SBIR

Small Business Innovation Research

FY 2010

NOAA Program Solicitation

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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:

Kelly K. Wright, 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: kelly.wright@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) (i) At least 51 percent owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States, (ii) 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; or (iii) a joint venture in which each entity to the venture must meet the requirements of either (i) or (ii) of this section;

(d) Including its affiliates, 500 or fewer 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

Copies of a final report on the Phase I project shall be submitted electronically 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 (submitted electronically), 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 Ms. Kelly Wright. Telephone: 301-713-3565 or e-mail: kelly.wright@noaa.gov
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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 Central Region Acquisition Division is **4:00 p.m. (EST) on January 14, 2010.**

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
Central Region Acquisition Division
601 E. 12th Street, Room 1756
Kansas City, Missouri 64106

Telephone: 816-426-7400

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

8.1 TOPIC: ECOSYSTEMS

8.1.1R SUBTOPIC: In-Field Sensors for Detection of Microbial Contaminants in Coastal Waters

Microbial contamination adversely impacts coastal water quality, and poor water quality has negative economic, health, and environmental impacts. The development and implementation of rapid and automated methods for monitoring and identifying microbial contamination in coastal waters is needed to support an ecosystems approach to managing coastal resources. The products derived from this SBIR call should help with some or all of the following: elucidate the relationships between human activities, ocean processes, and health outcomes and to facilitate ecological forecasting. Proposals are requested for development of sensors that meet the requirements for biological observing in the field, including meeting the detection limits needed for the NOAA-related field applications (e.g., demonstrated, detection limits appropriate for targets in real field samples). Designs may couple marine biotechnology and engineering approaches to enable field portable and in-situ biosensors that allow rapid enumeration of microbial targets of interest. Targets of interest include microbes that pose a risk to the health of humans, fisheries, protected resources, and/or ecosystems. Applications may include environmental or ballast water quality assessments, biosecure aquaculture, and protection of threatened or endangered species. Integrated mechanical, electrical, fluidic, and molecular biological innovations are needed in order to efficiently filter large volumes of water, process and detect microbes (viable or nucleic acids) with minimal to no human interaction, and to meet size, power, cost, and real-world detection limit requirements. To enable validation of ecological forecasting models and to support coastal management decisions, design and testing of portable or in-situ sensors should include the capacity to integrate biological data with physical and climatological data generated from automated platforms.

References:

Clark, J.S., et al. 2001. Ecological Forecasts: An Emerging Imperative, Science, 293, 657-660.

Goodwin, K.D. and R.W. Liktaker. 2008. Emerging technologies for monitoring recreational waters for bacteria and viruses. IN: Oceans and Human Health: Risk and Remedies from the Seas. P.J. Walsh, S.L. Smith, W.H. Gerwick, H. Solo-Gabriele, L. Fleming, eds. Academic Press, New York, pp. 381-404, ISBN-13: 978-0123725844.

Noble, R.T., and Weisber, S.B. 2005. A review of technologies for rapid detection of bacteria in recreational waters. Journal of Water and Health, 4, 381-392.

8.1.2F SUBTOPIC: Aquaculture: Sustainable Marine Aquaculture Operations

The purpose of this topic is to develop innovative products and services to support the development of environmentally, socially, and economically sustainable marine aquaculture. The focus is on products and services that will allow the aquaculture industry to expand in a way that is compatible with healthy marine ecosystems and other users of coastal and ocean resources.

As marine aquaculture technology moves from research to operations, there is a critical need to provide commercial products and services to aquaculture producers at a cost that does not jeopardize the economic viability of the industry. This includes, but is not limited to, methods, tools, instruments, technologies, and equipment for:

- Producing fish, shellfish, and marine algae in hatcheries
- Selecting appropriate sites for marine aquaculture operations
- Raising fish, shellfish, and marine algae to market size in land-based, coastal, and open-ocean grow-out facilities
- Preventing, diagnosing, and controlling disease
- Meeting the nutritional requirements of marine species in all life stages (from hatchery to market size), including use of diets that rely less on fish oil and fish meal without sacrificing the human health benefits of seafood consumption
- Preventing or reducing effluents and escapes from marine aquaculture facilities
- Excluding predators from aquaculture facilities in ocean and coastal waters
- Mitigating environmental impacts

References:

Nash, C.E., 2004. Achieving Policy Objectives to Increase the Value of the Seafood Industry in the United States: The Technical Feasibility and Associated Constraints. Food Policy 29, 621-641.

National Marine Fisheries Service, 2007. Summary of the National Marine Aquaculture Summit. Available at http://aquaculture2007.noaa.gov/pdf/summitsum_web_1_08.pdf

National Oceanic and Atmospheric Administration, 2007. NOAA 10 Year Plan for Marine Aquaculture. Available at http://aquaculture.noaa.gov/pdf/finalnoaa10yrrweb.pdf

8.1.3F SUBTOPIC: Aquaculture: Sustainable Marine Aquaculture Management

The purpose of this topic is to develop innovative products and services to support sound management of marine aquaculture. There is a need for resource managers and regulators to have access to affordable equipment, instruments, tools and

techniques to assess the potential risks and benefits of marine aquaculture facilities and to monitor the impacts of marine aquaculture operations on marine ecosystems. This includes, but is not limited to, methods, tools, technologies, and equipment for:

- Analyzing the risks associated with marine aquaculture production
- Evaluating proposed sites for marine aquaculture facilities
- Monitoring operations and their environmental impacts
- Analyzing genetic differences between farmed and wild, and providing methods to distinguish the two

References:

Nash, C.E., 2004. Achieving Policy Objectives to Increase the Value of the Seafood Industry in the United States: The Technical Feasibility and Associated Constraints. Food Policy 29, 621-641.

National Marine Fisheries Service, 2007. Summary of the National Marine Aquaculture Summit. Available at http://aquaculture2007.noaa.gov/pdf/summitsum_web_1_08.pdf

National Oceanic and Atmospheric Administration, 2007. NOAA 10 Year Plan for Marine Aquaculture. Available at http://aquaculture.noaa.gov/pdf/finalnoaa10yrrweb.pdf

8.1.4SG SUBTOPIC: Development of Hazard Resilient Structures and Infrastructure Systems Using New Technologies

NOAA's National Sea Grant College Program is focused on promoting hazard resilient coastal communities. To accomplish this, communities need access to new technologies that will enable them to resist and recover from the impacts of coastal disasters (e.g. hurricanes, tsunamis, coastal erosion, etc.) NOAA is looking for proposals that will develop new technologies and construction products that can be used to increase resiliency to coastal hazards, including water level changes (sea level rise and Great Lakes fluctuations) during both retrofitting and new construction.

8.1.5SG SUBTOPIC: Development of Renewable Alternative Energy Sources

The National Oceanic and Atmospheric Administration under the Small Business Innovation Research program is interested in proposals for the research and development of Renewable Ocean and Coastal Energy Technology, which will include the following technology areas of focus: a) Offshore/coastal wind, b) Wave, c) Tidal/current, d) Geothermal, and e) Biofuels, developed from microalgae or macroalgae. Projects may involve research in technology development, and/or testing and improvement of existing technologies.

References

Peer M. Schenk, Skye R. Thomas-Hall, Evan Stephens, Ute C. Marx, Jan H. Mussgnug, Clemens Posten[4], Olaf Kruse and Ben Hankamer, Second Generation Biofuels: High Efficiency Microalgae for Biodiesel Production, Bio Energy Research, Volume 1, Number 1, March, 2008

Michele Aresta, Angela Dibenedetto[a] and Grazia Barberio, Utilization of macro-algae for enhanced CO_2 fixation and biofuels production: Development of a computing software for an LCA study, Fuel Processing Technology Volume 86, Issues 14-15, October 2005, Pages 1679-1693

8.1.6SG SUBTOPIC: Development of Innovative Restoration Science and Tools

Development of innovative science, tools and techniques to improve the success of projects to restore degraded wetland, marine, estuarine, riparine or other coastal ecosystems. Topics could include development or demonstration of innovative restoration techniques, tools for assessment and valuation of degraded or restored ecosystems, monitoring tools, adaptive management, tools to predict success and set realistic goals for restoration projects (including tools to evaluate the effect of climate change or infrequent severe weather events on restoration project effectiveness), tools to integrate natural and social science for restoration decision making.

8.1.7SG SUBTOPIC: Development of Macroalgae Aquaculture

This solicitation seeks to develop innovative technologies, products, and services that will enhance the knowledge and technology base necessary for the development of an environmentally, socially, and economically sustainable domestic macroalgal aquaculture industry. Farming of macroalgae presents a long term sustainable mechanism to address two compelling environmental issues of the next century with the potential to improve coastal water quality and reduce atmospheric CO_2, while generating employment, and producing food, fiber and food ingredients. Extrapolations from Chinese yields suggest that, by cultivating less than 2% of the oceans' surface, seaweed farms could produce a biomass amount equal to that of all food crops farmed on land. Ancillary benefits would be to lessen future agriculture demands for finite fresh water, reduce conversion of terrestrial wild lands to agriculture, and creation of unique habitat for marine flora and fauna. Emphasis is placed on research that develops innovative approaches to solve major industry bottlenecks in an economically and environmentally sustainable manner. Research on new species for culture, improved production efficiencies, cost-efficiency measures, and adaption of techniques being successfully used in other countries is appropriate.

8.1.8SG SUBTOPIC: Aquaculture: Culture for 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.

8.2 TOPIC: CLIMATE

8.2.1C SUBTOPIC: Real-Time In Situ Measurements of Total Aerosol Extinction from Aircraft

Aerosols are important climate forcing agents due to their interactions with sunlight. Since these particles are often present in layers well above the Earth's surface, measurements from airborne platforms are needed to determine the optical properties of the aerosols. Unfortunately, most existing techniques for such airborne measurements are best suited for fine mode (submicron) particles only. Coarse particles, such as dust, sea salt, and biological material, are often poorly sampled yet are important components of the climate system.

One basic optical measurement for particles is integrated light extinction. If technology can be developed to make accurate measurements of total (fine + coarse) aerosol extinction from aircraft, significant reductions in the uncertainty in climate forcing due to particles might be achieved. The developed instrumentation would potentially be deployed on aircraft such as the WP-3Ds operated by NOAA's Aircraft Operations Center (see http://www.aoc.noaa.gov/) or on unmanned aerial systems (UASs). Substantial commercial potential may exist for both existing scientific aircraft and for possible future UAS fleets. Vertical profiles of in situ measurements of total extinction would be useful in validating satellite measurements of extinction.

Due to inertial sampling biases and relative humidity changes, and since it is also difficult to accurately retain water on particles at high ambient relative humidity when sampling on aircraft, an open path instrument mounted external to the aircraft fuselage is most likely to succeed. A successful instrument must be capable of measuring bulk extinction coefficients at mid-visible wavelengths with an uncertainty (combined accuracy and precision) of better than 5 Mm^{-1} at typical atmospheric dust particle sizes and concentrations with a ten-second or faster sample interval. A sample volume and aerodynamic transmission sufficient to detect particles at least 10 mm in diameter and a response at 10 Hz suitable for thin clouds are also desirable.

The successful design cannot have significant size-dependent biases caused, for example, by forward-scatter truncation (as is common with nephelometers). The instrument should be compact, lightweight, use little power, be capable of operating

from sea level to 45,000 ft altitude, be otherwise appropriate for airborne use, and operate autonomously yet be configurable remotely and in real time by an operator. It must operate in daylight. Instruments that fit within commonly used cloud probe canisters are especially encouraged.

8.2.2C SUBTOPIC: Simultaneous Real-Time In Situ Measurements of Aerosol Particle Shape and/or Density and Optical Size

Aerosol particles interact with solar radiation and are important components of the earth's radiation budget, hence climate. The size, shape, and water uptake characteristics (hygroscopicity) of aerosol particles in large part govern their direct role in climate forcing. Soot, dust, and sea salt are important aerosol components for which non-spherical or coarse particles are important. Most *in situ* optical measurement techniques assume spherical particles of a nominal density, doubling the associated uncertainty in the calculated scattering coefficients in some cases, such that the relative climatic importance of these populations is poorly known.

NOAA and other government agencies are developing unmanned aerial systems (UASs) as environmental monitoring platforms. Depending on the success and scale of these programs, a substantial market for lightweight, autonomous airborne sensors may soon develop. NOAA seeks new instrument designs that are capable of operating on UASs, as well as on existing manned aircraft, and that can measure relevant physical and optical characteristics to constrain aerosol direct radiative forcing. Additionally, vertical profiles of in situ measurements of particle shape would be useful in validating satellite measurements of shape factors.Of particular interest is a single instrument that is capable of all of the following:

1) measuring optical diameter
2) in addition to optical diameter, distinguishing non-spherical from spherical particles and/or measuring aerodynamic diameter,
3) possessing sufficient sensitivity and dynamic range to measure the aerosol accumulation and coarse modes (~0.1-10 mm diameter),
4) using broadband light sources to eliminate coarse-mode sizing ambiguities associated with Mie oscillations,
5) being easily adapted to studies of aerosol water uptake properties,
6) having sufficient sample volume to measure coarse mode (4 mm) particles with reasonable counting statistics in 10 seconds
7) being compact and lightweight, using little power, being capable of operating from sea level to 45,000 ft altitude, and being otherwise appropriate for airborne use, and

8.2.2C SUBTOPIC: Robust Software Data Integration Tool in Support Of the National Integrated Drought Information System and Climate Services Delivery

Advances in climate service delivery depend on how well data sets from multiple sources at diverse spatial and temporal scales are integrated. Climate data is produced

by numerous government agencies, universities, and private organizations in a vast range of formats utilizing an array of different quality and types of metadata practices. As the National Oceanic and Atmospheric Administration (NOAA) begins planning to deliver climate related services there will be a need to synthesize, integrate, and provide data access to the wide range of climate data that currently exist, seamlessly to the user. A need exists, therefore, to build supporting software architecture to assemble and integrate disparate data sets and establish a common and consistent data language to support climate service delivery.

An effort that is currently ongoing to prototype the delivery of climate services is through the National Integrated Drought Information System (NIDIS). The growing impacts of drought on society led to a call by state governors for drought preparedness information. NIDIS is working to provide dynamic and easily accessible drought information for the nation by serving as an integrated knowledge center by identifying, collecting, and disseminating existing drought data, assessments, forecasts, and services at the national, regional, watershed, state, county, and private sector levels. NIDIS provides this information to help decision-makers assess the risk of having too little water and to prepare for and mitigate the effects of drought (such as farmers making decisions about crops, forestry professionals planning ahead for the next fire season, and urban water managers preparing for high-demand seasons). Still in its initial phases, NIDIS is continually developing more robust services and regional decision support resources.

In parallel with the NIDIS effort, we are soliciting proposals to build and prototype software initially focusing on assembling and integrating drought related data and information in support of NIDIS. This software could be similar to efforts undertaken in the Consortium of Universities for the Advancement of Hydrologic Science program for water but geared toward the more diverse nature of drought. Types of drought related information could include new or existing remote sensing data, data from the National Weather Service's Advanced Hydrologic Prediction Service, or drought impact data from observing networks like the National Ecological Observatory Network. If successful, the prototype could then used to synthesize and integrate climate data in general, in support of the climate portal currently being developed to support NOAA's Climate Service, not just drought related data, are encouraged.

References:

Goodall, J. L., J. S. Horsburgh, T. L. Whiteaker, D. R. Maidment and I. Zaslavsky, (2008), "A first approach to web services for the National Water Information System," Environmental Modeling & Software, 23(4): 404-411, doi:10.1016/j.envsoft.2007.01.005.

Maidment, D. R., Zaslavsky, I. and J. S. Horsburgh, (2006), "Hydrologic Data Access Using Web Services," Southwest Hydrology, 5(3), http://www.swhydro.arizona.edu/archive/V5_N3/feature1.pdf.

8.2.4W SUBTOPIC: Airborne *in situ* Sensors for Measurement of Upper Troposphere Water Vapor

Water vapor is the most important atmospheric greenhouse gas, but its variability and distribution, particularly the vertical profile, are not well known due to lack of reliable long-term observations in the upper troposphere and stratosphere. The unmet operational and climate requirement is to measure moisture accurately with a less than 10% error in the upper troposphere and lower stratosphere from 10 through 15km in altitude, where water vapor amount varies widely from between 2.8 to 100 parts per million by volume (ppmv) (Stratospheric Processes and Their Role in Climate (SPARC), 2000). Current systems to not meet the accuracy and spatial and temporal requirements needed for water vapor observations. Water vapor observations are perhaps the most critically needed observations for improving climate models and their projections of future climate. Climate sensitivity depends very strongly on the strength of water vapor feedback. This feedback is strongest in the tropical upper troposphere (Sodem, 2006), where measurements are sorely lacking (Climate Workshop Report I, 2005).

Unfortunately, water vapor soundings obtained from the operational national radiosonde networks do not produce high quality data in the upper troposphere. Research balloons and research aircraft have yielded a fair amount of information. However, compared to the large variability of upper tropospheric humidity on a variety of spatial and temporal scales, the data obtained by in situ techniques is inadequate (SPARC, 2000). Moisture sensor technology used by radiosonde manufacturers systematically exhibit a dry bias in the cold conditions of the upper-troposphere (-50°C to -70°C) which renders this operational observing system inadequate as a data source for validating and initializing weather and climate models and for calibrating satellite sounders sensors. The Stratospheric Processes and their Role in Climate (SPARC) Report (2000) identified tunable diode laser (TDL) technology as the only sensor, *in situ* or remotely sensing, which is capable of achieving the required accuracy across the full range of temperature and moisture ranges. The National Weather Service (NWS) is installing the Water Vapor Sensing System (WVSS) on commercial aircraft as a part of its integrated observing system strategy (WMO, 2008). WVSS sensors use tunable diode laser (TDL) technology to measure water vapor from 40,000 ppmv near the Earth's surface to 100 ppmv near the tropopause. The WVSS sensor, when installed on several hundred commercial aircraft, will generate thousands of soundings every day and provide a detailed 3-D picture of water vapor within the troposphere.

Additional design and testing is necessary to extend WVSS sensitivity to water vapor from a threshold of 100 ppmv to 2.8 ppmv to support operational and climate applications. It is possible to extend the WVSS sensitivity to this level through a combination of techniques including extending the path length of the sample chamber or using a laser with a frequency that is within a stronger water vapor channel. The benefits of design work to extend the WVSS sensor sensitivity has the potential for cost effective integration into the existing NWS operational aircraft observation program and for adoption by other National Meteorological Services which participate in the World

Meteorological Organization's (WMO's) Aircraft Meteorological Data and Relay (AMDAR) Program.

References:

Climate Requirements for Upper-Air Observations: The need for a critical re-examination of current activities. Workshop Report I, Boulder, CO., February 2005.

Soden, B.J., and I.M. Held, 2006: An Assessment of Climate Feedbacks in Coupled Ocean–Atmosphere Models. , Journal of Climate **19**, 3354–3360.

Stratospheric Processes and Their Role in Climate (SPARC) Assessment of Upper Tropospheric and Stratospheric Water Vapor. SPARC Report No.2. December 2000.

Suitability of Water Vapor Sensors for the AMDAR Fleet. WIGOS Pilot Project Plan, Geneva, Switzerland, July 2008.

Water Vapor Sensing System (WVSS) Technical Description, SpectraSensors, Inc. World Meteorological Organization (WMO) AMDAR Program, http://amdar.wmo.int/ .

8.3 TOPIC: WEATHER AND WATER

8.3.1W SUBTOPIC: Unmanned Ground Vehicles for Streamgaging

Development of new autonomous technology to address the accurate, representative and consistent measurement of river flow rates is critically needed to support warning and forecast operations. The National Weather Service relies on observations of river stage-discharge characteristics for model calibration and validation, as part of its mission on river flow forecasting at over 4,000 points across the nation. The vast majority of the observations are collected by the U.S. Geological Survey (USGS), (which operates and maintains over 7,500 streamgages), the US Army Corps of Engineers and associated Federal, State, Municipal and Tribal agencies. Because of continuous changing characteristics of the river channels, there is a need to re-survey the river cross sections, and to obtain updated stage-discharge curves, at a cost of about $20,000 per year per cross section.

Recently, the USGS has been modernizing the re-calibration procedures by using acoustic sensors [1]as opposed to the traditional mechanical current meters, at a substantial reduction in the time required for cross-section calibration. Nevertheless,

[1]Rehmel, M.S, J.A. Stewart and S.E. Morlock, "Tethered Acoustic Doppler Current Profiler Platforms for Measuring Streamflow," USGS Open-File Report 03-237, 2003 http://hydroacoustics.usgs.gov/publications/rehmel_teth_dop.pdf

personnel and travel costs are the main component of the total maintenance cost. Therefore, an autonomous system to re-survey cross sections and update stage-discharge curves will result in considerable savings. Such a system should be able to self deploy, either on a regular schedule, upon command from a remote station, or based on local river conditions. It must be able to avoid moving obstacles on or in the water.

We request a Phase I study to demonstrate the feasibility of an inexpensive, completely autonomous device, that will be able to navigate a prescribed route, and, during flooding conditions, avoid floating debris and perform during the strong currents present during flooding. Similar devices which have been developed for hydrographic and fisheries surveys [2], [3], [4], are not directly suitable for steam gaging since they require personnel to deploy them at the site, are very expensive, and do not have the ability to evade moving obstacles on or in the water.

8.3.2D SUBTOPIC: Use of Emerging Satellite-derived Products to Support Weather Forecasts

NESDIS develops, implements and distributes a wealth of operational satellite-derived products; many of these are geared towards supporting weather forecasters in assessing the likelihood of near-term heavy rainfall and/or the sustainment of meteorological conditions for continued precipitation. Such satellite products often supplement existing ground networks (e.g., radar, surface reports, etc.) where such observations may be available (i.e., radar beam blockage due to terrain, off-shore systems, etc.). Unfortunately, a number of these products are not routinely available to private sector broadcast forecasters (except for web page access) because of the limitations of data on vendor based/turn-key packages that television broadcasters use. We request that a Phase I study be conducted to develop a prototype system to incorporate the necessary data streams and product reformatting to allow for emerging satellite data products to be used within these broadcaster based display packages. At a minimum, operational products (available free of charge through NESDIS data servers) such as the ensemble-Tropical Rainfall Potential (e-TRaP, Kidder et al. 2005; Ebert et al. 2009)[5], the blended Total Precipitable Water Product/Anomaly Product (Kidder and Jones, 2007)[6] and time-averaged passive microwave products from the Advanced Microwave Sounding Unit (AMSU; Ferraro et al. 2005)[7] will be included for the demonstration. The system must have the flexibility to incorporate a much broader set of products in the future such as drought and air quality products.

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[2] http://www.nauticalcharts.noaa.gov/csdl/AUV.html
[3] http://oceanexplorer.noaa.gov/technology/subs/abe/abe.html
[4] http://swfsc.noaa.gov/textblock.aspx?id=11830&parentmenuid=448
[5] http://www.ssd.noaa.gov/PS/TROP/trap.html
[6] http://www.osdpd.noaa.gov/bTPW and
http://www.osdpd.noaa.gov/bTPW/global_TPWPCT.html
[7] http://www.star.nesdis.noaa.gov/corp/scsb/mspps/

References:

Ebert, E., A. Salemi, M. Turk, M. Spampata and S. Kusselson, 2009: Validation of the ensemble Tropical Rainfall Potential (eTRaP) for landfalling Tropical Cyclones. *89th Annual Meeting of the AMS, Phoenix, AZ, 12-16 January 2009.*

Ferraro, R.R., F. Weng, N. Grody, L. Zhao, H. Meng, C. Kongoli, P. Pellegrino, S. Qiu and C. Dean, 2005: NOAA operational hydrological products derived from the AMSU. *IEEE Trans. Geo. Rem. Sens.,* **43,** 1036 – 1049.

Kidder, S., J. Knaff, S. Kusselson, R. Ferraro, R. Kuligowski and M. Turk, 2005: The Tropical Rainfall Potential. Part 1: Description and Examples. *Weather and Forecasting,***20,** 456 – 464.

Kidder, S.Q. and A.S. Jones, 2007: A blended satellite Total Precipitable Water product or operational forecasting. *J. Atmos. Oceanic Tech.* **24**, 74-81.

8.4 TOPIC: COMMERCE AND TRANSPORTATION

8.4.1N SUBTOPIC: Inexpensive calibration of High-Frequency (HF) Radars

High frequency (HF) radar systems require initial calibration by measuring the receive antenna pattern. Periodically, these patterns are re-measured to ensure data quality. Several studies have demonstrated improved data quality when using a measured receive antenna pattern as opposed to using an assumption of an ideal pattern (e.g. Paduan et al. 2006), and best practices call for them as a necessary component of the quality assurance and quality control of HF radar data (see link). Additionally, precise, high-resolution antenna calibrations are necessary for successful deployment of bi-static and multi-static HF radar systems as well as the extraction of accurate wave height from HF radar. Performing antenna pattern measurements is often a logistically difficult and costly aspect of the operation of HF radar systems. Because of that, at the present time, only 41 of the 90 sites reporting data to the Integrated Ocean Observing System's (IOOS) national HF radar network are using measured patterns (see link), largely because of the logistical difficulty and expense of the measurements. It should be noted that HF radars can provide sufficiently accurate data when ideal antenna patterns are assumed, but that situation is not typical. As critical functions such as USCG Search and Rescue (SAR) operations and NOAA Hazmat spill response become dependent on HF radar ocean surface current data, an inexpensive, simple, and robust calibration method is needed to ensure high quality data.

Measuring the receive antenna pattern typically employs a dedicated small ship carrying a transponder. The ship follows an arc of constant range to the HF radar site, with the on-board transponder providing a signal source. Data obtained at the HF radar site during this process are later combined with the ship's GPS position to determine the

antenna pattern measurement. Previous research (e.g. Fernandez et al. 2003, 2006) indicates that reflections from commercial shipping vessels can act as substitute for a transponder, though these studies lacked ship positions. Many commercial vessels now broadcast position information using the Automatic Information System (AIS), suggesting that it may now be possible to combine AIS with HF Radar ship reflections to produce antenna pattern measurements. We request a Phase I study of the feasibility of using AIS broadcasts and ship reflections for the routine calibration of IOOS HF radars. Ultimately, this research may lead to a commercial software product, integrating AIS and HF radar data to produce more cost effective and frequent calibrations of HF radar systems.

References:

Fernandez, D. M., J. F. Vesecky, and C. C. Teague, 2003. Calibration of HF radar systems with ships of opportunity, Proc. Intl. Geosci. Remote Sens. Symp. (IGARSS), vol. 7, pp 4271-3.

Fernandez, D. M., J. F. Vesecky, and C. C. Teague, 2006. Phase corrections of small-loop HF radar system receive arrays with ships of opportunity, IEEE J. of Oceanic Engineering, vol. 31, no. 4, DOI 10.1109/JOE.2006.886238

Paduan, J. D., K. C. Kim, M. S. Cook, and F. P Chavez, 2006. Calibration and Validation of Direction-Finding High-Frequency Radar Ocean Surface Current Observations, IEEE J. of Oceanic Engineering, vol. 31, no. 4, DOI 10.1109/JOE.2006.886195 HFR Network system calibrations (idealized or measured): http://www.sccoos.org/data/hfrnet/xml/stationStatus.php

SCCOOS Best Practices Document (based on Radio-wave Operators Working Group meetings (ROWG) and partially funded through NOAA): http://cordc.ucsd.edu/projects/mapping/documents/SCCOOS-BestPractices.pdf

8.4.2W SUBTOPIC: Weather Data Linker (WDL) – Sharing Data Among Systems of Systems

A weather data linker (WDL) system that can facilitate and enable access of weather data in the systems-of-systems operational environment is critically needed to support National Oceanic and Atmospheric Administration (NOAA) plans for enhanced data sharing for interagency projects. NOAA requires the capability for a proof of concept application with automated processes for weather information extraction of basic weather parameters such as temperature, humidity, and pressure from atmospheric data repositories at a horizontal resolution on the order of 1km, a vertical resolution on the order of 0.1km, and a temporal resolution on the order of 15 minutes.

NOAA collects a large quantity of weather data from many observation systems including in-situ surface, radar, and satellite data. In addition, a sizable amount of hydrometeorological information is generated by NOAA modeling systems. Basic weather parameters such as temperature, humidity, and pressure are readily available

at the surface level, but these data are less accessible for the upper atmosphere. These parameters are used in many weather applications including those utilized for aviation product generation and convective weather forecasts for short-term watches, warnings, and advisories.
Currently there is no single, comprehensive "system of systems" that can enable the sharing of basic weather parameters for all atmospheric layers over all geographical areas to include data from environmental and meteorological satellites. It is possible that evolving technologies may enable such a system to capture all observed parameters and report this data to appropriate agencies for development and distribution. Before this can happen we need an alternative capability to address today's needs. Existing hydrometeorological data repository and data exchange capabilities, e.g., those from the National Digital Forecast Database (NDFD) and Digital Weather Markup Language (DWML) from the Meteorological Development Laboratory (MDL), and the Aviation Digital Data Service (ADDS) from the Aviation Weather Center (AWC) within NOAA can be used as a starting point for this effort.

This WDL development can immediately benefit major planned NOAA National Weather Service (NWS) programs such as the Next Generation Air Transportation System (NextGen) that is focusing on a new direction in aviation weather information capabilities to help stakeholders at all levels make better decisions when weather impacts operations. An innovative data linking approach can facilitate and enable data access to allow effective data sharing among systems of systems, support developing Service Interaction Profiles (SIPs), and ultimately help the development of aviation products. The proposed approach should apply open source software for development and open data standards to allow maximum interoperable capability and data sharing.

References:

Tim Berners-Lee, February 2009, "The next Web of open, linked data" talk, http://www.ted.com/index.php/talks/tim_berners_lee_on_the_next_web.html

NWS National Digital Forecast Database (NDFD) website: http://www.weather.gov/ndfd

NWS MDL Digital Weather Markup Language (DWML) specification website: http://www.weather.gov/mdl/XML/Design/MDL_XML_Design.htm

NWS AWC Aviation Digital Data Service (ADDS) website: http://adds.aviationweather.noaa.gov

8.4.3R SUBTOPIC: Autonomous Underwater Vehicle for Short Term Current Observations

Traditional bottom-mounted current observations require costly vessel time and without *a priori* knowledge of the regime may result in measurements at a sub-optimal location. Autonomous Underwater Vehicle (AUV) technology has become commonplace and could prove useful for short deployments of current profilers. By evaluating short term

observations at several locations a better site for long term or permanent deployments may be identified.

We seek an UAV, fitted with an upward-looking acoustic current profiler, with the capability to deploy and navigate to a specific location, moor itself on the bottom for up to 10 days, and then return to the point of deployment. The bottom mount mooring is challenging 1 in the presence of currents and limited AUV buoyancy. The system must be deployable by 1-2 persons and withstand up to four knots of current while moored.

8.4.4N SUBTOPIC: Real Time Physical Oceanographic Measurements from Fixed Structures

Measuring and reporting water level, currents, and wave measurements in real time are an important component of NOAA's monitoring systems for promoting safe navigation. Various technologies including acoustics are presently used for measuring these parameters, however this often requires integration of sensors from multiple manufacturers or expensive placement of systems on harbor bottoms in the center portion of a waterway. Often times these instruments are lost due to burial or fishing activity resulting in higher overall costs.

Recent advances in acoustics and signal processing coupled with multi-frequency devices bring new on-board processing opportunities. We seek multiple oceanographic parameters from a single low-cost instrument that can be installed onto a fixed structure in a navigable waterway and provide:

- Two dimensional current measurement in a horizontal plane up to 300 m from instrument placement; and be placed no more than 10 m deep
- Up to 100 discrete velocity cells; and the simultaneous ability to sample in an independent cell
- Water level capability that will meet NOS requirements
- Significant wave height, peak period, and the dominant direction in real time
- Provide an output compatible with NOS requirements
- Be easily retrievable for periodic cleaning and maintenance

8.4.5R SUBTOPIC: Economical Profile Measurements of Winds and Temperatures in the Planetary Boundary Layer

A common yet unmet need in weather observations is spatially and temporally dense measurements of vertical profiles of winds and air temperature in the boundary layer. These measurements would improve aviation safety; improve forecasts of weather, wildfire evolution, and dispersion of plumes of hazardous materials (especially short-term forecasts); aid in renewable energy studies and production; and significantly improve the understanding of boundary layer transfer processes. Current measurements of wind and air temperature come from a network of 69 radiosonde sites across the conterminous US (NWS, 2009a) and a network of 35 Doppler radar wind profilers located in the breadbasket of the US (NWS, 2009b) . Radiosondes are launched every 12 hours from locations as far apart as 500 miles (800 km), making the

information both temporally and spatially very sparse. Doppler radar sites report data every hour from stations spaced about 200 miles (320 km) apart, but the observations typically do not include air temperature and a significant portion of the boundary layer falls below the observations. Other sensors, including sodars and aircraft-mounted instruments, also have significant limitations for measuring boundary layer winds and temperature. The cost and technical limitations of the various existing systems have precluded a spatially and temporally dense network required for the collection of boundary layer data described above. For instance, one approach might be to use a Direct Detection Lidar. These systems usually include 360 degree scanning capability for measuring winds and temperature in a volume, but the cost is too expensive to be considered for wide deployment. Replacing the scanning system with three fixed beams to measure profiles above the instrument at intervals (e.g., every 5 minutes)—instead of continuously in a volume around the instrument—might reduce the technical requirements sufficiently to significantly lower costs. A compelling need clearly exists for a small, mobile, and relatively inexpensive system that can be used reliably for months at a time, even in remote locations, to collect vertical profiles of winds and temperature throughout much of the boundary layer.

References:

NWS, 2009a. http://www.ua.nws.noaa.gov/factsheet.htm
NWS, 2009b. http://www.profiler.noaa.gov/npn/

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 2010-1	CLOSING DATE: January 14, 2010
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 2010-1 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 cost 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 14, 2010.

_____ 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:
National Science Foundation
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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.

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

Reno, NV November 2 – 5, 2009

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