



BROAD AGENCY ANNOUNCEMENT (BAA)

FORCEnet Science and Technology (S&T)

GWOT Focused Tactical Persistent Surveillance

INTRODUCTION

This publication constitutes a Broad Agency Announcement (BAA) as contemplated in Federal Acquisition Regulation (FAR) 6.102(d) (2). A formal Request for Proposal (RFP), solicitation, and/or additional information regarding this announcement will not be issued.

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I. GENERAL INFORMATION

1. Agency Name -

Office of Naval Research

2. Research Opportunity Title -

Technology for FORCENet Science and Technology (S&T) – GWOT Focused Tactical Persistent Surveillance

3. Program Name -

FORCENet Science and Technology (S&T) – GWOT Focused Tactical Persistent Surveillance

4. Research Opportunity Number -

BAA 07-014

5. Response Date -

White Papers: 05 June 2007

Oral Presentations: 23 -27 July 2007

Full Proposals: 31 August 2007

6. Research Opportunity Description -

Synopsis: The goal of the Global War on Terror (GWOT) Focused Tactical Persistent Surveillance program is to develop and demonstrate measurable advances in sensor technologies, tags and taggants, and communications which enable sensor networks of unmanned vehicles and unattended ground sensors to rapidly respond to small unit intelligence requirements. This will be accomplished through sensing technology development and algorithms that can directly support expeditionary warfighting forces in the Global War on Terrorism (GWOT). GWOT Focused Tactical Persistent Surveillance sensors are envisioned to operate in a net-centric environment¹ providing support to expeditionary forces to carry out the warfighting philosophies of the Marine Corps², Special Operations, and the Naval Expeditionary Combat Command (NECC). ONR seeks to develop the next generation of tactical sensing capabilities for Expeditionary forces. Data collection from sensors will be integrated into emerging net-centric Navy and Marine Corps Command & Control and Intelligence, Surveillance, and Reconnaissance (C2 and ISR) acquisition programs and Distributed Common Ground System (DCGS) through a Service Oriented Architecture (SOA)³. Sensor network communications technologies will also be designed to integrate both ground and relevant naval unmanned vehicle systems such as the Marine Corps Tier II UAV.

6.1 Operational Requirements

In today's asymmetric threat environment, it is critical that small units be able to rapidly and reliably task sensor networks to collect information, track entities, and provide actionable intelligence. Expeditionary fighting forces are highly trained fighting forces. This force needs the direct support of tactical sensor feeds that can automatically alert and warn the Naval forces of impending dangers but require tailored support to ensure that they are not overwhelmed with the volume of unprocessed sensor data. Providing sensors at the lowest tactical level that are agile is essential in fighting the asymmetric threat. Sensors must be able to be networked, be able to share data, cue other sensors, process algorithms, have an on-board processing capability, be of small size, weight, and power (SWAP), forward data when required, conserve power, and work autonomously with both ground, ship, and UAV-mounted sensors.

The requirement for a multi-mission capable networked sensor field comes from the need to support persistent surveillance, and multi-INT collection for Expeditionary Operations. Persistent surveillance is needed for operations against an asymmetric threat that requires the

¹ Netcentricity based programs and concepts include FORCEnet, Distributed Common Ground System (DCGS), DoD ISR Enterprise, MCISRE, etc.

² Marine Corps' warfighting philosophy is Distributed Operations (DO). DO is based on decentralized command and control, decentralized decision-making and execution, highly trained small unit leaders, and empowered decision makers at all levels down to the small unit leader.

³ The SOA that is applicable to technology development of the Program is the Navy (PEO C4I and Space) and Air Force Electronic Systems Command Netcentric Enterprise Solutions for Interoperability (NESI). NESI provides implementation guidance, technical criteria and reusable software components that can facilitate the design, development and usage of information systems that support Net-Centric Warfare. These are available at <http://nesipublic.spawar.navy.mil/>

effective monitoring of activity everywhere at once, all the time. The enemy may appear anywhere at any time; therefore, expeditionary forces must monitor a large area continuously in order to identify potential threats and take action to prevent them. Due to the dynamic nature of the battlefield, small units will need to rapidly re-allocate and re-task unmanned platforms and ground sensors to support time-critical intelligence needs. Technology sought in this BAA will develop the next generation of sensors and enable sensor networks to rapidly and reliably respond to small unit intelligence needs.

A record of the previous minutes, hours, or days may indicate where the enemy came from and where they went. Expeditionary forces will use this data to track insurgents down. No one sensor-type can be everywhere at once and a small number of mobile and static sensors will leave inevitable gaps in coverage. Therefore, a large number of sensors must be networked together at the tactical level to achieve persistent surveillance over a large area. A large number of autonomous sensor modalities can assist expeditionary force warfighters in investigating suspicious activity when it occurs.

Today's asymmetric threat drives the need for multi-INT sensors from many modalities. Cold war magnetic or acoustic sensors could usually identify a T-72 tank with a single type of sensor modality. However, a terrorist cannot be identified with a single type of sensor. More modalities are needed to identify the threat and that means more sensors and sensor types. Further, the multi-INT data needs to be brought together (networked) in the SOA in order to fuse it for timely battlefield awareness. ONR is seeking to develop the next generation of sensors and sensing capabilities.

This program will address the current shortfalls summarized by the following:

- Tactical sensor systems are not networked to each other
- Tactical units at the lowest echelon (team, squad, boat, patrol) now receive little or no intelligence of value because they have very few to none organic ISR assets under their control
- Fielded sensor modalities (operating modes or types of sensors, such as acoustic or imaging) have not been optimized against mission requirements
- Tactical netted sensor networks have not been defined
- Expeditionary forces have limited tagging and tracking capability; they have no capability to store historical track data
- Tags and taggants are often awkward to administer or adhere, are too big, and have limited use

This program will provide the sensors, tags/taggants, and sensor communications for evolving Naval/Marine Corps persistent ISR programs of record.

6.2 Program Goals

The goal of the GWOT Focused Tactical Persistent Surveillance program is to develop multi-INT sensors, tags/taggants for tracking and locating entities of interest, and sensor communications technologies to provide battlespace awareness (BA) and alerting at the lowest tactical levels (i.e., team, squad, patrol, etc). The objective is to provide Expeditionary forces with the sensing and tracking capabilities needed in irregular warfare against an asymmetric threat. Conventional warfare sensors have limited use in today's environments and changing missions. New sensors and tags are needed to support these missions:

- 'Line' surveillance and defense along roadways, pipelines, rivers, etc
- 'Point' defense and surveillance at check points, roadblocks, etc
- Forward Operating base (FOB), port, landing zone, area surveillance and protection
- Broad area surveillance up to 25 kilometers
- Unattended building monitoring and surveillance in urban environments
- Urban and littoral sensing
- Detection of weapons and arms caches
- Pre-deployment sensing before an assault or mission, in support of mission planning
- Tagging and tracking of high value entities, objects and vehicles

The capability transitioned to evolving and current programs of record (PoR) will provide the next generation of tactical sensors that are autonomous and have the capacity for on-board algorithm processing, networking and reporting.

The research will develop sensor technologies to perform in the NESI SOA environment, when applicable, to provide users with automation for intelligent management of sensing resources, and timely processing of multiple sources and sensors to support user's mission needs.

Three separate product areas are envisioned: sensors (ground and UAV-mounted), tags/taggants, and sensor communications

6.3 Program Product Areas

The GWOT Focused Tactical Persistent Surveillance program has a primary focus to develop and demonstrate the next generation of sensing and tracking technologies that will function with current and evolving PoRs that field capabilities utilized by units at the tactical level. These sensing and tracking technologies will function in a net-centric enterprise Service Oriented Architecture environment, when applicable, to provide users with automation for the intelligent management of sensing of multi-INT resources and reporting of data in near real-time (NRT) to support the user's mission needs against an asymmetric threat. The program will develop smart agile sensors that can process data and the capability to tag and track entities of interest.

Intel must now detect, classify, identify, geolocate and track low level entities in urban/littoral clutter. With respect to tactical sensor fields, adaptability and networking matters, numbers count, and organic control at the lowest tactical level drives tactical speed. ISR must support the current agile tactical operations and planning support with tactical speed, agility, and depth.

The program is structured around the following thrust areas:

- Developing smart agile tactical sensors capable of fulfilling specific expeditionary mission objectives. Sensors must have small size, low weight, and low power consumption (SWAP).
- Developing smart tags and taggants to track and locate entities of interest, tag readers, and algorithms that can characterize normal and suspicious tracks
- Creating a communications architecture for the tactical sensor network

ONR Program Linkages: Offerors should note that advanced sensor hardware to see through walls will not be designed or developed under this program, but under the Transparent Urban Structures (TUS) program. In addition, sensor fusion software and SOA services will be developed under the Large Tactical Sensor Program (LTSN). However, the sensors developed under this BAA may impact work done under LTSN (the development of smart algorithms for sensors, data and metadata standards, etc).

6.4 Detailed Product Area Descriptions

The following detailed product area descriptions are provided to give potential offerors insight into the scope of the problem and the technical effort needed to address it. The product areas may be used by Expeditionary forces in various configurations depending on mission requirements.

As an example of missions and their detectable features the following Table 1. is shown with examples of missions, detectable features, and the sensor modalities that may be able to do the sensing and detections of the asymmetric threat. This BAA does not intend to limit the selection of sensor modalities that the Offeror may wish to propose, but the development of new agile sensors should be tied to detection of some feature and an operational need to support different missions.

Intelligence sources may include Signals Intelligence (SIGINT) that includes Electronic Intelligence (ELINT) and Communication Intelligence (COMINT). Sources may also include Imagery Intelligence (IMINT), Ground Moving Target Indicator (GMTI), Open Source (OSINT), Human Intelligence (HUMINT) and Measurement and Signatures Intelligence (MASINT). Organic sensors may include those in common use by tactical forces (e.g., radar, electro-optic and infrared (EO/IR), Electronic Surveillance (ES) electromagnetic identification (EMID), acoustic, and non-acoustic) and may be deployed on air, ground, surface, or unattended platforms.

Mission	Detectable features	Examples of Sensor Modalities
Persistent surveillance of a 25 km radius (area of interest/ influence)	Personnel / vehicles within area, communications, weapons fire	Open source, EO/IR, THz, ESM/Collection, UWB Radar
Persistent and pervasive surveillance of a 5 km radius (area of responsibility)	Personnel / vehicles within area, communications, weapons fire	EO/IR, THz, Microphone Acoustic, ESM/Collection, Radar, Biometrics, EMID
Key facility defense (point)	Approaching personnel / vehicles, presence of weapons / explosives	EO/IR, THz, Radar, Biometric, EMID
Infrastructure protection (lines of communication incl roads, rivers, pipelines, powerlines)	Personnel and/or vehicles in vicinity of infrastructure, change detection, vessel movement on rivers	EO/IR, Radar, THz, ESM/Collection, Sonar, Magnetic
Surveillance of points of ingress/egress	Terrain features, personnel / vehicles within area, communications	EO/IR, Radar, ESM/Collection, Sonar, EMID, Magnetic
ISR coverage over a highly agile (maneuver and mission) force	Terrain features, personnel / vehicles within area, communications, weapons fire	Open source, EO/IR, THz, ESM/Collection, UWB Radar
Persistence against a fleeting target of opportunity	Terrain features, personnel / vehicles within area, communications, weapons fire	Biometrics, EMID, EO/IR, ESM
Check point	Personal biometric signatures, vehicle / material signatures	EO/IR, THz, Biometric, EMID, Radar
Surveillance of enemy facilities	Personnel inside, personnel entry/exit, communications, infrastructure/utilities use, substance detection	Radar, EO/IR, THz, ESM, Collection
Detection of objects and substances of interest (IED / chemical defense)	Chemical composition of substances, delivery/emplacement methods	THz, Associated particle, Chemical
Detection of suspicious behavior	Movement patterns, communication patterns, relationships, physiological stress levels	Open source, Chronicling, Collection, Biometric, Radar
Detection of gun shots	Acoustic report, muzzle flash, projectiles in flight	Radar, EO/IR, Microphone Acoustic, Radar
Hobby UAV defense	Engine noise (gas engines), power controller electrical noise (electric engines), radio link, possibly visual signature	Microphone Acoustic, ESM, EMID, Radar (non-penetrating)
Enhance effectiveness of HUMINT collection	Anything a human can directly observe	Open source, EO/IR, THz, Chronicling, Biometric, Microphone Acoustic, ESM, Coll, Radar (penetrating, Chemical

Table 1. Representative Mission Scenarios

6.4.1 Agile Sensors for GWOT Focused Tactical Persistent Surveillance

The development of multi-INT agile sensors for expeditionary forces must clearly meet the new ISR paradigm for the asymmetric threat. Intel must detect, classify, identify, geolocate, and track low level entities in urban/littoral clutter. To support the GWOT missions, organic sensors for low-level units must be capable of supporting the dynamic character of modern operations from the highly mobile to the long term. These sensors and systems will be rapidly mobile and deployable even in denied areas; capable of sustained, persistent operation, diverse in sensing modalities; inexpensive enough to be procured in very large quantities; small and light enough to cause minimal logistical impact; easy to use, networked and interoperable in a DCGS-based ISR enterprise.

Multi-INT tactical sensors organic to tactical units will greatly enhance situational awareness and drive a transformational increase in tactical speed against an asymmetric threat. To support a tactical user, sensors must be capable of detecting observable features of the GWOT threat (Ref Table 1) and have very modest SWAP characteristics. The following Table 2 depicts the sensor field metrics for this program.

Parameter	Description	Value
Area Coverage	Size of area that a Company-level unit's organic sensors can cover	25km radius
Modality Diversity	Number of different sensing modalities available at any point within the coverage area	3
Mobility	Average unit movement speed that the sensor network can keep up with	100 km/hr short term; 250 km/day long term
Penetration	Distance into enemy-controlled territory that sensor coverage can be projected	20 km
Operator MOS	Required operator specialty training / career field	Usable by non-intel MOSs
Maintenance	Routine maintenance required	None
Sensor Cost	Average cost of individual sensors / sensor platforms	\$300 (non-mobile platforms); \$5000 (mobile platforms)
Sensor Weight	Average weight of individual sensors	1 lb (non-mobile platforms); 5 lb (mobile platforms)
Operational Endurance	Duration that a Company-level unit can independently sustain ISR operations with organic sensors	30 days
Interoperability	Ability to exchange information with other units/systems	Interoperable with DCGS Integration Backbone (DIB)
Probability of Detection	Probability of detecting phenomenon of interest when present	95%
Probability of False Alarm	Probability that a phenomenon will be indicated as present when not actually present	5%

Table 2. Sensor Field Metrics

All sensor modalities developed under this program should have on-board processing for increased functionality. Algorithms being developed under the ONR Large Tactical Sensor Network program may be employed on some of the following smart sensors.

6.4.1.1 The following defines the desired sensors capabilities for ground/littoral sensors:

Desired Capabilities:

Sensor 1: EO/IR sensor package (<1 lb). Capabilities: Area surveillance day/night with enough resolution to cue a high resolution pan/tilt/zoom camera to identity objects of interest. Several cameras may be tasked to work cooperatively in tracking an entity. Smart video sensors will have the capability to process algorithms that will detect people and things, pass metadata, sensor feed, location of object, time observed, and classification and identification of object.

Sensor 2: EO/IR sensor package (< 10 lbs). Capabilities: Broad area surveillance day/night, objective 300x optical lens or better, facial recognition at .5 mile or less, people recognition at 5 miles, pan, tilt, HD TV, wide area to narrow view. Smart video sensors will have the capability to process algorithms that will detect people and things, pass metadata, sensor feed, location of object, time observed, and classification and identification of object.

Sensor 3: Biometric/IO Exploitation Package (<1 lb). Capabilities: Man-portable real time machine language translation and speaker identification for audio, video, and multi-media exploitation.

Sensor 4: Multi-modality Chem/Bio/Weather Nano-sensor Package (<2 lb). Capabilities: Multi-INT sensor capable of collection, identification, and correlating emissions from chemical and biological events. Package should have low power requirements.

Sensor 5: Acoustic Sensor Package (<3 lbs). Capabilities: Floating, tethered, maritime acoustic array for detecting fast moving boats and monitoring vessel traffic in rivers and around ports. On board processing capable of alerting on certain types of boats (acoustic signatures).

Sensor 6: Biologic-hosted Sensor/TTL capability: combined EO/IR audio sensor package for small biologics. Package must be light enough and safe enough to allow the carrier to complete prolonged mission of several hours duration.

Sensor 7: Multi-function Sensor Package: Combines multiple optics such as VIS, IR, UV optics to allow for background subtraction, automated moving target indication, entity detection and tracking, automated surveillance, object recognition, may be capable of 3D range imaging.

Sensor 8: Multi-function Urban Sensor Package (<3 oz) Leave behind sensor for monitoring unattended buildings, detects people and explosives, mote-sized or smaller, combines multiple sensor modalities for entity detection, presence of chemicals and munitions, automated surveillance, GPS, provides alerts, networked up to 2,000 urban sensors, self organizing, persistent surveillance.

Sensor 9: Passive Terahertz (THz) Imager Package (<1 lb) Capabilities: Handheld, wall mounted or vehicle mounted imager that can detect weapons and explosives through clothing of person or persons in a crowd. Used on patrols, checkpoints. 100m standoff capability desired. C320x240 pixels or better.

Sensor 10: Active Terahertz (THz) Imager Package (<5 lb) Capabilities: Detecting specific materials through clothes or metal. Sample target excited and emissions spectrum analyzed to detect explosives and other materials of interest. Algorithms must be developed for material identification.

Sensor 11: RF Sensor Package (1 lb). Capabilities: Detect and locate extremely weak unintentional radiated emissions at long distances.

Sensor 12: Multi-biometric Sensor Package (5 lbs) Capabilities. Collect multiple identifiers for people at checkpoints (retinal scans, heart rate, fingerprint, photo, license plate of vehicle) for processing.

Sensor 13: Acoustic Sensor Package (1 lb) Capabilities: Acoustic sensor for separating dialect differences. Classify dialect to area or region (e.g. Takrit or Baghdad) Provide acoustic tagging to a specific voice print. Requires on-board processing capability.

Sensor 14: Chemical/Explosives Sensor Package (non-CBRN) (<3 lbs): Capabilities: Hand held device for remote sensing, detection and identification of unique chemicals.

Sensor 15: Tactical Radar Package (< 5 lb) Capabilities: Small, low cost radars detecting dismounts and vehicle movement in urban areas, can use sensor as trip wires or for 360 degree surveillance. Sensor rotates for optimal area coverage; used for point defense, area protection, flank protection, hobby UAV detection, or other missions. Radar can tip EO/IR cameras for identification and classification of person, animal, vehicles. May use low cost Distributed Autonomous System (DAS) multistatic radar capable of detecting and tracking moving targets (including NLOS targets) such as dismounts and vehicles in urban-canon high-threat environments.

Sensor 16: Acoustic Counter-Sniper Package (< 1”x1”). Capabilities: Miniature sensor for detecting and locating counter fires, provides range and direction of fires. Identifies sound signatures for mortars, small arms, indirect fires; networked to relay appropriate alerts; also air droppable, hand emplaced, or body worn. Detect and locate incoming fire and guide return fire; 360° coverage.

Sensor 17: Counter-Sensor Sensor Package Capabilities: Provides location of insurgent sensors and optics within 1000m. Built in scope or hand held device. Sensor must discriminate whether friend/foe.

Sensor 18: Biometric “Lie Detector” Sensor (< 1 lb) Capabilities: Hand held and standoff device determines state of a person, level of agitation. Can use at check points in stand off mode or hand held during interrogations. Detects stress state at 30m; blood and pulse may be detected by IR; pulse and respiration at 30m using UWB.

Sensor 19: Open Source Sensor Package. Sensor that can translate open source material into structured data entries. Automated search tools automatically recognize entities of interest and information of interest, translate information into structured data entries.

Sensor 20: Magnetic Sensor Package (< 1 lb) Capability to detect weapons using magnetic fluxgate technology to increase sensor sensitivity and stand off range. Small and very inexpensive. Can send alert when weapon is detected. May use magnetic fluxgates sensor.

Sensor 21: Seismic Sensor Package (< 2 lb). Capability to sense ground vibration, has enough sensitivity to be able to identify vehicles and people, provides GPS location. Hand emplaced or air droppable.

Sensor 22: Terahertz Wand Package (< 4 lbs) Light weight wand to screen people at checkpoints for explosives and weapons.

Sensor 23: Sonar Sensor Package (<4 lb) Small floating, tethered sensor for detection of underwater objects. Can be emplaced off the side of a boat or air dropped.

Sensor 24: Electro Magnetic ID (EMID) Sensors/Tags (<3oz) Sensor detects emissions from vehicles (ignitions systems, alternators, control electronics to create unique signatures for tracking in urban environment, onboard processing to identify make/model, networked, can queue other sensors for tracking.

Sensor 25: Electronic Support Measures (ESM) Sensor Package (<1 lb). Capabilities: SIGINT sensor package capable of intercepting, identifying, correlating RF from 30 MHz to 6 GHz. Package should have a low power consumption and modular design for supporting UAV, UGS, surface, and man-portable operations. Broad area full spectrum survey and collection, detect active frequencies, catalog and ID frequencies, remotely program sensor to collect certain frequencies.

Sensor 26: Advanced Warning Sniper Sensor/EO/IR Package (<2 lb). Capability to detect/alert Marine of potential snipers, cues high resolution pan/tilt/zoom camera for a closer look, active or passive sensor, small enough to wear on one member of a squad or to be placed in the vicinity of a squad. Sensor package may include the camera or be capable of cueing a camera for the same results.

6.4.1.2 The following defines desired sensor capabilities in mobile/self propelled ground sensors:

Desired Capabilities:

Mobile Sensors 1: Sensor Mobility/TTL capability. Capabilities: artificial mobility capability with carrying capacity of at least 5 lbs., capable of moving in the horizontal and vertical directions on dry and wet walls, steel, and fiberglass.

Mobile Sensors 2: Sensor Mobility capability. Capabilities: artificial stimulus and response capability permitting the control of small biologics. Package must be light and safe enough to allow the carrier to complete a mission if several hours duration.

Sensor Mobility 3: Mobile Combined Multi-INT Sensors. Capabilities: Detection, identification, classification, of threats, sends immediate alerts, sensors may be hand held, tossed, mounted on robots, provides immediate situational awareness, networked, GPS for targeting, 1000m standoff capability.

6.4.1.3 The following defines the desired sensor capabilities for UAV-mounted sensors.

The Tier II UAV has different weight (payload) restrictions. The sensors depicted below are proposed for the Tier II UAV which will have a 3000 ft. operational altitude. The Tier II UAV total payload is approximately 20 pounds with the first payload allocated approximately 15 pounds and the second payload allocated approximately 5 pounds. The Tier II will collect only unclassified information. A separate ground station may be needed as an option for processing data and storage for SIGINT payloads.

It is expected that the Tier II UAV will employ the Common Data Link (CDL) per OSD⁴.

A concept demonstrator (approximately 20 pound payload) may be available for testing the following sensor prototypes.

All sensor weights below are target weights.

⁴ Footnote on current systems. All airborne ISR platforms have been directed by OSD to use KU band Common Data Link (CDL). True Omni antenna to Omni antenna have an effective range of 2NM at data rates of 10.71 mbs. The current EO/IR sensors tend to use MPEG-2 framing format and uses approximately 8 mbs of the total bandwidth for sending IMINT files. This leaves 2 mbs of bandwidth for the 2nd payload sensors. MPEG-4 (H.264) is an acceptable compression format which will generate more available bandwidth for the secondary sensors.

As an option a secondary antenna can be added to increase the range or use other frequencies but the weight will come out of the estimated 5 pound payload for the 2nd sensor. Note that the range for the Ku band omni antenna is only 2 NM but a directional antenna on the ground significantly increases effective link range.

Desired Capabilities:

Payload 1: IMINT Sensor Package (<15 lb) capabilities: High performance dual EO/IR sensor package, laser designator (preferred), laser pointer required, targeting quality, GPS coordinates with target location error (TLE) of 10 meter required and <3 meter objective; 15 pound and under, low power consumption, automatic tracking, capable of change detection.

Payload 2: IMINT Sensor Package (<15 lb) capabilities: 4-band EO/IR sensor that provides phenomenology for aided target recognition and change detection, broadband LWIR for buried objects and situational awareness, high-pass LWIR for disturbed earth detection, Near-IR for vegetation rejection and recently disturbed earth, and Visible for surface objects, vegetation, and situational awareness. For the EO band, a 1cm ground sampling distance is achieved at 1 mile standoff, allowing for automated image processing.

Payload 3: SIGINT Sensor Package (<5 lb) capabilities: SIGINT sensor package, plug and play payload, low power, minimized antennae, target area: 1) Full spectrum broad area survey and collection, 2) geolocation in real time; 3) cross-cueing EO/IR ball for immediate tactical payoff, 4) full spectrum survey/specific collect capability to collect on targets of tactical interest. Objective sensor should have flight tunable receivers that enable rapid re-tasking during flight operations.

Payload 4: SIGINT Sensor Package (<5 lb) capabilities: SIGINT sensor package and communications relay included, plug and play payload, low power, minimized antennae, target area: 1) Full spectrum broad area survey and collection, 2) geolocation in real time; 3) cross-cueing EO/IR ball for immediate tactical payoff, 4) full spectrum survey/specific collect capability to collect on targets of tactical interest. Objective sensor should have flight tunable receivers that enable rapid re-tasking during flight operations.

Payload 5: SIGINT Package (<5 lb). Capabilities: SIGINT sensor package and communications relay included, enable (on/off) NSA Type I encryption for on-board processing, plug and play payload, low power, minimized antennae, target area: 1) Full spectrum broad area survey and collection, 2) geolocation in real time; 3) cross-cueing EO/IR ball for immediate tactical payoff, 4) full spectrum survey/specific collect capability to collect on targets of tactical interest. Objective sensor should have flight tunable receivers that enable rapid re-tasking during flight operations.

Payload 6: Communications Relay Package. Capabilities: (See 6.4.3.1 Comms 3 **GC-T (Gateway Comms -Terrestrial)**) Capability of troops to talk to the UAV controller/sensor controller by voice. Additional functionality would be a microphone interface needed on each end; be able to support battlefield relevant tactical communications (EPLRS and SINCGARS); for targeting, share an image between target designator and Forward Air Controller (FAC) to guide munitions to target, target area on map shared at both ends for real time collaboration.

Payload 7: TTL Package (<5 lb) capabilities: Track all tagged entities of interest in area, GPS coordinates, and track creation for storage. Dynamic optical tag reader, laser interrogator, on

board processing and storage (1MB or more) of tag locations, time, and tag ID to create tracks. Also provide hand held version of tag reader.

Payload 8: SIGINT sensor/TTL Package (<5 lb). Capabilities: Automated collaborative geolocation of RF emissions. Package should have low power consumption and modular design supporting UAV, UGS and manportable operations. Objective sensor should have tunable receivers that enable rapid re-tasking during operations.

Payload 9: SIGINT Package (< 15 lb). Capabilities: SIGINT sensor package and communications relay included, NSA Type I encryption for on-board processing, plug and play payload, low power, minimized antennae, target area: 1) Full spectrum broad area survey and collection, 2) geolocation in real time; 3) cross-cueing EO/IR ball for immediate tactical payoff, 4) full spectrum survey/specific collect capability to collect on targets of tactical interest. Objective sensor should have flight tunable receivers that enable rapid re-tasking during flight operations. Must work with Payload 10.

Payload 10: IMINT Sensor Package (< 5 lb) capabilities: High performance dual EO/IR sensor package, laser designator (preferred), laser pointer required, targeting quality, GPS coordinates (TLE) with 10 meter required/3 meter objective, low power consumption, automatic tracking, capable of change detection; receives cross-cueing from SIGINT Payload. Must work plug-and-play with smaller IMINT payload such as Payload 9.

Payload 11: MASINT Sensor Package (< 15 lb) capabilities: SAR provides persistent surveillance up to 25 km, 2-D & 3-D Stripmap L-Band SAR Detect military targets under foliage, inside some buildings, some ground penetration, vehicles and dismounts. Provide static change detection.

6.4.2 Tagging, Tracking, and Locating

A tag has the ability to monitor enemy movement and track entities, objects, and noncombatant forces in real time. A track has the ability to provide situational awareness of adversary activity, use of infrastructure, and key enemy nodes. Locating tags/taggants provides the tactical commander with actionable intelligence in planning and execution of broad mission areas. Each tag/taggant will require a tag reading capability, and a methodology to create track with time and location information. Further, analysis/algorithms for level one fusion data integration of the new data sets and algorithms that can characterize tracks are necessary to process tracks for a historical perspective and further data manipulation.

The expeditionary forces will employ a variety of tags and taggants against GWOT threats dependent upon the mission. In order to optimize the use of tags/taggants, there are several desired capabilities to have a robust tagging and tracking capability.

Tagging, Tracking, and Locating capabilities:

- a) Tags/taggants that can be applied to cooperative and non-cooperative targets
- b) Tag/taggant readers that can clandestinely be inserted into an area of interest in numbers necessary to achieve track continuity
- c) Miniaturization of tags to button size and smaller
- d) On-board processing capability on tags Real time tag plotting capability to create tracks – Marine can have instant situational awareness of area tagged entities/vehicles while walking around
- e) Remote tag emplacement capability
- f) Signatures detection to identify unique vehicles and people
- g) Communications coverage to read tags over distances up to 1000m
- h) Algorithms that can remotely identify untagged specific persons and or vehicles
- i) Algorithms that can characterize (normal or suspicious) tracks of indigenous hires
- j) Data integration of secondary identifiers such as biometric, license plates, etc
- k) Active tags and reader that can work indefinitely on ambient power
- l) Hand held tag readers for dismounts at 500-1000m
- m) Tag power conservation to last up to 6 months
- n) Increase range to > 2 km

6.4.2.1 Tags/taggants that can be applied to cooperative and non-cooperative targets

Desired Capabilities:

Tag 1: Optical Tag Package:: easy to adhere, near invisible to the eye, provides geolocation of the tag, long battery life or energy source, undetectable emissions, stand-off reader up to 1000m. Smart optical tags incorporate onboard sensors (GPs, Mic, and camera) and processing capability to transmit GPS coordinates, speed and heading, Mic for transmitting audio, camera for

transmitting streaming video optically or by RF over areas greater than 2 km. Tag reader can locate tags at standoff, receive geo-reference, and create time, location, and entity/object track for processing. Identification of tracked object may be encoded in tag identification, is capable of both RF and covert optical data transmission.

Tag 2: Passive Optical Tag Package: Narrow band retro reflective, polarized tags for specific laser illuminators.

Tag 3: Data Capable Optical Tags: Optical tags are capable of sending and receiving data. Low bandwidth versions can optically send any discrete ASCII message such as serial number, GPS location, text message; high band versions can send streaming video and audio farther than 2 km.

Tag 4: Optical Taggant Package. Capability for tracking using a chemical spray that produces a non-toxic spectral 'barcode'. Optical tag reader to provide track data, time, location, tag identifier.

Tag 5: RF Sensor Reader/DRFM Package (1 lb). Capabilities: Using digital radio frequency memory (DRFM) as a tag reader.

Tag 6: Multi-spectral tag and reader.

Tag 7: Tag/taggant that can provide an alert/or change color when tag/taggant comes within range of explosive materials.

Tag 8: Taggant spray for large area coverage, border, non-toxic.

Tag 9: Taggant spray for highway shoulders, long duration, non-toxic, that would indicate patterns where dirt was disturbed.

Tag 10: Dual use taggants that can be used for tracking entities and can change color when tagged object comes in contact with vapors of interest.

Tag 11: Maritime tag readers (<3 lbs). Capabilities: Floating, tethered, maritime tag reader for detecting tagged entities and boats in rivers and around ports. On board processing capable of alerting on certain types of tags.

6.4.3 Communications of Sensors and Tactical UxVs

Timely and efficient sensor communications will be critical to GWOT and MDA operations, among others. The purpose of this program is to develop low-cost networked sensor communication technologies that operate under a variety of sensor modalities, platform mobility and challenging RF environments. The primary objective is to develop reduced SWaP (size, weight and power) transceiver, antenna and beam forming/steering technologies including advanced modulation and coding, for distributed sensors, gateways, UxV⁵ and ISR platforms. Ad-hoc networking solutions are anticipated to be leveraged (from commercial and other DoD programs) and integrated (not exclusively developed) in this program to enable seamless connectivity and reachback from the sensors to the destination data fusion/C2 nodes and the GIG.

In today's asymmetric threat environment, it is critical that small units be able to rapidly and reliably task sensor networks to provide actionable intelligence. Expeditionary fighting forces are highly trained. This force needs the direct support of tactical sensor feeds that can automatically alert and warn the Naval forces of impending dangers.

Extremely energy efficient and very small form factor data links and antennas will be critical for small sensors and UxV communications, both for mission endurance and the tactical constraints under which they may operate. At the same time, an uninterrupted and clear tactical common operational picture requires communications between sensor and C2/ISR nodes that is secure and reliable, with adequate bandwidth to support a variety of applications. The security of data transfer is not expected to be as severe as in, say, C2 information exchange, but will encompass a reasonable degree of COMSEC/TRANSEC and LPI/LPD/AJ to reduce overall system vulnerability.

This program will address the current shortfalls summarized by the following:

- High cost and large size, weight and power of the communications package not consistent with small platform size, endurance and expendability desired in communications between tactical UxVs, and other ground and sea-based sensors
- Inability to establish and maintain local tactical sensor and UxV networks connectivity to higher echelons for BLOS and NLOS environments while on the move
- Lack of high bandwidth and inadequate range for raw sensor data (EO/IR) reachback
- Tactical sensor systems are not networked to each other or to small units of expeditionary force warfighters for seamless reliable operation

⁵ UxVs include UUV (Unmanned Underwater Vehicles), USV (Unmanned Surface Vehicle) and small tactical UAV (Unmanned Aerial Vehicles). Small UAVs refer to airframe sizes of about 10'x10' or less, carrying total payload between 5 and 15 lbs.

This program is aligned with the evolving Naval/Marine Corps persistent and pervasive ISR thrust. It will develop low-cost networked sensor communication technologies that operate under a variety of sensor modalities, platform mobility and challenging RF environments.

The primary objective is to develop low cost reduced SWaP (size, weight and power) transceiver, antenna and beam forming/steering technologies including advanced modulation and coding, for distributed sensors, gateways, UxV and ISR platforms. These will be addressing new hardware technologies, algorithms and protocols.

Ad-hoc networking solutions are anticipated to be leveraged (from commercial and other DoD programs) and integrated (not exclusively developed) in this program to enable time-critical data exfiltration, relay and reachback from sensors to the ISR data fusion and C2 nodes. These are anticipated to be COTS/open source based software/middleware solutions, albeit modified for this application, in addition to algorithms and protocols that improve overall network performance and efficiency, such as for characteristics of auto-configuring, self-organizing and re-organizing. The communications networking ability is based not only on their geographic dispersion, but also on the mission and tactical situation, including remote reconfigurability weighted towards those areas where it is most required.

A notional representation of this program's scope and purpose is represented in Figure 1 and Figure 2 and enumerated in Table 3. Encompassed within the FORCEnet construct, the program's goal is to reliably and securely convey any data/information from any node, to anywhere, at anytime. Shown are small tactical UxVs that link (i) to each other, (ii) to higher echelons (high flyers, satellites or ground vehicles/stations), (iii) to individual sensors and/or sensor gateways (floating or ground). In addition to collecting, processing, relaying the data obtained from the distributed sensor field to a C2/ISR data-fusion node of interest, the UxVs and/or the gateways may add additional payload from concurrent EO/IR that is onboard, thus substantially increasing bandwidth requirements. (Note the underwater distributed sensing and data collection/relay is not part of this BAA, although any surfaced UUV as well as USV communications with floating sensors/buoys/gateways and to airborne/space platforms is part of this program). Cost, size and battery life are major drivers in the physical hardware for the distributed sensors as well as small UxVs. At the same time, sea surface multipath, urban NLOS, horizon limited BLOS (as from a low flying UAV at altitude between 1000'-3000') and mobility are a few of the many challenges that need to be addressed while operating in both urban and littoral environments.

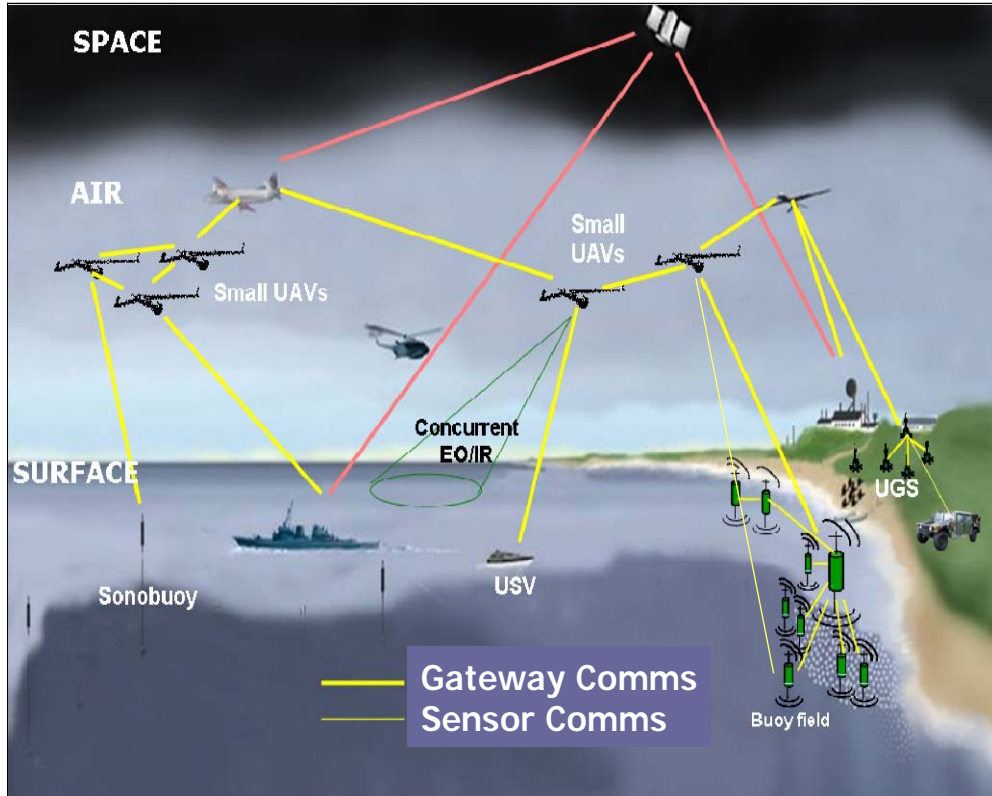


Figure 1: Communications for Networked, Distributed Platforms and Sensors

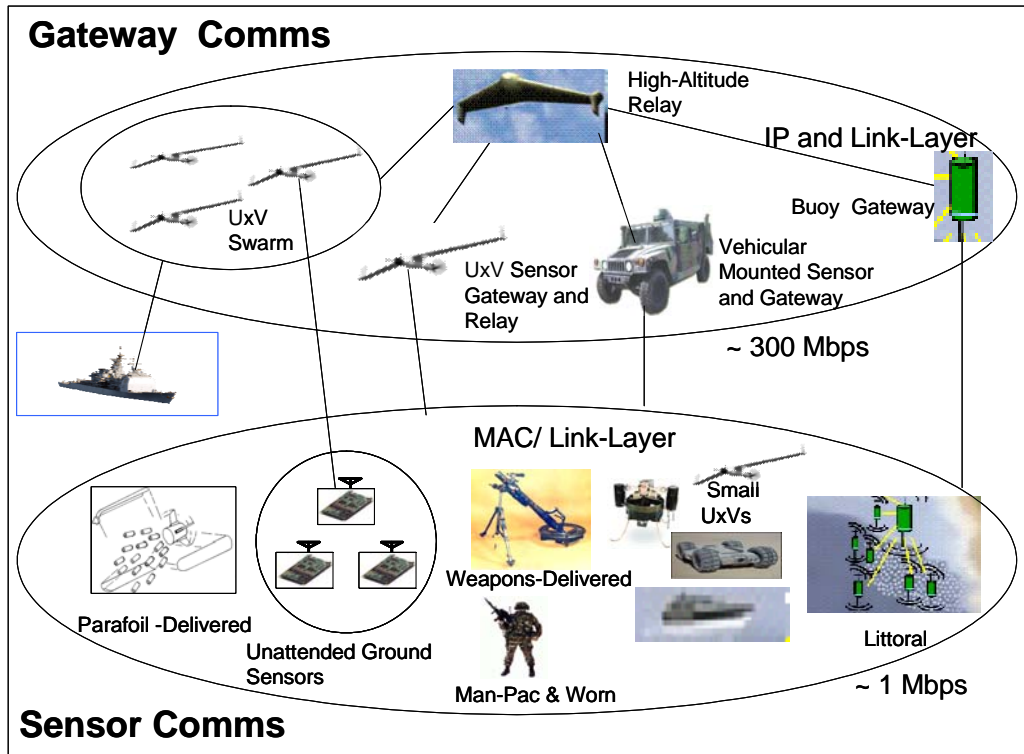


Figure 2: Communications Models for Networked, Distributed Platforms and Sensors Hierarchy

Platforms						
Comms Modalities	UGSs	Floating Sensors (Littoral, Riverine, etc)	Gateway ground nodes, Gateway buoys	UxVs	Vehicles, EFVs, and Towers	High-Flyers, High-Altitude Relays, Ground stations, ship
SC-N (Sensor Comms - Netted) [MAC, Multi-Hop, etc]	X	X	X	X	X	
SC-I (Sensor Comms - Interrogatory) [Optical Retro Reflectors, RF, etc]	X(MRR or RFQ)	X(MRR or RFQ)	X(INT)	X(INT)	X(INT)	X(INT)
GC-T (Gateway Comms -Terrestrial)			X	X	X	X
SATCOM**			X	X	X	X

Table 3. Comms Model - Platform Matrix

** Outside the scope of this BAA, but shown here for sake of completeness

UGS: Unmanned Ground sensor

MRR: Modulating Retro Reflector

RFQ: RF Queried

INT: Interrogator (INT)

The capability transitioned to evolving and current programs of record (PoR) will provide:

- Affordable communications link (transceiver, antenna) with size, weight and power consistent with platform requirements of small tactical UxVs, expeditionary fighting vehicles, and other ground and sea-based sensors
- Ability to connect and interconnect small unit local tactical sensors and UxVs to each other and to higher echelons (ships, ground stations) in many challenging environments (LOS, BLOS, NLOS, OTM, LPI/LPD)
- Provide high bandwidth for high resolution raw sensor data (EO/IR) reachback
- Reliable and seamless end-to-end networking of sensors to C2 and data fusion nodes.

The high-level technical approach taken in execution of this program involves leveraging both commercial and DoD technologies, as well as developing new technologies, and ultimately

integrating different data rate regimes under a common networking solution; this may include the following:

- Spiral Development to verify capabilities, waveforms, and networking on Software Defined Radio (SDR) platform and firmware upgrades
- Leveraging commercial components with well-charted path to ASICs for ultimate size, cost, power, performance goals.
- Leveraging existing DoD knowledgebase and know-how in projects sponsored by JTRS, DARPA, ARL, CERDEC, and ONR, in radio, directional antenna and mobile ad-hoc network technologies
- Bandwidth efficient modulation and coding to improve TCDL data rate and multipath performance, including evolving CDL to a system-on-chip
- Developing modulating retro-reflector technology for passive optical sensors
- Developing low cost directional antenna techniques for higher-gain performance in inter-UxV or UxV-gateway communications.
- If necessary, incorporate space and time diversity techniques for greater range, bandwidth and robustness

6.4.3.1 This program envisions the following regimes of communications data rates and applications.

Desired Capabilities:

Comms 1 SC-N (Sensor Comms - Netted): Within a UGS/floating sensor field and between these sensors to an access node, such as a gateway ground node, gateway buoy or an UxV etc.

- Nominal link data rate ~ 1 Mbps (Actual data throughput will scale down with number of nodes, but the design assumes state-of-art routing protocols), Range ~ 1km, SWaP* objectives (*not requirements*) of 10-50 cc, 0.1kg, 1-5W (peak), 65 mph, spectral range of interest (UHF and HF Groundwave)

Comms 2 SC-I (Sensor Comms - Interrogatory): This is on-demand data exfiltration either by optical modulating retro-reflector technology, or RF querying/localization.

- Nominal link data rate ~ 1-10 Mbps @ 1-10 km range, SWaP* objectives not specified although the interrogated sensor comms package should necessarily be smaller than those for netted comms above. The interrogator is on somewhat larger platform and not subject to specified SWaP.

Comms 3 **GC-T (Gateway Comms -Terrestrial)**:⁶ Within a geographically broad (theater) area involving relay/reachback of ISR data from sensor field and onboard UxV sensors to C2 nodes and the GIG. Example communication links include UxV to UxV, UxV to another access node such as a gateway ground node or gateway buoy, between gateways and ground stations/towers/EFVs/high flyers/ships etc. as shown in Fig. 2.

- Nominal link data rate ~ 300 Mbps (if networked comms, actual data throughput will scale down with number of nodes, the design assumes state-of-art routing protocols), Range ~ 30km, SWaP* objectives (*not requirements*) of 50-150 cc, 0.4kg, 10-20W (peak), 65 mph, spectral range of interest (2-5 GHz, Ku, and Ka bands)

*Size and weight values exclude battery (if any) and antenna and/or beam forming/switching elements.

Design specification ranges for spectrum, bit rate, distance, SWaP as provided above are preliminary. The offeror is expected to carry out independent system verification and engineering trade study to propose/address the optimal/effective operating regime vis-a-vis evolving requirements of small-platform UxVs and distributed sensors, technology maturity and affordability. Cost objective (in quantities) of \$50 or less for netted sensor comms package and \$500 or less for gateway comms package.

7. Point(s) of Contact -

**** Important Notices Regarding Questions****

- All Questions shall be submitted in writing by electronic mail.
- Questions and responses will be posted on the ONR web site at https://www.onr.navy.mil/02/baa/07_014/. No e-mail response will be provided.
- Questions presented by telephone call, fax message, or other means will not be responded to.
- There will be no meetings between potential offerors and ONR personnel.
- Questions regarding **white papers** must be submitted by 2:00 p.m. Eastern Time on Tuesday, 29 May 2007. Questions after this date and time may not be answered and the due date for submission of the white papers will not be extended.
- Questions regarding **oral presentations** must be submitted by 2:00 p.m. Eastern Time one week prior to the scheduled presentation. Questions after this date and time may not be answered and the date and/or time of the scheduled presentation will not be changed.
- Questions regarding **full proposals** must be submitted by 2:00 p.m. Eastern Time on Monday, 20 August 2007. Questions after this date and time may not be answered and the due date for submission of the proposals will not be extended.

⁶ Although CDL is the DoD mandated standard of airborne ISR sensor data, this program may explore and evaluate other low-cost high performance (such as netted connectivity instead of simple point-to-point and relay) solutions, in addition to generic CDL/TCDL antenna/waveform/terminal enhancements (such as beam forming, improved spectral efficiency, multipath mitigation and reduced SWaP)

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

Science and Technology Point of Contact:

Mr. Martin Kruger
Program Officer
Expeditionary Warfare and Combating Terrorism, ONR 30
Office of Naval Research
875 North Randolph Street – Suite 1160
Arlington, VA 22203-1995
E-mail Address: krugerm@onr.navy.mil

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

Business Point of Contact:

Mr. Chris Williamson
Contract Specialist, ONR 253
Office of Naval Research
875 North Randolph Street – Suite 1425
Arlington, VA 22203-1995
E-mail Address: williac@onr.navy.mil

8. Instrument Type(s) -

It is anticipated that all awards resulting from this announcement will be contracts, particularly cost plus fixed fee (CPFF). Contract awards will fall under the purview of the Federal Acquisition Regulation (FAR) and the Defense Federal Acquisition Regulation Supplement (DFARS).

9. Catalog of Federal Domestic Assistance (CFDA) Numbers -

N/A

10. Catalog of Federal Domestic Assistance (CFDA) Titles -

N/A

II. AWARD INFORMATION

Award Information is as follows:

- Total Amount of Funding Available: \$17M is available in FY08 for efforts over a 1-3 year timeframe. ONR plans to issue an annual BAA for this program. The total funding for the program is anticipated to be \$49M during FY08-FY12.
- Anticipated Number of Awards: 5-15
- Average Award Range in FY08: \$600,000-1,250,000
- Approximately \$4M out of \$49M will be set aside for participation by government labs.
- Proposed work should be structured for a one to three year period. Multiple-year proposals shall include a base performance period of twelve months with one or two 12-month options.

Proposals that build on current or previous DoD work are encouraged. Offerors enhancing work performed under other ONR or DoD projects must clearly identify the point of departure, what existing work will be brought forward, and what new work will be performed under this BAA.

III. ELIGIBILITY INFORMATION

Proposals from U.S.-owned or U.S.-based firms and U.S. colleges and universities will be considered for award under this solicitation. Privately managed Department of Energy (DOE) laboratories and other Federally Funded Research and Development Centers (FFRDCs) may bid in areas where they are uniquely qualified and if permitted under their sponsoring agreements.

Foreign entities may submit proposals under this BAA for unclassified/publicly releasable work if the proposed technology can be developed and demonstrated within that classification level.

Historically Black Colleges and Universities (HBCU) and Minority Institutions (MI) are encouraged to submit proposals and join others in submitting proposals. However, no portion of this BAA will be set aside for HBCU and MI participation due to the impracticality of reserving discrete or severable areas of FORCENet Science and Technology for exclusive competition among these entities.

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

IV. APPLICATION AND SUBMISSION INFORMATION

1. Application and Submission Process

(A) **Virtual Industry Day:** A Virtual Industry Day is available at https://www.onr.navy.mil/02/baa/07_014/.

(B) **White Papers:** White Papers are encouraged prior to submitting a full proposal. The due date for white papers is no later than 2:00 p.m. (Eastern Daylight Time) on Tuesday, 05 June 2007.

White papers will be evaluated to determine whether an offeror is encouraged to make an oral presentation of its white paper to a panel of government evaluators. The process for oral presentations is described below. Selection of white papers considered as being of “particular value” will be announced on or about Monday, 02 July 2007 by email. However, any such encouragement does not assure a subsequent award. Any offeror may submit a full proposal even if its white paper was not identified as being of “particular value”.

White papers must be unclassified.

(C) **Oral Presentations:** Oral presentations are tentatively planned for 23-27 July 2007. The Office of Naval Research will schedule an oral presentation for those offerors who have been notified by e-mail that their white paper technologies appear to be of “particular value” to the Navy. Any offeror whose white paper was not determined to be of “particular value” to the Navy or an interested party who did not submit a white paper by the May deadline can contact the Program Officer (see paragraph 7) to arrange to make an oral presentation along with the other scheduled offerors.

A detailed format for the presentation will be provided in the e-mail invitation. Each presentation will be no longer than thirty (30) minutes in duration. An additional ten (10) minutes will be allowed for questions (if any) from the panel of government reviewers. Those offerors whose technology is still considered as having “particular value” to the Navy will be encouraged to submit detailed technical and cost proposals. However, such encouragement after oral presentations does not assure a subsequent award. The Office of Naval Research will not reimburse travel costs and time for potential bidders to brief their proposals.

Oral presentations may be classified if the technology is sensitive and not releasable as unclassified or FOUO. Prior coordination with ONR’s Program Office is required to present a classified presentation.

(D) **Full Proposals:** An offeror may submit a full proposal without submitting a white paper or making an oral presentation.

The due date for receipt of full proposals is 2:00 p.m. (Eastern Daylight Time) on Friday, 31 August 2007. It is anticipated that final selections will be made on or about Friday, 05 October 2007. As soon as the final proposal evaluation process is completed, each offeror will be

notified via e-mail of its selection or non-selection for an award. Proposals exceeding the page limit may not be evaluated.

An offeror may submit a classified annex to the full proposal. Prior coordination with ONR's Program Office is required. The annex must fit within the 39 page limitation for the proposal.

2. Content and Format of White Papers/Full Proposals

The white papers submitted under this solicitation must be unclassified. The proposals submitted under this BAA are expected to be unclassified. However, a classified annex is permitted. Proposals will be protected from unauthorized disclosure in accordance with FAR 15.207, applicable law, and DoD/DoN regulations. Offerors are expected to appropriately mark each page of their submission that contains proprietary information.

Classified proposals must be submitted directly to the Technical Point of Contact (TPOC). Contracts resulting from the submission of a classified proposal will be 'unclassified.' An 'unclassified' Statement of Work (SOW) must accompany any classified proposal.

Summary: An offeror must submit a separate proposal for each of the capabilities described in Section 6.4 of this BAA if they wish to propose in more than one capability area. Some technologies may be classified or export controlled. Indicate on your UNCLASSIFIED white paper and/or proposal whether the technology is classified or restricted. Oral presentations may be given at the unclassified and classified levels. Full proposals may have a classified annex.

White Paper Format

- Paper Size – 8.5 x 11 inch paper
- Margins – 1” inch
- Spacing – single or double-spaced
- Font – Times New Roman, 12 point
- White papers are limited to ten (10) pages in length, as described below in the “White Paper Content” section.
- Copies – one (1) original, five (5) hard copies, and one electronic copy on CD-ROM (in Microsoft® Word or Excel 97 compatible or .PDF format).
- The White Paper should reference BAA 07-014 and identify the applicable program thrust area(s).

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

- Paper Size – 8.5 x 11 inch paper
- Margins – 1 inch
- Spacing – single or double-spaced
- Font – Times New Roman, 12 point
- Number of Pages – Volume 1 is limited to no more than 39 pages. Volume 2 has no page limitations. Limitations within sections of the Technical Proposal are indicated in the individual descriptions shown below. The cover page, table of contents,

abstract, executive summary, and resumes are excluded from the page limitations. Full Proposals exceeding the page limit may not be evaluated.

- Copies – one (1) original, 5 copies, and one electronic copy on a CD-ROM in either Microsoft Word or Adobe “.pdf” format.

White Paper Content

- **Cover Page:** The Cover Page shall be labeled “PROPOSAL WHITE PAPER” and shall include the BAA number, proposed title, technology interest areas addressed, Offeror’s administrative and technical points of contact, with telephone numbers, facsimile numbers, and e-mail addresses, and shall be signed by an authorized officer. This shall be one (1) page.
- **Abstract:** A very brief description of the technology including goals and objectives and technology areas to be addressed. This section shall be no more than one (1) page.
- **Technical Concept:** A description of the technology innovation, the Program thrusts addressed (described in Section I paragraph 6.3), and technical risk areas. This section may be six (6) pages or fewer. Include a detailed listing of the technical tasks/subtasks organized by year. Relate the product that results from the task/subtask and briefly state metrics that will be met as a result of the task/subtask. In addition, it should include a Statement of Operation Utility that clearly states what the proposed effort does for the warfighter. Not to exceed two (2) pages within the six (6) pages of the Technical Concept Section. A statement should also be made under each task where government facilities are proposed to be utilized.
- **Deliverables:** A detailed description of the results and products to be delivered. This section shall be no more than one (1) page in length.
- **Costs:** A one (1) page summary of costs segregated by both task and year. The research will begin on/about January 1, 2008.

Full Proposal Content

The Cost Proposal shall be separate and shall not be included with the Technical proposal. The Cost proposal CD-ROM shall be clearly labeled and separate from the Technical Proposal CD-ROM.

Volume 1: Technical Proposal

Volume 1 of the Full Proposal shall include the following sections, each starting on a new page. Sections not included in the page limitations are noted below. The page limit for those sections of the technical proposal that are constrained is thirty nine (39) pages.

- 1) **Cover Page:** (Not included in page limitations.) This should include the words “Technical Proposal” and the following:
 - a) BAA number;

- b) Title of Proposal;
 - c) Technology interest area to which the proposal is applicable and component of the Technology interest area if the proposal is limited to a Technology interest area component;
 - d) Identity of prime Offeror and complete list of subcontractors, if applicable;
 - e) Technical contact (name, address, phone/fax, electronic mail address);
 - f) Administrative/business contact (name, address, phone/fax, electronic mail address);
 - g) Duration of effort (differentiate basic effort and any options); and
 - h) The cover page must be signed and dated.
- 2) Table of Contents: Section, title and page numbers are required. (Not included in page limitations.)
 - 3) Abstract: (Not included in page limitations.) A brief description of the proposal including goals and objectives and technology areas to be addressed.
 - 4) Executive Summary: (Not to exceed three (3) pages.)
 - 5) Statement of Work: (Not to exceed twenty-five (25) pages.) A Statement of Work (SOW) clearly detailing the scope and objectives of the effort and the technical approach. The proposed SOW will be incorporated as an attachment to the resultant award instrument. To this end, each proposal must include a severable, self-standing SOW without any proprietary restrictions, which can be attached to the contract award. Include a detailed listing of the technical tasks/subtasks organized by year. Identify the product that results from the task/subtask, and make reference to metrics that will be met as a result of the task/subtask. Optional tasks should be indicated separately.
 - 6) Project Schedule and Milestones: (One (1) page) A summary of the schedule of events and milestones, with experimentation milestones clearly indicated.
 - 7) Assertion of Data Rights: (Not included in page limitations.) An Offeror may provide assertions to restrict use, release or disclosure of data and/or computer software that will be provided in the course of contract performance. The rules governing these assertions are prescribed in Defense Federal Acquisition Regulation Supplement (DFARS) clauses 252.227-7013, -7014 and -7017. These clauses may be accessed at the following web address:

<http://farsite.hill.af.mil/VFDFARA.HTM>

- The Government may challenge assertions that are provided in improper format or that do not properly acknowledge earlier federal funding of related research by the Offeror. Unlimited rights are strongly preferred.
- 8) Deliverables: (Not to exceed two (2) pages.) A detailed description of the results and items to be delivered, including experimentation articles. A list of sample deliverables is contained in Section VI, paragraph 2.
 - 9) Statement of Operational Utility: (Not to exceed two (2) pages.) A Statement of Operational Utility describes what the proposed effort does for the warfighter. It includes a detailed plan for experimentation to assess the functionality and usefulness of the key products of this effort during experimentation. The offeror should provide specific information about its approach to experimentation in laboratory and

operational environments, including both use of technology by military personnel and data collection and analysis in the context of experimentation hypotheses. Exit criteria should be stated in this section, and the plan should detail deliverables and how they meet exit criteria.

- 10) Proposer Qualifications: (Not to exceed two (2) pages.) A discussion of previous accomplishments and work in this, or closely related, areas, and the qualifications of the investigators. The proposal must clearly state the amount of time that is planned to be allocated by all key personnel to the proposed effort. Key personnel resumes shall be attached to the proposal. Resumes will not count toward the page limitations.
- 11) Management Approach: (Not to exceed three (3) pages.) The management plan should show the significant milestones of the technology development process. It should show Operational Utility assessment events. It should include obligation to provide reporting (Section VI, Para 2) and support meetings (Section VII, Para 3).
- 12) Other Agencies: (Not to exceed one (1) page.) Include the name(s) of any other agencies and points of contact to which the proposal has also been submitted.

Volume 2: Cost Proposal

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

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

- Cover Page: The words “Cost Proposal” should appear on the cover page in addition to the following information:
 - 1) BAA number;
 - 2) Title of Proposal;
 - 3) Identity of prime Offeror and complete list of subcontractors, if applicable;
 - 4) Technical contact (name, address, phone/fax, electronic mail address);
 - 5) Administrative/business contact (name, address, phone/fax, electronic mail address);
 - 6) Duration of effort (separately price the basic effort and the option(s));
 - 7) Names, phone number and e-mail addresses of DCMA and DCAA Points of Contacts; and
 - 8) Whether the proposal includes DCAA-approved Forward Pricing Rate Agreement (FPRA) direct and indirect rates.
- Part 1: This part shall contain a detailed breakdown of all costs by cost category by calendar or fiscal year. The following costs shall be included:

- 1) Direct Labor – Individual labor category or person, with associated labor hours and unburdened direct labor rates.
- 2) Indirect Costs – Fringe Benefits, Overhead, G&A, COM, etc. (Must show base amount and rate.)
- 3) Travel – Number of trips, destination, duration, etc.
- 4) Subcontract – A cost proposal as detailed as the offeror’s cost proposal will be required to be submitted by the subcontractor. The subcontractor’s cost proposal can be provided in a sealed envelope with the offeror’s cost proposal or will be obtained from the subcontractor at a later date prior to award.
- 5) Consultant – Provide consultant agreement or other document which verifies the proposed loaded daily/hourly rate.
- 6) Materials – Specifically itemized by cost. An explanation of any estimating factors, including their derivation and application, shall be provided. Where possible, indicate purchasing method (competition, engineering estimate, market survey, etc.)
- 7) Other Directs Costs, particularly any proposed items of equipment or facilities. Equipment and facilities generally must be furnished by the contractor/recipient. (Justifications must be provided when Government funding for such items is sought.) Include a brief description of the Offeror’s procurement method to be used (competition, engineering estimate, market survey, etc.)
- 8) Fee/Profit including fee percentage.

- Part 2: This part shall contain cost breakdown by task/sub-task using the same task numbers identified in the Statement of Work. When options are contemplated, options must be separately identified and priced by task/sub-task corresponding to the same task numbers in the Statement of Work.

3. Significant Dates and Times

Significant dates and times associated with this BAA are show in the table below.

Event	Date	Local Time
Virtual Industry Day at https://www.onr.navy.mil/02/baa/07_014/	N.A.	N.A.
White Papers Due	05 June 2007	2:00 PM EDT
Notification of Initial Navy Evaluations of White Papers	02 July 2007*	N.A.
Oral Presentation of Proposal	23-27 July 2007*	TBD
Notification of Navy Evaluations of Oral Presentations	10 August 2007*	N.A.

Full Proposals Due	31 August 2007*	2:00 PM EDT
Notification of Selection for Award	05 October 2007*	N.A.
Contract Awards	January 2008*	N.A.

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

4. Submission of Late Proposals

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

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

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

(c) It was the only proposal received.

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

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

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

The Contracting Officer must promptly notify any offeror if its proposal, modifications or revision was received late, and must inform the offeror whether its proposal will be considered.

5. Address for the Submission of White Papers, Oral Presentation Material, and Full Proposals

Offerors shall make submissions to the Office of Naval Research at the address specified below:

Office of Naval Research
875 North Randolph Street – Suite 1425*
Arlington, VA 22203-1995
Attn: Mr. Martin Kruger, ONR Code 30

* If using overnight courier, please use Room 1160 instead of Suite 1425. If a telephone number is required, please use (703) 696-5349.

Important Notes Regarding Submission of White Papers and Proposals

If using the United States Postal Service (USPS), please allow an additional five (5) business days because USPS mail is sent to a central location for special processing before delivery to this address. Commercial carriers such as FedEx and UPS may also encounter delays in delivery, so early submission is recommended to avoid late receipts of the proposal.

WHITE PAPERS OR PROPOSALS SENT BY FAX OR EMAIL WILL NOT BE CONSIDERED.

V. EVALUATION INFORMATION

1. Evaluation Criteria

The following evaluation criteria apply to the white paper, oral presentations and full proposal submissions. Proposals will be selected through a technical, scientific, and business decision process with technical and scientific considerations being more important than cost. Technical criteria A-D are listed in descending order of priority. Even though cost is of less importance than the technical factors combined, it will not be ignored. The degree of its importance will increase with the degree of equality of the proposals in relation to the other factors on which selection is to be based, or when the cost is so significantly high as to diminish the value of the technical superiority to the Government. The sub-criteria, i.e., the numbered items within each of the lettered factor paragraphs, are of equal importance.

A. Overall scientific and technical merits of the proposal

1. The degree of innovation and ability to deliver technology that will improve expeditionary force warfighting capabilities described in Section I, paragraph 6.4.
2. The soundness of technical concept.
3. The Offeror's awareness of the state of the art and understanding of the scope of the problem and the technical effort needed to address it.

4. Risk management in demonstrating objectives including structuring of the overall demonstration approach to control risk.
- B. Expeditionary warfighter and naval relevance, plus anticipated contributions of the proposed technology to Distributed Operations, FORCEnet, and network centric warfare operations. Also of importance is the extent to which the government will have at least government purpose technical data rights and similar rights to computer software in order to transition the technology.
- C. Offeror's capabilities, related experience, and past performance, including the qualifications, capabilities and experience of the proposed principal personnel.
 1. The quality of technical personnel proposed and their appropriateness for the work proposed.
 2. The Offeror's experience in relevant efforts with similar resources.
 3. The ability to manage the proposed effort.
- D. Management Plan. The Management Plan is not required in the white paper. The Management Plan is required for oral presentations and the Full Proposal and will be evaluated in accordance with the following criteria:
 1. Plan is in milestone format with succinct factual description of how achievement of milestones will be managed.
 2. Relationship between cost and milestone achievement is defined.
 3. Estimate of technical, schedule and cost risk is stated with risk management plan provided.
- E. The realism of the proposed cost.

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

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

2. Evaluation Panel

Technical and cost proposals submitted under this BAA will be protected from unauthorized disclosure in accordance with FAR 3.104-5 and 15.207. Government technical experts drawn from the Naval operational community, Office of Naval Research, the Naval systems commands, Navy warfare centers, the Naval Research Laboratory (NRL), and other Naval and Defense activities/agencies will evaluate the white papers, oral presentations, and full proposals.

The Government may use selected support contractor personnel to assist in the evaluation and administrative functions of any ensuing White Papers, presentations, and proposals from this announcement. These support contractors will be bound by appropriate non-disclosure agreements to protect proprietary and source-selection information. Proposal selection and award decisions are solely the responsibility of Government personnel.

VI. AWARD ADMINISTRATION INFORMATION

1. Administrative Requirements

- The North American Industry Classification System (NAICS) code – The North American Industry Classification System (NAICS) code for this announcement is 541710 with a small business size standard of 500.
- CCR - Successful offerors not already registered in the Central Contractor Registry (CCR) will be required to register in CCR prior to award of any grant, contract, cooperative agreement, or other transaction agreement. Information on CCR registration is available at <http://www.onr.navy.mil/02/ccr.htm>.
- Certifications – For contracts, in accordance with FAR 4.1201, prospective contractors shall complete electronic annual representations and certifications at <http://orca.bpn.gov>. The Online Representations and Certifications Application (ORCA) must be supplemented by DFARS and contract specific representations and certifications found at http://www.onr.navy.mil/02/rep_cert.asp
- Subcontracting Plans - Successful contract proposals that exceed \$500,000.00, submitted by all but small business concerns, will be required to submit a Small Business Subcontracting Plan in accordance with FAR 52.219-9, prior to award. This requirement also applies to non-profits, including educational institutions.
- This acquisition potentially involves technical data that is subject to U. S. export control laws and regulations. The following clause will be incorporated into any resultant contract where access to export-sensitive technical data is anticipated:

NAVAIR 5252.227-9507 NOTICE REGARDING THE DISSEMINATION OF EXPORT-CONTROLLED TECHNICAL DATA (JAN 1992)

(a) Export of information contained herein, which includes release to foreign nationals within the United States, without first obtaining approval or license from the Department of State for items controlled by the International Traffic in Arms Regulations (ITARs), or the Department of Commerce for items controlled by the Export Administration Regulations (EAR), may constitute a violation of law.

(b) For violation of export laws, the contractor, its employees, officials or agents are subject to:

- (1) Imprisonment and/or imposition of criminal fines; and
- (2) Suspension or debarment from future Government contracting actions.

(c) The Government shall not be liable for any use or misuse of the information, technical data or specifications in this contract. It shall not be liable for any patent infringement or contributory patent infringement. The Government neither warrants the adequacy nor the completeness of the information, technical data or specifications in this contract.

(d) The contractor shall include the provisions of paragraphs (a) through (c) above in any subcontracts awarded under this contract.

- Offerors should state that their proposals will be valid for 180 days from submission.

2. Deliverables

The following is a sample of deliverables that could be required under a research effort. The following deliverables, primarily in contractor format, are anticipated as necessary. However, specific deliverables should be proposed by each offeror.

- Software
- Algorithms with documentation
- Smart agents with documentation
- Source code
- Prototypes
- Tool design
- Analysis documents
- Design documents
- Working models
- Executable code
- Modeling and simulation tools
- Metadata
- Sensors
- Communications and networks
- Reports and technical items resulting from meetings.
- Execution plan
- Technical progress reports at regular time intervals (monthly or quarterly, but not both) as specified in the award document, including detailed technical data, algorithms and software as appropriate
- Financial progress reports at regular intervals as specified in the award document
- Presentation material(s)
- Other documentation or reports, such as publications
- Final technical report

VII. OTHER INFORMATION

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

Each proposer must provide a very specific description of any equipment/hardware that it needs to acquire to perform the work. This description should indicate whether or not each particular

piece of equipment/hardware will be included as part of a deliverable item under the resulting award. Also, this description should identify the component, nomenclature, and configuration of the equipment/hardware that it proposes to purchase for this effort. It is the Government's desire to have the contractors purchase the equipment/hardware for deliverable items under their contract. The purchase on a direct reimbursement basis of special test equipment or other equipment that is not included in a deliverable item will be evaluated for allowability on a case-by-case basis. Maximum use of Government integration, test, and experiment facilities is encouraged in each of the Offeror's proposals.

Government research facilities and operational military units are available and should be considered as potential government furnished equipment/facilities. These facilities and resources are of high value and some are in constant demand by multiple programs. It is unlikely that all facilities would be used for the GWOT Focused Tactical Persistent Surveillance Program. The use of these facilities and resources will be negotiated as the program unfolds. Offerors should explain as part of their proposals which of these facilities they recommend are critical for the project's success.

2. Security Classification

In order to facilitate intra-program collaboration and technology transfer, awardees will work at the unclassified level to the maximum extent possible. However, access to and storage of some classified information may be required.

If awardees use unclassified data in their deliveries and experimentation regarding a potential classified project, they should use methods and conventions consistent with those used in classified environments. Such conventions will permit the various subsystems and the final system to be more adaptable in accommodating classified data in the transition system.

Oral presentations may be given at the classified level. A classified annex may be submitted with the full proposal.

3. Project Meetings & Reviews

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

4. Department of Defense High Performance Computing Program

The DoD High Performance Computing Program (HPCMP) furnishes the DoD S&T and DT & E communities with use-access to very powerful high performance computing systems. Awardees of ONR contracts, grants, and assistance instruments may be eligible to use HPCMP assets in support of their funded activities if ONR Program Officer approval is obtained and if

security/screening requirements are favorably completed. Additional information and an application may be found at <http://www.hpcmo.hpc.mil/>.

5. Protection of Proprietary and Sensitive Information

The parties acknowledge that, during performance of the contract resulting from this BAA, the Contractor may require access to certain proprietary and confidential information (whether in its original or derived form) submitted to or produced by the Government. Such information includes, but is not limited to, business practices, proposals, designs, mission or operation concepts, sketches, management policies, cost and operating expense, technical data and trade secrets, proposed Navy budgetary information, and acquisition planning or acquisition actions, obtained either directly or indirectly as a result of the effort performed on behalf of ONR. The Contractor shall take appropriate steps not only to safeguard such information, but also to prevent disclosure of such information to any party other than the Government. The Contractor agrees to indoctrinate company personnel who will have access to or custody of the information concerning the nature of the confidential terms under which the Government received such information and shall stress that the information shall not be disclosed to any other party or to Contractor personnel who do not need to know the contents thereof for the performance of the contract. Contractor personnel shall also be informed that they shall not engage in any other action, venture, or employment wherein this information will be used for any purpose by any other party.