

**THE DEPARTMENT OF HOMELAND SECURITY
SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM**

**PHASE I PROGRAM SOLICITATION FY 09.2
Science and Technology (S&T) Directorate**

Closing Date: July 2, 2009, 4:30pm Eastern Daylight Time (EDT)

Important:

- **Solicitation Number: DHS SBIR-2009.2**
- **May 1, 2009:** Pre-release issued
- **May 18, 2009:** Full Solicitation issued
- **May 18, 2009 through July 2, 2009:** Phase I Proposals Submitted and Accepted
- **July 2, 2009:** Deadline for Submission of Phase I Proposals is **4:30 p.m.** Eastern Daylight Time
- **Susan D. Eicher, Contracting Officer (202-254-2363)**

Classified proposals are not accepted under this DHS S&T Directorate SBIR Solicitation.

Contact with Technical Points of Contact: Please note that contact with the Technical Points of Contact for each topic is limited to 15 days prior to issuance of the full-solicitation.

Deadline for Receipt. *Proposals must be completely submitted and electronically date stamped no later than 4:30 p.m. EDT on July 2, 2009.*

No Printed Solicitation Books. Solicitations are available only in electronic format from the FedBizOpps web site, www.fedbizopps.gov, in accordance with the Government Paperwork Elimination Act (GPEA). For convenience, the Solicitation will be available at <https://www.sbir.dhs.gov> after it is posted on the FedBizOpps website.

Information: If you have questions about the DHS SBIR Program, please submit your questions via email STSBIR.PROGRAM@dhs.gov

About this DHS S&T Directorate SBIR FY 09.2 Solicitation: There are eight (8) topics in this Solicitation.

Notice: For administrative purposes only, submissions to this Solicitation will be handled by a DHS Support Contractor.

TABLE OF CONTENTS

		Page
1.0	SBIR PROGRAM DESCRIPTION	4
1.1	SBIR Introduction.....	4
1.2	SBIR Three Phase Program	4
1.3	SBIR Proposer Eligibility and Limitations	5
1.4	SBIR Research and Analytical Work	6
1.5	SBIR Conflicts of Interest.....	6
1.6	Questions about SBIR Solicitation Topics and Proposal Submission.....	6
1.7	Outreach Conferences and Events	7
2.0	DEFINITIONS.....	7
2.1	Research or Research and Development.....	7
2.2	Small Business Concern	8
2.3	Research Institution	8
2.4	Socially and Economically Disadvantaged Small Business Concern.....	9
2.5	Women-Owned Small Business Concern.....	9
2.6	Funding Agreement	9
2.7	Subcontract	9
2.8	Commercialization.....	9
2.9	Essentially Equivalent Work.....	9
2.10	Historically Black Colleges and Universities/Minority Institutions (HBCU/MI)	10
2.11	Historically Underutilized Business Zone (HUB Zone) Small Business Concern.....	10
2.12	Service-Disabled Veteran	10
2.13	Small Business Concern Owned and Controlled by Service-Disabled Veterans	10
2.14	Small Business Concern Owned and Controlled by Veterans.....	10
2.15	United States	10
2.16	Manufacturing-related R&D as a Result of Executive Order 13329	10
2.17	Energy Independence and Security Act of 2007.....	10
2.18	Foreign National (Foreign Person) means any person who is not:.....	11
3.0	PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS	11
3.1	Proposal Requirements	11
3.2	Administrative and Technical Screening Checklist.....	12
3.3	Proprietary Information	12
3.4	Limitations on Length of Proposal	12
3.5	Phase I Proposal Format	13
3.6	Page Numbering.....	16
3.7	Phase II Proposal Invitation.....	17
3.8	Phase II Proposal Format	17
3.9	False Statements.....	19
3.10	SBIR Phase II Cost Match	19
4.0	METHOD OF SELECTION AND EVALUATION CRITERIA	21
4.1	Introduction.....	21
4.2	Evaluation Criteria - Phase I.....	23
4.3	Evaluation Criteria – Phase II.....	24
4.4	Assessing Commercial Potential of Proposals.....	24
5.0	CONTRACTUAL CONSIDERATIONS	25

5.1	Phase I Awards	25
5.2	Phase II Awards	25
5.3	Phase I Report	26
5.4	Commercialization Updates in Phase II.....	26
5.5	Payment Schedule.....	27
5.6	Markings of Proprietary Proposal Information.....	27
5.7	Copyrights.....	28
5.8	Patents	28
5.9	Technical Data Rights.....	29
5.10	Contractor Commitments.....	29
5.11	Contractor Registration.....	30
5.12	Additional Information	30
6.0	SUBMISSION OF PROPOSALS.....	31
6.1	Electronic Proposal Submission	31
6.2	Proposal Deadline	31
6.3	Notification of Proposal Receipt.....	32
6.4	Information on Proposal Status.....	32
6.5	Evaluation Results	32
6.6	Correspondence Relating to Proposals	32
7.0	SCIENTIFIC AND TECHNICAL INFORMATION ASSISTANCE	32
7.1	SAFETY Act.....	32
7.2	Scientific and Technical Reference	33
7.3	State and Other Assistance Available.....	33
8.0	TECHNICAL TOPICS	33
8.1	SBIR TOPIC NUMBER: H-SB09.2-001	36
8.2	SBIR TOPIC NUMBER: H-SB09.2-002	38
8.3	SBIR TOPIC NUMBER: H-SB09.2-003	40
8.4	SBIR TOPIC NUMBER: H-SB09.2-004	42
8.5	SBIR TOPIC NUMBER: H-SB09.2-005	44
8.6	SBIR TOPIC NUMBER: H-SB09.2-006	46
8.7	SBIR TOPIC NUMBER: H-SB09.2-007	48
8.8	SBIR TOPIC NUMBER: H-SB09.2-008	51

DHS S&T DIRECTORATE SOLICITATION FOR THE SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM

1.0 SBIR PROGRAM DESCRIPTION

1.1 SBIR Introduction

The Department of Homeland Security (DHS) Science & Technology (S&T) Directorate, hereafter referred to as DHS S&T, invites small business concerns to submit proposals under this Solicitation for the Small Business Innovation Research (SBIR) Program. Small business concerns with the capability to conduct research or research and development (R/R&D) in any of the topic areas described in Section 8.0, and commercialize the results of that R&D are encouraged to participate.

Objectives of the DHS S&T SBIR Program include stimulating technological innovation, strengthening the role of small business in meeting research and development needs, fostering and encouraging participation by socially and economically disadvantaged small business concerns in technological innovation, and increasing the commercial application of DHS supported research or R&D results.

The Federal SBIR Program is mandated by Public Laws (PL 97-219, PL 99-443, PL 102-564, PL 106-554, PL 110-235, and PL 111-10). The basic design of the DHS SBIR Program is in accordance with the Small Business Administration (SBA) SBIR Policy Directive, 2002. The SBIR Program presented in this Solicitation encourages scientific and technical innovation in areas specifically identified by the Science and Technology (S&T) Directorate. The guidelines presented in this Solicitation incorporate and exploit the flexibility of the SBA Policy Directive to encourage proposals based on scientific and technical approaches likely to yield results important to DHS and the private sector.

1.2 SBIR Three Phase Program

The DHS S&T FY09.2 SBIR Program Solicitation is issued pursuant to the authority contained in the Small Business Innovation Development Act of 1982, PL 97-219, PL 99-443, PL 102-564, PL 106-554, PL 110-235, and PL 111-10, and as amended by 15 U.S.C. 638. SBIR Policy is provided by the Small Business Administration through the SBA Policy Directive. The purpose of Phase I is to determine, insofar as possible, the scientific, technical, and commercial merit and feasibility of ideas submitted under the SBIR Program. Phase I awards are up to \$100,000 in cost and up to a six-month period of performance. Proposals must concentrate on that research or research and development (R/R&D) which will significantly contribute to proving the scientific, technical, and commercial feasibility of the proposed effort, the successful completion of which is a prerequisite for further DHS support in Phase II. Several different proposed solutions to a given topic may be funded. The measure of Phase I success includes evaluations of the extent to which Phase II results would have the potential to yield a product or process of continuing importance to DHS and/or the private sector. Proposers are encouraged to consider whether the research or research and development they are proposing to DHS also has private sector potential, either for the proposed application or as a base for other applications.

Subsequent Phase II awards will be made to concerns on the basis of results of their Phase I projects and the scientific, technical, and commercial merit of the Phase II Proposal. Phase II

awards are up to \$750,000 in cost, and up to a 24-month period of performance. Phase II is the principal research or research and development effort and is expected to produce a well-defined deliverable prototype. A more comprehensive proposal will be required for Phase II. Further details are provided in Section 3.7 of this Solicitation.

SBIR Phase III refers to work that derives from, extends, or logically concludes effort(s) performed under prior SBIR funding agreements. Phase III is typically oriented towards commercialization of SBIR research or technology. SBIR awardees may seek contracts with the private sector or the Federal government (non-SBIR federal government sources) to further develop or supply goods or services related to the work performed under an entity's SBIR contract(s).

This Solicitation is for Phase I Proposals only. Only proposals submitted in response to this Solicitation will be considered for Phase I awards. Only proposals submitted in response to topics contained in this Solicitation will be accepted and considered for Phase I award. Proposers who were not awarded a contract in response to a prior SBIR solicitation may update or modify and re-submit the same or modified proposal if it is responsive to any of the topics listed in Section 8.0 of this Solicitation.

A separate solicitation will not be issued for Phase II of this SBIR Phase II Program Solicitation, Only those concerns that were awarded Phase I contracts are eligible to participate in Phases II and III.

DHS will select and invite Phase I awardees to submit a Phase II Proposal to maintain the momentum of the Phase I R/R&D and to accomplish an expeditious review leading to a Phase II award. Phase II Proposals shall be submitted online in accordance with Section 6.0 of this Solicitation.

DHS is not obligated to make any awards under either Phases I, II, or III, and all awards are subject to the availability of funds. DHS is not liable for any costs expended by the proposer before award of any contract.

1.3 *SBIR Proposer Eligibility and Limitations*

Each proposer must qualify as a small business for research or research and development purposes as defined in Section 2.0 of this Solicitation and must certify to this on the Cover Sheet of its Proposal. For both SBIR Phases I and II, the primary employment of the principal investigator must be with the small business concern at the time of the award and during the conduct of the proposed effort. Primary employment means that more than one-half of the principal investigator's time is spent with the small business. Primary employment with a small business concern precludes full-time employment at another organization. For both Phase I and Phase II, all research or research and development work shall be performed by the small business concern and its subcontractors in the United States.

Joint ventures and limited partnerships are permitted, provided that the entity created qualifies as a small business in accordance with the Small Business Act, 15 USC 631, and the definition included in Section 2.2 of this Solicitation.

1.4 *SBIR Research and Analytical Work*

a. **For Phase I**, a minimum of two-thirds of the research and/or analytical work shall be performed by the proposing firm unless otherwise approved in writing by the Contracting Officer. The percentage of work is usually measured by both direct and indirect costs for Phase I.

b. **For Phase II**, a minimum of one-half of the research and/or analytical work shall be performed by the proposing firm, unless otherwise approved in writing by the Contracting Officer. The percentage of work is usually measured by both direct and indirect costs for Phase II.

1.5 *SBIR Conflicts of Interest*

Awards made to concerns owned by or employing current or previous Federal Government employees could create conflicts of interest for those employees and could be in violation of federal law. Such proposers should contact the cognizant Ethics Counselor from the employee's Government agency for further guidance.

1.6 *Questions about SBIR Solicitation Topics and Proposal Submission*

- a. **Help Desk.** All questions about this Solicitation, as well as proposal preparation, should be submitted via email to STSBIR.PROPOSALS@dhs.gov. Questions about the electronic submission of proposals should be submitted to the Help Desk toll free number: 1-800-754-3043, or via email to sbirhelp@sainc.com. The Help Desk may be contacted from 8:30 a.m. to 5:00 p.m. EST.
- b. **The DHS SBIR Website.** The DHS SBIR website at <https://www.sbir.dhs.gov> offers electronic access to the SBIR Solicitation, frequently asked questions (FAQs), and answers to FAQs, as well as hyperlinks to other useful information.
- c. **Electronic Proposal Submission.** All Phase I and Phase II Proposals shall be submitted via the electronic submission web site at <http://www.sbir.dhs.gov>. The DHS submission procedure is a four (4) step process before final submission is complete. Upon completion of the cover sheet, technical proposal, and cost proposal, proposers must select "Submit Proposal" for the complete proposal to be electronically date stamped and officially received by the DHS SBIR Program Office. Once the "Submit Proposal," button has been selected, an email confirmation receipt will be forwarded to your email account upon successful submission of your proposal.
- d. **General Questions about the DHS SBIR Program.** General questions pertaining to the DHS SBIR Program should be submitted to STSBIR.PROGRAM@dhs.gov or by calling the DHS SBIR Program contact: Ms. Elissa I. Sobolewski, SBIR Program Director, 202-254-6768.
- e. **Technical Questions about Solicitation Topics.** From May 1, 2009 through May 15, 2009, this Solicitation is issued for pre-release on the Federal Business Opportunities (FedBizOpps) web site (www.fedbizopps.gov) and the DHS SBIR web site

(<https://www.sbir.dhs.gov>) with the names of the Technical Point of Contact for each technical topic. During the period May 1, 2009 through May 15, 2009, proposers have an opportunity to contact Technical Points of Contact by telephone or by email to ask technical questions about specific technical topics. Questions should be limited to specific information related to improving the understanding of a particular topic's requirements. If information given in response to a question is deemed necessary for the preparation of proposals, that information will be made available via an updated topic description(s). Proposers may not ask for advice or guidance on its solution approach, nor submit additional material to the Technical Points of Contact.

No further direct contact between proposers and Technical Points of Contact shall occur from May 18, 2009 through July 2, 2009 for reasons of competitive fairness. However, proposers may submit written questions to STSBIR.PROPOSALS@dhs.gov. Questions may be limited to technical information related to improving the understanding of a particular topic's requirements; any other questions, such as those asking for advice or guidance on solution approach, will not receive a response.

If information given in response to a question is deemed necessary for the preparation of proposals, that information will be made available to the public for general viewing on the FedBizOpps website at <http://fedbizopps.gov> and on the DHS website at <https://www.sbir.dhs.gov>.

- f. **All proposers are advised to monitor the <http://www.fedbizopps.gov> and <https://www.sbir.dhs.gov> websites during the solicitation period for questions and answers and other information relevant to the topic under which they are proposing.**

1.7 *Outreach Conferences and Events*

The DHS S&T SBIR Program participates in the National SBIR Conferences held each year and in many state-organized conferences for small business. For information on these events, visit the website, <https://www.sbir.dhs.gov> located under "What's New," or refer to the <http://www.sbir.gov> web site for upcoming SBIR outreach events. The DHS Program Office encourages small disadvantaged, women-owned, veteran-owned, service-disabled veteran-owned and other socially and economically disadvantaged small businesses to participate.

2.0 *DEFINITIONS*

The following definitions apply for the purposes of this Solicitation:

2.1 *Research or Research and Development*

Any activity that is:

- a. **Basic Research.** Scientific study and experimentation to provide fundamental knowledge required for the solution of problems.

- b. **Exploratory Development.** A study, investigation or minor development effort directed toward specific problem areas with a view toward developing and evaluating the feasibility and practicability of proposed solutions.
- c. **Advanced Development.** Proof of design efforts directed toward projects that have moved into the development of hardware for test.
- d. **Engineering Development.** Full-scale engineering development projects for DHS or first responder use but which have not yet received approval for production.

2.2 *Small Business Concern*

A small business concern is one that, on the date of award for both Phase I and Phase II funding agreements, meets all of the following criteria:

- a. Is 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. Is 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 foreign business entities in the joint venture;
- c. Is (1) at least 51 percent owned and controlled by one or more individuals who are citizens of the United States or permanent resident aliens in the United States, (2) at least 51% owned and controlled by another business concern that is itself at least 51% owned and controlled by individuals who are citizens of, or permanent resident aliens in the United States; or (3) a joint venture in which each entity to the venture must meet the requirements of either (1) or (2) of this section; and
- d. Has, including its affiliates, not more than 500 employees..

Control can be exercised through common ownership, common management, and contractual relationships. The term "affiliates" is defined in greater detail in 13 CFR 121.103. The term "number of employees" is defined in 13 CFR 121.106.

A business concern may be in the form of an individual proprietorship, partnership, limited liability company, corporation, joint venture, association, trust, or cooperative. Further information may be obtained at <http://sba.gov/size>, or by contacting the Small Business Administration's Government Contracting Area Office or Office of Size Standards.

2.3 *Research Institution*

A Research Institution is any organization located in the United States that is:

- a. A university;
- b. A nonprofit institution as defined in section 4(5) of the Stevenson-Wydler Technology Innovation Act of 1980; or
- c. A contractor-operated federally funded research and development center (FFRDC), as identified by the National Science Foundation in accordance with the government-wide Federal Acquisition Regulation issued in accordance with section 35(c)(1) of the Office of

Federal Procurement Policy Act. (See <http://www.nsf.gov/statistics/ffrdc/> for a list of eligible FFRDCs.)

2.4 *Socially and Economically Disadvantaged Small Business Concern*

A socially and economically disadvantaged small business concern is one that is at least 51% owned and controlled by one or more socially and economically disadvantaged individuals, or an Indian tribe, including Alaska Native Corporations (ANCs), a Native Hawaiian Organization (NHO), or a Community Development Corporation (CDC). Control includes both the strategic planning (as that exercised by boards of directors) and the day-to-day management and administration of business operations. See 13 CFR 124.109, 124.110, and 124.111 for special rules pertaining to concerns owned by Indian tribes (including ANCs), NHOs or CDCs, respectively.

2.5 *Women-Owned Small Business Concern*

A women-owned small business is one that is at least 51 percent owned and controlled by one or more women, or in the case of a publicly owned business, at least 51 percent of the stock of which is owned by women, and who also control and operate it. "Control" in this context means exercising the power to make policy decisions. "Operate" in this context means being actively involved in the day-to-day management of the business.

2.6 *Funding Agreement*

Any contract, or grant, or cooperative agreement entered into between any Federal Agency and any small business concern for the performance of experimental, developmental, or research work funded in whole or in part by the Federal Government.

2.7 *Subcontract*

A subcontract is any agreement, other than one involving an employer-employee relationship, entered into by an awardee of a funding agreement calling for supplies or services for the performance of the original funding agreement. This includes consultants. See Section 3.5.b (9) of this Solicitation.

2.8 *Commercialization*

Commercialization is the process of developing marketable products or services and delivering products or services for sale (whether by the originating party or by others) to Government or commercial markets.

2.9 *Essentially Equivalent Work*

This occurs when (1) substantially the same research is proposed for funding in more than one contract proposal or grant application submitted to the same Federal agency; (2) substantially the same research is submitted to two or more different Federal agencies for review and funding consideration; or (3) a specific research objective and the research design for accomplishing an objective are the same or closely related in two or more proposals or awards, regardless of the funding source.

2.10 *Historically Black Colleges and Universities/Minority Institutions (HBCU/MI)*

Listings for the Historically Black Colleges and Universities (HBCU) and Minority Institutions (MI) are available through the Department of Education website, <http://www.ed.gov/about/offices/list/ocr/edlite-minorityinst.html>.

2.11 *Historically Underutilized Business Zone (HUBZone) Small Business Concern*

HUB Zone small business concern means a small business concern that appears on the List of Qualified HUB Zone Small Business Concerns maintained by the Small Business Administration. See <https://eweb1.sba.gov/hubzone/internet/general/approved-firms.cfm> for more details.

2.12 *Service-Disabled Veteran*

A veteran with a disability that is service connected as defined in Section 101 (16) of Title 38, United States Code.

2.13 *Small Business Concern Owned and Controlled by Service-Disabled Veterans*

A small business concern that:

- a. not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and
- b. the management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a veteran with permanent and severe disability, the spouse or permanent caregiver of such a veteran.

2.14 *Small Business Concern Owned and Controlled by Veterans*

A small business concern that:

- a. not less than 51 percent of which is owned by one or more veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more; and
- b. the management and daily business operations of which are controlled by one or more veterans.

2.15 *United States*

"United States" means the fifty states, the territories and possessions of the Federal Government, the Commonwealth of Puerto Rico, the Republic of the Marshall Islands, the Federated States of Micronesia, the Republic of Palau, and the District of Columbia.

2.16 *Manufacturing-related R&D as a Result of Executive Order 13329*

Manufacturing-related R&D as a result of Executive Order 13329 relates to: (i) manufacturing processes, equipment and systems; or (ii) manufacturing workforce skills and protection.

2.17 *Energy Independence and Security Act of 2007*

On December 19, 2007, the President signed into Law the “Energy Independence and Security Act of 2007” which allows preference to be given to proposals that address research for renewable energy or energy efficiency.

2.18 Foreign National (Foreign Person) means any person who is not:

- a. a citizen or national of the United States; or
- b. a lawful permanent resident; or
- c. a protected individual as defined by 8 U.S.C.1324b(a)(3).

"Lawful permanent resident" is a person having the status of having been lawfully accorded the privilege of residing permanently in the United States as an immigrant in accordance with the immigration laws and such status not having changed.

"Protected individual" is an alien who is lawfully admitted for permanent residence, is granted the status of an alien lawfully admitted for temporary residence under 8 U.S.C. 1160(a) or 8 U.S.C.1255a(a)(1), is admitted as a refugee under 8 U.S.C.1157, or is granted asylum under section 8 U.S.C.1158; but does not include (i) an alien who fails to apply for naturalization within six months of the date the alien first becomes eligible (by virtue of period of lawful permanent residence) to apply for naturalization or, if later, within six months after November 6, 1986, and (ii) an alien who has applied on a timely basis, but has not been naturalized as a citizen within two (2) years after the date of the application, unless the alien can establish that the alien is actively pursuing naturalization, except that time consumed in the Service's processing the application shall not be counted toward the 2-year period.

3.0 PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

3.1 Proposal Requirements

A proposal to any topic under the DHS S&T SBIR Program must provide sufficient information to persuade the Science and Technology Directorate, that the proposed work represents an innovative approach to the investigation of an important scientific or engineering problem and is worthy of support under the stated criteria. The proposed research or research and development must be responsive to the chosen topic, although need not use the exact approach specified in the topic (see Section 4.1 of this Solicitation). Any small business contemplating a proposal for work on any specific topic shall determine that (a) the technical approach has a reasonable chance of meeting the topic objective, (b) this approach is innovative, not routine, with commercial application, and (c) the company has the capability to implement the technical approach, i.e., has or can obtain people and equipment suitable to the task.

Classified proposals will not be accepted under this DHS S&T SBIR Solicitation and will be appropriately destroyed upon receipt.

3.2 *Administrative and Technical Screening Checklist*

Read and follow all instructions contained in this Solicitation. All proposals that fail to address the following items will be considered "non-responsive" to this Solicitation and will not be evaluated.

- a. Submit your proposal electronically via the website (<https://www.sbir.dhs.gov>) and prepare your SBIR Proposal as instructed on the website. A complete Proposal consists of the Proposal Cover Sheets, Technical Proposal and Cost Proposal. Your Proposal is not a complete submission unless it has been finalized within the electronic submission system. You will receive email confirmation that your proposal has been submitted. If you do not receive an email, contact the Help Desk or the SBIR Program as instructed in Section 1.6 of this Solicitation.
- b. The proposal adheres to the topic criteria and the proposal cost adheres to the funding thresholds specified in this Solicitation. The cost on the cover sheets matches the cost on the Cost Proposal.
- c. The Project Summary on the cover sheets contains NO proprietary information. In the event of an award, this project summary will be posted at <http://www.sbir.dhs.gov>. Mark proprietary information within the Technical Proposal as instructed in Section 5.6 of this Solicitation.
- d. The content in the Technical Proposal, including supporting data (if applicable), must include all of the items in Section 3.5(b) of this Solicitation in the order specified.
- e. The header on each page of your Technical Proposal must contain your company name, topic number, and proposal number. (The header may be included in the one-inch margins.)
- f. Limit your proposal to the page limitations established for Phase I and/or Phase II proposals.
- g. Use a type size no smaller than a 12-point font on standard 8 1/2 " X 11" paper with one (1) inch margins
- h. The Technical Proposal must not be in two-column format.

Note: Public access to the internet is available at most public libraries, local schools or a Small Business Development Center (SBDC) in your area.

3.3 *Proprietary Information*

If information is provided that the proposer believes constitutes a trade secret, proprietary commercial or financial information, or personal information or data, it will be treated in confidence to the extent permitted by law, provided that it is clearly marked in accordance with Section 5.6 of this Solicitation.

3.4 *Limitations on Length of Proposal*

This Solicitation is designed to reduce the investment of time and cost to small business concerns in preparing a formal proposal. Those who wish to respond must submit a direct, concise, and informative research or research and development proposal of no more than the page limitations established for Phase I and/or Phase II Proposals, including proposal cover sheets and cost

proposal. Promotional and non-project related discussion is discouraged. The space allocated to each section will depend on the problem chosen and the principal investigator's approach. In the interest of fairness, pages in excess of the Phase I, 25-page limitation (and Phase II, 50-page limitation) (including attachments, appendices, or references) will not be considered for review or award.

3.5 *Phase I Proposal Format*

The Phase I Proposal length is limited to 25 pages.

- a. **Proposal Cover Sheets.** Prepare the Proposal Cover Sheets (as provided on the electronic submission website <https://www.sbir.dhs.gov>), including a brief technical abstract of the proposed R&D project and a discussion of anticipated benefits and potential commercial applications. Once you save the cover sheets, the system will assign a proposal number. You may edit the cover sheets as often as necessary until the Solicitation closes. Your cover sheets will count as the first two pages of your proposal, no matter how they print out. If your proposal is selected for award, the technical abstract and discussion of anticipated benefits will be publicly released on the DHS S&T SBIR website; therefore, do not include proprietary or classified information in these sections.
- b. **Technical Proposal.** Create a single file that covers the following items in the order given below. Begin your Technical Proposal on Page 3 (since the cover sheets are pages 1 and 2) and put your company name, topic number, and proposal number in the header of each page. (The header may be included in the one-inch margins.) The Technical Proposal file must be in Portable Document Format (PDF) for evaluation purposes. You cannot upload the Technical Proposal to the DHS S&T submission website until you have created the cover sheets and have been assigned a proposal number. Perform a virus check before uploading the Technical Proposal file. If a virus is detected, it may cause rejection of the proposal. The Technical Proposal must be a single file, including graphics and attachments. **Do not lock or encrypt the file you upload.**
 - (1) **Identification and Significance of the Problem or Opportunity.** Define the specific Technical Problem or opportunity addressed and its importance. (Begin on Page 3 of your Proposal.)
 - (2) **Phase I Technical Objectives.** Enumerate the specific objectives of the Phase I work, including the questions it will try to answer to determine the feasibility of the proposed approach.
 - (3) **Phase I Work Plan.** Provide an explicit, detailed description of the Phase I approach. The Plan must indicate what is planned, how, when, and where the work will be carried out, a schedule of major events, the final product to be delivered, and the completion date of the effort. The Phase I effort must determine the technical feasibility of the proposed concept. The methods planned to achieve each objective or task must be discussed explicitly and in detail. This Section must be a substantial portion of the total proposal.
 - (4) **Related Work.** Describe significant activities directly related to the proposed effort, including any conducted by the principal investigator, the proposing firm, consultants, or others. Describe how these activities interface with the proposed project and discuss

- any planned coordination with outside sources. The proposal must persuade reviewers of the proposer's awareness of the state-of-the-art in the specific topic. Describe previous work not directly related to the proposed effort but similar. Provide the following: (a) short description, (b) client for which work was performed (including individual to be contacted and phone number), and (c) date of completion.
- (5) **Relationship with Future Research or Research and Development.** (a) State the anticipated results of the proposed approach, assuming project success. (b) Discuss the significance of the Phase I effort in providing a foundation for Phase II research or research and development effort.
- (6) **Commercialization Strategy.** Describe, in approximately two (2) or more pages, your company's strategy for commercializing this technology in the DHS, other Federal Agencies, and/or private sector markets. Provide specific information on the market need the technology will address and the size of the market. Also, include a schedule showing the quantitative commercialization results from this SBIR Project that your company expects to achieve and when (i.e., amount of additional investment, sales revenue, etc.).
- (7) **Key Personnel.** Identify key personnel who will be involved in the Phase I effort including information on directly related education and experience. A concise resume of the principal investigator, including a list of relevant publications (if any), must be included. All resumes will count toward the 25-page limitation. In addition to Key Personnel, identify any non-U.S. citizen(s) that you expect to be involved on this project, their country of origin and level of involvement.
- (8) **Facilities/Equipment.** Describe available instrumentation and physical facilities necessary to carry out the Phase I effort. Items of equipment to be purchased (as detailed in the Cost Proposal) must be justified under this Section. Also, state whether or not the facilities where the proposed work will be performed meet environmental laws and regulations of federal, state (name), and local governments for, but not limited to, the following groupings: airborne emissions, waterborne effluents, external radiation levels, outdoor noise, solid and bulk waste disposal practices, and handling and storage of toxic and hazardous materials.
- (9) **Subcontractors/Consultants.** Involvement of a university or other subcontractors or consultants in the project may be appropriate (see Section 2.3 of this Solicitation). If such involvement is intended, it must be described in detail and identified in the Cost Proposal. A minimum of two-thirds of the research and/or analytical work in Phase I, as measured by direct and indirect costs, must be carried out by the proposing small business concern, unless otherwise approved in writing by the Contracting Officer. No portion of an SBIR award may be subcontracted back to any Federal Government Agency or Federally Funded Research and Development Centers (FFRDCs). SBA may issue a case-by-case waiver to this provision after review of the DHS written justification that includes the following information: (a) an explanation of why the SBIR research project requires the use of the Federal/FFRDC facility or personnel, including data that verifies the absence of non-federal facilities or personnel capable of supporting the research effort; (b) why the Agency will not and cannot fund the use of the Federal/FFRDC facility or personnel for the SBIR Project with non-SBIR money;

and (c) the concurrence of the small business concern's chief business official to use the Federal/ FFRDC facility or personnel. Award is contingent on the Sponsoring Agency obtaining a waiver.

- (10) **Prior, Current, or Pending Support of Similar Proposals or Awards.** *Warning --* While it is permissible, with proposal notification, to submit identical proposals or proposals containing a significant amount of essentially equivalent work (see Section 2.9 of this Solicitation) for consideration under numerous Federal Program Solicitations, it is unlawful to enter into contracts or grants requiring essentially equivalent effort. If there is any question concerning this, it must be disclosed to the soliciting agency or agencies before award.

If a proposal submitted in response to this Solicitation is substantially the same as another proposal that has been funded, is now being funded, or is pending with another Federal Agency, the proposer must so indicate on the Proposal Cover Sheet and provide the following information:

- (a) Name and address of the Federal Agency(s) to which a proposal was submitted, will be submitted, or from which an award is expected or has been received.
- (b) Date of proposal submission or date of award.
- (c) Title of Proposal.
- (d) Name and title of principal investigator for each proposal submitted or award received.
- (e) Title, number, and date of Solicitation(s) under which the proposal was submitted, will be submitted, or under which award is expected or has been received.
- (f) If award was received, state contract number.
- (g) Specify the applicable topics for each SBIR Proposal submitted or award received.

Note: If Section 3.5.b (10) of this Solicitation does not apply, state in the Proposal "No prior, current, or pending support for proposed work."

- c. **Cost Proposal.** Complete the Cost Proposal in the format shown in the Cost Breakdown Guidance, using the online Cost Proposal Form on the electronic submission web site. Some items in the Cost Breakdown Guidance at <https://www.sbir.dhs.gov/reference/DHS%20SBIRSTTR%20COST%20PROPOSAL%20BREAKDOWN%20ITEMS%20GUIDANCE.pdf> may not apply to the proposed project. If such is the case, there is no need to provide information on each and every item. What matters is that enough information be provided to allow DHS to understand how the proposer plans to use the requested funds if the contract is awarded. Note: there is a 20-minute timeout limit for entering cost proposal data via the electronic submission system. You may want to peruse the Cost Breakdown Guidance prior to initiating your Cost Proposal.

- (1) List all key personnel by name as well as by number of hours dedicated to the project as direct labor.
- (2) Special tooling and test equipment and material cost may be included under Phases I and II. The inclusion of equipment and material will be carefully reviewed relative to need and appropriateness for the work proposed. The purchase of special tooling and test equipment must, in the opinion of the Contracting Officer, be advantageous to the Government and should be related directly to the specific topic. These may include such items as innovative instrumentation and/or automatic test equipment. Title to property furnished by the Government or acquired with Government funds will be vested with DHS unless it is determined that transfer of title to the contractor would be more cost effective than recovery of the equipment by DHS.
- (3) Cost for travel funds must be justified and related to the needs of the project. DHS requests that you budget, as a minimum, travel to attend a one day meeting with Science & Technology Directorate program management personnel. Reasonable travel costs may include this one day meeting. This meeting may consist of a Phase I Kick-Off meeting or a presentation of your project findings to your Phase I Program Manager. Travel will typically be performed at the beginning of your Phase I award or at the conclusion of the Phase I effort; depending on the Science & Technology Directorate Program Manager's determination.
- (4) Cost sharing is permitted for proposals under this Solicitation; however, cost sharing will not be considered nor will it be an evaluation factor in the consideration of a Phase I Proposal.
- (5) The Cost Proposal template on the electronic submission web site is required to complete the Cost Proposal. If additional Cost Proposal information is required, it may be placed at the end of your Technical Proposal (and included in the page count limitation).

If applicable, a brief explanation of cost estimates for equipment, materials, and consultants or subcontractors can be placed in the comment section of the Cost Proposal. However, when a proposal is selected for award, the proposer must be prepared to submit further documentation to the Contracting Officer to substantiate costs (e.g., a brief explanation of cost estimates for equipment, materials, and consultants or subcontractors).

The Cost Proposal will count as one page of your proposal no matter how it prints out. For more information about cost proposals and accounting standards, see the DCAA publication called "Information for Contractors" available at <http://www.dcaa.mil>.

3.6 Page Numbering

Number all pages of your proposal consecutively. The cover sheets are pages 1 and 2. The Technical Proposal begins on page 3.

3.7 *Phase II Proposal Invitation*

This Solicitation is for Phase I only. A Phase II Proposal can be submitted only by a Phase I awardee and only in response to a request from the Contracting Officer. DHS S&T Directorate Program Managers for the applicable topic may recommend that Phase I participants be invited to submit Phase II Proposals based upon site visits, the monthly and/or final reports, and progress made towards the accomplishment of Phase I technical objectives and plans for Phase II. Not all Phase I participants will be invited to submit a Phase II Proposal. The number of Phase II Proposal invitations will depend upon the number of Phase I awards made in the topic, the availability of funding, and the quality of the Phase I research. DHS reserves the right to invite all, some, or none of the Phase I awardees in a topic to submit Phase II Proposals.

The DHS S&T SBIR Program may recommend to a Contracting Officer that a Phase I contractor be invited to submit a Phase II Proposal, beginning no earlier than two thirds (2/3) into the Phase I period of performance (DHS S&T's SBIR Jump Start feature). (*Example: four months into a six month period of performance.*) While some Phase II invitations will be made prior to completion of the Phase I period of performance, funding is reserved for those deserving Phase I projects that require the maximum period of performance to complete the Phase I effort. DHS will evaluate each Phase II Proposal when received, and if the proposal is deemed to be highly rated, will enter into negotiations for award. The goal is to accelerate the technology development and reduce, or eliminate, the gap between the Phase I and Phase II efforts.

An invitation to submit a Phase II Proposal is the onset of the Phase II review process and is not a commitment for award. An invitation to submit a Phase II Proposal does not qualify as a Phase II award; each Phase II Proposal must meet the SBIR Phase II criteria in this Solicitation, as well as undergo the DHS source selection process. Phase II Proposals must be received no later than 45 days from the Phase II invitation status notification.

Phase I awardees that do not receive an invitation to submit a Phase II Proposal may submit a Phase II Proposal. However, non-invited Phase I awardees may conclude that DHS assessed the accomplishments of the Phase I effort and determined it did not demonstrate further consideration beyond the Phase I funding level.

All Phase I awardees not invited under the Jump Start feature will be notified of Phase II invitation status after the Phase I period of performance has been completed.

3.8 *Phase II Proposal Format*

As discussed previously, a separate solicitation will not be issued for Phase II. These proposals instructions are provide as information only for those organizations who may receive a Phase I proposal and be invited to submit a Phase II proposal. Phase II Proposal is limited to 50 pages, using a type size no smaller than a 12-point font on standard 8 ½ X 11" paper with one (1) inch margins. Two-column format is not allowed.

- a. **Each Phase II Proposal** must contain Proposal Cover Sheets, a Technical Proposal, Cost Proposal and Company Commercialization report, if applicable. See Section 3.8 (d) of this Solicitation. In addition, each Phase II Proposal must contain approximately two or more pages of a Commercialization Strategy in the Technical Proposal.

b. Commercialization Strategy

1. What is the first product that this technology will go into?
2. Who will be your customers, and what is your estimate of the market size?
3. How much money will you need to bring the technology to market, and how will you raise that money?
4. Does your company contain marketing expertise and, if not, how do you intend to bring that expertise into the company?
5. Who are your competitors, and what is your price and/or quality advantage over your competitors?

The Commercialization Strategy must also include a schedule showing the quantitative results from the Phase II project that your company expects to report in its Company Commercialization Report Updates one year after the start of the Phase II, at the completion of Phase II, and after the completion of Phase II (i.e., amount of additional investment, sales revenue, etc. – see Sections 4.4 and 5.4 of this Solicitation).

- c. Cost Match.** Proposers that request Phase II Cost Match funding have an opportunity in the Commercialization Strategy to present the compelling value of the proposed Phase II Project. The Commercialization Strategy should provide qualitative and quantitative information directly related to the Cost Matching; explaining the improved time interval or acceleration between the completion of Phase I work and the of launching of the innovative products, processes, or services into the marketplace. Additional Phase II Cost Match guidance can be found in Section 3.10 of this Solicitation

d. Company Commercialization Report

For those concerns that have received prior SBIR Phase II funding, a succinct Commercialization Report must be included with the Proposal. The Company Commercialization Report is submitted online in accordance with Section 3.8 (a) of this Solicitation. The following are examples of company commercialization data expected in the Commercialization Report. Additional Commercialization Reporting requirements and Commercialization Update requirements can be found in Sections 4.4 and 5.4 of this Solicitation.

1. Any business concern or subsidiary established for the commercial application of a product or service for which an SBIR award is made.
2. Revenue from the sale of new products or services resulting from the research conducted under each Phase II award;
3. Additional investment from any source, other than Phase I or Phase II awards, to further the research and development and/or commercialization conducted under each Phase II award.

4. Whether the Phase II technology has been used in a fielded DHS system or acquisition program, and, if so, which system or program.
5. The number of patents resulting from the contractor's participation in the SBIR Program.
6. Whether the company has completed an initial public offering (IPO) of stock resulting, in part, from the Phase II Project.

Update the information in the Company Commercialization Report for any prior Phase II award received by the company. The company may apportion sales or additional investment information relating to more than one Phase II award among those awards, if it notes the apportionment for each award.

3.9 *False Statements*

Knowingly and willfully making any false, fictitious, or fraudulent statements or representations, may be a felony under the False Statement Act (18 U.S.C. §1001), punishable by a fine of up to \$10,000, up to five years in prison, or both.

3.10 *SBIR Phase II Cost Match*

- a. **General Provisions of the DHS SBIR Cost Match Feature.** The DHS SBIR Program has implemented a Cost Match Feature for SBIR projects to attract matching cash from an outside investor for the Phase II SBIR effort. The purpose is to focus SBIR funding on those projects that are most likely to be developed into viable new products that DHS and others will buy and that will thereby make a major contribution to homeland security and/or economic capabilities. The cost match can occur at the time of award, or during the Phase II period of performance.

Outside investors may include such entities as another company, a venture capital firm, an individual investor, or a non-SBIR government program; they do not include the owners of the small business, their family members, and/or affiliates of the small business. The outside investors must commit a minimum of \$100,000 up to a maximum of \$500,000 in order to be considered for DHS S&T SBIR cost match. DHS will, at its option, match up to 50% of funds received. The SBIR Phase II basic awards will be made for a maximum of \$750,000 and the cost match award will be made for a maximum of \$250,000. The total cumulative SBIR funding for the Phase II award plus DHS cost match cannot exceed \$1,000,000. Outside investors may contribute funding above the \$1,000,000 cost match ceiling, however, DHS SBIR will only match 50% up to the \$250,000 maximum.

The additional work proposed should be an expansion of the technical work being performed in the Phase II project and must fall within the general scope of the present Phase II project.

- b. **How to Qualify for the SBIR Phase II Cost Match.** To qualify for the SBIR Cost Match feature, a company must be a Phase I awardee submitting a Phase II Proposal or a

Phase II awardee. The company is encouraged to discuss the application with their SBIR Program Manager and the DHS SBIR Program Director. The awardee is to follow Phase II Proposal instructions and guidance, but provide the cost match documentation and request for matched funding.

1. A Phase II Proposal must be submitted electronically on the DHS Electronic Submission website (<https://www.sbir.dhs.gov>).
2. The proposing company must:
 - a. State that the outside investor will match funding in the SBIR Phase II proposal, in cash, and state the amount of the outside investment, contingent on the company's selection for Phase II award.
 - b. Certify that the outside funding proposed in the application qualifies as a Cost Match investment, and the investor qualifies as an "outside investor," as defined above.
 - c. Provide a brief statement (less than one page) describing that portion of the effort that the investor will fund. The investor's funds may pay for additional research and development on the company's SBIR project or, alternatively, they may pay for other activities not included in the Phase II Statement of Work, provided these activities further the development and/or commercialization of the technology (e.g., marketing).
 - d. Provide qualitative and quantitative information reflecting any additional Period of Performance to complete the new or expanded effort. Provide a concise Statement of Work for the Cost Match effort (less than four pages) and detailed Cost Proposal (less than one page).
3. The outside investor must provide:
 - a. A brief statement describing the investor's experience in evaluating companies' abilities to successfully commercialize technology, the investor's assessment of the market for this particular SBIR technology, and of the ability of the company to bring this technology to market.
 - b. A letter of commitment, signed by the investor(s), containing a commitment to provide a minimum of \$100,000 or up to \$500,000 Phase II Cost Match funding, in cash, contingent on the company's selection or performance of the Phase II award. An investor may contribute above the \$500,000 Phase II Cost Match; however Government matching funds will not exceed 50% up to the \$250,000 maximum.
4. The Transfer of Investor Funding:

The company shall certify within 60 days that the entire amount of the matching funds from the outside investor has been transferred to the company. The Certification consists of a letter, signed by both the company and its outside investor, stating that "\$_____ in cash has been transferred to our company from our outside investor in accord with the SBIR Cost Match procedures." The letter must be sent to a DHS appointed Contracting Officer, along with a copy of the company's bank statement showing the funds have been deposited. The transfer of investor funds from another Government agency will be coordinated with the DHS SBIR designated Contracting Officer. **IMPORTANT:** If the Contracting Officer does not receive this certification showing the transfer of funds within 60 days, the company will be ineligible to compete for Phase II Cost Match funding, unless a specific written exception is granted by the DHS SBIR Program Director.

Failure to meet these conditions in their entirety and within the time frames indicated may disqualify a company from participating in the SBIR Cost Match. DHS maintains the right to award some, all, or none of the Phase II Cost Match requests. Phase II Cost Match funding is contingent upon the number of applications, availability of funds, and proper certification of investor funds.

c. Additional Reporting Requirement.

In the company's final Phase II Progress Report, a brief accounting must be included (in the company's own format or format that has been provided by the DHS PM) of how the investor's funds were expended to support the project.

4.0 METHOD OF SELECTION AND EVALUATION CRITERIA

4.1 Introduction

SBIR Proposals will be processed and distributed to the appropriate technical program manager within DHS for evaluation and action. DHS Program Managers may seek technical advice from Federal Government employees and/or from technical and business experts who may be non-Federal Government employees. In all cases, evaluators and advisors will be required to sign Certificates of Non-Disclosure and Statements of Financial Interest and will receive training regarding Procurement Integrity and conduct required during the Source Selection process. Non-Government personnel may be used to handle the administrative functions for the SBIR Program. The support contractors will be bound by appropriate non-disclosure agreements to protect proprietary and source-selection information. They will not be permitted to release any source selection information to third parties, including others in their organization. DHS will select proposals for funding based on technical merit and the evaluation criteria contained in this Solicitation document.

Phase I SBIR Proposals will be evaluated on a competitive basis and will be considered to be binding for six (6) months from the date of closing of this Solicitation unless the proposer states otherwise. If selection has not been made prior to the proposal's expiration date, proposers may be asked to extend their proposal for an additional period of time. Proposals meeting stated

Solicitation requirements will be evaluated by scientists and/or engineers knowledgeable in the topic area. A proposal that meets the goals of a solicitation topic but does not use the exact approach specified in the topic will be considered relevant. (Prospective proposers shall contact the DHS SBIR Program as described in Section 1.6 of this Solicitation to determine whether submission of such a proposal would be useful.)

Proposals will be evaluated using the criteria listed in Section 4.2 of this Solicitation (and Section 4.3 of this Solicitation for Phase II). Final decisions will be made based upon these criteria and consideration of other factors including possible duplication of other work and program balance. In the evaluation and handling of proposals, every effort will be made to protect the confidentiality of the proposal and any evaluations. There is no commitment by DHS to make any awards on any topic, to make a specific number of awards, or, to be liable for any costs expended by the proposer prior to award of any contract.

For proposals that have been selected for contract award, a Contracting Officer will prepare a contract to be signed by both parties before work begins. Any negotiations that may be necessary will be conducted between the proposer and the Contracting Officer. It should be noted that only a duly appointed Contracting Officer has the authority to enter into a contract on behalf of the U.S. Government.

Prior to receiving a contract award, the proposer must be registered in the Central Contractor Registration (CCR) database. For information regarding registration, call 1-888-227-2423 or visit <http://www.ccr.gov>.

Phase II Proposals will be subject to a technical review process similar to Phase I. Final decisions will be made by the DHS Source Selection Authority (SSA) based upon the scientific and technical evaluations and other factors, including a commitment for Phase III follow-on funding, the possible duplication with other research or research and development, program balance, budget limitations, and the potential of a successful Phase II effort leading to a product of continuing interest to DHS. DHS is not obligated to make any awards under Phase II, and all awards are subject to the availability of funds. DHS is not liable for any costs expended by the proposer prior to award of a contract.

Upon written request and after final award decisions have been announced, evaluation results will be provided to unsuccessful proposers on their Phase I and Phase II Proposals (see Section 6.4 of this Solicitation).

Restrictive notices notwithstanding, Phase I and Phase II Proposals may be handled, for administrative purposes only, by support contractors. All support contractors will be subject to the terms of their signed non-disclosure agreements.

Phase I and Phase II Proposals will be evaluated for strengths, weaknesses, and deficiencies using the following definitions:

- a. Strength - An aspect of a proposal that benefits the Government in terms of the quality of the Proposer's performance, cost effectiveness, or reduced risk and is expected to contribute to successful contract performance.

- b. Weakness - A flaw in the proposal that increases the risk of unsuccessful contract performance. A "significant weakness" in the proposal is a flaw that appreciably increases the risk of unsuccessful contract performance.
- c. Deficiency - A material failure of a proposal to meet a Government requirement or a combination of significant weaknesses in a proposal that increases the risk of unsuccessful contract performance to an unacceptable level.

The following adjectival ratings will be used in the evaluation of Phase I and Phase II Proposals:

Excellent: A convincing demonstration that all SBIR FY 09.2 requirements are met or exceeded by the proposer's display of the highest levels of innovation, technical competence, personnel expertise, and potential for commercialization. The proposal fully and completely meets the expectations and sets forth plans and approaches that show a high probability of meeting DHS' S&T Directorate requirements. Proposals in this category are strongly recommended for funding. Has strengths that will significantly benefit the Government.

Very Good: Approaches and planning considerations demonstrate that the proposer is able to interpret goals and project them clearly into concise plans. Proposer demonstrates an awareness of the subtle interactions influencing system design; technical and planning efforts show strong promise of meeting DHS' S&T Directorate requirements. Proposals in this category are recommended for funding. Has one or more strengths that will benefit the Government.

Good: Plans and approaches are provided to the extent requested, and key or pivotal points have been satisfactorily addressed in the proposal. The proposer has presented an orderly plan to meet the stated goals, but the proposal does not necessarily demonstrate any exceptional features, innovations, or originality. The technical analyses satisfactorily meet requirements and are technically correct. Funding of proposals in this category is dependent on availability of funds. Few or no strengths.

Fair: The proposal indicates a shallow understanding of the problem. The technical analyses only marginally meet the goals, and the proposer fails to demonstrate a reasonable probability of successfully performing the desired task or commercializing the resulting product. Funding of proposals in this category is dependent on availability of funds.

Unacceptable: Does not meet the SBIR FY 09.2 criteria. Not recommended for funding.

4.2 *Evaluation Criteria - Phase I*

DHS plans to select for award those Proposals offering the best value to the Government and the Nation considering the following factors in decreasing order of importance:

- a. The soundness, technical merit, and innovation of the proposed approach and its incremental progress toward topic or subtopic solution.
- b. The qualifications of the proposed principal/key investigators, supporting staff, and consultants. Qualifications include not only the ability to perform the research and development but also the ability to commercialize the results.

- c. The potential for commercial (Government or private sector) application and the benefits expected to accrue from this commercialization as assessed utilizing the criteria in Section 4.4 of this Solicitation.
- d. The cost realism and reasonableness of the cost proposal. The cost proposal will not be adjectively graded.

Members of the evaluation team may presume that the technical approach provided by the proposer serves as a rationale for the labor mix and labor hours used.

Technical reviewers will base their conclusions only on information contained in the proposal. It cannot be assumed that reviewers are acquainted with the offeror or key individuals or any referenced experiments. Relevant supporting data such as journal articles, literature, including Government publications, etc., should be contained or referenced in the proposal and will count towards the 25-page limit.

4.3 *Evaluation Criteria – Phase II*

The Phase II Proposal will be reviewed for overall merit based upon the criteria below in decreasing order of importance:

- a. The soundness, technical merit, and innovation of the proposed approach and its incremental progress toward topic or subtopic solution.
- b. The potential for commercial (Government or private sector) application and the benefits expected to accrue from this commercialization as assessed utilizing the criteria in Section 4.4 of this Solicitation.
- c. The qualifications of the proposed principal/key investigators, supporting staff, and consultants. Qualifications include not only the ability to perform the research and development but also the ability to commercialize the results.
- d. The cost realism and reasonableness of the cost proposal. The cost proposal will not be adjectively graded.

Members of the evaluation team may presume that the technical approach provided by the proposer serves as a rationale for the labor mix and labor hours used.

Phase II Proposal evaluations may include on-site evaluations of the Phase I effort by Government personnel.

4.4 *Assessing Commercial Potential of Proposals*

The commercial potential of a Proposal will be assessed using the following criteria:

- a. The proposer's commercialization strategy [see Section 3.5.b (6) of this Solicitation] and, as discussed in that strategy:
 - (1) any commitments of additional investment in the technology during Phase II from the private sector, prime contractors, non-SBIR programs, or other sources, and
 - (2) any Phase III follow-on funding commitments; and

- b. The proposer's record of commercializing its prior SBIR Projects.

A Report showing that the proposing company has no prior Phase II awards will not affect its ability to receive an award. Such a company's proposal will be evaluated for commercial potential based on its commercialization strategy in item 4.4(a) of this solicitation, above.

Government transition of the proposed effort is very important. The small business shall include its transition vision in the Commercialization Strategy. The small business must understand the planned use of their effort and the needs of the DHS customer/end user.

5.0 CONTRACTUAL CONSIDERATIONS

Note: Eligibility and Limitation Requirements (Section 1.3 of this Solicitation) will be enforced.

5.1 Phase I Awards

- a. **Number of Phase I Awards.** The number of Phase I awards will be consistent with the Science and Technology Directorate's budget, and the number of anticipated Phase II contracts. No Phase I contracts will be awarded until all qualified proposals (received in accordance with Section 4.2 of this Solicitation) on a specific topic have been evaluated. Proposers will be notified of selection by a DHS designated Contracting Officer. After the Phase I awards are made, proposers will be notified of non-selection.
- b. **Type of Funding Agreement.** All winning proposals will be funded under negotiated contracts and may include a reasonable fee or profit consistent with normal profit margins provided to profit-making concerns for R/R&D work. The firm-fixed-price acquisition vehicle will be used for all Phase I contracts.
- c. **Average Dollar Value of Awards.** Phase I awards to small businesses will typically cover a one-half person-year effort over a period not to exceed six months (subject to negotiation). Public Law 102-564 allows agencies to make Phase I awards up to \$ 100,000 without justification.
- d. **Timing of Phase I Awards.** The anticipated time between the date that this Solicitation closes and the award of the Phase I is less than six (6) months.

5.2 Phase II Awards

- a. **Number of Phase II Awards.** The number of Phase II awards will depend upon the results of the Phase I efforts and the availability of funds. DHS anticipates that approximately 30 percent of its Phase I awards will result in Phase II projects. This is merely an advisory estimate and DHS reserves the right and discretion not to award any or to award less than or more than this percentage of the Phase II topic area.
- b. **Type of Funding Agreements.** Each Phase II Proposal selected for an award will be funded under a negotiated contract and may include a reasonable fee or profit consistent with normal profit margins provided to profit-making concerns for R/R&D work. The firm-fixed price acquisition vehicle or the cost-plus-fixed-fee acquisition vehicle may be used for the Phase II contracts.

- c. **Average Dollar Value of Awards.** Phase II awards will typically cover two (2) to five (5) person-years of effort over a period generally not to exceed 24 months. PL 102-564 states that the Phase II awards may be up to \$750,000 each without justification.
- d. **Timing of Phase II Awards.** Phase II awards will be made incrementally, as quickly as possible, to maintain the momentum of the Phase I effort. The Phase II Proposal invitation process is an attempt to identify expeditiously those Phase I awardees deserving of Phase II awards. DHS reserves the right to evaluate individual Phase II Proposals when received and make Phase II Proposal invitations incrementally, to some, all, or none of the Phase I participants.

5.3 *Phase I Report*

- a. **Content.** A Final Report is required for each Phase I Project. The Report must address in detail the project objectives, work performed, results obtained, and estimates of technical feasibility. In addition, Monthly Status Reports and Progress Reports will be required by DHS. The format for these reports will be mutually agreed upon between DHS and the potential awardee prior to contract award. Please keep in mind that the Monthly Status and Progress Reports and/or Final Reports will be used as a basis to determine progress made towards the accomplishments of Phase I technical objectives when DHS is considering its invitation of contractors to submit Phase II Proposals.
- b. **Preparation.**
 - 1) If desirable, language used by the company in its Phase II Proposal may also be used in the Final Report.
 - 2) For each unclassified report, the company submitting the Report shall specify one of the following statements it will use:
 - a) Approved for public release; distribution unlimited.
 - b) Distribution authorized to U.S. Government Agencies only; contains proprietary information. Note: DHS, after reviewing the company's entry, has final responsibility for assigning a distribution statement.
- c. **Submission.** The company shall submit an electronic copy of the monthly reports and final report on each Phase I project in accordance with the Phase I contract and negotiated schedule via the DHS website: <https://www.sbir.dhs.gov>. Submission of the monthly reports are normally every 30 days after the project start date, and the final report submission schedule will normally be within 15 days after completion of the Phase I technical effort. Contractors shall include the company name, topic number, proposal number and contract number in each report. Submission instructions will be provided in the awarded contract.

5.4 *Commercialization Updates in Phase II*

If, after completion of Phase I, the contractor is awarded a Phase II contract, the contractor shall be required to periodically update the following commercialization results of the Phase II project through the website at <https://www.sbir.dhs.gov>.

- a. Sales revenue from new products and non-R&D services resulting from the Phase II technology;
- b. Additional investment from sources other than the federal SBIR Program in activities that further the development and/or commercialization of the Phase II technology;
- c. Whether the Phase II technology has been used in a fielded DHS system or acquisition program and, if so, which system or program;
- d. The number of patents resulting from the contractor's participation in the SBIR Program;
- e. Growth in number of firm employees; and
- f. Whether the firm has completed an initial public offering of stock (IPO) resulting, in part, from the Phase II project.

These updates on the project will be required one year after the start of Phase II, at the completion of Phase II, and subsequently when the contractor submits a new SBIR Proposal to DHS. Concerns that do not submit a new proposal to DHS will be asked to provide updates on an annual basis for five (5) years after the completion of Phase I.

5.5 *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 proposer. Successful proposals may be paid periodically as work progresses in accordance with the negotiated price and payment schedule. Phase I contracts are primarily firm-fixed-price R&D contracts, under which monthly payments may be made. Final payment will follow completion of contract performance and acceptance of all work required under the contract.

Phase II funding awards may be Cost Reimbursement type contracts. Interim payments will be permitted in accordance with the negotiated price and payment schedule. Provisions for payment of a fee or profit will be permitted. Final payment will follow completion of contract performance and acceptance of all work required under the Contract. Milestone billing payments may be used by DHS in the Phase I Contract awards.

5.6 *Markings of Proprietary Proposal Information*

The proposal submitted in response to this Solicitation may contain technical and other data that the proposer does not want disclosed to the public or used by the Government for any purpose other than proposal evaluation. Information contained in unsuccessful proposals will remain the property of the proposer except for the proposal cover sheet. The Government may, however, retain copies of all proposals. Public release of information in any proposal submitted will be subject to existing statutory and regulatory requirements.

If proprietary information is provided by a proposer in a proposal that constitutes a trade secret, proprietary commercial or financial information, or personal information or data, it will be treated in confidence, to the extent permitted by law, provided that the "Proposal Contains Proprietary Information" checkbox on the Proposal Cover Sheet is checked and the information contained on each page is clearly marked by the proposer with the term "PROPRIETARY" (do not use "Company Confidential"), as discussed below. Note: the Cover Sheet cannot be marked as "Proprietary", as the abstract will be publically disclosed if the proposal results in contract award.

By checking the "Proposal Contains Proprietary Information" check box on the Proposal Cover Sheet, the following legend is assumed:

"This data, except the proposal cover sheet, shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed in whole or in part for any purpose other than to evaluate the proposal. If a contract is awarded to the proposer as a result of or in connection with the submission of these data, the Government shall have the right to duplicate, use or disclose the data to the extent provided in the contract. This restriction does not limit the Government's right to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction is contained on the pages of the proposal listed on the line below."

Use of any restrictive legend except those provided above will be unacceptable to the Government and may constitute grounds for removing the proposal from further consideration. The Government will limit dissemination of properly marked information to within official channels.

Each page of the proposal containing proprietary data which the proposer wishes to restrict must be marked with the following legend:

"Use or disclosure of the proposal data on lines specifically identified by asterisk (*) are subject to the restriction on the Cover Sheet of this proposal."

If all of the information on a particular page is proprietary, the proposer should so note by including the word "PROPRIETARY" (do not use "Company Confidential") in both the header and footer on that page. The Government assumes no liability for disclosure or use of unmarked data and may use or disclose such data for any purpose.

In the event properly marked data contained in a proposal in response to this Solicitation is requested pursuant to the Freedom of Information Act, 5 USC §552, the proposer will be advised of such request and prior to such release of information will be requested to expeditiously submit to DHS a detailed listing of all information in the proposal which the proposer believes to be exempt from disclosure under the Act. Such action and cooperation on the part of the proposer will ensure that any information released by DHS pursuant to the Act is properly determined.

5.7 Copyrights

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

5.8 Patents

Small business concerns normally may retain the principal worldwide patent rights to any invention developed with Government support. The Government receives a royalty-free license for its use, reserves the right to require the patent holder to license others in certain limited circumstances, and requires that anyone exclusively licensed to sell the invention in the United States must normally manufacture it domestically. SBIR awardees shall report inventions to the awarding agency within two months of the inventor's report to the awardee. Awardees may report

inventions to DHS through the Edison Invention Reporting Systems at www.iedison.gov. Use of the Edison System satisfies all invention reporting requirements mandated by any award.

5.9 *Technical Data Rights*

Please refer to FAR clause 52.227-20, "Rights in Data -- SBIR Program."

5.10 *Contractor Commitments*

Upon award of a contract, the contractor shall be required to make certain legal commitments through acceptance of Government contract clauses in the Phase I Contract. The outline that follows is illustrative of the types of provisions required by the Federal Acquisition Regulation that will be included in the Phase I contract. This is not a complete list of provisions to be included in Phase I contracts, nor does it contain specific wording of these clauses. Copies of complete general clauses and provisions will be made available prior to contract award.

- a. **Standards of Work.** Work performed under the contract must conform to high professional standards.
- b. **Inspection.** Work performed under the contract is subject to Government inspection and evaluation at all reasonable times.
- c. **Examination of Records.** The Comptroller General (or a fully authorized representative) shall have the right to examine any directly pertinent records of the contractor involving transactions related to this contract.
- d. **Default.** The Government may terminate the contract if the contractor fails to perform the work contracted or fails to make progress during performance under the contract.
- e. **Termination for Convenience.** The contract may be terminated at any time by the Government if it deems termination to be in its best interest, in which case the contractor will be compensated for work performed and for reasonable termination costs.
- f. **Disputes.** Any dispute concerning the contract that cannot be resolved by agreement may be decided by the Contracting Officer with a right of appeal.
- g. **Contract Work Hours.** The contractor may not require an employee to work more than eight hours a day or forty hours a week unless the employee is compensated accordingly (that is, receives overtime pay).
- h. **Equal Opportunity.** The contractor shall 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 shall 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 Handicapped.** The contractor shall not discriminate against any employee or applicant for employment because he or she is physically or mentally handicapped.
- k. **Officials Not to Benefit.** No member of, or delegate to Congress, shall benefit from the 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 contract may be terminated by the Government if any gratuities have 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. **Security Requirements.** The contractor shall safeguard any classified information associated with the contracted work in accordance with applicable regulations.
- p. **American-Made Equipment and Products.** When purchasing equipment or a product under the SBIR funding agreement, purchase only American-made items whenever possible.

5.11 *Contractor Registration*

Before a contract can be awarded to a successful proposer under this Solicitation, the proposer must be registered in the Central Contractor Registration (CCR) database. The CCR allows Federal Government contractors or concerns interested in conducting business with DHS to provide basic information on business capabilities and financial information. To register, visit <http://www.ccr.gov> or call 1-888-227-2423.

5.12 *Additional Information*

- a. **General.** This Program Solicitation is intended for informational 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.
- b. **Small Business Data.** Before award of an SBIR Contract, the Government may request the proposer to submit certain organizational, management, personnel, and financial information to confirm responsibility of the proposer in accordance with FAR Part 9.
- c. **Proposal Preparation Costs.** The Government is not liable for any costs expended by the proposer before award of any contract.
- d. **Government Obligations.** This Program Solicitation is not an offer by the Government and does not obligate the Government to make any specific number of awards. Also, awards under this program are contingent upon the availability of funds.
- e. **Duplication of Work.** If an award is made pursuant to a proposal submitted under this Program Solicitation, the contractor shall be required to certify that he or she has not previously been, nor is currently being, paid for essentially equivalent work by an agency of the Federal Government.
- f. **Unsolicited Proposals.** Unsolicited Proposals *will not* be accepted under the DHS SBIR Program in either Phase I or Phase II. Phase III awards can only be made to recipients of Phase I or Phase II awards.
- g. **Classified Proposals.** Classified proposals will not be accepted under this DHS SBIR Solicitation.

6.0 SUBMISSION OF PROPOSALS

Each Proposal must be submitted via the DHS electronic submission website at <https://www.sbir.dhs.gov> and contain a completed:

- Proposal Cover Sheet,
- Technical Proposal,
- Cost Proposal, and
- Commercialization Report (Phase II Proposals only).

6.1 Electronic Proposal Submission

For complete electronic proposal submission on the DHS electronic submission website, first prepare the Proposal Cover Sheets (select "Prepare/Edit Phase I Cover Sheet" from the Main Menu). The website will assign the Cover Sheet a Proposal Number, which will be used for tracking throughout the submission process. Prepare the Technical Proposal in a single Portable Document Format (PDF) file, check it for viruses, and upload it to the submission website, following instructions on the website. The Cost Proposal must be submitted on-line.

Technical Proposals must be a single file, including all graphics and attachments, should have the company name and proposal number (from the cover sheet) in the header, and must be in PDF. Proposers shall conduct a virus check on each Technical Proposal prior to uploading. Every uploaded file will be scanned for viruses by the DHS. If a virus is detected, the file will be deleted and may cause rejection of the proposal.

Once uploaded, the Technical Proposal file may be viewed or downloaded from the website by clicking on the Check Upload button. Proposers are responsible for verifying that the Technical Proposal was received and converted properly. Technical Proposals may be uploaded as often as necessary, each time overwriting the file previously submitted. Once a file is overwritten, the previous version is NOT retrievable. Proposers electing to modify their Proposals in any way shall allow enough time to upload a complete updated Proposal. Failure to provide a complete modification by the Solicitation closing will render the proposer's proposal as "late" regardless of whether the proposer has previously submitted a complete Proposal.

Upon successful submission of your Proposal, an email confirmation receipt will be forwarded to your email account. Signatures are not required on the cover sheets and Cost Proposal for electronic submission. If your Proposal is selected for award, the DHS designated Contracting Officer will contact you for all appropriate signatures.

6.2 Proposal Deadline

Proposals will be accepted from *May 18, 2009 – July 2, 2009*. The Deadline for electronic receipt of proposals is 4:30 pm EDT July 2, 2009. Proposals must be completely submitted to the DHS submission website by the specified closing time of 4:30 pm EDT, on July 2, 2009. Complete submission means that the entire proposal (including the following three (3) parts: Cover Sheets, Technical Proposal, and Cost Proposal) has been properly completed and fully transmitted to the DHS submission website and electronically date stamped. The Solicitation deadline is firm. As

the close date draws near, heavy traffic on the web server may cause delays. Plan ahead and leave ample time to prepare and submit your proposal. Proposers bear the risk of website inaccessibility due to heavy usage in the final hours before the Solicitation closing time. In accordance with FAR 52.215-1, proposers are responsible for submitting proposals, and any modification, or revisions, so as to reach the Government office designated in the solicitation by the time specified in the solicitation.

6.3 *Notification of Proposal Receipt*

Notification of receipt of each proposal will be provided via e-mail.

6.4 *Information on Proposal Status*

Evaluation of Phase I Proposals and award of contracts will be expedited, but no information on proposal status will be available until the final selections are made. However, Contracting Officers may contact any and all qualified proposers prior to contract award. Selections will be posted on the DHS SBIR website when all selected proposals have been negotiated for award within six months of the Solicitation closing date.

Evaluation of Phase II Proposals will begin upon receipt of the individual proposals. DHS reserves the right to make Phase II awards incrementally as Phase II Proposals are received and evaluated. Selections will be posted on the DHS SBIR website as awards are made.

6.5 *Evaluation Results*

Any proposer that submits a request within three (3) days of being notified of their proposal being selected, or non-selected, for award will be provided a copy of the evaluation results. The request must be emailed to STSBIR.PROPOSALS@dhs.gov.

6.6 *Correspondence Relating to Proposals*

All correspondence relating to proposals must cite the SBIR Solicitation Number, contractor's proposal number, and the specific Topic Number.

7.0 *SCIENTIFIC AND TECHNICAL INFORMATION ASSISTANCE*

7.1 *SAFETY Act*

Congress enacted the Support Anti-terrorism by Fostering Effective Technologies Act of 2002 (the "SAFETY Act") as part of the Homeland Security Act of 2002. The SAFETY Act provides limitations on the potential liability of those concerns that develop and provide qualified anti-terrorism technologies. The DHS Science and Technology Directorate, acting through its Office of SAFETY Act Implementation, encourage the development and deployment of anti-terrorism technologies by making available the SAFETY Act's system of "risk management" and "liability management."

Offerors submitting proposals in response to this Solicitation are encouraged to submit SAFETY Act applications on their existing technologies and are invited to contact the Office of SAFETY Act Implementation (OSAI) for more information at 1-866-788-9318 or visit OSAI's web site at www.safetyact.gov.

7.2 *Scientific and Technical Reference*

Scientific and technical reference information is provided with each individual topic provided in Section 8.0 of this Solicitation.

7.3 *State and Other Assistance Available*

Many states have established programs to provide services to those small concerns and individuals wishing to participate in the Federal SBIR Program. These services vary from state to state, but may include:

- o Information and technical assistance.
- o Matching funds to SBIR recipients.
- o Assistance in obtaining Phase III funding.

Contact your State SBIR Support office at www.ed.gov/offices/OERI/SBIR/statelink.html for further information.

Small businesses may seek general administrative guidance from small and disadvantaged business utilization specialists located in various activities throughout the continental United States.

8.0 *TECHNICAL TOPICS*

This Section contains detailed topic descriptions defining the technical areas in which DHS requests proposals under this Solicitation. Topics are listed and numbered separately. A list of the topics currently eligible for proposal submission is included in this Section followed by full topic descriptions. These are the only topics for which proposals will be accepted at this time.

DHS invests in programs offering the potential for revolutionary changes in technologies that promote homeland security or accelerates the prototyping and deployment of technologies that reduce homeland vulnerabilities. Thus, the DHS SBIR goal is to pursue as many innovative research ideas and concepts that promote homeland security with the potential for commercialization.

DHS has identified technical topics in this S&T SBIR Solicitation FY 09.2 to which small businesses may respond. Please note that these topics are UNCLASSIFIED. Classified Phase I Proposals will **not be accepted**. Although the topics are unclassified, the subject matter may be considered to be a “critical technology.” If a contractor plans to employ non-U.S. citizens in the performance of a DHS SBIR Contract, the contractor shall identify these individuals in its proposal as specified in Section 3.5.b (7) of this Solicitation.

ELECTRONIC SUBMISSION of Cover Sheet, Technical and Cost Proposal **IS REQUIRED**.

Only proposals submitted through the on-line submission website at <https://www.sbir.dhs.gov> will be accepted or considered for award by the DHS. Proposals must be prepared and submitted in accordance with the instructions below.

HELPFUL HINTS:

Consider the file size of the technical proposal to allow sufficient time for uploading.

- Perform a virus check.
- Signature is not required at the time of submission.

- If you encounter problems during electronic submission call toll free at 1-800-754-3043.
- Facsimile (fax) or e-mail proposals submissions will not be accepted.

Phase I SBIR Proposals shall not exceed \$100,000 and must be a **six-month or less effort**.

DHS Phase II Proposals may be recommended by the respective DHS S&T Phase I Program Manager and invited by the Contracting Officer. Phase II invitations will be based upon progress toward meeting the Phase I technical objectives, the technical results reflected in the monthly and/or final reports, site visits conducted by DHS, and plans for Phase II.

Prior to receiving a contract award, the small business **MUST** be registered in the Central Contractor Registration (CCR) Program. You may obtain registration information by calling 1-888-227-2423 and pressing 3 or at <http://www.ccr.gov>.

As funding is limited, DHS reserves the right to select and fund only those proposals considered to be superior in overall technical quality and highly relevant to the DHS mission. As a result, DHS may fund more than one proposal in a specific topic area if the technical quality of the proposal(s) is deemed superior, or it may not fund any proposals in a topic area. Each proposal submitted to DHS must have a topic number and must be responsive to only one topic.

- Cost proposals will be considered to be binding for 180 days from closing date of this Solicitation.
- Successful proposers will be expected to begin work no later than 30 days after contract award.
- For planning purposes, the Phase I contract award process is normally completed within 45 to 60 days from issuance of the selection notification letter to Phase I proposers.
- DHS holds kick-offs meetings with all successful bidders approximately two weeks after contract award to discuss the SBIR Program and reporting, invoicing, technical objectives and other subjects.

CLOSED

**DHS S&T DIRECTORATE TOPICS -- DHS Small Business Innovation Research (SBIR)
Fiscal Year 09 Publication 2**

- H-SB09.2-001 Mobile General Aviation (GA) Aircraft Screener**
- H-SB09.2-002 Human-Animal Discrimination Capability for Unattended Ground Sensors**
- H-SB09.2-003 Novel Techniques to Culture Fastidious Bacterial Biological Threat Agents (BTAs) from Limited Forensic Samples**
- H-SB09.2-004 Software Testing and Vulnerability Analysis**
- H-SB09.2-005 Novel Diagnostic Imaging System**
- H-SB09.2-006 Noise Cancellation for Voice Operated Switch (VOX) Communications**
- H-SB09.2-007 Enhancing Training Effectiveness through Cognitive State Assessment**
- H-SB09.2-008 Wearable Energy to Power and Operate Responder Tools (Wearable EPORT)**

CLOSED

8.1 **SBIR TOPIC NUMBER: H-SB09.2-001**

TITLE: Mobile General Aviation (GA) Aircraft Screener

TECHNOLOGY AREAS: Robotics, radiography, sensors, imagery, imagery enhancement

OBJECTIVE: Develop a demonstrable, prototype mobile system that will provide rapid, non-intrusive inspection of the voids in the fuselage, empennage, wing and stabilizer areas, and engine nacelles of general aviation (general aviation) aircraft for weapons, contraband or other proscribed items and materials hidden within the aircraft structure.

DESCRIPTION: The Department of Homeland Security's Science and Technology (S&T) Directorate is seeking a mobile system to non-intrusively survey general aviation (GA) aircraft for weapons, contraband or other proscribed items. For purposes of this SBIR topic, all aircraft, fixed or rotary wing, with maximum gross takeoff weight of 50,000 pounds or less are considered to be GA aircraft.

The mobile prototype system developed under this project will examine the various aircraft voids, including those contained within the empennage, wings and stabilizers, and engine nacelles, as well as the passenger and cargo compartments. Neither the vehicle nor sensors can pose a risk or a hazard to the aircraft, crew, or airport or maintenance personnel in any way. The system will be capable of ensuring a survey of the entire airframe. The sensor suite of the vehicle will support operator discrimination between airframe structure and installed equipment and non-airframe associated objects such as concealed threats or illicit items. Further, the system must be as compact as possible, as light weight as possible, and amenable to operation throughout the airport and cargo environs. The system must be operable by a single operator who will maneuver the vehicle, position the sensor(s) and interpret the resultant sensor information. The system shall present resultant imagery and any other resultant sensor information supporting identification of illicit weapons or contraband to the operator and record all raw data for subsequent replay and analysis. Although not required by this SBIR to implant automated target recognition, the results of the survey, including location(s) of threat object(s), and the raw sensor data associated with such object(s), will be made available.

The system must be capable of operating in an expeditious manner so as not to delay aircraft or flight operations.

PHASE I: Conduct a feasibility analysis and develop a definitive set of requirements including capabilities, limitations, and theoretical effectiveness. Develop preliminary software, sensor, and vehicle requirements. Conduct modeling of the sensor/sensor display suite. Generate a top-level technology development plan that includes schedule and costs for a possible SBIR Phase II and a Phase III effort. A migration path to

screening larger, commercial aircraft should be discussed but will not be detailed or demonstrated.

PHASE II: Develop a prototype device sufficiently robust to demonstrate attainment of the requirements developed during Phase I in both the laboratory and in a limited field demonstration. Demonstrate the capability to detect and identify pre-determined targets concealed within a GA aircraft. Estimate, from a limited set of targets and airframes available, the potential effectiveness of a production device. Refine the technology development plan, cost and schedule estimates.

PHASE III: COMMERCIAL APPLICATIONS: A mobile non-intrusive inspection system for small aircraft has broad security applicability not only to the Department of Homeland Security, but also to the Department of Defense for aviation and other screening needs. This system should be able to conduct surveys of the interior of an aircraft without offloading cargo.

REFERENCES:

United States Government Accountability Office Report to Congressional Requesters, “Aviation Security, Federal Efforts to Secure U.S.-Bound Air Cargo Are in the Early Stages and Could Be Strengthened”; GAO-07-660; April 2007

Center for American Progress, “Keeping Bombs Off Planes: Securing Air Cargo, Aviation’s Soft Underbelly”; P.J. Crowley and Bruce R. Butterworth; May 2007; www.americanprogress.org

KEY WORDS: General aviation; aircraft airframe; fuselage; empennage; wings; stabilizers; engine nacelles; mobile sensor; screening; sensors; survey; target identification; imagery; detection; non-intrusive

8.2 SBIR TOPIC NUMBER: H-SB09.2-002

TITLE: Human-Animal Discrimination Capability for Unattended Ground Sensors

TECHNOLOGY AREAS: Unattended ground sensor algorithms

OBJECTIVE: Develop signal processing and data processing algorithms for Unattended Ground Sensors (UGS) that can discriminate human from animal activity.

DESCRIPTION: The U.S. Customs and Border Protection (CBP) use Unattended Ground Sensors (UGS) to detect personnel who illegally cross the U.S. border in remote locations. The UGS units generally consist of: sensor(s) for detecting activity in the immediate vicinity; a buried housing that contains a processing unit that interprets the received signals from the sensor(s) and performs administrative and control tasks; a radio for communicating alarms back to a CBP Command Center, and a power supply. The current generation of UGS units used by the CBP is multi-modal in nature. This refers to an UGS design that can incorporate a single sensor type or multiple sensor types in a single UGS housing. Sensor types that can be deployed with a multi-modal UGS include seismic, acoustic, passive infra red (PIR), imagers, and magnetic. Seismic and PIR sensor types are most commonly used for detecting personnel in an area with detection ranges of 25-50 meters depending upon the sensor and the environment. DHS is not currently pursuing imagers as a means of discrimination due to their high cost, vulnerability, and maintainability. The goal is a distributed UGS field that can be deployed and left for a minimum of 2 years without discovery or maintenance.

UGS units that are deployed in remote areas on the U.S. southern and northern borders can have significant wild and domesticated animal activity in their area of deployment (jack rabbits, coyotes, male deer, cows, horses, javelina on the southern border, and deer, moose, coyotes on the northern border). Seismic processing in the current generation of UGS attempts to discriminate against animal activity by use of cadence differences between human and animal footfalls but this technique is not always successful and can be spoofed by the adversary. PIR processing generally involves detection of increased heat when a human or animal walks by with little discrimination capability between them. The alarming on UGS units without being able to separate out animal from human presence causes increased workload to CBP agents in responding to false alarms.

Software algorithms need to be developed that can run on a UGS low power processor and which can reliably discriminate human from animal activity. The software algorithms can make use of approaches that increase the discrimination capability of humans from animals on a single sensor (i.e., seismic for example) or make use of clues from the multi-modal sensors that can be used on a single UGS unit (seismic, acoustic, PIR). Time series data is being collected by DHS S&T in areas of interest near the U.S. border. Segments of time series will be made available where video camera coverage has confirmed the presence of animals, humans, or vehicles passing in close proximity to multi-modal sensors. The available data will consist of co-located geophone (3-axis),

accelerometer (3-axis), microphone, and PIR sensor time series. The time series will be made available as binary flat files with a MatLab data reader or as a Universal File Format (UFF). The collected data will be from a site at the U.S. southern border. The edited time series segments provide a basis for testing and developing highly reliable algorithms for discriminating animal from human presence on UGS deployed by the CBP.

PHASE I: Demonstrate algorithms that can reliably discriminate human from animal activity on multi-modal UGS sensors using data sets supplied by DHS S&T. Both a training and a test data set will be made available.

PHASE II: Further refine algorithms for discriminating human from animal activity, code algorithms for implementation on a low power processor implementation that will be specified by DHS S&T (commercially available UGS unit), and work with UGS manufacturer for code transport into their unit for a field demonstration.

PHASE III: COMMERCIAL APPLICATIONS: Refine algorithms from the Phase II field test results. Develop application program interface (API) for the software so that the developed algorithms can be incorporated into UGS units used by DHS' SBInet program and UGS units used by the U.S. Army and Marine Corps.

REFERENCES:

“Seismic Detection Algorithm and Sensor Deployment Recommendations for Perimeter Security”; by Lacombe, Peck, Anderson, et al; 2006 SPIE Defense and Security Symposium on Unattended Ground, Sea, and Air Sensor Technologies and Applications

“Acoustic and Seismic Modalities For Unattended Ground Sensors” by Sleaf, Ladd, McDonald, and Elbring, 1999 SPIE Conference on Unattended Ground Sensor Technologies and Applications, SPIE Vol. 3713

“Single and Three Axis Geophone: Footstep Detection with Bearing estimation, Localization, and Tracking”; by Pakhomov, Sicignano, Sandy, Goldburt; Proceedings of SPIE Vol. 5090 (2003)

KEY WORDS: Unattended ground sensors; seismic; acoustic; PIR; algorithms; discrimination; human; animal

8.3 SBIR TOPIC NUMBER: H-SB09.2-003

TITLE: Novel Techniques to Culture Fastidious Bacterial Biological Threat Agents (BTAs) from Limited Forensic Samples

TECHNOLOGY AREAS: Bioforensics/microbiology

OBJECTIVE: Develop a methodology to culture and isolate fastidious microorganisms from trace evidence to support forensic attribution of a biocrime.

DESCRIPTION: Homeland Security Presidential Directive (HSPD) 10, “Biodefense for the 21st Century” established a dedicated central microbial forensic laboratory known as the National Bioforensics Analysis Center (NBFAC), as part of the Department of Homeland Security to provide bioforensics analysis of evidence associated with the event. The NBFAC operates in partnership with the Federal Bureau of Investigation (FBI), the lead investigative agency in acts of terrorism. In support of this mission, the Science and Technology (S&T) Directorate’s Chemical Biological Division (CBD) is charged with pursuing research to improve response and restoration, conduct threat risk assessments, and invest in bioforensics research and development. Specifically, S&T is seeking innovative culturing techniques to isolate and culture fastidious organisms from limited samples collected from the scene of a biocrime. At the end of Phase II, a completed SOP for culturing fastidious select agent bacteria from a limited amount of sample will be delivered. At a minimum, organisms to be addressed include: *Francisella tularensis*, *Yersinia pestis*, *Coxiella burnetii*, *Nickelssia sp.*, *Brucella sp.*, and *Burkholderia mallei*.

One of the challenges to forensic attribution of a biocrime is the limited amount of sample collected from the crime scene. Many biological samples have a short half-life if not properly stabilized resulting in only trace amounts ($<10^3$ cfu) being available for attribution analysis. When dealing with fastidious or, difficult to culture, organisms, trace amounts may not be sufficient for culture-based forensic analysis. To help combat this problem, non-culture-based identification methods have been developed. However, these methods lack three distinct advantages of culture methods: 1) the microbe is made available for multiple downstream tests likely to be required in a criminal case; 2) the microbe is made available for antimicrobial susceptibility testing; and 3) the microbe is proven to be viable. Simply recovering an organism from a forensic sample by nucleic acid analysis or immunochemical means does not necessarily mean that organism was viable and thus, able to cause disease. Development of techniques that allow culture of fastidious organisms from limited samples is necessary to achieve attribution in biocrime cases involving these organisms.

In the Phase I effort, the awardee will be required to submit a report detailing the current state-of-the-art in culturing conditions for the organisms, an analysis of why the organisms are classified as fastidious, what would be required to increase the culture efficiency of the organisms and a research plan for addressing these requirements in order

to more efficiently culture the organisms in phase II from trace quantities ($\leq 10^3$ cfu). Deliverables are required by the end of the period of performance.

Assuming successful and on-time completion of Phase I activities, in Phase II the awardee will be required to demonstrate the ability to successfully culture the organisms within a 48-72 hour period of time starting from a trace amount of sample ($10^2 - 10^3$ cfu). Results must be verified with secondary tests. The deliverables will be a final SOP and the successful demonstration of the methodology to DHS, NBFAC and FBI personnel. Deliverables are required by the end of the period of performance.

PHASE I: Must submit a report detailing the current state-of-the-art protocols for culturing the organisms, why they are insufficient for trace amounts and a research plan for increasing the culture efficiency of the organisms.

PHASE II: Must perform a successful laboratory demonstration of 48-72 hour culture of the organisms from trace amounts of starting material. Identification of organisms in culture must be verified with secondary tests. Final SOP for methodology will be delivered to DHS.

PHASE III: COMMERCIAL APPLICATIONS: The methodology developed in Phase I and Phase II, will be transferred to and used by the National Bioforensics Analysis Center (NBFAC) and the Federal Bureau of Investigation (FBI) to support forensic analysis of a biocrime.

REFERENCES:

Breeze RG, Budowle B, and Schutz SE (Eds.). Microbial Forensics. New York, NY. Elsevier Academic Press. 2005.

Doern GV. Detection of Selected Fastidious Bacteria. *Clinical Infectious Diseases* 2000 30(1):166-173.

Zengler K (Ed.). Accessing Uncultivated Microorganisms. Washington, DC. ASM Press 2008.

KEY WORDS: Microbial forensics; bioforensics; fastidious organisms; culture techniques; sample preparation

8.4 **SBIR TOPIC NUMBER: H-SB09.2-004**

TITLE: Software Testing and Vulnerability Analysis

TECHNOLOGY AREAS: Cyber security

OBJECTIVE: Develop services and capabilities to rigorously and routinely build, test, and analyze source and binary forms of software in realistic conditions representative of operational environments in Federal Government and other critical infrastructures.

DESCRIPTION: Software in use today across the country's critical infrastructures has grown increasingly complex in: form and function; interaction with underlying platforms; interaction with other resident software; behavior in today's networked and distributed environments; and resiliency to new and increasingly sophisticated forms of attack. Vulnerabilities in that software put those critical resources at risk. The overall stability, reliability and resilience of software have not kept pace in these increasingly demanding environments. New vulnerabilities in fielded software are found daily, many of which are not known or reported to the vendor. New and innovative methods, services, and capabilities in build, test, and analysis phases are needed to improve the quality and reliability of software used in the nation's critical infrastructures.

PHASE I: Demonstrate a new analysis tool or integrated service capable of discovering errors or vulnerabilities in software in either source or binary forms. Proofs-of-concept for integrated services may combine existing tools and apply distributed computing capabilities for multi-platform build and test services.

PHASE II: Develop and implement a production ready tool with initial results in application against multiple code bases available in source or binary form. Integrated services at the end of this phase provide a multi-platform scalable and usable service covering some phases of build, test, and analysis as part of an improved software development and engineering lifecycle.

PHASE III: COMMERCIAL APPLICATION: The commercialized product will be used by Government agencies and public/private enterprises to test and analyze software in critical infrastructure operational environments.

REFERENCES:

Banking and Finance Sector R&D Agenda, Challenge #1, p. 6, 2008

National Research Council, "Toward a Safer and More Secure Cyberspace", Category 1, p. 83, 2007

Federal Plan for Cyber Security and Information Assurance Research and Development, Secure Software Engineering, p. 81, 2006

Infosec Research Council Hard Problems List, Problem #4 – Building Scalable Secure Systems, p. 19, 2005

President’s Information Technology Advisory Committee (PITAC), “Cyber Security: A Crisis of Prioritization”, Research Priority #3, p. 39, 2005

Computing Research Association, Four Grand Challenges in Trustworthy Computing, Challenge #2, p. 17, 2003

The National Strategy to Secure Cyberspace, Priority II, Area B, Topic #2, p. 32, 2003

Information Institute for Infrastructure Protection (I3P), Cyber Security Research and Development Agenda, Research Area #3, p. 18, 2003

National Research Council, “Trust in Cyberspace”, Recommendation #2, p. 244, 1999

KEYWORDS: Software Vulnerability Analysis; information assurance; cyber security

CLOSED

8.5 SBIR TOPIC NUMBER: H-SB09.2-005

TITLE: Novel Diagnostic Imaging System

TECHNOLOGY AREAS: Counter – Improvised Explosive Device (IED)

OBJECTIVE: Develop and demonstrate a prototype portable (hand-held or robot carried) imaging system capable of imaging an improvised explosive device (IED) in one pass.

DESCRIPTION: Today, IEDs are becoming more advanced in their design and use. Builders of the IEDs are studying tactics used by bomb technicians to detect, set up and disarm an IED and are developing new ways to defeat the bomb technician's mission. This can result in harm to all in the area, including the bomb technician, and is of great concern. Once an object is identified as an IED, bomb technicians must then formulate a plan of attack to render safe the device. Diagnostic Imaging Systems use sound waves, radioactive particles, magnetic fields, or x-rays to provide an image of potential devices and anomalies after passing through the target. Most of the "on-line" diagnostic tools used (e.g., Laser Induced Breakdown, Surface Enhanced Raman, Quadrupole Resonance Mass Spectrometry, and Transmission X-Ray scanners) are bulky, expensive, and not suitable for integration onto robotic platforms. The operating principle of the various techniques is based on the fact that rays and particles interact differently with various materials, especially when abnormalities are present. In this way, the interior of the vehicle can be visualized for analysis.

PHASE I: A feasibility study to determine the existence of novel technologies that meet the diagnostic imaging needs of the bomb technician; the difficulties anticipated to develop each candidate approach; and an estimate of the effectiveness for each approach. The results of this study will be used to make a decision whether or not to proceed further with the project. This study will provide possible alternative solutions to the problem of imaging an IED in one pass.

PHASE II: The Phase II effort is designed to support the next stage of development for the selected diagnostic imaging technology. A working diagnostic imaging prototype will be developed that is portable (hand-held or robot carried), that is capable of computer aided detection of key components.

PHASE III: COMMERCIAL APPLICATIONS: Commercial applications of this technology would potentially be fielded to every accredited bomb squad.

REFERENCES:

"National Strategic Plan for U.S. Bomb Squads", National Bomb Squad Commanders Advisory Board (NBSCAB) (December 2008)

“Research Challenge in Combating the Terrorist Use of Explosives in the United States”,
National Science and Technology Council Committee on Homeland and National
Security Subcommittee on Domestic – IEDs (November 2008)

KEYWORDS: Diagnostic imaging equipment; X-ray diagnostics; radiographic
analysis; ultrasound; 3-D imaging

CLOSED

8.6 SBIR TOPIC NUMBER: H-SB09.2-006

TITLE: Noise Cancellation for Voice Operated Switch (VOX) Communications

TECHNOLOGY AREAS: Command, control and interoperability (CCI), human factors

OBJECTIVE: A noise attenuation solution that significantly improves handheld radio communications capabilities for operating in high noise level environments.

DESCRIPTION: First responders must to be able to effectively and safely communicate when operating in high noise environments. Operational procedures, such as hand and arm signals, currently provide a limited solution in that they are not effective for scenarios requiring hands-free communication. Using a combination of passive and active technologies, commercially-available solutions that cancel ambient noises work best when communicating without radios or when communicating through radios in a push-to-talk mode. These technologies have had limited success in addressing the voice operated switch (VOX) mode with radios. While in VOX mode, the radios act as an open microphone, no longer enabling the external technology that distinguishes between human speech and other noises, causing the radio to continuously transmit unwanted noise across the network and interfering with other ability to use that same frequency.

A single noise attenuation solution will enable effective voice communications in high-noise operating environments regardless of the communications mode (through radios in a push-to-talk mode, through radios in a VOX mode and without radios). The solution must have a minimal impact on the first responder's equipment profile, no impact on their ability to perform operational tasks and easy to employ. The solution must also be compatible with existing communications systems and be available at a price point consistent with market demands.

PHASE I: Phase I will explore the feasibility of potential technical courses of action and result in a recommended development roadmap for phase two implementation.

PHASE II: Phase II will result in the development and delivery of a prototype solution that addresses the previously defined need.

PHASE III: COMMERCIAL APPLICATIONS: A successful solution will be widely applicable across the first response community. It will be particularly useful for special teams such as HAZMAT, search and rescue as well as special weapons and tactics; all of which often require the use of hands-free communications in a potentially high noise environment. The same technology may also have broader applicability beyond the first response community, including construction and the military. As a prototype, additional development and testing will be required to realize a successful transition. The DHS Science and Technology (S&T) Directorate's First Responder Technologies Program, in collaboration with Command, Control and Interoperability

Division (CCI) and the Human Factors Division is a potential venue for any follow-on work required after the prototype is delivered.

REFERENCES:

Quiet Pro Feasibility Study Report – First Responder Technologies Program, DHS (December 2008)

Intelligibility of Selected Radio Systems in the Presence of Fireground Noise (NTIA Technical Report TR-08-453) – Department of Commerce (June 2008)

Digital Working Group Interim Report – International Association of Fire Chiefs (May 2008)

Background Noise and Radio Performance – Motorola (2008)

KEYWORDS: Ambient noise; background noise; radio communications systems; voice communications; prototypes; human factors engineering

CLOSED

8.7 SBIR TOPIC NUMBER: H-SB09.2-007

TITLE: Enhancing Training Effectiveness through Cognitive State Assessment

TECHNOLOGY AREAS: Cognitive workload assessment, brain-based technologies, adaptive systems, training

OBJECTIVE: Develop a system that incorporates brain-based sensor technology to provide real-time cognitive state and performance feedback for customized training to maximize screener performance. The system should be suitable for deployment in operational training environments.

DESCRIPTION: Training of individuals to ensure that they are qualified and prepared for the job with the appropriate operational experience is crucial for mission success. Training currently relies on traditional classroom and on-the-job sessions that utilize lectures, videos, and web-based methods to communicate the information that screeners need to perform.

Screeners are required to complete 100 hours of training before they go on the job and they must do at least three hours of training each week while employed, in addition to their daily duties. This stringent training requirement is necessary, due to the importance of accuracy in screening; however, the repetitiveness of the training over time degrades its effectiveness.

Screening is a repetitive visual search task that often has a very low probability of encountering a threat, but extremely high consequences if a serious threat is missed. The nature of this task, combined with extensive training sessions, frequently induces fatigue, boredom and inattention. Cognitive state assessment uses brain-based sensors to reveal a person's current engagement, attention, focus, fatigue, and overload. These measures, when taken during training sessions, can provide information about a screener's current understanding of the concept being presented. Brain-based sensor technologies will allow for real-time workload management and adaptation of training to individual needs by evaluating changes in cognitive state and adapting the training curriculum in real time to maximize effectiveness through sequencing, multimodal information delivery, filtering, or other mitigation strategies.

A system to enable automated cognitive workload assessment, operational effectiveness and related mitigation strategies would build upon existing cognitive state assessment technologies and incorporate novel sensing technologies. System sensors should be portable, lightweight, non-invasive, in an easy-to-use form-factor, and deployable at reasonable cost.

PHASE I: Review existing brain-based sensor technologies to determine applicability. Develop framework for cognitive state assessment algorithms. Develop a user model of the tasks required to assemble, set-up, calibrate, initiate, select modes of operation,

operate, adjust, receive feedback, and terminate operations. This model will describe the interactions among the screener, the cognitive state assessment system, and the system operator. Provide recommendations for operationalizing brain-based sensor technology that responds to the requisites of the user model including an analysis of relevant trade-offs, if any, in accommodating the different requisites. Identify a candidate system or systems for further evaluation in Phase II.

PHASE II: Demonstrate initial system configuration and evaluate screener cognitive state assessment in a simulated training situation. Demonstrate functional system and the use of unobtrusive prototype sensors in diverse operational training environments. Evaluate system performance, obtain screener feedback, further refine sensors and algorithms based on evaluation and feedback and identify a mechanism for mass deployment.

PHASE III COMMERCIAL APPLICATIONS: This system could be used in a broad range of DHS, military, and civilian applications where automatic real-time detection of cognitive state could be leveraged to improve training effectiveness. Civilian and military applications include training for imagery analysis, monitoring tasks, interpreting medical images, surveillance system monitoring, critical infrastructure protection, and other screening tasks.

REFERENCES:

Bolton, A., Campbell, G., & Schmorow, D. (2007). Towards a closed-loop training system: Using a physiological-based diagnosis of the trainee's state to drive feedback delivery choices. In D. Schmorow (Ed.), *Foundations of Augmented Cognition*, 3rd Edition. Berlin: Springer.

Cage, J. (2007, November). Statement of John Cage, National President, American Federation Of Government Employees, AFL-CIO, Before the Transportation Security and Infrastructure Protection Subcommittee, House Committee on Homeland Security on Aviation Security Part II: A Frontline Perspective on The Need for Enhanced Human Resources and Equipment. Last retrieved from <http://hsc.house.gov/Static/documents/20071101164946-13819.pdf> on July 28, 2008.

Cohn, J., Kruse, A, and Stripling, R. (2005, July). Investigating the Transition from Novice to Expert in a Virtual Training Environment Using Neuro-Cognitive Measures. In D. Schmorow (Ed) *Foundations of Augmented Cognition*, Lawrence Erlbaum Associates, New Jersey.

GAO-07-299, Aviation Security: Screener Training and Performance Measurement Strengthened, but More Work Remains. Last retrieved from <http://www.gao.gov/new.items/d05457.pdf> on July 29, 2008.

KEY WORDS: non-invasive, EEG, fNIR, eye tracking, training, workload assessment, cognitive state, human performance, screening

CLOSED

8.8 **SBIR TOPIC NUMBER: H-SB09.2-008**

TITLE: Wearable Energy to Power and Operate Responder Tools (Wearable EPORT)

TECHNOLOGY AREAS: First responder equipment, wearable power supply

OBJECTIVE: There is a need for miniature (and scalable) wearable energy units that can supply power to multiple body worn sensors and portable computing devices on a first responder.

DESCRIPTION: The safety of emergency responders is the highest priority of Incident Commanders. Currently, responders use a variety of devices (e.g., communication radios, Personal Alert Safety System (PASS), etc.) to enhance their safety during an incident response. All of the current devices rely on their own batteries for consistent power to operate, each adding additional weight to the gear that the first responders carry with them. Furthermore, the batteries have to be removed from the responder and recharged at designated stations at regular intervals.

In the near future, even more powered devices will be developed, such as advanced location tracking, physiological monitoring, multiple displays and visual alerting devices along with portable computing devices, causing an increased power need for responders.

The recent advancements in the research and development of small portable power generation and distribution units might help facilitate a cost effective and modular solution for the first responders' need for reliable, robust, highly efficient power systems for current and next-generation devices. Envisioned are small and light units that will consolidate and distribute all power needs to support an array of plug and play sensors for different responder equipment configurations.

This SBIR topic area seeks to explore wearable power generation and distribution technologies that will power an array of body worn sensors and devices for the first responders. The technologies will need to be: easy to use; lightweight and compact (less than 4 ounces, 3.5"x2.5"x0.5" or less); non-invasive; able to be integrated with existing personal protective equipment through open-standard interconnects; able to be used in all types of operational environments; modular depending on the users power requirements; and not be cost prohibitive. It is also preferred that the energy unit be in non-rigid casing for wearable textile integration.

PHASE I: Develop concepts and an architecture for wearable energy generation and distribution technologies that can be used by PASS devices, Location Tracking sensors, Physiological Monitoring Devices, and portable computing platforms that first responders may use as part of their operational activities. To the extent possible, the development may include the use of simulation models, as well as concept prototypes to demonstrate the validity and performance of the proposed technologies.

PHASE II: Develop a prototype of a wearable power system with interconnects. Evaluate the prototype in a simulated operational environment. Conduct tests of the power unit using multiple sensors and multiple units in multiple operating environments.

PHASE III: COMMERCIAL APPLICATIONS: The small power generation system has significant commercial applications with the directly intended audience, as well as indirect related applications such as the utilities, medical, sports, telecom, and many other industries. Power units could be produced by various manufacturers thereby creating a market for this capability in numerous flexible configurations.

REFERENCES:

J. Rae-Dupree, "Wearable battery? What next?", *San Jose Business Journal*, 24 Sept. 2004, <http://sanjose.bizjournals.com/sanjose/stories/2004/09/27/story3.html>

S. Park, S. Jayaraman, "Wearable Sensor Systems: Opportunities and Challenges", *Proc. IEEE Engineering in Medicine and Biology 27th Annual Conference*, IEEE, 2005, pp. 4153-4155

O. Amft, M. Lauffer, S. Ossevoort, F. Macaluso, P. Lukowicz, G. Troester, "Design of the QBIC wearable computing platform", *Proc. of the 16th IEEE International Conference on Application-Specific Systems Architectures and Processors*, IEEE, 2004, pp. 1-13

U. Anliker, P. Lukowicz, G. Troester, J. Schwartz-S., and W. DeVaul-R, "The Weararm: Modular, High Performance, Low Power Computing Platform Designed for Integration into Everyday Clothing", *Proc. 5th International Symposium on Wearable Computers*, 2001

KEY WORDS: wearable power supply; body area networks and sensors; personnel tracking; physiological monitoring

DHS FY 09.2 Phase I SBIR Checklist

Page Numbering:

- Number all pages of your proposal consecutively; the Cover Sheets count as pages 1 and 2 no matter how they print out; the Technical Proposal begins on page 3
- Total for each Phase I proposal is 25 pages inclusive of Cover Sheets, Technical Proposal, Cost Proposal and resumes
- Beyond the Phase I 25-page limit, do not send appendices, attachments and/or additional references

Proposal Format:

- Cover Sheet, Technical and Cost proposals MUST be submitted electronically at <https://www.sbir.dhs.gov>

The Technical Proposal Must Address:

- Identification and Significance of the Problem or Opportunity
- Phase I Technical Objectives
- Phase I Work Plan
- Related Work
- Relationship with Future Research or Research and Development
- Commercialization Strategy
- Key Personnel, Resumes
- Facilities/Equipment
- Subcontractors/Consultants
- Prior, Current, or Pending Support of Similar Proposals or Awards

Final Checklist:

- The Cover Sheet was prepared on-line
- The Technical Proposal was uploaded
- The Cost Proposal was submitted on-line and shows detailed cost and fee/profit breakout and the total cost and fee/profit are also listed on the Cover Sheet. Ensure the total cost and fee/profit shown on the Cost Proposal matches the cost and fee/profit listed on the Cover Sheet.
- The Submit Proposal button was selected to transmit the Proposal to DHS and time stamp the Proposal
- Email confirmation of the receipt of your Proposal was received

□ SBIR Help Desk. Phone: 1-800-754-3043; email: sbirhd@sainc.com

CLOSED