SBIR

Small Business Innovation Research

FY 2008

NOAA Program Solicitation

Opening Date: October 17, 2007
Closing Date: January 23, 2008

October 2007 **NOAA 2008-1**

U.S. DEPARTMENT OF COMMERCE
http://www.oarhq.noaa.gov/ORTA

TABLE OF CONTENTS

DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

PROGRAM SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH

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 strong research capabilities in any of the areas listed in Section 8 of this solicitation are encouraged to participate. **Unsolicited proposals are not accepted under the Small Business Innovation Research (SBIR) program.**

Objectives of this program include stimulating technological innovation in the private sector and strengthening the role of small business in meeting Federal research and development (R&D) needs. This program also seeks to increase the commercial application of innovations derived from Federal research and to foster and encourage participation by socially and economically disadvantaged and woman-owned small businesses. Also, in accordance with E.O. 13329, the NOAA SBIR program will give a high priority, where feasible, to proposals that are directed toward innovations that will aid the manufacturing sector of the Nation's economy.

1.2 Three-Phase Program

The "Small Business Innovation Research Program Reauthorization Act of 2000" 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.

The funding vehicles for NOAA's SBIR program in both Phase I and Phase II are contracts. This document solicits Phase I proposals only.

NOAA has the unilateral right to select SBIR research topics and awardees in both Phase I and Phase II, and to 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 technical 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.

1.2.2 Phase II – Research and Development

Only 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 and a plan to commercialize the final product. NOAA may require delivery of the prototype. Each Phase II applicant will be required to provide information for the SBA Tech-Net Database System (http://tech-net.sba.gov) when advised this system can accept their input.

Further information regarding Phase II proposals and Tech-Net requirements will be provided to all firms receiving Phase I contracts.

1.2.3 Phase III – Commercialization

In Phase III, it is intended that non-SBIR capital be used by the small business to pursue commercial applications of Phase II.

1.3 Eligibility

Each organization submitting a proposal **must** qualify as a small business (Section 2.1) for research or R&D purposes (Section 2.2) at the time of the award. In addition, the primary employment of the principal investigator must be with the small business at the time of the award and during the conduct of the research. More than one-half of the principal investigator's time must be spent with the small business for the period covered by the award. **Primary employment with a small business precludes full-time employment with another organization. The NOAA program manager in consultation with the contracting officer must approve deviation from these requirements.**

Also, for both Phase I and Phase II, the work must be performed 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. **The NOAA program Manager in consultation with the contracting officer may approve exceptions to this requirement.**

Joint ventures and limited partnerships are eligible, provided the entity created qualifies as a small business as defined in this solicitation. **Consultative arrangements between firms and universities or other non-profit organizations are encouraged, with the small business serving as the prime contractor.**

1.4 Contact with NOAA

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

Requests for general information on the NOAA SBIR program may be addressed to:

Dr. Joseph M. Bishop, NOAA SBIR Program Manager
1335 East West Highway, SSMC1, Suite 106
Silver Spring MD 20910 – 3284
Telephone: 301-713-3565, Fax: 301-713-4100
E-mail: joseph.bishop@noaa.gov

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

2.0 DEFINITIONS

2.1 Small Business Concern

A Small Business Concern is one that, at the time of award for Phase I and Phase II is:

(a) Organized for profit, with a place of business located in the United States, which operates primarily within the United States or which makes a significant contribution to the United States economy through payment of taxes or use of American products, materials or labor;

(b) In the legal form of an individual proprietorship, partnership, limited liability company, corporation, joint venture, association, trust or cooperative, except that where the form is a joint venture, there can be no more than 49 percent participation by business entities in the joint venture;

(c) At least 51 percent owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States, or it must be a for-profit business concern that is at least 51% owned and controlled by another for-profit business concern that is at least 51% owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States (except in the case of a joint venture);

(d) including its affiliates, 500 or less employees.

2.2 Research or Research and Development

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, and includes 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) above.

2.3 Socially and Economically Disadvantaged Small Business Concern

Is one that is:

(a) at least 51 percent owned by (1) an American Indian tribe or a native Hawaiian organization, or (2) one or more socially and economically disadvantaged individuals, and

(b) controlled by one or more such individuals in its management and daily business operations.

A socially and economically disadvantaged individual is defined as a member of any of the following groups: Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Subcontinent Asian Americans, or any other individual found to be socially and economically disadvantaged by the Small Business Administration (SBA) pursuant to Section 8(a) of the Small Business Act, 15 U.S. Code (U.S.C.) 637(a).

2.4 Women-Owned Small Business

A small business that is at least 51 percent owned by a woman or women who also control (meaning to exercise the power to make policy decisions) and operate (meaning being actively involved in the day-to-day management) the small business.

2.5 Funding Agreement

The funding vehicles for NOAA's SBIR program in Phase I and Phase II are firm-fixed price contracts.

2.6 Subcontract

This is any agreement, other than one involving an employer-employee relationship, entered into by the contractor, calling for supplies or services required solely for the performance of the original firm-fixed price contract.

2.7 Commercialization

This is locating or developing markets and producing and delivering products or services for sale (whether by the originating party or by others). As used here, commercialization includes both Government and private sector markets.

3.0 PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

3.1 Proposal Requirements

The objective is to 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. **A proposal will not be deemed acceptable if it represents presently available technology.** 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.

NOAA reserves the right not to submit to technical review any proposal which 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 10.

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 must 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. **The Phase I proposal must provide a description of potential commercial applications.**

3.2 Phase I Proposal Limitations

- Page Length - **no more than 25 pages**, consecutively numbered, including the cover page, project summary, main text, references, resumes, any other enclosures or attachments, and the proposal summary budget.

- Paper Size - must be 21.6 cm X 27.9 cm (8 ½" X 11").

- Print Size - **must be easy to read with a fixed pitch font of 12 or fewer characters per inch or proportionally spaced font of point size 10 or larger with no more than six lines per inch. Margins should be at least 2.5cm.**

Supplementary material, revisions, substitutions, audio or videotapes, or computer floppy disks will **not** be accepted.

Proposals not meeting these requirements will be returned without review.

3.3 Phase I Proposal Format

3.3.1 Cover Sheet

Complete Section 9.1 "Cover Page" as page 1 of each copy of each proposal. **NO OTHER COVER WILL BE ACCEPTED.** Xerox copies are permitted.

3.3.2 Project Summary

Complete Section 9.2 "Project Summary" as page 2 of your proposal. The technical abstract should include a brief description of the problem or opportunity, the innovation, project objective, and technical approach.

In summarizing anticipated results, include technical implications of the approach (for both Phase I and II) and the potential commercial applications of the research. **The Project Summary of the proposals that receive an award will be published by NOAA and, therefore, must not contain proprietary information.**

3.3.3 Technical Content

Beginning on page 3 of the proposal, include the following items with headings as shown:

(a) **Identification and Significance of the Problem or Opportunity.** Make a clear statement of the specific research problem or opportunity addressed, its innovativeness, commercial potential, and why it is important. Show how it applies to a specific subtopic in Section 8.

(b) **Phase I Technical Objectives.** State the specific objectives of the Phase I 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 R&D plan. The plan should indicate not only what will be done, but also where it will be done, and how the R&D will be carried out. The methods planned to achieve each objective or task should be discussed in detail. **This section should be at least one-third of the proposal.**

(d) **Related Research or R&D.** Describe research or R&D that is directly related to the proposal, including any conducted by the principal investigator or by the proposer's firm. Describe how it relates to the proposed effort, and describe any planned coordination with outside sources. **The purpose of this section is to persuade reviewers of the proposer's awareness of recent development in the specific topic area and assure them that the proposed research represents technology presently not available in the marketplace.**

(e) **Key Personnel and Bibliography of Related Work.** Identify key personnel involved in Phase I, including their related education, experience, and publications. Where resumes are extensive, summaries that focus on the most relevant experience and publications are suggested. List all other commitments that key personnel have during the proposed period of contract performance.

(f) **Relationship with Future R&D.** Discuss the significance of the Phase I effort in providing a foundation for the Phase II R&D effort. Also state the anticipated results of the proposed approach, if Phases I and II of the project are successful.

(g) **Facilities and Equipment.** The conduct of advanced research may require the use of sophisticated instrumentation or computer facilities. The proposer should provide a detailed description of the availability and location of the facilities and equipment necessary to carry out Phase I.

(h) **Consultants and Subcontracts.** The purpose of this section is to convince NOAA that: (1) research assistance from outside the firm materially benefits the proposed effort, and (2) arrangements for such assistance are in place at the time the proposal is submitted.

Outside involvement in the project is encouraged where it strengthens the conduct of the research; such involvement is not a requirement of this solicitation.

1. Consultant – A person outside the firm, named in the proposal as contributing to the research, must provide a

signed statement confirming his/her availability, role in the project, and agreed consulting rate for participation in the project. **This statement is part of the page count.**

2. Subcontract – Similarly, where a subcontract is involved in the research, the subcontracting institution must furnish a letter signed by an appropriate official describing the programmatic arrangements and confirming its agreed participation in the research, with its proposed budget for this participation. **This letter is part of the page count.**

(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.

(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.

(k) **Guest Researcher.** State if the applicant is a guest researcher at NOAA, naming the sponsoring laboratory.

(l) **Cost Sharing.** Cost participation could serve the mutual interest of NOAA and certain SBIR contractors by helping to assure the efficient use of available resources. Except where required by other statutes, NOAA does not encourage or require cost sharing on Phase I projects, nor will cost sharing be a consideration in evaluation of Phase I proposals.

3.4 Equivalent Proposals or Awards

A firm may have received other SBIR awards or elected to submit essentially equivalent proposals under other SBIR program solicitations. In these cases, a statement **must** follow the Technical Content section in the proposal indicating:

(a) the name and address of all agencies to which a proposal was submitted or from which an SBIR award was received;

(b) the date of proposal submission or date of award;

(c) the title, number, and date of the SBIR program solicitation under which a proposal was submitted or award 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 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.

3.5 Prior SBIR Phase II Awards

If a small business concern has received one or more Phase II awards from any of the Federal agencies in the prior five fiscal years, it must submit on a separate page, the names of awarding agencies, dates of awards, funding agreement numbers, amounts, topic or subtopic titles, follow-on agreement amounts, sources and dates of commitments, and current commercialization status for each Phase II. **This required information shall not be part of the page count limitation.**

3.6 Proposed Budget

Complete the "NOAA/SBIR Proposal Summary Budget" (Section 9.3) for the Phase I effort, and include it as the last page of the proposal. Some items on this form may not apply. Enough information should be provided to allow NOAA to understand how the offeror plans to perform if the contract is awarded. A complete cost breakdown should be provided giving labor rates, proposed number of hours, overhead, G&A, and profit. A reasonable profit will be allowed. When proposing travel, identify the number of trips, people involved, labor categories, destination of travel, duration of trip, commercial airfare or mileage rate, per diem expenses, and purpose of travel. Budgets for travel funds must be justified and related to the needs of the project. Where equipment is to be purchased, list each individual item with the corresponding cost. The inclusion of equipment will be carefully reviewed relative to need and appropriateness for the research proposed. Equipment is defined as an article of nonexpendable, tangible property having a useful life of more than one year and an acquisition cost of $5,000 or more per unit.

SBA Policy requires that NOAA not issue SBIR awards that include provisions for subcontracting any portion of the contract back to the originating agency or any other Federal Government agency or to other units of the Federal Government. Requests for waivers from this requirement must be sent to the NOAA program manager.

For Phase I, the proposing firm must perform a minimum of two-thirds of the research and/or analytical effort. The total cost for all consultant fees, facility leases, usage fees, and other subcontract or purchase agreements may not exceed one-third of the total contract price. For Phase II, the proposing firm must perform one-half of the research and/or analytical effort.

4.0 METHOD OF SELECTION AND EVALUATION CRITERIA

4.1 Introduction

All Phase I and II proposals will be evaluated on a competitive basis. Each Phase I proposal will be screened by NOAA to ensure that it meets the administrative requirements outlined in Section 4.2. Proposals that meet these requirements will be peer reviewed, undergo competitive review within each laboratory, and may also undergo a third round of competitive review across the agency.

4.2 Phase I Evaluation Criteria

To avoid a misunderstanding, small businesses are cautioned that Phase I proposals not satisfying all the evaluation criteria shall be returned without peer review and eliminated from consideration for a contract. Proposals may not be resubmitted (with or without revisions) under this solicitation. All copies of proposals that fail the screening process will be returned. The evaluation criteria are:

(a) The proposing firm must qualify as a small business (Section 2.1). If it is a subsidiary of another firm, this limit applies to all employees under control of the parent organization.

(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 $95,000.**

(e) **The project duration for the Phase I research must not exceed six months.**

(f) The proposing firm must carry out a minimum of two-thirds of expenditures under each Phase I project.

(g) The proposal must contain information sufficient to be peer reviewed.

4.3 Phase I Evaluation and Selection Criteria

Phase I proposals will be rated by NOAA and/or external scientists or engineers with equal consideration given to the following criteria, except for item (a), which will receive twice the value of any of the other items:

(a) The scientific and technical merit of the Phase I research plan and its relevance to the objectives, with special emphasis on its innovativeness and originality.

(b) Importance of the problem or opportunity and anticipated benefits of the proposed research to NOAA, and the commercial potential, if successful.

(c) How well the research objectives, if achieved, establish the feasibility of the proposed concept and justify a Phase II effort.

(d) Qualifications of the principal investigator(s), other key staff, and consultants, and the probable adequacy of available or obtainable instrumentation and facilities.

Reviewers will base their ratings on information contained in the proposal. It cannot be assumed that reviewers are acquainted with any experiments referred to, key individuals and facilities.

Final award decisions will be made by NOAA based upon ratings assigned by reviewers 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. NOAA may elect to fund several or none of the proposals received on a given subtopic. Approximately one-third of subtopic areas are generally funded in this solicitation. Upon selection of a proposal for a Phase I award, NOAA reserves the right to negotiate the amount of the award.

4.4 Phase II Evaluation and Selection Criteria

The Phase II proposal will undergo NOAA and external peer review for the purpose of determining overall technical or scientific merit. Review panels, composed of senior technical specialists, will make the final Phase II selection decision based on the written reviews and the company presentation to the panel. Each of the following evaluation criteria will receive approximately equal weight, except for item (a), which will receive twice the value of any of the other items:

(a) The scientific and technical merit with emphasis on innovation and originality.

(b) Degree to which the Phase I objectives were met.

(c) The commercial potential of the proposal as evidenced by: 1) a record of commercialization, 2) the existence of Phase II funding commitments from non-SBIR sources, 3) existence of Phase III follow-on commitments, and 4) the presence of other indications of commercial potential of the research.

(d) The adequacy of the Phase II objectives to meet the problem or opportunity.

(e) The qualifications of the principal investigator and other key personnel to carry out the proposed work.

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

4.5 Release of Proposal Review Information

After final award decisions have been announced, the technical evaluations of a proposal will be provided to the proposer only upon written request and for a period not to exceed 90 days. The identity of the reviewers will not be disclosed.

5.0 CONSIDERATIONS

5.1 Awards

Contingent upon availability of funds, NOAA anticipates making about **10** Phase I firm-fixed price contracts of no more than **$95,000** each. Performance period, with no exception, shall be no more than six months. Historically, NOAA has funded about ten percent of the Phase I proposals submitted which is approximately one-third of the subtopic areas.

Phase II awards shall be for no more than $400,000 (except for subtopics with the suffix "SG", which are limited to $300,000). The period of performance in Phase II will depend upon the scope of the research, but should not normally exceed 24 months.

It is anticipated that **approximately one-third 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 seven months after the completion of Phase I.

For planning purposes, proposers should understand that Phase I awards are made in July, Phase II proposals are due the following February, and Phase II awards are made during August and September.

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

5.2 Reports

Six copies of a final report on the Phase I project shall be submitted to NOAA upon completion of the Phase I research. The final report 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 Department of Commerce 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 the Department of Commerce."

Progress reports in a brief letter format will be required also.

5.3 Payment Schedule

The specific payment schedule (including payment amounts) for each contract will be incorporated into the contract upon completion of negotiations between the Government and the successful Phase I or Phase II contractor.

5.4 Proprietary Information, Inventions, and Patents

5.4.1 Limited Rights in Information and Data

Information contained in unsuccessful proposals will remain the property of the proposer, except that the "Project Summary" page may be made available to a limited audience through the SBA Tech-Net System. The Government may, however, retain copies of all proposals. Any proposal, which is funded, will not be made available to the public, except for the "Project Summary" page.

The inclusion of proprietary information is discouraged unless it is absolutely necessary for the proper evaluation of the proposal.

Proprietary information submitted to NOAA will be treated in confidence, to the extent permitted by law, if it is confined to a separate page with a numbering system key, and marked with a legend reading: "Following is proprietary information which (name of proposing firm) requests not be released to persons outside the Government, except for purposes of evaluation."

Any other legend will be unacceptable to NOAA and may constitute grounds for return of the proposal without further consideration. Without assuming any liability for inadvertent disclosure, NOAA will limit dissemination of such information to its

employees and, where necessary for evaluation, to outside reviewers on a confidential basis.

Since technical reports may eventually be made available to the public, such reports shall not contain any language limiting their use other than for SBIR data as described below.

5.4.2 Copyrights

The contractor may normally establish claim to copyright any written material first produced in the performance of an SBIR contract. If a claim to copyright is made, the contractor shall affix the applicable copyright notice of 17 U.S.C. 401 or 402 an acknowledgment of Government sponsorship (including contract number) to the material when delivered to the Government, as well as when the written material or data are published or deposited for registration as a published work in the U.S. Copyright Office. For other than computer software, the contractor gives to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government.

For computer software, the contractor gives to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license for all such computer software to reproduce, prepare derivative works, and perform publicly and display publicly, by or on behalf of the Government.

5.4.3 Data Rights

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.

According to Federal Acquisition Regulation 52.227-20, Rights and Data – SBIR Program (March 1994), the contractor is authorized to affix the following “SBIR Rights Notice” to SBIR data delivered under the contract:

SBIR RIGHTS NOTICE

These SBIR data are furnished with SBIR rights under Contract No. _____ (and subcontract _____, if appropriate). For a period of four years after acceptance of all items to be delivered under this contract, the Government agrees to 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 forgoing use and use by support contractors. After the aforesaid four-year period, the Government has a royalty-free 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.

(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.

5.4.4 Patents

Small business firms normally may retain the worldwide patent rights to any invention made with NOAA support. As described in more detail in FAR 52.227-11, NOAA receives a royalty-free license for Federal Government use, reserves the right to require the patent holder to license others in certain circumstances, and requires that anyone exclusively licensed to sell the invention in the United States must substantially manufacture it domestically. To the extent authorized by 35 U.S.C. 205, NOAA will not make public any information disclosing a NOAA-supported invention to allow the contractor a reasonable time to pursue a patent (less than four years). SBIR awardees must report inventions that are planned to be patented to the SBIR Program Office, 1335 East West Highway, Room 106, Silver Spring, MD 20910.

5.5 Awardee Commitments

Upon the award of a contract, the contractor will be required to make certain legal commitments. The outline that follows illustrates 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 of Work. 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 about 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., received 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 with funds provided through the contract, purchase only American-made equipment and products to the extent possible, in keeping with the overall research needs of the project.

5.6 Additional Information

(a) Projects. The responsibility for the performance of the principal investigator, and other employees or consultants, who carry out the proposed work, lies with the management of the organization receiving an award.

(b) Organizational Information. Before award of an SBIR contract, the Government may request the proposer to submit certain organizational, management, personnel, and financial information to assure responsibility of the proposer.

(c) **Duplicate Awards. If an award is made under this solicitation, the contractor will be required to certify that he or she has not previously been, nor is currently being, paid for essentially equivalent work by any agency of the Federal Government. Severe penalties may result from such actions.**

(d) **It is recommended that upon submission of your proposal you obtain a Dunn and Bradstreet Number. You will need this number to be eligible to receive an award. You can obtain this number free of charge by contacting Dunn and Bradstreet by phone at 1-800-333-0505 or on-line at http://www.dnb.com/US/duns_update/index.html. In addition, all award winners will be required to fill-out on-line forms located at: http://www.ccr.gov/ and http://orca.bpn.gov/. It is required that these forms be filled out upon submission of the proposal. Within these forms please pay special attention to filling out the data required in the North American Industry Classification System (NAICS) and the Federal Supply Classification (FSC) portions of the forms. This will greatly expedite the contract award process.**

This program solicitation is intended for information purposes and reflects current planning. 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.

5.7 Research Projects with Human Subjects, Human Tissue, Data or Recordings Involving Human Subjects

Any proposal that includes research involving human subjects, human tissue, data or recordings involving human subjects must meet the requirements of the Common Rule for the Protection of Human Subjects, codified for the Department of Commerce at 15

CFR Part 27. Any questions regarding these requirements should be addressed to Dr. Joseph M. Bishop. Telephone: 301-713-3565 or e-mail: joseph.bishop@noaa.gov.

5.8 Research Projects Involving Vertebrate Animals

Any proposal that includes research involving vertebrate animals (including fish) 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, 2101 Constitution Avenue, NW, Washington, D.C. 20055. In addition, such proposals must meet the requirements of the Animal Welfare Act (7 U.S.C. 2131 et seq.), 9 CFR Parts 1, 2, and 3, and if appropriate, 21 CFR Part 58. These regulations do not apply to proposed research using pre-existing images of animals or to research plants 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.

6.0 SUBMISSION OF PROPOSALS

6.1 Deadline for Proposals

Deadline for Phase I proposal receipt (six copies) at the NOS/NMFS/OAR Acquisition Division is **4:00 p.m. (EST) on January 23, 2008.**

NOAA assumes no responsibility for evaluating proposals received after the stated deadline or that do not adhere to the other requirements of this solicitation (see 10.0 NOAA SBIR Checklist). Such proposals may be returned to the proposer without review.

Federal Acquisition Regulation (FAR 52.215-1) regarding late proposals shall apply.

Letters of instruction will be sent to those eligible to submit Phase II proposals. The Phase II proposals are due after receipt of the Phase I Final Report, approximately seven months after commencement of the Phase I contract.

Proposers 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

Hardcopy submission of NOAA proposals should be sent in six copies to:

ATTN: SBIR Proposals
U.S. Department of Commerce, NOAA
NOS/NMFS/OAR Acquisition Division, Code OFA65
1305 East West Highway, SSMC4, #7608
Silver Spring MD 20910-3281
Telephone: 301-713-0820 x 126

For local delivery, the NOS/NMFS/OAR Acquisition Division is located near the intersection of East-West Highway and Colesville Road, and close to the Silver Spring Metro.

Acknowledgment of receipt of a proposal by NOAA will be made. All correspondence relating to proposals must cite the specific **proposal number** identified in the acknowledgment.

(a) **Packaging: Secure packaging is mandatory. NOAA cannot process proposals damaged in transit. All six copies of the proposal must be sent in the same package. Do not send separate "information copies," or several packages containing parts of a single proposal, or two packages of six copies of the same proposal. The top copy must be signed as an original by the principal investigator and the corporate official. Other copies may be photocopies.**

(b) **Bindings: <u>Do not use special bindings or covers</u>**. Staple the pages in the upper left hand corner of each proposal. Separation or loss of proposal pages cannot be the responsibility of NOAA.

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. 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://www.lib.noaa.gov

7.2 Oceanography and Marine Science

Scientific information in the areas of oceanography and marine science may be obtained from organizations shown in the website
http://www.nsgo.seagrant.org/SGDirectors.html

8.0 RESEARCH TOPICS

8.1 TOPIC: ECOSYSTEMS

8.1.1N Subtopic: Coral Ecology

This subtopic seeks the development of methods and measuring systems to allow assessment of coral health. Of particular interest are proposals relative to the following:

(a) The development of methods that successfully produce sustainable culturing of scleractinian coral cells and tissues lines for in vitro propagation and experimentation. The products of such methods could serve as laboratory research models, creation and maintenance of genetically distinct lines, and an alternative to wild-captured specimen in support of conservation and restoration efforts. Acceptable cell cultures may consist of undifferentiated or differentiated cell types able to be maintained under defined in vitro tissue culture conditions and have defined characteristics of scleractinian corals. Tissue explants are also desirable which are able to grow and differentiate into polyps with defined tissue-culture conditions that allow characteristic polyp development with or without skeletal formation of the characteristic aragonite crystalline structure, as well as maintaining normal reproductive characteristics. A successful applicant will produce lines of either scleractinian cells, tissues and/or polyps, cloned from genetically distinct parental material, thus enabling the production of individuals lines that are each genetically distinct. It is expected that the successful applicant will be able to provide multiple genetic lineages. The methodology must also be amenable to mass propagation of the individual products (i.e., cell lines, tissues, or polyps). Candidate species of interest include, but are not limited to Porites, Montastraea, Acropora, Stylophora, Pocillopora or Fungia.

(b) The development of a prototype underwater system capable of stimulating and capturing fluorescence response images over the full visible to near-infrared spectrum. The desired system will have, at a minimum, the following characteristics:

- Self-contained, diver controllable, and fully submersible to a minimum of 50 meters
- Controllable light excitation source
- Hyperspectral image capture over the range of 360 nanometers to 920 nanometers in no more than 2.5 nanometer increments in 5 seconds or less
- Selectable filter components to minimize image capture time
- Real-time image and information display.
- Real-time image processing (i.e. neural network spectral pattern recognition and analyses)

The prototype will be a SCUBA diver-operable, field-ruggedized, submersible, imaging system able to capture the entire fluorescent spectra characteristic of coral fluorescent protein profiles in-situ, and compare them, in real time, with reference spectra of a given coral health status. If the total scan time prevents the capture of an image of

acceptable spatial resolution, then an adequate means of image stabilization must be provided. A totally self contained unit is preferred, unless it can be demonstrated that sufficient added benefit in real time data acquisition and processing justifies the relative loss of portability and mobility. A successful applicant would, when the prototype is built, demonstrate the functional operation of the system in both laboratory and field settings, and be able to refine the design to meet specific needs of measuring individual coral colony fluorescence in actual field coral reef environments. Ranking factors will include system compactness, flexibility, and ease of use, image acquisition speed and quality, and the degree to which the applicants demonstrate an understanding of the characteristics of coral fluorescence response.

References:

Boschma, H. 1923, Experimental Budding in Fungia fungites, Proc. Knon. Ned. Akad Wet. Amsterdam 26:88-96.

Domart-Coulon I, Tambutte´ S, Tambutte´ E, Allemand D, 2004, Short term Viability of Soft Tissue Detached from the Skeleton of Reef-building Corals, J Exp Mar Biol Ecol 309:199–217.

Kramrasky-Winter E, Loya,Y, 1996, Mar Ecol Prog Ser 134:179-185.

Krupp, DA, Hunter CL, Jokiel PL, Neves E, Gillette PA, 1997, In Search of the Phoenix: Regeneration of Cryptic Residual Tissue in Hawaiian Reef Corals Subjected to Osmotic Stress, Am Soc Zoo.

Krupp, DA, Jokiel PL, Chartland TS,1993, Asexual Reproduction by Fungia scutaria on Dead Coralla in Kanehoe Bay, Oahu Hawaiian Islands, Proc. of 7th Int. Symposim Coral Reef, Guam (1992) 1:527-534.

Muller WE, Dorn A, Uhlenbruck G, 1985, The Molecular Mechanisms of the Distinct Calcium Dependent Aggregation Systems in Marine Sponges and Corals, Acta Histochem Suppl, 31:37-46.

Sammarco, PW, 1982, Polyp Bail-out: An Escape Response to Environmental Stress and a New Means of Reproduction in Corals, Mar Ecol Prog Ser. 10:57-65.

Shafir S, Van Rijn J, Rinkevich B, 2001, Nubbing of Coral Colonies: A Novel Approach for the Development of Inland Broodstocks, Aquarium Sci Conserv 3: 183–190.

Shafir S, Van Rijn J, Rinkevich B, 2006, Steps in the Construction of Underwater Coral Nursery, an Essential Component in Reef Restoration, Acts. Mar Biol. 149: 679–687.

Sutherland, K. P., J. W. Porter, et al. 2004, Disease and Immunity in Caribbean and Indo-Pacific Zooxanthellate Corals, Marine Ecology Progress Series 266: 273-302.

Waddell, J. E. 2005, The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: Dept. of Commerce, National Oceanic and Atmospheric Administration, NOAA Technical Memorandum NOS NCCOS 11: 522.

8.1.2N Subtopic: Seagrass Transplanting Tool

This solicitation seeks the development of a transplanting tool for seagrasses. Seagrasses are a critical NOAA trust resource that is frequently damaged, requiring restoration. However, seagrass restoration remains mired in physically intensive, manual methods. Several attempts have been made at creating mechanical planting devices, but they have either performed poorly or have significant operational limitations. Because transplanting of wild seagrass stock remains a logical and economical alternative for restoration there exists a significant need to develop clever, low-cost methods for transplanting selected seagrass species: shoalgrass (Halodule wrightii), manatee grass (Syringodium filiforme) and eelgrass (Zostera marina). Criteria for such a tool include portability by a single person or two people working as a team; ability to use the tool both intertidally and subtidally (SCUBA diving) and assembly from locally available components. The method may include collection of sediment or may be sediment-free. The tool must be able to collect as well as install seagrasses and allow transportation from the salvage site to a planting site of distances not less than 100 miles. Two installation methods may be used; one unique to the tool and a second utilizing a rigid, iron mesh frame. Success criteria would include consideration of material costs, work-hours on a per-planting unit basis for collection, transportation and installation, both intertidally and by SCUBA diving. Also important is that the tool, when completed, is broadly available to users unencumbered by proprietary claims to said tool.

References:

Fonseca, M.S., W.J. Kenworthy, G.W. Thayer. 1998. Guidelines for mitigation and restoration of seagrass in the United States and adjacent waters. NOAA COP/Decision Analysis Series. 222p

8.1.3R Subtopic: A Passive Acoustic Sensor System to be Used on an Autonomous Underwater Vehicle (AUV)

We continue to be interested in the use of passive acoustics to measure the distribution of fishes in spawning mode. This is crucial to defining spawning habitat. The presence of some spawning fishes can be identified by their spawning calls (vocalizations) using hydrophones (see http://marine.rutgers.edu/leophone/). This application is also useful to the study of marine mammals. There is an important place for AUVs here because the east coast shelf is very large with regard to what conditions spawning fish might seek. Therefore, spatial coverage is most efficient by AUV mounted with a hydrophone. Innovations to pursue are the successful mounting (including balancing, ballasting, and power supply) of a hydrophone recorder to an AUV vehicle in a way that minimizes

hydrological noise and isolates mechanical and electrical noise between the sensor and vehicle, and also potentially supports the calculation of position of the sound source using synthetic aperture triangulation.

NOTE: The commercial potential of this subtopic is good as the number of AUVs is increasing annually, and this device could be used on AUVs of all sizes and depth ratings including the NOAA sponsored Eagle Ray, REMUS, and Fetch AUVs. The concept is feasible as seabed mounted recorders already exist, and NOAA and its university partners could be on the cutting edge of adapting this technology.

8.1.4R Subtopic: Pressurized Live Specimen Collecting Container for Use with Remotely Operated Vehicles (ROVs) or Human Occupied Vehicles (HOVs)

The physiology of deep sea fish and invertebrates is very poorly known due to the difficult challenges of bringing up live animals for controlled experiments. Developing a system whereby animals could be captured, brought to the surface, and maintained under their natural temperature and pressure conditions would be extremely valuable. To target specific animals, the system would have to be deployable from a submersible (HOV) or ROV. Submersibles, such as the Pisces IV and V, operate to a depth of 2000m. Therefore, the first consideration is that the container would need to be capable of maintaining a 3,000 psi internal environment. Second, the container should have a minimum internal volume of 5 gallons, but still be small enough and light enough to be carried down in the front rack of the vehicle. Third, the container needs a door or lid that can be closed and secured with a mechanical arm at depth. Fourth, the container needs to have a means of viewing the contents (e.g., an inverted glass or acrylic dome or conical frustrum). Fifth, the container should have at least four penetrators, two for maintaining a continuous flow of pressurized seawater. Sixth, handles or other means to attach devices including: a means to send the container to the surface on its own, syntactic foam or some other flotation device to achieve positive buoyancy, a counterweight initially attached to it via a mechanical or acoustic release, and an attached transmitter. Once at the collecting site, the pilot would place the container on the bottom and use the manipulators to capture animals of interest such as sea stars, urchins, corals, etc. and place them into the container. The pressure lid would then be closed and the release triggered to send it to the surface. The ship would track its position and recover it via its transmitter. Experiments could begin once the pressurized seawater system was set up. Differences in the chemistry of the water entering and exiting the container would be measured to obtain information on energy consumption, metabolic rates, etc.

Container Requirements:

1.) A 3,000 psi internal rating. 2.) A minimum internal volume of 5 gallons. 3.) A closure that seals underwater and when open provides clear access to an opening that is a minimum of 5 inches in diameter, and preferably 6 inches. 4.) A viewport, with a maximum view of the interior. 5.) Four penetrators, two for seawater circulation and two others. It is desirable that one of the penetrators is fitted with a device that would allow

light into the chamber. 6. Multiple handles or other attachment points. 7.) Weight in water is preferably 100 lbs or less, and should definitely not exceed 150 pounds. 8.) The pressure vessel must be designed, manufactured, and tested to the ASME code for pressure vessels.

8.1.5R Subtopic: Global Measurements of Ambient Noise: Gauging Impacts on the Marine Environment

Several studies have found a gradual increase in ambient sound levels of the world's oceans by as much as 10 dB in the low-frequency (10-100Hz) range over the last 30 years [e.g., Andrew et al., 2002, McDonald, et al., 2006, and Dahl et al., 2007]. These studies indicate a link between the rise in ambient noise level and an increase ocean ship traffic as well as to seasonal and long-term changes in ocean climate. Increased wave height caused by high wind speeds and rainfall leads to increased ocean noise levels, and both wind and rainfall will vary seasonally as well as being influenced by long-term, regional climatic conditions such as the Pacific- decadal Oscillation and El Nino. Melting of the Arctic icecap will also lead to an increase in anthropogenic noise as ship traffic will increase over an ice-free Arctic Ocean. Hydrophones in the Antarctic have detected significant seasonal variability in ocean noise due to the breakup of the icesheet and large icebergs, and may through long–term observations be able to discern changes in cryogenic ocean noise due to increasing ocean temperatures. Increasing ambient noise has been shown to affect vocalizations of terrestrial animals, and in the ocean can be expected to significantly impact the calling patterns of endangered and threatened cetacean species. Thus a low-cost, global hydroacoustic monitoring system that is readily available to the civilian research community with near-real-time and broadband capabilities is needed to provide a worldwide view of seasonal and climatic variations of ocean ambient noise. Additional benefits of passive acoustic observation include the detection of living marine resources, observation of physical oceanographic processes, remote sensing of human activities, and determination of overall contributions to marine ambient noise. These capabilities are central to NOAA's role in understanding, managing, and conserving marine ecosystems and will serve many or most of NOAA's long-term visions provided in NOAA's Ecosystem Goal Team Priorities. This acoustic network will provide an estimate of ambient noise budgets and characterization of the nominal acoustic environment for a regional ecosystem. It will also significantly contribute to NOAA's ability to characterize ecosystem conditions and assess the impact of human activity (e.g. fishing) on coral reef environments. We seek advanced capabilities to monitor, assess, and predict regional ecosystem health by monitoring ambient noise levels of the global ecosystem. Sensor development for detecting and quantifying biological organisms and processes on ocean observing systems is also required.

References:

Andrew, R.K., B.M. Howe, and J. A. Mercer, 2002, Ocean Ambient Sound: Comparing the 1960s with the 1990s for Receiver off the California Coast, ARLO 3, 65-70.

McDonald, M.A. and J.A. Hildebrand, 2006, Increases in Deep Ocean Ambient Noise in the Northeast Pacific West of San Nicolas Island, California, J. Acoust. Soc.Am 120(2), 711-718.

Dahl, P., J.H. Miller, D.H. Cato, R.K. Andrew, 2007, Underwater Ambient Noise, 23-33, Winter Issue, Acoustics Today.

8.1.6F Subtopic: Integrated System for Measuring Demersal Fish Habitats

Considerable effort and expense are being directed toward advanced acoustic mapping of the continental shelf seafloor (NOAA 2004). However, acoustic mapping alone cannot measure all factors that determine habitat quality. Similar efforts are needed to determine and understand habitat quality variables related to fisheries productivity. Sediment quality is a critical issue. Sediments are the repositories of organic material that fuel benthic and demersal food webs. Solar energy fixed by primary production at the sea surface that becomes tissue in important commercial fish species passes through the food web. To date, assessment of sediment quality on a scale comparable with that of acoustic mapping has been a logistical impossibility; far too time-consuming and labor-intensive. In light of this difficulty and the pressing need to determine habitat quality, the development of an in situ package that will quantify sediment biogeochemistry components is critical to ecosystem-based fisheries management. The required system, attached to trawl doors as they skim the seabed would measure ambient and re-suspended material from soft sediment during trawling operations aboard commercial and research fishing vessels. Material re-suspended by the passage of trawl doors provides an opportunity to examine the fisheries stoichiometry of near-bottom and surface sediment layers, specifically, nutrients, organic matter, sulfide, oxygen, and other biogeochemicals. Suspended particles could be determined by standard turbidity techniques (Standard Methods 1998; Gardner et al. 1990). Inorganic nitrogen and phosphorus (ambient and released from the sediment) which are essential for fisheries' protein production could readily be measured by existing methods. An index of labile organic matter from recent algal deposition could be detected by fluorometer (D'Sa et al. 1997). Cutting edge grain size instrumentation and ruggedized electrochemical electrodes would likely be incorporated. A useful system would require a means of measuring and correcting for ambient concentrations of analytes in very near bottom water. Measurement of actual labile organic matter (Mayer et al. 1995) is not envisaged. The proposed system should be deployable on cooperating commercial trawlers (with operator/observer) with data access upon retrieval. Fisheries research vessels capable of multibeaming while trawling presents the opportunity to fully calibrate the system in acoustically well-characterized sediments at hundreds of shelf sites per year. This calibration would allow data from systems aboard all fishing vessels to be integrated with acoustic reflectivity and other data to produce habitat maps.

References:

D'Sa, E., S. Lohrenz, V. Asper, and R. Walters, 1997. Time Series Measurements of Chlorophyll Fluorescence in the Oceanic Bottom Boundary Layer with a Multisensor

Fiber-optic Fluorometer. J Atm Ocean Tech 14: 889-896.

Gardner, W.D., M.J. Richardson, I.D. Walsh, and B.L. Berglund. 1990, In-situ Optical Sensing of Particles for Determination of Oceanic Processes: What Satellites Can't See, but Transmissometers Can. Oceanography 3, 11-17.

Mayer, L. M., L. L. Schick, T. Sawyer, C. J. Plante, P. A. Jumars, and R. L. Self, 995. Bioavailable Amino Acids in Sediments: A Biomimetic, Kinetics-based Approach. Limnol. Oceanogr. 40:511-520.

NOAA 2004, The Gulf of Maine Mapping Initiative. Coastal Services, Volume Issue 2 March/April, NOAA Coastal Services Center, Charleston, SC 29405.

Clesceri, L. S., A. E. Greenberg and A. E. Eaton, 1998, Standard Methods for the Examination of Water and Wastewater, Method 2130 B, (Turbidity Nephelometric Method), 20th Edition.

8.1.7F Subtopic: Field Device for Molecular Determination of Fish Species/Stock Identification

Identification of marine fish species is important in fish abundance surveys for studies of marine ecosystem function and stock assessment of commercially important species. Identification of fish species is usually performed by examining morphological characteristics of the captured fish and comparing these with key indicators. Accurate species identification requires substantial training and experience of personnel. Identification of fish in early life stages is especially challenging for closely related species because cryptic eggs and larva of closely related species lack morphologically distinguishing features. There is a clear need for biosensor technology for identification of fish species and stock. Identification of fish species and stock structure has been advanced by such molecular approaches as analysis of microsatellites, single nucleotide polymorphisms (SNPs), and mitochondrial genes among other molecular characteristics. These techniques can be applied to fish tissues, eggs, and larva to enable studies of fish life history characteristics, marine ecosystem function, fisheries management. and seafood forensics. Molecular techniques for species and stock identification are typically laboratory based, slow and expensive. There is a clear need for portable instrumentation that can be used in the field, including aboard ships. An ideal technique should be relatively inexpensive (less than $1/sample), rapid (less than one hour), specific (90% or better), sensitive (100 cells or less), and accurate (80-90%). Phase I should demonstrate the feasibility of a device for fish species identification and operational characteristics. The design of the device may include gene detection with or without amplification, and electrochemical sensing, among other possibilities.

References:

Hyde, J.R., E. Lynn, R. Humphreys Jr, M. Musyl, A.P. West and R. Vetter. 2005. Shipboard Identification of Fish Eggs and Larvae by Multiplex PCR, and of the

United States and Pacific Freely Associated States: 2005. Dept. of Commerce, National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NOS NCCOS 11: 522.

8.1.8F Subtopic: Aquaculture: Production Systems for Marine Mollusks

The purpose of this topic is to further the commercial production of mollusks through both aquaculture and wild fisheries. Proposals should be directed to all aspects of mollusk farming, hatchery production, and stock enhancement including: hatchery and grow-out methods, disease diagnostics and control, shellfish safety, nutrition, and predator prevention and control.

8.1.9F Subtopic: Acoustic Propagation Software Interface to Support Marine Conservation Management

NOAA is responsible under various federal laws to assessing the effects of sound exposure, both incidental and directed, on protected marine species in a wide variety of conditions. The variability in these conditions, both in terms of the kinds of sound sources and the operational environment, render simplistic, 'back-of-the-envelope' models to predict received sound fields virtually useless. There are many sophisticated, empirically-tested sound propagation models in existence that describe sound fields that animals surrounding a sound source will likely encounter. However, many of these are highly specialized, working well in certain conditions and poorly in others, and/or overly-complicated for practical application by conservation managers.

NOAA seeks phase I applications for an acoustic propagation software interface that demonstrates the use of multiple propagation models, appropriate to the specific conditions being considered, to accurately predict underwater sound fields arising from marine sources. The software should have a simple user-interface that guides non-specialized analysts through the process of selecting the appropriate sound propagation model and outputs data both visually and textually. The software interface should be adaptable in terms of the type and nature of the output data and should enable users to specify received level ranges in three-dimensions. The software should be able to consider both impulsive and non-impulsive sources in deep and shallow water of all bottom types. The software should also provide all appropriate cautions and caveats about conditions in which even the best sound propagation models have relative difficulty in predicting empirical conditions.

8.1.9SG Subtopic: CO2 Sensor for Closed-Circuit Mixed-Gas Rebreathers

NOAA supports more then 25,000 dives per year. An important objective of the NOAA Advanced Diving Program is to extend the bottom time per dive and to extend the depth limit from 130 feet to 300 feet. This will considerably increase the undersea areas where self-contained wet diving scientist can take fine measurements and conduct experiments to monitor, assess, and predict ecosystem health. An important part of the Advanced Diving Program is to introduce closed circuit mixed gas rebreathers (CCRs) into the NOAA dive programs. Standard SCUBA is called open circuit because the diver's breathing gas is exhaled into the water. As the diver's depth increases the total amount of gas required to fill the lungs increases proportionately although the oxygen consumed remains constant. The closed circuit breathing apparatus recycles the divers exhaled breath while removing the carbon dioxide and replacing the consumed oxygen. This greatly reduces the amount of gas required for shallow and deep dives. The partial pressure of oxygen is sensed electronically and controlled to specified levels using a computer. This is the technology that has matured within the last few years and is now reliable enough to be considered for use by the scientific community. One shortcoming of currently available systems is the lack of a reliable carbon dioxide sensor that will warn the diver when the carbon dioxide level is becoming too high. There are over 3,000 CCRs in use today and their users rely on manufacturers test results and their own experience to know how long a dive the carbon dioxide scrubber canister will support. The sensor must be contained within the breathing apparatus, detect carbon dioxide over the range of 0.5 to 5% surface equivalent, and operate to a minimum depth of 300 feet in gas mixtures of oxygen, nitrogen, helium, and water vapor. Sensors proposed must use non-infrared technology because the diver's breathing gas is exhaled into the water.

8.1.10SG Subtopic: Aquaculture: Developing and Improving Species Culture

Proposals are requested for research, which offers to make significant, industry-wide improvements in finfish, shellfish, and ornamental species systems for both small scale and large-scale applications, including gaining access to harvest areas and growing areas through improved monitoring and through processing techniques. Priority will be given to research, which finds innovative approaches that will solve major industry bottlenecks in an economically and environmentally compatible manner. Research aimed at new species for culture and research to adapt techniques being used successfully in other countries is appropriate.

8.1.11SG Subtopic: Aquaculture: Water Reuse and Effluent Treatment Systems

Proposals are requested for developing integrated aquaculture systems with minimum impact on the environment. These include development of innovative water reuse systems for ponds and raceways and other novel systems for treating effluent. Special priority will be given to prototype, modular water reuse systems suitable for producing a variety of species anywhere in the U. S.

8.1.12SG Subtopic: Aquaculture: Culture of Marine organisms for Marine Natural Products

Research in the past two decades has found that there are many marine organisms which produce novel natural products of use in treating human diseases. To utilize these products commercially and in clinical trials, however, they need either to be chemically synthesized, produced using biotechnology, or produced through aquaculture of organisms. Research is needed to find economically cost-effective and biologically viable ways to culture marine organisms specifically for their production of novel natural products.

8.1.13SG Subtopic: Aquaculture: Open Ocean Aquaculture

Both engineering and biological technology needs to be explored for the development of open-ocean or offshore culture systems. Large scale, offshore, submersible and floating systems need to be developed for Atlantic, Gulf of Mexico and Pacific conditions. Automatic feeding and harvesting functions, predator control systems, as well as telemetry and remote control systems will be considered in this competition. The biological technology would include hatchery, nursery, and transport systems for candidate species for open-ocean aquaculture. Field tests of candidate species are encouraged.

8.1.14SG Subtopic: Aquaculture: Disease Diagnostics and Control

Given the severe problems with aquaculture disease diagnostics and controls, we seek proposals in those areas aimed at reducing negative impacts on the U.S. aquaculture industry.

8.1.15SG Subtopic: Aquaculture: Improved Diet Formulations

Projects are being sought to develop improved diets for marine species that are lower in fishmeal content while maintaining a beneficial level of Omega 3 fatty acids and economic competitiveness. Projects that develop technologies for reducing any feed contaminants such as PCBs, pesticides and herbicides are also appropriate under this topic.

8.1.16SG Subtopic: Aquaculture: Mechanization of Underwater Tasks Related to Aquaculture and the Harvest of Shellfish and Macro-algae

Significant progress has been made in the development of robotic tools for a variety of underwater tasks in marine science, defense, and certain industrial activities. These tools allow for the reduced human presence in hazardous situations or for doing tasks that are too deep, too difficult, or simply monotonous. The use of scuba divers for underwater tasks related to marine resources may represent areas where these mechanized or robotic techniques have application. The purpose of this topic is to identify and develop innovative robotic methods to accomplish tasks related to living marine resources that will take advantage of recent advances in underwater technology. We are seeking approaches that will improve the economic viability of U.S. aquaculture industry and promote the sustainable use of our coastal and ocean resources. Examples of tasks that are currently burdened by the high cost of underwater human presence include but are not limited to: 1) biofouling removal from aquaculture structures and net pens, 2) monitoring and sampling of the seabed within/under pen arrays, 3) shellfish harvesting, and 4) macro algae harvesting. Techniques are sought that reduce the impact of the activity on the cultured species (in the case of aquaculture) and on non-target species and the substrate (in the case of shellfish or macro algae harvesting). Proposals should also address issues of cost of the technology compared to present costs for the same function.

8.2 TOPIC: CLIMATE

8.2.1C Subtopic: Autonomous Dissolved Inorganic (DIC) and Total Alkalinity (TAlk) Measurement Systems for Profiling and Mooring Systems

Carbon dioxide is one of the most important gases in the atmosphere affecting the radiactive heat balance of the earth. As a result of the industrial and agricultural activities of humans, current atmospheric CO_2 concentrations are around 380 ppm, increasing at about 0.5% per year. The atmospheric concentration of carbon dioxide is now higher than experienced on Earth for at least the last half million years, and is expected to continue to rise, leading to significant temperature increases and decreasing oceanic pH by the end of this century. The global oceans are the largest natural reservoir for this excess carbon dioxide, absorbing approximately one-third of the carbon dioxide added to the atmosphere by human activities each year (Sabine and Feely, 2007). It is now well established that there is a strong possibility that the partial pressure of CO_2 in the ocean surface will double over its pre-industrial value by the middle of this century, with accompanying surface-ocean acidity (pH) decreases (Feely et al., 2004). The process of absorption of anthropogenic CO_2 by the oceans has benefited humankind by significantly reducing the greenhouse gas levels in the atmosphere and thus reducing the global warming impact on the planet. However, the uptake of carbon dioxide by the ocean is starting to take its toll on the chemistry of the seawater. If current carbon dioxide emission trends continue, the ocean will continue to undergo acidification, to an extent and at rates that have not occurred for tens of millions of years. To address these issues and to pinpoint the locations that will be affected, and more importantly, to assess how and where the chemical changes will

occur in the future it is imperative to understand the processes responsible. The NOAA Climate Program Office is interested in developing autonomous instruments to measure dissolved inorganic carbon (DIC) and total alkalinity (TAlk) for use on CTD-rosette systems as well as on open-ocean and coastal moorings and floats. Potential customers include NOAA, national, and international investigators studying the impacts of ocean acidification. Specifications for the dissolved inorganic carbon system are as follows. The profiling system must measure DIC concentrations to within 2-4 µmoles/kg. The moored system must measure DIC concentrations every 3 hours for up to a ½ year at a time without servicing. The system accuracy and precision should be within 2-4 µmoles/kg with calibrations traceable back to standard reference materials from Scripps Institution of Oceanography. The system design needs to be compact and flexible enough to be safely mounted on a wide variety of CTD cages and surface moorings. Systems should have the capability to either log internally, or transmit data to the surface. The systems should have the option to be powered internally or externally. The system needs to be able to operate under a wide range of environmental conditions. Specifications for the total alkalinity system are as follows. The profiling system must measure TAlk concentrations to within 3-5 µmoles/kg. The moored system must measure TAlk concentrations every 3 hours for up to a ½ year at a time without servicing. The system accuracy and precision should be within 3-5 µmoles/kg with calibrations traceable back to standard reference materials from Scripps Institution of Oceanography. The system design needs to be compact and flexible enough to be safely mounted on a wide variety of CTD cages and surface moorings. Systems should have the capability to either log internally, or transmit data to the surface. The systems should have the option to be powered internally or externally. The system needs to be able to operate under a wide range of environmental conditions.

References:

Feely, R.A., C.L. Sabine, K. Lee, W. Berelson, J. Kleypas, V.J. Fabry, and F.J. Millero, 2004. Impact of Anthropogenic CO2 on the CaCO3 System in the Oceans, Science, 305(5682), 362–366.

Sabine, C.L., and R.A. Feely, 2007. The Oceanic Sink for Carbon Dioxide. In Greenhouse Gas Sinks, D. Reay, N. Hewitt, J. Grace, and K. Smith (eds.), CABI Publishing, Oxfordshire, UK.

8.2.2C Subtopic: Development of Dropsonde Technology to Measure Aerosols

Aerosols influence global climate and human health and can affect local and regional weather processes (see e.g. Cotton and Jirak, 2006; Evan et al., 2006; Jacobson and Kaufman, 2006). They remain one of the least well-understood components of the climate system (IPCC, 2006). They are highly variable in space, time, and properties, with a range of different effects dependent upon these variabilities (Fountoukis et al. 2007). Therefore, numerous measurements are required to characterize them. One critical and little-observed quantity is the vertical distribution of aerosols in the atmosphere. Aerosol vertical distribution plays a role in several major questions: at

what altitude do aerosol layers occur; where are aerosols relative to clouds and other atmospheric features; how do aerosols change the distribution and flux of radiative energy; etc. (Ramanathan et al., 2001). Vertically resolved aerosol data are relatively scarce and expensive. Such data can currently be collected using airborne (or in situ) instruments and, since June 2006, retrievals from the A-Train satellite CALIPSO. Aerosol measurements made using dropsondes could increase the value of in situ aerosol measurements by multiplying the number of vertical profiles a single flight can collect. They could complement measurements made at ground sites and validate CALIPSO data. Dropsondes can already measure pressure, temperature, water vapor, winds, and GPS location (Ralph et al., 2005) and are used by hurricane hunters to measure storm parameters (Kamineni et al., 2006). Therefore, adding aerosol measurements would enhance a substantial dropsonde capability. Dropsondes could be effective for observing aerosol layers both above and below clouds. Finally, dropsondes are a relatively inexpensive way to make frequent measurements that could capture the variable distributions and properties of atmospheric aerosols. We request a Phase I study that might demonstrate the feasibility and value of dropsonde aerosol measurements for improving our ability to understand and describe aerosol vertical distributions, toward the ends of increasing knowledge of the climate system, reducing uncertainty in model projections, and improving forecasting capabilities. This subtopic addresses two items from the Goal Teams Priorities List ("New technologies for aircraft and dropsonde water vapor measurements" and "Transition of climate research into commercially viable tools, products, and services") and would contribute to the Climate Performance objectives "Describe and understand the state of the climate system through integrated observations, analysis, and data stewardship" and "Reduce uncertainty in climate projections through timely information on the forcing and feedbacks contributing to changes in the Earth's climate."

References:

Cotton, W.R., and I.L. Jirak (2006), Effect of Air Pollution on Precipitation Along the Front Range of the Rocky Mountains, J. Appl. Met. and Clim., 45, 236- 245.

Evan, A. T., J. Dunion, J. A. Foley, A. K. Heidinger, and C. S. Velden (2006), New Evidence for a Relationship Between Atlantic Tropical Cyclone Activity and African Dust Outbreaks, Geophys. Res. Lett., 33, L19813, doi:10.1029/2006GL026408.

Fountoukis, C., et al. (2007), Aerosol–Cloud Drop Concentration Closure for Clouds Sampled During the International Consortium for Atmospheric Research on Transport and Transformation 2004 campaign, J. Geophys. Res., 112, D10S30, doi: 10. 1029/2006JD007272.

Intergovernmental Panel on Climate Change (IPCC), Working Group I: The Physical Basis of Climate Change (2006): The Fourth Report.

Jacobson, M. Z., and Y. J. Kaufman (2006), Wind Reduction by Aerosol Particles, Geophys. Res. Lett., 33, L24814, doi:10.1029/2006GL027838.

Kamineni, R.., T.N. Krishnamurti, S. Patinaik, E.V. Browell, S. Ismail, and R.A. Ferrare (2006), Impact of CAMEX-4 Datasets for Hurricane Forecasts Using a Global Model, J. Atm. Sci., 63, 151-174.

Ralph, F.M., P.J. Neiman, and R. Rotunno (2005), Dropsonde Observations in Low-Level Jets Over the Northeastern Pacific Ocean from CALJET-1998 and PACJET-2001: Mean Vertical-Profile and Atmospheric-River Characteristics, Monthly Weather Rev., 133, 889-910.

Ramanathan, V., P.J. Crutzen, J.T. Kiehl, and D. Rosenfeld (2001), Aerosols, Climate and the Hydrological Cycle, Science 294, 2119-2124.

8.2.3C Subtopic: Decision Support Tools for Water Resources Management

One of NOAA's main goals is to "understand climate variability and change to enhance society's ability to plan and respond." A desired outcome of the goal is enhanced public and private sector planning and decision making through better use of information about the impacts of climate variability and change on climate-sensitive decisions and sectors, such as water management, agriculture, fisheries, forests, infrastructure planning, coastal zones, and public health. The NOAA Climate Program Office Climate Assessments and Services Division (CASD) (http://www.climate.noaa.gov/cpo_pa/) stimulates and supports research and applications activities designed to link climate science to society in order to expand regional adaptive capacity in the face of climate change and variability. Specifically, CASD seeks to: identify, explore and communicate the information needs of a diverse suite of decision-makers in order to foster a solution-oriented focus to NOAA research and services; identify, understand & assess the sensitivity and adaptability of managed systems to climate; explore the uses and identify the limits of evolving knowledge to manage risks and opportunities related to climate variability and change; and catalyze and accelerate the development, prototyping and evaluation of tools and methods for productively connecting science to decision-making needs and structures. The use of climate information for resource management and infrastructure planning is an important focus of several CASD programs, including Regional Integrated Sciences and Assessments (RISA) (http://www.climate.noaa.gov/cpo_pa/risa). Sector Applications and Research Program (http://www.climate.noaa.gov/cpo_pa/sarp/), and Transition of Research Applications to Climate Services (TRACS) Program (formerly NOAA Climate Transition Program (NCTP)) RISA teams (currently 8 across the U.S.), in particular, have been developing models, tools, and information for use in the water resources management area. In FY2008, this sub-topic will support research on the development and transition of drought related decision support tools, methods, and processes, particularly those involving working with stakeholders. Proposals should focus on developing and transitioning products to support drought planning and the communication of climate impact information tailored to specific regional needs, including products and services of relevance to the US Drought Portal (USDP) initiative and complying with USDP technical standards and requirements.[1] The USDP will improve access to and sharing

[1] (www.joss.ucar.edu/joss_psg/meetings/Meetings_2006/nidis/presentations/Owen.pdf)

of drought-related data and information locally, regionally, and nationally. SBIR funding under this sub-topic will accelerate the transition of research activities into improved climate information and increase applicability of that information to the needs of the external community enabling businesses, academia, and government agencies to minimize the impacts of drought. The offeror is urged to the extent that it is possible to leverage work undertaken under the SARP, RISA, and TRACS Programs, particularly TRACS. Phase I should focus on exploration and the initial phase of development of the decision support tool. Phase II should focus on full development of the tool and mechanisms for commercialization of the product.

8.3 TOPIC: WEATHER AND WATER

8.3.1R Subtopic: In-situ Measurement System to Provide Pseudo Volume Filling Sampling (PVS)

Weather, by its very nature, occurs in three spatial dimensions and, so, is usually modeled as a time-ordered three dimensional process in numerical models. However, most systems designed to provide physical measurements from the real atmosphere into the numerical model are not three dimensional. That is, the measurements are at sampling points along a line or along a surface and they do not fill the three dimensional space where the weather occurs. To fill the real three dimensional atmosphere with measurement points would be expensive, but would provide the best input data set for the numerical model. This suggests the need for a measurement system that would provide pseudo volume-filling sampling (PVS), i.e. measurements at some given density in all dimensions, to yield a good input data set to the numerical model at reasonable cost. Imagine a system capable of generating a number of sampling points that could drift and move in different ways to disperse throughout a volume. Each would provide time samples of atmospheric parameters along their lines of travel. A fast enough generation of sampling points capable of fast enough maneuvering in different ways would provide a PVS observation system. Practically, such a system might be realized by small balloons carrying ultra-light sondes that report position and atmospheric measurements by radio for several hours or days. The balloons could be released rapidly from one or more points and tend to disperse by the winds and by some maneuvering capability. The ultra-light sondes would only need small balloons to carry them in the atmosphere and would be relatively cheap to produce and deploy. An example of the use of a system like this might be to release a large number of these small sonde-balloon packages after a hurricane passes over an island and try to achieve PVS of the trailing portion of a hurricane. We request a Phase I SBIR study to develop a theoretical basis and conceptual mechanism for innovative ways of carrying ultra-light sondes into the atmosphere to achieve PVS for a portion of that atmosphere. The possibility of maneuvering capability for individual sonde carriers should be considered. This study should concentrate on the sonde carriers and associated mechanisms only. Assume that sondes weighting 20 to 100 grams with lifetimes of hours to days are available and that these sondes report three dimensional position, temperature, pressure and humidity at a suitable rate through an existing communication system. The PVS system should be capable of deploying sonde carriers at a suitable rate to adequately sample a given weather feature.

Reference: Klarreich, E., 2007. Sensor Sensibility, Science News, 171, 18, 272-275.

8.4 TOPIC: COMMERCE & TRANSPORTATION

8.4.1W Subtopic: Radar Algorithm for Lightning Probabilities with Lightning Threat Web Page Display

This subtopic requests development of a Radar Algorithm that computes cloud-to-ground (CG) lightning initiation probabilities and frequent strike probabilities, with output displayed on a real-time CG lightning threat web page. A substantial study at the National Weather Service (NWS) Jacksonville, Florida office confirmed the results of prior studies, demonstrating a probabilistic relationship between CG lightning occurrence (and frequency) and the height of the 40dBZ radar echo above the -10C level, using data from the WSR-88D radar. The results, published in the NWA Electronic Journal of Meteorology (2007), revealed the probabilistic relationship, which also provided an average 5-10 minute lead time on CG lightning initiation using the technique evaluated. The concept is directly tied to NOAA's National Weather Service mission of protecting life and property, and enhancing the nation's economy. CG lightning ranks 2nd in weather-related fatalities, right behind floods. More people are killed and injured by lightning than hurricanes and tornadoes combined. Despite this, no real-time threat information is provided by the NWS. Focus is on public education efforts with respect to lightning and lightning safety. Studies such as the one at NWS Jacksonville suggest probabilistic warning information can be provided to customers. Subtopic would test a new radar algorithm that would yield real-time CG lightning probabilities, allowing the NWS to provide real-time lightning threat information never provided before. Output would be evaluated internally and externally (via key customer groups). Subtopic would lead to a transfer of research results from prior CG lightning studies into a real-time operational CG lightning probability radar algorithm. This information could be provided to customers via a real-time CG lightning threat website, which could include not only lightning initiation probabilities, but probabilities of numerous lightning strikes (which can yield a greater amount of damage). Subtopic would also evaluate the use of the Internet for disseminating real-time CG lightning threat information, based on algorithm output, updated every minute.

8.4.2W Subtopic: Automated Software for Quality Control of in situ Surface Meteorological and Oceanographic Observations

NOAA's Ocean Prediction Center, Tropical Prediction Center, and Environmental Modeling Center use in situ ocean surface meteorological observations and ocean surface and subsurface oceanographic observations collected through Volunteer Observing Ships (VOS) and other platforms such as moored and drifting buoys for operational hurricane, marine and ocean forecasts, and initialization of forecast models. Quality control (QC) of in situ observations is a critical step to ensure the integrity and scientific value of these observations for operational forecasts. Only data that passes quality control procedures are used in operations and models. Quality control includes testing for both instrumentation accuracy and scientific consistency. Proposals submitted in response to this subtopic shall address scientific quality control of ocean surface meteorological and oceanographic observations from ships, buoys and other platforms, such as ARGO floats for critical variables such as surface pressure, surface winds, wave heights, temperature (both air and ocean), currents, and salinity. The resulting software should have the capability to flag erroneous observations to allow users to examine the nature of the error. It should also have the capability to correct errors, if feasible, so that the resulting corrected observation can be used directly for models or operations. Error detection and correction should be based on solid meteorological, oceanographic, or climatological theories and scientific understandings. Extensive and intuitive data display capability (such as ship tracks, all or partial observations within a given domain, platform identifications, climatology and variability of a given physical parameter, historical range of all available observations at a given location, reasons for error flags) is required. Flexibility to add new scientific criteria for future enhancement is highly desirable. Additional capability to quality control subsurface oceanographic observations and coastal ocean observations is also desirable.

8.4.3D Subtopic: Autonomous Vessel-launched Airborne Anomaly Detection and Reporting System

Marine debris, such as derelict fishing nets, can endanger fish, marine mammals, marine turtles, vessels, and coral reefs. Convergence zones in the ocean concentrate marine debris and may serve as target areas for debris removal operations, if cost-effective systems for detection and recovery can be developed. Debris can then be recovered before it continues to kill endangered species, and foul coral reefs and pristine beaches. The GhostNet project has tested the use of satellites to locate convergence zones for the targeting of airborne surveys to locate individual pieces of marine debris. Experimental marine debris visual surveys with NOAA P3 aircraft have detected thousands of individually logged pieces of debris including derelict nets, lines, and floats as well as hundreds of marine mammals, birds, turtles, and fish. The next step in developing an operational Ghost Net system is to develop a low-cost aerial survey capability that can be used as part of an integrated satellite/aircraft/vessel system employing satellite observations of convergence zones, utilizing Unmanned Aerial System (UAS) flights to locate debris, and using a recovery vessel to find and retrieve detected debris. The UAS will also be an important tool for validating satellite-

derived debris likelihood maps, assessing marine debris locations after hurricanes, and performing marine mammal studies. This subtopic seeks development of a low-cost UAS capable of being launched and recovered from a small vessel (~30 ft). The UAS must be able to observe the ocean with a visible camera system (additional sensors, such as infrared, are desirable); automatically detect objects or sea-life in the water (perhaps using anomaly-detection software for detecting sea-life or debris in the camera images); telemeter back to the vessel the GPS position and an image or automated classification of each object in near-real-time; deploy a small buoy with satellite communications to mark and telemeter the position of distantly located debris so that the vessel can rendezvous with the debris; and return to a specified rendezvous point or return point updated from the vessel during the survey flight. The UAS envisioned must be self-contained and portable, easily launched from and requiring only power obtained from a small vessel, programmed to survey along a specified flight path or search pattern at a specified altitude for at least one (preferably two or more) hour, and easily recovered by vessel personnel for reuse within a matter of minutes or hours. The entire UAS system should be successfully tested at sea, performing the functions detailed above.

References:

Pichel, W., T. Veenstra, J. Churnside, D. Foley, K. Friedman, R. Brainard, J. Nicoll, Q. Zheng, P. Clemente-Colón, 2007, Marine Debris Collects Within the North Pacific Subtropical Convergence Zone, accepted for publication in the Marine Pollution Bulletin.

Pichel, W.G., et al. 2003, Ghost Net - Derelict Net Detection in the North Pacific and Alaska Waters Using Satellite and Airborne Remote Sensing and Surface Drifters, Proceedings, 30th International Symposium on Remote Sensing of the Environment, November 10-14, 2003, Honolulu, Hawaii.

8.4.4N Subtopic: Dredged Channel Depth Monitoring

More than 90% of U.S. maritime trade passes through the 300 deep draft and 600 shallow draft navigation projects in U.S. ports and harbors. These dredged channels cover over 25,000 miles of navigable waterways. The U.S. ports and harbors served by these dredged channels annually handle nearly 2.5 billion tons of domestic and foreign cargo, which in turn supports more than 13 million jobs nationwide. The U.S. Army Corps of Engineers is responsible for maintaining the condition of these dredged channels. Through periodic surveys, they determine the actual channel depths, areas that are shoaling, and any obstructions that may exist in the channels. The information is reported to NOAA where it is included on a nautical chart, and if a change in condition is critical, the information is distributed via a Notice to Mariners. The gathering and distribution of this information is infrequent and not comprehensive of a channel. Furthermore, it is not the information that would benefit mariners most. It is simply a static table of the minimum depths in different large sections of each channel. At present, technology does not exist to provide a complete picture of a channel's depth

and condition at the time of each ship's transit. However, such information would allow ships to determine the "best deep water" exactly when they needed it, thus improving the safety and efficiency of their transits. Research is required to provide a comprehensive method for remote, real-time monitoring of navigation channel depths. Measurements of channel depth should be to within 1 foot of accuracy, and channel widths to within 10 feet of accuracy, throughout the entire channel length (1 mile to 100 miles). The "horizontal resolution" of such a monitoring method should be such that the channel is effectively 100% surveyed. The method must be comparable in cost to the periodic sonar surveys currently in use. The use of the information would be for navigation, and not for monitoring dredging contracts.

8.4.5N Subtopic: Software to Extrapolate the MLLW Line from Tidally-Referenced Topographic Lidar Data Collected at a Tide Stage Slightly above MLLW

NOAA's National Geodetic Survey (NGS) is Congressionally mandated to map the National Shoreline, which is utilized in updating nautical charts and managing coastal resources. Additionally, the National Shoreline is an important tool for determining marine and maritime boundaries. While conventional methods of shoreline mapping rely on tide-coordinated stereo photography, NGS has recently developed procedures for mapping shoreline using topographic light detection and ranging (lidar) data. Our approach entails cleaning the raw lidar point cloud data and then utilizing NOAA's VDatum vertical datum transformation utility to convert from ellipsoidal heights to a tidal datum, such as Mean Lower Low Water (MLLW) or Mean High Water (MHW). Next, the data are interpolated to a grid to produce a tidally-referenced digital elevation model (DEM). Shoreline extraction can then be performed in an automated manner using a routine to generate elevation contours from the tidally-referenced DEM.

While these procedures for extracting shoreline from lidar data have been proven effective, a few problems remain unsolved. One current challenge relates to the fact that it is logistically difficult to collect lidar data at a tide stage well below MLLW, simply because there are very few windows of opportunity. Thus, airborne data acquisition is often performed near, at, or even slightly above, MLLW. To extract a MLLW shoreline, it is therefore necessary to extrapolate the seaward edge of the tidally-referenced point cloud or DEM slightly past the MLLW line. When available, bathymetric lidar data may be merged with the topographic lidar data to assist in shoreline extraction. This merging of bathymetric and topographic data is beneficial in that enables the problem to be treated as one of data interpolation, as opposed to extrapolation. However, the problem is still nontrivial, since the data in the intertidal zone and near shore region in the merged data set are often very sparse and noisy. Proposals submitted in response to this subtopic shall address the development and implementation of algorithms for extrapolating the MLLW line from tidally-referenced topographic lidar data collected slightly above MLLW, and also for interpolating between topographic and bathymetric lidar data sets to obtain a clean, accurate, and reliable elevation model covering the MLLW line. It is acceptable for the algorithms to operate on the raw point cloud data, the interpolated DEM, derived contours, or any combination of the above. The data extrapolation and interpolation method(s) used should be based on solid mathematical

theory and provide good results for a variety of beach types. Error estimates should be computed and displayed. It is desirable for the final software product to function as an add-on to existing commercially-available GIS or image processing software.

9.0 SUBMISSION FORMS
9.1 NOAA/SBIR COVER PAGE

NOAA/SBIR SMALL BUSINESS INNOVATION RESEARCH	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

SOLICITATION NO.: NOAA 2008-1	CLOSING DATE: January 23, 2008
NAME OF SUBMITTING FIRM	
TAXPAYER IDENTIFICATION NUMBER	
DUNS NUMBER	
ADDRESS OF FIRM (INCLUDING ZIP CODE + 4)	
TITLE OF PROPOSED PROJECT	
REQUESTED AMOUNT: $	PROPOSED DURATION: Six (6) Months
SOLICITATION SUBTOPIC NO.	SOLICITATION SUBTOPIC TITLE

THE ABOVE ORGANIZATION CERTIFIES THAT:	YES	NO
1. It is a small business firm as defined on page 6.		
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.		
3. A minimum of two-thirds of the research will be performed by this firm in Phase I.		
4. It qualifies as a socially and economically disadvantaged small business as defined on page 7.		
5. It qualifies as a woman-owned small business as defined on page 7.		
6. It will permit the government to disclose the title and technical abstract page, plus the name, address and telephone number of the corporate official if the proposal does not result in an award to parties that may be interested in contacting you for further information or possible investment.		
7. Is your business in a HUB Zone? (See: http://map.sba.gov/hubzone)		

PRINCIPAL INVESTIGATOR/ PROJECT DIRECTOR	CORPORATE OFFICIAL (BUSINESS)	OTHER INFORMATION
NAME (Printed)	NAME (Printed)	YEAR FIRM FOUNDED
SIGNATURE	SIGNATURE	NUMBER OF EMPLOYEES
DATE	DATE	Average Previous 12 months _____ Currently _____
TITLE	TITLE	HAS THIS PROPOSAL BEEN SUBMITTED TO ANOTHER AGENCY? Yes ☐ No ☐
TELEPHONE NO. + AREA CODE	TELEPHONE NO. + AREA CODE	IF YES, WHAT AGENCY? _____
E-MAIL (Printed)	E-MAIL (Printed)	FAX #

PROPRIETARY NOTICE

For any purpose other than to evaluate the proposal, this data shall not be disclosed outside of the Government and shall not be duplicated, used or disclosed in whole or in part, provided that if a funding agreement is awarded to this proposer as a result of or in connection with this submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the funding agreement. This restriction does not limit the Government's right to use information contained in the data source without restriction. The data in this proposal subject to this restriction is contained on separate proprietary page(s).

9.2 NOAA/SBIR PROJECT SUMMARY FORM

NAME OF FIRM	
AMOUNT REQUESTED	
ADDRESS	PHONE # FAX # E-MAIL:
PRINCIPAL INVESTIGATOR (NAME AND TITLE)	
TITLE OF PROJECT	
SOLICITATION SUBTOPIC NUMBER	SOLICITATION SUBTOPIC TITLE
TECHNICAL ABSTRACT (LIMIT 150 WORDS)	
SUMMARY OF ANTICIPATED RESULTS	

9.3 NOAA/SBIR PROPOSAL SUMMARY BUDGET

FIRM:	PROPOSAL NUMBER: (Leave Blank)
PRINCIPAL INVESTIGATOR:	
	PRICE
DIRECT LABOR:	$
OVERHEAD RATE:	$
OTHER DIRECT COSTS:	$
MATERIALS:	$
GENERAL AND ADMINISTRATIVE (G&A):	$
PROFIT:	$
TOTAL PRICE PROPOSED:	$
THIS PROPOSAL IS SUBMITTED IN RESPONSE TO NOAA SBIR PROGRAM SOLICITATION 2008-1 AND REFLECTS OUR BEST ESTIMATES AS OF THIS DATE.	
_____ TYPED NAME AND TITLE DATE	_____ SIGNATURE DATE

9.4 NOAA/SBIR BUDGET INSTRUCTIONS

The offeror is to submit a cost estimate with detailed information for each element, consistent with the offeror's cost accounting system. This does not eliminate the need to fully document and justify the amounts requested in each category. Such documentation should be contained, as appropriate, on a budget explanation page immediately preceding the budget in the proposal.

1. Principal Investigator (PI)

The PI must be with the small business concern at the time of contract award and during the period of performance of the research effort. Additionally, more than half of the PI's time must be spent with the small business firm during the contract performance.

2. Direct Labor

All personnel (including PI) must be listed individually, with the projected number of hours and hourly wage.

3. Overhead Rate

Specify current rate and base. Use current rate already negotiated with a Federal agency, if available. If no rate has been negotiated, a reasonable overhead rate (10-15% is average) may be requested, which will be subject to approval by NOAA. Overhead includes fixed costs not directly related to the research effort, e.g., rent, heat, light, facilities, telephones, maintenance, insurance, etc.

4. Other Direct Costs

List all other direct costs which are not described above (i.e. consultants, subcontractor, travel, and equipment purchases). Each of the above needs a detailed explanation and elaboration of its relation to the project. (Up to $4,000 may be allocated for technical and commercial assistance.)

5. Materials

The materials and supplies required for the project must be identified. There is also a need to specify type, quantity, unit cost, and total estimated cost of these materials and supplies.

6. General & Administration (G&A)

Specify current rate and base. Use current rate already negotiated with a Federal agency, if available. If no rate has been negotiated, a reasonable G&A rate may be requested, subject to approval by NOAA. G&A includes costs associated with managing and running the small business, e.g. computers, copier, marketing, charitable contributions, loans, gifts, entertainment, dues, etc.

7. Profit

The small business may request a reasonable profit. About seven percent of the costs is the average proposed.

10.0 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 returned without consideration.

Six copies of the proposal must be received by 4:00 p.m. (EST) January 23, 2008.

_____ 1. The proposal is **25 PAGES OR LESS** in length.

_____ 2. The proposal is limited to only **ONE** of the subtopics in Section 8.

_____ 3. The proposal budget is for **$95,000 or LESS**.

_____ 4. The abstract contains **no proprietary information** and does **not exceed** space provided on the Project Summary.

_____ 5. The proposal contains only pages of 21.6cm X 27.9cm size (8 ½" X 11").

_____ 6. The proposal, Cover Page and Project Summary contains **an easy-to-read font (fixed pitch of 12 or fewer characters per inch or proportional font of point size 10 or larger) with no more than six lines per inch**, except as a legend on reduced drawings, but not tables.

_____ 7. The **COVER PAGE** has been completed and is **PAGE 1** of the proposal.

_____ 8. The **PROJECT SUMMARY** has been completed and is **PAGE 2** of the proposal.

_____ 9. The **TECHICAL CONTENT** of the proposal begins on **PAGE 3** and includes the items identified in **SECTION 3.3.3** of the solicitation.

_____ 10. The **SBIR PROPOSAL SUMMARY BUDGET** has been completed and is the **LAST PAGE** of the proposal.

_____ 11. The P.I. is employed by the company.

NOTE: Proposers are cautioned of unforeseen delays that can cause late arrival of proposals, with the result that they may be returned without evaluation.

11.0 SBIR NATIONAL CONFERENCES

FEDERAL R&D OPPORTUNITIES
FOR
TECHNOLOGY INTENSIVE FIRMS

Sponsored by:
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All Federal SBIR Departments and Agencies

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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.

National Critical Technologies.

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

Richardson, TX October 29, 2007 – November 1, 2007

For further information on this conference and upcoming conferences see the SBIR Homepage: www.sbirworld.com