



**U.S. Department of Homeland Security (DHS)**

**Small Business Innovation Research (SBIR) Program**

**Pre-Solicitation #: HSHQDC-15-R-00017**

Due Date: January 21, 2015 at 2:00 pm ET

Issued By:  
DHS Office of Procurement Operations  
on behalf of:  
the Science and Technology Directorate  
and the Domestic Nuclear Detection Office

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## 1.0 PROGRAM DESCRIPTION

### 1.1 Summary

The Department of Homeland Security (DHS) Small Business Innovation Research (SBIR) Program, comprised of the Science and Technology (S&T) Directorate's SBIR Program and the Domestic Nuclear Detection Office's (DNDO) SBIR Program, invites small business concerns (SBC) to submit innovative proposals under this Solicitation. Eligible small businesses with the capability to conduct research or research and development (R/R&D) in any of the homeland security-related topic areas described in **Appendix A**, and to commercialize the results of that R/R&D, are encouraged to participate. The DHS SBIR Program Office encourages all small businesses, particularly small disadvantaged, women-owned, veteran-owned, service-disabled veteran-owned, and socially and economically disadvantaged small businesses to submit proposals in response to topics described in this Solicitation.

#### **IMPORTANT:**

- Please read the solicitation carefully. Failure to comply with the requirements herein will result negatively in the proposal evaluation.
- This Solicitation contains topics for both the S&T Directorate's SBIR Program and DNDO's SBIR Program. Only proposals submitted in response to topics contained in this Solicitation will be accepted and considered for awards. **Section 7.0** outlines the nine (9) research topics – seven (7) S&T topics and two (2) DNDO topics. Unsolicited proposals will not be accepted.
- While the Phase II proposal process is covered in this Solicitation, at this time this Solicitation requests Phase I proposals only. See **Section 1.3**.
- Small businesses that are majority-owned by multiple venture capital operating companies, hedge funds or private equity firms are not eligible to submit proposals in response to this Solicitation. See **Section 3.8**, Eligibility.
- Per the Small Business Administration (SBA) SBIR Policy Directive, dated February 24, 2014, to be eligible for a Phase I award, Offerors must meet or exceed the following benchmarks:
  - Phase I to Phase II Transition Rate, See **Section 3.9**, DHS Phase II Transition Rate Benchmark
  - Commercialization Rate Benchmark, See **Section 3.10**, DHS Commercialization Rate Benchmark.

### 1.2 DHS SBIR Program, Purpose and Objectives

The statutory purpose of the SBIR Program is to strengthen the role of innovative small business concerns in Federally-funded R/R&D. Program objectives are to: (1) stimulate technological innovation; (2) strengthen the role of small business in meeting Federal R/R&D needs; (3) foster and encourage participation by socially and economically disadvantaged small businesses (SDBs) and by women-owned small businesses (WOSBs); and (4) increase private sector commercialization of innovations developed through Federal R/R&D, thereby increasing

competition, productivity, and economic growth. The federal SBIR Program is mandated by the Small Business Research and Development Act of 1982 (Public Law 97-219), the Small Business Research and Development Act of 1992 (Public Law 102-564), and the SBIR/STTR Reauthorization Act of 2011 (Public Law 112-81).

The DHS SBIR Program follows the policies and practices of the Small Business Administration (SBA) [SBIR Policy Directive](#), dated February 24, 2014. This Solicitation incorporates and uses the flexibility of the SBA SBIR Policy Directive to encourage innovative proposals in response to the research topics listed in **Section 7.0**.

In its commitment to also support Executive Order 13329 which encourages innovation in manufacturing-related research and development, DHS seeks, through its SBIR Program and topic descriptions, research related to advanced processing, manufacturing processes, equipment and systems; or manufacturing workforce skills and protection.

### 1.3 Three Phase Program

The SBIR Program is a three phase program. The objective of Phase I is to determine the scientific, technical, and commercial merit and feasibility of the proposed effort, and the quality of performance of the small business concern, with a relatively small agency investment prior to providing further Federal support in Phase II. Phase I proposals should concentrate on that R/R&D which will significantly contribute to proving the scientific and technical feasibility, and commercialization potential of the proposed effort, the successful completion of which is a prerequisite for further DHS support in Phase II. Offerors are encouraged to consider whether the R/R&D being proposed also has private sector potential, either for the proposed application or as a base for other applications.

The objective of Phase II is to continue the R/R&D effort from the completed Phase I. Phase II efforts further develop work from Phase I that meets particular program needs and exhibits potential for commercial application. Phase II is the principal R&D effort and is expected to produce a well-defined deliverable prototype. Phase II awards may be made to small business concerns on the basis of the results of their Phase I projects, and the scientific merit, technical merit, and commercialization potential of the Phase II proposal. Phase II awardees may receive up to one additional, sequential Phase II award to continue the work of an initial Phase II award. The additional, sequential Phase II award has the same guideline amounts and limits as an initial Phase II award. In addition, Phase II awardees may receive additional funding under the DHS SBIR Commercialization Readiness Pilot Program (see **Section 5.15**).

In accordance with the SBIR/STTR Reauthorization Act of 2011 (Section 5105, Public Law 112-81), **DHS no longer uses an invitation process for Phase II**. All small businesses awarded a Phase I contract originating from this Solicitation are eligible to submit a Phase II proposal. A Contracting Officer will notify Phase I awardees of the Phase II proposal submission requirements and the deadline for Phase II submissions.

For details on the S&T and DNDO Phase I and II Cost Proposal thresholds, see **Section 3.4**.

SBIR Phase III refers to work that derives from, extends, or completes an effort made under prior SBIR funding agreements, but is funded by sources other than the SBIR Program. Phase III work is typically oriented towards commercialization of SBIR research or technology. Under Phase III, the SBIR awardee is expected to seek contracts and obtain funding from the private sector and/or the Federal government (non-SBIR federal government sources) to develop the prototype or supply goods or services related to the work performed under the SBIR contract(s) into a viable product or non-R&D service for sale in DHS and/or private sector markets.

A Phase III award, by its nature, is an SBIR award, has SBIR status, and must be accorded SBIR data rights. Phase III proposals can only be submitted by, and made to, a Phase I and/or Phase II awardee. The competition for SBIR Phase I and Phase II awards satisfies any competition requirement of the Armed Services Procurement Act, the Federal Property and Administrative Services Act, and the Competition in Contracting Act. Therefore, an agency that wishes to fund an SBIR Phase III project is not required to conduct another competition in order to satisfy those statutory provisions.

#### 1.4 Key Dates and Events

The following chart shows the important events and corresponding dates of the FY15.1 DHS SBIR Solicitation, HSHQDC-15-R-00017.

KEY DATES	
EVENT	DATE
Pre-solicitation issued:	December 3, 2014
Direct contact with Topic POC permitted:	December 4, 2014 – December 17, 2014
Solicitation released:	December 18, 2014
Phase I proposals submission:	December 18, 2014 – January 21, 2015
Last day to submit questions:	January 7, 2015 no later than 2:00 p.m. ET
Last day Q&A Posted on FedBizOpps	January 14, 2015
Deadline for receipt of proposals:	January 21, 2015, 2:00 p.m. ET

#### 1.5 SBIR Office Contacts

For general questions about the S&T Directorate's SBIR Program, please contact [STSBIR.PROGRAM@hq.dhs.gov](mailto:STSBIR.PROGRAM@hq.dhs.gov). For general questions about the DNDO SBIR Program, please contact [dnDOSBIR@hq.dhs.gov](mailto:dnDOSBIR@hq.dhs.gov).

#### 1.6 Definitions

Definitions provided in SBA's SBIR Policy Directive (dated February 24, 2014) and the Federal Acquisition Regulation (FAR) apply for the purposes of this Solicitation. Terms that are unique

to the SBIR Program, this specific SBIR solicitation, or may be unfamiliar to small business concerns, are defined in **Appendix B**.

## 1.7 Fraud, Waste and Abuse

DHS and the SBIR Program Office are taking proactive measures to reduce the vulnerability of the SBIR Program to fraud, waste, and abuse. The SBIR Policy Directive (dated February 24, 2014), Section 9 (f)(1) (i through ix), provides examples of fraud, waste and abuse relating to the SBIR Program. To report SBIR fraud, please contact the DHS Office of the Inspector General (OIG):

- Anonymous Hotline: 1-800-323-8603
- OIG Online Allegation Form: <http://www.oig.dhs.gov/hotline/hotline.php>
- Fax: (202) 254-4297
- Mail: DHS Office of Inspector General/MAIL STOP 2600  
Attention: Office of Investigations-Hotline  
245 Murray Drive SW, Building 410  
Washington, DC 20528

To reach someone within S&T's SBIR Program Office about fraud, waste and abuse, please contact Frank Barros, DHS S&T SBIR Program Analyst, at [francis.barros@hq.dhs.gov](mailto:francis.barros@hq.dhs.gov).

To reach someone within the DNDO SBIR Program Office about fraud, waste and abuse, please contact the DHS DNDO SBIR PM at [dndosbir@hq.dhs.gov](mailto:dndosbir@hq.dhs.gov).

## 2.0 REGISTRATION, CERTIFICATIONS, AND DATA COLLECTION

### 2.1 Mandatory Registrations

In order to prepare and submit SBIR proposals to DHS under this Solicitation, Offerors must be registered in the DHS SBIR electronic online proposal submission system at <https://sbir2.st.dhs.gov>.

Company registration is also required in the U.S. Small Business Administration's (SBA) Company Registry Database at <http://sbir.gov/registration>. Prior to submitting the complete proposal to DHS, each Offeror must:

1. Affirm registration in the SBA Company Registry;
2. Input the company's SBC Control ID number in the Company Data section of the DHS SBIR Cover Sheet; and
3. Append a copy of the completed SBA Company Registration information as the last page of the Technical Proposal.

Before an SBIR contract can be awarded, proposing firms must also be registered in the System for Award Management (SAM). SAM is the official U.S. Government system that consolidated the capabilities of the Central Contractor Registration (CCR)/Federal Register, Online Representations and Certifications Application (ORCA), and the Excluded Parties List System (EPLS) databases. Although not required at the time of proposal submission to the DHS SBIR Program, it is highly recommended that Offerors register in SAM during the proposal process. To register in SAM and/or update company's records, visit <https://www.sam.gov/portal/public/SAM/>.

Offerors are encouraged, but not required, to have a DUNS number and a CAGE code at the time of proposal submission. Companies must obtain these before a contract can be awarded to the company. To obtain a DUNS number, visit <https://fedgov.dnb.com/webform>. CAGE Codes are automatically assigned upon registration in SAM. For more information about the Commercial and Government Entry (CAGE) code, please visit [www.fsd.gov](http://www.fsd.gov).

## 2.2 Required Certifications

At the time of proposal submission, each small business concern must certify via the Cover Sheet of the proposal that it meets the size, ownership and other requirements of the SBIR Program. In addition, the SBA SBIR Policy Directive (dated February 24, 2014) includes certifications requirements set forth in Section 5143 of the SBIR/STTR Reauthorization Act of 2011. The certifications require small businesses to certify that they are meeting the Program's requirements during the life cycle of the funding agreement.

The DHS SBIR Programs will implement the certifications as follows:

1. SBIR Funding Agreement Certification – Time of Award (**Attachment 1**) – If selected for award, this certification will be provided by the Contracting Officer to the small business for completion prior to issuing the Phase I and Phase II award.
2. SBIR Funding Agreement Certification – Life Cycle Certification (**Attachment 2**) - The Life Cycle Certification will be included in resultant Phase I and Phase II contracts and considered a deliverable.

## 2.3 Data Collection Requirement

Each Phase I and Phase II applicant is required to either enter information into SBA's database at [www.SBIR.gov](http://www.SBIR.gov) or to update previously entered information. Companies should login to [www.SBIR.gov](http://www.SBIR.gov) using the account created when registering for the SBA company registry database. The following are examples of data to be entered into the database:

- Any business concern or subsidiary established for the commercial application of a product or service for which an SBIR award is made.
- Revenue from the sale of new products or services resulting from the research conducted under each Phase II award;

- Additional investment from any source, other than Phase I or Phase II awards, to further the research and development conducted under each Phase II award.

The SBC may apportion sales or additional investment information relating to more than one Phase II award among those awards, if it notes the apportionment for each award.

In addition, each Phase II awardee is required to update the appropriate information on the award in the database upon completion of the last deliverable under the funding agreement and is requested to voluntarily update the information in the database annually thereafter for a minimum period of 5 years.

### 3.0 PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

#### 3.1 Proposal Preparation and Length of Proposal

Offerors responding to this Solicitation must submit a direct, concise, and informative research or research and development proposal. Each complete proposal must be submitted via the DHS SBIR online proposal submission system portal at <https://sbir2.st.dhs.gov>.

Complete proposals contain the following:

PROPOSAL REQUIREMENTS		
	PHASE I	PHASE II
Page Limitation	25 pages	50 pages
Cover Sheet <sup>1</sup>	Pages 1-2	Pages 1-2
Technical Proposal	Pages 3-24	Pages 3-49
SBA Company Registry Information <sup>2</sup>	Mandatory	Mandatory
Cost Proposal <sup>3</sup>	Page 25	Page 50
Briefing Chart ( <b>Attachment 3</b> ) <sup>4</sup>	Mandatory	Mandatory
Commercialization Report <sup>4</sup>	N/A	If Applicable
Company Financial Information <sup>5</sup>	N/A	Mandatory S&T Topics ONLY
Non-disclosure Agreement <sup>6</sup>	Mandatory (DNDO Topics ONLY)	(NDA from Phase I applies to Phase II)

<sup>1</sup> Counts as two pages no matter how it prints out

<sup>2</sup> Appended to the Technical Proposal (See **Section 2.1**), but not included in the page count

<sup>3</sup> Counts as one page no matter how it prints out

<sup>4</sup> Not included in page count

<sup>5</sup> Company Financial Information must not be included in the proposal, instead it must be submitted via email; See **Section 3.7**

<sup>6</sup> DNDO topics ONLY; NDA must not be included in the proposal; See **Section 4.3**.

The Cover Sheet and the Cost Proposal are completed electronically via the DHS SBIR online proposal submissions system, while the Technical Proposal, Briefing Chart, and the Commercialization Report, if applicable, are uploaded as PDF documents.

No additional attachments, appendices or referenced material beyond the page limitations shall be considered in proposal evaluation.

### 3.2 Proposal Cover Sheet, Technical Abstract, Project Aims, and Summary of Results

Offerors are required to provide basic details about the proposed effort on the proposal Cover Sheet. Additionally, the Cover Sheet includes the following fillable sections: Technical Abstract, Project Aims, and Summary of Results.

The Technical Abstract is limited to 250 words. The abstract must identify the purpose of the work and briefly describe the work to be carried out, the finding or results, and the potential commercial applications of the effort. If the Offeror's proposal is selected for award, the Technical Abstract section will be publicly posted on the DHS SBIR website and on the Small Business Administration's website; therefore, do not include proprietary or classified information in the Technical Abstract section of the Cover Sheet.

The Project Aims section is limited to 500 words and is for Government use only. **For Phase I proposals only**, the Offeror must state the specific objectives of the Phase I R/R&D effort, including the technical questions the Offeror will answer to determine the Phase I feasibility of the proposed approach and the impact that the results of the proposed research will exert on the research field(s) involved. The Offeror must state concisely and realistically what the proposed research is intended to accomplish in terms of its potential for technological innovation and commercial application. The proposed product, process or service that will ultimately be developed must be defined. Milestones for each of the aims must be included, as these will be used in the evaluation process. **For Phase II proposals only (including second Phase II awards and CRPP awards)**, the Offeror must state the specific objectives of the Phase II research and development effort including the impact that the results of the proposed research will exert on the research field(s). The Offeror must state concisely and realistically what the proposed research is intended to accomplish in terms of its potential for technological innovation and commercial application. The proposed product, process or service that will ultimately be developed must be defined. Milestones for each of the aims must be included, as these will be used in the evaluation process.

The Summary of Results section is limited to 500 words, must not contain proprietary information, and is for Government use only. The Offeror must provide the anticipated results and implications of the approach (both Phases I and II) and the potential commercial applications of the research.

### 3.3 Technical Proposal Format and Content

Prepare the Technical Proposal in single column format, 12-point Times New Roman, with 1” margins on 8 ½” x 11” paper. Company name, topic number, and proposal number should be included in the header of each page. (The header may be included in the 1” margin.) The use of 10-point font is permissible for imbedded tables, figures and graphics. See **Section 3.1** for page limitations for Phase I and Phase II proposals.

The Technical Proposal must be a single file, including tables, figures, graphics and table of contents (if included). Do not lock, password protect, or encrypt the file to be uploaded. Perform a virus check before uploading the Technical Proposal file. If a virus is detected, it may cause rejection of the proposal.

The Technical Proposal must include the following sections in the order provided:

PROPOSAL FORMAT	
PHASE I PROPOSAL	PHASE II PROPOSAL
I. Identification and Significance of the Problem or Opportunity	I. Identification and Significance of the Problem or Opportunity
II. Phase I Technical Objectives	II. Phase I Technical Objectives and Results
III. Phase I Work Plan	III. Phase II Work Plan
IV. Related R/R&D	IV. Related R/R&D
V. Key Individuals and Bibliography of Directly Related Work	V. Key Individuals and Bibliography of Directly Related Work
VI. Relationship with Future R/R&D	VI. Relationship with Future R/R&D
VII. Commercialization Strategy	VII. Commercialization Plan
VIII. Facilities/Equipment	VIII. Facilities/Equipment
IX. Subcontractors/Consultants	IX. Subcontractors/Consultants
X. Potential Post Applications	X. Prior, Current, or Pending Support of Similar Proposals or Awards
XI. Prior, Current, or Pending Support of Similar Proposals or Awards	

The following is a brief description of each section of the Technical Proposal as applicable for each Phase:

- Identification and Significance of the Problem or Opportunity – Succinctly define the specific technical problem or opportunity addressed; the proposed innovation; the relevance and significance of the proposed innovation to a need(s) within the topic description; the proposed innovation relative to the state of the art; and the importance of the work proposed.
- Technical Objectives (Phase I proposals only) – State the specific objectives of the Phase I R/R&D effort, including the technical questions that must be answered to determine the feasibility of the proposed innovation/approach.

- Technical Objectives and Results (Phase II proposals only) – State the specific objectives of the Phase I R/R&D effort including the technical questions addressed to determine the feasibility. Address the progress, results and findings of the Phase I effort.
- Work Plan (Phase I proposals only) (including the efforts of the subcontractor(s)/consultant(s), if applicable) – Provide an explicit, detailed description of the Phase I approach. The Plan must indicate what tasks are planned, how, when, and where the work will be conducted, a schedule of major events, and the final product(s) to be delivered. The Phase I effort must determine the technical feasibility of the proposed concept, and address the questions cited in the Technical Objectives immediately above. The methods planned to achieve each objective or task must be discussed explicitly and in detail. Task descriptions, schedules, resource allocations, estimated task hours for each key personnel and planned accomplishments, including project milestones, must be included. This section will be a substantial portion of the total Technical Proposal.
- Work Plan (Phase II proposals only) (including the efforts of the subcontractor(s)/consultant(s), if applicable) – Provide an explicit, detailed description of the Phase II approach. The Plan must indicate what tasks are planned, how, when, and where the work will be conducted, a schedule of major events, the final product to be delivered, and the completion date of the effort. The Phase II effort must satisfy the anticipated results, as specified in the topic description. The methods planned to achieve each objective or task must be discussed explicitly and in detail. Task descriptions, schedules, resource allocations, estimated task hours for each key personnel and planned accomplishments, including project milestones, must be included. This section must be a substantial portion of the total proposal.
- Related Research/Research and Development – Describe significant (current and/or previous) R/R&D activities that are directly related to the proposed effort, including any conducted by the principal investigator, the Offeror, consultants, or others. Discuss any planned coordination with outside sources. Describe how these activities relate to the proposed project. Describe previous efforts similar but directly related to the proposed effort. For each effort, 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. The Offeror must persuade reviewers of his or her awareness of key, recent R/R&D conducted by others in the specific topic area.
- Key Individuals and Bibliography of Directly Related Work – Identify key personnel who will be involved in the effort including information on directly related education, experience, and bibliographic information. A concise resume for the Principal Investigator and all key personnel, including a list of relevant publications (if any), must be included. All resumes will count toward the appropriate page limitation, see **Section 3.1. Offerors must identify any non-U.S. citizen(s) expected to be involved on proposed project** [including direct employees, subcontractors and consultants], their country of origin, type of visa or work permit under which they are performing, and an explanation of their anticipated level of involvement on this project. **Do not include Privacy Act Information.**

- Relationship with Future Research/Research and Development (Phase I proposals only) – State the anticipated results of the proposed approach if the project is successful through Phase I and Phase II. Discuss the significance of the Phase I effort in providing a foundation for Phase II research or research and development effort, application and commercialization efforts (Phase III).
- Relationship with Future Research/Research and Development (Phase II proposals only) – State the anticipated results of the proposed approach if the project is successful through Phase II and Phase III. Discuss the significance of the Phase II effort in providing a foundation for Phase III commercialization efforts.
- Commercialization Strategy (Phase I proposals only) – (1) Explicitly describe the company's strategy (vision) for commercializing the proposed technology and how it will transition to the specific operational component in DHS, other Federal Agencies, and/or private sector markets. (2) Provide specific information on what related technologies, if any, already exist in the market and why the technology being proposed will be superior and how this information was ascertained. (3) Include a discussion on the Offeror's current capability to commercialize previously developed technologies, as well as how the Offeror intends to develop the proposed technology all the way to the market. Responses to (1), (2), and (3) must be specific to the technology being proposed. Failure to respond to any of the items listed will result in a lower valuation for criterion c (See **Section 4.1** for Phase I evaluation criteria). If the Offeror has no commercial experience (item (3)) this should clearly be stated and Offeror should describe how Offeror intends to bring the necessary experience to the company.
- Commercialization Plan (Phase II proposals only) – The Commercialization Plan must address the following: (Failure to address each item listed below in some detail will result in a lower valuation for criterion b (See **Section 4.1** for Phase II evaluation criteria):
  - a. *Company Information.* Focused objectives/core competencies; specialization area(s); products and significant product sales; and history of previous Federal and non-Federal funding, regulatory experience, and subsequent commercialization. Does the Offeror have marketing expertise and, if not, how does the Offeror intend to bring that expertise into the company?
  - b. *Customer and Competition.* Provide a clear description of key technology objectives, current competitors, and advantages (cost and technical) compared to competing products or services. Address who the customers will be, and for non-DHS customers explain the demand drivers for this technology. Estimate the market size. Has the Offeror made contact with anyone in the projected target customer base including DHS customers? Identify potential factors that could have positive and/or negative impacts regarding the transition of the proposed product.
  - c. *Market.* Provide milestones, target dates, analyses of market size, and the estimated market share after first and five year sales. Provide detailed explanation on the plan to obtain market share.
  - d. *Financing.* Provide detailed information on the identification and acquisition of costs associated in transitioning the proposed product/services into the market. If available, provide brief discussion on potential financial sources. What are the plans for securing necessary funding for Phase III?

- e. *Intellectual Property (IP)*. Provide a detailed description on how the company plans to acquire and protect appropriate IP of the proposed product/service. What is the IP strategy and how will it be protected? Address patent status, technology lead, trade secrets or other demonstrations of a plan to achieve sufficient protection to realize the commercialization stage and attain at least a temporal competitive advantage.
- f. *Assistance and Mentoring*. Provide plans for securing needed technical or business assistance through mentoring, partnering, or through arrangements with state assistance programs, small business development centers, Federally-funded research laboratories, Manufacturing Extension Partnership centers, or other assistance providers. Address how the product will be produced.

The Commercialization Plan must also include a schedule and the basis for that schedule showing the quantitative results from the Phase II project that the 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.).

- Facilities/Equipment – Provide information to allow the evaluators to assess the ability of the Offeror to carry out the activities of the proposed phase as well as all subsequent phases. Describe available instrumentation and physical facilities necessary to carry out the proposed effort. Equipment to be purchased, as detailed in the Cost Proposal, must be justified under this section. Also state whether or not the facilities where the proposed work will be performed meet environmental laws and regulations of federal, state, 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.
- Subcontractors/Consultants – Involvement of any subcontractor(s) or consultant(s) (including Federal Laboratories, FFRDCs, universities, and technical assistance providers) is permitted. If such involvement is proposed, it must be described in detail in this section and also in the Cost Proposal. Subcontractors' or consultants' involvement under Discretionary Technical Assistance (see **Section 5.11**) must be clearly delineated from involvement by other subcontractors and consultants. A minimum of two-thirds (66%) of the research and/or analytical work in Phase I, as measured by total contract value, must be carried out by the proposing small business concern. A minimum of one-half (50%) of the research and/or analytical work in Phase II, as measured by total contract value, must be carried out by the proposing small business concern.

If the small business determines that it needs to acquire services from a non-U.S. source, it must fully explain in its proposal why a non-U.S. source must be used, and why no qualified U.S. source exists to perform the same services.

- Potential Post Applications – Briefly describe the following: (1) whether and by what means the proposed project appears to have potential commercial application; and (2) whether and by what means the proposed project appears to have potential use by the Federal Government.

- 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 **Appendix B**) for consideration under numerous Federal program solicitations, it is unlawful to enter into funding agreements (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 an Offeror elects to submit identical proposals or proposals containing a significant amount of essentially equivalent work in response to this Solicitation, or other Federal program solicitations, or is substantially the same as another proposal that has been funded, is now being funded, will be submitted to other agencies for funding consideration, or is pending with DHS or another Federal Agency, the Offeror must indicate so on the Proposal Cover Sheet and provide the following information in the Technical Proposal:

- 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 or project manager 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 this section does not apply, the following statement should be included in the Technical Proposal: "No prior, current, or pending support for proposed work."

### 3.4 Cost Proposal

All Offerors must submit a cost proposal via <https://sbir2.st.dhs.gov>. Proposed costs must not exceed the maximum thresholds outlined below.

<b>S&amp;T SBIR Topics</b>		<b>DNDO SBIR Topics</b>	
<b><u>Phase I</u></b>	<b><u>Phase II</u></b>	<b><u>Phase I</u></b>	<b><u>Phase II</u></b>
\$100,000	\$750,000	\$150,000	\$1,000,000
6 months	24 months	6 months	24 months

Note: Phase totals are exclusive of Discretionary Technical Assistance (**Section 5.11**) and Cost Match (**Section 5.14**), if applicable.

For additional information on the items in the Cost Proposal, reference *the DHS SBIR Cost Proposal Guide* at <https://sbir2.st.dhs.gov> under “Reference Materials.”

Additionally, more information about cost proposals and accounting standards can be found in the DCAA publication, *Information for Contractors*, available at [www.dcaa.mil/dcaap\\_7641.90.pdf](http://www.dcaa.mil/dcaap_7641.90.pdf).

Proposals submitted under this Solicitation will be considered valid for 90 days. If a proposal is selected for award, Offerors should be prepared to submit further cost/pricing documentation to the Contracting Officer in order to justify items on the cost proposal.

The following are required elements of the cost proposal:

- Direct Labor – list the name, labor category, labor hours and labor rate of each employee working on the project
- Overhead Cost – specify the current overhead rate. Use overhead rate approved by a cognizant federal agency, if available.
- Other Direct Cost – include direct material, special testing, equipment, travel, subcontracts, etc.

For planning purposes, Offerors should budget for two mandatory trips to Washington, DC – a one-day post-award kick-off meeting and a one-day meeting to present the results in the final report.

### 3.5 Briefing Chart

The mandatory one-page Briefing Chart should provide a very concise summary of the overall effort. The Briefing Chart is uploaded during proposal submission and may be used in the evaluation process. The briefing chart **MUST NOT** contain proprietary or classified data. Offerors must use the Briefing Chart template provided in **Attachment 3**.

### 3.6 Commercialization Report

Offerors that have not received any Phase II awards should check the appropriate box on the Cover Sheet certifying that the company has not received SBIR Phase II funding from any agency. Offerors with no prior Phase II awards will not be negatively impacted in the evaluation process. Instead, such companies will be evaluated based on the Commercialization Plan, see **Section 3.3**.

All Phase II Offerors with previous Phase II awards must submit a Commercialization Report.

If applicable, the succinct Commercialization Report should be in PDF format and submitted as a separate upload during the Phase II proposal submission. The following are examples of company commercialization data expected in the Commercialization Report:

- Any business concern or subsidiary established for the commercial application of a product or service for which an SBIR award is made.
- Revenue from the sale of new products or services resulting from the research conducted under each Phase II award; delineate revenue by government, open market, prime contractors, other awards, and when this revenue event occurred.
- 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.
- Whether the Phase II technology has been used in a fielded DHS system or acquisition program, and, if so, which system or program.
- The number of patents resulting from the contractor's participation in the SBIR Program and whether any licenses based on these patents have been issued.
- Whether the company has completed an initial public offering (IPO) of stock, merged or been acquired resulting, in part, from any DHS SBIR Phase II project.

The Commercialization Report for any prior Phase II award received by the company must be current as of the end of the company's last full fiscal year (FY). The company may apportion sales or additional investment information relating to more than one Phase II award among those awards, if it notes the apportionment for each award.

### 3.7 Company Financial Information (**For S&T Topics ONLY**)

As part of the S&T Phase II proposal submission, Offerors are required to submit company financial information, including current balance sheet and income statement delineating sales to the government and prime contractors, and sales derived from SBIR developed products whether as stand-alone or enablers. Financial information should be from the previous twelve months or the most recent company full fiscal year. Do not include a specific listing of individual expense items. Also, do not include any banking information such as bank account numbers and routing numbers. **This information must not be included as a part of the Phase II proposal** which is uploaded to the system. Financials must be sent via email to [stsbir.program@hq.dhs.gov](mailto:stsbir.program@hq.dhs.gov) and must be received by the SBIR Program Office prior to Phase II proposal due date/time.

### 3.8 Eligibility

Small business Offerors that are majority-owned by multiple venture capital operating companies, hedge funds or private equity firms are not eligible to submit proposals in response to this Solicitation nor are they eligible to receive a DHS SBIR award.

To receive SBIR funds, each awardee of a Phase I or Phase II award must qualify as a small business concern at the time of award and at any other time set forth in SBA's regulations at 13 CFR 121.701 through 121.705.

For both Phase I and Phase II, the primary employment of the principal investigator must be with the small business concern at the time of the award and during contract performance. Primary employment means that more than one-half of the principal investigator's time is spent in the employ of the small business Offeror. This precludes full-time employment with another organization.

For both Phase I and Phase II, all research or research and development must be performed by the small business concern and its subcontractors in the United States.

### 3.9 DHS Phase II Transition Rate Benchmark

***For this Solicitation, the DHS Phase II Transition Rate benchmark requirement applies only to Offerors that have received 21 or more (more than 20) Phase I awards over the five (5) fiscal year period, from October 1, 2008 through September 30, 2013.***

The Phase II Transition Rate sets the minimum required number of Phase II awards an Offeror must have received for a given number of Phase I awards during a specified period. The SBIR awardee Phase II Transition Rate is calculated using the data in SBA's TechNet database. SBA posts the company transition rates on the Company Registry at <http://www.sbir.gov>. For the purpose of this benchmark requirement, awardee firms are assessed once a year, on June 1<sup>st</sup>, using their prior SBIR and STTR awards across all agencies.

Offerors to this Solicitation that have received 21 or more (more than 20) Phase I awards across all federal SBIR/STTR agencies over the five (5) year period should, prior to proposal preparation, verify that the company's Phase II Transition Rate in the Company Registry at <http://www.sbir.gov> meets or exceeds DHS' minimum benchmark. Upon verification in the Company Registry, if the Offeror believes there is a discrepancy with its Phase II Transition Rate, the Offeror may further provide pertinent award information/documentation to the SBA to clarify any discrepancies and request a reassessment. To do so, use the link on the Company Registry at [www.sbir.gov](http://www.sbir.gov).

The Phase II Transition Benchmark that DHS will use for this Solicitation is 25%.

Companies that apply for a DHS Phase I award and do not meet or exceed the DHS Phase II Transition benchmark rate will not be eligible for a DHS Phase I award during the one-year period beginning on June 1<sup>st</sup> and ending on May 31<sup>st</sup>.

### 3.10 DHS Commercialization Rate Benchmark

***The DHS Commercialization Rate benchmark requirement applies only to SBIR applicants that have received 16 or more (more than 15) Phase II awards over the past 10 fiscal years, excluding the most recently completed two fiscal years.*** For this Solicitation, the Commercialization Rate Benchmark is calculated over the time period 2002 through 2011 since

the current benchmark requirement was calculated on June 1, 2014. The Commercialization Rate benchmark went into effect June 1, 2014.

The DHS Commercialization Rate benchmark sets the minimum Phase III commercialization results a Phase I applicant must have realized from its prior Phase II awards in order to be eligible to receive a new DHS Phase I award. The Commercialization Rate benchmark establishes the commercialization results it is required to achieve from work it performed under its prior Phase II awards in order to be eligible to receive a new Phase I award.

Offerors must have received, to date, an average of at least \$100,000 of sales and/or investments per Phase II award received, or have received a number of patents resulting from the SBIR work equal to or greater than 15% of the number of Phase II awards received during the period. Offerors that fail to meet these benchmarks by updating their commercialization information on the Company Registry at [www.SBIR.gov](http://www.SBIR.gov) will not be eligible to receive a Phase I award through May 31, 2015.

### 3.11 Questions

General questions pertaining to the S&T's SBIR Program should be submitted to [STSBIR.PROGRAM@hq.dhs.gov](mailto:STSBIR.PROGRAM@hq.dhs.gov).

General questions pertaining to the DNDO's SBIR Program should be submitted to [dndosbir@hq.dhs.gov](mailto:dndosbir@hq.dhs.gov).

Technical questions concerning the research topics in **Section 7.0** during the pre-release period from **December 4, 2014 through December 17, 2014** shall be directed towards the respective Technical Point of Contact (topic authors) of the associated research topic. The pre-release period is an opportunity for Offerors to contact the respective topic author(s) via telephone and/or email. The Offeror is limited to discussing only further clarification on the technical aspects (e.g., objectives, description, etc.) of the topic. Offerors are prohibited from seeking advice or guidance on a solution approach, or submitting any materials. No further direct contact between Offerors and Technical Points of Contact shall occur after 5:00 pm ET on **December 17, 2014**; however, Offerors may submit questions to [STSBIR.PROPOSALS@hq.dhs.gov](mailto:STSBIR.PROPOSALS@hq.dhs.gov). Questions must be limited to technical information related to improving the understanding of a particular topic's requirements. Any other questions or inquiries seeking advice or guidance on a solution approach are unacceptable and will not receive a response. Responses to pertinent questions received by January 7, 2015 at 2:00 p.m. ET will be posted on FedBizOpps.gov and the DHS SBIR Program website at <https://sbir2.st.dhs.gov> as an amendment to the Solicitation. DHS will not respond to technical questions related to the technical topics if received after the last day to submit questions.

All Offerors are advised to monitor both the FedBizOpps website and the DHS SBIR Program website during the Solicitations period for supplemental posting of questions and answers, and other information relevant to the research topics in this Solicitation.

Questions about the electronic submission of proposals should be submitted to the Help Desk at (703) 480-7676, or via email to [dhssbir@reisystems.com](mailto:dhssbir@reisystems.com). The Help Desk may be contacted from 9:00 a.m. to 5:00 p.m. ET, Monday through Friday.

#### **4.0 METHOD OF SELECTION AND EVALUATION CRITERIA**

All Phase I and II proposals will be evaluated on a competitive basis. Each proposal will be evaluated on its own merit and the relevance of the specific concept as it relates to the SBIR topic rather than against other proposals submitted for the same topic area. DHS is under no obligation to fund any proposal or any specific number of proposals in a given topic. DHS may elect to fund several or none of the proposed approaches to the same topic or subtopic.

##### **4.1 Evaluation Criteria, Factors and Ratings**

The Phase I evaluation criteria, listed in decreasing order of importance, are as follows:

- a. Technical Merit – the soundness, technical merit, and innovation of the proposed approach and its incremental progress toward topic or subtopic solution. The following elements will be considered:
  - Soundness of the technical concept and the likelihood the research is achievable as proposed;
  - Demonstrated understanding of the scope of the problem, research objectives, and performance goals;
  - Degree of innovation and potential to offer a significant increase in capability or a significant reduction in cost commensurate with the potential risk of the innovative (i.e., not incremental) proposed approach; and
  - Details of the technology development strategy to be followed for the proposed concept. Clarity, fidelity, and completeness of the proposed work plan to achieve research objectives, to include: identification of a schedule and milestones, identification of risks and mitigation strategies, and method for assessing technical progress.
- b. Staff Qualifications and Capability – the qualifications of the proposed principal investigator, key personnel, supporting staff, and consultants. Qualifications include the ability to perform the research and development. The following elements will be considered:
  - Team’s understanding of past scientific and technical accomplishments, and the current state-of-the-art of knowledge or technology in the field; and
  - Quality of the proposed team (i.e., key personnel and partners identified have the breadth/range of competencies to execute the proposed effort).
- c. Potential for Commercialization – the potential for commercial application, either in the Government or private sector, and the benefits expected to accrue from this commercialization. The following element will be considered:

- Commercialization Strategy, as stated in **Section 3.3**.
  - Ability of the proposed team and the company to commercialize the results of the research.
- d. Cost/Price – the appropriateness of the elements of the cost proposal for the proposed effort. The following elements will be considered:
- Level of effort proposed, as appropriate for Phase I; and
  - Completeness of the proposed level of effort.

The Phase II evaluation criteria, listed in decreasing order of importance, are as follows:

- a. Technical Merit – the soundness, technical merit, and innovation of the proposed approach and its incremental progress toward topic or subtopic solution. The following elements will be considered:
- Soundness of the technical concept and the likelihood the research is achievable as proposed;
  - Understanding the scope of the problem, research objectives, and performance goals;
  - Degree of innovation and potential to offer a significant increase in capability or a significant reduction in cost commensurate with the potential risk of the innovative (i.e., not incremental) proposed approach; and
  - Details of the technology development strategy to be followed for the proposed concept. Clarity, fidelity, and completeness of the proposed work plan to achieve research objectives, to include identification of risks and mitigation strategies, and method for assessing technical progress.
- b. Potential for Commercialization – the potential for commercial application, either in the Government or private sector, and the benefits expected to accrue from this commercialization. The following element will be considered:
- Completeness of the Commercialization Plan, as stated in the Solicitation.
  - Ability of the proposed team and the company to commercialize the results of the research.

*The lack of a Company Commercialization Report, due to the offeror having no prior Phase II awards, will not affect its ability to receive an award.*

- c. Staff Qualifications and Capability – the qualifications of the proposed principal investigator, key personnel, supporting staff, and consultants. Qualifications include the ability to perform the research and development. The following elements will be considered:
- Teams understanding of past scientific and technical accomplishments, and the current state-of-the-art of knowledge or technology in the field; and
  - Quality of the proposed team (i.e., key personnel and partners identified have the breadth/range of competencies to execute the proposed effort).
- d. Cost/Price – the appropriateness of the elements of the cost proposal for the proposed effort. The following elements will be considered:
- Level of effort proposed, as appropriate for Phase II; and

- Completeness of the proposed level of effort.

Evaluators will assess the strengths, weaknesses, and deficiencies of the above criteria using the following definitions:

- a. Strength – An aspect of the proposal that benefits the Government in terms of the quality of the Offeror’s performance, cost effectiveness, or reduced risk towards successful contract performance. Note: an Offeror’s approach may offer more than what the solicitation/topic description requires; however, the Government may not benefit from such approach and will not include such in its evaluation.
- b. Weakness – A flaw in the proposal that decreases the likelihood successful contract performance. A “significant weakness” is a flaw that dramatically increases the risk of unsuccessful contract performance. When weaknesses are identified, the Government will provide comment(s) on the significance of the weakness.
- c. Deficiency – A material failure of a proposal that would result in an unacceptable level of contractor performance.

Evaluators will use one of the following adjectival ratings for each of the Technical Merit, Staff Qualifications and Capability, and Potential for Commercialization criterion:

- a. Excellent – Offeror’s proposed approach is highly likely to satisfy and/or exceed all topic objectives and shows the highest probability of successful contract performance. Offeror’s proposal has strengths that will significantly benefit the Government and no weaknesses.
- b. Very Good – Offeror’s proposed approach is likely to satisfy most of the topic objectives and shows a high probability of successful contract performance. Offeror’s proposal has strengths that will benefit the Government and one or more weaknesses, but no significant weaknesses.
- c. Good – Offeror’s proposed approach has a reasonable likelihood of satisfying the topic objectives and shows a good probability of successful contract performance. Offeror’s proposal has some strengths that will benefit the Government, and some weaknesses.
- d. Fair – Offeror’s proposed approach is unlikely meet the topic objectives and shows a low probability of successful contract performance. Offeror’s proposal has weaknesses, some that may be significant, and few strengths, if any, that will benefit the Government.
- e. Unacceptable – The Offeror’s proposed approach fails to meet the topic objectives and requirements.

The Cost/Price criterion is not adjectively rated as outlined above; rather, the evaluation team will determine if the cost proposal is either acceptable or unacceptable as defined below:

- a. Acceptable - The proposed cost elements, including labor mix, labor hours, material, special testing, special equipment, travel, subcontracts, if applicable, are appropriate for the proposed effort.

- b. Unacceptable - The proposed cost elements, including labor mix, labor hours, material, special testing, special equipment, travel, subcontracts, if applicable, are not appropriate for the proposed effort.

#### 4.2 Proposal Review Feedback

DHS will make award decisions, and notify applicants of its decisions, within 90 calendar days from the closing date of this Solicitation. Specific instructions on requesting feedback will be provided to each Offeror upon notification that their proposal was not selected for award. Requests for proposal feedback must be received within three (3) business days of the notification and will only be provided to Offerors upon request.

#### 4.3 Contractor Support Services In Support of the Selection Process

Offerors are advised that non-federal, contract support personnel will be used to carryout administrative functions for the SBIR Program Office and topic program managers. The contract support personnel will have access to proposals. Administrative duties may include, but are not limited to, making and distributing copies of proposal, scheduling and attending meeting, taking and compiling notes, etc.

In addition to administrative functions, DNDO will use contractor support as advisors in the source selection process.

**Applies to H-SB015.1-008 and H-SB015.1-009 ONLY**

Schafer Corporation  
Jeanne Ralls  
(978)735-4555  
[Jeanne.ralls@schafercorp.com](mailto:Jeanne.ralls@schafercorp.com)

In accomplishing their duties related to the source selection process, the aforementioned firm may require access to proprietary information contained in the Offerors' proposals. Therefore, pursuant to FAR 9.505-4, these firm must execute an agreement with each Offeror that states that they will (1) protect the Offerors' information from unauthorized use or disclosure for as long as it remains proprietary and (2) refrain from using the information for any purpose other than that for which it was furnished. To expedite the evaluation process, each Offeror must contact the above company to effect execution of such an agreement prior to submission of proposals.

A sample company-to-company, non-disclosure agreement can be found in **Attachment 4**. Offerors submitting proposals for **Topics H-SB015.1-008 and H-SB015.1-009** shall submit a copy of their signed agreement to [dnDOSBIR@hq.dhs.gov](mailto:dnDOSBIR@hq.dhs.gov). Proposals submitted to these topics will not be considered complete until the submission of the dually signed non-disclosure agreement.

## 5.0 CONSIDERATIONS

### 5.1 Awards

Each proposal selected for funding in the DHS SBIR Program will be awarded a negotiated contract. No contracts will be awarded until all relevant proposals submitted in response to a specific topic have been evaluated and an award decision rendered. The number of S&T SBIR Phase I and Phase II awards will be consistent with the S&T SBIR budget. All DHS SBIR awards resulting from this Solicitation will be posted at <https://sbir2.st.dhs.gov>.

A firm-fixed price (FFP) contract will be awarded for all Phase I awards. Phase II contracts can either be awarded as a cost-plus fixed-fee (CPFF) contract or firm-fixed price contract; however, in accordance with FAR 16.301-3, in order to award a CPFF contract, Offerors must have an accounting system that is adequate for determining cost applicable to the contract. Additionally, certified cost and pricing data may be required for Phase II or Phase III contracts over \$700,000.00. Fee and profit may be included in the Cost Proposal (see **Section 5.6**).

The anticipated time between the date that this Solicitation closes and the award of the Phase I contracts is approximately four (4) months. In general, Phase II awards will be awarded as quickly as possible after proposal selection to maintain the momentum of the Phase I effort. Phase II contracts are typically awarded within 90 – 120 days after the proposal due date.

### 5.2 Reports and Deliverables

Monthly reports and a final comprehensive report will be required in all resultant Phase I and Phase II contracts. Additionally, Phase II awards may require an interim report at the end of 12 month of performance. Phase I and II awardees will be required to submit the *SBIR Funding Agreement Certification – Life Cycle Certification (Attachment 2)* during the contract period of performance. Other deliverables specific to the topic description may also be required.

### 5.3 Invoice Instructions

The specific invoicing instructions will be incorporated into the contract upon completion of negotiations between the Government and the successful Phase I or Phase II Offeror. Successful Offerors may submit invoices monthly in accordance with the negotiated price and invoice instructions.

### 5.4 Innovations, Inventions and Patents

Proprietary Information. Information contained in unsuccessful proposals will remain the property of the applicant. The Government will, however, retain copies of all proposals. Public release of information in any proposal submitted will be subject to existing statutory and regulatory requirements.

If proprietary information is provided by an applicant in a proposal, which constitutes a trade secret, proprietary commercial or financial information, confidential personal information or data affecting the national security, it will be treated in confidence, to the extent permitted by law. This information must be clearly marked by the applicant with the term “proprietary information” (see the Marking of Proprietary section below) and the “Proposal Contains Proprietary Information” box on the DHS SBIR Cover Sheet must be checked “Yes”. This will automatically electronically place the following statement on the proposal:

“These data, except the proposal Cover Sheet data, shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed in whole or in part for any purpose other than evaluation of this proposal. If a funding agreement is awarded to this applicant as a result of or in connection with the submission of these data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the funding agreement and pursuant to applicable law. This restriction does not limit the Government's right to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction are contained on pages appropriately marked in this proposal.”

DHS assumes no liability for inadvertent disclosure or use of unmarked data. The Government will limit dissemination of such proprietary information to within official channels.

Marking of Proprietary Information. To properly mark proprietary information on the proposal, use an asterisk (\*) in the right and left margins on pages deemed proprietary. If all information on a page is deemed proprietary, include this statement, “ENTIRE PAGE IS PROPRIETARY,” in both the header and footer of the associated page. Do not label the entire proposal “proprietary.” All other markings (e.g., “Company Confidential”, “Business Sensitive”, etc.) will not be recognized.

Rights in Data Developed Under SBIR Funding Agreements. 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. To preserve the SBIR data rights of the awardee, the legend (or statements) used in the SBIR Data Rights clause included in the SBIR award must be affixed to any submissions of technical data developed under that SBIR award. Upon expiration of the four-year restrictive license, the Government has unlimited rights in the SBIR data. During the license period, the Government may not release or disclose SBIR data to any person other than its support services contractor except: a) for evaluation purposes; b) as expressly permitted by the contractor; or c) a use, release, or disclosure that is necessary for emergency repair or overhaul of items operated by the Government. Please refer to FAR clause 52.227-20, “Rights in Data – SBIR Program,” which will be included in all resultant contracts.

If the Offeror's proposal is selected for funding, the Contracting Officer will contact the apparent awardee so that the apparent awardee has the opportunity to submit assertions in accordance with FAR clause 52.227-20. The assertions must be identified and assertion of use, release, or disclosure must be provided for the government's review and acceptance. Contracts cannot be awarded until assertions have been approved.

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

Patents. Small business concerns normally may retain the principal worldwide patent rights to any invention developed with Government support. In such circumstances, the Government receives a royalty-free license for Federal Government use, reserves the right to require the patent holder to license others in certain circumstances, and may require that anyone exclusively licensed to sell the invention in the United States must normally manufacture it domestically. To the extent authorized by 35 U.S.C. 205, the Government will not make public any information disclosing a Government-supported invention for a minimum 4-year period (that may be extended by subsequent SBIR funding agreements) to allow the awardee a reasonable time to pursue a patent.

Invention Reporting. 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 NIH iEdison Invention Reporting Systems at [www.iedison.gov](http://www.iedison.gov). Use of the iEdison System satisfies all invention reporting requirements mandated by 37 CFR Part 401, with particular emphasis on the Standard Patent Rights Clauses, 37 CFR 401.14.

## 5.5 Cost-Sharing

Cost-sharing is permitted for proposals under this program solicitation; however, cost-sharing is not required and will not be an evaluation factor in consideration of the proposal.

## 5.6 Profit or Fee

In accordance with FAR 15.404-4, Offerors may include a reasonable fee or profit consistent with R/R&D work.

## 5.7 Joint Ventures or Limited Partnerships

Joint ventures and limited partnerships are eligible provided that the entity created qualifies as a small business in accordance with the Small Business Act, 15 U.S.C. 631.

## 5.8 Research and Analytical Work

For Phase I, a minimum of two-thirds (66%) of the research and/or analytical work must be performed by the proposing small business concern. For Phase II, a minimum of one-half (50%) the research and/or analytical work must be performed by the proposing small business concern. Subcontract cost will be calculated as a percentage of the total contract value.

## 5.9 Awardee Commitments and Summary Statements

Upon award of an SBIR contract, the awardee will be required to make certain legal commitments through acceptance of numerous clauses in the Phase I and Phase II contracts. The outline that follows is illustrative of the types of clauses to which the contractor would be committed. This list is not a complete list of clauses to be included in Phase I funding agreements, and is not the specific wording of such clauses. Copies of complete terms and conditions are available upon request.

- a. *Standards of Work.* Work performed under the funding agreement must conform to high professional standards.
- b. *Inspection.* Work performed under the funding agreement is subject to Government inspection and evaluation at all times.
- c. *Examination of Records.* The Comptroller General (or a duly authorized representative) must have the right to examine any pertinent records of the awardee involving transactions related to this funding agreement.
- d. *Default.* The Government may terminate the funding agreement if the contractor fails to perform the work contracted.
- e. *Termination for Convenience.* The funding agreement may be terminated at any time by the Government if it deems termination to be in its best interest, in which case the awardee will be compensated for work performed and for reasonable termination costs.
- f. *Disputes.* Any dispute concerning the funding agreement that cannot be resolved by agreement must be decided by the contracting officer with right of appeal.
- g. *Contract Work Hours.* The awardee may not require an employee to work more than 8 hours a day or 40 hours a week unless the employee is compensated accordingly (for example, overtime pay).
- h. *Equal Opportunity.* The awardee 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 awardee will not discriminate against any employee or application for employment because he or she is a disabled veteran or veteran of the Vietnam era.
- j. *Affirmative Action for Handicapped.* The awardee will not discriminate against any employee or applicant for employment because he or she is physically or mentally handicapped.
- k. *Officials Not To Benefit.* No Government official must benefit personally from the SBIR funding agreement.

- l. *Covenant Against Contingent Fees.* No person or agency has been employed to solicit or secure the funding agreement upon an understanding for compensation except bona fide employees or commercial agencies maintained by the awardee for the purpose of securing business.
- m. *Gratuities.* The funding agreement may be terminated by the Government if any gratuities have been offered to any representative of the Government to secure the award.
- n. *Patent Infringement.* The awardee must report each notice or claim of patent infringement based on the performance of the funding agreement.
- o. *American Made Equipment and Products.* When purchasing equipment or a product under the SBIR funding agreement, purchase only American-made items whenever possible.
- p. *Advertisements, Publicizing Awards, and News Releases.* All press releases or announcements about agency programs, projects, and contract awards must be cleared by the Contracting Officer's Representative (COR) and the Contracting Officer. Under no circumstances shall the Contractor, or anyone acting on behalf of the Contractor, refer to the supplies, services, or equipment furnished pursuant to the provisions of this contract in any publicity news release or commercial advertising without first obtaining explicit written consent to do so from the Program Manager/COR and the Contracting Officer. The Contractor agrees not to refer to awards in commercial advertising in such a manner as to state or imply that the product or service provided is endorsed or preferred by the Federal Government or is considered by the Government to be superior to other products or services.
- q. *E-Verify.* Contracts exceeding the simplified acquisition threshold may include the FAR clause 52.222-54 "Employment Eligibility Verification" unless exempted by the conditions listed at FAR 22.1803.
- r. *Prohibition on Contracting with Inverted Domestic Corporation.* Section 835 of the Homeland Security Act, 6 U.S.C. 395, prohibits the Department of Homeland Security from entering into any contract with a foreign incorporated entity which is treated as an inverted domestic corporation as defined in HSAR 3052.209-70. The Prohibition on Contracting with Inverted Domestic Corporation clause will be incorporated into awards resulting from this solicitation.

#### 5.10 Release of Proposal Information

In submitting a proposal, the Offeror agrees to permit the Government to publicly disclose basic company information upon award. Other proposal data is considered to be the property of the Offeror, and DHS will protect it from public disclosure to the extent permitted by law including the Freedom of Information Act. Please note, in accordance with the Small Business Administration's SBIR Policy Directive dated February 24, 2014, as amended on January 8, 2014, the DHS SBIR Office will provide the basic proposal information to the Small Business Administration's Application Information database at [www.SBIR.gov](http://www.SBIR.gov), as identified in the Policy Directive.

In an effort to increase the transition of SBIR technologies and facilitate partnerships between small businesses, large integrators, and program offices, the DHS SBIR Program Office may provide proposal information to the Department of the Navy's SBIR Program Office for inclusion in its Navy SBIR/STTR search database at [www.navysbirsearch.com](http://www.navysbirsearch.com). Awardees who do not want their proposal to be included in this database must opt out by answering "No" on the Cover Sheet.

#### 5.11 Discretionary Technical Assistance

DHS SBIR may provide up to \$5,000.00 per year for technical assistance to a SBIR awardee. Technical Assistance funds are in addition to the maximum award amount stated in **Section 3.4**. The purpose of Technical Assistance is to assist SBIR awardees in: (1) making better technical decisions on SBIR projects; (2) solving technical problems that arise during SBIR projects; (3) minimizing technical risks associated with SBIR projects; and (4) commercializing the SBIR products or processes.

Small business concerns can receive Technical Assistance in two ways:

1. Awardees can receive Technical Assistance through the DHS SBIR Program Office. The SBIR Program Office is under contract with a company that can provide technical assistance to Phase I or Phase II awardees. Awardees will receive notification from the DHS SBIR Office on what services are available and how to obtain these services at no cost to the small business. If an Offeror would like to receive Technical Assistance through the DHS SBIR Program Office, Technical Assistance costs should not be included in the Cost Proposal.
2. Awardees can also receive Technical Assistance outside of the SBIR Program Office. To do so, Offerors must enter into an agreement with a subcontractor for up to \$5,000.00 per year in Technical Assistance. (For example – Offerors can propose up to \$5,000 for a Phase I and up to \$10,000 for a 24 month Phase II effort). These subcontract costs must be accounted for in the Cost Proposal; however, profit or fee should not be applied to Technical Assistance costs. Offerors must provide a budget justification, an outline of the specific services technical assistance to be provided, and the detailed qualifications and experience of the proposed subcontractor/consultant being requested. Further, the Offeror must demonstrate in the Technical Proposal that the outside vendor selected can provide the specific technical services needed. Reimbursement is limited to services received that comply with 15 U.S.C. 638(q). Note, unspent funds for technical assistance services cannot be budgeted for other project costs. If all of the Technical Assistance funds are not spent, the balance will be de-obligated from the resultant contract. If an Offeror receives Technical Assistance from a vendor of its choice, they will not be eligible to receive assistance from the DHS Technical Assistance contractor on the Phase I or Phase II contract. Technical assistance from vendors other than those provided by the SBIR Program Office can be an important form of aid to the proposed project being submitted.

## 5.12 Classified and Unsolicited Proposals

Classified proposals are not accepted under the DHS SBIR Program. Classified proposals will be appropriately destroyed upon receipt.

The DHS SBIR Program is not a substitute for existing unsolicited proposal submissions and does not accept unsolicited proposals. The DHS SBIR Program is a competitive program designed to meet the needs of the DHS. If a proposal provides a solution or approach that is not germane to the objectives of the research topics listed in this Solicitation, the proposal will be determined “non-responsive” to the topic area.

## 5.13 Animal and/or Human Subjects

Funds cannot be released or used for any portion of the project involving animal and/or human subjects until all of the proper approvals have been obtained in accordance with applicable regulations. See **Appendix B** for more details concerning the use of Animal and/or Human Subjects.

## 5.14 Export Control

Offerors are advised that the export of any goods or technical data from the United States, and the disclosure of technical data to foreign nationals, may require some form of export license from the U.S. Government. Failure to obtain necessary export licenses may result in criminal liability of Offerors under U.S. laws.

Offerors are responsible for ensuring compliance with the International Traffic in Arms Regulations administered by the U.S. Department of State (22 C.F.R. Parts 120 to 130), Export Administration Regulations administered by the U.S. Department of Commerce (15 C.F.R. Parts 730 to 774), and Foreign Assets Control Regulations administered by the U.S. Department of Treasury (31 C.F.R. Parts 501 to 598), as warranted, and with compliance with all recordkeeping requirements under U.S. export regulations. Offerors are responsible for compliance with any applicable export license, reporting, or other preapproval requirements by the U.S. Government. DHS neither represents that a license or preapproval shall not be required nor that, if required, it shall be issued. Nothing granted herein to Offerors provides any such export license or other preapproval.

Offerors are asked to identify any anticipated export compliance issues in their response to this solicitation. Specifically, Offerors are advised to include information in their response regarding any known equipment, software or technical data that will be developed as a result of work to be performed under this solicitation that is subject to export control restrictions.

To the extent that export-controlled information may be provided to DHS by Offerors in response to a solicitation, Offerors are responsible for ensuring that such information is

appropriately marked, and are responsible for complying with all applicable export controls and regulations in the process of providing such information.

#### 5.15 DHS SBIR Phase II Enhancement Programs

To further encourage the transition of SBIR-funded research into DHS acquisition programs as well as to the private sector, the DHS SBIR Program offers several opportunities for an SBIR Phase II awardee to receive additional funding. Specifically, the DHS S&T SBIR Program Office offers Cost Match, SBIR Commercialization Readiness Pilot Program (CRPP) awards, and potential participation in the joint DHS-NSF Innovation-Corps (I-Corps) program. The DNDO SBIR Program Office offers Cost Match.

Cost Match. The DHS S&T and DNDO SBIR Programs include a Cost Match feature for their respective SBIR projects that attract matching funds from an outside investor for the Phase II SBIR effort. The purpose of the cost match is to focus DHS SBIR funding on those projects that are most likely to be developed into viable new products that DHS and others will purchase and that will make a major contribution to homeland security and/or economic capabilities. The cost match can occur 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. In order to be considered for DHS SBIR cost match, the outside investors must commit a minimum of \$100,000 up to a maximum of \$500,000. DHS will, at its discretion and subject to availability of funds, match up to 50% of funds received.

The additional work proposed for the Cost Match feature 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.

For more information about Cost Match visit <https://sbir2.st.dhs.gov>.

Commercialization Readiness Pilot Program (CRPP) Award. The SBIR/STTR Reauthorization Act of 2011 established the Civilian Commercialization Readiness Pilot Program (CRPP). The purpose of this program is to address the basic issues involved in transitioning any new product to the open market: (1) technology maturation, (2) business maturation, and (3) end-user product knowledge. The DHS SBIR Program received approval for its CRPP plan from the SBA on August 29, 2013.

At the discretion of the DHS S&T SBIR Program Office, a separate SBIR CRPP award may be issued to continue funding Phase II activities. A 12-month CRPP award will further mature the technology for inclusion into a larger DHS Program or DHS acquisition program. A project's inclusion in the CRPP is selective and at the discretion of DHS. If selected, contractors will be contacted during the SBIR Phase II period of performance.

DHS-NSF Innovation-Corps (I-Corps) Award. At the discretion of DHS, a separate contract for Phase II awardees may be issued to participate in a joint DHS-NSF Innovation-Corps (I-Corps) program during the first six months of the Phase II award period. Selectees for this award will receive funding up to \$50,000 to cover the expense of the I-Corps program. **The request to participate in the I-Corps program must be made in the Phase II proposal by selecting the I-Corps checkbox located on the Cover Sheet.**

I-Corp was established to encourage entrepreneurs to learn about market opportunities for technologies generated by government funded research. For more details on the I-Corps program refer to [www.nsf.gov/i-corps](http://www.nsf.gov/i-corps).

#### 5.16 Additional Information

This 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 funding agreement, the terms of the funding agreement are controlling.

Before award of an SBIR funding agreement, the Government may request the applicant to submit certain organizational, management, personnel, and financial information to assure responsibility of the applicant.

DHS shall not be liable for any costs incurred by the Offerors prior to award of any SBIR contract.

This Solicitation is not an offer by the Government and does not obligate the Government to make any specific number of awards. Also, awards under the SBIR Program are contingent upon the availability of funds.

If an award is made pursuant to a proposal submitted under this Solicitation, a representative of the contractor or grantee or party to a cooperative agreement will be required to certify that the concern has not previously been, nor is currently being, paid for essentially equivalent work by any Federal agency.

In the event that DHS has a need to share sensitive information with the SBIR awardee, the contractor must clear DHS suitability.

## 6.0 SUBMISSION OF PROPOSALS

**Proposals are due no later than 2:00 pm ET on January 21, 2015.** The DHS SBIR Programs use an electronic online proposal submission system located at <https://sbir2.st.dhs.gov>. All Offerors must submit proposals through this online system. Paper submissions and proposals received by any other means will not be accepted, evaluated, or considered for award.

Offerors are strongly encouraged to read the *Portal Registration and Submissions Training Guide* and follow the instructions for proposal submission. This guide can be found at <https://sbir2.st.dhs.gov> under “Reference Materials.” The Guide provides step-by-step instructions for company registration and proposal submission.

Questions about the electronic submission of proposals should be submitted to the Help Desk. The Help Desk may be contacted at (703) 480-7676, or [dhssbir@reisystems.com](mailto:dhssbir@reisystems.com) from 9:00 a.m. to 5:00 p.m. ET, Monday through Friday.

Late proposals will not be accepted or evaluated. Note: As the close of the solicitation approaches, heavy traffic on the web servers may cause delays. Plan ahead and leave ample time to prepare and submit your proposal. Offerors bear the risk of website inaccessibility due to heavy usage in the final hours before the Solicitation closing time. In accordance with the FAR clause 52.215-1, Offerors are responsible for submitting proposals, and any modifications or revisions, so as to reach the Government office designated in the Solicitation by the time specified in the Solicitation. FAR clause 52.215-1, Instructions to Offerors – Competitive Acquisition (Jan 2004) is hereby incorporated in this Solicitation by reference.

## **7.0 RESEARCH TOPICS**

### **7.1 S&T Directorate Topics**

The following are the topics for the FY15.1 S&T Directorate’s SBIR Program:

**H-SB015.1-001**  
**H-SB015.1-002**  
**H-SB015.1-003**  
**H-SB015.1-004**  
**H-SB015.1-005**  
**H-SB015.1-006**  
**H-SB015.1-007**

Specific details for each topic are included in **Appendix A**.

### **7.2 DNDO Topics**

The following are the topics for the FY15.1 DNDO SBIR Program:

**H-SB015.1-008**  
**H-SB015.1-009**

Specific details for each topic are included in **Appendix A**.

## APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

**SBIR TOPIC NUMBER: H-SB015.1-001**

**TITLE:** DNA and Latent Fingerprint Collection from Same Sample

**TECHNOLOGY AREAS:** Border Forensics, Cargo Forensics

**OBJECTIVE:** Develop a method for latent print work and DNA analysis from the same sample while optimizing DNA extraction protocol for fingerprints deposited on evidentiary materials used for human identification.

**DESCRIPTION:** Forensic evidence collection is an essential tool for acquiring information for law enforcement investigations and latent fingerprints are the main piece of evidence to investigate due to the unique and unchanged nature of the ridge patterns of each individual. Leveraging the S&T Directorate's current DNA Collection Efficiency project, identify techniques to both recover latent fingerprint and to extract DNA profile from the same piece of fingerprint evidence collected in the crime scene.

**PHASE I:** Determine by theory, previous research in related areas and/or laboratory experimentation, the most efficient and practical approach to both preserve the physical integrity of latent fingerprints on the typical surfaces on evidence encountered by Custom and Border Protection (CBP) forensic analysts while not interfering with DNA collection, extraction and analysis. Indicate for each method investigated, latent fingerprint image and DNA collection efficiency, physical and chemical degradation, detection sensitivity in the context of real world scenarios on each surface material from sample evidence and a prototype chemical or optical concept in the Phase I final report.

**PHASE II:** Construct, operate, and analyze the data from one (1) working prototype device based on a down select from concepts identified in Phase I, calibrated against a laboratory gold standard and real world evidence. The prototype will be delivered to the CBP LSS forensic laboratory no later than six months before the contracted closing date of the Phase II project with a comprehensive performance analysis. Government personnel will operate the system in the CBP LSS forensic laboratory for the remaining 6 months of the Phase II project.

**PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS:** A commercial version of the system, if system performance is confirmed, will be developed, and then installed to operate in the CBP forensic laboratory in Houston, TX. A system architecture, specification, and operator manual will be provided with the system for CBP to procure additional systems for use in other CBP forensic laboratories.

### REFERENCES:

Presley, L.A.; Baumstark, A.L.; Dixon, A. (1996). The Effects of Specific Latent Fingerprint and Questioned Document Examinations on the Amplification and typing of the HLA DQ Alpha Gene Region in Forensic Casework. *J Forensic Sci*; 41(6), 1012-1017.

<https://www.doj.state.wi.us/sites/default/files/2010-news/dna-analysis-plan-20100421.pdf>

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Grubwieser, P.; Thaler, A.; Köchl, S.; Teissl, R.; Rabl, W.; Parson, W. (2003). Systematic Study on STR Profiling on Blood and Saliva Traces after Visualization of Fingerprint Marks. *J Forensic Sci*; 48 (4), 733-741.

**KEY WORDS:** touch DNA, latent fingerprint collection, DNA collection method, forensic science, short tandem repeat (STR), epithelial cells, polymerase chain reaction (PCR)

**TECHNICAL POINT OF CONTACT:** David Masters, 202-254-6364, [david.masters@hq.dhs.gov](mailto:david.masters@hq.dhs.gov)

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**SBIR TOPIC NUMBER: H-SB015.1-002**

**TITLE:** Low-cost, Disposable, Tamper-Proof Bolt Seal

**TECHNOLOGY AREAS:** Transportation Security, Cargo Security, Cargo Container Seals and Locks, Electronic Seals and Locks

**OBJECTIVE:** Develop, prototype, and demonstrate a low-cost electronic reusable and/or disposable, tamper-proof cargo container/conveyance bolt seal for the maritime and air cargo environments.

**DESCRIPTION:** The current generation of bolt seals, despite being ISO-17712-2013 compliant, provides only limited protection from tampering and illicit entry into the container or conveyance. They can be defeated to gain access to the container or conveyance through removal and replacement, and disassembly and reassembly among other methodologies. Entries may be for the purpose of removing goods or merchandise but, they also present an opportunity for insertion of contraband (i.e., drugs, bulk currency, weapons, etc.), weapons of mass effect, as well as illegal aliens.

A number of more sophisticated and more secure devices have been developed and are available to industry as well as Customs and Border Protection (CBP) and Transportation Security Administration (TSA). While such units are very secure, they are also more costly and can be difficult to use. Except for compliance factors under the C-TPAT and FAST programs, the use of these devices are not mandatory to the industry, and as such, industry is reluctant to use these devices except in the case of highly valued and expensive merchandise. Meanwhile containers carrying more mundane cargo are essentially unprotected. This SBIR topic seeks a solution that would ensure the integrity of the container and its cargo between segments of the supply chain such as, for example, between a freight consolidator and an air cargo facility subject to the requirements as established below. The bolt seal must have unique non-duplicable features such that it cannot be replaced, must not in any way or in any form be reassembled after disassembly and removal, and must not allow tampering in any manner. The electronics of such device may have GPS and time keeping capability and, if so equipped, may store location and time of a tamper event in non-volatile memory. The memory may be

## APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

queried by a relocatable device and/or by a handheld device such as a smart phone. The vendor shall propose schema whereby a point of departure interrogation system shall relay presence of a seal and identification of such to the receiving facility. However, under no circumstances shall the actions described herein increase the time, effort, or workload on CBP or TSA Officers using the seals. In addition, the seals shall be designed so that they can be mass produced.

This SBIR topic description seeks proposals to prototype and test, in a field environment, an innovative, low-cost (i.e., ≤\$15.00 each), electronic disposable and/or reusable tamper-proof cargo container/conveyance bolt seal.

**PHASE I:** Develop conceptual designs for the bolt seal and determine the technical feasibility and potential for transition to high-speed bulk manufacturing for each concept. A final report on the above is required at the conclusion of the Phase I period.

**PHASE II:** Phase II will develop one (1) or more low-cost prototype(s), electronic disposable and/or reusable tamper-proof cargo container/conveyance bolt seals for internal (Contractor) testing. Upon successful completion of internal testing, the Contractor shall deliver to the Government no less than six (6) prototypes including any support or ancillary equipment for external testing by the Government with assistance from the Contractor. These prototypes shall be delivered not later than seven (7) months prior to the end of Phase II period of performance to allow for six (6) months testing and one (1) month for analysis and final report development. The final report is to include, at a minimum, external test results (with Government assistance); disposable and/or reusable bolt seal business case; and, a definitive plan to transition to full scale production.

**PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS:** This technology can benefit government entities such as the DHS operating components, CBP and TSA, as well as DOD, DOS, and ODNI. Commercial entities that ship high-value goods within the U.S. can benefit from the use of simple, cheap, and secure protection for their goods.

### REFERENCES:

Wolfe, M. (2002). Electronic Cargo Seals: Context, Technologies, and Marketplace. Prepared for: Intelligent Transportation Systems, Joint Program Office, Federal Highway Administration, U.S. Department of Transportation.

<https://www.hsdl.org/?view&did=444589>

Supply Chain Security (GAO-10-887). (2010). *United States Government Accountability Office*.

<http://www.gao.gov/new.items/d10887.pdf>

Caldwell, S. L. (2014). Maritime Security, Progress and Challenges with Selected Port Security Programs (GAO-14-636T). *United States Government Accountability Office*.

<https://www.hsdl.org/?view&did=754266>

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**KEY WORDS:** Cargo, Cargo Security, bolt seal, innovation, prototype, cargo container, container security

**TECHNICAL POINT OF CONTACT:** David Taylor, 202-254-5884, [david.taylor@hq.dhs.gov](mailto:david.taylor@hq.dhs.gov)

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**SBIR TOPIC NUMBER:** H-SB015.1-003

**TITLE:** Enhanced Distributed Denial of Service Defense

**TECHNOLOGY AREAS:** Cyber Security, Denial of Service, Information Sharing

**OBJECTIVE:** Develop tools, techniques, and polices that mitigate the impact of distributed denial of service (DDoS) attacks.

**DESCRIPTION:** Distributed Denial of Service (DDoS) attacks are used to render key resources unavailable. For example, a classic DDoS attack might disturb a financial institution’s website, and temporarily block a consumer’s ability to conduct online banking. A more strategic attack makes a key resource inaccessible during a critical period. Some examples of this type of attack may include rendering a florist’s website unavailable on Valentine’s Day, slowing or blocking access to tax documents in mid-April, disrupting communication during a critical trading window, etc. Prominent DDoS attacks have been conducted against financial institutions, news organizations, providers of internet security resources, and government agencies. Any organization that relies on network resources is considered a potential target.

The current environment provides several advantages to the attacker, considering that the resource acquisition cost for attackers is relatively low. An attacker often relies on a large number of compromised computers to conduct the attack. Further, as the network bandwidth and computational power increases, the attacker benefits from the increased resources, providing the capability to conduct more powerful attacks. Organizations that make use of network services must invest in resources that keep pace with the increasing significance of the attacks; while organizations that fail to do so run the risk of being compromised. In addition, organizations that deploy resources carelessly may simply provide the attacker with easily compromised resources that can then be used in future attacks. Even businesses with global scale reach, including those providing security related services, have faced challenges in keeping pace with vast DDoS attacks.

This effort seeks tools, techniques, and policies that would help mitigate the attack impact of a 1 Tbps attack originating from over 1,000 locations while shifting the overall advantage from the attacker to defender. The target of the attack may be a hypothetical regional bank that does not have capacity to absorb a 1 Tbps attack. Some collaborative effort will be needed to mitigate the attack. The collaborative effort must make reasonable assumptions on business relationships between the victim and other ISPs, content providers, and other organizations that may be relevant to mitigating the attack.

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In addition to tools that address today's attacks, this effort also encourages an approach that looks forward to new DDoS attack vectors, and propose solutions for attacks that are likely to occur in the future. Many of today's defenses are reactive and designed to address attack patterns that have already been observed. The network infrastructure continues to evolve, therefore enabling the potential for both new types of DDoS attacks and new defenses. For example, attackers are now adapting to growth in smart devices, cyber physical systems, and cloud computing, and are developing new types of DDoS attacks that exploit the unique characteristics of these systems. These same device characteristics may also be used to develop new defenses. Proposals that look forward to network changes and exploit these changes for defense are encouraged.

**PHASE I:** Phase I proposals should describe a specific tool or technique that can be applied in DDoS defense in the current network, and/or show how the tool or technique would address network changes that might occur in the next 3-5 years. The result is expected to include both an analysis that demonstrates the potential of the approach and proof of concept software.

**PHASE II:** A prototype device or software capable of deployment in medium scale organization or government agency is desired. The developed component will be delivered to DHS for piloting. The component should leverage applicable and operational best practices for the intended environment. Assertions of security should be verified by independent 3rd parties.

**PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS:** Refine components from Phase II, and work with operating systems and application developers to leverage the functions the module provides. Ensure that the component meets the standards necessary for the deployment in a federal government agency or department.

### REFERENCES:

Understanding Denial-of-Service Attacks: <http://www.us-cert.gov/ncas/tips/ST04-015>

A Taxonomy of DDoS Attacks and DDoS Defense Mechanisms; Mirkovic, Martin, Reiher;  
[http://www.lasr.cs.ucla.edu/ddos/ucla\\_tech\\_report\\_020018.pdf](http://www.lasr.cs.ucla.edu/ddos/ucla_tech_report_020018.pdf)

REN-ISAC Alert: Prevent Your Institution From Being An Unwitting Partner In Denial Of Service Attacks; <http://www.educause.edu/discuss/discussion-groups-related-educause-programs/security-discussion-group/ren-isac-alert-prevent-your-institution-being-u>

A Framework for Collaborative DDoS Defense G. Oikonomou, J. Mirkovic, P. Reiher and M. Robinson, ACSAC 2006, <http://www.isi.edu/~mirkovic/publications/ACSAC06.pdf>

DHS, FBI warn over TDoS attacks on emergency centers,  
<http://www.csoonline.com/article/731069/dhs-fbi-warn-over-tdos-attacks-on-emergency-centers>

## APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

**KEY WORDS:** Distributed Denial of Service Defense, DDoS, communication tools, collaboration

**TECHNICAL POINT OF CONTACT:** Daniel Massey, 202-254-6669, [daniel.massey@hq.dhs.gov](mailto:daniel.massey@hq.dhs.gov)

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**SBIR TOPIC NUMBER:** H-SB015.1-004

**TITLE:** Privacy Protecting Analytics for the Internet of Things

**TECHNOLOGY AREAS:** Big Data Analytics, Embedded Systems, Cyber-security, Sensors

**OBJECTIVE:** Develop and commercialize analytic capabilities and systems to characterize information from large collections of static and mobile sensors while protecting the privacy of individuals.

**DESCRIPTION:** With the rapid proliferation of sensors, embedded systems, and big data analytics come a host of opportunities for improving safety and security services for the public, critical infrastructure and first responders. As embeddable sensors and sensor platforms become smaller, consume less power and are dynamically re-configurable, a variety of applications associated with awareness, prevention, mitigation and response can be developed to improve the homeland security mission and operations related to catastrophic events. For example, an embedded accelerometer can determine impact to an object, chemical sensors detect the presence of toxic gasses, and physiological sensors can communicate health status. Analysis of different sensor modalities and locations can improve the efficiency and accuracy of responsive actions. However, there are significant privacy concerns associated with such individual sensors and/or sensor readings involving locations and individuals. This effort explores systems that will make it possible to accumulate process and characterize such data in ways that are not attributable to individuals but result in analytic results that are actionable to improve public safety and security.

**PHASE I:** Phase I will examine the feasibility of a proposed privacy protecting system for leveraging the internet of things for public security and safety. During this phase, sensors, embedded systems and scalable architecture designs will be defined that clearly protect the privacy of individuals while producing sensor network information that is clearly actionable for public safety and security applications. Primarily, the performers will conduct an analysis of the proposed system architecture and components that are relevant to the homeland security enterprise. Although not absolutely required, for mature concepts, performers may wish to demonstrate technical feasibility of the privacy protection methods that are inherent in the proposed design. Finally, depending on system maturity, performer may prototype and/or model a proposed system and components that demonstrate their proof of concept. Required Phase I deliverables will include a technical report that outlines the proposed concept and include architecture, embedded system and sensor design requirements and choices. Included in the report will be an analysis of the proposed system and results from relevant modeling

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activities and if available, any experimental prototyping that reflects performance for a mutually determined operational environment that is relevant to homeland security applications.

**PHASE II:** In Phase II, feasible designs will be implemented and demonstrate a priority homeland security capability in an operationally relevant environment. (See the 2014 Quadrennial Homeland Security Review 2014). Performers will demonstrate the efficacy of their design through a series of increasingly complex operations where various aspects of privacy, security, and information accuracy are communicated to the government. Progress and performance analysis of the sensors, embedded systems and architecture will be documented in the monthly technical reports. A robust prototype of the system will be developed and demonstrated using design choices that are suitable for commercialization, manufacturing and maintenance with targeted price points that are realistic relative to market demand. Demonstrations of the system will clearly communicate the privacy protection inherent in the design, scalability for large applications (greater than millions of sensors) and the value proposition created for users and responders to the overall system. Deliverables will include a demonstration for privacy officials as well as the user community, a final technical report that documents the Phase II system design, prototype sensors, embedded systems and the architecture.

**PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS:** Capabilities that result from this effort will lead to increased privacy for architecture designs involving high scale sensor networks. Commercial applications are significant and include: improved traffic flow, medical treatment, and customer service. Government applications include the prevention of Weapons of Mass Destruction related terrorism, situation awareness for first responders, and mass evacuation management.

### REFERENCES:

The 2014 Quadrennial Homeland Security Review

<http://www.dhs.gov/sites/default/files/publications/qhsr/2014-QHSR.pdf>

National Institute of Standards and Technology Cyber-Physical Systems Working Group.

<http://www.nist.gov/cps/cpspwg.cfm>

Mobile Millennium Project. <http://traffic.berkeley.edu>

**KEY WORDS:** Internet of things, privacy, big data, sensors, embedded systems, sensor networks

**TECHNICAL POINT OF CONTACT:** Stephen Dennis, 202-254-5788, [stephen.dennis@hq.dhs.gov](mailto:stephen.dennis@hq.dhs.gov)

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## APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

### **SBIR TOPIC NUMBER: H-SB015.1-005**

**TITLE:** A Wearable Communications Hub Designed to Streamline and Improve First Responder Communication Capabilities

**TECHNOLOGY AREAS:** Wearable Technologies, Situational Awareness, Connected Sensors, Public Safety Grade Communication, Personal Area Network

**OBJECTIVE:** Develop a high-level, scalable next-generation architecture and prototype for an intelligent communications interface device (also referred to as a communications hub) that serves to interconnect wearable technologies (e.g., video camera, sensors, heads-up displays) and voice communication tools to an array of radio communication devices carried by a first responder.

**DESCRIPTION:** Today, when a highly-trained first responder arrives at an incident scene, an array of communication tools such as land mobile radio (LMR), smartphone and other available communication devices and sensors can overwhelm and distract the first responder. The objective of the communications hub is to dissolve the barrier between responders and the many available sources of critical information.

The final goal is to integrate existing and emerging communications technologies already under development and sensors into responders' protective garments and standard equipment, making each responder a mobile, wireless communications hub and sensor platform, linked automatically to a wide-ranging mesh network. For example, a first responder could send a video clip collected at an incident scene without specifying which wireless network will be used to transmit the video clip, and be given a notification whether the video clip was successfully transmitted. With the creation of a broadband network by the First Responder Network Authority (FirstNet), public safety will have access to another broadband network in addition to their commercial provider, resulting in the ability for first responders to move seamlessly from one network to the other. The communications hub will further improve the situational awareness of the first responders in performing their duty of saving lives and protecting property.

To enable first responders to communicate seamlessly, a next generation communications system must include the following features: multimedia (support emergency responder's requirement for voice, data and video services); user friendly (auto detection, connection and configuration of wearable sensors and tools, including an array of available wireless communication devices); scalable (can incorporate new devices by using standard communication protocol); streamlined (automatically select the optimum communication network medium for communication); resilient (store and forward information when communication resources are congested or unavailable); ruggedized (able to withstand different extreme environmental conditions); weight and size (must be wearable in

## APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

lightweight, compact enclosure); and availability (battery will support a minimum of 8 hours of emergency response operation).

**PHASE I:** Develop a high level concept of operations for a next generation communications hub that supports a list of the various connected wearable sensors and tools and relevant use cases. The communications hub will also include a conceptual scalable next generation architecture supporting multiple networks (e.g., LMR, Commercial as well as Public Safety Broadband, Satellite, LTE deployable, Wi-Fi, etc.) connected to existing and theoretical first responder devices, along with a section outlining the technical feasibility and potential improvement in operations. The concept should embrace a standards-based approach.

**PHASE II:** Develop a detailed next generation technical architecture with width backward compatibility along with identifying and proposing relevant standards, and interfaces. Develop and deliver one or more working prototype(s) and conduct a pilot(s) and/or trial(s) to evaluate the operational use of the proof of concept. Include a comprehensive security assessment.

**PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS:** Based on the pilots/trials, refine the prototype for possible inclusion into the current APEX program within the First Responder Group at the DHS Science and Technology Directorate.

### REFERENCES:

Lien, S., Chen, K., and Lin, Y. (2011). Toward ubiquitous massive accesses in 3GPP machine-to-machine communications. *Communications Magazine, IEEE* 49, no. 4: 66-74. Retrieved from [http://santos.ee.ntu.edu.tw/papers/2011/2011\\_M\\_COM\\_Lien.pdf](http://santos.ee.ntu.edu.tw/papers/2011/2011_M_COM_Lien.pdf).

The National Public Safety Telecommunications Council (NPSTC). (2014). Defining Public Safety Grade Systems and Facilities. Retrieved from [http://www.npstc.org/download.jsp?tableId=37&column=217&id=3066&file=Public\\_Safety\\_Grade\\_Report\\_140522.pdf](http://www.npstc.org/download.jsp?tableId=37&column=217&id=3066&file=Public_Safety_Grade_Report_140522.pdf).

**KEY WORDS:** machine-to-machine, LTE deployables, Internet of Everything, wearable devices, sensors, situational awareness

**TECHNICAL POINT OF CONTACT:** John Merrill, 202-254-5604, [john.merrill@hq.dhs.gov](mailto:john.merrill@hq.dhs.gov)

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**SBIR TOPIC NUMBER:** H-SB015.1-006

**Title:** Total Vehicle Mobile X-Ray Scanner

**TECHNOLOGY AREAS:** Counter Improvised Explosive Device (C-IED), Scanning and diagnostics, vehicle borne Improvised Explosive Devices (VBIED)

## APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

**OBJECTIVE:** Develop a real time mobile X-Ray scanning and diagnostics device that can quickly scan an entire vehicle in near real time in order to determine if any explosive devices are present.

**DESCRIPTION:** Vehicle Borne Improvised Explosives Devices (VBIEDs) are the choice weapons of terrorists that threaten the security of a society. To counter this threat, the First Responders and other law enforcement personnel need Diagnostic Imaging tools to make a determination of the contents of the suspicious object without endangering the lives of the First Responders and security personnel. Current COTS (Commercially-Off-The Shelf) Mobile X-ray Scanners are truck mounted and neither suited for use in tight spaces or between parked cars to scan for vehicle bombs nor autonomous. The scanners also have a very small imaging area that makes them unsuitable for effectively scanning large objects. Screening vehicles for threats using X-Ray technology is a tedious and time consuming effort for bomb technicians. When responding to a possible vehicle bomb, a bomb technician's current options include manually opening the vehicle or using techniques that physically intrude upon the vehicle possibly resulting in physical damage to the vehicle. Bomb technicians require a means of determining the contents of a car or truck without physically opening or breaking into the vehicle. Three-dimensional mapping of vehicle contents is also desired.

The mobile Total Vehicle X-Ray Scanner would fill this capability gap by providing bomb squads the ability to conduct rapid mobile screening of vehicles and identifying explosive threats in near real time. Images will be of diagnostic resolution able to identify the threats listed above, will be sent to a mobile control box/screen operated by a bomb technician positioned a safe distance from the scanning area. The system can be used by public safety bomb squads, law enforcement and other first responders operating at the scene to scan suspicious vehicles that have a maximum height of 83 inches. The mobile platform needs to be remotely controlled, and must be maneuverable in tight spaces. The system will also improve the safety of first responders by allowing them to remotely control the device, providing a safe distance between themselves and the target being examined.

All operations must be remotely controlled by a wireless link, an optical fiber, or an Ethernet cable. The system is battery operated and can be driven around using a standard game pad. In the event the game pad is lost or damaged, all operations including driving and deployment can be performed by keys on a laptop. The image of the scanned object is displayed real-time on the laptop screen.

This scanning system will be designed to communicate with the laptop over a standard Wi-Fi link. In situations where there is radio frequency interference, an optical fiber can be used to communicate between the laptop and the scanner. The optical fiber is provided on a spool and unwraps as the scanner drives away.

**PHASE I:** Conduct and deliver a feasibility study to determine the most suitable option and establish requirements for the development of a Total Vehicle X-ray Scanning device. This includes initial design drawings and a list of materials needed.

## APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

**PHASE II:** Develop and deliver a Total Vehicle X-Ray Scanner prototype. Images must be of sufficient diagnostic quality and resolution to clearly identify all components of an IED to include power sources, detonators, circuit boards, and wires.

**PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS:** The Total Vehicle Mobile X-Ray Scanner would be a commercially available tool for bomb technicians at all levels of government whether federal, state or local as well as the private sector.

### REFERENCES:

There are numerous reports and products (e.g., Rapiscan, Leidos, and others) available on explosives detection but they are not specific to the topic of a mobile scanner as requested in this topic description. However, a number of references are given here to indicate the importance of the topic under consideration.

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

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

The following two reports are from Homeland Security Market Research:  
<http://homelandsecurityresearch.com/report/>

Tomographic Explosives Detection systems; EDS & BHS: Industry, Technologies and Global Market – 2014 – 2020

X-Ray Security Screening: Technologies, Industry and Global Market 2014 – 2020

**KEY WORDS:** vehicle, total, x-ray, scan, mobile

**TECHNICAL POINT OF CONTACT:** William Stout, 202-254-6021, [william.stout@hq.dhs.gov](mailto:william.stout@hq.dhs.gov)

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**SBIR TOPIC NUMBER:** H-SB015.1-007

**TITLE:** Canine Mounted Track and Transmit Device

**TECHNOLOGY AREAS:** Law Enforcement Asset Tracking, Sensor Integration, Detection Canine Systems, Emergency Response

**OBJECTIVE:** Demonstrate canine carried low profile GPS with stabilized integrated camera, to real-time track, record and transmit canine’s path of movement.

## APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

**DESCRIPTION:** Develop a tracking device that will attach to a canine for the purpose of documenting the movements of the canine for court/evidence purposes or verification of area(s) that have or have not been searched by a canine during deployments (i.e., wooded areas, water deployment reference cadaver canines, search and rescue operations, large crowd deployments for PB-IED K9 operations to verify whether a canine has swept an area or not, etc.). Such a device should be able to relay information to both the handler of the canine via a wrist or forearm mounted remote monitor and a command coordination center which would allow supporting teams to track the location of the canine teams for both safety and situational awareness.

The described tracking device would need to be able to deploy in all types of weather conditions (heat, cold, wet, dry, etc.) and be able to take direct impact strikes from objects to include but not limited to obstacles a canine might encounter during deployments and suspects during criminal apprehension. The mounting of such devices should be streamlined to the canine and avoid the possibility of being entangled around certain types of obstacles during actual deployments (i.e., tree branches, shrubs, fencing, furniture, etc.). The construction of such device needs to be of a low profile configuration that is a requirement for both the safety of the canine and handler who may have to be exposed while freeing the canine from becoming entangled. The proposed device should be affixed to a mounting device (collar, harness, etc.) that could be easily and quickly attached to the canine prior to being deployed (sometimes seconds can make a difference in the apprehension of a fleeing felon so the ease of utilizing this device is a must). The information/location from such tracking device would also need to be archived and producible for court purposes.

The device should be able to record the location of evidence or other important factors observed during the deployment of canines (i.e., clothing, weapons, change in direction, origination points, end points, etc.). Law enforcement canines deploy for various reasons that consist of the apprehension of fleeing persons, lost or medically ill persons, the recovery of evidence, the detection of contraband, crowd control, search and rescue operations, recovery of persons fatally injured, etc. Having a device that would track and record information during such deployment would be instrumental in the accuracy/proficiency of such operation. Data output requires date, time and location stamping at 1 sample/second and be capable of up to 8 hours of person borne recording media and 4 hours for canine borne storage data. Video data requires up to 30 minutes of storage allowing for overwriting of data over 30 minutes. All video output must be capable of being transferred to permanent storage. Geospatial location of 20 feet for outdoors and 10 feet for indoors are required. All outputs must match commercial quality standards. Offerors are encouraged to consider all devices already on the COTS market for potential integration and applicability in meeting the requirements described above.

**PHASE I:** Deliverable will be a design analysis that identifies the key component technologies used in the design, the integration approach, application to the mission areas identified, and design approach to achieve real-time stabilized streaming video to both handler and remote command center. The design analysis should also detail the technical feasibility of integration

## APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

of additional sensory inputs including, but not limited to, canine physiological measurements, accelerometers, audio inputs and environmental conditions.

**PHASE II:** Develop and deliver five complete functioning prototypes for Government test and evaluation, with at least one spare component replace module for each piece of the key technologies, i.e., tracking and recording devices. Prototypes to be sufficiently ruggedized to operate in typical conditions of canine law enforcement deployment with a streamlined deployment profile that does not increase safety risk to either the canine or handler. In addition, the Offeror shall produce a complete developmental test and evaluation report depicting the results of a prototype assessment in simulated (or actual) operational conditions.

**PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS:** Deployment of a fully functional canine tracking device has diverse application throughout the Homeland Security Enterprise (HSE). Major DHS components including the Transportation Security Administration, Customs and Border Protection, U.S. Secret Service, Federal Emergency Management Agency and the Federal Protective Service all maintain canine teams that are employed for diverse mission areas from narcotics and explosives detection, urban and rural search and rescue and traditional law enforcement patrol. There are over 16,000 non-Federal canine teams nationwide under the HSE umbrella that could have operational use of an effective tracking device. This device could be commercialized for use within the federal, state and local canine communities with a potential for use in the recreational canine community with some modification.

### REFERENCES:

DHS S&T Explosive Detection Canine Program Webinar - [https://share.dhs.gov/io\\_canine/](https://share.dhs.gov/io_canine/)

FEMA Urban Search and Rescue - [www.fema.gov/urban-search-rescue](http://www.fema.gov/urban-search-rescue)

International Police Working Dog Association - [www.ipwda.org](http://www.ipwda.org)

Penn Vet Working Dog Center – [www.pennvetwdc.org](http://www.pennvetwdc.org)

**KEY WORDS:** law enforcement, working dogs, canine tracking, sensor integration

**TECHNICAL POINT OF CONTACT:** Don Roberts, 202-254-5850, [don.roberts@hq.dhs.gov](mailto:don.roberts@hq.dhs.gov)

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**SBIR TOPIC NUMBER:** H-SB015.1-008

**TITLE:** Mass/Shielding Anomaly Passive Detector Module

**TECHNOLOGY AREAS:** Detection of R/N through technical means, Algorithms, Radiation detection techniques, Shielded threat detection techniques/technologies

## APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

**OBJECTIVE :** Develop an innovative system to detect highly shielded special nuclear material (SNM) contained within Personally Owned Vehicles (POVs) through measurements of total mass, mass distribution, density, or whether it is high-Z material.

**DESCRIPTION:** Technology is sought to detect highly shielded special nuclear material within Personally Owned Vehicles (POV) at checkpoints, entry points, or inspections through the detection of anomalous dense masses. The proposed system should not use external sources of ionizing radiation. The technical approach will need the capability to sufficiently discriminate between potential threats and other dense masses to include, but not limited to, the engine block, fuel, and passengers contained within the POV. The sensitivity should be as such to detect anomalous dense masses in the nominal range of 50-500 kilograms. Approaches that utilize a single sensing approach or a fusion of multiple approaches are acceptable. In the proposal the following information should be provided: the technologies estimated performance in detection of mass anomalies in POVs with calculations and/or modeling, cost of implementation, and other implementation requirements such as estimated screening time. If the proposed technology provides the ability to further discriminate between various density classes such as high-z materials, then its estimated performance should also be provided. The intended use of this technology is a sensor component within a larger threat detection system that may also include radiation detection. However, the proposed system should not include radiation detectors unless radiation detectors are needed to demonstrate the goal of detection of mass anomalies.

**PHASE I:** Evaluate innovative technologies/components/system(s) and/or improved capabilities fusion that detect heavily shielded SNM. Phase I will determine the scientific, technical, and commercial merit and feasibility of the proposed approach. Quantification of feasibility shall be demonstrated through either validated predictive modeling or through laboratory level measurements of sensor sensitivity. The preliminary design will be reviewed to determine feasibility/viability and readiness to proceed to Phase II.

**PHASE II:** Evaluate the performance of potential system components leading to the best system design. The effort will then extend into building the subsystem and/or prototype so that its performance can be quantified. The approach should include system analysis that incorporates empirical laboratory measurements in a simulated operational setting to establish its effectiveness. During this Phase, the Offeror will engage with a number of potential end users to determine a range of performance requirements and translate those into evaluation criteria.

**PHASE III:** The prototype developed in Phase II shall be further developed to meet end user requirements and to be integrated into a full shielded SNM detection system. The prototype shall then be evaluated in a controlled operational environment to assess operational viability.

**TECHNICAL POINT OF CONTACT:** [dndosbir15questions@hq.dhs.gov](mailto:dndosbir15questions@hq.dhs.gov)

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## APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

**SBIR TOPIC NUMBER: H-SB015.1-009**

**TITLE:** Stable Semiconductor Modules as Core Component in Pager Radiation Detectors

**OBJECTIVE:** To develop a semiconductor-based module for enhanced radiation detectors in pager applications. The selected semiconductor materials shall have neutron or gamma detection capability. Design and performance objectives shall satisfy or exceed the requirements set forth in the ANSI standards N42.32.

**DESCRIPTION:** Advances in radiation detection materials will greatly impact our present nuclear detection framework. Recent developments in semiconductor radiation detectors have provided a number of candidate materials for gamma and/or thermal neutron detection which can potentially provide low cost, high performance alternatives to the current COTS materials such as CsI and CZT for gammas and He-3 tube technology or LiI for neutrons. This topic area is soliciting efforts to further advance the state-of-the-art for materials that will be integrated into full detector devices or systems, such as personal radiation detectors (PRD's) in particular. The aspects of this topic will focus on materials and supporting technology development. The proposed approach shall also include efforts on integration of the module into a pager-based detector system. Each module should demonstrate long-term (>2 year), stable operation when controlled to operate at temperatures at or near room-temperature, but need to be able to be used in the ambient temperature ranges per the ANSI standards noted above. Proposals submitted against this topic must address one of the following approaches listed below:

For each approach, the proposal can include one or more candidate materials.

- Neutron-based Modules
  - Material candidates for neutron-based modules for pagers can include, but are not limited to: boron-filled 3-D semiconductor structures, LiInSe<sub>2</sub>, or other neutron-sensitive, semiconductor-based compounds. Neutron intrinsic efficiencies should be greater than 50%.
- Gamma-based modules
  - Material candidates for gamma-based modules for pagers can include, but are not limited to: TlBr, Tl<sub>6</sub>SeI<sub>4</sub> and other high-Z based semiconductor compounds.

The proposed approach for each sub-topic shall include discussion on electronics for readout and signal processing and shall address improvements over the current state-of-the-art. Materials developed as part of this SBIR, when coupled with advanced processing electronics and appropriate algorithms, will improve the detection of radiological and nuclear threats, and preferentially be capable of isotope identification.

**PHASE I:** The Offeror will identify one material as described in the aforementioned sub-topics. The Offeror must demonstrate feasibility of the selected material towards a viable detector. Furthermore, the Offeror must provide a preliminary design of the semiconductor module and

## APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

integration plans into a pager-based system. Offeror shall identify and address all critical scientific and technical issues and risks.

**PHASE II:** The Offeror must demonstrate the integration of the module into a pager-detection system prototype. The Offeror must provide the final design and evaluation of the prototype system and further initiate the transition of the prototype system as a commercial product, with the identification of a transition partner.

**PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS:** Design and demonstration of a production line of semiconductor modules for integration into pager-detector systems.

### REFERENCES:

- Kuan Hang “Scalable large-area solid-state neutron detector with continuous p–n; Junction and extremely low leakage current” NIMA 2014
- L.F. Voss et al., “Smooth Bosch etch for improved Si diodes, “ IEEE Electron Device Letters, October 2013
- Onodera et al., “Pixellated Thallium Bromide X-and Gamma-ray Detectors,” Nuclear Science Symposium Conference Record, 2003 IEEE (pp. 3428-3430 – volume 5)
- H. Kim, L. Cirignano, A. Kargar, A. Churilov, G. Ciampi, Y. Ogorodnik, W. Higgins, S. Kim, F. Olschner, and K. Shah, “Long term stability of thallium bromide gamma-ray spectrometers”, *IEEE Transactions on Nuclear Science*, Vol. 60, No. 2, pp. 1219-1224, (2013).

**KEY WORDS:** Thermal neutron detection, semiconductor compounds, gamma spectroscopy

**POINT-OF-CONTACT:** [dndosbir15questions@hq.dhs.gov](mailto:dndosbir15questions@hq.dhs.gov)

## APPENDIX B - DEFINITIONS

Commercialization. The processes of developing products, processes, technologies, or services and the production and delivery (whether by the originating party or others) of products, processes, technologies, or services for sale to or use by the Federal Government or commercial markets.

Conflicts of Interest. Contract awards made to small business concerns owned by or employing current or previous Federal Government employees could create conflicts of interest for those employees, which may be a violation of federal law of FAR Part 3.601 and the Ethics in Government Act of 1978, as amended. Small business Offerors that are owned by or employ current or previous Federal Government employees should seek guidance from the cognizant Ethics Counselor from the employee's Government agency.

Essentially Equivalent Work. Work that is substantially the same research, which is proposed for funding in more than one contract proposal or grant application submitted to the same Federal agency or submitted to two or more different Federal agencies for review and funding consideration; or work where a specific research objective and the research design for accomplishing an objective are the same or closely related to another proposal or award, regardless of the funding source.

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

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.

## APPENDIX B - DEFINITIONS

### Fraud, Waste and Abuse.

Fraud – Includes any false representations about a material fact or any intentional deception designed to deprive the United States unlawfully of something of value or to secure from the United States a benefit, privilege, allowance, or consideration to which an individual or business is not entitled.

Waste – Includes extravagant, careless or needless expenditure of Government funds, or the consumption of Government property, that results from deficient practices, systems, controls, or decisions.

Abuse – Includes any intentional or improper use of Government resources, such as misuse of rank, position, or authority or resources.

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, including products or services, funded in whole or in part by the Federal Government.

Joint Venture. See 13 CFR 121.103(h).

Key Individual (Key Personnel). The principal investigator/project manager and any other person named as a “key” employee in a proposal submitted in response to this program solicitation.

Principal Investigator/Project Manager. The one individual designated by the Offeror to provide the scientific and technical direction to a project supported by the funding agreement.

Proprietary Information. Proprietary information is information that is provided which constitutes a trade secret, proprietary commercial or financial information, confidential personal information or data affecting the national security.

Research or Research and Development (R/R&D). Any activity that is:

- a) A systematic, intensive study directed toward greater knowledge or understanding of the subject studies;
- b) A systematic study directed specifically toward applying new knowledge to meet a recognized need; or
- c) A systematic application of knowledge toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.

Research Involving Animal Subjects. DHS has adopted the principles of the U.S. Department of Agriculture (USDA) implementation of the Animal Welfare Act, the Public Health Service (PHS) implementation of the Health Care extension Act, and the other related federal principles and guidelines as they represent the ethical foundation for the care and use of animals in research. All research involving the care and use of animals in research shall be conducted in accordance with DHS Management Directive Number 026-01.

## APPENDIX B - DEFINITIONS

Research Involving Human Subjects. DHS has adopted Department of Health and Human Services (HHS) policies governing human subjects research, as set forth in 45 C.F.R. Part 46 (Subparts A-D). Subpart A of 45 C.F.R. part 46 is HHS' codification of the Federal Policy for the Protection of Human Subjects (also known as The Common Rule) which represents the basic foundation for the protection of human subjects in most research conduct or supported by U.S. Federal departments and agencies. All research involving human subjects shall be conducted in accordance with DHS Management Directive Number 026-04.

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/products and are invited to contact the Office of SAFETY Act Implementation (OSAI) for more information at 1-866-788-9318 or visit OSAI's website at [www.safetyact.gov](http://www.safetyact.gov).

SBIR Technical Data. All data generated during the performance of an SBIR award.

SBIR Technical Data Rights. The rights an SBIR awardee obtains in data generated during the performance of any SBIR Phase I, Phase II, or Phase III award that an awardee delivers to the Government during or upon completion of a Federally-funded project, and to which the Government receives a license.

Small Business Concern. A concern that meets the requirements set forth in 13 C.F.R. 121.702.

State Assistance. Many states have established programs to provide services to those small business 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; and/or
- Assistance in obtaining Phase III funding.

Visit [https://www2.ed.gov/programs/sbir/state\\_awards.html](https://www2.ed.gov/programs/sbir/state_awards.html) for further information.

Subcontract. Any agreement, other than one involving an employer-employee relationship, entered into by an awardee of a funding agreement calling for supplies or services for the performance of the original funding agreement. This includes consultants.

## ATTACHMENT 1: SBIR FUNDING CERTIFICATION – TIME OF AWARD

All small businesses that are selected for award of an SBIR funding agreement must complete this certification at the time of award and any other time set forth in the funding agreement that is prior to performance of work under this award. This includes checking all of the boxes and having an authorized officer of the awardee sign and date the certification each time it is requested.

Please read carefully the following certification statements. The Federal government relies on the information to determine whether the business is eligible for a Small Business Innovation Research (SBIR) Program award. A similar certification will be used to ensure continued compliance with specific program requirements during the life of the funding agreement. The definitions for the terms used in this certification are set forth in the Small Business Act, SBA regulations (13 C.F.R. Part 121), the SBIR Policy Directive and also any statutory and regulatory provisions referenced in those authorities.

If the funding agreement officer believes that the business may not meet certain eligibility requirements at the time of award, they are required to file a size protest with the U.S. Small Business Administration (SBA), who will determine eligibility. At that time, SBA will request further clarification and supporting documentation in order to assist in the verification of any of the information provided as part of a protest. If the funding agreement officer believes, after award, that the business is not meeting certain funding agreement requirements, the agency may request further clarification and supporting documentation in order to assist in the verification of any of the information provided.

Even if correct information has been included in other materials submitted to the Federal government, any action taken with respect to this certification does not affect the Government's right to pursue criminal, civil or administrative remedies for incorrect or incomplete information given in the certification. Each person signing this certification may be prosecuted if they have provided false information.

The undersigned has reviewed, verified and certifies that (all boxes must be checked):

1. The business concern meets the ownership and control requirements set forth in 13 C.F.R. §121.702.

Yes No

(2) If a corporation, all corporate documents (articles of incorporation and any amendments, articles of conversion, by-laws and amendments, shareholder meeting minutes showing director elections, shareholder meeting minutes showing officer elections, organizational meeting minutes, all issued stock certificates, stock ledger, buy-sell agreements, stock transfer agreements, voting agreements, and documents relating to stock options, including the right to convert non-voting stock or debentures into voting stock) evidence that it meets the ownership and control requirements set forth in 13 C.F.R. §121.702.

Yes No N/A Explain why N/A: \_\_\_\_\_

(3) If a partnership, the partnership agreement evidences that it meets the ownership and control requirements set forth in 13 C.F.R. §121.702.

Yes No N/A Explain why N/A: \_\_\_\_\_

(4) If a limited liability company, the articles of organization and any amendments, and operating agreement and amendments, evidence that it meets the ownership and control requirements set forth in 13 C.F.R. §121.702.

Yes No N/A Explain why N/A: \_\_\_\_\_

(5) The birth certificates, naturalization papers, or passports show that any individuals it relies upon to meet the eligibility requirements are U.S. citizens or permanent resident aliens in the United States.

Yes No N/A Explain why N/A: \_\_\_\_\_

(6) It has no more than 500 employees, including the employees of its affiliates.

Yes No

(7) SBA has not issued a size determination currently in effect finding that this business concern exceeds the 500 employee size standard.

Yes No

(8) During the performance of the award, the principal investigator will spend more than one half of his/her time as an employee of the awardee or has requested and received a written deviation from this requirement from the funding agreement officer.

Yes No Deviation approved in writing by funding agreement officer: \_\_\_%

(9) All, essentially equivalent work, or a portion of the work proposed under this project (check the applicable line):

Has not been submitted for funding by another Federal agency.

Has been submitted for funding by another Federal agency but has not been funded under any other Federal grant, contract, subcontract or other transaction.

A portion has been funded by another grant, contract, or subcontract as described in detail in the proposal and approved in writing by the funding agreement officer.

(10) During the performance of award, it will perform the applicable percentage of work unless a deviation from this requirement is approved in writing by the funding agreement officer (check the applicable line and fill in if needed):

SBIR Phase I: at least two-thirds (66 2/3%) of the research.

SBIR Phase II: at least half (50%) of the research.

Deviation approved in writing by the funding agreement officer: \_\_\_%

(11) During performance of award, the research/research and development will be performed in the United States unless a deviation is approved in writing by the funding agreement officer.

Yes No Waiver has been granted

(12) During performance of award, the research/research and development will be performed at my facilities with my employees, except as otherwise indicated in the SBIR application and approved in the funding agreement.

Yes No

(13) It has registered itself on SBA's database as majority-owned by venture capital operating companies, hedge funds or private equity firms.

Yes No N/A Explain why N/A: \_\_\_\_\_

(14) It is a Covered Small Business Concern (a small business concern that:

(a) was not majority-owned by multiple venture capital operating companies(VCOs), hedge funds, or private equity firms on the date on which it submitted an application in response to an SBIR solicitation; and (b) on the date of the SBIR award, which is made more than 9 months after the closing date of the solicitation, is majority-owned by multiple venture capital operating companies, hedge funds, or private equity firms).

Yes No

It will notify the Federal agency immediately if all or a portion of the work proposed is subsequently funded by another Federal agency.

I understand that the information submitted may be given to Federal, State and local agencies for determining violations of law and other purposes.

I am an officer of the business concern authorized to represent it and sign this certification on its behalf. By signing this certification, I am representing on my own behalf, and on behalf of the business concern that the information provided in this certification, the application, and all other information submitted in connection with this application, is true and correct as of the date of submission. I acknowledge that any intentional or negligent misrepresentation of the information contained in this certification may result in criminal, civil or administrative sanctions, including but not limited to: (1) fines, restitution and/or imprisonment under 18 U.S.C. §1001; (2) treble damages and civil penalties under the False Claims Act (31 U.S.C. §3729 *et seq.*); (3) double damages and civil penalties under the Program Fraud Civil Remedies Act (31 U.S.C. §3801 *et seq.*); (4) civil recovery of award funds, (5) suspension and/or debarment from all Federal procurement and nonprocurement transactions (FAR Subpart 9.4 or 2 C.F.R. part 180); and (6) other administrative penalties including termination of SBIR/STTR awards.

<b><i>Signature</i></b>	<b><i>Date</i></b>
<b><i>Print Name (First, Middle, Last)</i></b>	
<b><i>Title</i></b>	
<b><i>Business Name</i></b>	

## ATTACHMENT 2: SBIR FUNDING CERTIFICATION – LIFE CYCLE CERTIFICATION

All SBIR Phase I and Phase II awardees must complete this certification at all times set forth in the funding agreement (see §8(h) of the SBIR Policy Directive). This includes checking all of the boxes and having an authorized officer of the awardee sign and date the certification each time it is requested.

Please read carefully the following certification statements. The Federal government relies on the information to ensure compliance with specific program requirements during the life of the funding agreement. The definitions for the terms used in this certification are set forth in the Small Business Act, the SBIR Policy Directive, and also any statutory and regulatory provisions referenced in those authorities.

If the funding agreement officer believes that the business is not meeting certain funding agreement requirements, the agency may request further clarification and supporting documentation in order to assist in the verification of any of the information provided.

Even if correct information has been included in other materials submitted to the Federal government, any action taken with respect to this certification does not affect the Government's right to pursue criminal, civil or administrative remedies for incorrect or incomplete information given in the certification. Each person signing this certification may be prosecuted if they have provided false information.

The undersigned has reviewed, verified and certifies that (all boxes must be checked):

(1) The principal investigator spent more than one half of his/her time as an employee of the awardee or the awardee has requested and received a written deviation from this requirement from the funding agreement officer.

Yes No Deviation approved in writing by funding agreement officer: \_\_\_\_%

(2) All, essentially equivalent work, or a portion of the work performed under this project (check the applicable line):

Has not been submitted for funding by another Federal agency.

Has been submitted for funding by another Federal agency but has not been funded under any other Federal grant, contract, subcontract or other transaction.

A portion has been funded by another grant, contract, or subcontract as described in detail in the proposal and approved in writing by the funding agreement officer.

(3) Upon completion of the award it will have performed the applicable percentage of work, unless a deviation from this requirement is approved in writing by the funding agreement officer (check the applicable line and fill in if needed):

SBIR Phase I: at least two-thirds (66 2/3%) of the research.

SBIR Phase II: at least half (50%) of the research.

Deviation approved in writing by the funding agreement officer: \_\_\_\_%

(4) The work is completed and it has performed the applicable percentage of work, unless a deviation from this requirement is approved in writing by the funding agreement officer (check the applicable line and fill in if needed):

- SBIR Phase I: at least two-thirds (66.6%) of the research.
- SBIR Phase II: at least half (50%) of the research.
- Deviation approved in writing by the funding agreement officer: \_\_\_\_\_%
- N/A because work is not completed

(5) The research/research and development is performed in the United States unless a deviation is approved in writing by the funding agreement officer.

- Yes
- No
- Waiver has been granted

(6) The research/research and development is performed at my facilities with my employees, except as otherwise indicated in the SBIR application and approved in the funding agreement.

- Yes
- No
- It will notify the Federal agency immediately if all or a portion of the work proposed is subsequently funded by another Federal agency.
- I understand that the information submitted may be given to Federal, State and local agencies for determining violations of law and other purposes.
- I am an officer of the business concern authorized to represent it and sign this certification on its behalf. By signing this certification, I am representing on my own behalf, and on behalf of the business concern, that the information provided in this certification, the application, and all other information submitted in connection with the award, is true and correct as of the date of submission. I acknowledge that any intentional or negligent misrepresentation of the information contained in this certification may result in criminal, civil or administrative sanctions, including but not limited to: (1) fines, restitution and/or imprisonment under 18 U.S.C. §1001; (2) treble damages and civil penalties under the False Claims Act (31 U.S.C. §3729 *et seq.*); (3) double damages and civil penalties under the Program Fraud Civil Remedies Act (31 U.S.C. §3801 *et seq.*); (4) civil recovery of award funds, (5) suspension and/or debarment from all Federal procurement and nonprocurement transactions (FAR Subpart 9.4 or 2 C.F.R. part 180); and (6) other administrative penalties including termination of SBIR/STTR awards.

<b>Signature</b>	<b>Date</b>
<b>Print Name (First, Middle, Last)</b>	
<b>Title</b>	
<b>Business Name</b>	

**ATTACHMENT 3: BRIEFING CHART TEMPLATE**

<p><b><u>Proposal Title</u></b>  <b><u>Company</u></b>  <b><u>City, State</u></b>  <b><u>Proposal Number:</u></b></p>	
<p>Place a clear photograph, drawing, graphic or diagram of the concept related to innovation here</p> <p><i>Provide a simple, legible, but sufficiently detailed graphic to convey the main concept or idea of the research effort and/or development prototype.</i></p>	<p><b><u>Relevance and Goals and Commercialization</u></b></p> <p>Relevance and Goals:</p> <ul style="list-style-type: none"> <li>• Research goals and desired end state including performance targets</li> <li>• Advantages over other state-of-the-art solutions</li> <li>• Key technical challenges</li> </ul> <p>Commercialization Strategy:</p> <ul style="list-style-type: none"> <li>• Describe the current market potential for product/service development and estimated unit cost of the product</li> <li>• Identify end user interests or agreements</li> </ul>
<p><b><u>Technical Objectives and Work Plan</u></b>  Address:</p> <ul style="list-style-type: none"> <li>• Technological innovations supporting the approach, as appropriate</li> <li>• How the problem will be addressed</li> <li>• The current status of the proposed effort</li> <li>• The key technical challenges and/or risks</li> <li>• The planned technical accomplishments/key milestones</li> </ul> <p><u>Estimate the Technology Readiness Level (TRL 1 - 9) at beginning and end of contract</u></p>	<p><b><u>Milestones, Deliverables, Schedule and Team</u></b></p> <p>Milestones, Deliverables and Schedule:</p> <ul style="list-style-type: none"> <li>• Provide milestones, primary deliverables, and task durations for Phase I and Phase II, as appropriate</li> </ul> <p>Team:</p> <ul style="list-style-type: none"> <li>• List the proposing organization and principal investigator</li> <li>• List subcontractors</li> </ul>
<p><b>NON-PROPRIETARY, UNCLASSIFIED DATA</b></p>	

**ATTACHMENT 4: SAMPLE NON-DISCLOSURE AGREEMENT**

COMPANY-TO-COMPANY NON-DISCLOSURE AGREEMENT  
SOLICITATION HSHQDC-15-R-00017

The Parties to this Agreement agree that Schafer Corporation may have access to proprietary information of [Insert Name of Offeror] contained within the technical and cost proposals, solely to perform technical advisory services for the Government, in evaluating proposals submitted in response to this Solicitation.

The Parties agree to protect the proprietary information from unauthorized use or disclosure for as long as it remains proprietary, and to refrain from using the information for any purpose other than that for which it was furnished.

\_\_\_\_\_  
Company Name (Offeror)

\_\_\_\_\_  
Name of Company Official, Printed

\_\_\_\_\_  
Signed

\_\_\_\_\_  
Dated

\_\_\_\_\_  
Name of Schafer Corporation Official, Printed

\_\_\_\_\_  
Signed

\_\_\_\_\_  
Dated