

**NAVY**  
**14.3 Small Business Innovation Research (SBIR)**  
**Proposal Submission Instructions**

The responsibility for the implementation, administration, and management of the Navy SBIR Program is with the Office of Naval Research (ONR). The Director of the Navy SBIR Program is Mr. John Williams, [john.williams6@navy.mil](mailto:john.williams6@navy.mil). For program and administrative questions, please contact the Program Managers listed in [Table 1](#); **do not** contact them for technical questions. For technical questions about the topic, contact the Topic Authors listed under each topic from **21 August to 22 September 2014**. Beginning **22 September**, the SITIS system (<http://www.dodsbir.net/Sitis/Default.asp>) listed in Section 4.15.d of the DoD Program Solicitation must be used for any technical inquiry.

**TABLE 1: NAVY SYSCOM SBIR PROGRAM MANAGERS**

<u>Topic Numbers</u>	<u>Point of Contact</u>	<u>Activity</u>	<u>Email</u>
N143-126 thru N143-128	Mr. Mark Deebel	NAVSUP	<a href="mailto:mark.deebel@navy.mil">mark.deebel@navy.mil</a>
N143-129 thru N143-130	Mr. Mark Hrbacek	SSP	<a href="mailto:Mark.Hrbacek@ssp.navy.mil">Mark.Hrbacek@ssp.navy.mil</a>

The Navy’s SBIR Program is a mission oriented program that integrates the needs and requirements of the Navy’s Fleet through R&D topics that have dual-use potential, but primarily address the needs of the Navy. Companies are encouraged to address the manufacturing needs of the Defense Sector in their proposals. Information on the Navy SBIR Program can be found on the Navy SBIR website at <http://www.navysbir.com>. Additional information pertaining to the Department of the Navy’s mission can be obtained by viewing the website at <http://www.navy.mil>.

**PHASE I GUIDELINES**

Follow the instructions in the DoD Program Solicitation at [www.dodsbir.net/solicitation](http://www.dodsbir.net/solicitation) for program requirements and proposal submission guidelines. It is highly recommended that you follow the Navy proposal template located at <http://www.navysbir.com/submission.htm> as a guide for structuring your proposal. Cost estimates for travel to the sponsoring SYSCOM’s facility for one day of meetings are recommended for all proposals.

Technical Volumes that exceed the 20 page limit will be reviewed only to the last word on the 20th page. Information beyond the 20th page will not be reviewed or considered in evaluating the Offeror’s proposal. To the extent that mandatory technical content is not contained in the first 20 pages of the proposal, the evaluator may deem the proposal as non-responsive and score it accordingly.

The Navy requires proposers to include, within the **20-page limit**, an option which furthers the effort and will bridge the funding gap between Phase I and the Phase II start. Phase I options are typically exercised upon the decision to fund the Phase II. **The base amount of the Phase I should not exceed \$80,000 and six months; the Phase I option should not exceed \$70,000 and six months.**

Due to the timing and approval to obtain Government Furnished Equipment (GFE), it is recommended that GFE is not proposed as part of the Phase I proposal. If GFE is proposed and is determined during the proposal evaluation process to not be available, proposed GFE may be considered a weakness in the proposal.

Due to the short timeframe associated with Phase I of the SBIR process, the Navy does not recommend the submission of Phase I proposals that require the use of Human Subjects, Animal Testing, or Recombinant DNA. For example, the ability to obtain Institutional Review Board (IRB) approval for proposals that involve human subjects can take 6-12 months, and that lengthy process can be at odds with the Phase I time to award goals. Before Navy makes any award that involves an IRB or similar approval requirement, the proposer must demonstrate compliance with relevant regulatory approval requirements that pertain to proposals involving human, animal, or recombinant DNA protocols. It will not impact the Navy's evaluation, but requiring IRB approval may delay the start time of the Phase I award and if approvals are not obtained within two months of notification of selection, the award may be terminated. If you are proposing human, animal, and recombinant DNA use under a Phase I or Phase II proposal, you should view the requirements at: <http://www.onr.navy.mil/en/About-ONR/compliance-protections/Research-Protections/Human-Subject-Research.aspx>. This website provides guidance and notes approvals that may be required before contract/work can begin.

### **PHASE I PROPOSAL SUBMISSION CHECKLIST:**

**The following criteria must be met or your proposal will be REJECTED.**

**\_\_\_1. Include a header with company name, DoD proposal number, and DoD topic number on each page of your Technical Volume.**

**\_\_\_2. Include tasks (separately) to be completed during the option period in the 20-page technical volume and include the costs as a separate section in the Cost Volume. The costs for the base and option are clearly separate, and identified on the Proposal Cover Sheet, in the Cost Volume, and in the work plan section of the proposal.**

**\_\_\_3. BREAK OUT SUBCONTRACTOR, MATERIAL AND TRAVEL COSTS IN DETAIL. Use the "Explanatory Material Field" in the DoD Cost Volume worksheet for this information.**

**\_\_\_4. If Discretionary Technical Assistance (DTA) is proposed, add information required to support DTA in the "Explanatory Material Field" in the DoD Cost Volume worksheet.**

**\_\_\_5. The base effort should not exceed \$80,000 and have a period of performance of six months and the option should not exceed \$70,000 and have a period of performance of six months. If proposing direct DTA, a total of up to \$5,000 may be added to the Base or Option periods combined.**

**\_\_\_6. Upload your Technical Volume and the DoD Proposal Cover Sheet, the DoD Company Commercialization Report, and Cost Volume electronically through the DoD submission site by 6:00 am ET, 22 October 2014.**

**\_\_\_7. After uploading your file on the DoD submission site, review it to ensure that it appears correctly. Contact the DoD Help Desk immediately with any problems.**

The Navy will evaluate and select Phase I proposals using the evaluation criteria in Section 6.0 of the DoD Program Solicitation with technical merit being most important, followed by qualifications and commercialization potential of equal importance. Due to limited funding, the Navy reserves the right to limit awards under any topic and only proposals considered to be of superior quality will be funded.

Protests of Phase I and II selections and awards shall be directed to the cognizant Contracting Officer for the Navy Topic Number. Contracting Officer contact information may be obtained from the Navy SYSCOM SBIR Program Manager listed in Table 1.

One week after solicitation closing, e-mail notifications that proposals have been received and processed for evaluation will be sent. Consequently, e-mail addresses on the proposal coversheets must be correct.

The Navy typically awards a firm fixed price contract or a small purchase agreement for Phase I.

In accordance with section 4.10 of the DoD Instructions, your request for a debrief must be made within 30 days of non-award notification.

## **CONTRACT DELIVERABLES**

Contract Deliverables (CDRLs), typically progress reports, final reports, and initial Phase II proposals should be uploaded to <https://www.navysbirprogram.com/navydeliverables/> as required by the contract.

## **PHASE II GUIDELINES**

All Phase I awardees will be allowed to submit an **initial** Phase II proposal for evaluation and selection. The Phase I Final Report, Initial Phase II Proposal, and Transition Outbrief (as applicable), will be used to evaluate the offeror's potential to progress to a workable prototype in Phase II and transition technology in Phase III. The details on the due date, content, and submission requirements of the initial Phase II proposal will be provided by the awarding SYSCOM either in the Phase I award or by subsequent notification. **All SBIR/STTR Phase II awards made on topics from solicitations prior to FY13 will be conducted in accordance with the procedures specified in those solicitations (for all Department of Navy topics this means by invitation only).**

Section 4(b)(1)(ii) of the SBIR Policy Directive permits the Department of Defense and by extension the Department of the Navy (DoN), during fiscal years 2012 through 2017, to issue a Phase II award to a small business concern that did not receive a Phase I award for that R/R&D. The DoN will NOT be exercising this authority for Phase II awards. **In order for any small business firm to receive a Phase II award, the firm must be a recipient of a Phase I award under that topic.**

The Navy will evaluate and select Phase II proposals using the evaluation criteria in Section 8.0 of the DoD Program Solicitation with technical merit being most important, followed by qualifications and commercialization potential of equal importance. Due to limited funding, the Navy reserves the right to limit awards under any topic and only proposals considered to be of superior quality will be funded. The Navy does NOT participate in the FAST Track program.

The Navy typically awards a cost plus fixed fee contract for Phase II. The Phase II contracts can be structured in a way that allows for increased funding levels based on the project's transition potential. The Commercialization Readiness Program (CRP) [formerly the Commercialization Pilot Program (CPP)] was authorized and created as part of section 252 of the National Defense Authorization Act of Fiscal Year 2006. The statute set-aside is 1% of the available SBIR funding to be used for administrative support to accelerate transition of SBIR developed technologies and provide non-financial resources for the firms (e.g. the Navy's Transition Assistance Program). A percentage of SYSCOM SBIR funds are dedicated to expand transition funding to further develop SBIR technologies and to accelerate transition for existing Phase II projects, highlighting the Navy's commitment to technology transition.

**DISCRETIONARY TECHNICAL ASSISTANCE** – The SBIR Policy Directive section 9(b), allows the DoN to provide discretionary technical assistance to its awardees to assist in minimizing the technical risks associated with SBIR projects and commercializing products and processes. Firms may request, in their application for Phase I and Phase II proposals, to contract these services themselves in an amount not to exceed \$5,000 per year. This amount is in addition to the award amount for the Phase I or Phase II project.

Approval of direct funding for this discretionary technical assistance will be approved by the DoN SBIR office if the firm's proposal clearly identifies the need for assistance (purpose and objective of required assistance), provides details on the provider of the assistance (name and point of contact for performer) and why they are uniquely skilled to carry out this work (specific experience in providing the assistance proposed), and the cost of the required assistance (costs and hours proposed or other details on arrangement). This information must be included in the firm's cost proposal specifically identified as "Discretionary Technical Assistance" and is not subject to any profit or fee by the requesting (SBIR/STTR) firm. In addition, the provider of the discretionary technical assistance may not be the requesting firm, an affiliate of the requesting firm, an investor of the requesting firm, or a subcontractor or consultant of the requesting firm otherwise required as part of the paid portion of the research effort (e.g. research partner). Failure to include the required information in your proposal will result in your request for discretionary technical assistance being disapproved. Exceeding proposal limits identified for Phase I (\$150,000) without including the required identification of Discretionary Technical Assistance will result in your proposal being REJECTED without evaluation.

If the firm requests discretionary technical assistance in a Phase II proposal, they will be eliminated from participating in the Navy Transition Assistance Program (TAP) and Navy Opportunity Forum or any other assistance the Navy provides directly to firms.

Phase I awardees that propose more than \$150,000 in total funding (Base, Option and discretionary technical assistance) cannot receive a purchase order. Purchase orders are a type of Simplified Acquisition Procedure (SAP) intended to reduce administrative costs; improve opportunities for small, small disadvantaged, women-owned, veteran-owned, HUBZone, and service-disabled veteran-owned small business concerns to obtain a fair proportion of Government contracts; promote efficiency and economy in contracting; and avoid unnecessary burdens for agencies and contractors. The need to issue a Firm Fixed Price (FFP) contract may result in contract delays if the SYSCOM normally issues purchase orders for Phase I awards.

All Phase II awardees not receiving funds for discretionary technical assistance in their award must attend a one-day Transition Assistance Program (TAP) meeting during the second year of the Phase II. This meeting is typically held in the summer in the Washington, D.C. area. Information can be obtained at: <http://www.dawnbreaker.com/navytap>. Awardees will be contacted separately regarding this program. It is recommended that Phase II cost estimates include travel to Washington, D.C. for this event.

**PHASE III** – A Phase III SBIR award is any work that derives from, extends, or completes effort(s) performed under prior SBIR funding agreements, but is funded by sources other than the SBIR Program. Thus, any contract or grant where the technology is the same as, derived from, or evolved from a Phase I or a Phase II SBIR/STTR contract and awarded to the company which was awarded the Phase I/II SBIR is a Phase III SBIR contract. This covers any contract/grant issued as a follow-on Phase III SBIR award or any contract/grant award issued as a result of a competitive process where the awardee was an SBIR firm that developed the technology as a result of a Phase I or Phase II SBIR. The Navy will give SBIR Phase III status to any award that falls within the above-mentioned description, which includes according SBIR Data Rights to any noncommercial technical data and/or noncommercial computer software delivered in Phase III that was developed under SBIR Phase I/II effort(s). The government's prime contractors and/or their subcontractors shall follow the same guidelines as above and ensure that companies operating on behalf of the Navy protect the rights of the SBIR company.

**AWARD AND FUNDING LIMITATIONS** – In accordance with SBIR Policy Directive section 4(b)(5), there is a limit of one sequential Phase II award per firm per topic. Additionally in accordance with SBIR Policy Directive section 7(i)(1), each award may not exceed the award guidelines (currently \$150,000 for Phase I and \$1 million for Phase II) by more than 50% (SBIR/STTR program funds only) without a specific waiver granted by the SBA.

**TOPIC AWARD BY OTHER THAN THE SPONSORING AGENCY** – Due to specific limitations on the amount of funding and number of awards that may be awarded to a particular firm per topic using SBIR/STTR program funds (see above), Head of Agency Determinations are now required before a different agency may make an award using another agency’s topic. This limitation does not apply to Phase III funding. Please contact your original sponsoring agency before submitting a Phase II proposal to an agency other than the one who sponsored the original topic. (For DoN awardees, this includes other SYSCOMs.)

**TRANSFER BETWEEN SBIR AND STTR PROGRAMS** – Section 4(b)(1)(i) of the SBIR Policy Directive provide that, at the agency’s discretion, projects awarded a Phase I under a solicitation for SBIR may transition in Phase II to STTR and vice versa. A firm wishing to transfer from one program to another must contact their designated technical monitor to discuss the reasons for the request and the agency’s ability to support the request. The transition may be proposed prior to award or during the performance of the Phase II effort. Agency disapproval of a request to change programs shall not be grounds for granting relief from any contractual performance requirement. All approved transitions between programs must be noted in the Phase II award or award modification signed by the contracting officer that indicates the removal or addition of the research institution and the revised percentage of work requirements.

## **NAVY SBIR 14.3 Topic Index**

N143-126	Quantitative Infrared (IR) Thermal Image Comparison Software Tool
N143-127	Identification and Optimization of Advanced Wireless Textiles
N143-128	Advanced Textile Manufacturing Utilizing 3D Printing
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N143-130	Replacement Nose Fairing Material

## NAVY SBIR 14.3 Topic Descriptions

N143-126

TITLE: Quantitative Infrared (IR) Thermal Image Comparison Software Tool

TECHNOLOGY AREAS: Information Systems

ACQUISITION PROGRAM: Not Applicable

OBJECTIVE: To develop analytical software that will provide the capability to quantitatively evaluate and compare infrared images. The resulting software should be capable of interfacing with existing hardware while providing quantitative data, but not limited to graphs and charts.

DESCRIPTION: Infrared images are used to evaluate heat and cold stress of clothing, protective equipment or ensemble worn on human subjects. Currently, resulting images are evaluated by a subjective interpretation of a visual color coded representation of the infrared image. Such subjective interpretation is prone to ambiguous results and potentially false recommendations. Available image processing software does not provide the capability to quantitatively and objectively assess IR images.

PHASE I: Determine technical feasibility and define and develop a software concept that will interface with an existing FLIR® IR camera, analyze and compare IR images and provide comparative graphs and charts. The software must be compatible with Windows® version 7.

PHASE II: Develop, demonstrate and validate working prototype of proposed software. Access to the interfacing system will be provided for demonstration and validation purposes by the Navy Clothing and Textile Research Facility.

PHASE III: If Phase II is successful the small business will provide support in transitioning the Quantitative Infrared (IR) Thermal Image Comparison Software Tool for Navy use. Develop a plan to determine the effectiveness of the software in an operationally relevant environment. The small business will support the Navy with certifying and qualifying the system for Navy use. The end product will be a commercially available software system that is optimized and fully functioning.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: Any application where IR image analysis exists: Energy Auditing, Equipment Maintenance.

### REFERENCES:

1) Airborne Infrared Remote Sensing of Riverine Currents; By: Dugan, J. P.; Anderson, S. P.; Piotrowski, C. C.; et al., IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING, Volume: 52 Issue: 7, Pages: 3895-3907, Published: JUL 2014

2) Use of Infrared Spectroscopy for In-Field Measurement and Phenotyping of Plant Properties: Instrumentation, Data Analysis, and Examples; By: Cozzolino, Daniel; APPLIED SPECTROSCOPY REVIEWS, Volume: 49 Issue: 7, Pages: 564-584, Published: OCT 3 2014

3) Sample IR Image, uploaded in SITIS on 9/30/2014.

KEYWORDS: Infrared; Infrared Image; Analytical software; Maintenance; Image Comparison; Imaging; Data Collection

N143-127

TITLE: Identification and Optimization of Advanced Wireless Textiles

TECHNOLOGY AREAS: Human Systems

ACQUISITION PROGRAM: Not Applicable

**OBJECTIVE:** Develop an ensemble to advance human functionality, optimize personnel performance to account for reduced manning and to enhance the survivability of future warships by embedding technologies into the sailor's uniform to create a robust human/ship command and control interface.

**DESCRIPTION:** Naval uniforms do not exist to keep pace with evolving multifunctional human-system interface technologies envisioned for future ship command, control and operation therefore a need exists to advance the state of wearable technologies capable of seamlessly integrating with evolving ship systems. Regardless of the sailor's position, technologies will serve to wirelessly sense, process and receive/transmit information between the ship platform and the sailor. The resulting ensemble will also wirelessly communicate the sailor's position and track movement, as well as to monitor and relay the human state of health important for situations such as damage control events. Given the emergence of virtual displays, the embedded technologies shall be capable of communicating with them and leveraging their benefits. In some instances existing technologies offer suitable capabilities but their physical size is not conducive to integration into garments and may not offer the durability expected from clothing. In fact these technologies may not be able to withstand the rigors of daily wear or laundering expected from uniforms. Based upon the Navy's most desired technological needs for the near, mid and long term, complimentary wearable technologies will be identified.

**PHASE I:** A comprehensive report documenting the near, mid and far term technologies that will be developed. It shall include all fibers, fabrics, materials and systems that will enable linkage of identified ship systems to the human. The report will include a thorough analysis of technologies that range in maturity from early readiness levels through those that are commercially available spanning developments from Industry, Academia and other Government Agencies. One thing that must be considered is the cost for the proposed technologies. To address this, the report should include the costs associated with implementation of each technology.

**PHASE II:** Based upon the findings of Phase I, incorporate proposed technology into preliminary demonstration models exhibiting multifunctional capabilities that are transparent to the wearer, are appropriate for clothing applications and capable of validating functionality suitable for shipboard use in a laboratory environment such as ONR's Project Blueshark. Coinciding with the development of demonstration models, immature but promising technologies will be brought to fruition through additional research for incorporation into ensembles in the follow on phase.

**PHASE III:** Clothing embedded with multifunctional technologies will be optimized for final validation in a relevant shipboard environment and a technical data package developed.

**PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS:** Any application where a human/system interface exists: Commercial Shipping, Firefighting, Natural Gas and Petroleum Industry, Mining, etc.

**REFERENCES:**

1) Smart fabric sensors and e-textile technologies: a review By: Castano, Lina M.; Flatau, Alison B., SMART MATERIALS AND STRUCTURES, Volume: 23 Issue: 5, Article Number: 053001, Published: MAY 2014

2) Progress in interactive textiles for health monitoring By: Luprano, Jean, Edited by: Vincenzini, P; Scilingo, EP Conference: Symposium J on Biomedical Applications of Smart Technologies of CIMTEC / 4th International Conference on Smart Materials, Structures and Systems, Location: Montecatini Terme, ITALY Date: JUN 10-14, 2012, BIOMEDICAL APPLICATIONS OF SMART TECHNOLOGIES, Book Series: Advances in Science and Technology, Volume: 86, Pages: 1-8, Published: 2013

**KEYWORDS:** clothing; fiber; fabric; wearable technology; human/systems integration; wireless; physiological monitoring

N143-128

**TITLE:** Advanced Textile Manufacturing Utilizing 3D Printing

**TECHNOLOGY AREAS:** Materials/Processes

ACQUISITION PROGRAM: Not Applicable

OBJECTIVE: Develop additive manufacturing techniques based on 3D Fused Deposit Modeling for the creation of clothing and individual equipment. The appearance and physical properties shall replicate those of existing textiles.

DESCRIPTION: Recent advances in 3D printing have enabled the use of fibers in production of soft items; these advanced 3D printers could potentially be further developed and used for the production of complete garments/ensembles for military applications.

PHASE I: Define and develop the capability of applying 3D printing techniques to Naval clothing items, to include but not limited to; coveralls, socks and trousers (clothing specifications will be provided to the small business upon award). Develop initial concepts and evaluate their technical feasibility. Select most viable approach for further refinement.

PHASE II: Produce twenty (20) prototypes of each clothing item based on Phase I work. The prototypes should be appropriate for clothing applications and capable of validating functionality through laboratory testing and evaluation. During Phase II the company will work closely with the Navy Technical Point of Contact to define requirements and testing that will be completed at the Navy's Clothing and Textile Research Facility.

PHASE III: If Phase II is successful, the small business will provide support in transitioning the 3D Printing Technology for Navy use. Develop a plan to determine the effectiveness of the clothing items in an operationally relevant environment. The small business will support the Navy with certifying and qualifying the 3D Printing Technology for Navy use. The end product will be a commercially ready system that is optimized and fully functioning.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: Potential commercial applications are vast. Any end item utilizing a textile substrate could benefit from this advancement. Areas might range from disposable medical garments, scrim for composites to commodity clothing items.

REFERENCES:

1) INTEGRATION OF DIGITAL PRINTING INTO MANUFACTURING PROCESS OF GARMENT PROTOTYPE, By: Jevnsnik, S (Jevnsnik, Simona); Neral, B (Neral, Branko); Vraz, SK (Vraz, Silva Kresevic) ; Heinkinhemio, L (Heinkinhemio, Lea), Edited by: Dragcevic, Z, ITC&DC: 4TH INTERNATIONAL TEXTILE CLOTHING & DESIGN CONFERENCE, BOOK OF PROCEEDINGS, Pages: 611-616, Published: 2008

2) "3D GARSIM" - SOFTWARE APPLICATION FOR VIRTUAL GARMENT SIMULATION, By:Aileni, RM (Aileni, Raluca Maria); Ciocoiu, M (Ciocoiu, Mihai); Farima, D (Farima, Daniela); Edited by: Frunzeti, T; Popescu, V; Jugureanu, R; Stefan, V; Radu, C, ANYWHERE, ANYTIME - EDUCATION ON DEMAND, VOL II, Book Series: eLearning and Software for Education, Pages: 447-450, Published: 2011

3) Byron Spice; Jennifer Liu, "Teddy Bears at the Push of a Button: CMU-Disney Researcher Invents 3D Printing Technique for Making Soft, Cuddly Stuff" Carnegie Mellon University. April 28, 2014.  
[http://www.cmu.edu/news/stories/archives/2014/april/april28\\_3Dprintingteddybears.html](http://www.cmu.edu/news/stories/archives/2014/april/april28_3Dprintingteddybears.html).

KEYWORDS: 3d printing; clothing; fiber; fabric; FDM printing; yarns, technical textiles

N143-129

TITLE: A Sensor System for Precise, Automated Position-keeping for Ocean Going Vessels

TECHNOLOGY AREAS: Sensors

ACQUISITION PROGRAM: Strategic Systems Programs - ACAT I

**RESTRICTION ON PERFORMANCE BY FOREIGN NATIONALS:** The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 5.4.c.(8) of the solicitation. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

**OBJECTIVE:** Develop a sensor technology that will allow an ocean going vessel to automatically track and maintain a relative position to a surfaced SSBN without modifying the SSBN or installing any equipment onto the SSBN. The sensor system will have an all-weather capability and meet performance requirements in environmental conditions up to Sea State 4.

**DESCRIPTION:** The Transit Protection System (TPS) Blocking Vessels (BVs) escort United States Navy and United Kingdom Ballistic Missile Submarines (SSBNs) transiting primarily in and out of Kings Bay, GA and Bangor, WA.

The BVs utilize a modified Dynamic Positioning (DP) software package, typically used in the off-shore oil industry, to automatically maintain position during their escort mission. A key component of this automatic positioning capability is a Relative Reference Sensor System (R2S2) which provides the relative positioning data of the SSBN to the BVs DP Software which thereby adjusts the BV's control mechanisms to maintain position at a given set point. The components of a R2S2 typically consist of sensors (installed on the BVs), targets (installed on the SSBN) and other associated hardware (marine PCs, cables, etc.).

While the performance of the current system is sufficient to meet operational objectives, there is an inherent safety risk in that sailors onboard the SSBN must go topside while underway to install/uninstall the targets (three 10' tall, stanchion-mounted reflector poles). The current system's performance is also unreliable in adverse weather conditions, reducing the BV's mission effectiveness. Extensive review of existing technologies has failed to find any alternative sensor systems which do not require targets. The target-less characteristics of this proposed sensor system are beyond the existing state-of-the-art in the area of relative reference station-keeping sensor systems.

The next generation R2S2 should meet the following system requirements:

- The sensor system shall have no equipment installed or stored on the SSBN.

- The sensor system shall send data in a NMEA0183R data format to the DP System using a serial connection.

- The sensor system shall have a redundant capability.

- The sensor system shall be accurate within +/- 12 inches of true target vessel position.

- The sensor system shall be accurate within +/- 0.5 degrees of the true target vessel bearing.

- The sensor system shall provide updated data to the DP System once per second.

- The sensor system shall be able to track the target vessel from a range of 10ft – 500ft.

- The sensor system shall have an all-weather capability and meet performance requirements in environmental conditions up to Sea State 4.

**PHASE I:** Define and develop a concept for target relative reference sensing capability which can meet mission requirements, as stated above in the description. Analysis shall be conducted and presented to the BV Configuration Management Board (CMB) to verify that the requirements of the sensor system can be met prior to entrance into Phase II.

**PHASE II:** Develop a prototype system based on Phase I work for demonstration and validation. Phase II exit criteria will require successful installation, integration, and testing of the prototype sensor system on a single BV. The BV CMB will establish additional systems engineering requirements for this phase prior to granting approval to install and test the prototype system.

**PHASE III:** Integrate the Phase II developed system with TPS BVs for performance testing and validation. Phase III exit criteria will require successful installation and integration of the sensor system on all four TPS BVs, as well as successful testing with an SSBN. BV – SSBN testing will be conducted in accordance with a BV CMB approved test plan. Final acceptance of the system will be issued by an SSP representative.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: This sensor system has private sector commercial potential by reducing the maintenance of sensor systems in offshore oil operations. This system also has the potential for use during underway replenishments.

REFERENCES:

1. Dynamic Positioning. [http://en.wikipedia.org/wiki/Dynamic\\_positioning](http://en.wikipedia.org/wiki/Dynamic_positioning)
2. What is Dynamic Positioning.mp4. <http://www.youtube.com/watch?v=6yB5hmYVFQM>

KEYWORDS: Dynamic Positioning; Position Reference System; Relative Reference System; Automated Positioning System; Station Keeping; Underway Replenishment

N143-130                      TITLE: Replacement Nose Fairing Material

TECHNOLOGY AREAS: Materials/Processes

ACQUISITION PROGRAM: Strategic Systems Programs, ACAT I

RESTRICTION ON PERFORMANCE BY FOREIGN NATIONALS: The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 5.4.c.(8) of the solicitation. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: Develop, characterize and demonstrate a fully capable replacement material for the Nose Fairing.

DESCRIPTION: The Nose Fairing provides hydrodynamic and aerodynamic stability during launch and flight. The Nose Fairing provides a direct interface during onload and offload of the missile while supporting the entire weight of the missile.

SSP desires to develop a replacement material with the following parameters:

- Service Life Goal - 50 years
- Nominal Thickness - 0.5 inch
- Tensile Strength – Longitudinal > 8.0 ksi Property quantified to B-Basis\*\*
- Tensile Strength – Hoop > 2.5 ksi Property quantified to B-Basis\*\*
- Bending Strength – Longitudinal > 5.0 ksi
- Shear Strength > 1.6 ksi Property quantified to B-Basis\*\*
- Internal material damping - Loss Factor = 0.01 or higher
- Radio Frequency Transparent in the GigaHertz region of the electromagnetic spectrum (EM) spectrum
- Density - 0.58 gm/cc.
- Manufacturability – Must be able to form into a complex curvature (doubly curved shell of revolution)

\*\*At least 90 percent of the population of values is expected to equal or exceed the B-basis mechanical property allowable, with a confidence of 95 percent.

Research to date has not yielded a defined replacement material. Therefore additional research is required.

PHASE I: Conduct a feasibility study to develop a suitable material that satisfies defined characteristics and develop a method of fabrication for subscale article.

Identify technology and manufacturing development challenges and approach to address during Phase II.

PHASE II: Develop, fabricate, demonstrate, and validate sub-scale component prototypes. Manufacture nine articles in sub-scale prototypes. A suitable sub-scale article would be a 2ft X 2ft and 0.5 inch thickness panel of which 6 will be flat and 3 will have an internal curvature of 40" radius. The manufacturing process must also demonstrate scalability.

Measure physical and mechanical properties and validate that they meet or exceed the properties provided.

Conduct mechanical property testing of fabricated specimens and verify adequate performance to advance to full scale representative components.

PHASE III: Full scale Nose Fairing will be manufactured, demonstrated and transitioned into the missile. The small business will provide support in transitioning the technology for Navy use in Strategic Systems Programs. The small business will support the Navy with certifying and qualifying the system for Strategic Systems Programs use. Navy Strategic Systems Programs will provide the assets and test support as Government Furnished Equipment and Services.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: This technology could be adapted for use on structural panels used on commercial spacecraft or lightweight structural systems.

#### REFERENCES:

1) Payload Fairing. [http://en.wikipedia.org/wiki/Payload\\_fairing](http://en.wikipedia.org/wiki/Payload_fairing)

2) Nose Fairings on Rockets and Ballistic Missiles. <http://www.gpo.gov/fdsys/pkg/GPO-CRPT-105hrpt851/pdf/GPO-CRPT-105hrpt851-2-6.pdf>

KEYWORDS: Strategic Missiles; Composite Materials; Materials Development; RF transparent structural materials; Ultrastrong materials; Nanocomposites