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# SBIR

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# Small Business Innovation Research

**FY2016**

**Program Solicitation: NOAA2016-1**

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U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
<http://www.techpartnerships.noaa.gov>

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**DEPARTMENT OF COMMERCE  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION**

**PROGRAM SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH (SBIR)**

**1.0 PROGRAM DESCRIPTION**

**1.1 Introduction**

The Department of Commerce (DOC) National Oceanic and Atmospheric Administration (NOAA) invites small businesses to submit research proposals under this solicitation. Firms with the capability to conduct research and development (R&D) in any of the topic areas listed in Section 8 of this solicitation and to commercialize the results of that R&D are encouraged to participate. The Small Business Innovation Research (SBIR) Program is not a substitute for existing unsolicited proposal mechanisms. **Unsolicited proposals are not accepted under the SBIR program.**

The SBIR program was originally established in 1982 by the Small Business Innovation Development Act (P.L. 97-219). It was then expanded by the Small Business Research and Development Enhancement Act of 1992, extending the program to the year 2000 and then to 2008. The program was reauthorized under Public Law 112-81, Section E and extended through September 30, 2017.

Eleven federal agencies set aside a portion of their extramural R&D budget each year to fund research proposals from small science and technology-based firms. The objectives of the SBIR program are to: stimulate technological innovation in the private sector; strengthen the role of small business in meeting Federal R&D needs; foster and encourage participation by socially and economically disadvantaged persons and women-owned small business concerns in technological innovation; and increase private sector commercialization of innovations derived from federal research and development. The NOAA SBIR Program identifies and solicits proposals in subtopics that fall within NOAA's mission.

NOAA is not obligated to make any awards under this solicitation and all awards are subject to the availability of funds.

NOAA is not responsible for any costs expended by the proposer in the development of the proposal and prior to award of any contract.

**1.2 Three-Phase Program**

Legislation requires the Department of Commerce to establish a three-phase SBIR program by reserving a percentage of its extramural R&D budget to be awarded to small business concerns for innovation research. SBIR policy is provided by the Small Business Administration (SBA) through the SBA Policy Directive.

The funding vehicles for NOAA's SBIR program in both Phase I and Phase II are contracts. While the Phase II proposal process is covered in this announcement, this solicitation is for **Phase I proposals only**. A separate solicitation will not be issued requesting Phase II proposal submissions. Unsolicited proposals will not be accepted through the SBIR Program. A Phase II proposal can be submitted **only** by a Phase I awardee. NOAA has the unilateral right to select SBIR research topics and awardees in both Phase I and Phase II and award several or no contracts under a given subtopic.

### **1.2.1 Phase I – Feasibility Research**

The purpose of Phase I is to determine the scientific, technical, and commercial merit and feasibility of the proposed research and the quality of performance of the small business concern receiving an award. Therefore, the proposal should concentrate on research that will significantly contribute to proving the feasibility of the proposed research, a prerequisite to further support in Phase II. NOAA Phase I awards are up to \$120,000 with up to a six (6) month period of performance. Proposers are encouraged to consider, and discuss in their proposal, whether the research or research and development being proposed to NOAA also has private sector potential, either for the proposed application or as a base for other applications. Only DOC NOAA SBIR Phase I awardees will be eligible to submit a Phase II proposal.

### **1.2.2 Phase II – Research and Development (R&D)**

All firms that are awarded Phase I contracts under this solicitation will be given the opportunity to submit a Phase II proposal immediately following completion of Phase I. Phase II is the R&D or prototype development phase. It will require a comprehensive proposal outlining the research in detail, a detailed plan to commercialize the final product, and may require a company presentation to the NOAA SBIR Selection Committee. Instructions for Phase II proposal preparation and submission requirements will be provided to Phase I awardees toward the end of the Phase I period of performance. Phase II applicants will be required to provide information for the Small Business Administration (SBA) Database System (<http://sbir.gov>) when advised this system can accept their input.

Further information regarding Phase II proposals and SBA Database requirements will be provided to all firms receiving Phase I contracts. The following provides information for submitting a Phase II proposal to the Department of Commerce (DOC) National Oceanic and Atmospheric Administration (NOAA) SBIR program.

Phase II awards shall be for no more than **\$400,000**. The period of performance for Phase II will depend upon the scope of the research, but should not exceed **24 months**. For planning purposes, NOAA's goal is to make Phase II awards in the month of June.

Each Phase II proposal will be evaluated against the criteria set forth in Solicitation NOAA 2016-1 (see Section 4.4). Phase II award decisions will be made based upon scientific and technical quality, commercial potential and available funds. Final recommended award decisions will be made by the NOAA Technology Partnerships Committee (TPC) to the Contracting Officer (CO) based upon rankings assigned by reviewers and consideration of other factors which includes possible duplication of ongoing research and the importance of the proposed research as it relates to NOAA mission needs.

Phase II proposals should be more comprehensive than Phase I proposals and are **NOT** limited to 26 pages. One year after completing Phase II R&D activity the awardee shall be required to report on their commercialization activities.

### **1.2.3 Phase III – Commercialization**

Under Phase III, the proposer is required to obtain funding from either, the private sector, a non-SBIR Government source, or both, to develop the prototype into a viable product or non-R&D service for sale in the Federal government and/or domestic and international private sector markets. SBIR Phase III refers to work that derives from, extends, or completes an effort made under prior SBIR funding agreements, but is funded by sources other than the SBIR Program. Phase III work is typically oriented towards commercialization of SBIR research or technology and may be for products, production, services, Research / Research and Development (R/R&D) or a combination thereof.

### **1.3 Manufacturing-related Priority**

Executive Order (EO) 13329 “Encouraging Innovation in Manufacturing” requires SBIR agencies, to the extent permitted by law and in a manner consistent with the mission of that department or agency, to give high priority within the SBIR programs to manufacturing-related R&D. “Manufacturing-related” is defined as “relating to manufacturing processes, equipment and systems; or manufacturing workforce skills and protection.”

The NOAA SBIR Program solicits manufacturing-related projects through many of the subtopics described in this Solicitation. Further, NOAA encourages innovation in manufacturing by giving high priority, where feasible, to projects that can help the manufacturing sector through technological innovation in a manner consistent with NOAA’s mission. This prioritization will not interfere with the core project selection criteria described in Section 4.3.

### **1.4 Energy Efficiency and Renewable Energy Priority**

The Energy Independence and Security Act of 2007 (P.L. 110-140) directs SBIR Programs to give high priority to small business concerns that participate in or conduct energy efficiency or renewable energy system R&D projects.

The NOAA SBIR Program solicits energy efficiency or renewable energy system R&D projects through many of the subtopics described in this Solicitation. Further, NOAA encourages innovation in energy efficiency or renewable energy system R&D by giving high priority, where feasible, to projects that conduct energy efficiency or renewable energy system R&D through technological innovation in a manner consistent with NOAA's mission. This prioritization will not interfere with the core project selection criteria: scientific and technical merit and the potential for commercial success.

## 1.5 Eligibility and Limitations

Proposers for both Phase I and Phase II **must** qualify as a small business concern for research or research and development (R/R&D) purposes (Section 1.7.11) at the time of the award and at any other time set forth in the SBA's regulations at 13 CFR 121.701-121.705. Each awardee must submit a certification (See Section 2.4.1 and 9.5) stating that it meets the size, ownership and other requirements of the SBIR Program at the time of award, and at any other time set forth in SBA's regulations at 13 CFR 121.701-705.

For Phase I, a minimum of two-thirds of the research and/or analytical effort must be performed by the awardee <sup>1</sup>. For Phase II, a minimum of one-half of the research and/or analytical effort must be performed by the awardee.

For both Phase I and Phase II, the primary employment of the principal investigator (PI) must be with the small business concern (SBC) at the time of the award and during the conduct of the proposed project <sup>2</sup>. Primary employment means that more than one-half of the principal investigator's time is spent in the employ of the SBC. **Primary employment with a SBC precludes full-time employment with another organization.**

For both Phase I and Phase II, all work must be performed by the SBC and its subcontractors in the United States. "United States" means the fifty states, the territories and possessions of the United States, the Commonwealth of Puerto Rico, the District of Columbia, the Republic of the Marshall Islands, the Federated States of Micronesia, and the Republic of Palau. However, based on a **rare and unique circumstance**, for example, a supply or material or

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<sup>1</sup> In determining whether the awardee is complying with the requirement of performing at least two-thirds of the research and/or analytical effort during Phase I and one-half for Phase II, the government will consider the amount of an SBIR awardee's operational costs that is paid to outside contractual parties, such as subcontractors, consultants, and independent contractors. In contrast, expenditures for employee labor, materials, and related overhead and profit, will generally be categorized as effort performed by the awardee. Note that an SBIR awardee's operational costs that are directly expended towards facility leases, usage fees, and University partnerships, or similar paid arrangements with other organizations will generally be considered payments to outside contractual parties.

<sup>2</sup> When evaluating the question of primary employment of the principal investigator, the government will consider whether the individual has completed an Internal Revenue Service W-4 or W-9 form with the business. The business represents that individuals that have completed a W-4 form (and receives a W-2 form for filing of income taxes) are employees, while individuals that have completed a W-9 form (and receives a 1099-MISC form for filing of income taxes) are not employees. Instead, the latter are considered to be independent contractors, consultants, or subcontractors.

other item or project requirement that is not available in the United States, NOAA may allow that particular portion of the R/R&D work to be performed or obtained in a country outside of the United States.

**If a waiver is requested, it must be submitted, in writing, to the NOAA CO and SBIR Program Manager where work or supplies outside the United States are being considered and a detailed rationale explaining steps taken to locate potential United States sources; if any United States sources were located and any potential concerns for use of those sources; and any potential cost differences between United States sources and foreign sources (if applicable). This waiver request shall be submitted via email to the points of contact in paragraph 1.6 at least fourteen calendar days prior to the solicitation closing date. It is in the firm's best interest to submit these waiver requests as soon as they are known. Waivers are only approved in rare and unique circumstances.**

In accordance with the SBIR/STTR Reauthorization Act of 2011, each SBIR agency must determine whether an applicant for a Phase I award that has won multiple prior SBIR awards meets the benchmark requirements for progress towards commercialization before making a new Phase I award to the applicant. Small business concerns are assessed on June 1 of each year using their prior Phase I and Phase II SBIR and STTR awards across all SBIR agencies.

The Phase II Transition Rate Benchmark sets the minimum required number of Phase II awards the applicant must have received for a given number of Phase I awards received during the specified period. NOAA's minimum Phase I to Phase II transition rate to be eligible to receive a new Phase I award, is 0.25 over the past 5 fiscal years, excluding the most recently completed fiscal year. This transition rate benchmark applies only to Phase I applicants that have received more than 20 Phase I awards over the past 5 fiscal years, excluding the most recently completed fiscal year. This requirement does not apply to companies that have received 20 or fewer Phase I awards over the 5 year period. For those companies that have received more than 20 Phase I awards over the past 5 years, SBA posts the company transition rates on the Company Registry at SBIR.gov. Information on the Phase I to Phase II Transition Rate requirement is available at <https://www.sbir.gov/performance-benchmarks>.

Applicants to this solicitation that may have received more than 20 Phase I awards across all federal SBIR/STTR agencies over the past five (5) years should, prior to proposal preparation, verify that their company's Transition Rate on the Company Registry at SBIR.gov meets or exceeds the minimum benchmark rate of 0.25. The transition rate is calculated as the total number of SBIR and STTR Phase II awards a company received during the past 5 fiscal years divided by the total number of SBIR and STTR Phase I awards it received during the past 5 fiscal years excluding the most recently completed year.

SBA calculates individual company transition rates using SBIR and STTR award information across all federal agencies. SBA will identify, on June 1 of each year, the companies that fail to meet the benchmark. These companies will not be eligible to receive a Phase I award for a

period of one year from that date. SBA will notify the companies and the relevant officials at the participating agencies.

If a company believes that the information used was incomplete or inaccurate, it may provide feedback through the Company Registry at [www.sbir.gov](http://www.sbir.gov). SBA accepts requests for reconsideration of the eligibility determination from April 1st through April 30th of each year. Additional information on the Transition benchmark is available at [SBIR.gov](http://SBIR.gov).

**Venture Capital Participation:** NOAA elects to not use the authority that would allow venture capital operating companies (VCOCs), hedge funds or private equity firms to participate in the SBIR Program.

Unsolicited proposals or proposals not responding to subtopics listed herein are not eligible for SBIR awards. Only proposals that are directly responsive to the subtopics as described in Section 8 will be considered.

Potential awardees (along with their consultants or subcontractors) may not participate in the selection of any topic or subtopic. Additionally, they may not participate in the review of proposals. All offerors ( including Guest Researchers, contractors, Cooperative Research and Development Agreement (CRADA) partners and others working with NOAA) may only submit a proposal if they:

- Had no role in developing or reviewing the subtopic
- Have not been the recipient of any information on the subtopic not available in the solicitation or other public means
- Have not received any assistance from DOC in preparing the proposal for this specific solicitation (including any 'informal' reviews) prior to submission.

NOAA may not enter into, or continue an existing CRADA with an awardee on the subtopic of the award.

## 1.6 Contact with NOAA

In the interest of competitive fairness, oral or written communication with NOAA or any of its components, other than the contacts provided immediately below, concerning additional information on the technical topics described in Section 8 of this solicitation **is strictly prohibited**.

For general information on the NOAA SBIR program contact:

Vince Garcia, NOAA SBIR Program Manager  
1305 East West Highway, Room 7605  
Silver Spring, MD 20910

Telephone: (301) 713-3565 x184  
Email: [vincent.garcia@noaa.gov](mailto:vincent.garcia@noaa.gov)

For information on the solicitation and other related contractual issues contact:

Joan Clarkston, Contracting Officer  
DOC/NOAA-EAD-KC  
601 East 12<sup>th</sup> Street, Room 1734  
Kansas City, MO 64106

Telephone: (816) 426-7469  
E-mail: [Joan.E.Clarkston@noaa.gov](mailto:Joan.E.Clarkston@noaa.gov)

In order to permit timely posted responses, all questions pertaining to the solicitation and its subtopics are due no later than ***Wednesday, December 2, 2015 at 2:00 PM Eastern. After that date and time, NO ADDITIONAL QUESTIONS SHALL BE ACCEPTED.***

Additional scientific and technical information sources are listed in Section 7.

## **1.7 Definitions**

### **1.7.1 – Commercialization**

The process of developing products, processes, technologies, or services and the production and delivering (whether by the originating party or others) of the products, processes, technologies, or services for sale to or use by the Federal government or commercial markets.

***As used here, commercialization includes both Government and private sector markets.***

### **1.7.2 – Essentially Equivalent Work**

Work that is substantially the same research, which is proposed for funding in more than one contract proposal or grant application submitted to the same Federal agency or submitted to two or more different Federal agencies for review and funding consideration; or work where a specific research objective and the research design for accomplishing an objective are the same or closely related to another proposal or award, regardless of the funding source.

### **1.7.3 – Feasibility**

The practical extent to which a project can be performed successfully.

#### **1.7.4 - Funding Agreement**

Any contract, grant, or cooperative agreement entered into between any Federal agency and any small business concern (SBC) for the performance of experimental, developmental, or research work, including products or services, funded in whole or in part by the Federal Government.

***For purposes of this Solicitation, NOAA intends to award contracts in accordance with the Federal Acquisition Regulation.***

#### **1.7.5 – Historically Underutilized Business Zone (HUBZone) Small Business Concern** (See 13 CFR Part 126 for additional details)

Status as a qualified HUBZone Small Business Concern is determined by the Small Business Administration.

#### **1.7.6 – Innovation**

Something new or improved, having marketable potential, including: (1) development of new technologies; (2) refinement of existing technologies; or (3) development of new applications for existing technologies.

#### **1.7.7 – Joint Venture**

See 13 CFR 121.103(h).

***NOAA has elected to not permit award to a small business concern that is majority-owned by venture capital operating company(s), hedge fund(s), or private equity firm(s).***

#### **1.7.8 – Principal Investigator (PI)/Project Manager (PM)**

The one individual designated by the applicant to provide the scientific and technical direction to a project supported by a funding agreement.

#### **1.7.9 – Primary Employment**

The primary employment of the principal investigator/project manager must be with the SBC at the time of award and during the conduct of the proposed project. Primary employment means that more than one half of the PI/PM's time is spent in the employ of the small business concern. This precludes full-time employment with another organization (also see Section 1.5).

### **1.7.10 – Prototype**

A model of something to be further developed, which includes designs, protocols, questionnaires, software, and devices.

### **1.7.11 – Research or Research and Development (R/R&D)**

Any activity that is (a) a systematic, intensive study directed toward greater knowledge or understanding of the subject studied; (b) a systematic study directed specifically toward applying new knowledge to meet a recognized need; or (c) a systematic application of knowledge toward the production of useful materials, devices, systems, or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.

***In general, the NOAA SBIR program will fund Phase I and Phase II proposals with objectives that can be defined by (b) and (c) in the above paragraph.***

### **1.7.12 – SBIR Technical Data**

All data generated during the performance of a SBIR award.

### **1.7.13 – SBIR Technical Data Rights**

The rights an SBIR awardee obtains in data generated during the performance of any SBIR Phase I, Phase II, or Phase III award that an awardee delivers to the Government during or upon completion of a Federally-funded project, and to which the Government receives a license.

### **1.7.14 – Small Business Concern (SBC)**

A concern that meets the requirements set forth in 13 CFR 121.702.

### **1.7.15 – Socially and Economically Disadvantaged Small Business Concern**

See 13 CFR 124, Subpart B.

### **1.7.16 – Subcontract**

Any agreement, other than one involving an employer-employee relationship, entered into by an awardee of a funding agreement calling for supplies or services for the performance of the original funding agreement.

### **1.7.17 – Women-Owned Small Business**

An SBC that is at least 51% owned by one or more women, or in the case of any publically owned business, at least 51% of the stock is owned by women, and women control the management and daily business operations.

## **1.8 Fraud, Waste and Abuse**

Fraud includes any false representation about a material fact or any intentional deception designed to deprive the United States unlawfully of something of value or to secure from the United States a benefit, privilege, allowance, or consideration to which an individual or business is not entitled. Waste includes extravagant, careless, or needless expenditure of Government funds, or the consumption of Government property, that results from deficient practices, systems, controls, or decisions. Abuse includes any intentional or improper use of Government resources, such as misuse of rank, position, or authority or resources. Examples of fraud, waste, and abuse relating to the SBIR Program include, but are not limited to:

- (i) misrepresentations or material, factual omissions to obtain, or otherwise receive funding under, an SBIR award;
- (ii) misrepresentations of the use of funds expended, work done, results achieved, or compliance with program requirements under an SBIR award;
- (iii) misuse or conversion of SBIR award funds, including any use of award funds while not in full compliance with SBIR Program requirements, or failure to pay taxes due on misused or converted SBIR award funds;
- (iv) fabrication, falsification, or plagiarism in applying for, carrying out, or reporting results from an SBIR award;
- (v) failure to comply with applicable federal costs principles governing an award;
- (vi) extravagant, careless, or needless spending;
- (vii) self-dealing, such as making a sub-award to an entity in which the PI has a financial interest;
- (viii) acceptance by agency personnel of bribes or gifts in exchange for grant or contract

awards or other conflicts of interest that prevents the Government from getting the best value; and

(ix) lack of monitoring, or follow-up if questions arise, by agency personnel to ensure that awardee meets all required eligibility requirements, provides all required certifications, performs in accordance with the terms and conditions of the award, and performs all work proposed in the application.

Report any allegations of fraud, waste and abuse to:

Department of Commerce  
Office of Inspector General  
Complaint Intake Unit, Mail Stop 7886  
1401 Constitution Avenue, N.W.  
Washington, DC 20230

Telephone:

Local	202-482-2495
Toll free	1-800-424-5197
TTD	1-855-860-6950

Email: [hotline@oig.doc.gov](mailto:hotline@oig.doc.gov)

Fax: 855-569-9235

Website: <http://www.oig.doc.gov/Pages/online-hotline-complaint-form.aspx>

## **2.0 CERTIFICATIONS**

### **2.1 Certification of Size, Ownership, and SBIR Program Requirements**

Awardees will be required to certify size, ownership and other SBIR Program requirements with the submission of SBIR proposal, at the time of award, and during the funding agreement life cycle. A copy of these certifications is provided in Section 2.4.1, 2.4.2, 9.5 and 9.6.

### **2.2 Research Projects with Human Subjects, Human Tissue, Data or Recordings Involving Human Subjects**

#### **2.2.1 Protection of Human Subjects**

Any proposal that includes contractor participation in research involving human subjects, human tissue/cells, data or recordings involving human subjects must meet the requirements of the Common Rule for the Protection of Human Subjects (“Common Rule”), codified for the

Department of Commerce (DOC) at 15 C.F.R. Part 27. In addition, any such proposal that includes research on these topics must be in compliance with any statutory requirements imposed upon the Department of Health and Human Services (DHHS) and other Federal agencies regarding these topics, all regulatory policies and guidance adopted by DHHS, the Food and Drug Administration, and other Federal agencies on these topics, and all Executive Orders and Presidential statements of policy on these topics.

NOAA reserves the right to make an independent determination of whether a proposer's research involves human subjects. If NOAA determines that your research project involves human subjects, you will be required to provide additional information for review and approval. If an award is issued, no research activities involving human subjects shall be initiated or costs incurred under the award until the NOAA CO issues written approval. Retroactive approvals are not permitted.

NOAA will accept proposals that include research activities involving human subjects that have been or will be approved by an Institutional Review Board (IRB) currently registered with the Office for Human Research Protections (OHRP) within the DHHS and that will be performed by entities possessing a currently valid Federal wide Assurance (FWA) on file from OHRP that is appropriately linked to the cognizant IRB for the protocol. NOAA will not issue a single project assurance (SPA) for any IRB reviewing any human subjects protocol proposed to NOAA. Information regarding how to apply for an FWA and register an IRB with OHRP can be found at <http://www.hhs.gov/ohrp/assurances/index.html>.

Generally, NOAA does not fund research involving human subjects in foreign countries. NOAA will consider, however, the use of **preexisting** tissue, cells, or data from a foreign source on a limited basis if all of the following criteria are satisfied:

- (1) the scientific source is considered unique,
- (2) an equivalent source is unavailable within the United States,
- (3) an alternative approach is not scientifically of equivalent merit, and
- (4) the specific use qualifies for an exemption under the Common Rule.

Any award issued by NOAA is required to adhere to all Presidential policies, statutes, guidelines and regulations regarding the use of human embryonic stem cells. The DOC follows the NIH Guidelines by supporting and conducting research using only human embryonic stem cell lines that have been approved by NIH in accordance with the NIH Guidelines. Detailed information regarding NIH Guidelines for stem cells is located on the NIH Stem Cell Information website: <http://stemcells.nih.gov>. The DOC will not support or conduct any type of research that the NIH Guidelines prohibit NIH from funding. The DOC will review research using human embryonic stem cell lines that it supports and conducts in accordance with the Common Rule and NOAA implementing procedures, as appropriate.

Any request to support or conduct research using human embryonic stem cell lines not currently approved by the NIH, will require that the owner, deriver or licensee of the human

embryonic stem cell line apply for and receive approval of the registration of the cell line through the established NIH application procedures: [http://hescregapp.od.nih.gov/NIH\\_Form\\_2890\\_Login.htm](http://hescregapp.od.nih.gov/NIH_Form_2890_Login.htm). Due to the timing uncertainty associated with establishing an embryonic stem cell line in the NIH registry, the use of existing human embryonic stem cell lines in the NIH Embryonic Stem Cell Registry may be preferred by applicants or current award recipients. The NIH Embryonic Stem Cell Registry is located at: [http://grants.nih.gov/stem\\_cells/registry/current.htm](http://grants.nih.gov/stem_cells/registry/current.htm).

A proposer or current award recipient proposing to use a registered embryonic stem cell line will be required to document an executed agreement for access to the cell line with the provider of the cell line, and acceptance of any established restrictions for use of the cell line, as may be noted in the NIH Embryonic Stem Cell Registry. If the proposal includes exempt and/or non-exempt research activities involving human subjects the following information is required in the proposal:

- (1) The name(s) of the institution(s) where the research will be conducted;
- (2) The name(s) and institution(s) of the cognizant IRB(s), and the IRB registration number(s);
- (3) The FWA number of the applicant linked to the cognizant IRB(s);
- (4) The FWAs associated with all organizations engaged in the planned research activity linked to the cognizant IRB;
- (5) If the IRB review(s) is pending, the estimated start date for research involving human subjects;
- (6) The IRB approval date (if currently approved for exempt or non-exempt research);
- (7) If any FWAs or IRB registrations are being applied for, that should be clearly stated.

Additional documentation may be requested, as warranted, during review of the proposal, but may include the following for research activities involving human subjects that are planned in the first year of the award:

- (1) A signed (by the study principal investigator) copy of each applicable final IRB-approved protocol;
- (2) A signed and dated approval letter from the cognizant IRB(s) that includes the name of the institution housing each applicable IRB, provides the start and end dates for the approval of the research activities, and any IRB-required interim reporting or continuing review requirements;
- (3) A copy of any IRB-required application information, such as documentation of approval of special clearances (i.e. biohazard, HIPAA, etc.) conflict-of-interest letters, or special training requirements;

- (4) A brief description of what portions of the IRB submitted protocol are specifically included in the proposal submitted to NOAA, if the protocol includes tasks not applicable to the proposal, or if the protocol is supported by multiple funding sources. For protocols with multiple funding sources, NOAA will not approve the study without a nonduplication-of-funding letter indicating that no other federal funds will be used to support the tasks proposed under the proposed research or ongoing project;
- (5) If a new protocol will only be submitted to an IRB if an award from NOAA issued, a draft of the proposed protocol may be requested;
- (6) Any additional clarifying documentation that NOAA may request during review of proposals to perform the NOAA administrative review of research involving human subjects.

### **2.2.2 IRB Education Documentation**

A signed and dated letter is required from the Organizational Official who is authorized to enter into commitments on behalf of the organization documenting that appropriate IRB education has been received by the Organizational Official, the IRB Coordinator or such person that coordinates the IRB documents and materials if such a person exists, the IRB Chairperson, all IRB members and all key personnel associated with the proposal. The NOAA requirement of documentation of education is consistent with NIH notice OD-00-039 (June 5, 2000). Although NOAA will not endorse an educational curriculum, there are several curricula that are available to organizations and investigators which may be found at: <http://grants.nih.gov/grants/guide/notice-files/NOT-OD-00-039.html>.

### **2.3 Research Projects Involving Vertebrate Animals**

Any proposal that includes research involving live vertebrate animals must be in compliance with the National Research Council's "Guide for the Care and Use of Laboratory Animals," which can be obtained from National Academy Press, 500 5<sup>th</sup> Street, N.W., Department 285, Washington, DC 20055. In addition, such proposals must meet the requirements of the Animal Welfare Act (7 U.S.C. § 2131 et seq.), 9 C.F.R. Parts 1, 2, and 3, and if appropriate, 21 C.F.R. Part 58. These regulations do not apply to proposed research using preexisting images of animals or to research plans that do not include live animals that are being cared for, euthanized, or used by the project participants to accomplish research goals, teaching, or testing. These regulations also do not apply to obtaining animal materials from commercial processors of animal products or to animal cell lines or tissues from tissue banks.

NOAA reserves the right to make an independent determination of whether your research involves live vertebrate animals. If NOAA determines that your research project involves live vertebrate animals, you will be required to provide additional information for review and approval. If an award is issued, no research activities involving live vertebrate animals subjects shall be initiated or costs incurred under the award until the NOAA CO issues written approval.

If the proposal includes research activities involving live vertebrate animals, the following information is required in the proposal:

- (1) The name(s) of the institution(s) where the animal research will be conducted;
- (2) The assurance type and number, as applicable, for the cognizant Institutional Animal Care and Use Committee (IACUC) where the research activity is located. [For example: Animal Welfare Assurance from the Office of Laboratory Animal Welfare (OLAW) should be indicated by the OLAW assurance number, i.e. A-1234; a USDA Animal Welfare Act certification should be indicated by the certification number i.e. 12-R-3456; and an Association for the Assessment and Accreditation of Laboratory Animal Care (AAALAC) should be indicated by AAALAC.]
- (3) The IACUC approval date (if currently approved);
- (4) If the review by the cognizant IACUC is pending, the estimated start date for research involving vertebrate animals;
- (5) If any assurances or IACUCs need to be obtained or established, that should be clearly stated.

Additional documentation will be requested, as warranted, during review of the proposal, but may include the following for research activities involving live vertebrate animals that are planned in the first year of the award:

- (1) A signed (by the Principal Investigator) copy of the IACUC approved Animal Study Proposal (ASP);
- (2) Documentation of the IACUC approval indicating the approval and expiration dates of the ASP; and
- (3) If applicable, a nonduplication-of-funding letter if the ASP is funded from several sources.
- (4) If a new ASP will only be submitted to an IACUC if an award from NOAA issued, a draft of the proposed ASP may be requested.
- (5) Any additional clarifying documentation that NOAA may request during review of proposals to perform the NOAA administrative review of research involving live vertebrate animals.

## **2.4 Funding Agreement Addendums**

## 2.4.1 SBIR Funding Agreement Certification

### SBIR Funding Agreement Certification

**All small businesses must complete this certification with their proposal submission**

and any other time set forth in the funding agreement that is prior to performance of work under this award. This includes checking all of the boxes and having an authorized officer of the awardee sign and date the certification each time it is requested.

Please read carefully the following certification statements. The Federal government relies on the information to determine whether the business is eligible for a Small Business Innovation Research (SBIR) Program award. A similar certification will be used to ensure continued compliance with specific program requirements during the life of the funding agreement. The definitions for the terms used in this certification are set forth in the Small Business Act, SBA regulations (13 C.F.R. part 121), the SBIR Policy Directive and also any statutory and regulatory provisions referenced in those authorities.

If the funding agreement officer believes that the business may not meet certain eligibility requirements at the time of award, they are required to file a size protest with the U.S. Small Business Administration (SBA), who will determine eligibility. At that time, SBA will request further clarification and supporting documentation in order to assist in the verification of any of the information provided as part of a protest. If the funding agreement officer believes, after award, that the business is not meeting certain funding agreement requirements, the agency may request further clarification and supporting documentation in order to assist in the verification of any of the information provided.

Even if correct information has been included in other materials submitted to the Federal government, any action taken with respect to this certification does not affect the Government's right to pursue criminal, civil, or administrative remedies for incorrect or incomplete information given in the certification. Each person signing this certification may be prosecuted if they have provided false information.

The undersigned has reviewed, verified and certifies that (all boxes must be checked):

(1) The business concern meets the ownership and control requirements set forth in 13 C.F.R. §121.702.

Yes                       No

(2) If a corporation, all corporate documents (articles of incorporation and any amendments, articles of conversion, by-laws and amendments, shareholder meeting minutes showing director elections, shareholder meeting minutes showing officer elections, organizational meeting minutes, all issued stock certificates, stock ledger, buy-sell agreements, stock transfer agreements, voting agreements, and documents relating to stock options, including the right to

convert non-voting stock or debentures into voting stock) evidence that it meets the ownership and control requirements set forth in 13 C.F.R. § 121.702.

Yes                       No                       N/A

Explain why N/A: \_\_\_\_\_  
\_\_\_\_\_

(3) If a partnership, the partnership agreement evidences that it meets the ownership and control requirements set forth in 13 C.F.R. §121.702.

Yes                       No                       N/A

Explain why N/A: \_\_\_\_\_  
\_\_\_\_\_

(4) If a limited liability company, the articles of organization and any amendments, and operating agreement and amendments, evidence that it meets the ownership and control requirements set forth in 13 C.F.R §121.702.

Yes                       No                       N/A

Explain why N/A: \_\_\_\_\_  
\_\_\_\_\_

(5) The birth certificates, naturalization papers, or passports show that any individuals it relies upon to meet the eligibility requirements are U.S. citizens or permanent resident aliens in the United States.

Yes                       No                       N/A

Explain why N/A: \_\_\_\_\_  
\_\_\_\_\_

(6) It has no more than 500 employees, including the employees of its affiliates.

Yes  No

(7) SBA has not issued a size determination currently in effect finding that this business concern exceeds the 500 employee size standard.

Yes  No

(8) During the performance of the award, the principal investigator will spend more than one half of his/her time as an employee of the awardee or has requested and received a written deviation from this requirement from the funding agreement officer.

Yes  No  Deviation approved in writing by funding agreement officer: \_\_\_\_\_%

(9) All, essentially equivalent work, or a portion of the work proposed under this project (check the applicable line):

Has not been submitted for funding by another Federal agency.

Has been submitted for funding by another Federal agency but has not been funded under any other Federal grant, contract, subcontract or other transaction.

A portion has been funded by another grant, contract, or subcontract as described in detail in the proposal and approved in writing by the funding agreement officer.

(10) During the performance of award, it will perform the applicable percentage of work unless a deviation from this requirement is approved in writing by the funding agreement officer (check the applicable line and fill in if needed):

SBIR Phase I: at least two-thirds (66 2/3%) of the research

SBIR Phase II: at least half (50%) of the research

Deviation approved in writing by the funding agreement officer: \_\_\_\_\_%

(11) During performance of award, the research/research and development will be performed in the United States unless a deviation is approved in writing by the funding agreement officer.

Yes                       No                       Waiver has been granted

(12) During performance of award, the research/research and development will be performed at my facilities with my employees, except as otherwise indicated in the SBIR application and approved in the funding agreement.

Yes                       No

(13) It has registered itself on SBA's database as majority-owned by venture capital operating companies, hedge funds, or private equity firms.

Yes                       No                       N/A

Explain why N/A: \_\_\_\_\_

\_\_\_\_\_

(14) It is a Covered Small Business Concern [a small business concern that: (a) was not majority-owned by multiple venture capital operating companies (VCOCs), hedge funds, or private equity firms on the date on which it submitted an application in response to an SBIR solicitation; and (b) on the date of the SBIR award, which is made more than 9 months after the closing date of the solicitation, is majority-owned by multiple venture capital operating companies, hedge funds, or private equity firms].

Yes                       No

It will notify the Federal agency immediately if all or a portion of the work authorized and funded under this award is subsequently funded by another Federal agency.

I understand that the information submitted may be given to Federal, State, and local agencies for determining violations of law and other purposes.

I am an officer of the business concern authorized to represent it and sign this certification on its behalf. By signing this certification, I am representing on my own behalf, and on behalf of the business concern that the information provided in this certification, the application, and all other information submitted in connection with this application, is true and correct as of the date of submission. I acknowledge that any intentional or negligent misrepresentation of the information contained in this certification may result in criminal, civil or administrative sanctions, including but not limited to: (1) fines, restitution and/or imprisonment under 18 U.S.C. §1001; (2) treble damages and civil penalties under the False Claims Act (31 U.S.C. §3729 et seq.); (3) double damages and civil penalties under the Program Fraud Civil Remedies Act (31 U.S.C. §3801 et seq.); (4) civil recovery of award funds, (5) suspension and/or debarment from all Federal procurement and nonprocurement transactions (FAR Subpart 9.4 or 2 C.F.R. part 180); and (6) other administrative penalties including termination of SBIR/STTR awards.

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Signature

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Date

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Print Name (First, Middle, Last)

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Title

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Business Name

## 2.4.2 SBIR Funding Agreement Certification – Life Cycle Certification

All SBIR Phase I and Phase II awardees must complete this certification at all times set forth in the funding agreement (see §8(h) of the SBIR Policy Directive). This includes checking all of the boxes and having an authorized officer of the awardee sign and date the certification each time it is requested.

Please read carefully the following certification statements. The Federal government relies on the information to ensure compliance with specific program requirements during the life of the funding agreement. The definitions for the terms used in this certification are set forth in the Small Business Act, the SBIR Policy Directive, and also any statutory and regulatory provisions referenced in those authorities.

If the funding agreement officer believes that the business is not meeting certain funding agreement requirements, the agency may request further clarification and supporting documentation in order to assist in the verification of any of the information provided.

Even if correct information has been included in other materials submitted to the Federal government, any action taken with respect to this certification does not affect the Government's right to pursue criminal, civil, or administrative remedies for incorrect or incomplete information given in the certification. Each person signing this certification may be prosecuted if they have provided false information.

The undersigned has reviewed, verified and certifies that (all boxes must be checked):

(1) The principal investigator spent more than one half of his/her time as an employee of the awardee or the awardee has requested and received a written deviation from this requirement from the funding agreement officer.

Yes     No                       Deviation approved in writing by funding agreement officer: \_\_\_\_\_%

(2) All, essentially equivalent work, or a portion of the work performed under this project (check the applicable line):

Has not been submitted for funding by another Federal agency.

Has been submitted for funding by another Federal agency but has not been funded under any other Federal grant, contract, subcontract or other transaction.

A portion has been funded by another grant, contract, or subcontract as described in detail in the proposal and approved in writing by the funding agreement officer.

(3) Upon completion of the award it will have performed the applicable percentage of work, unless a deviation from this requirement is approved in writing by the funding agreement officer (check the applicable line and fill in if needed):

- SBIR Phase I: at least two-thirds (66 2/3%) of the research
- SBIR Phase II: at least half (50%) of the research
- Deviation approved in writing by the funding agreement officer: \_\_\_\_\_%

(4) The work is completed and it has performed the applicable percentage of work, unless a deviation from this requirement is approved in writing by the funding agreement officer (check the applicable line and fill in if needed):

- SBIR Phase I: at least two-thirds (66 2/3%) of the research
- SBIR Phase II: at least half (50%) of the research
- Deviation approved in writing by the funding agreement officer: \_\_\_\_\_%
- N/A because work is not completed

(5) The research/research and development is performed in the United States unless a deviation is approved in writing by the funding agreement officer.

- Yes
- No
- Waiver has been granted

(6) The research/research and development is performed at my facilities with my employees, except as otherwise indicated in the SBIR application and approved in the funding agreement.

- Yes
- No

It will notify the Federal agency immediately if all or a portion of the work authorized and funded under this award is subsequently funded by another Federal agency.

I understand that the information submitted may be given to Federal, State, and local agencies for determining violations of law and other purposes.

I am an officer of the business concern authorized to represent it and sign this certification on its behalf. By signing this certification, I am representing on my own behalf, and on behalf of the business concern that the information provided in this certification, the application, and

all other information submitted in connection with the award, is true and correct as of the date of submission. I acknowledge that any intentional or negligent misrepresentation of the information contained in this certification may result in criminal, civil or administrative sanctions, including but not limited to: (1) fines, restitution and/or imprisonment under 18 U.S.C. §1001; (2) treble damages and civil penalties under the False Claims Act (31 U.S.C. §3729 et seq.); (3) double damages and civil penalties under the Program Fraud Civil Remedies Act (31 U.S.C. §3801 et seq.); (4) civil recovery of award funds, (5) suspension and/or debarment from all Federal procurement and nonprocurement transactions (FAR Subpart 9.4 or 2 C.F.R. part 180); and (6) other administrative penalties including termination of SBIR/STTR awards.

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Signature

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Date

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Print Name (First, Middle, Last)

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Title

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Business Name

## 3.0 PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

### 3.1 Proposal Requirements

NOAA reserves the right not to complete a technical review of any proposal which it determines has insufficient scientific and technical information, or one which fails to comply with the administrative procedures as outlined in the NOAA/SBIR Checklist in Section 9.7. Proposals that do not pass the screening criteria (outlined in Section 4.2) will be rejected without further consideration.

The offeror must provide sufficient information to demonstrate that the proposed work represents a sound approach to the investigation of an important scientific or engineering innovation. The proposal must meet all the requirements of the subtopic in Section 8 to which it applies.

A proposal must be self-contained and written with all the care and thoroughness of a scientific paper submitted for publication. It should indicate a thorough knowledge of the current status of research in the subtopic area addressed by the proposal. Each proposal should be checked carefully by the offeror to ensure inclusion of all essential material needed for a complete evaluation. The proposal will be peer reviewed as a scientific paper. All units of measurement should be in the metric system.

The proposal must not only be responsive to the specific NOAA program interests described in Section 8 of the solicitation, but also serve as the basis for technological innovation leading to **new commercial products, processes, or services**. An organization may submit different proposals on different subtopics or different proposals on the same subtopic under this Solicitation. When the proposed innovation applies to more than one subtopic, the offeror must choose that subtopic which is most relevant to the offeror's technical concept.

Proposals principally for the commercialization of proven concepts or for market research shall not be submitted for Phase I funding, since such efforts are considered the responsibility of the private sector.

The proposal should be direct, concise, and informative. Promotional and other material not related to the project shall be omitted.

NOAA will notify the various offerors whether they have been recommended for a potential award within 90 calendar days of the closing date of this solicitation. If selected for potential award and approved by the CO, the offeror can anticipate receiving an actual award within 180 calendar days of the closing date of the solicitation. The offeror shall **not** proceed with work until an official award is received.

### 3.2 Phase I Proposal Limitations

- Page Length - **no more than 26 pages**, consecutively numbered, including the cover page, project summary, main text, references, resumes, other applicable technical enclosures or attachments, and the Proposed Budget (Section 9.3). The only exceptions to the page count limitation are the additional Supplemental Budget Documentation for the Proposed Budget (See Section 9.4 for a more detailed discussion); SBIR Funding Agreement Certification (Form 9.5); SBIR.gov Company Registry documentation (see Section 3.3.2); and those pages necessary to comply with the itemization of prior SBIR Phase II awards, per Section 3.5. No additional attachments, appendices, or references beyond the 26 page limitation shall be considered in the technical proposal evaluation.
- Paper Size - must be standard size (21.6 cm X 27.9 cm; 8 ½" X 11").
- Format - must be easy to read with a font of at least 10 point. Margins should be at least 2.5cm / 0.984".
- Electronic Submission Size – Email submissions, which include email message text and all attachments, must not exceed 20MB in size.
- Electronic Format - All attachments must be compatible with either Adobe Portable Document Format (pdf) or Microsoft Word 2010 (.docx) format.

Supplementary material, revisions, substitutions, audio or video tapes, or other electronic media will **not** be accepted.

Proposals not meeting these requirements will be rejected without further review.

### 3.3 Phase I Proposal Submission Forms and Technical Content

This section includes instructions for completing required forms and writing the Technical Content section. A complete proposal application must include:

**Technical Proposals:** One (1) Adobe Portable Document Format (.pdf) or Microsoft Word 2010 (.docx) compatible electronic file(s) which includes each of the following (not to exceed a total of 26 printed pages):

- (a) Cover Page (required form, see Section 3.3.1 and 9.1)
- (b) Project Summary (required form, see Section 3.3.3 and 9.2)
- (c) Technical Content (up to 22 pages, see Section 3.3.4)
- (d) Proposed Budget (required form, see Section 3.6 and 9.3)

**Supplemental Budget and Other Information:** One (1) Adobe Portable Document Format (.pdf) or Microsoft Word 2010 (.docx) compatible electronic file(s) of each of the following (not counted towards 26 page limit):

- (a) Supplemental Budget documentation (required, see Section 9.4)
- (b) SBIR Funding Agreement Certification (required form, see Section 9.5)
- (c) Screen shot or similar copy of proposers' Company Registry as noted on SBIR.gov website (required, see Section 3.3.2)
- (d) List of prior Phase II awards for proposers awarded more than 15 SBIR Phase II awards in the prior five fiscal years (required, if applicable, but does not count toward the 26 page limit. See Section 3.5).
- (e) Letter from the relevant individual(s) that can commit the offeror to complete the required proposal, if awarded the contract. The letter shall be on the offeror's letterhead, dated, and indicate intent to perform the in accordance with the submitted proposal, if selected.
  - Individual. If the offeror is an individual, the letter shall be signed by that individual. The signature shall be followed by the individual's typed, stamped, or printed name and the words, "an individual doing business as \_\_\_\_\_" [insert firm's name].
  - Partnership. The letter shall provide a list of all partners with authority to bind the partnership shall be provided. The letter will be signed in the partnership name and contain at least one signatory of the partnership's name typed, stamped, or printed.
  - Corporation. The letter shall provide a list of the relevant individuals that have authority to bind the corporation. The letter will be signed in the corporate name followed by the word "by" and the signature and title of the person authorized to sign.

Proposals received missing any of these required items will be rejected without further review. For instructions on proposal submission, see Section 6.2.

### 3.3.1 Proposal Cover Sheet

Complete all items in the "Cover Page" (front and back side) required form and use as page 1 of the proposal. Ensure that required signatures are included. The government may reject any unsigned offers received. **NO OTHER COVER PAGE WILL BE ACCEPTED.**

If you check the Yes box on #7 of the Cover Sheet, your contact information will be provided to National Institute of Standards and Technology (NIST) Hollings Manufacturing Extension Partnership (MEP). You may be contacted by your local MEP to explore business-related support services that could benefit the potential of the project you proposed.

Before NOAA can award a contract to a successful offeror under this solicitation, the offeror must be registered in the System for Award Management (SAM). To register, visit <https://www.sam.gov/portal/public/SAM/> or call 1-866-606-8220. This procurement shall be awarded as a "contract" and not a "grant." Within SAM.gov, you must complete the Representations and Certifications Section and include the North American Industry Classification System (NAICS) code 541712 with your registration.

The Data Universal Numbering System (DUNS) number is a nine-digit number assigned by Dun and Bradstreet Information Services. If the offeror does not have a DUNS number, it should contact Dun and Bradstreet directly to obtain one. A DUNS number will be provided immediately by telephone at no charge to the offeror. For information on obtaining a DUNS number, the offeror, if located within the United States, should call Dun and Bradstreet at 1-866-705-5711, or access their website at <http://fedgov.dnb.com/webform>.

No award shall be made under this solicitation to a small business concern without proper registration in SAM.

Small Business Concerns may also be able to obtain free to low cost assistance with the SAM.gov website through their local state Procurement Technical Assistance Centers (PTAC). Information can be obtained at <http://www.aptac-us.org>.

Be sure to identify proposal page numbers that contain confidential information in the Proprietary Notice section at the end of the Cover Sheet.

### **3.3.2 Data Collection Requirement**

Each Phase I and Phase II applicant is required to provide information for SBA's database ([www.SBIR.gov](http://www.SBIR.gov)). The following are examples of the data to be entered by applicants into the database:

- Any business concern or subsidiary established for the commercial application of a product or service for which an SBIR award is made.
- Revenue from the sale of new products or services resulting from the research conducted under each Phase II award.
- Additional investment from any source, other than Phase I or Phase II awards, to further the research and development conducted under each Phase II award.
- Update the information in the database for any prior Phase II award received by the SBC. The SBC may apportion sales or additional investment information relating to more than one Phase II award among those awards, if it notes the apportionment for each award.

Each Phase II awardee is required to update appropriate information on the award in the database upon completion of the last deliverable under the funding agreement and is requested to voluntarily update the information in the database annually thereafter for a minimum period of 5 years.

### 3.3.3 Project Summary

Complete all sections of the “Project Summary” form and use as page 2 of your proposal. The technical abstract should include a brief description of the problem or opportunity, the innovation, project objective, and technical approach.

In summarizing anticipated results, include technical implications of the approach and the potential commercial applications of the research. **Each awardee’s Project Summary will be published on the NOAA SBIR website and, therefore, must NOT contain proprietary information.**

### 3.3.4 Technical Content

Beginning on page 3 of the proposal, the following sections are required: **(All headings must be included. If a particular section does not apply, please include the heading, followed by N/A)**

- (a) **Identification and Significance of the Problem or Opportunity.** Make a clear statement of the specific research problem, technical problem, or opportunity addressed. Indicate its innovativeness, commercial potential, and why it is important. Show how it applies to one of the specific subtopics in Section 8.
- (b) **Phase I Technical Objectives.** State the specific objectives of the Phase I research or R&D effort, including the technical questions it will try to answer to determine the feasibility of the proposed approach.
- (c) **Phase I Work Plan.** Include a detailed description of the Phase I research or R&D plan. The plan should indicate not only what will be done, *but also* where it will be done and how the research will be carried out. The method(s) planned to achieve each objective or task, mentioned in item (b) above, should be discussed in detail. In most cases, **this section is typically at least one-third of the proposal.**
- (d) **Related Research or R&D.** Describe research or R&D that is directly related to the proposal including any conducted by the principal investigator or by the proposer’s firm. Describe how it relates to the proposed effort, and describe any planned coordination with outside sources. **The purpose of this section is to demonstrate the offeror’s awareness of recent developments in the specific topic.**
- (e) **Key Individuals and Bibliography of Related Work.** Identify key individuals involved in Phase I, including their directly related education, experience, and bibliographic information. Where vitae are extensive, summaries that focus on most relevant experience or publications are desired and may be necessary to meet proposal size limitation. List all other commitments that key personnel have during the proposed period of contract performance.

- (f) **Relationship with Future R&D.** Discuss the significance of the Phase I effort in providing a foundation for the Phase II R&D effort. Also state the anticipated results of the proposed approach, if Phases I and II of the project are successful.
- (g) **Facilities and Equipment.** The conduct of advanced research may require the use of sophisticated instrumentation or computer facilities. The proposer should provide a detailed description of the availability and location of the facilities and equipment necessary to carry out Phase I. NOAA facilities and/or equipment will be available for use by awardees only if specifically provided for in the subtopic description. All related transportation/shipping/insurance costs shall be the sole responsibility of the contractor. If expressed in the subtopic description that access to NOAA resources will be made available under mutual agreement between awardee and NOAA staff, the contractor shall not make arrangements until after award to visit NOAA labs, exchange or conduct samples testing, and make any collaborative discussions in regards to their SBIR proposal (see Section 1.6).
- (h) **Consultants and Subcontracts.** The purpose of this section is to show NOAA that: (1) research assistance from outside the entity materially benefits the proposed effort, and (2) arrangements for such assistance are in place at the time of proposal submission.

Outside involvement in the project is encouraged where it strengthens the conduct of the research. Outside involvement is not a requirement of this solicitation and is limited to no more than 1/3 of the research and/or analytical effort in Phase I (also see Section 1.5).

1. Consultant – A person outside the firm, named in the proposal as contributing to the research, must provide a signed statement confirming his/her availability and role in the project. Additionally, it should document the total amount anticipated with hours and an agreed consulting rate for participation in the project. This statement is part of the page count.
2. Subcontract – Similarly, where a subcontract is involved in the research, the subcontracting organization or institution must furnish a letter signed by an appropriate official describing the programmatic arrangements and confirming its agreed participation in the research. This letter is part of the page count. The proposed budget for this participation shall be included in the Supplemental Budget Documentation section and does not contribute to the 26 page count limitation.

No individual or entity may serve as a consultant or subcontractor if they (See Section 1.5):

1. Had any role in developing or reviewing the subtopic; or
2. Have been the recipient of any information on the subtopic not available to the public.
3. Received assistance from DOC in preparing the proposal for this specific solicitation (including any 'informal' reviews) prior to submission.

- (i) **Potential Commercial Applications and Follow-on Funding Commitment.** Describe in detail the commercial potential of the proposed research, how commercialization would be pursued, benefits over present products on the market, and potential use by the Federal Government. Address the following:
  1. Market opportunity – Describe the current and anticipated target market, the size of the market, and include a brief profile of the potential customer.
  2. Technology and competition – Describe the competitive landscape, the value proposition and competitive advantage of the product or service enabled by the proposed innovation. Also include what critical milestones must be met to get the product or process to market and the resources required to address the business opportunity.
  3. Finances – Describe your strategy for financing the innovation.
  
- (j) **Cooperative Research and Development Agreements (CRADA).** State if the applicant is a current CRADA partner with NOAA, or with any other Federal agency, naming the agency, title of the CRADA, and any relationship with the proposed work. An Agency may NOT enter into, nor continue, a CRADA with an awardee on the subtopic of the award.
  
- (k) **Guest Researcher.** State if the offeror or any of its consultants or subcontractors is a guest researcher at NOAA, naming the sponsoring laboratory.
  
- (l) **Cost Sharing.** Cost-sharing is permitted for proposals under this program solicitation; however, cost-sharing is not required. Cost-sharing will not be an evaluation factor in consideration of your Phase I proposal.

### 3.4 Similar Proposals or Awards. \*\*\* WARNING \*\*\*

While it is permissible, with proposal notification, to submit identical proposals or proposals containing a significant amount of essentially equivalent work for consideration under numerous Federal program solicitations, **it is unlawful to enter into funding agreements requiring essentially equivalent work.** If there is any question concerning this, it must be disclosed to the soliciting agency or agencies before award.

If an applicant elects to submit identical proposals or proposals containing significant amount of essentially equivalent work under other Federal program solicitations, a statement must be included in each such proposal indicating:

- (a) the name and address of all agencies to which a proposal was submitted or from which awards were received;
  
- (b) the date of proposal submission or date of award;

- (c) the title, number, and date of solicitation(s) under which a proposal(s) was submitted or award(s) received;
- (d) the specific applicable research topic for each proposal submitted or award received;
- (e) the title of the research project; and
- (f) the name and title of the principal investigator or project manager for each proposal submitted or award received.

If no equivalent proposal is under consideration or equivalent award received, a statement to that effect **must** be included in this section of the technical content area of the proposal and certified within the Cover Page.

### 3.5 Prior SBIR Phase II Awards

If a small business concern has received more than 15 SBIR Phase II awards from any of the Federal agencies in the prior five (5) fiscal years, it must submit as an attachment to its Phase I proposal the following list of items: name of awarding agency; date of award; funding agreement number; amounts of award; topic or subtopic title; follow-on agreement amount; source and date of commitment; and current commercialization status for each Phase II. The offeror shall document the extent to which it was able to secure Phase III funding to develop concepts resulting from previous Phase II SBIR Awards. **This required information shall not be considered part of the Phase I page count limitation.**

### 3.6 Proposed Budget

Complete the "NOAA SBIR Proposed Budget" (See Section 9.3) for the Phase I effort and include it as the last page of the technical proposal. Verify the total request is accurate and does **not exceed \$120,000**. Proposals exceeding \$120,000.00 shall be automatically rejected. The Proposed Summary Budget must be signed by the Corporate Official. Some items of the form under Section 9.3 may not apply to every proposal. Additionally, some firms may have different accounting practices for their overhead rates. Offerors should use indirect rates consistent with their own accounting system, even if different from the rate categories shown on the form. These differences should be discussed in the Supplemental Budget Documentation. Enough information, though, should be provided on the Proposed Budget to allow NOAA to understand how the offeror plans to use the requested funds if the award is considered. A complete cost breakdown should be provided giving direct costs, indirect costs, other direct costs G&A, and profit. The offeror is to submit a cost estimate with detailed information consistent with the offeror's cost accounting system. A reasonable profit will be allowed.

As a reminder in completing the Proposal Budget Summary for Phase I, a minimum of two-thirds of the research and/or analytical effort must be performed by the proposing small

business concern. The total cost for all consultant fees, facility leases, usage fees, and other subcontract or purchase agreements may not exceed one-third of the contract price. For Phase II, a minimum of one-half of the research and/or analytical effort must be performed by the proposing small business concern. The total cost for all consultant fees, facility leases, usage fees, and other subcontract or purchase agreements may not exceed one-half of the contract price.

Offerors shall provide additional supplemental budget documentation for the Proposed Budget for the Government's Cost and Pricing Review. ***This Supplemental Budget Documentation shall NOT be utilized for evaluation of the Technical Proposal. Offerors must ensure that all relevant technical information is included within the 26 page technical proposal.*** The Supplemental Budget Documentation does **NOT** count towards the 26 page count requirement. The Supplemental Budget Documentation shall include a cover sheet and be organized and easy to understand. The information should only supplement and help to justify and explain the amounts requested on the Proposed Budget sheet. Additionally, the documentation should indicate any known or anticipated source, quantity, unit price, competition obtained, and basis used to establish source and reasonable costs (e.g. other direct costs, equipment, and travel, etc.).

A more detailed discussion of completing the Proposed Budget and the Supplemental Budget Documentation is provided in Section 9.4.

### **3.7 Multiple Proposals**

Offerors may submit multiple proposals to this solicitation. Offerors should submit separate proposal packages for each topic area they wish to be considered. If offerors have multiple proposals with different methods or deliverables that they wish to propose on the same topic area, a separate proposal package should be provided for each method or deliverable.

## **4.0 METHOD OF SELECTION AND EVALUATION CRITERIA**

### **4.1 Introduction**

All Phase I and II proposals will be evaluated and judged on a competitive basis. **A proposal will not be deemed acceptable if it represents presently available technology.** Proposals will be initially screened to determine responsiveness (See Section 4.2 and 9.7). Proposals passing this initial screening will be technically evaluated by engineers or scientists (reviewers may be NOAA employees or outside of NOAA) to determine the most promising technical and scientific approaches. Each proposal will be judged on its own merit. NOAA is under no obligation to fund any proposal or any specific number of proposals in a given topic. It also may elect to fund several or none of the proposed approaches to the same topic or subtopic.

## 4.2 Phase I Screening Criteria

Phase I proposals that do not satisfy all of the screening criteria shall be rejected without further review and will be eliminated from consideration for award. Rejected proposals may not be resubmitted (with or without revision) under this solicitation. The screening criteria (also see Section 9.7) are:

- (a) The proposing firm must qualify as a small business, in accordance with Section 1.7.14.
- (b) The Phase I proposal must meet **all** of the requirements stated in Section 3.
- (c) The Phase I proposal must be limited to one subtopic and clearly address research for that subtopic.
- (d) Phase I proposal budgets must not exceed \$120,000.
- (e) The project duration for the Phase I feasibility research must not exceed six months.
- (f) The proposing firm must carry out a minimum of two-thirds of expenditures under each Phase I project.
- (g) All work must be performed by the small business concern and its subcontractors in the United States, unless a waiver has been granted in advance by the CO (see Section 1.5).
- (h) The proposal must contain information sufficient to be peer reviewed as research.

## 4.3 Phase I Evaluation and Selection Criteria

Phase I proposals that comply with the screening criteria will go through the following process:

**Step 1:** The proposals will be evaluated by internal NOAA and/or external scientists or engineers via peer review in accordance with the following criteria:

- (1) The technical approach and the anticipated agency and commercial benefits that may be derived from the research (25 points).
- (2) The adequacy of the proposed effort and its relationship to the fulfillment of requirements of the research subtopic (15 points).
- (3) The level of innovation the proposed effort offers to the research subtopic (20 points).

- (4) Consideration of a proposal's commercial potential as evidenced by the SBC's Commercialization Plan (25 points).
- (5) Qualifications of the proposed principal/key investigators, supporting staff, and consultants (15 points).

Technical reviewers will base their rankings on information contained in the proposal. It is assumed that reviewers are not acquainted with any experiments referred to, key individuals, or the firm. No technical clarifications may be made after proposal submission.

**Step 2:** A NOAA-wide selection panel will review the content of the proposals based on the following evaluation factors to develop a final ranking:

- (1) Proposal priority ranking resulting from Step 1.
- (2) Economic impact (e.g., ability of the company to develop a commercially viable product, service or process); number and record of past performance for SBIR and STTR awards; consideration given to companies without previous SBIR awards; existence of outside non-SBIR funding or partnering commitments; and/or the presence of other relevant supporting material contained in the proposal that indicates the commercial potential of the idea (such as letters of support, journal articles, literature, Government publications, etc.).

Final award recommendation decisions will be made by NOAA based upon rankings assigned by the selection panel and consideration of additional factors, **including possible duplication of other research**, the importance of the proposed research as it relates to NOAA needs, and the availability of funding. In the event of a "tie" between proposals, manufacturing-related projects as well as those regarding energy efficiency and renewable energy systems will receive priority in the award selection process. NOAA may elect to fund several or none of the proposals received on a given subtopic. Upon recommendation of a proposal for a Phase I award, NOAA reserves the right to review and negotiate, if necessary, the amount of the award.

#### **4.4 Phase II Evaluation and Selection Criteria**

During the feasibility study project performance period, Phase I awardees will be provided instructions for preparation and submission of Phase II proposals. Phase II proposals that comply with the screening criteria as stated in those instructions will be evaluated by NOAA and external scientists and engineers in accordance with the step 1 and 2 evaluation criteria (see 4.3 above).

Upon selection of a proposal for Phase II award, NOAA reserves the right to review and negotiate, if necessary, the amount of the award. NOAA is not obligated to fund any specific Phase II proposal.

## 4.5 Release of Proposal Review Information

Notifications to the various offerors of recommendations of potential selection or non-selection of award that passed the screening criteria will be advised within 90 calendar days of closing of the solicitation. Copies of the technical evaluations shall be provided tentatively 30 days after completion of potential selection or non-selection of award. The identity of the reviewers will not be disclosed.

## 5.0 CONSIDERATIONS

### 5.1 Awards

NOAA will award firm-fixed price contracts to successful offerors for both Phase I and II. A firm-fixed price contract identifies a price that is not subject to any adjustment on the basis of the contractor's cost expenditure in performing the effort. This agreement type places upon the contractor the risk and full responsibility for all costs and resulting profit or loss. It provides maximum incentive for the contractor to control costs and perform effectively and imposes a minimum administrative burden upon both parties. NOAA also does not allow any advance payments to be made on its awards. The firm-fixed price shall be inclusive of all transportation/shipping/insurance costs for government furnished property (if requested in the proposal and accepted by the government) made available for use by awardee and all deliverables/prototypes to be furnished to NOAA.

Contingent upon availability of funds, NOAA currently anticipates making approximately **sixteen (16) to twenty-one (21)** Phase I firm-fixed price contracts of no more than **\$120,000** each. Total performance period shall be no more than six (6) months. Historically, NOAA has funded about ten percent of the Phase I proposals submitted.

Phase II awards shall be for no more than \$400,000. The period of performance to complete Phase II effort will depend upon the scope of the research, but the final report due date must not exceed 24 months. One year after completing the R&D activity, the awardee shall be expected to report on their commercialization activities. The total period of performance for Phase II is anticipated to be approximately 36 months.

It is anticipated that **approximately half of the Phase I awardees will receive Phase II awards**, depending upon the availability of funds. To provide for an in-depth review of the Phase I final report and the Phase II proposal and commercialization plan, Phase II awards will be made approximately five months after the completion of Phase I.

For planning purposes, proposers should understand that Phase I awards are tentatively planned for July 2016. Phase II proposals are tentatively due to NOAA in March 2017 and Phase II awards are tentatively planned for June 2017.

**This Solicitation does not obligate NOAA to make any awards under either Phase I or Phase II. Furthermore, NOAA is not responsible for any monies expended by the proposer before award of any contract resulting from this Solicitation.**

## **5.2 Reports**

Phase I awardees will be required to submit two progress reports and a final report. Phase I reports are due at 2, 4, and 6 months after award.

Phase II awardees will be required to submit four progress reports, a final report, and a commercialization report. Phase II reports are due at 2, 6, 12, 18, and 24 months, or as to be negotiated on a case by case basis. The commercialization report is due 36 months after award. The payment schedule in paragraph 5.3 is tied to these reports.

Phase I and Phase II progress reports should be brief letter reports and include all technical details regarding the research conducted up to that point in the project and will provide detailed plans for the next stages of the project. The acceptance of each progress report will be contingent upon appropriate alignment with the solicited and proposed milestones. Consideration will be given to changes from the solicited and proposed milestones if results from experimentation warrant a deviation from plan. Inclusion of proprietary information within the progress reports and final report may be necessary in order to effectively communicate progress and gain appropriate consultation from NOAA experts regarding next steps. All such proprietary information will be marked according to instructions provided in Section 5.5.

Final reports submitted under Phase I and Phase II shall include a single-page project summary as the first page, identifying the purpose of the research, and giving a brief description of the research carried out, the research findings or results, and the commercial applications of the research in a final paragraph. The remainder of the report should indicate in detail the research objectives, research work carried out, results obtained, and estimates of technical feasibility.

All final reports must carry an acknowledgement on the cover page such as: *“This material is based upon work supported by the National Oceanic and Atmospheric Administration (NOAA) under contract number \_\_\_\_\_. Any opinions, findings, conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of NOAA.”*

The information provided in the Phase II commercialization update reports will be compiled and used as general statistics to help determine the value of NOAA SBIR Program, educate stakeholders about the outcomes and impact, and attract new entrants.

The Phase II commercialization update report shall include the following:

- a. A description of the company's efforts to further develop, commercialize and derive revenues from the technology resulting from this SBIR award. These may include but are

not limited to: customer/potential customer base, overview of marketing and sales strategies, other uses of knowledge gained, partners, licensing, committed resources, market readiness, use of knowledge gained for other projects, manufacturing, and financing strategy. Also discuss difficulties, and barriers to entry.

If work has ended on the project, please provide an explanation as to why (i.e. technical objective not met, existing barriers to entry, could not obtain follow-on funding, technology not economically viable, alternative technology entered the market, or other explanation).

b. Information about any follow-on funding commitment(s) and investments to further the development and/or commercialize the Phase II technology.

If follow-on funding was not obtained, provide possible reasons (i.e. technical objective not met, technology not economically viable, alternative technology entered the market, or other explanation).

c. Details about products and /or processes being developed, used for other projects, or currently in the marketplace resulting from the SBIR project.

d. A list of any patents or published patent applications resulting from the SBIR project.

e. Sales revenue from new products or processes received from the commercialization of this SBIR project include: sales, manufacturing, product licensing, royalties, consulting, contracts, or other.

To help assess the effectiveness of our program in meeting programmatic and SBIR objectives, NOAA may periodically request information from small businesses about progress taken towards commercialization of the technology after the completion of Phase I and II contracts.

### **5.3 Payment Schedule**

If selected for award, the government shall contact the potential awardee to confirm the appropriate amounts tied to the reports in paragraph 5.2. Typically, they have been even amounts for each payment period. The specific payment schedule (including payment amounts) for each award will be incorporated into the resulting contract.

No advance payments will be allowed. To receive an SBIR payment the SBC must re-certify that they remain eligible as SBC to receive funding and have not changed their SBC status or any other terms of condition of initial award.

For Phase II, a total of six payments, in even amounts, are anticipated to coincide with the reports except for the last payment. The sixth payment for \$5,000.00 will be made after the commercialization report is accepted (see Section 5.2). Failure to submit the report within twelve months of the completion of the R&D activity period for Phase II may result in a de-obligation of the \$5,000.00.

## **5.4 Deliverables**

Offers submitted in response to subtopics that require delivery of a prototype should state in the proposal, the plan to develop and deliver the specified prototype. Shipping shall be Freight on Board (F.O.B) Destination which means that the contractor is responsible for all transportation/shipping/insurance costs for deliverables. Notwithstanding the absence of such an explicit statement in the offeror's proposal, delivery of the developed prototype as called for by the Solicitation subtopic is required for field testing or feasibility testing.

Even though a prototype may be required to be delivered for the project, it is important to note that this prototype is still the property of the offeror. NOAA would only do field or lab testing on that product to determine its potential feasibility in a production (or development) environment.

## **5.5 Innovations, Inventions, and Patents**

### **5.5.1 Proprietary Information**

Information contained in unsuccessful proposals will remain the property of the proposer. Any funded proposal will not be made available to the public, except for the "Project Summary" page.

The inclusion of proprietary information within the proposal is discouraged unless it is absolutely necessary for the proper evaluation. Information contained in unsuccessful proposals will remain the property of the offeror. The Government may, however, retain copies of all proposals. Public release of information in any proposal submitted will be subject to existing statutory and regulatory requirements. If proprietary information is provided by an offeror in a proposal, which constitutes a trade secret, proprietary commercial or financial information, confidential personal information or data affecting the national security, it will be treated in confidence, to the extent permitted by law. This information must be clearly marked by the offeror with the term "confidential proprietary information" and the following legend must appear on the first page of the technical section of the proposal:

"These data shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed in whole or in part for any purpose other than evaluation of this proposal. If a funding agreement is awarded to this offeror as a result of or in connection with the submission of these data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the funding agreement and pursuant to applicable law. This restriction does not limit the Government's right to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction are contained on pages \_\_\_\_\_ of this proposal."

Any other legend may be unacceptable to the Government and may constitute grounds for removing the proposal from further consideration, without assuming any liability for inadvertent

disclosure. The Government will limit dissemination of such information to its employees and, where necessary for evaluation, to outside reviewers on a confidential basis.

Examples of laws that restrict the government to protect confidential/proprietary information about business operations and trade secrets possessed by any company or participant include: Freedom of Information Act (FOIA) – 5. U.S.C. § 552(b); Economic Espionage Act – 18 U.S.C. § 1832; and Trade Secrets Act – 18 U.S. C. § 1905.

In view of the above, proposers are cautioned that proposals are likely to be less competitive if significant details are omitted due to the proposer's reluctance to reveal confidential/proprietary information.

### **5.5.2 Rights in Data Developed under SBIR Contracts**

Except for copyrighted data, the Government shall normally have unlimited rights to data in Phase I, II, or III awards, such as:

- (a) data specifically identified in the SBIR contract to be delivered without restriction;
- (b) form, fit, and function data delivered under the contract;
- (c) data delivered under the contract that constitute manuals or instructions and training material for installation, operation, or routine maintenance and repair of items, components, or processes delivered or furnished for use under the contract; and
- (d) all other data delivered under the contract.

To preserve the SBIR Data Rights of the awardee, the following must be affixed to any submissions of technical data developed under that SBIR award:

#### **SBIR RIGHTS NOTICE (DEC 2007)**

These SBIR data are furnished with SBIR rights under Contract No. \_\_\_\_\_ (and subcontract \_\_\_\_\_, if appropriate). For a period of 4 years, unless extended in accordance with FAR 27.409(h), after acceptance of all items to be delivered under this contract, the Government will use these data for Government purposes only, and they shall not be disclosed outside the Government (including disclosure for procurement purposes) during such period without permission of the Contractor, except that, subject to the foregoing use and disclosure prohibitions, these data may be disclosed for use by support Contractors. After the protection period, the Government has a paid-up license to use, and to authorize others to use on its behalf, these data for Government purposes, but is relieved of all disclosure prohibitions and assumes no liability for unauthorized use of these data by third parties. This Notice shall be affixed to any reproductions of these data, in whole or in part.

**(END OF NOTICE)**

The Government's sole obligation with respect to any properly identified SBIR data shall be as set forth in the paragraph above. The four-year period of protection applies for Phases I, II, and III.

### **5.5.3 Copyrights**

With prior written permission of the CO, the awardee normally may copyright and publish (consistent with appropriate national security considerations, if any) material developed with Government support. The Government receives a royalty-free license for the Federal Government and requires that each publication contain an appropriate acknowledgement and disclaimer statement.

### **5.5.4 Patents**

Small business concerns normally may retain the worldwide patent rights to any invention made with Government support. In such circumstances, the Government receives a royalty-free license for Federal Government use, reserves the right to require the patent holder to license others in certain circumstances, and may require that anyone exclusively licensed to sell the invention in the United States must normally manufacture it domestically. To the extent authorized by 35 U.S.C. 205, the government will not make public any information disclosing a Government-supported invention for a minimum 4-year period (that may be extended by subsequent SBIR funding agreements) to allow the awardee a reasonable time to pursue a patent.

### **5.5.5 Invention Reporting**

SBIR awardees must report inventions to the NOAA SBIR Program within two months of the inventor's report to the awardee. The reporting of patents and other patent obligations shall be completed through the iEdison System unless noted in resulting contract. For additional information on the iEdison System go to <https://s-edison.info.nih.gov/iEdison/>.

## **5.6 Considerations**

Upon award of a funding agreement, the contractor will be required to make certain legal commitments through acceptance of numerous clauses in Phase I funding agreements. The outline that follows is illustrative of the types of clauses to which the contractor would be committed. This list is not a complete list of clauses to be included in Phase I funding agreements, and is not the specific wording of such clauses. Copies of complete terms and conditions are available upon request.

- (a) Standards of Work. Work performed under the contract must conform to high professional standards.
- (b) Inspection. Work performed under the contract is subject to Government inspection and evaluation at all reasonable times.
- (c) Examination of Records. The Comptroller General (or a duly authorized representative) shall have the right to examine pertinent records of the contractor involving transactions related to this contract.
- (d) Default. The Government may terminate the agreement if the contractor fails to perform the work contracted.
- (e) Termination for Convenience. The Government may terminate the contract at any time if it deems termination to be in the best interest, in which case the contractor will be compensated for work performed and for reasonable termination costs.
- (f) Disputes. Any dispute concerning the contract, which cannot be resolved by agreement, shall be decided by the Contracting Officer with right to appeal.
- (g) Contract Work Hours. The contractor cannot require an employee to work more than eight hours a day or 40 hours a week, unless the employee is compensated accordingly (i.e. overtime pay).
- (h) Equal Opportunity. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.
- (i) Affirmative Action for Veterans. The contractor will not discriminate against any employee or applicant for employment because he or she is a disabled veteran or veteran of the Vietnam era.
- (j) Affirmative Action for the Handicapped. The contractor will not discriminate against any employee or applicant for employment because he or she is physically or mentally handicapped.
- (k) Officials Not to Benefit. No Government official shall benefit personally from any SBIR contract.
- (l) Covenant Against Contingent Fees. No person or agency has been employed to solicit or secure the contract upon an understanding for compensation, except bona fide employees or commercial agencies maintained by the contractor for the purpose of securing business.
- (m) Gratuities. The Government may terminate the contract if any gratuity has been offered to any representative of the Government to secure the contract.

- (n) Patent Infringement. The contractor shall report each notice or claim of patent infringement based on the performance of the contract.
- (o) American-Made Equipment and Products. When purchasing either equipment or a product, under the SBIR funding agreement, purchase only American-made items whenever possible.

## 5.7 Additional Information

- (a) **Projects**. The responsibility for the performance of the principal investigator, and other employees or consultants, who carry out the proposed work, lies with the management of the organization receiving an award.
- (b) **Organizational Information**. Before award of an SBIR contract, the Government may request the proposer to submit certain organizational, management, personnel, and financial information to assure responsibility of the proposer.
- (c) **Duplicate Awards**. **If an award is made under this solicitation, the contractor will be required to certify that he or she has not previously been, nor is currently being, paid for essentially equivalent work by any agency of the Federal Government. Severe penalties may result from such actions.**
- (d) **Your firm is required to obtain a Dunn and Bradstreet Number (DUNS) and register in the System for Award Management (SAM) database and complete the Online Representations and Certifications (in order to be eligible to receive a contract award.**
- (e) **In addition, your firm is required to register in the SBIR database ([www.SBIR.gov](http://www.SBIR.gov)) and submit a copy of your firms registration information from the Company Registry.**
- (f) If there is any inconsistency between the information contained herein and the terms of any resulting SBIR contract, the terms of the contract are controlling.
- (g) The Government is not responsible for any monies expended by the offeror before award of any contract.
- (h) NOAA may provide technical assistance to awardees as allowed by legislation.

## 5.8 Technical Assistance for Proposal Preparation and Project Conduct

**National Institute of Standards and Technology (NIST)/Hollings Manufacturing Extension Partnership (MEP):** Proposers may wish to contact the NIST Hollings MEP for

manufacturing and other business-related support services. The MEP works with small- and medium-sized companies to help them create and retain jobs, increase profits, and save time and money. The nationwide network provides a variety of services, from business development assistance to innovation strategies to process improvements and the identification of commercialization opportunities. MEP is a nationwide network of locally managed extension centers with over 1,400 technical experts located in every state. To contact a MEP center, call 1-800-MEP-4MFG (1-800-637-4634) or visit MEP's website at [www.mep.nist.gov](http://www.mep.nist.gov).

**Commercialization Assistance Program (CAP):** NOAA is committed to providing assistance in commercialization planning of products, services or technologies developed Phase II awardees under the SBIR program. The NOAA Commercialization Assistance Program (CAP) is a program which can assist in the successful commercialization of these products, services or technologies developed in association with the DOC NOAA SBIR Program. The NOAA CAP may cover assistance in such areas as assessing small business commercialization needs; planning, developing, and assisting in the preparation of a Phase II commercialization plan; identifying markets and developing entry strategies; and helping determine key requirements and traits for market viable products or services.

The CAP is a mentoring and training program that includes one-on-one business counseling organized around topics that will contribute to the development of a strategic action plan, business plan, or a licensing or go-to-market strategy. Additionally, the CAP seeks to provide robust strategic and technical assistance to program participants seeking to commercialize their SBIR products initially funded by the NOAA SBIR Program.

NOAA has set aside the maximum legislatively allowed amount of funds available for CAP assistance for Phase II awardees interested in this training. The SBIR Phase II awardee has the option to not participate in this assistance effort that is available to them. More information on the CAP will be provided in the Phase II proposal preparation instructions sent to each Phase I awardee.

Proposers may also contact independent state, regional, or area specific resources, for example, economic development agencies for additional assistance and resources.

## **6.0 SUBMISSION OF PROPOSALS**

### **6.1 Deadline for Proposals and Modifications**

**Deadline for Phase I proposal submission to the NOAA SBIR Program Office is 4:00 p.m. (Eastern Standard Time) on January 14, 2016. All submissions must be sent electronically via email. Specific instructions located in Section 6.2 below.**

Offerors are responsible for submitting proposals that adhere to the requirements of the solicitation (see Section 9.7 NOAA/SBIR Checklist) so as to reach the government office by the time specified in the solicitation.

**Any proposal that is received after the exact time specified for receipt of proposals is “late” and will not be considered. It is the offeror’s responsibility, when transmitting its proposal electronically, to ensure the proposal’s timely delivery by transmitting the proposal sufficiently in advance of the time set for receipt of proposals to allow timely receipt by the agency.**

**Late proposals and their modifications that are not considered shall be held unopened, except for identification, until after award and then shall be retained with other unsuccessful proposals.**

Modifications to proposals may be submitted at any time **before** the solicitation closing date and time, which includes responses to an amendment or correcting a mistake. For modifications, the offeror shall provide a completely revised proposal (Technical Proposal and Supplemental Budget and Other Information per Section 3.3) with a cover letter indicating that it is replacing a previously submitted proposal. The government will not swap partial files from a previously submitted version. A late modification of an otherwise successful proposal that makes its terms more favorable to the Government will be considered at any time it is received and may be accepted. Revised proposals may only be submitted when requested or allowed by the CO. Proposals may be withdrawn at any time before award. Withdrawals are effective upon receipt of notice by the CO.

**Letters of instruction will be sent to Phase I awardees (e.g. completed Phase I within the required time frame) to submit Phase II proposals. The Phase II proposals are due after receipt of the Phase I Final Report, approximately eight months after commencement of the Phase I contract.**

Offerors are cautioned of unforeseen delays that can cause late arrival of proposals at NOAA, resulting in them not being included in the evaluation procedures. No information on the status of proposals under scientific/technical evaluation will be available until formal notification is made.

## **6.2 Proposal Submission**

**The technical proposal and supplemental budget information must be submitted electronically via email to [NOAA.SBIR@noaa.gov](mailto:NOAA.SBIR@noaa.gov).** Submission to any other address is not acceptable. This email address is ONLY for submission of proposals. Questions regarding the solicitation shall be forwarded to the contracting officer, and they shall not be submitted to this email address.

When emailing your proposal, the contractor shall follow these instructions:

- Subject line shall contain “FY2016-1 NOAA SBIR- Subtopic 8.xxx : Company Name”

- Where xxx is the subtopic number (ex. 8.2.2F)
- If multiple emails are required (in order to stay under 20 Megabytes), the contractor shall include after company name an annotation similar to “Email 1 of 2”, etc.
- All submissions are electronically timestamped at the government’s email server in order to be considered. They must be received no later than 4:00PM EST, January 14, 2016 deadline. Please keep in mind that the bigger email files may take time to reach our email servers, so plan accordingly.
- Limit on email size (which includes mail text and all attachments) is 20 Megabytes (MB)
- All attachments must be in Adobe Portable Document Format (.pdf) or Microsoft Word 2010 (.docx) compatible format.
- Acknowledgment of receipt of the emailed proposal submission by the NOAA will be made. All correspondence relating to proposals must cite the specific **proposal number** identified in the acknowledgment.
  - This acknowledgement receipt will be sent via email to the address of the sender/offeree of the proposal
  - It is anticipated that all acknowledgment receipt notifications will be sent out no more than ten business days after close of this solicitation.
- Modifications - If the offeror needs to submit a modification to their proposals, they can do so, but it must follow these specific instructions:
  - Subject line should contain same info as requirement above, but with a prefix of the word “Modification” (ex. “Modification – FY2016-1 NOAA SBIR – Subtopic 8.2.2F : ACME Inc”)
  - Must be submitted by the deadline.
  - Must contain a full proposal submission (complete technical proposal and supplemental budget and other information). If only updates or changes are submitted, it will not be accepted as it will be considered an incomplete proposal.

To be considered a complete proposal, the application must include:

**Technical Proposals:** One electronic copy of the following (totaling a maximum of 26 pages):

- (a) Cover Page ( required form see Section 3.3.1 and 9.1)
- (b) Project Summary (required form, see Section 3.3.3 and 9.2)
- (c) Technical Content (up to 22 printed pages, see Section 3.3.4)
- (d) Proposed Budget (required form, see Section 3.6 and 9.3)

**Supplemental Budget and Other Information:** One electronic copy of the following (not counted towards the 26 page limit):

- (a) Supplemental Budget documentation (required, see Section 9.4)
- (b) SBIR Funding Agreement Certification (required form, see Section 9.5)
- (c) Screen shot or similar copy of proposers’ Company Registry as noted on SBIR.gov website (required, see Section 3.3.2)

- (d) List of prior Phase II awards for proposers awarded more than 15 SBIR Phase II awards in the prior five fiscal years (required, if applicable, but not included in the 26 page limit. See Section 3.5)
- (e) Letter from the relevant individual(s) that can commit the offeror to complete the required proposal, if awarded the contract. The letter shall be on the offeror's letterhead, dated, and indicate intent to perform the in accordance with the submitted proposal, if selected.
- Individual. If the offeror is an individual, the letter shall be signed by that individual. The signature shall be followed by the individual's typed, stamped, or printed name and the words, "an individual doing business as \_\_\_\_\_" [insert firm's name].
  - Partnership. The letter shall provide a list of all partners with authority to bind the partnership shall be provided. The letter will be signed in the partnership name and contain at least one signatory of the partnership's name typed, stamped, or printed.
  - Corporation. The letter shall provide a list of the relevant individuals that have authority to bind the corporation. The letter will be signed in the corporate name followed by the word "by" and the signature and title of the person authorized to sign.

Proposals in response to this solicitation shall be valid for a period of 240 calendar days after the closing date of the solicitation.

### 6.3 Warning

**While it is permissible, with proper notification to NOAA, to submit identical or essentially equivalent proposals for consideration under numerous Federal program solicitations, it is unlawful to enter into contracts requiring essentially equivalent effort. Offeror, if awarded, will be required at the time of the award and during the term of the award up to final payment to certify that essentially equivalent work is not being performed under funding agreements from any other federal agencies. If there is any question concerning this, it must be disclosed to the soliciting agency or agencies before award.**

## 7.0 SCIENTIFIC AND TECHNICAL INFORMATION SOURCES

### 7.1 General Information

The following web pages may be sources for additional technical information:

<http://www.noaa.gov>

<http://techpartnerships.noaa.gov/>

<http://www.lib.noaa.gov>

### 7.2 Oceanic and Atmospheric Science

- Overcoming Technical Barriers to the Sustainable Development of Competitive Marine Aquaculture in the United States (2008)  
[http://www.nmfs.noaa.gov/aquaculture/docs/aquaculture\\_docs/noaanist\\_techbarriers\\_final.pdf](http://www.nmfs.noaa.gov/aquaculture/docs/aquaculture_docs/noaanist_techbarriers_final.pdf)
- NOAA Marine Aquaculture Policy (2011)  
[http://www.nmfs.noaa.gov/aquaculture/docs/policy/noaa\\_aquaculture\\_policy\\_2011.pdf](http://www.nmfs.noaa.gov/aquaculture/docs/policy/noaa_aquaculture_policy_2011.pdf)
- Department of Commerce Aquaculture Policy (2011)  
[http://www.nmfs.noaa.gov/aquaculture/docs/policy/doc\\_aquaculture\\_policy\\_2011.pdf](http://www.nmfs.noaa.gov/aquaculture/docs/policy/doc_aquaculture_policy_2011.pdf)
- Wankel S. D., Huang Y. W., Gupta M., Provencal R., Leen J. B., Fahrland A., Vidoudez C. and Girguis P. R. (2013) Characterizing the distribution of methane sources and cycling in the deep sea via in situ stable isotope analysis. *Environmental Science and Technology* 47: 1478-1486. doi: 10.1021/es303661w
- Yvon-Lewis S. A., Hu L. and Kessler J. (2011) Methane flux to the atmosphere from the Deepwater Horizon oil disaster. *Geophysical Research Letters* 38. doi: 10.1029/2010GL045928
- Zang K., Zhao H., Wang J., Xu X., Huo C. and Zheng N. (2013) High-resolution measurement of CH<sub>4</sub> in sea surface air based on cavity ring-down spectroscopy technique: The first trial in China Seas. *Huanjing Kexue Xuebao/Acta Scientiae Circumstantiae* 33: 1362-1366.
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- O'Reilly, C., Santos, I. R., Cyronak, T., McMahon, A., & Maher, D. T. (2015). Nitrous oxide and methane dynamics in a coral reef lagoon driven by porewater exchange: Insights from automated high frequency observations. *Geophysical Research Letters*, 2015GL063126. doi: 10.1002/2015GL063126
- Call, M., Maher, D. T., Santos, I. R., Ruiz-Halpern, S., Mangion, P., Sanders, C. J., . . . Eyre, B. D. (2015). Spatial and temporal variability of carbon dioxide and methane fluxes over semi-diurnal and spring-neap-spring timescales in a mangrove creek. *Geochimica et Cosmochimica Acta*, 150, 211-225. doi: 10.1016/j.gca.2014.11.023

- Schneider B., Gülzow W., Sadkowiak B., Rehder G. (2014) Detecting sinks and sources of CO<sub>2</sub> and CH<sub>4</sub> by ferrybox-based measurements in the Baltic Sea: Three case studies. *J. Marine Syst.* 140:13 – 25. doi: 10.1016/j.jmarsys.2014.03.0140924-7963
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- Huang K., Cassar N., Wanninkhof R. and Bender M. (2013) An isotope dilution method for high-frequency measurements of dissolved inorganic carbon concentration in the surface ocean. *Limnology and Oceanography: Methods* 11: 572-583. doi: 10.4319/lom.2013.11.572
- Gülzow W., Rehder G., Schneider v. Deimling J., Seifert T., Tóth Z. (2013) One year of continuous measurements constraining methane emissions from the Baltic Sea to the atmosphere using a ship of opportunity. *Biogeosciences* 10: 81–99. doi: 10.5194/bg-10-81-2013.
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- Du M., Yvon-Lewis S., Garcia-Tigreros F., Valentine D. L., Mendes S. D., Kessler J. D. (2014) High Resolution Measurements of Methane and Carbon Dioxide in Surface Waters over a Natural Seep Reveal Dynamics of Dissolved Phase Air–Sea Flux. *Environ. Sci. Technol.* 48: 10165–10173. doi: 10.1021/es5017813
- For more information on NOAA NOy Cavity Ring Down Spectrometer:  
<http://techpartnerships.noaa.gov/WorkingwithNOAA/OpenOpportunities/TabId/299/ArtMID/1381/ArticleID/10778/LICENSING-OPPORTUNITY-NOy-Cavity-Ring-Down-Spectrometer.aspx>
- One-year, no-cost research and technology license information:  
<http://techpartnerships.noaa.gov/sites/orta/Documents/RESEARCH%20LICENSE%2011-6-12.pdf>
- For more information on Smart Module:  
<http://techpartnerships.noaa.gov/WorkingwithNOAA/OpenOpportunities/TabId/299/ArtMID/1381/ArticleID/11371/Smart-Module-for-Communications-Processing-and-Interface-Patent-Pending.aspx>
- For more information on US Patent 819,5395: <http://www.google.com/patents/US8195395>

### **7.3 SBIR National Conferences**

#### **Federal R&D Opportunities for Technology Intensive Firms**

Marketing Opportunities for R&D and Technology Projects with Federal Agencies and Major Corporations.

Techniques and Strategies for Commercializing R&D through Venture Capital, Joint Ventures, Partnering, Subcontracts, Licensing, and International Markets.

Management Seminars in Marketing and Business Planning.

Working with Academia and the States.

Agency and company exhibits and/or One-on-One tables will be open for networking opportunities for all attendees!

For further information on dates and times of upcoming conferences, see the SBIR Homepage and go to the EVENTS section: [www.sbir.gov](http://www.sbir.gov)

## 8.0 RESEARCH TOPICS

### 8.1 TOPIC: Resilient Coastal Communities and Economies

#### 8.1.1F SUBTOPIC: Improving Outcomes of Marine Aquaculture via Genomic Approaches

**Summary:** In comparison to human medicine or land based agriculture, the genomic basis for improving marine aquaculture breeding outcomes is in its infancy. Most aquaculture facilities rely on batch spawning and trial and error. There is little chance of identifying individual parents and the specific genetic traits that provide eggs and larvae with superior qualities of growth, feed conversion and disease resistance. The sequencing of the human genome took 10 years and 3 billion dollars. The cost of genome sequencing has declined to <10 days and < 1,000 per human genome. Perhaps more important non-model genomes such as abalone, yellowtail (*Seriola* sp.) bluefin tuna, and rock scallop can be developed based on linkages to data bases from better studied biomedical model organisms such as the zebrafish. NOAA resource managers and the aquaculture industry seeks assistance in developing high-throughput, low cost methods to conduct pedigree analyses, and to identify and routinely screen for functional genes associated with favorable growth characteristics and genes associated with disease sensitivity and resistance.

**Project Goals:** Genetic trait selection is an integral part of land based agriculture and has revolutionized the production of corn, rice and soybeans. Atlantic salmon is the only marine species to undergo extensive selective breeding. Concerns over escapement from offshore farms, the need to recover endangered species via hatchery rearing, as well as consumer preference, dictates that the domestication of newer aquaculture species such as yellowtail and the stock enhancement of natural populations of depleted abalone must rely on a full understanding and the retention of mostly wild genetic characters, but it must also weed out the inferior spawning stock with each broodstock collection and spawning event. Assistance from the private biotech community is critical to developing rapid, cost-effective screening procedures designed for pedigree analysis, genomic trait selection to improve outcomes of aquaculture, and monitor the success of out-planting as a means of wild stock recovery. While the ultimate goal might be commercial biotech kits that could be sold to hatchery managers (similar to a modern pregnancy kit), the immediate and perhaps longer term economic model would be to provide a continuing fee-for-service business to support hatchery managers.

#### **Phase I Activities and Expected Deliverables:**

Activities Include:

- Identification of a family of single nucleotide polymorphisms (SNPs), to allow parent-offspring and kinship analyses in a candidate aquaculture species among the tuna family (Scombridae), jack family (Carangidae), the drum and croaker family (Sciaenidae), or the abalone genus (*Haliotis*). This could include Pacific bluefin tuna, yellowtail jack, white seabass, or red abalone.
- Genetic screening of existing data bases for identification of trait-associated genes in a candidate aquaculture species among the tuna family (Scombridae), jack family (Carangidae), the drum and croaker family (Sciaenidae) or the abalone genus (*Haliotis*). This could include Pacific bluefin tuna, yellowtail jack, white seabass or red abalone.

Deliverables include:

- A next-generation SNP assay or similar approach to identify parent-offspring relationships that is not dependent on conventional micro-satellite or sequence based approaches.
- A roadmap to the development of a high-throughput, low cost automated assay of parent-offspring relationships in a hatchery environment.
- A roadmap to the development of a SNP chip or similar approach to allow rapid and low cost screening for hatchery managers for favorable and unfavorable genetic traits.

### **Phase II Activities and Expected Deliverables:**

Activities Include

- Development and testing of a market ready technique for high-throughput, automated screening of parent stock and eggs for paternity analysis
- Development and testing of a prototype chip for screening polymorphic genes associated with desirable and undesirable traits in an aquaculture setting. Design should be flexible to allow the addition of new markers as our understanding of the underlying genomes improves.

Deliverables include:

- Market ready technique for high-throughput, automated screening of parent stock and eggs for paternity analysis
- Prototype chip for screening polymorphic genes associated with desirable and undesirable traits in an aquaculture setting. Prototype should be designed to be flexible to allow the addition of new markers as our understanding of the underlying functional genomes improves.

*NOTE: Even though a prototype may be required to be delivered for the project, it is important to note that this prototype is still the property of the offeror. NOAA would only do field or lab testing on that product to see its feasibility in a production (or development) environment*

### **8.1.2F SUBTOPIC: Developing Technologies for Offshore Aquaculture in The United States**

**Summary:** Offshore aquaculture refers to aquaculture in the waters between state maritime boundaries and the end of the Exclusive Economic Zone (EEZ). Offshore aquaculture has the potential to complement wild harvest fisheries, increase our domestic supply of safe, healthy seafood and contribute to resilient coastal communities and economies. There is huge opportunity for offshore aquaculture development in the United States. The U.S. EEZ is the largest in the world, spanning a wide range of ocean conditions and habitats. Less than 0.01% of the U.S. EEZ could potentially produce up to 600,000 metric tons or more per year of an equally wide range of farmed aquatic species. Dozens of commercial operations around the world currently use offshore aquaculture technologies, and U.S. companies, investors, and farmers have participated in this global aquaculture industry by exporting technology, equipment, seedstock, services, investment and feed.

With the development and impending implementation of the Fishery Management Plan for Regulating Offshore Aquaculture in the Gulf of Mexico, the United States is poised to grow its domestic offshore aquaculture industry. With this growth will come new challenges to working in remote, offshore environments, and a range of technologies will be needed to address logistical and environmental issues. Proposals are requested for research towards innovative products and services to specifically develop offshore aquaculture capabilities for finfish, shellfish, or seaweeds. Priority is given to research that addresses technology bottlenecks to developing domestic offshore aquaculture operations and in turn increase our sustainable seafood supply, protect our ocean resources, and create economic opportunities for coastal communities.

**Project Goals:** New technologies, products and methods are needed to address challenges in developing offshore aquaculture for finfish, shellfish, and seaweeds. Projects that would support production improvements can include but are not limited to: technologies, methods or products that address offshore farming technologies, preventing risks from escapes (such as sterile stock), development of tools for management, remote and/or real-time monitoring, transportation, facility maintenance, and harvest, feeds for offshore culture, preventing disease transfer, and hatchery technology. Priority will be given to proposals that specifically target and address issues associated with offshore aquaculture and the unique challenges it presents.

#### **Phase I Activities and Expected Deliverables:**

Activities Include:

- Develop high probability solutions to key bottleneck issues.
- Execute research and development of techniques and management measures to address these bottlenecks.
- Explore commercialization opportunities (preliminary business planning)

Deliverables include:

- Proof of concept at the lab or bench scale
- Refinement of products or solutions
- Commercialization plan with permit requirements, preliminary enterprise budgets and business plan
- Technical Report showing commercial application of developed technology/technique and research results.

#### **Phase II Activities and Expected Deliverables:**

Activities Include:

- Prototype or pilot scale trials of the techniques and products developed in Phase I.
- Further refinement and/or expansion of product or solutions
- Refinement of profit/loss models, enterprise budgets and business plan

Deliverables include:

- Detailed report on developed technology/technique showing biological, legal and economic feasibility under commercial conditions

*NOTE: Even though a prototype may be required to be delivered for the project, it is important to note that this prototype is still the property of the offeror. NOAA would only do field or lab testing on that product to see its feasibility in a production (or development) environment*

**References:**

Overcoming Technical Barriers to the Sustainable Development of Competitive Marine Aquaculture in the United States (2008)

[http://www.nmfs.noaa.gov/aquaculture/docs/aquaculture\\_docs/noaanist\\_techbarriers\\_final.pdf](http://www.nmfs.noaa.gov/aquaculture/docs/aquaculture_docs/noaanist_techbarriers_final.pdf)

NOAA Marine Aquaculture Policy (2011)

[http://www.nmfs.noaa.gov/aquaculture/docs/policy/noaa\\_aquaculture\\_policy\\_2011.pdf](http://www.nmfs.noaa.gov/aquaculture/docs/policy/noaa_aquaculture_policy_2011.pdf)

Department of Commerce Aquaculture Policy (2011)

[http://www.nmfs.noaa.gov/aquaculture/docs/policy/doc\\_aquaculture\\_policy\\_2011.pdf](http://www.nmfs.noaa.gov/aquaculture/docs/policy/doc_aquaculture_policy_2011.pdf)

**8.1.3F SUBTOPIC: Orthogonal Stereo Camera System for Visual Fish Surveys**

**Summary:** NOAA Fisheries is mandated to provide the best scientific information available to establish conservation and management measures for the sustainability of our Nation's living marine resources and healthy oceans. One national priority relevant to this mission is the need to resolve data-limited fish assessments. Many of the data-limited assessments result directly from the inability to effectively sample rocky and reef habitats. The scientific community has relied on camera systems deployed along the bottom to provide counts and measures for assessments. One research approach is the accurate synchronization of paired stereo cameras which provide the counts and precise length measurements of fish during camera surveys. Another research approach is the use of multiple synchronized pair stereo cameras where their view fields are orthogonally arranged and stitched to provide a 360 degree horizontal view to eliminate double counting targets while providing accurate length measures (to 0.5 cm accuracy). Research has demonstrated that the use of paired stereo cameras with sufficient accuracy in "synchronization" and "stitched view fields" have significantly improved abundance estimates for assessments; however to date, commercially available stereo camera systems lack the accuracy in "synchronization" and "stitched view fields" for scientific data collections. There is consensus (and market) among fisheries scientists within the agency and among the international scientific community regarding a need for an off-the-shelf (easy to use turn-key) orthogonal stereo camera system with accurate "synchronization" and "stitched view field" capabilities that could be widely deployed to improve visual fish survey operations to resolve data-limited stock assessments in difficult to sample reef and rocky habitats.

**Project Goals:** An orthogonal stereo camera system needs to be designed and commercialized to provide accurate "synchronization" and "stitched view fields" among multiple stereo cameras to enable accurate counting and measuring (length to within 0.5 cm) of fish during scientific underwater visual surveys. Researchers have investigated the applicability of

using accurately synchronized stereo cameras for measuring fish length and recommend arranging multiple pairs of synchronized stereo cameras orthogonally and horizontally to stitch the stereo view fields together to provide a horizontal 360 degree sampling field will prevent double counting of fish. Although there are underwater stereo cameras and spherical cameras that are commercially available, there are no commercial products that provide sufficiently accurate “stereo camera synchronization” and accurate “stitching between multiple synchronized stereo cameras” that can be utilized for visual fish surveys providing precise fish length measurements to the nearest 0.5 cm. There is a need to develop and commercialize an orthogonal stereo camera system with these features that is easily to deploy and use, including clear protocols for its calibration, operation, and performance metrics. Another system feature that researchers have investigated is an optional fish detection trigger (through active acoustic and/or far-field infrared detection) which minimizes data collect for only detected targets having applicability for prolonged deployments. Although this is not a requirement for this SBIR, it is important to recognize this might be an optional feature that is desired by the scientific community. There is sufficient research published to guide the specifications of developing and commercializing a standardized low-cost stereo camera system with these requirements that will be widely used for visual fish surveys both domestically and internationally. This orthogonal stereo camera system will wide international applicability for the data-limited regions that require stakeholder engagement, therefore its operation must be relatively simple and reliable. The goal of commercializing this portable underwater stereo camera system is to provide a low cost and reliable tool that will be widely deployed in standardized visual fish surveys to resolve data-limited stock assessments.

There is a need to commercialize an orthogonal stereo camera system for visual fish surveys to accurately identify, count, measure fish per unit sampling volume. Underwater stereo cameras have recently become available as commercial products; however none of these existing products are designed with accurate “synchronization of stereo cameras” and accurate “stitching of view fields of multiple stereo camera units” for providing accurate fish length measures (to the nearest 0.5 cm) from scientific visual fish surveys. Therefore, the NOAA mission and the wider scientific community would benefit from the development and commercial availability of an orthogonal stereo camera system with accurate “synchronization” and “view field stitching” that can be deployed for visual fish surveys.

An orthogonal stereo camera system with accurate “synchronization between stereo cameras” and accurate “stitching of stereo camera view fields” to count fish and accurately measure fish length to the nearest 0.5 cm within a 360 degree horizontal view around the system to be deployed on the seafloor (to depths of 500 meters) during visual fish surveys. This orthogonal stereo camera arrangement should have the ability to capture high definition (HD) video (at least 1080p at 30 f/s) or capture HD still images (at least 6 megapixels) to count, identify, and accurately measure fish (accuracy within 0.5 cm) in the 360 degree sampling volume around the system with the intent of reducing double counting of fish. Camera must have minimal lens distortion to obtain accurate fish length measurements using stereo camera imaging. The cameras must have low light sensitivity (at least 0.2 lux @ f 1.4). An optional feature that enables a fish detection trigger is desirable to capture digital fish images. The system could include an optional feature of synchronized lighting or strobed modules synchronized to the stereo camera units for capturing digital fish images at night or low light conditions. The

system should be relatively user-friendly turn-key operation with clear operational instructions. Software needed for calibration of stereo camera modules and lens distortion compensation to achieve accurate and precise fish length measurements to the nearest 0.5 cm within the sampling volume at various angles of fish orientation. Software interface for accurate synchronization, operation data collection and data storage. Software is needed for data export with metadata and post processing (i.e., stitching sampling fields of the orthogonal stereo cameras, fish counts and length measurements). The system must contain sufficient data storage capacity for continuous HD video recording for duration of 2 hours with data downloading capability

### **Phase I Activities and Expected Deliverables:**

Activities include:

- Explore the feasibility in building out an orthogonal stereo camera for visual fish surveys to accurately identify, count, measure fish per unit sample volume.
- Provide proof of concept in ensuring the stereo cameras (either two or more) is synchronized.

Deliverables include:

- Progress Reports and Detailed Final Report as outlined in solicitation
- Provide design and technical report for (and any white papers associated with) the camera
- Provide prototype buildout specification and blueprint for camera, ensuring the details outlined above is taken into consideration.

### **Phase II Activities and Expected Deliverables:**

Activities include:

- Prototype or pilot scale trials of the techniques and products developed in Phase I.
- Further refinement and/or expansion of product or solutions
- Refinement of profit/loss models, enterprise budgets and business plan

Deliverables include:

- Progress Reports and Detailed Final Report on developed technology/technique of the low cost stereo camera system for visual fish surveys showing the accuracy, precise, and reliability of measures, and the economic feasibility under commercial conditions

*NOTE: Even though a prototype may be required to be delivered for the project, it is important to note that this prototype is still the property of the offeror. NOAA would only do field or lab testing on that product to see its feasibility in a production (or development) environment*

## **8.2 TOPIC: Healthy Oceans**

### **8.2.1N SUBTOPIC: Affordable, lightweight, wireless-control ROV for sustained observation of benthic ecosystems**

**Summary:** Conserving coastal places provides economic benefits to local communities. These communities rely on dollars spent on activities such as recreation and tourism. NOAA's National Ocean Service works to conserve marine areas — and preserve the economic benefits of these special places to local communities through its coastal management and place-based conservation programs. National Marine Sanctuaries are mandated to fulfill this place-based conservation and through our research we are working to understand the natural and anthropogenic changes and interactions occurring at Gray's Reef.

Traditional neutral buoyancy ROVs (Remotely Operated Vehicles) have more flexibility with endurance underwater by way of the powered umbilical connecting it to the surface operating station. Unfortunately, currents, wave action and underwater stability inconveniently limit long term studies at many sites due to the complexities of the vessel support station needing constant maneuvering to keep from dragging the ROV from its subject of study. Scuba divers, neutral buoyancy ROVs, and the vessels that support them are loud and behave awkwardly and invasively compared to the natural environment surrounding them. This awkward, intrusive behavior results in altered organism behavior thus altering the study itself. A benthic ROV operated wirelessly from the surface can eliminate much of the altered behaviors. The divers are no longer present. With a wireless benthic ROV, the constant maneuvering of the neutral buoyancy ROV is removed and reduced to a slow crawl or no movement at all. This is very important in the study of fishes as the loud and disruptive noise from the support vessel can be eliminated by providing some distance to the surface communications of the crawler. Once the ROV is positioned onto the study site, it can monitor and film its subject silently and without movement. While it is filming, payloads on the chassis such as scientific sensors are also quietly recording data and delivering both the video and data in real time to the surface by way of the wireless transmissions from surface buoy to support station. Government agencies, universities, private organizations and citizens conduct thousands of dives each year studying the waters beneath our global oceans, lakes, and rivers worldwide. NOAA's Office of National Marine Sanctuaries and the wider ocean science research and education community would benefit from an affordable (under \$15,000.00), lightweight, benthic ROV that communicates wirelessly from its support station (vessel, shore, etc.). To our knowledge, this technology does not exist in the wireless capacity; however there is ample evidence it is needed to accomplish studies over a period of time much longer than that allowed by a scuba diver or the limited resources of the support vessel/station in terms of fuel and personnel. In addition, non-diving personnel should be able to provide direct observations of a reef or its inhabitants, even tiny macro video subjects, in real time without going to the seafloor.

**Project Goals:** Currently commercially available benthic ROVs are proprietary hardware and software and the ability of the end user to easily customize, repair, or extend the hardware or software capabilities is very limited, and thus NOAA personnel are at the mercy of the manufacturer for support. NOAA personnel should be able to have the control to modify their crawler platform to meet NOAA's changing mission requirements, via commercially available

components, access to all spare parts at low cost, and open source software with full access to all source code. The ROV should be a platform which NOAA personnel have full ability to customize, extend, reconfigure, adapt, and repair.

For an operator aboard a nearby surface vessel to most effectively control the robot in real time, the communications and control link between operator and robot should be wireless, allowing the surface vessel freedom from constant maneuvering to precisely station-keep above the robot as it would if it were directly tethered to it. This reduces both manpower required to pilot the vessel while operating the rover and reduces the cost of fuel otherwise consumed in station-keeping. A wireless communication link also allows the operation of the robot from shore.

Most currently available benthic ROVs are designed for greater than 1000 meter depths. While essential for doing deep ocean surveys, this high level of performance (and the inevitable high cost to achieve it) is unnecessary for shallow water surveys such as those typical in the majority of the NOAA National Marine Sanctuaries such as Gray's Reef, Thunder Bay, Channel Islands, Florida Keys, American Samoa, Hawaiian Islands Humpback Whaler and others.

A benthic ROV designed for the littoral zone incorporating a wireless link can be much lower in cost and complexity. This allows NOAA and the scientific community to acquire more of these vehicles and perform more surveys per dollar while also obtaining the cost benefits of reduced manpower required for operation, easier operator training, and greatly reduced vessel fuel consumption.

Even in a well-surveyed Sanctuary like Gray's Reef, many fundamental questions have not been answered. Example: Does this species of fish stay in one area, or wander down the reef over 24 hours? How far does it go? Conducting such a behavior survey involving physically following an organism at unpredictable times over an unpredictable distance would require close coordination of multiple teams of divers doing as many as 24 separate dives (at 60 feet), and a massive logistic and diver support operation.

An event whose time of occurrence may be unpredictable such as the time of night an octopus leaves its lair to hunt and when it returns can be difficult to capture for divers with a 50 or 60 minute no-decompression dive limit (especially when divers with their noise, motion and bubbles would have to hover around in front of its lair).

A benthic ROV with a high-definition camera recharged from the surface could follow the organism across the seafloor thereby completing such a survey efficiently and easily. Currently, to complete that survey with any commercially available benthic robot operated via a tether wire directly connected to a surface vessel operator control unit (OCU) the vessel would need to continuously run its engines to maintain constant course corrections to keep station above the rover and so as not to drag it along the seafloor. An untethered radio link of approx. one mile range is desired to allow the vessel some distance from the study site.

System Minimum Requirements

- Wet Weight Environmental Footprint Threshold <.1psi target <.08 psi. exerted on substrate being traversed, to minimize harm to fauna living in seabed.
- Dry Weight threshold 40 lbs, target 30 lbs – deployable and recoverable by one person at sea.
- High Definition 1080P video camera with sufficient control over the camera from the OCI to:
  - Record/Stop
  - Playback Recording (to OCI monitor)
  - Delete Recording
  - Camera Menu System
  - Manual/Auto focus
  - Iris Control
  - Wide Angle / Zoom
  - Turn Video Lights On/Off
  - Camera Pan/Tilt
  - Camera Positioning Arm deploy/retract
  - Desired Radio Link Range Over Seawater with two-foot waves, two-foot swells
  - Minimum 0.4 miles 1.0 miles or better is desired.

### **Phase I Activities and Expected Deliverables:**

Activities include:

- Trade study of design tradeoffs to achieve threshold and target reliability for ROV and wireless control station at target cost
- Study of approaches for maximizing surface wireless link range over water
- Design for digital remote control and mounting of NOAA's three preferred underwater video camera systems and Remote Video Lighting Management
- Study of methods of scaling the ROV for operation in deeper depths and higher sea states.
- Study of feasible approaches to long term power and recharging while at depth.

Deliverables include:

- Detailed proof of concept report documenting the feasibility of designing low cost versions of the subsystems that make up the ROV and the feasibility of building such an ROV (rated for 200 feet), Buoy, Tether, and Control station for under the threshold price of \$14,000.00 with a target price of \$10,000.00.
- Detailed trade study of the cost/performance/deck-handling options for the ROV.
- Detailed trade study of different approaches to maximizing the range of the wireless communications link.
- Detailed assessment of costs and the additional changes to extend depth to 600 feet.
- Detailed assessment of power strategies and preferred battery chemistry and in-situ charging techniques.

### **Phase II Activities and Expected Deliverables:**

Activities include:

- Assemble prototype of complete benthic ROV

- Contract with engineers to optimize mechanical and electronic components for robustness and reliability, design modularity, ease of maintenance, and ease of low cost manufacture.
- Explore least-cost options for components, including injection molding, rapid prototyping, etc.
- Complete CAD/CAM design of all mechanical and electrical components necessary for assembly.
- Develop User-Friendly Operator Control Interface software for use with a standard Windows or Linux Computer and standard "game controller" joystick or other standard 'human interface device' (HID) controller; with options for modular addition of HTML based graphical screen displays of controls such as ROV speed, compass, pitch and roll indicators, battery life, arm position, etc.

Deliverables include:

- Prototype ROV delivered for test and evaluation to characterized strengths and weaknesses of the system before Phase 3 commercialization.
- Full engineering documentation for manufacturable components, they should be complete enough to produce all parts ready for assembly. Detailed manufacturing prints for ROV mechanical and electronic systems, Buoy, Cabling, Camera control system, power supply and charger, shipping container, manual; Control Software

*NOTE: Even though a prototype may be required to be delivered for the project, it is important to note that this prototype is still the property of the offeror. NOAA would only do field or lab testing on that product to see its feasibility in a production (or development) environment*

## 8.2.2N SUBTOPIC: Lionfish Control

**Summary:** The western Atlantic Ocean, Caribbean Sea, and Gulf of Mexico are currently experiencing a rapidly expanding and seemingly uncontrolled invasion by Indo-Pacific lionfish. In the last 15 years, populations have grown beyond our ability to control them by traditional response modes – diver removal, for example. Impacts to reef communities are being observed in many locations, with predation rates that can remove up to 70% of the forage base of other reef fish. Lionfish now occupy depths down to 1000 feet, and are in very high densities in many places, the vast majority of which are below diving depths, and they appear to have no currently functioning natural controls. Lionfish have been caught in deep water in some traditional traps, principally lobster traps, and some by hook-and-line, but in insufficient numbers to control populations.

**Project Goals:** Most fish traps currently in use are not considered environmentally friendly. They can damage habitats, and most are non-selective, capturing and containing fish throughout their deployment period, and subjecting them to predation by other animals that enter the trap. They also produce by-catch, which are non-targeted animals (for example, eels, sharks and grunts in traps intended for other reef fish). The by-catch often dies before it can be released back to the sea, and much that is released cannot return to the bottom

because gases that expand in the fish during ascent cause them to be too buoyant to swim back to the bottom on their own. These animals, invariably under heightened stress, are often eaten by barracuda and other predators soon after release. And when lost, traps often continue “ghost fishing,” attracting and killing captured animals as long as they stay intact. Unless new ways are developed to deal with the lionfish invasion through biological controls (parasites, diseases, genetic sterilization), the only practical ways to remove lionfish from deep habitats may be by using innovative capture devices. This subtopic addresses the challenge of developing and testing devices that remove invasive fish from deep water rapidly, in high numbers, and without the drawbacks of other collection techniques.

### **Phase I Activities and Expected Deliverables:**

Activities include:

- Prepare conceptual design for device that will
  - selectively capture lionfish with minimal impact to the environment while operating or if lost, and
  - avoid impacts to non-targeted

Deliverables include:

- Concept for operations
- Prototype design
- Commitments in principle from potential users

### **Phase II Activities and Expected Deliverables:**

Activities include:

- Build prototype to test operational characteristics
- Conduct field tests to evaluate function and effectiveness
- Construct devices using materials intended for actual operations
- Demonstrate viability of any ancillary operations intended to complement fish removal (e.g., disposal, or distribution as part of supply chain for restaurant use)

Deliverables include:

- Prototype
- Field test results
- Operational device built with final materials
- Disposal or distribution plan.

*NOTE: Even though a prototype may be required to be delivered for the project, it is important to note that this prototype is still the property of the offeror. NOAA would only do field or lab testing on that product to see its feasibility in a production (or development) environment*

### 8.2.3D SUBTOPIC: Sensor System for Measuring Oxygen Demands in Natural Waters

**Summary:** Occurrences of large volumes of hypoxic or anoxic waters, also known as “dead zones”, are widespread in the United States, including the Gulf of Mexico, the Great Lakes, the Chesapeake Bay, the Long Island Sound, and coastal waters off Oregon and Washington. A capability to monitor and forecast the locations of these dead zones is highly desired from the standpoint of ecosystem and water quality management.

Satellite optical remote sensing is a promising tool to build such a capability because light absorption and scattering by oxygen-consuming organic matter is detectable from space. Establishing direct linkages between the optical signatures of these organic materials and their oxygen consumption is currently hindered by the lack of adequate and user-friendly instruments for routine and quick response measurements of oxygen consumption in natural water bodies. Such instrumentation would greatly facilitate NOAA’s development of remote-sensing algorithms for monitoring, forecasting, and managing aquatic ecosystems and water quality.

**Project Goals:** NOAA is requesting proposals for a field instrument system equipped with sensors capable of simultaneously and directly (not by proxy) measuring biochemical oxygen demand (BOD) and chemical oxygen demand (COD) in both freshwater and marine environments. Once developed, data-acquisition should be achievable in both stationary and profiling modes, and the system should be accurate, rugged, reliable, portable, low-cost, quick-response, anti-foulant, submersible to ~100 m, and easy to deploy from a variety of platforms (e.g., land, zodiac, small research vessel).

#### **Phase I Activities and Expected Deliverables:**

Activities include:

- Research and technology development for a proof-of-concept BOD/COD sensor system.

Deliverables include:

- A detailed proof-of-concept report describing research results and technology development completed for a BOD/COD sensor system, and
- A description of where the principal investigator expects the project to be at the end of Phase II, including a description of how this sensor system will be commercialized.

#### **Phase II Activities and Expected Deliverables:**

Activities include:

- Development of a prototype system;
- Lab calibration of the prototype system; and
- Demonstration field tests of the prototype system. Build prototype to test operational characteristics

Deliverables include:

- A prototype system calibrated in the lab which demonstrates the success of the research / technology development;

- A detailed report on the results of demonstration field deployments in both modes (stationary and profile) of the prototype system; and
- A thorough plan, including a timeline, describing the transition of this prototype system into the commercial marketplace

*NOTE: Even though a prototype may be required to be delivered for the project, it is important to note that this prototype is still the property of the offeror. NOAA would only do field or lab testing on that product to see its feasibility in a production (or development) environment*

#### **8.2.4D            SUBTOPIC: Innovative Multi-Platform Sensor for Marine Debris and Object Detection and Mapping**

**Summary:** Detecting and mapping objects and debris in our oceans, coastal areas and marine navigation routes has been a difficult problem. Advancements in sensor and measurement technologies are drastically needed. Marine debris and pollutants pose significant navigational and environmental threats. The tsunami on March 11, 2011 making landfall in Japan produced 5 million tons of debris in the ocean, and it is believed that more than 1 million tons of debris are still floating. This debris significantly threatens marine navigation and coastal environments. As the downhill flow rate of the Greenland glaciers further increases (doubled in the last decade), a larger number of icebergs are being calved. With the warming trend in ocean temperatures, these icebergs are melting at a faster rate and calving to produce smaller icebergs that are more difficult to detect. The same is occurring in the southern ocean. Wind and ocean currents are transporting these icebergs into shipping routes, posing significant threat to marine navigation. With the warming trend, sea ice is also changing affecting navigational paths. Routine monitoring of these changes is urgently needed. Melting sea ice also plays a role in climate change. Accurate knowledge of sea ice extent and location is needed for climate studies and forecasting. Accidents at sea, be it marine vessels, cargo or aircraft, require an ability to rapidly search large regions for debris in order to focus search & rescue and recovery resources. Identifying the location of the debris allows the search & rescue area to be reduced significantly and thereby improving chances of finding survivors, minimizing cargo loss and reducing costs in these efforts. NOAA seeks innovative sensor and measurement technology that can be deployed from manned and unmanned ships and aircraft, as well as satellite platforms in the future, that can provide accurate detection and mapping of marine debris and objects over large swath / coverage areas.

**Project Goals:** This project seeks an innovative sensor and measurement approach for detecting and mapping debris and objects in our oceans, coastal areas and marine navigational routes. The sensor should be deployable from manned and unmanned marine vessels and aircraft; provide wide swath coverage; and the measurement technique can be applied from a spaceborne platform in the future.

#### **Phase I Activities and Expected Deliverables**

Activities include:

- Define measurement and operational requirements for applications discussed above in the project summary. These should include specific requirements that each type of platform (e.g. marine vessel, aircraft, manned, unmanned, etc.) will place on the final sensor and measurement technique.
- Develop and define measurement concept(s), sensor concept and system specifications.
- Develop preliminary system design to meet above requirements and specifications.
- Determine measurement performance in terms of final geophysical parameters, spatial coverage and temporal coverage.
- Determine feasibility and cost to build prototype and estimate operational costs of a Phase 3 system for each type of platform (spaceborne excluded).
- Identify commercial applications / market spaces and potential revenue from the product (maybe sensor itself and/or data products it produces) developed based on the system developed through the SBIR.

Deliverables include:

- Requirements Definitions.
- Sensor Concept and Preliminary System Design.
- Performance, Feasibility, Cost Analysis.
- Commercial Application Analysis.
- Final Report.

## **Phase II Activities and Expected Deliverables:**

Activities include:

- Develop detailed system design for Phase II prototype system.
- Perform full system performance analysis and determine compliance with requirements and specifications from Phase I.
- Develop test / verification plan for evaluating Phase II prototype performance.
- Fabricate Phase II prototype system.
- Execute performance / verification testing.
- If possible within the funding scope of the Phase II, execute small demonstration experiment exhibiting the performance of the sensor in a real-world environment.
- Identify commercial products and market space being addressed by the technology developed through this effort.

Deliverables include:

- Performance Analysis Report.
- Test/Verification Plan
- Performance Testing Report
- Phase II Prototype System.
- Commercial / Market Analysis Report.

*NOTE: Even though a prototype may be required to be delivered for the project, it is important to note that this prototype is still the property of the offeror. NOAA would only do field or lab testing on that product to see its feasibility in a production (or development) environment*

#### **8.2.5R            SUBTOPIC: Autonomous direct measure of carbonate ion in saline waters**

**Summary:** Chemical changes in seawater result from the uptake of carbon dioxide (CO<sub>2</sub>) either as a result of rising atmospheric CO<sub>2</sub> levels (i.e. ocean acidification), or as a result of enhanced respiration particularly within coastal waters. These changes include increasing concentrations of dissolved inorganic carbon (DIC), the production of carbonic acid (e.g. acidification), an increase in the partial pressure of seawater CO<sub>2</sub>, and shifts in the ratio of bicarbonate to carbonate ion availability whereby carbonate ion concentration decline with increasing CO<sub>2</sub> levels. How these changes affect marine life is a prominent issue for contemporary oceanography and marine resource management. Geological evidence reveals dramatic changes in marine life as a consequence of past events where similar rates of CO<sub>2</sub> increase occurred and experimental studies indicate that a broad range of contemporary taxa are sensitive to such changes. Documentation of the chemical changes accompanying ocean acidification is a key element in acquiring the environmental intelligence needed to foster a resilient society. Carbonate ion concentration is a particularly important variable with regards to ocean acidification as a number of important impacts to marine calcifiers are often attributed to its decrease. However, rather than being directly measured, carbonate ion is generally calculated from two of the four major CO<sub>2</sub> system parameters: pH, pCO<sub>2</sub>, DIC, and total alkalinity resulting in a propagation of error associated with the two measured parameters as well as the dissociation constants used to solve the carbonic acid system from them. Direct measurement using existing ion selective electrodes (ISE) significantly lack the sensitivity or precision needed for marine science or monitoring applications. Spectrophotometric methods are available remain laborious and not available at this time for autonomous applications. There is an emergent need for an accurate direct determination of carbonate ion with a precision of  $\pm 5 \mu\text{M}$  that is suitable for autonomous applications including sustained deployments and in experimental research applications.

**Project Goals:** This project will provide the field with an autonomous direct measure of carbonate ion concentration with suitable precision and accuracy for marine monitoring and research applications. The new Method will be useful to a wide range of users (e.g., marine resource managers, environmental monitoring entities, aquaculturist, fisheries, etc.) and would prove immensely valuable in assessing the impact of ocean acidification on the health of the marine ecosystem. Other applications would include clinical chemistry whereby the most important buffer of plasma is the bicarbonate/carbonic acid pair due to the important role CO<sub>2</sub> plays on the regulating plasma pH.

#### **Phase I Activities and Expected Deliverables**

Activities include:

- Investigate technical feasibility of the proposed new technique
- Demonstrate that the new method works in seawater
- Demonstrate that the proposed new technique will provide high sensitivity and high precision measurements of carbonate ion concentration

Deliverables include:

- Theoretical proof or/and practical testing results
- Comprehensive and detailed proposal outlining the research tackled in Phase II
- Provide a cost analysis for Phase II and future operational systems.

### **Phase II Activities and Expected Deliverables:**

Activities include:

- Test the new technique.
- Design a prototype using the new technology
- Demonstration of the proposed technology

Deliverables include:

- Provide test results proving the success of the new technique.
- Deliver a prototype using the new technology
- Comprehensive report outlining the research in detail
- Plan to commercialize the final product
- A Company presentation to the SBIR Panel

*NOTE: Even though a prototype may be required to be delivered for the project, it is important to note that this prototype is still the property of the offeror. NOAA would only do field or lab testing on that product to see its feasibility in a production (or development) environment*

### **8.2.6R SUBTOPIC: Laser-Based Analyzer for Methane, Carbon and Hydrogen Isotopic Measurements in the Deep Sea**

**Summary:** Development of laser-based sensors that are capable of measuring chemical species (gases and isotopes) will greatly enhancing the ability to understand biogeochemical processes in a range of ocean environments from the deep sea to coastal environments. Laser-based platforms can provide highly sensitive and precise measurements and be designed to target isotopic species. Laser-based platforms are particularly well suited to gas and stable isotope measurements but currently are large in size and have power requirements limiting the ability to deploy them in the deep sea. The development of smaller, more compact, and less power-hungry instruments will allow new in situ studies of biogeochemical processes in the ocean, including surveys of hydrate-hosting continental shelf sediments or hydrothermal vent settings. Other advances will come from the utilization of different lasers, different sensing schemes, new detectors, and targeting a variety of chemical species. Atmospheric sensors exist that utilize laser-based spectroscopy for such gases as methane, CO<sub>2</sub>, and N<sub>2</sub>O. Many such sensors are currently being used for surface water analysis, but very limited work has been done to push the technology into submersible sensors

**Project Goals:** New laser-based sensors that can be deployed on a variety of platforms, such as ROV's, AUV's and seafloor observatories are needed to understand biogeochemical processes and the carbon cycle in the deep sea. Technology advancements to decrease sensor size, power requirements and sensor accuracy are needed. Other areas of technology innovation will come from advancing gas extraction techniques, targeting a range of gases, utilizing new sensing schemes, and using novel lasers and detectors.

### **Phase I Activities and Expected Deliverables:**

Activities include

- Identify key challenges for sensor design
- Execute research and development of sensor design including identifying target gas species, package size and power requirements

Deliverables include

- Proof of concept
- Report showing promise for commercial application of developed technology/techniques

### **Phase II Activities and Expected Deliverables:**

Activities include

- Design and build prototype
- Test prototype in ocean environment

Deliverables include

- Detailed report on developed sensor technology showing sensitivity, precision, and accuracy and reliability with calibrations

*NOTE: Even though a prototype may be required to be delivered for the project, it is important to note that this prototype is still the property of the offeror. NOAA would only do field or lab testing on that product to see its feasibility in a production (or development) environment*

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### 8.3 TOPIC: Climate Adaptation and Mitigation

#### 8.3.1C SUBTOPIC: Ultra-High Precision Measurements of Atmospheric Methane Stable Isotope Ratios

**Summary:** Atmospheric methane (CH<sub>4</sub>) is the second most important contributor to radiative forcing, and monitoring its concentration is vital for understanding changes in Earth's climate. Interpreting variations of atmospheric CH<sub>4</sub> allows for determination of its sources and sinks. However, concentration measurements alone generally do not provide enough information on specific methane sources and sinks, which is required to develop predictive capability for climate-carbon-cycle feedback processes. On the other hand, measurements of ratios of stable isotopes of CH<sub>4</sub> can provide more information on processes responsible for observed variations of CH<sub>4</sub>. Currently NOAA collaborates with University of Colorado scientists to make ultra-high precision laboratory-based measurements of <sup>13</sup>C:<sup>12</sup>C, and 2H:1H of CH<sub>4</sub> using isotope ratio mass spectrometers. These devices are labor intensive and require significant pre-processing of samples. Direct optical methods (i.e. spectroscopy) have potential to greatly streamline this process if small volumes can be used and measurements can be made with as good or better precision and stability than existing mass spectrometric techniques. Instruments with such characteristics are not currently available in the marketplace.

**Project Goals:** Instrument developers should aim for measurements of CH<sub>4</sub> isotope ratios at ambient mole fractions (2 ppm) that achieve the following precisions (i.e. one sigma standard deviations of 20 repeated aliquots of whole air) using < 200 mL of air (STP) in less than 20 min:

δ<sup>13</sup>C CH<sub>4</sub>: 0.03 per mil

δ<sup>2</sup>H CH<sub>4</sub>: 0.5 per mil.

#### Phase I Activities and Expected Deliverables:

Activities include:

- Develop conceptual methodology
- Verify methodology
- Investigate and Identify appropriate components

Deliverables include:

- Bench-level prototype

#### Phase II Activities and Expected Deliverables:

Activities include:

- Purchase components
- Integrate components
- Construct working bench-level prototype
- Perform initial bench testing
- Iteratively test and refine the original design as necessary

Deliverables include:

- Integration of the prototype into a laboratory setting
- Provision of verification of data quality in cooperation with NOAA laboratories.

*NOTE: Even though a prototype may be required to be delivered for the project, it is important to note that this prototype is still the property of the offeror. NOAA would only do field or lab testing on that product to see its feasibility in a production (or development) environment*

### **8.3.2D            SUBTOPIC: High Stability Atmospheric Carbon Dioxide and Methane Analyzer**

**Summary:** Atmospheric carbon dioxide (CO<sub>2</sub>), and methane (CH<sub>4</sub>) are the dominant contributors to man-made radiative forcing, and accurate measurements of their concentrations are vital for understanding changes in the Earth's climate, and for providing independent verification of emissions. Atmospheric transport models are used to infer emissions and removals of atmospheric gases from their observed dry-mole fractions. Monitoring the vertical variations of the dry-mole fraction of CO<sub>2</sub> and CH<sub>4</sub> in the atmospheric column as well as at the surface will enable scientists to validate and improve the transport models in addition to providing improved estimates of emissions. Vertical profiles also serve as a way to directly test the accuracy of satellite total column estimates, without having to rely strongly on the validity of transport models. At present there are very few highly accurate (calibrated) vertical profiles of greenhouse gases in the atmosphere. The problem would be solved with a light weight instrument certified by the FAA for deployment on commercial aircraft.

**Project Goals:** Each aircraft could collect multiple profiles per day. Because of the extreme time constraints and maintenance schedule of commercial jets this instrument would have to have demonstrated stability of better than 0.2 ppm for CO<sub>2</sub> and 2 ppb for CH<sub>4</sub> over a 6 to 12 month period. That would enable it to operate without direct human assistance for that time period. The instrument should also be capable of making measurements from 0 to 42000 feet above sea level, have a sample resolution of better than 2s and have 5s and 300s precisions of 0.1 and 0.05 ppm for CO<sub>2</sub> and 1.0 and 0.5 ppb for CH<sub>4</sub>, respectively. Measurements made at cell pressures below 120 mbar are desirable to avoid the complications of an upstream pump that might be required to produce sufficient flow and resolution at the highest altitudes. The ability to also measure the mole fraction of CO and H<sub>2</sub>O repeatedly to better than 7 ppb and 50 ppm, respectively, in 5s and stably over 6 months is desirable but not essential.

#### **Phase I Activities and Expected Deliverables:**

Activities Include

- Develop conceptual methodology
- Verify methodology
- Investigate and Identify appropriate components

Deliverables include

- Bench-level prototype

#### **Phase II Activities and Expected Deliverables:**

#### Activities Include

- Purchase components
- Integrate components
- Construct working bench-level prototype
- Perform initial bench testing
- Iteratively test and refine the original design as necessary

#### Deliverables include

- Integration of the prototype into a laboratory setting
- Provision of data quality verification in cooperation with NOAA laboratories.

*NOTE: Even though a prototype may be required to be delivered for the project, it is important to note that this prototype is still the property of the offeror. NOAA would only do field or lab testing on that product to see its feasibility in a production (or development) environment*

### **8.3.3D SUBTOPIC: Airborne instrumentation**

**Summary:** Atmospheric methane (CH<sub>4</sub>) is a significant precursor to O<sub>3</sub> on a global scale and is a short-lived climate-forcing agent, second only to carbon dioxide (CO<sub>2</sub>). Near-term mitigation of methane emissions is a major component of current international policy discussions. However, substantial gaps exist in the understanding of methane sources, confounding the development of scientifically sound mitigation strategies.

Airborne chemical measurements, whether based on dedicated research aircraft, unmanned aerial vehicles, or on regular commercial flights, present an emerging opportunity to quantify and attribute methane emissions to specific sources. Simultaneous airborne measurements of ethane (C<sub>2</sub>H<sub>6</sub>) and the stable isotopes of methane (CH<sub>4</sub> and <sup>13</sup>CH<sub>4</sub> or CH<sub>3</sub>D) are needed to constrain methane sources, its interannual variability, its atmospheric growth rate, and its atmospheric fate.

This SBIR topic calls for instrumentation advances to provide flight-capable measurements of ethane and stable isotopes of methane. The instrumentation should be capable of quantifying <sup>13</sup>CH<sub>4</sub>/CH<sub>4</sub> at a precision of 0.5% relative to an isotopic standard (e.g. 0.5 del units), CH<sub>3</sub>D/CH<sub>4</sub> at a precision of 10 del units, and ethane at a precision of 10 parts per trillion by volume, all at 1 Hz data rates. This topic directly addresses NOAA strategic goals and is responsive to the 2013 President's Climate Action Plan goal for improved scientific understanding to reduce methane emissions.

**Project Goals:** Production of an instrument that provide flight-capable measurements of ethane and stable isotopes of methane. .

#### **Phase I Activities and Expected Deliverables:**

##### Activities Include

- Develop conceptual methodology

- Verify methodology
- Investigate and Identify appropriate components

Deliverables include

- Bench-level prototype

### **Phase II Activities and Expected Deliverables:**

Activities Include

- Purchase components
- Integrate components
- Construct working bench-level prototype
- Perform initial bench testing
- Iteratively test and refine the original design as necessary

Deliverables include

- Integration of the prototype into a laboratory setting
- Provision of data quality verification in cooperation with NOAA laboratories.

*NOTE: Even though a prototype may be required to be delivered for the project, it is important to note that this prototype is still the property of the offeror. NOAA would only do field or lab testing on that product to see its feasibility in a production (or development) environment*

#### **8.3.4N SUBTOPIC: Ship mounted remote profiling of oceanographic properties**

**Summary:** NOAA's goals of (1) resilient coastal communities and economies, (2) healthy oceans, (3) a weather-ready nation, and (4) climate adaptation and mitigation, all hinge upon the depth of intelligence gathered about the dynamic ocean environment. Key oceanographic information drives climate and weather models, provides bench marks for how the ocean is changing, and is also important for other forms of coastal intelligence such as hydrography. A time varying and fully three dimension understanding of the subsurface ocean temperature and salinity is fundamental to improving our understanding of this important boundary condition, yet many measurements rely on inefficient in situ instrumentation beyond the top few meters of the ocean. Fine-scale ship based measurements are dependent on observations using equipment to sample vertically through the water column at a fixed location, or on hull-mounted and towed-sensor equipment for measurements along transects at a quasi-fixed depth. Such instrumentation is expensive in terms of either the time spent for the deployment and recovery or in terms of expendable probes that are simply dropped not recovered. Ship-based remote sensing to measure efficiently an extended region of the sub-surface oceanographic profiles would offer a huge improvement.

There are techniques that may be leveraged to provide remotely-sensed oceanographic profiles in real time. For example, temperature, salinity, and density effects have been shown to cause measureable and statistically deterministic shifts in the scattered spectrum from lidar.

Using the highly directional and stable frequency characteristics of lasers, Raman and Brillouin scattering may be leveraged to characterize the temperature, salinity, or overall sound speed profile of the water column. While these phenomena have been demonstrated for decades, no commercial instrumentation has been built to provide reliable measurements to the shipboard oceanographic community..

**Project Goals:** Proposals are requested for instrumentation designed for surface or underwater vessels to remotely sense physical oceanographic properties, specifically including but not limited to sound speed and temperature, as profiles in real time. Preferential treatment will be given to proposals engineered for maximum profile range, measurement accuracy, and compatibility with real time output to support other instrumentation, such as multi-beam (swath) echosounders.

### **Phase I Activities and Expected Deliverables:**

Activities Include

- Develop and define the remote sensing sensor concept and preliminary system specifications, including installation, operation, and maintenance requirements on a ship-based platform.
- Determine the preliminary system measurement performance in terms of the precision, accuracy, and resolution in both the spatio-temporal location and the final oceanographic parameters.
- Determine feasibility and cost to build a prototype system in a Phase II and estimate operational costs of a Phase III system. Identify market and revenue potential developed through the SBIR from the sensor and/or its data.

Deliverables include

- Complete the sensor instrumentation concept and preliminary system design, including a detailed description of the hardware and software to remotely determine underwater sound speed and temperature profiles
- Performance Analysis Report
- Commercialization Plan
- Final report

### **Phase II Activities and Expected Deliverables:**

Activities Include

- Develop detailed system design for Phase II prototype system.
- Perform full system measurement performance analysis and demonstrate compliance with requirements and specifications from Phase I
- Develop test / verification plan for evaluating Phase II performance
- Fabricate Phase II prototype system & execute performance per 3.
- Refine commercialization plan through Phase III systems / data.

Deliverables include

- Detailed System and Performance Analysis Report
- Test / Verification Plan
- Prototype System Testing Report
- Phase III Commercialization Plan / Report

- Final Report

### **8.3.5R SUBTOPIC: Miniaturized CO detector for airborne use on small UAVs**

**Summary:** Carbon monoxide (CO) is a primary atmospheric pollutant emitted by combustion sources such as automobile engines and forest fires. CO has an indirect effect on climate through its role as a sink for hydroxyl radical that results in ozone formation and lengthening the atmospheric lifetime of methane. Due to its principal combustion sources and reasonably long (months) lifetime, CO is widely used as a tracer for studying the regional and long-range transport of pollution from such sources as urban areas and forest fires.

Commercially available instruments are used to monitor CO at many locations around the US and the world, but these instruments are bulky and heavy and thus measurements are typically made only at the surface. To study CO transport from sources, vertically resolved measurements are required. With the expanding capabilities of small unmanned aerial vehicles (sUAVs), the ability to deploy sensors to make vertically resolved measurements to improve the characterization of emissions and atmospheric transport could be greatly enhanced. However, sUAVs have limited payloads that necessitate instrument miniaturization. This SBIR subtopic solicits the development of a miniature CO sensor that is compatible with sUAVs and may be commercialized.

**Project Goals:** The development of a miniature CO sensor capable of measuring ambient CO down to 10 parts per billion in a 1 second measurement in a package weighing nominally less than 5 pounds, occupying less than 250 cubic inches and requiring less than 10 W of power.

#### **Phase I Activities and Expected Deliverables:**

Activities Include

- Design the sensor and theoretically verify the feasibility of the design
- Laboratory demonstration of the feasibility is highly desired.

Deliverables include

- A theoretical model of the detection method
- A complete design of the sensor that can prove the design meets all requirements

#### **Phase II Activities and Expected Deliverables:**

Activities Include

- Improve the design for a practical sensor.
- Procure necessary parts
- Construct a sensor for laboratory demonstration.

Deliverables include

- A complete theoretical model of the detection method
- A complete and practical design of the sensor
- Laboratory results demonstrating the practical and flight-capable sensor that is near marketable state.

## **8.4 TOPIC: Weather-Ready Nation**

### **8.4.1W SUBTOPIC: Unmanned Aerial Vehicle (UAV) Applications Supporting the NWS Mission**

**Summary:** Unmanned aerial vehicles (UAVs) are a technology supporting an explosive rate of private sector innovation. This project focuses on unmet need of every branch of NOAA, but particularly the NWS, which will then branch outward to numerous state and local government entities (e.g. Emergency Management, Department of Transportation, US Forestry Service, Coast Guard etc.), and to private entities supporting the government entities. The project, in particular, focuses on UAV utilizations that can directly save lives, as well as indirectly save lives through improved forecasts, warnings, and public alerts.

**Project Goals:** A NOAA White Paper (available upon request) has been developed with two dozen valuable applications of small UAVs for the National Weather Service and its partners (e.g. Emergency Management, Department of Transportation, US Forestry Service, Coast Guard, etc.). The funded project will utilize air worthy craft, appropriate payloads, and approved testing facilities, to demonstrate the following applications:

- 1) Acquisition of boundary layer temperature, humidity, and wind information for high-res models in support of more accurate forecasts of tornadoes and severe thunderstorms, flash floods, and winter storms.
- 2) Ability to survey storm damage, provide before- and after-storm imagery, and access imagery to wildfire burn scars.
- 3) Ability to access river level information that could support more accurate river flood forecasts.
- 4) Ability to utilize UAVs to monitor, and potentially alert swimmers to, the presence of deadly rip currents.
- 5) Ability to utilize UAVs to alert communities of approaching deadly weather, e.g. flash flood, tornado, etc. (i.e. a flying siren for communities that cannot afford ground-based siren systems).
- 6) Ability to assess road conditions during and after winter storm events.
- 7) Utilization of UAVs for meteorological research initiatives (e.g. sensing boundaries that could initiate thunderstorms).
- 8) River flood or storm surge inundation impacts using LIDAR payload.
- 9) Utilizing UAVs for search and rescue efforts.
- 10) Utilizing UAVs for wildfire support, both gathering video of fire area and gathering meteorological data to support better near-term forecasts to help wildfire incident teams.

These are all critical needs that cannot be easily addressed without UAVs and the payloads they would carry.

#### **Phase I Activities and Expected Deliverables:**

Activities include:

- Develop and demonstrate a cost-feasible, air-worthy craft that could accomplish the project requirements. "Cost-feasible" refers to a means by which smaller potential customers could afford the technology.
- Ensure ability to transmit UAV accessed information in real time to a ground station.
- Ensure ability of craft to fly in variety of conditions that could be faced, including precipitation, moderate winds, etc.
- Developing a cost-feasible proposal

Deliverables include:

- Video captured from UAV over a "simulated" damage area in different conditions (e.g. in precipitation, in moderate winds, etc.)
- Meteorological data (temperature, wind, and humidity) acquired in real-time at a test facility, at least every 100 ft up to a height of at least 3,000 ft AG (5,000-10,000ft preferable).
- Illustration of cost-feasible nature of the technology, preferably under \$50,000, as well as the total cost of ownership (i.e. required maintenance costs, insurance, expected lifetime for daily operation, etc.).

### **Phase II Activities and Expected Deliverables:**

Activities include:

- Demonstrate each of the two dozen UAV applications given in NOAA's White Paper at a variety of test facilities and in different atmospheric environments. Additional applications from NOAA's partners (e.g. emergency management, coast guard, etc.) may be added.

Deliverables include

- Demonstration results for each application from NOAA's White Paper and NOAA's partners. Each demonstration should illustrate the ability of the craft to acquire and transmit the desired data or imagery, or perform the required task.
- Results gathered from different flying environments should be separated to illustrate UAV abilities and limitations.
- Demonstration of ease of operation and training by entities not familiar with these craft.
- Company plans for commercialization of their UAV craft for customers focused on the needs described in NOAA's White Paper.
- Company presentation of results at AUVERSI national meeting

### **8.4.2W SUBTOPIC: Satellite Environment Space Weather Products**

**Summary:** Satellite systems are susceptible to the low-energy and high-energy particle environment in space, which can cause surface charging, bulk charging, and single-event upsets in electronic devices. Currently real-time data and numerical models are available to provide information on the conditions in space and the likelihood that the recent conditions could be responsible for anomalous spacecraft effects. In addition to the particle data available from the current NOAA Geostationary Operational Environment Satellites (GOES), the next generation satellite series beginning with the launch of GOES-R in 2016 will include a broader suite of low- and high-energy charged particle measurements. It is desired to improve the

utilization of the real-time data and models and to develop new products and services that address specific needs of the satellite industry.

**Project Goals:** The goal of this project is to develop improved products to address the impacts of space weather on the satellite industry. This activity will: 1) evaluate the utility to the satellite industry of specific products, including forecasts, real-time information, and retrospective information, both existing and potential; 2) utilize currently available data to develop test products for evaluation; 3) plan for products that will be possible with data soon to be available on the upcoming GOES-R mission; 4) develop products utilizing available numerical models. Products may be public-facing or tailored to specific users, or some combination of the two.

**Phase I Activities and Expected Deliverables:**

- Assess the needs of potential customers and users of satellite-environment products.
- Develop test products based on customer feedback utilizing existing data (from NOAA and/or other sources) and evaluate the accuracy and consistency.
- Develop a product plan for data that will be available from GOES-R.
- Develop test products using available numerical models of the satellite environment.
- Obtain feedback on the test products and planned products from potential customers.
- Deliver a report and documentation on test and planned products, including customer feedback. Provide prototype code for all products.

**Phase II Activities and Expected Deliverables:**

- Develop prototypes of the products for test and evaluation
- Establish links to real-time data
- Develop code that could be made operational
- Document code for possible transition to operations
- Run the test code in real-time, and retrospectively if appropriate, and evaluate the performance.
- Develop products based on customer needs and requirements

*NOTE: Even though a prototype may be required to be delivered for the project, it is important to note that this prototype is still the property of the offeror. NOAA would only do field or lab testing on that product to see its feasibility in a production (or development) environment*

**References:**

Existing Products from GOES 13-15	Planned GOES-R Products
--	Ions, 0.03-30 keV, 15 channels, 14 look direction
--	Electrons, 0.03-30 keV, 15 channels, 14 look directions
Protons, 80-800 keV, 5 channels, 9 look directions	Protons, 80-10,000 keV, 10 channels, 5 look directions
Protons, 0.74-900 MeV and >700 MeV, 11 channels, 2 look directions	Protons, 1-500 MeV and >500 MeV, 11 channels, 2 look directions
Electrons, 30-600 keV, 5 channels, 9 look	Electrons, 50-4,000 keV and >2 MeV, 11

directions	channels, 5 look directions
Electrons, >0.8, >2 and >4 MeV, 3 channels, 2 look directions	
Alpha particles, 3.8-500 MeV, 6 channels, 2 look directions	Alpha particles, 10-200 MeV/n, 5 channels, 1 look direction
--	Heavy ions (Be-Cu), 10-200 MeV/n, 5 channels, 1 look direction
Trapped particle pitch angles	Trapped particle pitch angles
Proton Integral Fluxes and Daily Fluences, >1, >5, >10, >30, >50, >60 and >100 MeV	Proton Integral Fluxes and Daily Fluences, >1, >5, >10, >30, >50, >60 and >100 MeV
--	Moments (densities and temperatures) and Level of Spacecraft Surface Charging
--	Solar Proton Event Detection and Event Fluences
--	Linear Energy Transfer Spectra from Heavy Ion Fluxes

#### 8.4.3W SUBTOPIC: Satellite ground station network for real-time space weather data

**Summary:** The Nation’s critical infrastructure and economy are increasingly susceptible to the impacts of space weather. Leadership at the highest levels of government, including DHS, DoD, and the White House, are involved in efforts to prepare and respond to severe space weather outbreaks. Some of the most critical real-time space weather data comes from satellites both near Earth and at various locations around the solar system. Data from geosynchronous or geostationary satellites are fairly easy to acquire in real-time as it requires only one downlink site on the ground. Data from LEO and MEO satellites often have 60-90 minute latency between satellite and the operational data processing sites. This is typically due to the lack of satellite downlink sites and the time between when the data is acquired by the sensors on the satellite and when the satellite can downlink the data to a site on the ground. Similarly, satellite out in the solar wind such as ACE or DSCOVR at the first Lagrange point (L1) or at other points such as the fifth Lagrange point (L5) require a number of downlink sites around the world in order to provide continuous real-time data links. Current satellite downlink options are being met by a number of different solutions. Some solutions require international partnerships. Other existing solutions for satellites constellations such as COSMIC II are not adequate for providing real-time data with less than 15 minute latencies.

**Project Goals:** The goal of this activity is to assess the needs of the operational satellite data systems for space weather and explore options for optimizing down-link locations and satellite dishes to provide continuous and near-real time access to the satellite data. Phase I of this activity would require an assessment of current and planned satellite systems, including LEO, MEO, L1, L5, and even polar Molniya orbits and what the real-time satellite data downlink systems might look like. Phase II of this effort would involve investigation into satellite communication and dish technologies that might provide improved downlink capabilities and flexibilities.

#### Phase I Activities and Expected Deliverables:

Activities include:

- Assess requirements and current capabilities of the Real-time Solar Wind Network used for tracking the ACE and DSCOVR satellites at L1
- Assess requirements for tracking satellites at L5
- Assess requirements and current capabilities for tracking constellations of LEO satellites to provide near-continuous real-time data flow.
- Assess downlink options for other orbits such as MEO and Molniya.

Deliverables include:

- A report on the technical requirements for real-time satellite data downlinks for each type of orbit described above. This report should include an assessment of current capabilities and areas where current solutions are not providing optimal data access and latencies

### **Phase II Activities and Expected Deliverables:**

Activities include:

- Concept implementation and product development.
- Identify various solutions to providing improved data downlink for the various satellite orbits. Explore options such as satellite-to-satellite data relays to improve latencies.

Deliverables include:

- Report on suggested solutions to satellite downlink options including ground system hardware specifications

#### **8.4.4D SUBTOPIC: L-Band Radio Frequency Interference Filtering**

**Summary:** The Middle Class Tax Relief and Job Creation Act of 2012, Section 6401 (a), (3) directed the Secretary of Commerce to identify 15 MHz of U.S. government use spectrum suitable for repurposing, i.e., sharing with commercial wireless carriers. The Secretary of Commerce identified 1695 – 1710 MHz as the band to be designated for sharing with the wireless carriers. In order to ensure the continued successful capture of satellite meteorological data, while providing opportunity for the wireless carriers to also operate in the band, NOAA is seeking innovative approaches to potentially mitigate interference signals from wireless user equipment (UE), such as, handheld smart phones and devices in close proximity to NOAA/NWS satellite ground stations. An effective interference mitigation approach will ensure the uninterrupted flow of critical meteorological data from Low Earth Orbiting (LEO)/Polar Orbiting Environmental Satellites (POES) and Geostationary Operational Environmental Satellite system (GOES) satellites once spectrum sharing begins. The wireless carriers could begin commercial use of the frequency soon. Additionally, it is likely that in the future there will be more spectrum auctions, which may require additional spectrum sharing between the government and wireless telecommunications industry. The Radio Frequency Interference Monitoring System (RFIMS) program was initiated to investigate mitigate the risk associated with sharing the frequency band. A key aspect of the project will be to investigate opportunities to filter/separate out interference, rather than simply monitor it and identify it. The filtering of interference as opposed to simply monitoring for interference provides for a

significantly better solution as it proactively negates the affects the of interference; where simply monitoring would interaction with the wireless carriers and reliance on the wireless carriers to take corrective action.

**Project Goals:** The L-Band Radio Frequency (RF) Filtering project goals are to significantly advance the technology of the hardware and software used in satellite communication by developing a fully adaptive and re-configurable architecture that is agnostic to specified waveforms and standards; i.e., NOAA L-Band RF Filtered ground stations will be able to cognitively choose to operate in any frequency band with any modulation and multiple access specification depending on the restrictions of the environmental and operating conditions capable of identifying and separating unwanted signals; including LTE with Orthogonal Frequency Division multiplexing (OFDM) and unintentional broad band radio frequency interference (RFI) in the 1695 – 1710 MHz band from the operational Quadrature Phase Shift Keying (QPSK) modulated satellite downlink signals.

While the interference issue primarily affects government users (e.g. National Weather Service, Department of Defense (DoD), and the Department of Interior (DOI)), civilian and commercial organizations that capture these down-links and use the data for daily and critical weather forecasting in support of a weather ready nation could also potentially benefit from this project. The project is intended to demonstrate a reconfigurable RF front-end filter covering a frequency range of greater than or equal to 1695 – 1710 MHz up to the entire L-Band range. This front-end will consist of fully waveform-agile channels and analog-sensing channels designed to detect, identify and separate waveforms over the spectral field of regard. Depending on the design, the system could filter/separate signals at the RF or IF (intermediate frequency) level, or both. In addition to maintaining critical communication links, this project will equip each satellite receive ground station with a compact and powerful signal sensing and analysis platform capable of characterizing the signal environment. This project will also enable rapid RF front-end filter platform deployment for new waveforms and changing operational requirements.

### **Phase I Activities and Expected Deliverables:**

Activities include:

- Demonstrate the feasibility of a filter to effectively identify and separate out unwanted interference from Long-Term
- Evolution (LTE) wireless carriers, in real-time, without a priori knowledge of the interfering signals in the 1695-1710 MHz band. Where the interference could be 10 db below the noise floor, sources are very mobile and transient, as is expected in LTE operations. Also the interference may be the result of aggregation of multiple low-power interference sources.
- Produce a feasibility study, documenting the proof of concept design of an adaptive filter capability.
- Document all analysis, laboratory test environments/equipment configurations, modeling and simulations utilized during the study phase.

Deliverables include:

- A feasibility study documenting the offerors' proof of concept, with supporting analysis using a prescriptive model.

- Analysis using mathematical (deterministic) models of the impact of the developed algorithms, simulations and laboratory experiments.
- Report showing the promise for commercial applications.

**Phase II Activities and Expected Deliverables:**

Activities include

- Simulation using statistical (stochastic) models of the techniques and products developed in phase I.
- Development and initial testing of prototype(s).
- Prototype trials in either a laboratory or field environment of the techniques and products developed in Phase I.

Deliverables include

- A prototype or laboratory equipment and documented configuration with detail on how either could be turned into a production model.
- Detailed report on developed technology/technique showing the results of simulation and prototyping and economic feasibility under commercial conditions.

*NOTE: Even though a prototype may be required to be delivered for the project, it is important to note that this prototype is still the property of the offeror. NOAA would only do field or lab testing on that product to see its feasibility in a production (or development) environment*

**8.5 TOPIC: SBIR Tech Transfer (SBIR-TT)**

**8.5.1TT SUBTOPIC: NOy Cavity Right-Down Instrument**

**Summary:** The Patent Pending NOAA NOy-Cavity Ring-Down Spectrometer is a sensitive, compact detector that measures total reactive nitrogen (NOy), as well as NO<sub>2</sub>, NO and O<sub>3</sub> using cavity ring-down spectroscopy (CRDS). This product is unique in that the optical cage system holds four optical cavities (with associated sample cells) and a laser together, allowing a measurement of all four trace gases simultaneously and with a robust calibration in a small package. The NOAA CRDS is compact and has lower power, size, weight, and vacuum requirements than chemiluminescence-based instruments while approaching equivalent sensitivity, precision and time response.

Climate science and air quality monitoring provide ongoing applications for instrumentation to accurately measure atmospheric trace gases. The precision and accuracy of this instrument make it a versatile alternative to standard chemiluminescence-based NOy instruments currently on the market.

The markets for scientific instruments in the U.S. and abroad are well-established and supported by a number of known scientific instrument manufacturers, including at least three domestic and three international commercial manufacturers of a cavity ring down NO<sub>2</sub>

instruments. Given the compact and efficient performance and other unique features of this instrument for measuring ambient air across a range of environments and measurement platforms, it is an excellent licensing opportunity for the scientific instrument manufacturing sector.

**Project Goals:** The NOAA NOy CRDS was developed for the Earth System Research Laboratory in Boulder, CO, in order to support the lab's research activities. There is one prototype in existence, which is in regular use by the lab. The goal of NOAA's Technology Transfer program is to encourage the broader use of NOAA's patented or patent-pending technologies in commercial markets and/or to encourage the development of new uses for our technologies. The project goal, therefore, for this SBIR Technology Transfer solicitation is to receive proposals from companies that are interested and able to develop a more compact and commercially viable version of the NOAA NOy for sale.

In order to accomplish this goal, companies sending proposals against this SBIR Technology Transfer topic would be required to sign a one-year, no-cost research and technology license (see Reference below) which may be renewed under Phase II, should the Phase I activities be deemed successful.

#### **Phase I Activities and Expected Deliverables:**

Activities include

- Define baseline requirements including operation/install requirements on targeted platforms
- Refine system concept and specifications for intended use, if necessary
- Define commercial design concept to meet intended requirements and specifications
- Determine feasibility and cost to build prototype and estimate operational costs for a Phase III system
- Perform commercial application study identifying market space and potential revenue from the product

Deliverables include

- Commercial Product Design and Feasibility
  - Product/application design and description
  - Need - what problem is this application solving?
  - Target industry sector(s) for the product/application
  - Additional Research and Development needs
  - Anticipated costs to bring product to market
- Marketing study
  - Size of the industry
  - Room for growth
  - Competitive landscape
  - Prospective markets
- Sales and Marketing Plan
  - Target markets for years 1, 5, and beyond
  - Anticipated sales for years 1, 5, and beyond
  - Anticipated selling price and per unit profit margins
  - Anticipated time to turn a profit

- Phase II Prototype Design and Build Plan

### **Phase II Activities and Expected Deliverables:**

Activities include

- Develop detailed system design for Phase II prototype system.
- Perform full system performance analysis and determined compliance with requirements and specifications from Phase I.
- Develop test / verification plan for evaluating Phase II prototype performance.
- Fabricate Phase II prototype system.
- Execute performance / verification testing.
- Identify commercial products and market space being addressed by the technology developed through this effort.

Deliverables include

- Performance Analysis Report.
- Test/Verification Plan
- Performance Testing Report
- Phase II Prototype System

### **References:**

- For more information on NOAA NOy Cavity Ring Down Spectrometer:  
<http://techpartnerships.noaa.gov/WorkingwithNOAA/OpenOpportunities/TabId/299/ArtMID/1381/ArticleID/10778/LICENSING-OPPORTUNITY-NOy-Cavity-Ring-Down-Spectrometer.aspx>
- One-year, no-cost research and technology license information:  
<http://techpartnerships.noaa.gov/sites/orta/Documents/RESEARCH%20LICENSE%201-6-12.pdf>

## **8.5.2TT      SUBTOPIC: Smart Module for Communications Processing and Interface**

**Summary:** Engineers at NOAA's National Data Buoy Center have developed a patent-pending data collection and reporting system, the Smart Module for Communications Processing and Interface, for use on data buoys or similar ocean- or land-based platforms where environmental data are being collected. The benefit of the Smart Module design is that it may be readily retrofitted to a data buoy, weather station, or other similar applications, in order to add additional data acquisition capabilities or features, without disturbing existing communications and data logging equipment at the location. This saves both time and money for testing and certifying new equipment at existing data gathering sites, some of which may be quite remote and difficult to access. By eliminating the risk of compromising an entire system by adding new components, the Smart Module makes adding new capabilities to existing platforms relatively simple and extremely cost effective.

**Project Goals:** The Smart Module was developed for the National Buoy Data Center (NDBC) in Stennis, MS, in order to support NOAA's operational buoy systems around the world. The

NDBC manufactures a small number of these modules in house for its own use. The goal of NOAA's Technology Transfer program is to encourage the broader use of NOAA's patented or patent-pending technologies in commercial markets and/or to encourage the development of new uses for our technologies. The project goal, therefore, for this SBIR Technology Transfer solicitation is to receive proposals from companies that are interested and able to develop one or more commercially viable applications for the patent-pending Smart Module technology.

In order to accomplish this goal, companies sending proposals against this SBIR Technology Transfer topic would be required to sign a one-year, no-cost research and technology license (see Reference below) which may be renewed under Phase II, should the Phase I activities be deemed successful.

### **Phase I Activities and Expected Deliverables:**

Activities include

- Define baseline requirements including operation/install requirements on targeted platforms
- Refine system concept and specifications for intended use, if necessary
- Define commercial design concept to meet intended requirements and specifications
- Determine feasibility and cost to build prototype and estimate operational costs for a Phase III system
- Perform commercial application study identifying market space and potential revenue from the product

Deliverables include

- Commercial Product Design and Feasibility
  - Product/application design and description
  - Need - what problem is this application solving?
  - Target industry sector(s) for the product/application
  - Additional Research and Development needs
  - Anticipated costs to bring product to market
- Marketing study
  - Size of the industry
  - Room for growth
  - Competitive landscape
  - Prospective markets
- Sales and Marketing Plan
  - Target markets for years 1, 5, and beyond
  - Anticipated sales for years 1, 5, and beyond
  - Anticipated selling price and per unit profit margins
  - Anticipated time to turn a profit
- Phase II Prototype Design and Build Plan

### **Phase II Activities and Expected Deliverables:**

Activities include

- Develop detailed system design for Phase II prototype system.
- Perform full system performance analysis and determined compliance with requirements and specifications from Phase I.

- Develop test / verification plan for evaluating Phase II prototype performance.
- Fabricate Phase II prototype system.
- Execute performance / verification testing.
- Identify commercial products and market space being addressed by the technology developed through this effort

Deliverables include

- Performance Analysis Report.
- Test/Verification Plan
- Performance Testing Report
- Phase II Prototype System

#### References:

- For more information on Smart Module:  
<http://techpartnerships.noaa.gov/WorkingwithNOAA/OpenOpportunities/TabId/299/ArtMID/1381/ArticleID/11371/Smart-Module-for-Communications-Processing-and-Interface-Patent-Pending.aspx>
- One-year, no-cost research and technology license information:  
<http://techpartnerships.noaa.gov/sites/orta/Documents/RESEARCH%20LICENSE%201-6-12.pdf>

### 8.5.3TT      **SUBTOPIC: System for Monitoring, Determining, and Reporting Directional Spectra of Ocean Surface Waves in Near Realtime from a Moored Buoy**

**Summary:** NOAA and a number of other scientific and academic institutions have built and maintained an extensive national network of buoys with the purpose of providing more accurate weather and water forecasts to the public. As a part of this network, NOAA engineers have developed a System for Monitoring, Determining and Reporting Directional Spectra of Ocean Surface Waves from a Moored Buoy, which was awarded a US patent in 2009.

While many existing weather data buoys adequately measure wave height, oftentimes other useful wave data, such as direction, are not captured. This could be important, for example, if wave direction is opposite tidal direction, causing conditions near shore where wave heights may increase. In addition, wave direction may differ from wind direction, and thus a report of wind direction may not always be indicative of wave direction.

Wave direction in particular is useful for mariners (both commercial and recreational) when plotting a course to avoid broaching waves. Similarly, scientists, decision makers, and the general public find wave direction data useful in studying shore erosion, environmental impacts of waves, and for calculating ideal surf times and locations. Furthermore, other wave data (e.g. - slope) may be useful to oceanographers and engineers, as well as mariners.

While NOAA has integrated this technology into its buoy network, there is still great potential for a commercial venture to use the technology to new networks and applications using this

technology to serve highly personalized data to specific regions or industries (e.g., energy, tourism, etc.).

**Project Goals:** The technology was developed for the National Buoy Data Center (NDBC) in Stennis, MS, in order to support NOAA's operational buoy systems around the world. The goal of NOAA's Technology Transfer program is to encourage the broader use of NOAA's patented or patent-pending technologies in commercial markets and/or to encourage the development of new uses for our technologies. The project goal, therefore, for this SBIR Technology Transfer solicitation is to receive proposals from companies that are interested and able to develop one or more commercially viable applications for the patent-pending wave direction technology.

In order to accomplish this goal, companies sending proposals against this SBIR Technology Transfer topic would be required to sign a one-year, no-cost research and technology license (see Reference below) which may be renewed under Phase II, should the Phase I activities be deemed successful.

### **Phase I Activities and Expected Deliverables:**

Activities include

- Define baseline requirements including operation/install requirements on targeted platforms
- Refine system concept and specifications for intended use, if necessary
- Define commercial design concept to meet intended requirements and specifications
- Determine feasibility and cost to build prototype and estimate operational costs for a Phase III system
- Perform commercial application study identifying market space and potential revenue from the product

Deliverables include

- Commercial Product Design and Feasibility
  - Product/application design and description
  - Need - what problem is this application solving?
  - Target industry sector(s) for the product/application
  - Additional Research and Development needs
  - Anticipated costs to bring product to market
- Marketing study
  - Size of the industry
  - Room for growth
  - Competitive landscape
  - Prospective markets
- Sales and Marketing Plan
  - Target markets for years 1, 5, and beyond
  - Anticipated sales for years 1, 5, and beyond
  - Anticipated selling price and per unit profit margins
  - Anticipated time to turn a profit
- Phase II Prototype Design and Build Plan

## **Phase II Activities and Expected Deliverables:**

Activities include

- Develop detailed system design for Phase II prototype system.
- Perform full system performance analysis and determined compliance with requirements and specifications from Phase I.
- Develop test / verification plan for evaluating Phase II prototype performance.
- Fabricate Phase II prototype system.
- Execute performance / verification testing.
- Identify commercial products and market space being addressed by the technology developed through this effort

Deliverables include

- Performance Analysis Report.
- Test/Verification Plan
- Performance Testing Report
- Phase II Prototype System

## **References:**

- For more information on US Patent 819,5395:  
<http://www.google.com/patents/US8195395>
- One-year, no-cost research and technology license information:  
<http://techpartnerships.noaa.gov/sites/orta/Documents/RESEARCH%20LICENSE%201-6-12.pdf>

## 9.0 SUBMISSION FORMS AND CERTIFICATIONS

### 9.1 NOAA Small Business Innovation Research (SBIR) Phase I Cover Page

Solicitation No.:	NOAA2016-1	Closing Date:	January 14, 2016
Name of Submitting Firm:			
Address of Firm (including Zip Code +4):			
Title of Proposed Project:			
Requested Amount:		Proposed Duration:	
Solicitation Subtopic Title:			
Solicitation Subtopic No.:			

THE ABOVE ORGANIZATION CERTIFIES THAT:

1. It is a small business firm as defined in this Solicitation.
Yes  No
2. The primary employment of the principal investigator will be with the firm at the time of award and during the conduct of the research.
Yes  No
3. A minimum of two-thirds of research will be performed by this firm in Phase I.
Yes  No
4. It qualifies as a minority and disadvantaged small business as defined in this Solicitation.
Yes  No
5. It qualifies as a woman-owned small business as defined in this Solicitation.
Yes  No
6. It will permit the government to disclose contact information of the corporate official of your concern, if your proposal does not result in an award, to appropriate local and State-level economic development organizations that may be interested in contacting you for further information.
Yes  No
7. It authorizes contact information and project title to be provided to the NIST Manufacturing Extension Partnership (MEP) Program after awards have been announced.
Yes  No
8. This firm and/or Principal Investigator  has  has not submitted proposals for essentially equivalent work under other federal program solicitations, or  has  has not received other federal awards for essentially equivalent work.
9. The offeror and/or any of its principals  are  are not presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency; and  have  have not within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a Federal, state or local government contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property; and  are  are not presently indicted for, or otherwise criminally or civilly charged by a Government entity with, commission of any of these offenses.
10. It is a veteran-owned small business concern.
Yes  No
- It is a service-disabled veteran-owned small business concern.
Yes  No
11. It is a HUBZone small business concern listed, on the date of this representation, on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration, and no material change in ownership and control, principal office of ownership or HUBZone employee percentage has occurred since it was certified by the Small Business Administration in accordance with 13 CFR Part 126; and
Yes  No

It is a joint venture that complies with the requirements of 13 CFR Part 126, and the representation above is accurate for the HUBZone small business concern, or concerns that are participating in the joint venture. [The offeror shall enter the name or names of the HUBZone small business concern or concerns that are participating in the joint venture]:

Yes  No

Each HUBZone small business concern participating in the joint venture shall submit a separate signed copy of the HUBZone representation.

12. The company was not involved in the selection of any topic or subtopic. The company shall not participate in the review of the proposals.

Yes  No

13. The company is registered in SAM.gov and the Representations and Certifications are completed. The NAICS code 541712 is included in the registration.

Yes  No

**PRINCIPAL INVESTIGATOR**

Name:

Title:

Day Telephone No.:

Signature & Date:

Email:

Fax No.:

**CORPORATE OFFICIAL (BUSINESS)**

Name:

Title:

Day Telephone No.:

Signature & Date:

Email:

Fax No.:

**OTHER INFORMATION**

Year Firm Founded

Number of Employees: Avg. Previous 12 mos.

Currently

Has a proposal for essentially equivalent work been submitted to another agency?

Yes  No

If yes, what Agency?

Is your company registered in SAM?

Yes

No

Taxpayer Identification Number:

Data Universal Numbering System (DUNS) Number:

**PROPRIETARY NOTICE**

These data shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed in whole or in part for any purpose other than evaluation of this proposal. If a funding agreement is awarded to this applicant as a result of or in connection with the submission of these data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the funding agreement and pursuant to applicable law. This restriction does not limit the Government's right to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction are contained on pages \_\_\_\_\_ of this proposal.

## 9.2 NOAA SBIR Project Summary Form

NAME OF FIRM:

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AMOUNT REQUESTED:

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ADDRESS:

PHONE #:

FAX #:

E-MAIL:

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PRINCIPAL INVESTIGATOR (NAME AND TITLE):

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TITLE OF PROJECT:

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SOLICITATION SUBTOPIC NUMBER:

SOLICITATION SUBTOPIC TITLE:

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TECHNICAL ABSTRACT (LIMIT 200 WORDS):

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SUMMARY OF ANTICIPATED RESULTS:

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### 9.3 NOAA SBIR Proposed Budget

COMPANY NAME					
A. PERSONNEL <i>(Employees)</i> NAME	ROLE IN PROJECT	EST. HOURS	HOURLY RATE	FRINGE BENEFITS [_____%]	TOTAL COST
	<i>Principal Investigator /Project Manager</i>				\$ _____
					\$ _____
					\$ _____
					\$ _____
					\$ _____
B. EQUIPMENT <i>(specify type, whether purchased or leased, and cost)</i>					\$ _____
C. TRAVEL					\$ _____
D. OTHER DIRECT COSTS					\$ _____
1. Materials and Supplies			\$ _____		
2. Testing Services			\$ _____		
3. Computer Services			\$ _____		
4. Research Institution			\$ _____		
5. Subcontracts (including Consultants)			\$ _____		
6. Other			\$ _____		
TOTAL OTHER DIRECT COSTS					\$ _____
E. TOTAL DIRECT COSTS <i>(A through E)</i>					\$ _____
F. INDIRECT COSTS <i>(specify rate(s), as applicable)</i>					
TOTAL INDIRECT COSTS					\$ _____
G. TOTAL COSTS <i>(F plus G)</i>					\$ _____
H. FEE OR PROFIT RATE [_____%]					\$ _____
I. TOTAL AMOUNT OF THIS REQUEST <i>(H plus I)</i>					\$ _____
<p>J. Has any executive agency of the United States Government performed any review of your accounts or records in connection with any other grant or contract within the past year?    <input type="checkbox"/> Yes    <input type="checkbox"/> No</p> <p style="margin-left: 40px;">If Yes, give name, address, and phone number of reviewing office and official:</p>					
K. CORPORATE/BUSINESS AUTHORIZED REPRESENTATIVE – TYPED NAME AND SIGNATURE AND DATE					
<b>If additional space is needed, please provide the information in the Supplemental Budget Information.</b>					

## 9.4 NOAA SBIR Budget Instructions

In accordance with Section 3.7 of the solicitation, the offeror is to submit a cost estimate with detailed information for each element, consistent with the offeror's cost accounting system.

### **NOAA SBIR Proposed Budget**

Complete the "NOAA SBIR Proposed Budget" (See Section 9.3) for the Phase I effort and include it as the last page of the technical proposal. Verify the total request is accurate and does **not exceed \$120,000.00**. A proposal that exceeds \$120,000.00 shall automatically be disqualified.

The Proposed Summary Budget shall be signed by the Corporate Official. Some items of the form under Section 9.3 may not apply to every proposal. Additionally, some firms may have different accounting practices for their overhead rates. Offerors should use indirect rates consistent with their own accounting system, even if different from the rate categories shown on the form. These differences should be discussed in the Supplemental Budget Documentation and, if necessary, a budget form (consistent with the firm's accounting practices) can be provided with the Supplemental Budget Documentation. Enough information should be provided on the Proposed Budget to allow NOAA to understand how the offeror plans to use the requested funds if award is considered. A complete cost breakdown should be provided giving direct costs, indirect costs, other direct costs, overheads, G&A, and profit. The offeror is to submit a cost estimate with detailed information consistent with the offeror's cost accounting system. A reasonable profit is allowed.

As a reminder in completing the Proposal Budget Summary for Phase I, a minimum of two-thirds of the research and/or analytical effort must be performed by the proposing small business concern. The total cost for all consultant fees, facility leases, usage fees, and other subcontracts may not exceed one-third of the total proposal price (also see Section 1.5). For Phase II, a minimum of one-half of the research and/or analytical effort must be performed by the proposing small business concern. The total cost for all consultant fees, facility leases, usage fees, and other subcontract or purchase agreements may not exceed one-half of the total proposal price.

### **Supplemental Budget Documentation**

Offerors shall provide additional supplemental budget documentation for the Proposed Budget for the Government's Cost and Pricing Review. ***This Supplemental Budget Documentation shall NOT be utilized for evaluation of the Technical Proposal. Offerors must ensure that all relevant technical information is included within the 26 page technical proposal.***

The Supplemental Budget Documentation does **NOT** count towards the 26 page count requirement and shall include a coversheet and be organized and easy to understand. The information should only supplement and help to justify and explain the amounts requested on the Proposed Budget sheet. Additionally, the documentation should indicate any known or anticipated source, quantity, unit price, competition obtained, and basis used to establish source and reasonable costs (e.g. other direct costs, equipment, and travel, etc.). If additional room is required, and not available on the SBIR Proposed Budget Form, it may be

incorporated into the Supplemental Budget Documentation. The Proposed Budget Form should annotate the location of this information appropriately.

### **Instructions for Proposed Budget Summary Form:**

**Lines A Direct Labor.** List the key personnel by name and role/function in the project. Other direct personnel need not specifically named, but their role, such as “technician,” total hours and hourly rate should be entered. Personnel whose costs are indirect (e.g. administrative personnel) should be included in Line F. Fringe benefits can be listed for each employee in the space provided, or they may be included within the indirect costs in Line F. Provide the Fringe Benefit percentage rate, if applicable, in accordance with the firm’s accounting practices. In the Supplemental Budget Documentation, information shall be provided regarding the development of the Fringe Overhead rate or Other Indirect Rates, as applicable. As a reminder, the PI/PM must be employed by the small business concern at the time of contract award and during the period of performance of the research effort. Additionally, at least 51% of the PI/PM's time must be spent with the awardee during the contract performance (also see Section 1.5).

**Line B, Equipment.** List items costing over \$5,000 and exceeding one year of useful life. Lesser items may be shown in Line D. Indicate in the Supplemental Budget Documentation whether equipment is to be purchased or leased along with supporting documentation on where it will be purchased or leased. List each individual item with the corresponding cost. If additional room is required for this information, you may include it in the Supplemental Budget Documentation. Include a copy of the quote, online catalog screenshot, or catalog price with the Supplemental Budget Documentation. Providing this information helps the government in speeding up its cost or pricing review. Discuss any competition utilized, basis of source, and reasonableness of price. The inclusion of equipment will be carefully reviewed relative to need and appropriateness for the research proposed.

**Line C, Travel.** Include the overall requested Travel Amount on the 9.3 Budget Form. In the Supporting Documentation, the offeror shall itemize by destination, purpose, personnel, period, and cost for both staff and consultants. Budget breakdowns for travel funds must be justified and related to the needs of the project. Inclusion of travel expenses will be carefully reviewed relative to need and appropriateness for the research proposed. Foreign travel is not an appropriate expense. Typically travel for a technical kick-off meeting or to present a final report is not required.

**Line D, Other Direct Costs.** The overall materials and supplies, testing and/or computer services, and subcontracts (including consultants), and any other direct costs required for the project must be identified on the 9.3 Budget Form. In the Supplemental Budget Documentation, it shall specify type, quantity and unit cost (if applicable), and total estimated cost of these other direct costs. Incorporate a quote/proposal or catalog price for any other direct costs listed in the Supplemental Budget Documentation. The proposal should identify direct (e.g. labor categories, hours, & rates), indirect, other direct costs (e.g. materials, travel,

etc.), and profit, as applicable. Discuss any competition utilized, basis of source, and reasonableness of price.

**Line E, Total Direct Costs.** Enter the sum of Lines A through E.

**Line F, Indirect Costs.** Cite your established Overhead (OH) and General and Administrative (G&A) rate, as appropriate. If you utilize different or additional overhead rates in accordance with your accounting practices, incorporate this information in this section with appropriate rate information. If additional room is required, incorporate the information in the Supplemental Budget Documentation. Also include information on the development of your indirect cost and their pools in the Supplemental Budget Documentation. A discussion of Indirect Costs and samples can be obtained at [www.dcaa.mil/chap6.pdf](http://www.dcaa.mil/chap6.pdf). If you have a negotiated Indirect Cost Rate with another federal agency, include a copy of this documentation with your Supplemental Budget Documentation.

**Line G, Total Costs.** Enter the total amount of the proposed project, the sum of Lines E and F.

**Line H, Profit.** The small business concern may request a reasonable profit. Include the rate proposed.

**Line I, Total Amount of this request.** Enter the sum of Lines G and H. This amount must equal the amount entered in the Cover Sheet Form. It cannot exceed \$120,000.00.

**Line J, Review of Accounts.** Answer yes or no. If yes, enter name, address, and phone number of reviewing office and official. Additional details can be provided with the Supplemental Budget Information, as needed.

**Line K, Corporate/Business Authorized Representative.** A date with signature of someone with the authority to commit the company must be given.

## 9.5 SBIR Funding Agreement Certification

All small businesses must complete this certification with their proposal submission and any other time set forth in the funding agreement that is prior to performance of work under this award. This includes checking all of the boxes and having an authorized officer of the awardee sign and date the certification each time it is requested.

Please read carefully the following certification statements. The Federal government relies on the information to determine whether the business is eligible for a Small Business Innovation Research (SBIR) Program award. A similar certification will be used to ensure continued compliance with specific program requirements during the life of the funding agreement. The definitions for the terms used in this certification are set forth in the Small Business Act, SBA regulations (13 C.F.R. part 121), the SBIR Policy Directive and also any statutory and regulatory provisions referenced in those authorities.

If the funding agreement officer believes that the business may not meet certain eligibility requirements at the time of award, they are required to file a size protest with the U.S. Small Business Administration (SBA), who will determine eligibility. At that time, SBA will request further clarification and supporting documentation in order to assist in the verification of any of the information provided as part of a protest. If the funding agreement officer believes, after award, that the business is not meeting certain funding agreement requirements, the agency may request further clarification and supporting documentation in order to assist in the verification of any of the information provided.

Even if correct information has been included in other materials submitted to the Federal government, any action taken with respect to this certification does not affect the Government's right to pursue criminal, civil, or administrative remedies for incorrect or incomplete information given in the certification. Each person signing this certification may be prosecuted if they have provided false information.

The undersigned has reviewed, verified and certifies that (all boxes must be checked):

(1) The business concern meets the ownership and control requirements set forth in 13 C.F.R. §121.702.

Yes                       No

(2) If a corporation, all corporate documents (articles of incorporation and any amendments, articles of conversion, by-laws and amendments, shareholder meeting minutes showing director elections, shareholder meeting minutes showing officer elections, organizational meeting minutes, all issued stock certificates, stock ledger, buy-sell agreements, stock transfer agreements, voting agreements, and documents relating to stock options, including the right to

convert non-voting stock or debentures into voting stock) evidence that it meets the ownership and control requirements set forth in 13 C.F.R. § 121.702.

Yes                       No                       N/A

Explain why N/A: \_\_\_\_\_  
\_\_\_\_\_

(3) If a partnership, the partnership agreement evidences that it meets the ownership and control requirements set forth in 13 C.F.R. §121.702.

Yes                       No                       N/A

Explain why N/A: \_\_\_\_\_  
\_\_\_\_\_

(4) If a limited liability company, the articles of organization and any amendments, and operating agreement and amendments, evidence that it meets the ownership and control requirements set forth in 13 C.F.R §121.702.

Yes                       No                       N/A

Explain why N/A: \_\_\_\_\_  
\_\_\_\_\_

(5) The birth certificates, naturalization papers, or passports show that any individuals it relies upon to meet the eligibility requirements are U.S. citizens or permanent resident aliens in the United States.

Yes                       No                       N/A

Explain why N/A: \_\_\_\_\_  
\_\_\_\_\_

(6) It has no more than 500 employees, including the employees of its affiliates.

Yes  No

(7) SBA has not issued a size determination currently in effect finding that this business concern exceeds the 500 employee size standard.

Yes  No

(8) During the performance of the award, the principal investigator will spend more than one half of his/her time as an employee of the awardee or has requested and received a written deviation from this requirement from the funding agreement officer.

Yes  No  Deviation approved in writing by funding agreement officer: \_\_\_\_\_%

All, essentially equivalent work, or a portion of the work proposed under this project (check the applicable line):

Has not been submitted for funding by another Federal agency.

Has been submitted for funding by another Federal agency but has not been funded under any other Federal grant, contract, subcontract or other transaction.

A portion has been funded by another grant, contract, or subcontract as described in detail in the proposal and approved in writing by the funding agreement officer.

(10) During the performance of award, it will perform the applicable percentage of work unless a deviation from this requirement is approved in writing by the funding agreement officer (check the applicable line and fill in if needed):

SBIR Phase I: at least two-thirds (66 2/3%) of the research

SBIR Phase II: at least half (50%) of the research

Deviation approved in writing by the funding agreement officer: \_\_\_\_\_%

(11) During performance of award, the research/research and development will be performed in the United States unless a deviation is approved in writing by the funding agreement officer.

Yes                       No                       Waiver has been granted

(12) During performance of award, the research/research and development will be performed at my facilities with my employees, except as otherwise indicated in the SBIR application and approved in the funding agreement.

Yes                       No

(13) It has registered itself on SBA's database as majority-owned by venture capital operating companies, hedge funds, or private equity firms.

Yes                       No                       N/A

Explain why N/A: \_\_\_\_\_

\_\_\_\_\_

(14) It is a Covered Small Business Concern [a small business concern that: (a) was not majority-owned by multiple venture capital operating companies (VCOCs), hedge funds, or private equity firms on the date on which it submitted an application in response to an SBIR solicitation; and (b) on the date of the SBIR award, which is made more than 9 months after the closing date of the solicitation, is majority-owned by multiple venture capital operating companies, hedge funds, or private equity firms].

Yes                       No

It will notify the Federal agency immediately if all or a portion of the work authorized and funded under this award is subsequently funded by another Federal agency.

I understand that the information submitted may be given to Federal, State, and local agencies for determining violations of law and other purposes.

I am an officer of the business concern authorized to represent it and sign this certification on its behalf. By signing this certification, I am representing on my own behalf, and on behalf

of the business concern that the information provided in this certification, the application, and all other information submitted in connection with this application, is true and correct as of the date of submission. I acknowledge that any intentional or negligent misrepresentation of the information contained in this certification may result in criminal, civil or administrative sanctions, including but not limited to: (1) fines, restitution and/or imprisonment under 18 U.S.C. §1001; (2) treble damages and civil penalties under the False Claims Act (31 U.S.C. §3729 et seq.); (3) double damages and civil penalties under the Program Fraud Civil Remedies Act (31 U.S.C. §3801 et seq.); (4) civil recovery of award funds, (5) suspension and/or debarment from all Federal procurement and nonprocurement transactions (FAR Subpart 9.4 or 2 C.F.R. part 180); and (6) other administrative penalties including termination of SBIR/STTR awards.

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Signature

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Date

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Print Name (First, Middle, Last)

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Title

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Business Name

## 9.6 SBIR Funding Agreement Certification – Life Cycle Certification

All SBIR Phase I and Phase II awardees must complete this certification at all times set forth in the funding agreement (see §8(h) of the SBIR Policy Directive). This includes checking all of the boxes and having an authorized officer of the awardee sign and date the certification each time it is requested.

Please read carefully the following certification statements. The Federal government relies on the information to ensure compliance with specific program requirements during the life of the funding agreement. The definitions for the terms used in this certification are set forth in the Small Business Act, the SBIR Policy Directive, and also any statutory and regulatory provisions referenced in those authorities.

If the funding agreement officer believes that the business is not meeting certain funding agreement requirements, the agency may request further clarification and supporting documentation in order to assist in the verification of any of the information provided.

Even if correct information has been included in other materials submitted to the Federal government, any action taken with respect to this certification does not affect the Government's right to pursue criminal, civil, or administrative remedies for incorrect or incomplete information given in the certification. Each person signing this certification may be prosecuted if they have provided false information.

The undersigned has reviewed, verified and certifies that (all boxes must be checked):

The principal investigator spent more than one half of his/her time as an employee of the awardee or the awardee has requested and received a written deviation from this requirement from the funding agreement officer.

Yes     No                       Deviation approved in writing by funding agreement officer: \_\_\_\_\_%

All, essentially equivalent work, or a portion of the work performed under this project (check the applicable line):

- Has not been submitted for funding by another Federal agency.
- Has been submitted for funding by another Federal agency but has not been funded under any other Federal grant, contract, subcontract or other transaction.
- A portion has been funded by another grant, contract, or subcontract as described in detail in the proposal and approved in writing by the funding agreement officer.

Upon completion of the award it will have performed the applicable percentage of work, unless a deviation from this requirement is approved in writing by the funding agreement officer (check the applicable line and fill in if needed):

- SBIR Phase I: at least two-thirds (66 2/3%) of the research
- SBIR Phase II: at least half (50%) of the research
- Deviation approved in writing by the funding agreement officer: \_\_\_\_\_%

The work is completed and it has performed the applicable percentage of work, unless a deviation from this requirement is approved in writing by the funding agreement officer (check the applicable line and fill in if needed):

- SBIR Phase I: at least two-thirds (66 2/3%) of the research
- SBIR Phase II: at least half (50%) of the research
- Deviation approved in writing by the funding agreement officer: \_\_\_\_\_%
- N/A because work is not completed

The research/research and development is performed in the United States unless a deviation is approved in writing by the funding agreement officer.

- Yes
- No
- Waiver has been granted

The research/research and development is performed at my facilities with my employees, except as otherwise indicated in the SBIR application and approved in the funding agreement.

- Yes
- No

It will notify the Federal agency immediately if all or a portion of the work authorized and funded under this award is subsequently funded by another Federal agency.

I understand that the information submitted may be given to Federal, State, and local agencies for determining violations of law and other purposes.

I am an officer of the business concern authorized to represent it and sign this certification on its behalf. By signing this certification, I am representing on my own behalf, and on behalf

of the business concern that the information provided in this certification, the application, and all other information submitted in connection with the award, is true and correct as of the date of submission. I acknowledge that any intentional or negligent misrepresentation of the information contained in this certification may result in criminal, civil or administrative sanctions, including but not limited to: (1) fines, restitution and/or imprisonment under 18 U.S.C. §1001; (2) treble damages and civil penalties under the False Claims Act (31 U.S.C. §3729 et seq.); (3) double damages and civil penalties under the Program Fraud Civil Remedies Act (31 U.S.C. §3801 et seq.); (4) civil recovery of award funds, (5) suspension and/or debarment from all Federal procurement and nonprocurement transactions (FAR Subpart 9.4 or 2 C.F.R. part 180); and (6) other administrative penalties including termination of SBIR/STTR awards.

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Signature

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Date

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Print Name (First, Middle, Last)

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Title

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Business Name

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Business Name

## 9.7 NOAA/SBIR CHECKLIST

Please review this checklist carefully to assure that your proposal meets the NOAA requirements. Failure to meet these requirements may result in your proposal being rejected without consideration.

**Email submission of the proposals (Technical and Supplemental Budget and Other Information) must be received by 4:00 p.m. (EST) January 14, 2016.**

- \_\_\_\_\_ 1. The **COVER PAGE** (Form 9.1) has been completed and is page 1 and 2 of the proposal. Required signatures are included (see Section 3.3.1)
- \_\_\_\_\_ 2. The **PROJECT SUMMARY** (Form 9.2) has been completed and is page 2 of the proposal. The abstract contains no proprietary information (see Section 3.3.3).
- \_\_\_\_\_ 3. The **TECHICAL CONTENT** of the proposal begins on **PAGE 4** and includes the items identified in **SECTION 3.3.4** of the solicitation. The technical content section of the proposal is limited to 22 pages in length.
- \_\_\_\_\_ 4. The **PROPOSED BUDGET** (Form 9.3) has been completed, including signature, and is the **last page** of the proposal. The proposal budget is for \$120,000 or less. No more than one-third of the budget is allocated to outside parties such as consultants and/or subcontractors. See Section 3.6 for additional information.
- \_\_\_\_\_ 5. Other Supplemental Budget Documentation is provided in accordance with Section 9.4.
- \_\_\_\_\_ 6. SBIR Funding Agreement Certification (Form 9.5) completed and provided; offeror meets program requirements including eligibility requirements in Paragraph 1.5 for transition rates.
- \_\_\_\_\_ 7. In accordance with Section 3.5, provide list of prior Phase II awards for proposers awarded more than 15 SBIR Phase II awards in the prior five fiscal years, if applicable.
- \_\_\_\_\_ 8. Screen shot or similar copy of Company Registry is provided in accordance with Section 3.3.2.
- \_\_\_\_\_ 9. The entire technical proposal, including forms and technical content, is **26 pages or less in length** (excluding Other Supplemental Budget Documentation, SBIR Funding Agreement Certification, SBIR.gov Company Registry documentation, and those pages necessary to comply with the itemization of prior SBIR Phase II awards) (see Section 3.2).
- \_\_\_\_\_ 10. The proposal, cover page and project summary contains an easy-to-read font of at least 10 points (see Section 3.2).
- \_\_\_\_\_ 11. The proposal contains only pages of 21.6cm x 27.9cm size (8 ½" x 11") (see Section 3.2).
- \_\_\_\_\_ 12. The proposal is limited to only one of the subtopics in Section 8 and 3.3.4(a).
- \_\_\_\_\_ 13. The Principal Investigator/Project Manager will be employed by the company at least 51% of the time during the award period (see Section 1.5 and 1.7.9).
- \_\_\_\_\_ 14. All work must be performed by the small business concern and its subcontractors in the United States, unless a waiver has been granted in advance by the CO (see Section 1.5). All supplies, materials, and equipment must be American Made unless a waiver has been granted by the CO.
- \_\_\_\_\_ 15. Followed specific electronic submission instructions (see Section 6.2).

**NOTE: Proposers are cautioned that late arrival of proposals shall result in them being rejected without evaluation.** Potential offerors are advised to sign up within <https://www.fedbizopps.gov> to receive notification of any amendment or questions and answers to the solicitation that may be released after opening date.