



SBIR



Small Business Innovation Research FY2018

Program Solicitation: **NOAA2018-1**

Opening Date: October 18, 2017

Closing Date: January 31, 2018

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 (NOAA) 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, 2022.

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 offeror 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 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. Offerors 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 the completion of the Phase II will depend upon the scope of the research, but it should not exceed **24 months**. There is also a one year commercialization activity period upon completion of the research, as discussed further in this document. 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 2018-1 (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 offeror 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

Offerors 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.¹ 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.² 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

¹ 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.

² 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. 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.

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) 628-1011
Email: vincent.garcia@noaa.gov

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

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

Telephone: (816) 426-7469
E-mail: 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 ***Tuesday, December 5, 2017 at 2:00 p.m. Eastern to Joan Clarkston at joan.e.clarkston@noaa.gov. When sending questions, include the solicitation number in the header "NOAA2018-1." Questions sent to any other email address may not be answered. After that date and time, NO ADDITIONAL QUESTIONS SHALL BE ACCEPTED.***

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

NOAA ACQUISITION AND GRANTS OFFICE OMBUDSMAN (OCT 2016)

- a. The NOAA Acquisition and Grants Office (AGO) Ombudsman is available to organizations to promote responsible and meaningful exchanges of information. Generally, the purpose of these exchanges will be to:
 1. Allow contractors to better prepare for and propose on business opportunities.
 2. Advise as to technologies and solutions within the marketplace that the government may not be aware of, or is not fully benefiting from.
 3. Identify constraints in transparency and process.
- b. The AGO Ombudsman will objectively, reasonably, and responsibly collaborate with parties and recommend fair, impartial, and constructive solutions to the matters presented to him/her. Further, the AGO Ombudsman will maintain the reasonable and responsible confidentiality of the source of a concern, when such a request has been formally made by an authorized officer of an organization seeking to do business with, or already doing business with NOAA.
- c. Before consulting with the AGO Ombudsman, interested parties must first address their concerns, issues, disagreements, and/or recommendations with the respective contracting officer for resolution. However, direct access to the AGO Ombudsman may be sought when an interested party questions the objectivity or equity of a contracting officer's decision, or when there is a bona fide reason to believe that reasonable, responsible, and objective consideration will not be received from an assigned contracting officer.
- d. There are several constraints to the scope of the AGO Ombudsman's authority, of instance:
 1. Consulting with the AGO Ombudsman does not alter or postpone the timeliness of any formal process (e.g., protest, claims, debriefings, employee employer action, activities

involving A-76 competition performance decisions, judicial or congressional hearings, or proposal, amendment, modification, or deliverable due dates, etc.).

2. The AGO Ombudsman cannot participate in the evaluation of the proposals, source selection process, or the adjudication of protests or formal contract disputes.

3. The AGO Ombudsman is not authorized to generate or alter laws, judicial decisions, rules, policies, or formal guidance.

4. The AGO Ombudsman is not authorized to develop or alter opportunity announcements, solicitations, contracts, or their terms or conditions.

5. The AGO Ombudsman cannot overrule the authorized decisions or determinations of the contracting officer.

6. The AGO Ombudsman has no authority to render a decision that binds AGO, NOAA, the Department of Commerce, or the U.S. Government.

7. The AGO Ombudsman is not NOAA's agent relative to the service of magistrate or judicial process and cannot be used to extend service of process to another party (whether federal, public, or a private entity).

e. After review and analysis of a filed concern or recommendation, the AGO Ombudsman may refer the interested party to another more suitable federal official for consideration.

Moreover, concerns, disagreements, and/or recommendations that cannot be resolved by the AGO Ombudsman will need to be pursued through more formal venues.

f. The AGO Ombudsman is not to be contracted to requested copies of forms and/or documents under the purview of a contracting officer. Such documents include Requests for Information, solicitations, amendments, contracts, modifications, or conference materials.

g. To speak to the NOAA Ombudsman, contact Rafael Roman at Rafael.roman@noaa.gov and include the solicitation number.

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 funds(s), or private equity firm(s).

1.7.8 National Environmental Policy Act (NEPA)

The National Environmental Policy Act, or NEPA, is a United States environmental law that promotes the enhancement of the environment and was enacted as law on January 1, 1970 (*Pub.L. 91-190*). All NOAA SBIR Phase I and Phase II awards must go through an agency internal NEPA assessment before a full award is made. The purpose is to capture any details of the project that may potentially or inadvertently pollute/affect the environment. A NOAA

representative, through the NOAA SBIR Office, will work with the vendor in completing this assessment after a selection is made, but before an award is given.

1.7.9 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.

1.7.10 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).

1.7.11 Prototype

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

1.7.12 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.

1.7.13 SBIR Technical Data

All data generated during the performance of a SBIR award.

1.7.14 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.

1.7.15 Small Business Concern (SBC)

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

1.7.16 Socially and Economically Disadvantaged Small Business Concern

See 13 CFR 124, Subpart B.

1.7.17 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.

1.7.18 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.

All applicants must complete the DoC OIG agency mandatory training and sign/submit the certification of completion along with their proposal. As outlined in the Cover Page (Form 9.1, question 14) the link to the Fraud, Waste, and Abuse training slides is located here: <http://www.techpartnerships.noaa.gov/SBIR.aspx>. Certification can be found at the end of the training module. All applicants must print, sign, and submit certification of completion.

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
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 an offeror'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. 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.

An offeror 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 5th 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

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.

Signature

Date

Print Name (First, Middle, Last)

Title

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.

Signature

Date

Print Name (First, Middle, Last)

Title

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 (Section 9.1), project summary (Section 9.2), 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 Fraude, Waste, and Abuse Training Certification of Completion (Section 1.8); 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 (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) SBIR Fraud, Waste, and Abuse Training Certification of Completion (required, see Section 1.8)
- (d) Screen shot or similar copy of offerors' Company Registry as noted on SBIR.gov website (required, see Section 3.3.2)
- (e) List of prior Phase II awards for offerors 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).
- (f) 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 and 2 of the proposal (see Section 9.1). 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). 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 3 of your proposal (see Section 9.2). 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 4 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 offeror’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. It is important that individuals indicated in

this section are clearly identified by the offeror as to whether they are an employee, consultant, or other subcontractor. This shall correspond appropriately in the budget summary (Section 9.3) and supplemental budget (Section 9.4).

- (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 offeror 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. The information provided shall correspond appropriately to the budget summary (Section 9.3) and supplemental budget (Section 9.4).

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).

- 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.
- 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:

- Market opportunity – Describe the current and anticipated target market, the size of the market, and include a brief profile of the potential customer.
- 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.
- 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. If cost sharing is being provided, explain what is being provided in this section. 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 on the Cover Page (see Section 9.1).

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. 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, 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 total contract amount.

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.

3.8 Kickoff Meeting

All Phase I award recipients will be required upon award to travel to the NOAA SBIR Program office in Silver Spring, Maryland to attend a Kickoff Meeting for one day. The official date shall be determined by the government at a later date. This is currently planned to be a full day and awardees will be providing a brief presentation. Instructions will be provided to awardees. Awardees shall factor in the cost of this trip for no more than two individuals within the proposed total budget. Failure to factor in the travel for this trip could result in additional cost to the awardee.

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 1.7.15.
- (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 shall 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). Scoring points may weigh differently for each criteria for the Phase II Evaluation. Additional information shall be provided with instructions for proposal submission for Phase II to those offerors.

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. The Phase II proposal process may require a company presentation in Silver Spring, MD.

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 available tentatively 30 days after completion of the recommended awardee list to the Contracting Officer.** The identities of 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 (which includes completion of all objectives or tasks specified in the proposal). Upon completion of the R&D activity, the awardee will have a one year period to pursue and report on their commercialization activities. The total period of performance for Phase II is anticipated to be approximately 36 months (which includes the 12 month commercialization activities).

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, offerors should understand that Phase I awards are tentatively planned for June 2018. Phase II proposals are tentatively due to NOAA in January 2019 and Phase II awards are tentatively planned for May 2019.

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 offeror 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. The final report shall encompass

completion of all the objectives or tasks from the proposal.

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 Section 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 offeror. 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, offerors are cautioned that proposals are likely to be less competitive if significant details are omitted due to the offeror'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 (MAY 2014)

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 in accordance with award agreement.

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 offeror to submit certain organizational, management, personnel, and financial information to assure responsibility of the offeror.
- (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) and submit a copy of your firm's 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): Offerors 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.

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 assistance. 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.

Offerors 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 31, 2018. 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) 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.

For Phase II, instructions will be provided to Phase I awardees in regards to the Phase II proposal submission process. The Phase II proposals are typically due after receipt of the Phase I Final Report. Typically, proposals are due around 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. 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 “FY2018-1 NOAA SBIR- Subtopic 8.xxx : Company Name”
 - Where xxx is the subtopic number (ex. 8.2.2)
 - 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 due no later than 4:00 p.m. EST, January 31, 2018 deadline. Please keep in mind that the bigger email files may take time to reach our email servers, so plan accordingly. It is the offeror’s responsibility to ensure that the proposal and other supplemental information is received on time.
- 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/offeror 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 proposal, 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 – FY2018-1 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) SBIR Fraud, Waste, and Abuse Training Certification of Completion (required, see Section 1.8)
- (d) Screen shot or similar copy of offerors' Company Registry as noted on SBIR.gov website (required, see Section 3.3.2)
- (e) List of prior Phase II awards for offerors 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)
- (f) 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

- NOAA Strategic Research Guidance Memorandum information:
<http://nrc.noaa.gov/CouncilProducts/StrategicResearchGuidanceMemorandum.aspx>

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

8.0 RESEARCH TOPICS

Overview of FY2018 Subtopics

Subtopic Number	TOPIC	SUBTOPIC
8.1.1	Integrated Earth System Process and Predictions	Radio Occultation from Recoverable Air Balloons for Weather Applications
8.1.2	Integrated Earth System Process and Predictions	Determining the Timing and Location of Fish Spawning
8.1.3	Integrated Earth System Process and Predictions	Calibration of Low-cost Air Quality Sensors
8.2.1	Environmental Observations	Portable, Fast, and Intelligent Phytoplankton Species-identifier and Counter
8.2.2	Environmental Observations	Bottom Feeder - a Benthic Data Provider
8.2.3	Environmental Observations	Automating Bearing and Distance Measurements in Big-Eye 25 x 150 Binoculars and Recording/Saving Images
8.2.4	Environmental Observations	Improving Attachment Systems for Remotely-Deployed Cetacean Tags with External-Electronics
8.2.5	Environmental Observations	Low-cost Mooring Location Beacon for Coastal Applications
8.2.6	Environmental Observations	Next Generation Marine Visibility (FOG) Sensors
8.2.7	Environmental Observations	Autonomous Mapping of the Hypoxic Zone in the Gulf of Mexico
8.2.8	Environmental Observations	Under Keel Clearance Management in support of Precision Navigation
8.2.9	Environmental Observations	Open Water Surface ROV for Bathymetry
8.2.10	Environmental Observations	Create the Next Generation National Water Level Observation Station
8.2.11	Environmental Observations	Clean Energy Source to Power NOAA Long-term Observation and Monitoring Networks
8.2.12	Environmental Observations	Inexpensive, Novel Weather Observing Systems
8.2.13	Environmental Observations	Developing a Cost Effective Air-deployed Unmanned Aircraft system (UAS) for Use in Turbulent Environments
8.3.1	Decision Science, Risk Assessment and Risk Communication	Coral Restoration Outplanting

Subtopic Number	TOPIC	SUBTOPIC
8.3.2	Decision Science, Risk Assessment and Risk Communication	Automated Tools for Detecting Entanglement Risks Associated with Aquaculture
8.3.3	Decision Science, Risk Assessment and Risk Communication	Development of “Permit Wizard” Software for Assisted Permit Application Completion
8.3.4	Decision Science, Risk Assessment and Risk Communication	Location-Specific Threat Tracking Tool For Better Warning Response
8.3.5	Decision Science, Risk Assessment and Risk Communication	Developing Low-cost, High-nutrition Plant-based feed for Finfish Aquaculture Operations
8.3.6	Decision Science, Risk Assessment and Risk Communication	Developing Monitoring Tools to Detect Disease in Marine Aquaculture Operations
8.4.1	SBIR – Technology Transfer	Miniature Open Path CRDS Instrument

8.1 TOPIC: Integrated Earth System Processes and Predictions

8.1.1 SUBTOPIC: Radio Occultation from Recoverable Air Balloons for Weather Applications

Summary:

Radio occultation from satellites have been proven very useful for numerical weather prediction, which in turn led to the commercial weather data pilot (CWDP) projects. However, radio occultation from air balloons have not been explored previously. With the availability of low cost Global Positioning System (GPS) receivers and maturing technology, there appears to be opportunities for measuring atmospheric profiles from recoverable air balloons, or even in conjunction with the radiosondes currently being launched. Therefore, this project provides an opportunity to study the feasibility of radio occultation from air balloons which may have great commercialization potentials.

Project Goals:

The goal is to demonstrate the feasibility by designing and developing a hardware/software system for balloon platform with sufficient quality for measuring global navigation satellite system (GNSS) signals in retrieving atmospheric profiles such as temperature, moisture, and pressure through radio occultation. The balloon platform should reach heights of several kilometers. The commercialization of this project highly depends on the success of the feasibility and data quality demonstrated.

8.1.2 SUBTOPIC: Determining the Timing and Location of Fish Spawning

Summary:

The reproductive life history of fish, including when and where they spawn (=release of eggs from ovary), has been critical to the proper management of a fish species in the commercial fishery. To increase catch, commercial fishermen have historically focused on aggregations of fish at the time of spawning and, in response; management agencies have used this information to assign fishing limits in an effort to sustain populations.

An important tool for the management of fish is the analysis of population structure using genetic markers. Results of the analyses of genetic population structure have critical impacts on the management of a species since they may mean the difference between managing a species as a single entity or as separate populations across their range. Genetic population analyses based on samples taken from the wild rely on the supposition that fish from discrete reproductive populations are known and being assessed separately. Yet, for many species of fish this assumption is clearly violated since their spawning sites are unknown and DNA samples for genetic analysis are taken without this information (e.g., sablefish - Jasonowicz et al., 2017).

For a few species, the timing and location of spawning is known. However, for many marine fish, particularly deep-water species, it is not. This includes some of the most commercially important species such as sablefish and Pacific hake. Even for species such as halibut where some reproductive information is available, our knowledge is incomplete. For species such as Pacific hake, spawning information is essential for their management since changing climate-ocean conditions are altering seasonal migratory behaviors (Benson et al., 2002; Ressler et al., 2007). These changes have been hypothesized to have altered the timing and locations of spawning and how this impacts the assessment of population size for this species is unclear.

While there has been significant development of tagging technologies (e.g., archival and acoustic tags) to follow the general movements of fish and to discern their habitat (e.g. depth and temperature) preferences, there has been relatively little effort to develop technologies that could determine when and where a fish spawns. There has been some research using radio transmitters or acoustic telemetry tags that are inserted into the ovary (via the oviduct) with the hypothesis that when spawning and egg release occurs, the tag is expelled from the ovary and can be detected by a receiver in the environment. If one could locate the tag then the location (but not timing) of spawning can be inferred. In these studies, the general tag locations were made by manually searching shoreline areas with receivers to detect signals (Pierce et al., 2007; Skovrind et al., 2013), or an existing acoustic telemetry array was employed (Binder et al., 2014). However, in all of these cases, some a priori knowledge of where the spawning locations were located was necessary to either search for the tags or to determine where to locate the telemetry arrays. This approach may have some probability of success in a very limited space such as a freshwater lake or shoreline, but would be impossible in a large open body of water such as the ocean. In addition, these methods do not define the timing of spawning. Clearly, when dealing with species in the ocean that have wide distribution, radio transmitters or acoustic telemetry cannot be used for this purpose. Further, this would be even more difficult for fish species that reside in deep water that would be inaccessible to manual searching with receivers or for telemetry array deployment.

The Problem: A technology is needed that can determine the precise timing of spawning (=release of eggs from the ovary) and to link that event to the simultaneous determination of the geographic location of that spawning event. We hypothesize that, depending on how this problem is addressed other uses for this technology could be envisioned such as the archiving of other types of data from the fish (see project goals).

Project Goals:

To solve this problem, a successful technology would be one in which the release of eggs from the female could be determined, the timing of that release recorded, and that information could subsequently be obtained by a researcher. In addition, the technology would have to also determine the geographic location at which the release of the eggs occurred. The release of eggs from the ovary (signaling spawning) might be directly monitored or, indirectly monitored through the simultaneous release of something that could be placed in the ovary and be used as a proxy for egg release. The egg proxy could then be used as a signal itself or as a trigger that could then initiate other processes such as the release of a tag (e.g., satellite popup tag)

that is attached to the fish. That tag could then be used to transmit or contain the information on the time and location of egg release. From past studies, we know that proxies such as miniature radio transmitters or acoustic tags can be expelled from the ovary at the time of spawning. It is then a matter of how to link these proxies with other technologies that would record that information and relay it to the researcher.

In developing this technology, no a priori knowledge of where and when the spawning will take place can be assumed and it is unlikely that the fish itself will ever be recovered. Rather, the information on when and where spawning occurs has to be transferred independently to the researcher from where it is collected and could, therefore, involve some form of satellite transmission.

While the technology in this subtopic proposal is being directed at solving the issue of where and when fish spawning takes place, it could also be used for other purposes depending on how the problem is solved. The general concept of detecting and archiving what is occurring in a fish over some period of time and then eventually relaying that information to an individual (researcher or other), could have significant applications in physiology (detecting and recording various internal parameters such as blood pressure), behavior (sensing the movements of predators or other neighboring fish such as those in a school), or surveillance (detecting the presence or movements of other objects such as marine mammals or ships). The use would depend on what precisely is placed into the fish and what that device could record.

Subtopic References:

Benson, AJ, McFarlane, GA, Allen, SE, and Dower JF. 2002. Changes in Pacific hake (*Merluccius productus*) migration patterns and juvenile growth related to the 1989 regime shift. *Can. J. Fish. Aqu. Sci.* 59: 1969–1979.

Binder, T.R., Holbrook, C.M., Miehl, S.M., Thompson, H.T. and Krueger, C.C. 2014. Use of oviduct-inserted acoustic transmitters and positional telemetry to estimate timing and location of spawning: a feasibility study in lake trout, *Salvelinus namaycush*. *Animal Biotelemetry* 2014, 2:14.

Jasonowicz, A.J., Goetz, F.W., Goetz, G.W. and Nichols, K.M. (2017) Love the one you're with: genomic evidence of panmixia in the sablefish (*Anoplopoma fimbria*). *Canadian Journal of Fisheries and Aquatic Sciences* 74(3): 377-387.

Pierce, R.B., Younk, J.A. and Tomcko, C.M. 2007. Expulsion of miniature radio transmitters along with eggs of muskellunge and northern pike—a new method for locating critical spawning habitat. *Environ Biol Fish* (2007) 79:99–109

Ressler PH, Holmes JA, Fleischer GW, Thomas RE, and Cooke KC. 2007. Pacific hake, *Merluccius productus* autecology: A timely review. *Fish. Rev.* 69(1-4):1-24.

Skovrind, M., Christensen, E.A.F., Carl, H., Jacobsen, L. and Moller, P.R. 2013. Marine spawning sites of perch *Perca fluviatilis* revealed by oviduct-inserted acoustic transmitters.

8.1.3 SUBTOPIC: Calibration of Low-cost Air Quality Sensors

Summary:

The last several years have seen an explosion in the manufacture and use of low-cost sensors for the measurement of air pollutants. Such sensors offer the promise of distributed measurements of atmospheric pollutants over wide geographical areas, and as such have important potential applications for source attribution, local air quality, and human health/exposure. However, it is critical that the performance (accuracy, precision, selectivity) of these sensors be well characterized, and continually monitored during measurement periods. In particular, as with all air quality instrumentation, sensors need to be regularly calibrated, which represents a major challenge for large-scale networks (with hundreds or even thousands of sensor nodes). General approaches include laboratory-based calibrations (exposing sensors to known levels of pollutants under controlled, well-defined conditions) and co-location calibrations (placing sensors near high-fidelity regulatory-grade monitors). However, neither approach has been demonstrated as effective on a large scale.

Project Goals:

Development of novel approaches for the evaluation and calibration of low-cost sensors during and after deployment.

NOAA is presently developing an air quality forecasting capability which would greatly benefit from an expanded base of observations. The development of novel approaches for the evaluation and calibration of low-cost sensors during and after deployment is critical to the implementation of a cost effective air quality observing network. Such approaches could be physical systems, such as portable calibration setups or calibration modules internal to the sensor nodes, or be methodology-based, such as new algorithms or descriptions of “best practices” for calibration. The approaches developed must be suited for large-scale use, be applicable to in-use sensors, and provide a means by which sensor performance (accuracy, precision, etc.) can be described quantitatively. Calibration approaches could be focused on a particular sensor or class of sensors (e.g., measurements of a single gas-phase pollutant, or of the number or mass concentration of particulate matter), or be broadly applicable to low-cost sensors generally.

8.2 TOPIC: Environmental Observations

8.2.1 SUBTOPIC: Portable, Fast, and Intelligent Phytoplankton Species-identifier and Counter

Summary:

Phytoplankton form the foundation of most aquatic ecosystems and therefore quantitative information about their species composition is critical for many fields of research and applications. For example, in coastal and inland waters, species-specific cell counts data can be useful for eutrophication assessment and detection of harmful algal blooms. Satellite water color remote sensing can potentially be a powerful tool for rapidly and cost-effectively retrieving information associated with phytoplankton composition, provided that large amount of field data obtained in diverse natural waters are available to develop this tool.

Extant techniques to measure phytoplankton cell counts are inadequate to satisfy this need. The classical method requires a phytoplankton taxonomist, or a non-professional aided by books, to look through a microscope, recognize, and count manually. The process is tedious and time-consuming, and lacks consistency because it depends on who is counting. Some instruments use an alternative approach that replaces the microscope with an imaging instrument, but still require manual species identification. Some achieved automatic identification and quantification of phytoplankton cells down to individual species. However, they lack portability, speediness of data acquisition, and accuracy of species identification.

Project Goals:

The objective of this subtopic is to develop a portable, fast, and intelligent instrument that can be used to automatically and accurately measure the cell number concentration of each individual phytoplankton species present in a given natural water sample. This is a challenging task considering that 1) in natural waters phytoplankton cells are mixed with non-living particles of similar size and abundance; 2) different phytoplankton species can vary greatly in size and morphology; and 3) phytoplankton cells can form chains or arbitrarily shaped colonies. We envision that the new instrument capable of addressing these challenges would require two essential components, image acquisition and artificial taxonomist. The image acquisition component is used to capture and record information about individual cells such as size, color, morphology, excitation-emission spectra, and etc., basically any information that can be used to extract unique traits to characterize a species. This component must have a sufficiently large throughput to provide statistically representative cell counts for at least dominant species in the sample. The artificial taxonomist component is used to replace the human taxonomist to identify the taxon of each unknown cell based on the information captured by the image acquisition component. Advanced image processing algorithms play a key role in this component.

Expectations for Phase I include a detailed proof-of-concept report describing research results and technology development completed for the instrument, 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 instrument will be commercialized.

8.2.2 SUBTOPIC: Bottom Feeder - a Benthic Data Provider

Summary:

NOAA's diverse responsibilities include exploration, scientific studies for biogeochemical sensing, mapping, and other activities of the coastal and oceanic benthos. Two ongoing endeavors related to the benthos are optical measurements of the bottom albedo and ecosystems mapping within the euphotic zone, in particular coral reef mapping, with coincident spectral and coral health measurements. Technology exists for determination of optical properties of the ocean bottom, albeit in a time consuming, labor intensive method. Additionally technology exists in vehicle design, mapping and non-destructive, determination of coral health. These topics are also performed by separate manual, expensive, labor-intensive methods. These two endeavors can be further developed and integrated as multiple subsystems into a utilitarian, efficient, cost effective, innovative commercial system capable of many mission applications in addition to optical measurements and coral reef mapping with health assessments. These two related efforts are in line with NOAA's Strategic Research Guidance Memorandum, "...development of novel sensing elements and platforms, with the end goal being to increase efficiency and reliability, improve data return, and reduce costs." This concept of a multipurpose vehicle that feeds benthic data to the surface for further dissemination and analysis is referred to as NOAA's Bottom Feeder.

Project Goals:

Overall the Bottom Feeder is conceptualized as an AUV with alternate tethered capability for feeding bottom data to the surface. The submerged vehicle will be multifunctional, with initial primary functions of 1) provide optical data and 2) map coral reef ecosystems for depth range of zooxanthallate corals to mesophotic depths. The bottom feeder vehicle will need to maintain course and speed, provide position information, maintain a set distance from the bottom, horizontal and vertical operation, have a robust collision avoidance system, be capable of data transmission to the surface (via cable and wireless) and be freely autonomous or when conditions warrant, tethered operations. A dual power source is preferred, one for the vehicle, the other for the payloads. The power sources can be linked for ascending, either for retrieval or emergency situations. Provisions for ascending should be carefully considered, such as buoyancy shifted to the bow for collision avoidance system and controlled rate, with pinger and beacon activated.

Rationale for the optical sensor(s) comes from a need of the remote sensing community. NOAA/NESDIS(National Environmental Satellite, Data, and Information Service)/STAR (Center for Satellite applications and Research)/Coral Reef Watch is currently working with operational optical (ocean color) satellite sensor, Visible Infrared Imaging Radiometer Suite (VIIRS) as well as other optical satellite sensors providing products in coastal waters, including over shallow water coral reefs. Bottom albedos (radiances) are issues that need to be corrected per bottom type. Thus one of our two primary systems on the autonomous vehicle is a device capable of measuring the visible portion of the electromagnetic spectrum (approx. 300-800 nm wavelengths) for current and anticipated future optical satellite mounted sensors. To collect useful optics from the benthos, a sensor(s) is required that measures irradiance (upward looking), measures a standard optical calibration plate, and measures the bottom radiances (downward looking) and transmit those data to the surface. Optical concerns need to be considered such as the sensor(s) subsystem may be configured such as on an extension from

the aft of the vehicle to avoid vessel shadow, but streamlined sufficiently to avoid entanglement or striking obstructions.

Rationale for the mapping originates from NOAA and several other agencies responsible for the monitoring the extent and health of U.S. coral reef holdings worldwide. The mapping and health assessment of coral reefs requires long-term investment of human resources and expensive survey systems with support subsystems. Recent technology exists in vehicle design, mapping and non-destructive, fast determination of coral health. These technologies can be further developed and integrated into multiple subsystems for a utilitarian, efficient, cost effective, novel commercial multi-purpose vehicle. There are systems available for mapping coral reefs, including stereo color camera systems producing three dimensional and accurate geo-located mosaics. Many of these systems are diver controlled, following preset transects, which can be automated. Additionally high quality spectral imagery provides information that can be used in numerous applications, such as automated classification of the benthos. Imaging spectrometers have been providing data for terrestrial and aquatic applications and have been miniaturized. Mosaics of coral reefs of concern are possible with dual camera systems, providing stereo (3-D) and sharp imagery. In addition to dual cameras for a stereo and mosaic generation, the bottom feeder should have two additional sensor components, an imaging spectrometer and a non-destructive, fast response coral health monitor. The imaging spectrometer provides a spectral image, which can be co-located with the camera images for sharpening as well as augmenting the stereo image information for classifications. The coral health sensor will provide point data, in contrast to an image, intermittently along the transect for coral health and possible stressor exposure within the mapped mosaic. A video camera would provide useful supplemental information, especially during the system development.

These two initial functions of the Bottom Feeder will directly provide data to NESDIS, NOS (National Ocean Service), NMFS (National Marine Fisheries Service) and Office of Oceanic and Atmospheric Research (OAR) as well as other State and Federal agencies, non-governmental organization (NGO), academic and commercial communities.

Rationale for having modular or compartmentalized and power / attachment (compartment) interfaces are to provide for additional sensors both for NOAA as well as to increase the commercialization of the Bottom Feeder. The third function of the bottom feeder is to map deep-water benthic habitats with design for an exchangeable set of sensors, such as sonar systems, etc. Additional examples of sensors are only to be incorporated into a design interface or "hooks" for future applications for the bottom feeder. In addition to sensors, a sampler subsystem for water / sediment/ small materials needs to be designed into the bottom feeder. An example of future additional sensor plans include such aspects as efficient lights for deep ocean optical surveys with mounting or compartmental design. Whereas plans for modular or compartmental replacement of lights with e.g. sonar systems when non-optical surveys are conducted.

The bottom feeder, being multi-functional and can operate within a wide range of depths in an autonomous mode or in a tethered mode having two applications (optical determination of the bottom and coral reef 3-D mosaic, spectral and health mapping) with built in capabilities for other future applications will provide NOAA, other agencies, academia, NGOs, and companies

a cost effective way to meet mission responsibilities and provide a highly competitive commercial system.

8.2.3 SUBTOPIC: Automating Bearing and Distance Measurements in Big-Eye 25 x 150 Binoculars and Recording/Saving Images

Summary:

Conducting marine mammal stock assessments is a core function of the agency to provide the scientific basis for marine mammal conservation. Traditional methods for estimating abundance, density, and distribution for multiple cetacean species rely almost exclusively on visual surveys conducted on-board ships. Visual surveys involve the use of “Big-Eye” 25 x 150 binoculars to manually scan for cetaceans to a maximum distance of about 11-13 km from the ship. Scanning is done by trained observers who locate and identify species and estimate group sizes, which are ultimately used to estimate population abundance and in the development of habitat models. Two key measures are obtained using the binoculars, which include bearing and reticle distance to the sighted animal. While the bearing measurement is easy to obtain with accuracy, the reticle distance however, is at best an estimate due to the motion of the vessel and sea state. In addition, reticle distance measurement errors can be compounded at distance and when the target animal is being tracked. Similar to theodolite readings obtained on land, an automated reading of bearing and reticle distance measurements would reduce or eliminate uncertainty while recording cetacean sightings. Further, a second issue is the lack of any photographic or video evidence of what the observer sees through the binocular. The availability of an image or video would help to verify species identification in situations where the animal is too far to identify or close-in approaches to verify species identification is not possible.

Project Goals:

There is a need to design, test, and make commercially available Big-Eye binoculars that can digitally show reticle measurements and bearings as the binocular is swiveled by the observer and simultaneously be recorded in a computer database. A secondary goal is the ability to obtain images or video of the observer visual field during a sighting or tracking of animal.

8.2.4 SUBTOPIC: Improving Attachment Systems for Remotely-Deployed Cetacean Tags with External-Electronics

Summary:

In order to effectively manage protected species such as endangered or depleted cetacean populations, we require detailed knowledge of their broad-scale habitat use, movements, and migration patterns over the course of months or years in order to assess how they are affected by environmental factors and anthropogenic activities. To address this problem, researchers are increasingly turning to electronic tagging technology in order to track animals and provide

data needed for stock assessments and other management actions (Sheridan et al., 2007). Until the last decade, medium-sized cetaceans, including many of the toothed whales, could not be tagged because they were either too large to capture safely for direct application of electronic tags, or because they were considered too small to tolerate the recent generation of implantable satellite-linked tags that penetrate more than 20 cm into blubber (e.g., Mate et al. 2007). A significant reduction in the size of the transmitters, and the development of attachment darts a decade ago, allowed for the remote deployment of tags on small to medium size cetaceans, with the transmitter remaining external and only darts anchoring the tag to the tissue (Andrews et al. 2008). However, the dart design has remained essentially unchanged since then, but has experienced a high level of premature tag detachments. Thus, there is a need to redesign and commercialize an attachment system for improved tag retention in order to increase tag attachment duration. This attachment system should also minimize potential impacts to study species.

Project Goals:

There is a need to design and test (addressing factors that likely impact attachment duration), and make commercially available an attachment system that improves the retention of a remotely deployed external –electronics satellite-linked tag used for tracking cetacean movements. It must also decrease the chance of any anchor element breakage, while improving existing performance. Performance improvements include consistent multi-month attachment durations while minimizing tissue impacts and risks to the tagged animal's welfare.

8.2.5 SUBTOPIC: Low-cost Mooring Location Beacon for Coastal Applications

Summary:

A low-cost beacon based on less data intensive satellite transmission, or cell phone based network for highly populated coastal areas or enclosed estuaries, does not currently exist in the market, and would have a broad interest by scientists deploying moored instrumentation in coastal habitats. Needed features for a coastal mooring beacon include: surfacing detection; fast satellite data acquisition and transmission; extended battery life; waterproofing; and ruggedized design. Developing a low-cost beacon for the recovery of coastal mooring packages would open the market for coastal research project

Project Goals:

There is a need for a low-cost beacon for the recovery of coastal, often shallow, research moorings. Typical offshore oceanographic moorings are instrumented with expensive equipment and the addition of a satellite beacon for their recovery is justified. However, these beacon's cost range is in the order of several thousand dollars (e.g., \$3000 to \$8000), which make them not affordable for smaller budget coastal projects, where the total cost of mooring packages is lower.

8.2.6 SUBTOPIC: Next Generation Marine Visibility (FOG) Sensors

Summary:

A new method and technology for remotely monitoring fog is needed to support physical oceanographic real time measurements for maritime commerce support. The current generation visibility sensors use a lot of power and infer visibility during reduced visibility at a local sensor nearest out 5 to 10 miles. To heat and remove condensation, they require commercial power. There is a model that uses large battery packs with large solar recharging for remote locations that has limited reliability, accuracy and precision. The current system has a high maintenance and replacement cost.

Project Goals:

A technological leap is needed to provide remote autonomous real time visibility determination for maritime operations throughout the United States and its territories. Human watch standers at at USCG Vessel Traffic Service & Port Security Command Centers have interpolated the range and distance to incoming fog banks as have Marine Vessel Pilots and Navigators for over 50 years. Video cameras have indirectly tracked and measured distances to multiple fixed targets to determine relative visibility conditions over an entire bay or water way. This technological leap will create an autonomous low cost easily maintained (or renewed) very low power near real time detection and measurement system perhaps using grey scale analysis that has been applied to port access and vehicle under carriage security (explosive detection) monitoring operations. Images will be transmitted over our web services directly to communities, port authorities, navigation centers, & maritime operators in every coast, seaport, river, harbor, and inlet. The application may even find traction with the National Weather Service (NWS) for airport visibility monitoring.

8.2.7 SUBTOPIC: Autonomous Mapping of the Hypoxic Zone in the Gulf of Mexico

Summary:

The hypoxic zone in the northern Gulf of Mexico, a region devoid of life, occurs in an area that was once one of the most fertile fishing grounds in the region. Since the 60s and 70s, nutrient rich water flowing into the Gulf from the vast Mississippi River watershed, has caused an annually recurring hypoxic zone that extends over an area that can approach the size of New Jersey. Hypoxia is generally used to denote waters containing less than 2mg/l of oxygen and which are typically too low to support life, hence the common name of “dead zone” for severe hypoxia areas around the US.

The largest dead zone in the US is in the Gulf of Mexico and a major effort to mitigate this dead zone has been undertaken since the early 2000's by the interagency and multistate Hypoxia Task Force (HTF). Primarily focused on reducing watershed nutrient pollution, NOAA's responsibilities to the HTF include providing the scientific understanding of the causes

of the hypoxic zone and its ecosystem impacts. Over the years, NOAA's research investment has led to development of quantitative predictive models currently used to establish hypoxia mitigation goals and nutrient reduction targets needed by the States in the Mississippi River watershed to achieve those goals.

NOAA's assessment of HTF progress toward their hypoxia mitigation goal is based on hypoxic zone monitoring, currently very limited in scope despite the national interest in the issue. Adequate monitoring data are a fundamental need for proper calibration and validation of the predictive hypoxia models being used for decision-making. Current hypoxic zone monitoring is limited to one shelfwide survey per year due to limited funding to support the extensive ship surveys and fixed observation systems needed to monitor the area impacted by the dead zone on an annual basis. These issues are further compounded by the large size of the system and logistical constraints with measuring oxygen throughout the water column, especially near the bottom where hypoxia typically occurs.

Gliders are widely recognized as an effective and cost-efficient monitoring tool for high spatiotemporal coverage of water quality parameters. They are routinely used for mapping parameters in regions where water column density gradients are low enough to enable adequate buoyancy control. The Gulf of Mexico dead zone, however, is a challenging environment for glider mapping because a large portion of it occurs in relatively shallow, high-density gradient areas of the shelf or along bottom waters below the halocline. Glider deployments to date have not been able to fully map the dead zone due to the difficulty in controlling buoyancy in these conditions. For gliders to be operationally useful for hypoxia monitoring in the Gulf, there is an urgent need to overcome these multiple challenges in a cost effective manner while also maintaining data coverage and accuracy.

Project Goals:

NOAA is seeking autonomous vehicle technologies that can resolve the challenge of mapping the Gulf dead zone effectively and cost-efficiently. The goals are to 1) substantially improve the monitoring capabilities currently implemented for the Gulf hypoxic zone, to 2) provide a cost-efficient mapping capability that could leverage operational support from interested partners as contribution to the Cooperative Hypoxia Monitoring Program (<https://service.ncddc.noaa.gov/rdn/www/media/documents/activities/2016-workshop/Hypoxia-Proceedings-Paper-2016.pdf>), currently in development, and, if successful, to 3) extend this technology to other environments where high density gradients in shallow waters have hampered glider applications to monitoring. Integrated, multiple autonomous vehicle platforms (e.g. gliders and autonomous surface vehicles) working synergistically to cover the full range of sampling environments are also encouraged. Current sampling methodologies rely on a ship-based platform to measure the annual dead zone (<https://gulfhypoxia.net/>). Proposed AUV technology should provide a similar capability, in both time and space, and be able to sample over the range of salinity, temperature, and depths encountered during the annual summer survey cruise.

8.2.8 SUBTOPIC: Under Keel Clearance Management in Support of Precision Navigation

Summary:

The United States marine transportation system is an essential driver of the U.S. economy. Every day, U.S. ports and waterways handle millions of tons of domestic and international cargo ranging from agricultural products to heating oil and automobiles. Every year the ships carrying the cargo are getting larger requiring deeper draft. One of the key factors is the clearance between the bottom of the ship and the seafloor – known as the under keel clearance – which is determined differently from port to port and is typically based on external factors such as the nature of the seafloor bathymetry, surface currents, water level, and weather. Improved accuracy in the management of underkeel clearance systems will enable a ship to take on more cargo safely. For example, for every extra foot of draft gained entering a port today's larger cargo ships could load an additional 40,000 more barrels of crude oil. This equates to \$2 Million of extra product that can be loaded for every foot of increased draft per transit.

The International Hydrographic Organization (IHO) is working to standardize the display of Underkeel Clearance Management Systems to show real time go/no-go areas in critical navigation situations. This proposed project is to develop an underkeel clearance management system utilizing draft International Standards (S-129).

Project Goals:

To develop an underkeel clearance management system based on draft IHO standards that can be utilized by Portable Pilot Units and Electronic Chart Systems to provide enhanced decision support for areas that fall under critical under keel clearance management areas.

8.2.9 SUBTOPIC: Open Water Surface ROV for Bathymetry

Summary:

In our damage assessment work, we have need for shallow water (could be <1m) bathymetric characterizations at centimeter accuracy (i.e., survey grade GPS) in open coastal waters. Currently, this work is performed by hand with staff in the water towing an instrument raft behind. This is highly inefficient, and not infrequently, depending on site conditions this can be an impossible task for snorkelers.

We have investigated the market place for a more efficient solution, but have not found a cost-effective solution that meets our demands.

Project Goals:

The project goal is to design a remote controlled ROV hardware and software package to carry an integrated instrument package for bathymetry, capable of operating on the surface in open coastal waters. The instrument package would minimally combine a data logger, GPS, and

depth sounder. The ROV should be able to operate in seas up to 1-2 feet. The depth sounder should produce data in waters as shallow as 1-2 feet. The GPS must be survey grade accuracy, and should receive GLONASS satellites. The data logger should integrate all data streams into a single record with 1 sec or less logging frequency. Optimally, the remote control unit would provide realtime feedback to the operator. Better still, the unit could be pre-programmed to operate within a given survey box. Data should be easily downloadable and exportable to desktop PCs for GIS processing.

8.2.10 SUBTOPIC: Create the Next Generation National Water Level Observation Station

Summary:

We have top level requirements. We have robust quality assurance, quality control, information management, and dissemination operational management processes. Our current generation measurement system is 15+ years old and resides within a large sail area (if impacted by Category 2 or greater winds), water plane area (if impacted by storm surge), NEMA 4x water tight enclosures with relatively weak appendages supporting antennas, solar panels, conduit, connectors, and sensors. This research will create that next evolutionary station that can support multiple sensors (water level, meteorological, HAB, current meter, etc.), store the data, survive, transmit the data near real time, be self-powered, permits remote troubleshooting & fixing, and self-positioned to the National Spatial Reference System and local datum within 0.1-cm sphere (in all directions).

Project Goals:

Create the next generation lightweight small scale-able water level measurement system that can be deployed anywhere in the Continental United States, Alaska, Hawaii, and its territories and survive providing near real time data (every 6-min or 18-min) for processing, QA/QC, storage, & dissemination; used by partners & stakeholders. Must haves: remote troubleshooting, sustainable with maintenance visits every three to five years, survivable & operating in all locations in predictable environmental conditions over 50 years), surviving under 10-meters of water (return to continuous real time operation when storm surge or flooding recedes), and initial cost under \$25,000 per station. A typical station can be seen on our tides and currents web site.

8.2.11 SUBTOPIC: Clean Energy Source to Power NOAA Long-term Observation and Monitoring Networks

Summary:

NOAA and other federal agencies have been maintaining and operating weather and ocean observation and monitoring networks to improve weather forecasts accuracy and build a weather-ready nation. Traditional battery technology limits the long-term observations and has

caused serious environmental concerns. Solar or wind-based power generation are also limited by the large footprint, high capital cost, high maintenance and low efficiency. They are difficult to scale up and integrate into existing NOAA's monitoring and observation network. There is a strong need to develop a clean, low-cost, small footprint energy generation technology to power NOAA's long-term monitoring and observation instrumentation networks.

Clean power technology that uses water temperature gradient as power source for buoys and floats has been developed in the past decade. Similar techniques could also be developed to take advantages of diurnal air temperature difference, air-water, air-ice or water-ice interface to harness energy to power the weather or marine instrumentation and observation network. This option is particular attractive for instrumentation installed in remote, harsh environments such as deserts and arctic regions.

This subtopic invites small, high-tech firms that specialize in power generation, clean battery, instrumentation design and system integration to develop a novel technology to address the above issue and evaluate technical requirements and feasibility for such system. Once the system reaches commercialization stage, not only will it enable NOAA long-term observation and monitoring capability at a much lower costs, at the same time, it would also address and improve four other major priorities outlined in the NOAA Strategic Research Guidance Memo (SRGM) as well.

Project Goals:

The ultimate goal is to develop clean, renewable, low-cost, small footprint, low-maintenance technology to power NOAA's long-term observation and monitoring networks. The system should also provide innovative and efficient means to integrate into existing observation and monitoring instrumentation platforms.

8.2.12 SUBTOPIC: Inexpensive, Novel Weather Observing Systems

Summary:

NOAA has fielded many valuable, but expensive, weather observing systems for use in initializing numerical weather prediction models and for environmental modeling. NOAA greatly needs complementary observing systems that are lower in cost and can provide plentiful, regular observations, ideally over more data sparse areas. These potential new observations would be assimilated directly into NOAA data assimilation algorithms and also would indirectly improve the assimilation of other observing systems by "anchoring" them. NOAA solicits SBIR proposals for the design and demonstration of observing systems meeting these criteria.

Project Goals:

To build and demonstrate an inexpensive new observing system that will complement the existing observing system and improve NOAA's data assimilation quality and forecast quality.

8.2.13 SUBTOPIC: Developing a Cost Effective Air-Deployed Unmanned Aircraft System (UAS) for Use in Turbulent Environments

Summary:

For tropical, extratropical and polar storm systems the lower part of the boundary layer including the air sea interface is a critical region where energy is ultimately transferred from the ocean to the atmosphere. Adequately Sampling this environment however has been difficult due to a combination of safety and logistical limitations. Still, in order to better meet NOAA's mandate to protect property and save lives through improved forecasting, significant advancements in physical understanding and model improvement must be made. Existing observing systems responsible for capturing the lower atmosphere and upper ocean boundary environment associated with turbulent storms is currently very limited. NOAA p3 Measurements from GPS dropsondes, stepped frequency microwave radiometers and onboard Doppler radar only provide "instantaneous" values and are limited in nature. Doppler winds are not available below 500 meters and good dropsondes only provide very sparse coverage of atmospheric temperature and moisture in the lowest parts of the storm. Low flying, longer endurance "continuous" UAS should be able to dramatically improve kinematic (winds) and thermodynamic (temperature and moisture) coverage in this critical region of the storm. These types of observations, once they become routine, should significantly help improve NOAA's future forecasts associated with these turbulent storm environments.

Project Goals:

The successful project would ultimately develop and successfully test and operate an air deployed UAS in turbulent storm environment(s) using NOAA aircraft. The successful project would leverage existing onboard NOAA deployment systems (GPS or Airborne Expendable Bathythermograph (AXBT) sonobuoy launch) and utilize NOAA's one way advanced data system (Advanced Vertical Atmospheric Profiling System (AVAPS)).

8.3 TOPIC: Decision Science, Risk Assessment and Risk Communication

8.3.1 SUBTOPIC: Coral Restoration Outplanting

Summary:

Coral reefs provide food and livelihood to millions of people and their ecosystem services (e.g. tourism, fishing, coastal protection) are valued at \$30B/year globally and \$100M/year in the U.S. Preserving the critical socio-economic functions that corals reefs provide necessitates a multi-pronged approach that ranges from actions at the global to local level. Globally we need to dramatically and rapidly abate ocean warming, and locally we need to manage overfishing and pollution, while at the same time repopulating target reefs with resilient, genetically diverse, and reproductively viable populations through active restoration. Active coral

restoration has been occurring in the Caribbean basin for 15 years, and due to the dramatic decline in coral reef health and extent, has been growing globally as both a conservation management strategy and a method to promote tourism.

Corals for repopulation can originate from existing nurseries where they are fragmented, or millions of naturally produced eggs and sperm can be brought to a lab or nursery and reared. Either way the corals must be grown in land-based or in-water nurseries until they are large enough to “plant” on a reef. While some biological questions remain, the obstacles to achieving restoration at scale are primarily in the realm of increasing efficiency and drastically reducing the amount of time it takes to deploy corals to the reef. We need to scale up from deploying thousands of corals at a time to hundreds of thousands or even millions of corals at a time.

The primary method of coral restoration for the past several decades has been fragmenting existing corals (primarily branching corals), growing them to a larger size in in-water nurseries, and then transporting them and “outplanting” them to appropriate reef sites for restoration. This technique has been used for several decades, primarily with Elkhorn and Staghorn coral in the Caribbean. The structures used for in-water nurseries have evolved over the years and vary in cost, ability to withstand currents and hurricanes, minimize biofouling, and other factors. Some methods include small concrete or ceramic tile “plugs” screwed into cinder blocks, and fragments of branching coral tied with fishing line to cinder block and rebar “apartment blocks”, PVC “trees” anchored to the shallow seabed, or “clotheslines”. So far the most optimal designs have involved floating structures that minimize biofouling. However, even the most optimal designs are designed to repopulate small scale restoration projects that are perhaps 100m² and the biggest bottleneck of all is the “outplanting” phase.

It is estimated that over 150 organizations globally are engaged in coral restoration, with at least that same number showing interest in beginning restoration work. Coral restoration is a growing segment in both the non-profit, for-profit, coastal protection, government mitigation, and tourism development space. The highest cost for performing restoration currently is associated with diver and vessel time.

The industry is currently lacking a design for an efficient in-water floating nursery structure that can be coupled with an equally efficient method to collect corals off of the nursery structure and “outplant” a reef restoration site. The coral nursery structure should accommodate a minimum of 1000 coral fragments of Caribbean Elkhorn coral (~4 cm at deployment to nursery and growing to ~20cm at outplanting). The structure should be deployable by two divers in a single one-tank SCUBA dive (~1 hr). Structure should feature a simple and rapid method for coral attachment / detachment, be stable when exposed to heavy weather, minimize/eliminate biofouling, be reusable for at least five years, and cost less than \$250 when deployed at scale. The re-attachment to reef method should be such that 3000 ~20cm Elkhorn corals can be “outplanted” to a reef restoration site and the nursery structure can be re-stocked with ~4cm coral fragment in less than one day.

Such new technology that radically decreases diver-coral interaction time, will increase the number of corals that can be deployed per unit time, and would be readily paid for by the many large and small scale organizations using these techniques.

Project Goals:

Coral reef restoration is expanding rapidly and globally. There is a broad ecological and socio-economic need for coral restoration, and there is an untapped market for efficient coral nursery structures that are affordable, easy and quick to set up, and allow for the rapid deployment of grown corals onto the reef. There are many slight variations and modifications but the basic current methodology is:

- A nursery structure is erected underwater in a shallow, easily accessible environment.
- Coral fragments are attached by tying individual coral fragments with fishing line to the in-water nursery structure.
- The structure is cleaned of biofouling organisms during the coral growth period,
- When the coral is ready to be planted it is untied from the structure, placed in a bucket and moved to the reef restoration site.
- At the reef restoration site, the coral is glued onto the reef with underwater epoxy.

The overall project goal is to increase the efficiency of coral restoration by improving the design of both in-water nursery structures and the “outplanting” of corals from the structures to the reef restoration site. The nursery structure should be designed to:

- deploy in ~1 hr by 2 SCUBA divers
- hold 1000 ~4cm Elkhorn coral fragments that can grow to ~20cm each
- attach and detach corals rapidly (such that structures can be restocked and ~3000 ~20cm diameter Elkhorn corals can be planted in one day)
- cost \$250/unit, given mass market fabrication, and a 10 unit minimum purchase

Prefabricated, inexpensive, but sturdy structures, with simple attachment/detachment sites, and a method for getting these corals onto the reef rapidly would change this industry entirely. Using snaps or small cement or ceramic tiles that could be wedged onto the reef could increase efficiency by >10 times. If the SBC technology is successful and affordable, communities/localities world-wide that rely on coral reefs as their economic engine through recreation and tourism will pay for this, as will large-scale coral restoration NGOs, and government agencies that engage in mitigation.

8.3.2 SUBTOPIC: Automated Tools for Detecting Entanglement Risks Associated with Aquaculture

Summary:

Machine vision and/or artificial intelligence tools to detect and respond to entanglement risks specifically associated with aquaculture operations in coastal or offshore environments (e.g. entanglements of offshore marine aquaculture systems and gear with marine mammals and turtles, or other species of concern). Creation and deployment of a system that can anticipate entanglement events and potentially deter the animal and/or alert aquaculture operators when there is either an increased likelihood of an entanglement, or an actual entanglement event. This could be real time detection/monitoring or a combination of real time detection and

modeling. The next step would be to act on the information provided by that tool; systems which could respond (or at least have a pathway to effect a response) to risks with deterrent and mitigation and measures and are preferred.

Project Goals:

Risk of entanglements caused by aquaculture installations creates a critical roadblock for many interested parties seeking to obtain aquaculture permits in the US. Currently, the only tools available would be sensors and cameras that might be capable of alerting farm managers to an active crisis, but there is nothing that could help them avoid a crisis before it occurred. Particularly for unmanned farm sites that could exist several miles offshore, early detection of risks could provide deeply valuable protection. Most of the entanglement events that could occur at an aquaculture installation remain unknown to the operators without a human site visit. Animals that become entangled stand very little chance of surviving/escaping, but paying salaries and ensuring the safety for 24 hour staffing to monitor a farm site is prohibitively expensive. If affordable technology could be developed and deployed that could sense animals likely to become entangled and deter them, and/or immediately alert farmers if an entanglement has occurred, they could take a very rapid, specific action in response (as opposed to visiting the site, discovering a problem and having to make a return trip to the site to resolve it). In addition to protecting marine mammals and other species of concern, this type of system could potentially prevent damage to equipment, escape events, and tremendous time and expense to operators incurred while resolving entanglements. Providing farmers with a tool to reliably and affordably avoid and/or cope with animal entanglements will significantly improve success rates of permit applications and allow for increased growth of US aquaculture. Potential buyers of this technology will be aquaculture producers who have a need for farm-side monitoring that can alert them to events that threaten their crops and/or equipment. Research institutions would also purchase these to protect experimental farms and research installations.

8.3.3 SUBTOPIC: Development of “Permit Wizard” Software for Assisted Permit Application Completion

Summary:

Develop an automated or semi-automated permit assistant for marine aquaculture. Similar to tax preparation programs available to the public, programs should be template based, draw on existing documents and laws in the public domain, and be used on a fee-for-service basis with the result being dramatically reduced time/effort for completion of permit documents (Environmental Assessments, Environmental Impact Statements, Corps of Engineers permits, and so on), with improved information quality and consistency, less expense and improved permit reviews. Electronic assistants may focus on any area of marine aquaculture permitting, for any agency permitting process, and/or could provide “one stop” services for multi-agency permit applications. Those focused on federal permit requirements are preferred.

Project Goals:

Aquaculture producers are currently faced with slow, complex and often confusing permitting processes that must be completed before they can begin operations. The concern over placing significant time and investment into completing and submitting a permit application only to have it rejected is deterring much needed investment in aquaculture. Having an automated tool to speed up and improve the accuracy of the permit application process will result in more permit applications being filed and more permits being awarded. Projects must demonstrate a high degree of accuracy and completeness when providing a final product to their customers, and must demonstrate the capacity to incorporate frequent and potentially unanticipated updates to laws, regulations and policies that influence the permit process and permitting decisions. Potential buyers of this software could include state or federal permitting agencies who have are responsible for managing the permit process, reviewing incoming permit applications and then approving and issuing permits related to aquaculture. Primary users of this software will be aquaculture producers who are seeking to obtain or renew permits associated with aquaculture activities.

8.3.4 SUBTOPIC: Location-Specific Threat Tracking Tool For Better Warning Response

Summary:

Social scientists have indicated the importance of location-specific threat information for personal threat confirmation when it comes to correct response to NWS warnings. Warning areas tend to be many times larger than the actual area of imminent threat. People tend to ignore warnings without personal threat confirmation due to the very high location-based false alarm rate. The NWS has rather archaic tools for providing threat information...primarily in the form of generic text products. It is difficult to assess the threat specifics as to what, where, and when from these products. This unmet need exists because NWS field offices are restricted from creating such resources. The private sector has primarily created online applications that simply display radar imagery and warning polygons, with very little innovation beyond that. They may display automated or model-defined guidance such as storm track and future radar, but have very little forecaster-based threat guidance that may be more accurate and timely, and the output may be difficult for a non-scientist to understand. The only tool that NWS field offices have for providing location-specific threat information is social media posts, for which the information provided, and access by the public, is generally limited, and as a privately owned entity, could become unavailable to the NWS in the future.

The NWS needs an innovative tool that allows forecasters to easily provide real-time threat tracking information to be used by the public to confirm the existence and location of a weather- or water-related hazard. Likewise, a tool that allows a user to create their own alert criteria based on his needs, communicated in a manner a non-scientist can understand, is not presently available.

Providing the best threat information possible, in support of the NWS mission of protecting life and property and enhancing the national economy requires an innovative online resource that

allows NWS field office staff to track and alert people to a variety of weather- and water-related hazards, and provide this information in a form that non-scientists can understand. Such a resource, that supports the NWS mission, would be of value to all residential and business entities, and thus have considerable commercial value. TV meteorologists across the country, for example, could provide the resource output to their viewers.

Project Goals:

The NWS needs a truly innovative resource that provides location-based threat information on the following hazards for which warnings are issued:

- Tornadoes and Severe Thunderstorms
- Floods
- Hurricanes and Storm Surge
- Winter Storms
- Extreme Heat and Cold

It could optionally provide a means for NWS staff to provide threat information on other deadly hazards for which warnings are not issued, including:

- Excessive Lightning
- Rip Currents

Innovation can focus on how NWS staff could provide the following to the public through this resource. Some potential examples:

- Accurate hazard tracks and pathcasts (based on an entered motion vector)
- Simple threat indications for hazards that the non-scientist can understand (e.g. green, yellow, red stoplight colors based on threat level).
- Linkage to appropriate threat response information for a given hazard and threat level.
- Incorporation of real-time radar imagery with a feature to indicate user's location.

The desired online resource would achieve the following goals:

- Have a means for NWS staff to develop hazard tracking displays (e.g. tornado signature track, hail core location/track, etc.) that can be easily accessed and interpreted by the general public as well as specific user groups (e.g. emergency managers, hospitals, etc).
- Have an efficient means of displaying the following hazard threats: winter storm conditions, severe t-storm, tornado, flood, hurricane, excessive lightning, extreme heat/cold, etc), perhaps incorporating a threat level color coding that a non-scientist would understand (e.g. green, yellow, red stoplight colors).
- Have a means for alerting the user based on user-defined criteria (e.g. alert me for baseball or larger hail, excessive lightning, etc) rather than NWS-established criteria or warning type.
- Have a simple means for NWS staff to provide and adjust information through this resource, particularly for rapidly changing situations.
- Be able to incorporate existing useful data sets, such as real-time radar imagery and animations.
- Be able to plot warning areas, as well as allow NWS staff to plot location and track of particular hazards (e.g. tornado).

This project requires considerable innovative thinking. While there are online applications that provide a few of the above goals (e.g. warning alerts, radar displays, etc), there is no known application that accomplishes all of the above goals in a manner that is easy for non-scientists to interpret.

If successfully designed, it aims to be the most powerful threat resource provided by the NWS in meeting its WeatherReady Nation mission to create communities that are more resilient to disasters. It would have considerable commercial value given its potential utility for every person, business entity, government entity, school, etc.

8.3.5 SUBTOPIC: Developing Low-Cost, High-nutrition Plant-based Feed for Finfish Aquaculture Operations

Summary:

The U.S. imports more than 80% of the seafood we eat by value, half of which is from aquaculture produced in other nations. Future projections show that there will be a global supply gap, and the U.S. could position itself to help fill the shortfall. Although a small producer, the U.S. is a major player in global aquaculture, supplying a variety of advanced technology, feed, equipment, and investment to other producers around the world. Domestically, the U.S. marine aquaculture industry contributes to the nation's food security and supports a growing amount of economic activity in coastal communities and at working waterfronts in every coastal state and the Great Lakes. Currently, most production – approximately two-thirds by value – consists of bivalve mollusks such as oysters, clams, and mussels, while salmon and shrimp constitute most of the rest. Rapid advances in research and technology have helped catalyze the expansion of this industry to include a greater diversity of finfish species that can be raised in monoculture or multi-trophic operations (i.e., pens that include seaweed, shellfish, and/or finfish). Though there are many variables that may affect the profitability of a commercial finfish operations, getting easily accessible, cost-effective and nutritious feed that has minimal impact on the surrounding environment significantly affects the bottom-line for all producers. While finfish aquaculture operations in the past have relied upon fishmeal or fish processing byproducts as a primary ingredient for the feed, using fish to produce more fish is expensive, wasteful, at times difficult to obtain, and creates other unintended impacts to the environment. In recent years, significant scientific advances have been made to create fish feeds that are comprised mostly of plant-based products, with the addition of essential proteins, vitamins and amino acids needed for fish survival and rapid growth. There have also been many advances in making the feeds water soluble, which can help mitigate some of the excess organic waste from accumulating on the seafloor below the cages that may, exacerbate water quality problems in adjacent areas.

Project Goals:

The goal is to have a business develop and market a low-cost, highly-nutritious plant-based feed that can be used as feed for a variety of finfish aquaculture operations. The potential

market for such cost-effective and environmentally safe fish feeds is huge, ranging from commercial finfish aquaculture operations to fish hatcheries used to augment species recovery in the U.S. and around the world. The project would provide funds and incentive for a business to comprehensively assess the rapidly changing scientific advances related to fish feeds for various species, assess needs from the commercial industry, and develop a commercially viable product that can be used to feed fish, while minimizing impacts to ecosystems or the water quality. If successful, this effort could contribute to establishing the U.S. as a leader in the production of non-fish protein feed for aquaculture products world-wide.

8.3.6 SUBTOPIC: Developing Monitoring Tools to Detect Disease in Marine Aquaculture Operations

Summary:

The U.S. marine commercial aquaculture industry contributes to the nation's food security and supports a growing amount of economic activity in coastal communities and at working waterfronts in every coastal state. Currently, most production – approximately two-thirds by value – consists of bivalve mollusks such as oysters, clams, and mussels, while salmon and shrimp constitute most of the rest. There is great interest from government and industry to help expand the industry, especially for shellfish operations in coastal areas.

Because the shellfish industry relies on natural environments, often located close to shore, it presently faces various risks from poor water quality issues, including infectious disease and pathogens. Such risks are of great concern to the industry as infected stock cannot be sold due to public health concerns. There is an urgent need to build upon scientific advances to develop low cost, near real-time precision instruments that can detect one or more types of pathogens, such as *Vibrio*. While scientific research has made advances in being able to detect in situ pathogens, such as *Vibrio*, the technology has not yet been produced at a low cost for commercial use. The ability to deploy such instruments on or nearby individual production cages or tanks, would greatly help the industry quickly detect and respond to poor water quality events. Businesses could use such timely information to guide day-to-day operations and decision-making and increase profits.

Project Goals:

The goal is to have a business develop a low cost, easy-to-use, and highly accurate monitoring instrument that can be easily deployed at finfish or shellfish aquaculture facilities around the nation to detect one or more common pathogens, such as *Vibrio*. The project would permit a comprehensive assessment of recent scientific advances in this field, articulate the precise needs from the industry, and then develop a commercial product that meets those needs in a cost-effective manner.

8.4 TOPIC: SBIR - Technology Transfer (SBIR-TT)

8.4.1 SUBTOPIC: Miniature Open Path CRDS Instrument

Summary

In 2017, NOAA received U.S. Patent 9,709,491 for its innovative *System and Method for Measuring Aerosol or Trace Species*. The instrument based on this patent is known as an Open Path Cavity Ringdown Spectrometer (OPCRDS). NOAA is seeking one or more private sector partners to develop a light-weight, miniature version of the instrument for use on drones, balloon-launched instrument packages, or other useful applications.

Closed-path cavity ringdown spectrometers transfer a sample through inlet tubing to the optical cavity where its extinction is measured; however, substantial sample loss may occur in the inlet tubing, which can bias the measurements. For example, with aerosols, coarse particles or humidified particles may be inadequately characterized due to either impaction losses with the inlet tubing or evaporation during transport through the tubing. The purpose of the OPCRDS is to eliminate these artifacts and thereby provide a more accurate means of measuring aerosol extinction under a very broad range of ambient atmospheric conditions. A novel feature of the open-path design is that it overcomes the problem of auto-correlated extinction measurements that can arise with closed-path CRD instruments; this is discussed in section 4.1 of the published report on the OPCRDS. Another novel feature of the OPCRDS is the zeroing mechanism which is described in the patent.

Project Goals:

The NOAA Open Path CRDS was developed for the Earth System Research Laboratory in Boulder, CO, in order to support the lab's aerosol monitoring research activities. The full-sized instrument, which is used for in-situ atmospheric measurements, has been licensed to a U.S. company for commercialization. The miniature version of the instrument is a separate embodiment listed in the patent and has not currently been licensed. Although a prototype of the miniature instrument does exist, interested companies should propose their own design and should be capable of developing the complete instrument based on the proposed end use(s).

The goal of the project is to develop a commercially viable instrument that could be used for one or more applications. Companies specializing in scientific instrumentation for the federal, state, and academic markets, both domestic and international, may wish to apply. However, commercially viable applications outside environmental modelling will also be considered. Interested companies should clearly demonstrate plans to attract customers other than NOAA for any product they are seeking to develop.

Companies submitting a successful proposal will receive a one-year, no-cost research and development license (see Reference below) which may be renewed under Phase II, should the Phase I activities be deemed successful

Subtopic References:

For more information on NOAA Open Path Cavity Ring Down Spectrometer:

<https://www.google.com/patents/US9709491>

9.0 SUBMISSION FORMS AND CERTIFICATIONS

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

Solicitation No.:	NOAA2018-1	Closing Date:	January 31, 2018
Submitting Firm:			
Address of Firm (including Zip Code +4):			
Title of Proposed Project:			
Requested Amount:		Proposed Duration:	
		Solicitation Subtopic No.:	
Solicitation Subtopic Title:			

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

[Empty text box for joint venture details]

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

14. The company has completed the Fraud, Waste, and Abuse training available on <http://techpartnerships.noaa.gov/SBIR.aspx> and attached the completed certification page. 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.

9.3 NOAA SBIR Proposed Budget

Company Name				
A. PERSONNEL (Employee(s))		EST. HOURS	HOURLY RATE	TOTAL COST
NAME	ROLE IN PROJECT			
1	Principal Investigator/ Project Manager			\$ -
2				\$ -
3				\$ -
4				\$ -
5				\$ -
6				\$ -
Total Direct Labor / [] See Supplemental Budget for Additional Details or Information				\$ -
Fringe Benefits			0%	\$ -
Total Direct Labor & Fringe Rate				\$ -
B. EQUIPMENT (specify type, whether purchased, or leased, and cost)			Cost of Item	
			\$ -	
			\$ -	
			\$ -	
Total Equipment Costs/ [] See Supplemental Budget for Additional Details or Information				\$ -
C. TRAVEL (include purpose and from/to)			Cost of Travel	
Kick off Technical Meeting			\$ -	
			\$ -	
			\$ -	
Total Travel Costs/ [] See Supplemental Budget for Additional Details or Information				\$ -
D. OTHER DIRECT COSTS			Total Cost	
Materials and Supplies			\$ -	
Testing Services			\$ -	
Computer Services			\$ -	
Research Institution (Subcontract)			\$ -	
Other Subcontracts/Consultants			\$ -	
Total Other Direct Costs/ [] See Supplemental Budget for Additional Details or Information				\$ -
E. TOTAL DIRECT COSTS & FRINGE (A through D)				\$ -
F. INDIRECT COSTS (Specify type & rate, as applicable)			Rate	
			0%	
			0%	
			0%	
			0%	
Total Indirect Costs/ [] See Supplemental Budget for Additional Required Information				\$ -
G. TOTAL COSTS (E+F)				\$ -
H. FEE OR PROFIT RATE				0% \$ -
I. TOTAL AMOUNT OF THIS REQUEST (G+H)				\$ -
<p>J. Has any executive agency of the United States Government performed any review of your accounting system or records in connection with any other grant or contract within the past year? <input type="checkbox"/> Yes / <input type="checkbox"/> No</p> <p>If Yes, give name, address, and phone number of review office and official. We strongly encourage you to provide copies of any negotiated forward rate price agreements with your supplemental information</p>				

9.4 NOAA SBIR Budget Instructions

In accordance with Section 3.6 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.

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, 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. It is highly recommended that offerors including supporting documentation in the supplemental budget information to support your requested costs. This will expedite the government's review of the pricing. The government may be unable to support an award to a contractor without this information being provided.

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 that are to be determined 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. If a Fringe Benefit rate is utilized, it can be listed in the space provided. 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 shall include it in the Supplemental Budget Documentation. Include a copy of the quote, online catalog screenshot, catalog price, or other information on how the amount was developed with the Supplemental Budget Documentation. 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. Information provided regarding the development of those costs shall be provided in the Supplemental Budget Section. Some examples of potential information that may be provided are: screenshots of similar airfare costs, distance for private vehicle operational costs, utilizing the government's hotel & per diem costs (or other related standard), etc. Inclusion of travel expenses will be carefully reviewed relative to need and appropriateness for the research proposed. Foreign travel is not an appropriate expense. **Ensure that the Technical Kickoff Expense is included (for no more than 2 individuals for a one day meeting (see Section 3.8)).**

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 supporting documentation such as a copy of a quote/proposal, catalog price, online pricing, for any other direct costs listed in the Supplemental Budget Documentation. If one is not included, explain how you developed that estimate. Discuss any competition utilized, basis of source, and reasonableness of price. Be sure to include copies of any subcontracts (including Universities and consultants) and proposals with the Supplemental Budget Information, if not included elsewhere.

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

Line F, Indirect Costs. Cite your established Indirect Rates (e.g. Overhead, General and Administrative rate, etc.), 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. If you have a negotiated Indirect Cost Rate or Forward Rate Pricing Agreement 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.

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: _____%

(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.

Signature

Date

Print Name (First, Middle, Last)

Title

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.

Signature

Date

Print Name (First, Middle, Last)

Title

Business Name

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 31, 2018.

- _____ 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 3 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 point (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).
- _____ 16. Provided a copy of the Mandatory DOC Office of Inspector General (OIG) Fraud, Waste, and Abuse Certificate of Completion (Section 1.8).

NOTE: Offerors 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.