

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

PHASE I PROGRAM SOLICITATION FY 08.1  
Science and Technology (S&T) Directorate/  
Homeland Security Advanced Research Projects Agency (HSARPA)

- **Reference Number: DHSSBIRFY081**
- **3 December 2007:** Pre-release issued
- **19 December 2007:** Full solicitation issued on or before 19 December 2007
- **19 December 2007 through 4 February 2008:** Full-proposals accepted
- **4 February 2008:** Deadline for receipt of proposals is **4:30 p.m. EST**

Proposals are sought from small business concerns for participation in the Department of Homeland Security, Science and Technology Directorate Small Business Innovation Research (SBIR) Program. The SBIR Program is a three-phase program which implements Public Law 102-564, the Small Business Research and Development Enhancement Act of 1992. The following five (5) research topics are available under the solicitation:

H-SB08.1-001 - Assess Ability to use Eye Tracking and Pupil Dilatation to Determine Intent to Deceive.

H-SB08.1-002 - Miniature Chem/Bio/Explosive Sensors.

H-SB08.1-003 - Mapping of Long-term Threats, Vulnerabilities, and Impacts.

H-SB08.1-004 Trace Explosives Sampling for Vehicle Borne Improvised Explosives Device (VBIED)

H-SB08.1-005 - Smart Sensor System.

**Classified proposals are not accepted under this DHS SBIR Solicitation.**

During the period 3 December 2007 through 18 December 2007, proposers have an opportunity to contact Technical Points of Contact by telephone or by email to ask technical questions about specific technical topics. No further direct contact between proposers and Technical Points of Contact shall occur from 19 December 2007 through 4 February 2008 for reasons of competitive fairness.

**Deadline for Proposal Receipt.** Proposals must be completely submitted and electronically date stamped by **4:30 p.m. EST on 4 February 2008**

**No Printed Solicitation Books.** Solicitations are available only in electronic format from the Federal Business Opportunities (FedBizOpps) web site at [www.fbo.gov](http://www.fbo.gov), in accordance with the Government Paperwork Elimination Act (GPEA). For convenience, the solicitation will be available at <http://www.sbir.dhs.gov> after it is posted on the FedBizOpps web site.

**Information:** If you have questions about the DHS SBIR program, please submit your questions via the web site at <http://www.sbir.dhs.gov>

**What's New:** DHS intends to award either Purchase Orders and/or Contracts in Phase I at \$99,990. DNDO does not have topics in this solicitation. This is a solicitation for DHS S&T SBIR only.

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

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# DHS SOLICITATION FOR THE SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM

## *1.0 SBIR PROGRAM DESCRIPTION*

### *1.1 SBIR Introduction*

The Department of Homeland Security (DHS), hereafter referred to as DHS, 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 and development (R&D) in any of the topic areas described in Section 9.0, and to commercialize the results of that R&D are encouraged to participate.

Objectives of the DHS 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 the Small Business Innovation Development Act of 1982 (PL 97-219, as amended by PL 106-554). 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*

This program solicitation is issued pursuant to the Small Business Innovation Development Act of 1982 (PL 97-219, as amended by PL 106-554). 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 may not exceed \$99,990 in cost nor extend beyond a six-month period of performance. Proposals should 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 \$750,000 in cost and do not exceed 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.

Under Phase III, the small business is expected to obtain funding from the private sector and/or Government sources excluding SBIR funding, to further develop the prototype into viable product(s) or service(s) for sale to Government and/or private sector.

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

For SBIR Phase II, no separate solicitation will be issued. **Only those concerns that were awarded Phase I contracts are eligible to participate in Phases II and III.**

DHS will invite Phase II proposals from a group of Phase I awardees 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.

DHS is not obligated to make any awards under either, Phase I, II, or III, and all awards are subject to the availability of funds. The DHS is not liable for any costs expended by the proposer before award of any contract. At the time of the issuance of this solicitation, the Government appropriations are subject to a Continuing Resolution (CR). Should the Government's appropriations still be subject to a CR at Phase I award, any Phase I award shall be made subject to the availability of funds and provide that no performance shall begin until appropriations are available.

### **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 and must certify to this on the Cover Sheet of the proposal. For both SBIR Phases I and II, the primary employment of the principal investigator must be with the small business firm 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.

### **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 cost 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, the proposal preparation and electronic submission should be submitted via the web site, <http://www.sbir.dhs.gov>, or via the Help Desk toll free number: 1-800-754-3043. The Help Desk may be contacted from 8:30 a.m. to 5:00 p.m. EST.
- b. **The DHS SBIR web site** <http://www.sbir.dhs.gov> offers electronic access to the SBIR solicitation, submission of frequently asked questions (FAQs), answers to FAQs, and 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 sheets, 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 [faq@hsarpasbir.com](mailto:faq@hsarpasbir.com) or by calling the DHS SBIR Program contacts: Mr. Vinny Schaper, SBIR Program Director, 202-254-6119 or Ms. Elissa I. Sobolewski, SBIR Program Manager, 202-254-6768.
- e. **Technical Questions about Solicitation Topics.** From 3 December 2007 through 18 December 2007, this solicitation is issued for pre-release on the Federal Business Opportunities (FedBizOpps) web site ([www.fbo.gov](http://www.fbo.gov)) and the DHS SBIR web site ([www.sbir.dhs.gov](http://www.sbir.dhs.gov)) with the names of the Technical Points of Contact for each technical topic. During the period 3 December 2007 through 18 December 2007, 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. 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 19 December 2007 through 4 February 2008 for reasons of competitive fairness. However, proposers may submit written questions to [faq@hsarpasbir.com](mailto:faq@hsarpasbir.com). Questions shall 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://fbo.gov> and on the DHS website at <http://www.sbir.dhs.gov>.

- f. **All proposers are advised to monitor the <http://www.fbo.gov> and <http://www.sbir.dhs.gov> web sites 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 SBIR program participates in two National SBIR Conferences each year and in many state-organized conferences for small business. For information on these events, visit the web site, <http://www.sbir.dhs.gov> located under "What's New," or refer to the <http://www.SBIRWorld.com> web site for upcoming SBIR outreach events.

## **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 Department of Homeland Security (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 at the time of award of a Phase I or Phase II contract meets all of the following criteria:

- a. Organized for profit, with a place of business located in the United States, which operates primarily within the United States or which makes a significant contribution to the United States economy through payment of taxes or use of American products, materials, or labor;
- b. In the legal form of an individual proprietorship, partnership, limited liability company, corporation, joint venture, association, trust or cooperative, except that where the form is a joint venture, there can be no more than 49 percent participation by foreign business entities in the joint venture;
- c. At least 51 percent owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States, except in the case of a joint venture, where each entity to the venture must be 51 percent owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States; and
- d. Not more than 500 employees, including its affiliates.

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, 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. ([Click here](#) 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).

### **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 DTIC web site, <http://www.dtic.mil/dtic/hbcumi/>.

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

HUBZone 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 <http://www.sba.gov/hubzone> 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 Foreign National**

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 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 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). Any small business contemplating a proposal for work on any specific topic should 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 firm 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 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 web site (<http://www.sbir.dhs.gov>) and prepare your SBIR proposal as instructed on the web site. 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.

- 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.
- d. The content in the technical proposal, including supporting data (if applicable), shall include all of the items in Section 3.5(b) in the order specified.
- e. The header on each page of your technical proposal shall 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 shall 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.

### ***3.4 Limitations on Length of Proposal***

This solicitation is designed to reduce the investment of time and cost to small 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 sheet 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 25-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 web site <http://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 SBIR web site; 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 firm 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 submission web site until you have created a cover sheet 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 should 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 should 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 should determine the technical feasibility of the proposed concept. The methods planned to achieve each objective or task should be discussed explicitly and in detail. This section should 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 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. Identify any non-U.S. citizen 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) shall 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). If such involvement is intended, it should 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 firm, 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) 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) 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.

- (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 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. Hence, travel will typically be held at the beginning of your Phase I award or at the conclusion of the Phase I effort; depending on the Science & Technology program manager requirement.
- (4) Cost sharing is permitted for proposals under this solicitation; however, cost sharing is not required nor will it be an evaluation factor in the consideration of a Phase I proposal.
- (5) The cost proposal form 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 should 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 Program Managers for the applicable topic may recommend that Phase I performers 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 performers 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 funding available, 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 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. (*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 the solicitation, as well as undergo the DHS source selection process. Phase II proposals must be received no later than 30 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 will be notified of Phase II invitation status after the Phase I period of performance has been completed.

### 3.8 Phase II Proposal Format

Phase II proposal length 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. No two-column format is 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). 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 section 4.4).

- c. **Cost Match.** Proposers that request Phase II Cost Match funds 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 II 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 4.6.

#### 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). 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.

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.

Additional instructions regarding Phase II proposal preparation and submission is on the <http://www.sbir.dhs.gov/UsefulLinks.asp> web site.

### **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 Program.** The DHS SBIR program has implemented a Cost Match program 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. 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 program, 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 the SBIR program manager. 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 web site ([www.sbir.dhs.gov](http://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. Additional guidance on Cost Matching can be found at the on the web site: <http://www.sbir.dhs.gov/UsefulLinks.asp>.
  - 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 must certify within 60 days that the entire amount of the matching funds from the outside investor has been transferred to the company. 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 the DHS appointed contracting office 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 office does not receive, within 60 days, this certification showing the transfer of funds, the company will be ineligible to compete for a Phase II Cost Matching funding, unless a specific written exception is granted by the DHS SBIR program manager.

Failure to meet these conditions in their entirety and within the time frames indicated may disqualify a company from participation in the SBIR Cost Match. DHS maintains the right to award some, all, or none Phase II Cost Match requests. Phase II Cost Match funding is contingent upon, 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 will be required to sign Non-Disclosure and Conflict of Interest Agreements. The Government may use selected support contractor personnel to handle the administrative functions for the program. These 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 other 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 or engineers knowledgeable in the topic area. Proposals will be evaluated first on their relevance to the chosen topic. 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 should contact the DHS SBIR program as described in Section 1.6 to determine whether submission of such a proposal would be useful.)

Proposals found to be relevant will then be evaluated using the criteria listed in Section 4.2 (and Section 4.3 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 before award of a contract.

For proposals that have been selected for contract award, a Government Contracting Officer will draw up an appropriate contract to be signed by both parties before work begins. Any negotiations that may be necessary will be conducted between the proposer and the Government 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 DHS 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 II Proposals (see Section 6.4).

Restrictive notices notwithstanding, Phase I and Phase II proposals may be handled, for administrative purposes only, by support contractors. All support contractors are bound by appropriate non-disclosure agreements.

#### **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.

Each Cost Proposal will be evaluated for cost realism and reasonableness, and overall best value to the Government. 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 firm 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.
- 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.

Each Cost Proposal will be evaluated for cost realism and reasonableness, and overall best value to the Government. 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)] 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 firm has no prior Phase II awards will not affect the firm's ability to win an award. Such a firm's proposal will be evaluated for commercial potential based on its commercialization strategy in item (a), above.

Government transition of the proposed effort is very important. The small business should include their 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) 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) on a specific topic have been evaluated. Proposers will be notified of selection/non-selection within three (3) months of the closing date of this solicitation.

- 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 the government reserves the right and discretion not to award any or to award less than or more than this percentage of Phase II projects.
- 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.
- c. **Average Dollar Value of Awards.** Phase II awards will typically cover two to five 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 performers.

## 5.3 Phase I Report

- a. **Content.** A final report is required for each Phase I project. The report must contain in detail the project objectives, work performed, results obtained, and estimates of technical feasibility. In addition, monthly status and progress reports will be required by DHS. Please keep in mind that the monthly status reports and/or final reports are used as a basis to determine progress made towards the accomplishments of Phase I technical objectives when inviting Phase II proposals.
- b. **Preparation.**
  - 1) If desirable, language used by the company in its Phase II proposal to report Phase I progress may also be used in the final report.
  - 2) For each unclassified report, the company submitting the report must state one of the following statements:
    - 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 web site: <http://www.sbir.dhs.gov>. 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. Please include the company name, topic number, proposal number and contract number in each report. Detailed submission instructions will be provided at contract award and on the DHS web site: <http://www.sbir.dhs.gov>.

CLOSED

#### **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 web site at <http://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. Contractors that do not submit a new proposal to DHS will be asked to provide updates on an annual basis for five years after the completion of Phase II.

#### **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 proposers may be paid periodically as work progresses in accordance with the negotiated price and payment schedule. Phase I contracts are primarily 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 or Small Purchase Orders. Progress payments are allowed in accordance with the negotiated price and payment schedule. Provisions for payment of fee or profit are also allowable. Final payment will follow completion of contract performance and acceptance of all work required under the agreement.

#### **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 this information is clearly marked by the proposer with the term "PROPRIETARY" (do not use "Company Confidential") and provided that the following legend that appears on the Proposal Cover Sheet of the proposal is completed:

"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."

Any other legend other than Source Selection Information in accordance with FAR 3.104, will be unacceptable to the Government and may constitute grounds for removing the proposal from further consideration and without assuming any liability for inadvertent disclosure. The Government will limit dissemination of properly marked information to within official channels. In addition, 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 U.S.C. §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 must report inventions to the awarding agency within 2 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](http://www.iedison.gov). Use of the Edison System satisfies all invention reporting requirements mandated by any award.

### **5.9 Technical Data Rights**

Rights in technical data, including software, developed under the terms of any contract resulting from proposals submitted in response to this solicitation generally remain with the contractor,

except that the Government obtains a royalty-free license to use such technical data only for Government purposes during the period commencing with contract award and ending four years after completion of the project under which the data were generated. Upon expiration of the four-year restrictive license, the Government has unlimited rights in the SBIR data. See FAR clause 52.227-20, "Rights in Data -- SBIR Program."

### **5.10 Contractor Commitments**

Upon award of a contract, the contractor will 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 Regulations 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 provisions will be made available prior to 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 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.
- 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 shall be decided by the contracting officer with 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, receive overtime pay).
- h. **Equal Opportunity.** The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.
- i. **Affirmative Action for Veterans.** The contractor will not discriminate against any employee or applicant for employment because he or she is a disabled veteran or veteran of the Vietnam era.
- j. **Affirmative Action for Handicapped.** The contractor will not discriminate against any employee or applicant for employment because he or she is physically or mentally handicapped.
- k. **Officials Not to Benefit.** No 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 DHS can award a contract 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.
- 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 will 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 are not accepted under this DHS SBIR solicitation.

## **6.0 SUBMISSION OF PROPOSALS**

Each proposal must be submitted on the DHS electronic submission web site at <http://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 web site, first prepare the proposal cover sheet (select "Prepare/Edit Phase I Cover Sheet" from the Main Menu). The web site 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 web site, following instructions on the web site. The cost proposal may be submitted either using the on-line form or as the last page(s) of your technical proposal file.

Technical proposals should be a single file, including all graphics and attachments, should have the company name and proposal number (from the cover sheets) in the header, and should be in PDF. Proposers are responsible for performing a virus check on each technical proposal prior to uploading. Every uploaded file will be scanned for viruses. 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 web site 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 must 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 had 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 the proposal is selected for award, the DHS designated contracting office will contact you for all appropriate signatures.

### **6.2 *Proposal Deadline***

Proposals are accepted from 17 December 2007 – 4 February 2008. Deadline for electronic receipt of proposals is 4:30 pm EST 4 February 2008. Proposals must be completely submitted to the DHS submission web site by the specified closing time. 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 web site 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 web site 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 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 selection is made. However, contracting officers may contact any and all qualified proposers prior to contract award. Selections will be posted on the DHS SBIR web site 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 web site as awards are made.

#### **6.5 Evaluation Results**

Any proposer that submits a request within 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 should be emailed to [faq@hsarpasbir.com](mailto:faq@hsarpasbir.com).

#### **6.6 Correspondence Relating to Proposals**

All correspondence relating to proposals should cite the SBIR solicitation number, proposal number, and 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, encourages 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 [helpdesk@safetyact.gov](mailto:helpdesk@safetyact.gov) or visit OSAI's web site at [www.safetyact.gov](http://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.

#### **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:

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

Contact your State SBIR Support office at [www.ed.gov/offices/OERI/SBIR/statelink.html](http://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 outlining the technical areas in which DHS requests proposals. Topics are listed and numbered separately.

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 solicitation (8.1) 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 you plan to employ non-U.S. citizens in the performance of a DHS SBIR contract, please identify these individuals in your proposal as specified in Section 3.5.b (7) of the program solicitation. 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.

ELECTRONIC SUBMISSION of Cover Sheet, Technical and Cost proposal **IS REQUIRED**. Only proposals submitted through the on-line submission web site at <http://www.sbir.dhs.gov> will be accepted or considered for award. 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 no longer 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 \$99,990 and should be a **six-month or less effort**.

DHS Phase II proposals may be invited by the respective Phase I DHS Program Manager. 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 solicitation.
- Successful proposers will be expected to begin work no later than 30 days after contract award.
- For planning purposes, the 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 08 Publication 1**

- H-SB08.1-001**      Assess Ability to use Eye Tracking and Pupil Dilation to Determine Intent to Deceive
- H-SB08.1-002**      Miniature Chem/Bio/Explosive Sensors
- H-SB08.1-003**      Mapping of Long-term Threats, Vulnerabilities, and Impacts
- H-SB08.1-004**      Trace Explosives Sampling for Vehicle Borne Improvised Explosives Device (VBIED) Detection
- H-SB08.1-005**      Smart Sensor System

CLOSED

## 8.1 SBIR TOPIC NUMBER: H-SB08.1-001

**TITLE:** Assess Ability to use Eye Tracking and Pupil Dilation to Determine Intent to Deceive

**TECHNOLOGY AREAS:** Iris Tracking, Pupil Measurement, Deception Technology

**OBJECTIVE:** Assessment of the viability to use pupillary response to determine intent to deceive

**DESCRIPTION:** Recent government sponsored research is working to produce a new line of flexible physiological and behavioral sensor technologies that are to be available for homeland security applications. These sensors, which must be non-invasive in nature and protect the privacy of the individual(s) involved, will be used to support human centered/behavioral screening processes in a variety of high and low volume venues. Security screening is conducted to evaluate the risk of individuals entering transportation and other critical infrastructure and requires efficient, rapid and accurate examination of a person. Persons involved in or planning to be involved in possible malicious or deceitful acts will show various behavioral or physiological abnormalities. Much of the technology and publications to date have focused on detection of guilty individuals using electrodermal measures. Research into other psychophysiological measures or the mechanisms underlying deception is still in its early stages. Early research has shown that pupil size varies with changes in a person's cognitive processing load. Current but unproven studies suggest that a cognitive decision to deceive or practice deception will result in a increased pupil size due to the greater cognitive processing required in comparison to truthful recall. An assessment study to determine the correlation between Pupillometry (dilation and contraction of the pupil relative to observed stimulus or emotion) and intent to deceive is required.

**PHASE I:** Proof of concept assessment showing the validity of the theory relating deception or the intent to deceive and pupil dilation and potential for automation.

**PHASE II:** Identification and delivery of prototype device, based on proven theory that can be used to measure pupil dilation in conjunction with intent to deceive

**PHASE III: COMMERCIAL APPLICATIONS:** New technology successfully developed in this program will transition to commercial security screening products for access control for federal, state, and local homeland security applications. In addition, this technology has commercial potential for similar DOD applications.

### REFERENCES:

1. Educating Information – Interrogation: Science and Art, Foundations for the Future, Intelligence Science Board, National Defense Intelligence College, December 2006
2. Simion, C., & Shimojo, S. (2004). How Early Does the Brain “Know” What It Likes? Evidence from Pupillometry [Abstract]. *Journal of Vision*, 4(8):103, 103a, <http://journalofvision.org/4/8/103/>, doi:10.1167/4.8.103.
3. E. H. Hess. Pupillometries. In N. S. Greenfield and R. A. Stembach (Eds.) *Handbook of Psychophysiology*, pages 491- 531. Holt, Richard & Winston, New York, NY, 1972.
4. S. R. Steinhauer, Ph.D. Pupillary Responses, *Cognitive Psychophysiology and Psychopathology*, <http://www.wpic.pitt.edu/research/biometrics/Publications/PupilWeb.htm>

**KEY WORDS:** Pumetry, Deception, Deceit, Deception Techniques, Reaction to Emotional Stimuli, Pupil, Dilation

## **8.2 SBIR TOPIC NUMBER: H-SB08.1-002**

**TITLE:** Miniature Chem/Bio/Explosive Sensors

**TECHNOLOGY AREAS:** Chem/Bio/Explosive Detection, Communications

**OBJECTIVE:** To develop robust and inexpensive miniature collector and sensor systems that enable ubiquitous Chemical, Biological, and/or Explosive detection through integration into hand held devices such as cellular phones or attached to other personal wireless devices that provide for sensor integration, geo-location, and contain an independent power supply.

**DESCRIPTION:** Many modern detectors for chemical, biological, or explosive materials are generally too large to fit inside a handheld device that is approximately 2 inches x 4 inches x 3/4 inch thick. The primary application for these miniature collection and detection systems is integration with cellular and other wireless devices that enable it to become part of a larger distributed alert network that improves situational awareness for mission personnel. The collection and sensing system should become inexpensive, low power, robust to the environment, of no personal risk and maintenance free for the life of the device.

**PHASE I:** Develop and document a miniaturized collection and sensor systems design concept and/or miniature physics based collection or sensor component to accurately assess presence of chemical, biological or explosives in the immediate area. During this phase of the investigation, evidence for the eventual miniaturization for the collector and/or components should be collected and documented. Understand that power budgets for cellular and other wireless devices are highly limited and affect marketability.

**PHASE II:** Produce a prototype miniaturization for the proposed system and/or components with a demonstration that involves sensing and communication for specific geographical environments and ambient conditions. Demonstrate that the collector, sensor and/or system is feasible in Phase I.

**PHASE III:** Working with DHS program managers and major cell phone designers and suppliers provide working models of the developed technology for integration into a larger ubiquitous detection system for biological, chemical and/or explosive materials detection. Produce first run beta collection, sensor, and/or systems and support independent test and evaluation of the system.

**KEY WORDS:** Chemical detection, Biological detection, Explosive detection, Cell Phone, Cell-all, collector

### 8.3 SBIR TOPIC NUMBER: H-SB08.1-003

**TITLE:** Mapping of Long-term Threats, Vulnerabilities, and Impacts

**TECHNOLOGY AREA(S):** Information analytics

**OBJECTIVE:** Develop capabilities to graphically depict the complex, long-term threats to the security of the United States and its vulnerabilities to terrorist incidents or other disasters

**DESCRIPTION:** The impact of various terrorist actions as well as natural or manmade disasters on the physical, social, behavioral, and economic life of the United States and its citizens is dependent on multiple factors. These include, but are not limited to, the type, severity, and persistence of the terrorist agent or natural catastrophe; the particular vulnerabilities of infrastructures, locations, and populations; the efficacy of response and remediation measures, including such capabilities as communications; and the resilience or strength of the public affected by the incident. At this stage in the development of an effective homeland security policy, information on some of these factors is being collected and analyzed. What is most lacking, however, is a method for integrating and depicting the multivariate nature of threats to the homeland, both the local- and national-level vulnerabilities to multiple threats, and especially the potentially long-term and diverse effects of terrorist incidents or other disasters.

**PHASE I:** Identify the multiple factors that determine the impact of a terrorist event or natural or manmade disaster on a local, national, or international scale and over the short, medium, or long term.

**PHASE II:** Develop mathematical methods for systematically analyzing threats and vulnerabilities and their resulting effects and impacts.

**PHASE III:** Develop and demonstrate visually appealing and informative (for decision-making) techniques that depict the complex, multivariate nature of threats to homeland security. The work is expected to transition into current CID activities in the Visual Analytics and Physics-based Simulation Program.

**KEYWORDS:** Visual analytics, terrorist threats, disaster, geographical information systems, vulnerabilities, critical infrastructure

**REFERENCES:** The National Visualization and Analytics Center ([www.nvac.pnl.gov](http://www.nvac.pnl.gov)); the Dynamic Data Analysis Center ([www.dydan.rutgers.edu](http://www.dydan.rutgers.edu)); the Northeast Visualization and Analytics Center ([www.geovista.psu.edu/NEVAC/](http://www.geovista.psu.edu/NEVAC/))

#### 8.4 SBIR TOPIC NUMBER: H-SB08.1-004

**TITLE:** Trace Explosives Sampling for Vehicle Borne Improvised Explosives Device (VBIED) Detection

**TECHNOLOGY AREAS:** Analytical Chemistry, Explosives Detection, Sampling

**OBJECTIVE:** Development of enhanced sampling capabilities for trace level explosives on a range of vehicles within the United States.

**DESCRIPTION:** Trace explosive detection equipment has been developed for a broad range of applications and venues. The technology industry has commercialized a number of sensitive, yet robust, trace detection systems. In many cases, these *Commercial Off-the-Shelf* (COTS) devices are not limited by the sensitivity or selectivity of the techniques, rather from the shortcomings of the particular sampling interface. Such limitations arise, in part, due to the low levels of explosive residue associated with domestic screening applications. This solicitation seeks enhanced sampling capabilities, to be used and/or integrated with COTS IMS (COTS ION Mobility Spectrometers) explosives detection equipment, for domestic VBIED detection. DHS S&T is soliciting novel sample collection systems, rather than detection equipment. Proposals for improved detectors or sensors will be disqualified. Proposals must limit collection to the vehicles' exterior and must be performed without direct contact with the vehicle. It is highly desirable that the proposed systems will collect from the entire exterior of the vehicle only. At a minimum, at least 10 points (10 cm<sup>2</sup> per point) on the vehicle must be sampled. Proposals that involve any type of driver/passenger interrogation will be disqualified. Proposals must include a Concept of Operation for the proposed technology as well as anticipated figures of merit (to include throughput, sampling efficiency, range of materials that can be collected, etc.). The resulting sample must be amenable for direct analysis via COTS IMS systems. Portability and "Minimal Deployed Footprint" of any system is highly desirable.

**PHASE I:** Demonstrate the feasibility of the proposed technical approach. A laboratory demonstration, although not required, is desirable. The chemical and/or physical basis of the proposed technology should be described.

**PHASE II:** Develop prototype system for testing with a mutually acceptable COTS IMS system. Analytical characterization of prototype system should be documented to quantitatively demonstrate enhanced sampling capability (over "aviation style" swipes/swabs).

**PHASE III COMMERCIAL APPLICATIONS:** In addition to homeland security and defense applications, enhanced sampling capabilities are required by state and federal law enforcement entities as well as private security organizations.

#### **REFERENCES:**

1. *Survey of Commercially Available Explosives Detection Technologies and Equipment 2004*, prepared by Sandia National Laboratories for The National Law Enforcement and Correction Technology Center, a Program of the National Institute of Justice, 11/04.

**KEYWORDS:** Trace Explosives, Explosives Detection, Sampling, Portals, VBIEDs

## 8.5 SBIR TOPIC NUMBER: H-SB08.1-005

TITLE: Smart Sensor System

### OBJECTIVE:

An end-to-end smart sensor system is sought to accomplish real-time data acquisition and processing. The front-end of this system will compose of a modular platform that is capable of hosting various kinds of sensors from imaging, environmental, to nuclear, chemical, or bio-sensors. These smart sensors will form a sensor web to process data individually and collectively for better understanding of the target environment. The back-end of this system will be able to semantically analyze the overall data and assist knowledge management and decision making.

For example, developing a scalable imaging sensor system that is capable of processing images and extracting important visual information in real-time. Such a system can be used to analyze information from individual or multiple sensors as well as capture multiple parameters; for example, tracking the activities of subjects, detecting unusual events such as a package left behind, and capturing license plate data. The output of these smart sensors will be actionable knowledge to detect or prevent crime or hostile activity.

Another application of such smart sensor system is fast deployment of "Sensor Motes" at natural or man-made disastrous areas to rapidly map out "hot" zones and predict future dispersion. For example, these sensor motes can be dropped from airplanes and autonomously form sensor networks. The basic communication module can be standardized, while the sensor module can be interchangeable to detect nuclear, biological, chemical, or other dispersible natural agents.

### DESCRIPTION:

Sensor webs of the future will be able to configure and reconfigure on the fly to adjust to the changing environment and sensor capabilities. Several crucial pieces of technology will be sought in this solicitation. The proposers may choose to cover one or all of these technology areas.

Front-end Sensing Module: The design of these sensors is expected to be modular so that their sensing functions can be quickly adjusted to meet the needs of each mission. They should possess some computational capability for on-board data processing. For example, a smart image sensor system typically captures the image then passes to a separate device to process the data and extract useful information. This approach is limited by several factors; namely, the image collection time, the network bandwidth, the computational power required for processing, the sensor's resolution,

- (1) the field of view, and background interference. All of these factors, as well as other conditions, such as the operating environment in which the imaging system has been placed and the specific function to which it is being applied, limit the effectiveness of imaging for real-time analysis and decision-making.

The development will focus on a smart imaging sensor and information processing system. The system is being denoted "smart" because it will contain embedded processing capabilities for in-place analysis of the captured images as well as automated subject recognition and image collection. The sensors will obtain high-resolution visual information. Algorithms and operational software will extract only relevant visual information in real-time, such as subject or target direction and speed detection, and multiple object tracing. A database of object signatures will be created using the unique signals gathered by the sensors, allowing for future target matching and recognition. The system must also be scalable and adaptable to accommodate different venues and applications.

The system envisioned will be applied to a variety of imaging activities or venues, such as at ports of entry, along the borders, near critical infrastructures, transportation nodes, and around national assets.

Permanent installations such as these will be supplemented by temporary or conditional uses for monitoring National Security Events, such as the Olympics or other national-level sporting events, inaugurations, visits by dignitaries, and political conventions. The objectives in all these cases are to detect unusual patterns of activity and identify perpetrators of putative terrorist or criminal activity.

- (2) **Middleware-based Architecture:** The deployable sensor motes may have limited power and life-span. The sensor web will be able to reconfigure when there are malfunctions or change of sensing topography. There should also be algorithms developed to optimize power consumptions and maximize data output.
- (3) **Back-end knowledge Management:** The increased capability of distributed and embedded computing has enabled a much more powerful way to analyze the collected data from multiple sources. The web ontology also enables semantic data analyses to harvest previous unseen or unknown knowledge or patterns.

**PHASE I:** Phase I efforts are expected to benchmark existing sensor web capabilities and formulate a design and proof of concept. The modular design and the algorithms to configure and reconfigure on the fly should be demonstrated in the laboratory environment. A specific homeland security application is expected to be included in the demonstration. For example, a smart imaging system (SIS) will be able to capture and analyze information from multiple sensors and manage multiple parameters should be developed and confirmed (e.g., simulation, laboratory experiment) for at least one venue or homeland security application. Alternatively, a scalable SIS capable of analyzing individual sensor information in different venues is acceptable. Real-time processing is key to this effort.

**PHASE II:** A minimum of 20 such distributed units are expected to be delivered and demonstrated. The modular design will enable rapid interchangeable sensing capabilities such as nuclear vs. chemical detections. The rapid configurability and re-configurability will be demonstrated with power and topography changes. Automation of the operation is the objective of the Phase II effort. This will include the demonstration of the detection of unusual activity indicative of crime or terrorism and, after suitable training of the SIS, recognition of patterns of activity. In all cases, the processing must be embedded with the sensor.

**PHASE III COMMERCIAL APPLICATIONS:** Commercial applications of the system will depend on development of a small or miniature SIS operating on low power and requiring low bandwidth transmission from sensor sites. Automated collection of operational conditions and system parameters will be indexed to the processed images. Suitable warnings and indicators will also be required.

The potential commercial applications of such SISs include monitoring and protection of commercial buildings or facilities, such as banks, malls, stadiums, transportation hubs, or schools. The systems can also be used for environmental monitoring or to sense impending flooding of coastal areas, riverbanks, or levee systems.

For deployable sensors, the commercial applications will include a set of prototypes that are ruggedized and readily deployable. Note that these can also be “floaters” on a flooded area with GPS capabilities to map out affected areas and detect bio-agents. They can also be wearable (pervasive) units for first responders.

#### REFERENCES:

1. Advanced Research & Development Agency (ARDA) Video Analysis and Content Extraction (VACE) Program ([www.ic-arda.org/InfExploit/vace](http://www.ic-arda.org/InfExploit/vace))
2. NASA Sensor Web Concept (<http://esto.nasa.gov/sensorwebmeeting/>)

**KEYWORDS:** Imaging, smart sensors, embedded processing, surveillance, monitoring, real-time analysis, critical infrastructure, environmental monitoring, sensor web, deployable sensors

## 9.0 DHS FY 08.1 PHASE I SBIR CHECKLIST

### Page Numbering:

- Number all pages of your proposal consecutively
- Total for each proposal is 25 pages inclusive of cover sheets, technical proposal, cost proposal and resumes
- Beyond the 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 <http://www.sbir.dhs.gov>

### The Technical Proposal addresses:

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

### Final checklist:

- The Cover Sheet was prepared on-line
- The Technical Proposal was uploaded
- The Cost Proposal was prepared on-line and shows detailed cost breakout and the total cost is also 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
- Web site Help Desk 1-800-754-3043