



U.S. Department of Homeland Security (DHS)

Small Business Innovation Research (SBIR) Program

Solicitation #: HSHQDC-16-R-00012

Due Date: January 20, 2016 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 (SBCs) 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 twelve (12) research topics – ten (10) 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 Benchmarks, 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 FY16.1 DHS SBIR Solicitation, HSHQDC-16-R-00012.

KEY DATES	
EVENT	DATE
Pre-solicitation issued:	December 1, 2015
Direct contact with Topic POC permitted:	December 1, 2015 – December 15, 2015
Solicitation released:	December 16, 2015
Phase I proposals submission:	December 16, 2015 – January 20, 2016
Last day to submit questions:	January 6, 2016 no later than 2:00 p.m. ET
Last day Q&A Posted on FedBizOpps	January 13, 2016
Deadline for receipt of proposals:	January 20, 2016, 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. For general questions about the DNDO SBIR Program, please contact 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.

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.

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.

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 or to update previously entered information. Companies should login to 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 ¹	Pages 1-2	Pages 1-2
Technical Proposal	Pages 3-24	Pages 3-49
SBA Company Registry Information ²	Mandatory	Mandatory
Cost Proposal ³	Page 25	Page 50
Briefing Chart (Attachment 3) ⁴	Mandatory	Mandatory
Commercialization Report ⁴	N/A	If Applicable
Company Financial Information ⁵	N/A	Mandatory S&T Topics ONLY
Non-disclosure Agreement ⁶	Mandatory (DNDO Topics ONLY)	(NDA from Phase I applies to Phase II)

¹ Counts as two pages regardless of print results

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

³ Counts as one page regardless of print results

⁴ Not included in page count

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

⁶ DNDO topics ONLY - NDA must not be included in the proposal, but submitted separately via provided email; 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; description of hurdles to acceptance of the innovation. 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:

- 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.
- Date of proposal submission or date of award
- Title of proposal
- Name and title of principal investigator or project manager for each proposal submitted or award received
- 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
- If award was received, state contract number
- 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.

S&T SBIR Topics		DNDO SBIR Topics	
<u>Phase I</u>	<u>Phase II</u>	<u>Phase I</u>	<u>Phase II</u>
\$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 “Resources.”

Additionally, more information about cost proposals and accounting standards can be found in the DCAA publication, *Information for Contractors*, available at www.dcaa.mil/dcaam_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 Phase I planning purposes, Offerors should budget for two mandatory trips to Washington, DC – a post-award kick-off meeting and a one-day meeting to present the results in the final report. The structure of the kick-off meeting is different for S&T and DNDO topics. Refer to the table below for details:

PHASE I TRAVEL DETAILS		
Day	S&T Topics	DNDO Topics
1	(Mandatory) Session includes: <ul style="list-style-type: none"> • Program background and contracting overview • One-on-One sessions with Topic Managers 	(Mandatory) Session includes: <ul style="list-style-type: none"> • Program background and contracting overview • One-on-One sessions with Topic Managers
2	(Mandatory) Commercialization workshop	N/A
3	(Optional) Showcasing and Presentation Workshop - venue where small businesses can enhance their presentation skills in front of Government, Industry and representatives from the investment community	N/A

Phase II travel requirements will be provided to Phase I awardees at a later date.

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, sales derived from SBIR developed products whether as stand-alone or enablers, and general sales. 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 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, 2009 through September 30, 2014.

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 1st, using their prior SBIR and STTR awards across all agencies.

Firms applying 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 (October 1, 2009 through September 30, 2014) 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 a firm believes that their Phase II Transition Rate was calculated incorrectly, they should notify SBA, provide the correct award information/documentation, and request a reassessment of the rate.

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 1st and ending on May 31st of the current year.

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 2004 through 2013 since the current benchmark requirement was calculated on June 1, 2015. The Commercialization Rate benchmark went into effect June 1, 2015.

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. Firms that are notified by SBA that they failed to meet these benchmarks will not be eligible to receive a Phase I award through May 31, 2016.

3.11 Questions

General questions pertaining to the S&T's SBIR Program should be submitted to STSBIR.PROGRAM@hq.dhs.gov.

General questions pertaining to the DNDO's SBIR Program should be submitted to dndosbir@hq.dhs.gov.

Technical questions concerning the research topics in **Section 7.0** during the pre-release period from **December 1, 2015 through December 15, 2015** 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 the 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 the Offerors and the respective Technical Points of Contact shall occur after 5:00 pm ET on **December 15, 2015**; however, Offerors may submit questions to 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 the pertinent questions received by January 6, 2016 by 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. 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 risk 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 – The proposal demonstrates a superior understanding of the requirements and an approach that significantly exceeds all topic objectives. Proposal has exceptional strengths that will significantly benefit the Government and risk of unsuccessful performance is very low.

- 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 to 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 meetings, 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-SB016.1-011, H-SB016.1-012, and H-SB016.1-013 ONLY

Schafer Corporation
TAR_SBIR_NDA_request@schafercorp.com
(978)735-4555

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 firms 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-SB016.1-011** and **H-SB016.1-012** shall submit a copy of their signed agreement to 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

While it is the intent of the DHS SBIR Program to award a negotiated contract for each proposal selected, selection does not guarantee award. 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 \$750,000.00 - See FAR 15.403-4(a). 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, reporting deliverables, 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 must report inventions to DHS through the NIH iEdison Invention Reporting Systems at 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 the DHS SBIR Office will provide the basic proposal information to the Small Business Administration’s Application Information database at 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. 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. Note that the DNDO SBIR Program Office does not offer CRPP, nor I-Corps opportunities.

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 award may be issued to participate in a joint DHS-NSF Innovation-Corps (I-Corps) program during the Phase I award period, or 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 either the Phase I or Phase II proposal by selecting the I-Corps checkbox located on the Cover Sheet.**

I-Corps 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.

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 20, 2016. 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 "Resources." 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 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 FY16.1 S&T Directorate's SBIR Program:

- H-SB016.1-001 – Security Systems Video/Audio Interoperability Device**
- H-SB016.1-002 – Applicability of Blockchain Technology to Privacy Respecting Identity Management**
- H-SB016.1-003 – Malware Prediction for Situational Understanding and Preemptive Cyber Defense**
- H-SB016.1-004 – Autonomous Indoor Navigation and Tracking of First Responders**
- H-SB016.1-005 – Internet of Things (IoT) Low-Cost Flood Inundation Sensor**
- H-SB016.1-006 – Low-Cost, Real-Time Data Analytics for Underserved EMS Agencies**
- H-SB016.1-007 – Real-Time Assessment of Resilience and Preparedness**
- H-SB016.1-008 – Using Social Media to Support Timely and Targeted Emergency Response Actions**
- H-SB016.1-009 – Blockchain Applications for Homeland Security Analytics**
- H-SB016.1-010 – Remote Identity Proofing Alternatives to Knowledge Based Authentication/Verification**

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

7.2 DNDO Topics

The following are the topics for the FY16.1 DNDO SBIR Program:

- H-SB016.1-011 - Smartphone/Smart device Toolkit for Virtual and Actual Radiation Detection, Identification, and Localization**
- H-SB016.1-012 - Plastic Composite Based Scintillators for Multi-Signature Radiation Detectors**
- H-SB016.1-013 - Portable Linear Accelerator (linac) for Active Interrogation Systems for Radiological Gamma Isotope Source Replacement**

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

APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

SBIR TOPIC NUMBER: H-SB016.1-001

TITLE: Security Systems Video/Audio Interoperability Device

TECHNOLOGY AREAS: video/audio transmission, video/audio interoperability, security systems, surveillance cameras, security cameras, CCTV, incident command, situational awareness

OBJECTIVE: Develop a prototype video/audio interoperability device that enables authorized users to access video security systems and rebroadcast the signals with the ease of a “plug and play” solution.

DESCRIPTION: First Responders, such as law enforcement and incident command managers, rely heavily on video and audio technology to increase their situational awareness while onsite at an incident, monitoring an incident from afar, or conducting day-to-day response. Security and emergency response operations are often provided for special events, such as National Security Special Events (NSSE, which is defined as an event of national or international significance deemed by DHS to be a potential target for terrorism or other criminal activity) and for various contingency operations with situational awareness often gathered through the provision of video and audio transmissions that are both digital and analog. There is a need for a device that enables plug and play capture of video and audio from existing surveillance systems. Phase I will design a self-contained concept that will capture video and audio from security systems commonly implemented by both public and private entities. Phase II will use the research from Phase I to develop and build the prototype device, and conduct field testing.

PHASE I: The objective of Phase I is to design a self-contained concept that will capture video and audio from closed-circuit and networked security systems commonly implemented by both public and private entities. The concept will address how to access the video and audio feed with the approval of the owners, and rebroadcast it to first responders for improved situational awareness and providing participant safety.

The concept will enable plug and play access, through hard-wired or wireless capability, to the widest array of existing public and/or private video security systems for use during an emergency or response operation. To optimize the ability for authorized DHS components to readily access on-the-scene information, the concept will consider characteristics of typical video and audio security systems installed in buildings or used to monitor large outdoor areas (such as closed-circuit television (CCTV) cameras, networked camera systems, their types of inputs and outputs, encryption systems, and wireless of transmissions).

Deliverables will include a detailed concept design of a self-contained, portable interoperability device which enables the capture and retransmission of video and audio signals. The documentation will identify significant types of video surveillance systems (with estimated percentage of users and complexity of each system type), a proposed methodology for accessing these systems, any partial or quick-win solutions for rapid implementation, and a detailed technical description of the proposed portable device and how it could be used. An

APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

additional deliverable will outline a plan to prevent unauthorized parties to acquire and improperly use the device.

PHASE II: Based on Phase I results, construct and demonstrate the operation of a prototype video interoperability device which enables authorized users to quickly access public and (with appropriate permissions) private systems, for the purpose of providing security and situational awareness.

Deliverables will include a functioning working prototype, a test plan, conduct of a laboratory or field test, and user instructions for operation. In addition, a plan to prevent unauthorized parties to acquire and improperly use the device will address how to transition the final prototype to a product and make it available in the marketplace to authorized users.

PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS: The government application of this technology will be for emergency management oversight at incident command centers and to provide situation awareness support at special security events. These applications may include security, fire, emergency medical services, and emergency management.

REFERENCES:

“Closed-Circuit Television.” Wikipedia; The Free Encyclopedia,
https://en.wikipedia.org/wiki/Closed-circuit_television

Security Cameras/ Security Systems Fact Sheet: Transit Overview,
https://www.pcb.its.dot.gov/factsheets/security/sec_overview.aspx#page=tech

Stowell, Holly. (June 15, 2015). *Surveillance for Security and Beyond*. Retrieved from
<https://sm.asisonline.org/Pages/Surveillance-for-Security-and-Beyond.aspx>

Private Sector Camera Initiative, Chicago Office of Emergency Management and Communications. Retrieved from
http://www.cityofchicago.org/content/dam/city/depts/oemc/supp_info/OEMC_Private_Sect_Fact_sheet.pdf

KEY WORDS: CCTV, security cameras, video interoperability, video security systems, situational awareness systems, incident command

SBIR TOPIC NUMBER: H-SB016.1-002

TITLE: Applicability of Blockchain Technology to Privacy Respecting Identity Management

TECHNOLOGY AREAS: Identity, Privacy, and Cybersecurity

OBJECTIVE: Design information security and privacy concepts on the blockchain to support identity management capabilities that increase security and productivity while decreasing costs and security risks for the Homeland Security Enterprise (HSE).

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DESCRIPTION: Blockchain technologies, if incorporated with the security and privacy capabilities required by the HSE, potentially offer a flexible, resilient and potentially lower cost alternative to current Homeland Security Enterprise identity management capabilities.

Current HSE identity management deployments utilize centralized authoritative sources to vouch for the accuracy of the information they collect and maintain. While mechanisms for storing this information can vary (Lightweight Directory Access Protocol (LDAP), databases, Active Directory, etc.), they are ultimately a type of organizationally owned and controlled ledger.

This in turn has led to an ecosystem where processing a transaction to validate information (e.g., birth date) it is necessary to (1) first discover the entity that is considered authoritative for that information, (2) establish the technical means (protocols, data formats, etc.) to interact with that entity, and (3) rely upon the ability and scalability of that entity to validate the information.

Potential examples of this type of interaction within the Homeland Security Enterprise (HSE) are validation of employment status, citizenship, eligibility to work, validation of qualifications of first responders and any other type of interaction that requires a central authority to provide a distributed validation capability.

However, recent innovations around crypto-currencies point to a potential answer to this dilemma. Of particular interest is the underlying technology of the 'bitcoin' crypto-currency, which is called the blockchain. The blockchain is in effect a common, public ledger, which utilizes cryptographic mechanisms to verify transactions and information in a decentralized manner.

The potential applicability of blockchain technology goes beyond crypto-currencies (which is simply an application built on top of that technology) to many other uses such as smart contracts, provenance and attribution, distributed validation of information and more.

This SBIR topic is focused on determining and demonstrating if classic information security concepts such as confidentiality, integrity, availability, non-repudiation and provenance as well as privacy concepts such as pseudonymity and selective disclosure of information can be built on top of the blockchain to provide a distributed, scalable approach to privacy respecting identity management.

PHASE I: Analyze the current implementation of the public blockchain technology and develop the concepts and methods needed to demonstrate the implementation of information security principles of confidentiality, integrity, availability, non-repudiation and provenance as well as privacy concepts such as pseudonymity and selective disclosure of information on the public blockchain.

APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

This phase will demonstrate the various information security and privacy concepts and methods using a multi-user information-sharing prototype and provide detailed architecture and technical details that document and explain the implementation. In addition, this phase will explore, analyze and document the feasibility of applying the developed concepts and methods to a private or consortium based blockchain.

PHASE II: Apply the concepts and methods developed in Phase I to the domain of identity management – in particular to the assertion and validation of identity information (i.e., attributes).

Phase II will demonstrate via a prototype how such a system could interoperate with existing identity assertion, validation and attribute sharing infrastructure built on top of current protocols such as SAML 2, OpenID Connect and OAUTH2. It will provide detailed architectural papers, technical details and prototype code that explain and document the implementation. In addition, this phase will explore, analyze and provide documentation on the incentive structures that need to be put into place for the adoption of this technology over the status quo.

PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS: Potential HSE Applications of this technology include attribute registries used to share emergency responder qualifications, employment eligibility or organizational affiliations as a precursor to physical and logical access control.

Commercial applications include digital contracts, attribution of knowledge work and more.

REFERENCES:

Nakamoto, Satoshi. Bitcoin: A Peer-to-Peer Electronic Cash System. Retrieved from <https://bitcoin.org/bitcoin.pdf>

Buterin, Vitalik. (August 7, 2015). On Public and Private Blockchains. Retrieved from <https://blog.ethereum.org/2015/08/07/on-public-and-private-blockchains/>

Gault, Mike. (July 5, 2015). Forget Bitcoin — What Is the Blockchain and Why Should You Care? Retrieved from <http://recode.net/2015/07/05/forget-bitcoin-what-is-the-blockchain-and-why-should-you-care/>

Security Assertion Markup Language v2 (SDO: OASIS), Retrieved from <https://www.oasis-open.org/standards#samlv2.0>

RFC 9749: The OAUTH 2 Authorization Framework (SDO: IETF), Retrieved from <https://tools.ietf.org/html/rfc6749>

KEY WORDS: cryptography, bitcoin, blockchain, identity, attributes

APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

SBIR TOPIC NUMBER: H-SB016.1-003

TITLE: Malware Prediction for Situational Understanding and Preemptive Cyber Defense

TECHNOLOGY AREAS: Cyber Security, Cyber Attack Modeling, Resilient Systems, Situational Awareness, Situational Understanding

OBJECTIVE: Develop predictive malware capability and demonstrate a cyber defense method that uses prediction of malware developments to support situational understanding and defensive actions

DESCRIPTION: Situational Understanding for Cyber Security is in its infancy. Although many tools and methods exist, breaches and compromises are in the news almost daily, showing that the current state-of-the-art is ineffective. Hundreds of thousands of unique malware samples are collected on a daily basis. With this onslaught of malware, new defensive techniques must be developed. Predicting malware capabilities and malware development would greatly enhance the situational understanding of cyber defenders. Response to attacks typically occurs only after infiltration or infection of a system. Therefore, the defenders are lagging behind the adversaries, granting attackers a window of success before defensive actions are executed. Preemptive cyber defense, in which the defender is anticipating the next attack rather than responding to the previous one, can shift the advantage away from the attacker and on to the defender. As a result, situational understanding is enhanced and cyber defense is improved because attacks are less effective.

Malware-based attacks are a significant concern to cyber security. Currently, signature-based detection approaches fail to capture novel malware variants, and are not timely, as signatures take days to months to develop. Available detection techniques based on machine learning are limited because they are trained on existing sets of malware. Preemptive defense can address these shortcomings by anticipating what the adversaries will do next. Attacks can be reduced by identifying trends in malware development and predicting them over time. Preemptive malware defense requires an effective capability to predict future malware developments and to exploit these predictions for situational understanding and to improve security.

This SBIR topic seeks methods of predicting malware developments, as well as ways of using these predictions to enhance situational understanding and support malware defense. Predictions which are verifiably correct are paramount to the success of the proposed effort. Thus, meaningful ways of evaluating the predictions should be defined. Emphasis should also be placed on how the proposed techniques can be used to enhance situational understanding and as part of a malware defense system.

PHASE I: Design a preemptive cyber defense method capable of identifying trends in malware and predicting malware developments, identify ways of validating this method, and describe how it would be used for enhanced situational understanding and in a defense system.

APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

PHASE II: Create a prototype by implementing the proposed method in a malware defense system that uses prediction of malware developments to improve situational understanding and cyber defense. Specify at least three appropriate metrics, then validate the prototype with these metrics.

Deliverables for Phase II include validation results of the prototype, delivery of a prototype suitable for pilot implementation in a real world setting with metrics showing enhanced situational understanding, success of predictive malware efforts, and success of a preemptive cyber defense method. In addition, there is a requirement to deliver a plan for Phase III.

PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS: This technology will have application in cyber defense efforts of the Homeland Security Enterprise (HSE), and on the commercial market through licensing to software security firms, online providers of software (i.e., application stores), and Government IT providers.

REFERENCES:

Blanch, Rick, "Malware Threats, Trend and Predictions for 2014", McAfee, 2014

Pfeffer, Avi, et al. "Malware Analysis and Attribution Using Genetic Information." Malicious and Unwanted Software (MALWARE), 2012 7th International Conference on. IEEE, 2012.

Canzanese, Raymond, Moshe Kam, and Spiros Mancoridis. "Toward an Automatic, Online Behavioral Malware Classification System." Self-Adaptive and Self-Organizing Systems (SASO), 2013 IEEE 7th International Conference on. IEEE, 2013.

Neugschwandtner, Matthias, et al. "Forecast: skimming off the Malware Cream." Proceedings of the 27th Annual Computer Security Applications Conference. ACM, 2011

Our top 10 predictions for security threats in 2015 and beyond. (November 12, 2014). Retrieved from: <http://www.sophos.com/en-us/threat-center/security-threat-report.aspx>

KEY WORDS: Cyber Security, Cyber Attack Modeling, Resilient Systems, Situational Awareness, Situational Understanding, predictive analysis, malware analysis

SBIR TOPIC NUMBER: H-SB016.1-004

TITLE: Autonomous Indoor Navigation and Tracking of First Responders

TECHNOLOGY AREAS: Communications, Interoperability, Emergency Preparedness, Response, Community Resiliency, Smart Devices, Wearables

OBJECTIVE: Develop a wearable capability for autonomous indoor navigation and tracking of first responders indoors in various types of building structures.

APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

DESCRIPTION: The S&T First Responders Group (FRG) is devoted to meeting the needs of the first responder community. FRG supports the community's ability to protect the homeland and respond to disasters by ensuring that they have the equipment, technology, and information they need. This involves leveraging a wide array of innovative thinkers and ideas through a variety of vehicles. The DHS S&T Next Generation First Responder (NGFR) program is designing new technologies and leveraging existing capabilities to solve first responder problems and make them better protected, connected, and fully aware. As part of NGFR, this SBIR topic is targeted at meeting a critical need that previous research and development efforts have not been able to achieve: accurately tracking first responders indoors.

The development of sensors and communications able to perform well across a variety of indoor environments is one of the biggest challenges in first responder tracking research and development. The ability to use a Global Positioning System (GPS) is extremely limiting for indoor tracking capabilities due to its weak signal strength and its inability to penetrate buildings. There are limited alternatives to GPS, such as wave measurements, magnetic fields, sonar/acoustics, etc. Each alternative comes with both benefits and limitations, and offer varying levels of tracking capability. Previous research and development activities have highlighted the significant challenges associated with indoor tracking. In early 2015, the Federal Communications Commission (FCC) provided rules to ensure commercial cellular carriers and equipment vendors can come together to field more accurate indoor 911 wireless caller, (i.e., cell phone), location capabilities (see reference #1 and #2 below) to enable First Responders to derive a "dispatch-able" address based on the location of the cellular telephone. In a similar context, FRG is seeking personalized, modular and scalable approaches to track next generation first responders indoors using current or emerging technologies, sensors, and techniques. The proposed technology must work regardless of materials used in the building structure, (e.g., wood, concrete, steel, glass or any combination of building materials), and of varying heights. Ideally, a solution will be wearable, self-reporting, provide real-time x, y, z positioning, and will be mission agnostic allowing for use with any first responder practitioner (e.g., law enforcement, firefighter, emergency management, etc.).

PHASE I: Develop a high level concept of operations for a next-generation indoor tracking capability that includes: a listing of the various connected wearable sensors and tools targeted, as well as relevant first responder use cases for their application. The concept of operations for this tracking capability shall include a conceptual, scalable, next-generation architecture that supports multiple communications networks (e.g., Land Mobile Radio (LMR), Commercial as well as Public Safety Broadband, Satellite, Long-Term Evolution (LTE) deployable, Wi-Fi, etc.) connected to existing and theoretical first responder devices. It shall also embrace a standards-based approach (e.g., Open Geospatial Consortium, BlueTooth, Zigby). Finally, the concept of operations shall also include a section outlining the technical feasibility and potential first responder operational improvement areas.

APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

Deliverables include; monthly quad chart that shows task descriptions, percentage completed, targeted completion date, etc.; monthly status calls to discuss the monthly technical report and quad chart.

PHASE II: Based off of work completed in Phase I, develop a detailed next-generation technical architecture. The architecture must identify and propose relevant standards, and interfaces. The offeror must also develop and deliver a minimum of four, or more, working prototypes and conduct trials to evaluate the operational use of the proof of concept based on Phase I use cases. A comprehensive security assessment must also be provided.

Additional deliverables in Phase II include; monthly quad chart that shows task descriptions, percentage completed, targeted completion date, etc.; monthly status calls to discuss the monthly technical report and quad chart.

Finally, there is a requirement to assist DHS S&T Communications, Outreach and Responder Education (CORE) personnel in the development and review of communications materials.

PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS: Based on the results of the Phase II trials, there is potential for this technology to be inserted into S&T's NGFR program and Customs and Border Protection (CBP) agents needing tracking capabilities while operating indoors.

This technology could also be leveraged by the commercial sector in market segments where people or objects need to be tracked indoors, and by wireless carriers to support FCC Wireless E911 Location Accuracy Requirements.

REFERENCES:

FCC Wireless E911 Location Accuracy Requirements, PS Docket No. 07-114 (March 3, 2015). Retrieved from: <https://www.fcc.gov/document/fcc-adopts-new-wireless-indoor-e911-location-accuracy-requirements-0>

Cellular Carriers Technology Roadmap and Wireless E9-1-1 Location Accuracy Requirements (January 21, 2015). Retrieved from: <http://apps.fcc.gov/ecfs/comment/view?id=60001009867>

Project Responder 4: 2014 National Technology Plan for Emergency Response to Catastrophic Incidents (July 2014), Homeland Security Studies and Analysis Institute. Retrieved from: <http://www.firstresponder.gov/TechnologyDocuments/Project%20Responder%204.pdf>

KEY WORDS: indoor location, situational awareness, indoor 3D map, RF ranging, barometric altimeter, velocimeter, inertial measurement.

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SBIR TOPIC NUMBER: H-SB016.1-005

TITLE: Internet of Things (IoT) Low-Cost Flood Inundation Sensor

TECHNOLOGY AREAS: Flood Resilient Communities; Information Sharing; Interoperable Communications; Wireless Emergency Alerts; Alerts (WEA); Warnings and Notifications; Deployables; Internet of Things (IoT); Sensor Web Enablement; Mesh Network

OBJECTIVE: Develop deployable, low-cost flood inundation sensor for alerts, warnings and notifications to responders and citizens using IoT Wireless Emergency Alerts

DESCRIPTION: Flooding is the nation’s leading natural disaster accounting for the greatest loss of life, property damage, and environmental degradation. Man-made discharge from hydroelectric power supplies, while a controlled release, can result in life-threatening situations as the stage/discharge downstream impacts recreational, residential and commercial properties and people. Flash flooding can result in rapid inundation of low-lying areas, underpasses, and critical transportation corridors—impacting emergency response, isolating critical infrastructure, and posing life-threatening situations. The ability to rapidly predict, detect and react to ever-changing flood conditions requires the ability to monitor flood-prone areas in real-time across large geographies.

Providing flood monitoring across broad areas requires a scalable mesh network of affordable, interoperable sensors. The ability to accurately predict and project the rise of flood waters requires the design and development of a ruggedized, modular, deployable (attached to natural or man-made physical structures), GPS-enabled (x, y and z), submersible, low-cost flood sensor; it must also have a wireless, sustainable power source that operates based upon open, web-enabled sensor standards that can leverage an open source IoT architecture design. The flood sensors, and their associated mesh network, would first relay information through open data exchange standards for inclusion within an organization’s operation center for analysis. From there, information would relay to hand-held devices through wireless emergency alerting and then to other IoT sensors for detection and verification.

The resulting IoT Flood Inundation Sensor is expected to be designed and developed in such a way to facilitate its commercialization at a commodity-based level to allow procurement and adoption by rural, resource-constrained communities in the United States and around the world.

PHASE I: Prepare an engineering concept report for the design of a modular, low-cost, integrated flood inundation sensor(s) that meets all of the requirements in the description, based upon both best available technology and best affordable technology. The sensor design will be based on current state of the technology as well as based on requirements derived from DHS S&T stakeholder community, including the Lower Colorado River Authority (LCRA) and the Texas Department of Public Safety (TDPS).

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Deliverables include; engineering concept report that includes initial schematic design, modular sensor engineering specifications, functional characteristics, performance and operational parameters and target unit cost estimations; monthly quad chart that shows task descriptions, percentage completed, targeted completion date, etc.; monthly status calls to discuss technical report and quad chart.

PHASE II: Develop, deploy, test, evaluate, and monitor a prototype of an IoT low-cost flood inundation sensor(s) mesh network, consisting of a minimum of 100 viable sensor units, based upon the engineering concept report design criteria and user requirements from Phase I. Part of the Phase II effort will be to engage the DHS stakeholders (e.g., LCRA and TDPS) to determine the mesh network deployment, evaluation and performance testing acceptance criteria. The assembled sensors, and the associated application programming interfaces (APIs) necessary to implement the mesh network protocols, will be provided to and integrated with the stakeholder operational centers to perform the operational test and evaluation. The test and evaluation should be performed no later than the 18th month of the contract period of performance, over a period of not less than 4 months to align with the regions annual flooding periods. The DHS stakeholders will provide in-kind services, access to subject matter experts, operation center and other architecture environments necessary to deploy, test and monitor the sensor network deployment and operation.

Phase II deliverables shall include; kick-off meeting; monthly quad chart that shows task descriptions, percentage completed, targeted completion date, etc.; monthly status calls to discuss technical report and quad chart; a minimum of 100 viable sensors, associated APIs and necessary software for implementation, technical implementation guidance, test and evaluation plans, and six (6) months of sensor monitoring and diagnostics for sensor performance. Performance and evaluation criteria will be co-developed with S&T and stakeholders. In addition, there is a requirement to deliver an engineering findings report for repeatable, scalable commercialization of the IoT Flood Inundation Sensor network toward the end of the performance period.

Finally, there is a requirement to assist DHS S&T Communications, Outreach and Responder Education (CORE) personnel in the development and review of communications materials.

PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS: Several flood sensor initiatives highlight the need for early warning for flooding, especially in developing countries. However, even the United States has yet to develop and commercialize a low-cost flood alert, warning and notification sensor capability to address the nation's most common and costly hazard. Over the last 30 years, the average losses from flood events have been 89 fatalities and \$8.2 billion in damages per year.

The DHS stakeholders involved in this initiative (e.g. LCRA and TDPS) have indicated their interest in deploying a comprehensive mesh network array across their jurisdictional areas of responsibility.

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In addition to this homeland security application for flood resiliency and response, other homeland security and commercial applications for open standards-based, modular components could be designed and used toward the following government missions and commercial services: audio and visual alerts, reverse 9-1-1, road closure routing, onboard transceiver and service applications, and a number of smart city and smart transportation services as an IoT offering.

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Lower Colorado River Authority (LCRA) Interactive Map: <http://maps.lcra.org/interactive.aspx>

KEY WORDS: Flood, Internet of Things, Smart City, Open Web Standards, Sensor Web Enablement (SWE); First Responder Early Warning, Resilience; Mesh Network

SBIR TOPIC NUMBER: H-SB016.1-006

TITLE: Low-Cost, Real-Time Data Analytics for Underserved EMS Agencies

TECHNOLOGY AREAS: Communications, predictive (data) analytics, information sharing, incident response and management, operational framework, real-time incident management.

OBJECTIVE: A low-cost, real-time data analytics solution to enable underserved Emergency Medical Service (EMS) and first responder agencies to improve quality and response

DESCRIPTION: While the United States has a National emergency call system, there is no national standard on how these calls are recorded, reported or stored when someone calls 9-1-1. Without a standard, communities have selected from a myriad number of Computer Aided Dispatch (CAD) vendors, each with a proprietary software solution and an accompanying set of features and cost models. Not only are there significant differences in the capabilities of these systems, there are different technical architectures, workflows, and use cases. With over 3,100 counties in the United States and no standards, 9-1-1 incident data (as recorded in the CAD databases) can vary from county to county, municipality to municipality, provider to provider and state to state. With such a broad and disparate set of technologies supporting CAD, EMS

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and first responder agencies vary in how they provide operational response to these call incidents.

Further, this wide range of solutions comes at various costs; this poses a substantial challenge for agencies that have limited resources. EMS and first responders in many communities do not have new infrastructure, which limits or eliminates access to data. Without current and relevant data, change management processes and continuous quality improvement, which inform and improve response during emergencies, is limited or non-existent.

On the vendor side, a very limited number of real-time analytic solutions exist today and they require considerable integration and maintenance. This requirement further pushes the cost of those solutions beyond the reach of many underserved EMS agencies. This limitation in the marketplace has precluded the ability of underserved EMS agencies to become high performing EMS agencies.

This topic focuses on addressing the need for a low-cost (or no-cost) data analytics solution that can support EMS and first responder agencies irrespective of their resource levels. The solutions needs to be low-/no- cost, and must operate independent of proprietary or vendor-specific database architectures, and must enable real-time access, analysis and reporting of CAD data.

The DHS First Responders Group envisions this early-stage work under SBIR to lay the groundwork for a broader, innovation that gives thousands of EMS and first responder agencies the opportunity to become high-performance organizations. Consistent with S&T's Visionary Goals of Enabling the Decision-Maker and Protecting the Responder of the Future, this work can also seed longer-term efforts to create a national, standards-based solution that supports real-time or predictive analytics for timely, actionable response information and that can drive de facto reporting standards that will enable regional, statewide and nationwide views of operational incident data.

PHASE I: Identify key performance indicators (KPI) from high performing EMS and first responder agencies in varied geographic and rural versus urban settings. This Phase will establish the feasibility of producing a prototype solution that provides a low cost real-time EMS analytics tool, leveraging the identified KPIs. Included in the final technical report will be an analysis of county attributes in different geographic locations.

Deliverables include; monthly quad chart that shows accomplishments, milestones, activities and risks; monthly status call to discuss the monthly technical report and quad chart; and quarterly Interim Project Review (IPR) that includes power point presentation on the status of the research, preliminary or expected findings, and any risks associated with work in progress.

PHASE II: Using a subset of KPIs defined in Phase I, develop the data and technical architecture to support a low cost real-time data analytics prototype. Conduct at least two pilots or trials that confirm the operational value of the prototype.

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Deliverables in Phase II include; monthly quad chart that shows accomplishments, milestones, activities and risks; monthly status call to discuss the monthly technical report and quad chart; quarterly Interim Project Review (IPR) that include power point presentation on the status of the research, preliminary or expected findings, and any risks associated with work in progress; and completion of a one page template, to be provided by DHS S&T FRG, outlining a communications and outreach for after Phase II (i.e., list of Government agencies that will benefit from technology, outreach events that will provide partnering opportunities, etc.). During Phase II there is a requirement to assist DHS S&T FRG Communications, Outreach and Responder Education (CORE) personnel with the development and review of communications materials.

PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS: Based on the strength of Phase II prototypes and pilots—as well as the strength of a commercialization plan that facilitates adoption—the capabilities that result from this effort will provide the foundation of a real-time data analytics solution which would be available for any US EMS agency as part of their Continuous Quality Improvement (CQI) program.

However, there is significant potential for other state, local and commercial healthcare and emergency medical services segments to take interest in and/or invest in bringing this EMS capability to market if it demonstrates the potential to influence efficiencies and outcomes for emergency medical care facilities and professionals.

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KEY WORDS: Emergency call system, standards adoption, quality improvement, computer-aided dispatch (CAD), incident response, technology standards.

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SBIR TOPIC NUMBER: H-SB016.1-007

TITLE: Real-Time Assessment of Resilience and Preparedness

TECHNOLOGY AREAS: Community, Economic & Infrastructure Resilience; Emergency Preparedness and Response; Natural Disasters and Related Geophysical Studies; Advanced Data Analysis and Visualization; and Communications & Interoperability

OBJECTIVE: Develop an application to assess a community's posture with respect to resilience factors (to be provided by the government) using open-source data streams such as print and visual media, government data bases, and social media.

DESCRIPTION: Communities across the United States are in different states of preparedness for a natural disaster. Assessing a community's resilience requires a dedicated, expensive, and time-consuming data collection effort and produces information that quickly becomes outdated due to ongoing changes in the community. For example, community planners may invest in a new road construction that would influence a community's resilience factor, but was not captured in the initial data collection. Essentially, evaluating a community's resilience using existing methods and technology yields a static 'snapshot', which, while useful in the near term, is not sufficient to inform federal, state, and local disaster planning efforts.

There is a need for a low-cost, flexible application that can analyze a community's resilience on a near real-time basis and present this information in visual and data formats on mobile and fixed platforms. The application would access open-source data feeds, such as print and visual media, social media, and community and state government data, and use this information to evaluate a community's preparedness using DHS-provided resilience factors.

Technical challenges involve the identification of open-source data that are relevant to DHS-provided resilience factors and the development of algorithms to analyze and prioritize these data against the resilience factors. The application must be able to incorporate new data in real time to support an accurate assessment of a community's resilience state. In addition, the application must be engineered for deployment on smart phones, tablets, and PC platforms.

PHASE I: Develop a program plan that outlines the overall system architecture and technology required to develop the resilience assessment application. The architecture will specifically identify the targeted open-source data to be used and how the data will be analyzed and displayed to a user. Include milestones, description of demonstrations, and a comprehensive technical description of the developed application.

PHASE II: Develop an application that uses open-source data to assess a community's resilience and provides results to a user. Test the application's effectiveness in providing accurate resilience information (DHS will provide the community and specific disaster of interest six months after the start of Phase II) and provide results of the test.

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Provide a comprehensive business plan to make the application commercially available to community, state, commercial, and federal planners.

PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS: This technology can strengthen disaster preparedness and response for government entities such as the Federal Emergency Management Agency (FEMA) and the Department of Commerce, as well as State and local governments, commercial insurance firms, and the construction, medical, and foodstuff industries. The data provided through this application will assist community planners and support government and private sector decision-making before, during, and after a disaster.

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KEY WORDS: Information Collection, Information Management, Collaborative Analysis, Collaborative Decision-making, Social Understanding, Cultural Understanding, Behavioral Understanding

SBIR TOPIC NUMBER: H-SB016.1-008

TITLE: Using Social Media to Support Timely and Targeted Emergency Response Actions

TECHNOLOGY AREAS: Communications, information sharing, technology acquisition, Computer Aided Dispatch (CAD), data analytics, social media, crowd-sourcing

OBJECTIVE: Develop a data analytics engine (set of algorithms) to correlate social media comments and activity with real time agency CAD incident data.

DESCRIPTION: Social media outlets, such as Facebook, Twitter, Instagram, and Snapchat, to name a few, have become ubiquitous in the modern world of communications. During real-world emergency events there potentially exists a wealth of unstructured information and unverified datasets about these events that are being shared via social media outlets as the events are unfolding. Organizing and correlating this information with CAD incident data already available to the Incident Command could greatly improve the effectiveness of response decisions and actions. This crowd-sourced data, once validated (including an analysis of any potential false positives) could be correlated with actual real-time incident data, so that more

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timely and targeted response actions can be identified that allow for escalation preparedness throughout the event timeline.

Public Safety, Fire and Emergency Medical Services (EMS) agencies generally use CAD data to understand actions occurring in the past. The data is often aggregated around specific quantitative metrics and does not capture broader, influential external factors including environmental, social, meteorological, political, economic, and other factors. The impact of these factors is often only known as part of post-event analysis as they are not a part of the reportable incident data set available in the Computer Aided Dispatch (CAD) system during the event.

Identifying the types of influential external factors—which are often shared via social media—and correlating those factors with CAD information can drive an enhanced, upgraded, or differing response that could impact community preparedness and resilience. The resultant actionable data will support decision making as events unfold (instead of afterward), better; this serves the community as a whole, reduces risk, and ensures the best use of resources.

PHASE I: Develop a target set of scenarios that would benefit from social media correlation. Identify the broader external factors, usually discussed in social media feeds, which can improve situational insight to the target set of scenarios. Identify the operational incident (CAD) data that correlates with the social media feeds for the target set of scenarios. Describe the technical feasibility of developing algorithms to correlate social media with incident command data feeds for the target set of scenarios and the potential improvements in real-time/response operations.

Deliverables include; monthly quad chart that shows accomplishments, milestones, activities and risks; monthly status call to discuss the monthly technical report and quad chart; and quarterly Interim Project Review (IPR) that includes power point presentation on the status of the research, preliminary or expected findings, and any risks associated with work in progress.

PHASE II: Down select to a single target scenario based on Phase I and development of the set of algorithms to support a pilot protocol by which a social media feed is correlated with operational incident data. Establish the validation and trust algorithms that could support more timely and targeted response actions and allow for escalation preparedness.

Deliverables in Phase II include; monthly quad chart that shows accomplishments, milestones, activities and risks; monthly status calls to discuss the monthly technical report and quad chart; quarterly interim project briefings (IPR) that include power point presentation on the status of research, preliminary or expected findings, and risks associated with the work in progress; and completion of a one page template, to be provided by DHS S&T FRG, outlining a communications and outreach plan for after Phase II (i.e., list of Government agencies that will benefit from technology, outreach events that will provide partnering opportunities, etc.).

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During Phase II there is a requirement to assist DHS S&T FRG Communications, Outreach and Responder Education (CORE) personnel with the development and review of communications materials.

PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS: Based on the results of the Phase II technology, an integral standardized output format would be developed, which would post correlated results to a web dashboard for use by local Public Safety officials and 9-1-1 communications dispatchers. Once standardized, a national view of scenarios could then be used by DHS to understand local, regional and state incident data as correlated with social media to better understand risk scenarios that could impact the United States as a whole, or individual states or regions.

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KEY WORDS: Social media, social networks, crowd-sourcing, computer-aided-dispatch (CAD), technology integration, 9-1-1 dispatch, incident response.

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SBIR TOPIC NUMBER: H-SB016.1-009

TITLE: Blockchain Applications for Homeland Security Analytics

TECHNOLOGY AREAS: Identity, encryption, authentication, cyber security, internet of things, and data analytics

OBJECTIVE: Design a product to support the implementation of block chain based data management, data analysis, and information sharing.

DESCRIPTION: Blockchain technologies potentially offer a very flexible, low cost, and secure means of implementing data analytics architectures. In the virtual currency world, blockchains are distributed ledgers that keep track of all transactions authenticated by thousands of independent users' machines. This process in crypto currency, known as mining, inherently makes the ledger extremely difficult and expensive to hack. The use of machines to authenticate transactions makes authentication more cost effective. Virtual currencies like bitcoin have a governing body that manages and updates the algorithms for transactions and rules for user participation.

Numerous entities – banks, technology companies, etc. – are exploring blockchain applications for the future. DHS can benefit from solutions that offer this level of flexibility, security, accountability and cost.

PHASE I: Design and prototype an ecosystem that supports blockchain technology applications for data analytics that significantly improve DHS mission and operations. Proposed use cases include, but are not limited to, crypto-certified data and/or analytic transactions involving users and devices for the internet-of-things applications (IoT) such as encrypted sensor data transactions and analytics for first responders; information sharing and analysis between state, local, and federal law enforcement; and third party information sharing architectures involvement, perhaps in applications that improve security and experiences for the traveling public, or that improve bio-threat awareness. Offerors may define and propose relevant use cases and architectural concepts where there is a significant value proposition for the homeland security enterprise.

Proposed solutions can involve open or closed environment blockchain applications. For example, open environments, such as cryptocurrencies, where anyone can participate. There are also closed-permissions based environments where community involvement may be controlled by participants. Regardless of the architecture, privacy is an important DHS priority for use cases that might involve any personally identifiable information (e.g., biographical, biometric). National computer, network and information security policies and standards are also important considerations for a viable solution that involves government participation. For scalability, solutions must also consider speed of analysis and any transaction validation features.

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In Phase I, the application ecosystem will be developed for data management that will include a data analytics methodology and approach for applying blockchain technology to significantly improve or enable homeland security applications and use cases. Produce an architecture that leverages existing or creates algorithms and computational techniques where practicable; show how components and services function in the ecosystem; and develop an approach for building and maintaining this ecosystem. Demonstrate and/or document implementation feasibility with respect to: concept of operations, crypto-certified data transactions, governance models, analytic framework, analytic algorithms, costs, privacy protection and security. Identify risks to privacy, security, operational performance and technology and develop appropriate risk mitigation strategies.

PHASE II: Prototype, or expand on the prototype, developed in Phase I for the blockchain data management ecosystem(s), including the development of software services and design, and implementation of any equipment needed. Implement, expand, refine and characterize the performance of system modules and algorithms. Demonstrate prototype(s) and algorithms in a laboratory environment with data that reflects proposed homeland security applications and use cases. Demonstrate the value proposition of general core capabilities by developing and demonstrating multiple but disparate applications from the same core product capabilities. Refine the architecture and technical approach based on feedback from the government and marketplace as appropriate for selected applications. Initiate transition/commercialization options that leverage the strengths of demonstrated results, market demand and homeland security value propositions.

In Phase II, the software ecosystem prototype will be delivered and made available to the government for assessment. This can happen through the delivery of preliminary software, equipment, or cloud based platform access.

PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS: Blockchain technologies stand to radically transform options for data management, sharing and analysis across government. Because of the significant impact in areas such as governance, data sharing agreement enforcement, and encrypted analytics interchanges, there are a wide variety of applications in government and the commercial marketplace that can benefit from successful product development. Information sharing for the homeland security enterprise can help the DHS security operations across components as well as the state fusion centers. Additionally, such technologies can assist with resolving matters related to disaster response, where a variety of public and private resources are required to inform decision making at all levels of government and for individuals.

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KEY WORDS: Identity, encryption, crypto-certification, encrypted data analytics, authentication, cyber security, internet of things, and data analytics

SBIR TOPIC NUMBER: H-SB016.1-010

TITLE: Remote Identity Proofing Alternatives to Knowledge Based Authentication/ Verification

TECHNOLOGY AREAS: Identity, Fraud, and Cybersecurity

OBJECTIVE: Design and demonstrate the feasibility of high assurance alternatives to knowledge-based verification techniques for population scale remote identity proofing.

DESCRIPTION: The vast majority of organizations remotely identity proof an individual using a Knowledge Based Verification (KBV) or Knowledge Based Authentication (KBA) technique; i.e., by asking them "secret" questions that only they can supposedly answer to prove their identity.

As shown by the recent Internal Revenue Service (IRS) data breach, KBV is broken and rapidly becoming less effective as a verification tool as a by-product of the availability of personal information on social media as well as the variety of data breaches of credit bureaus and data brokers. This availability of personal information has led to situations where answers to these "secret" questions can easily be discovered with a minimal level of effort by a determined fraudster who can then use that information to impersonate an individual.

At a high level, identity proofing of an individual is a three step process consisting of (1.) identity resolution (confirmation that an identity has been resolved to a unique individual

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within a particular context, i.e., no other individual has the same set of attributes), (2.) identity validation (confirmation of the accuracy of the identity as established by an authoritative source) and, (3.) identity verification (confirmation that the identity is claimed by the rightful individual).

This SBIR topic is focused on investigating identity verification alternatives to KBV/KBA that provide varying levels of assurances of identity for remote identity proofing. Potential techniques to be explored include, but are not limited to, biological or behavioral characteristic confirmation - a process that compares biological (anatomical and physiological) characteristics in order to establish a link to an individual where facial photo comparison, trusted referee confirmation - a process that relies on a trusted referee to establish a link to an individual (guarantors, notaries and certified agents are examples of trusted referees), and physical possession confirmation - a process that requires physical possession or presentation of evidence to establish an individual's identity.

PHASE I: Identify and define five or more non-KBV/KBA approaches that exist in practice and in theory to establish a link between a particular set of data and an individual. Perform an analysis to determine the technical feasibility of each approach as well as the threats and potential mitigations for each approach.

PHASE II: Analyze and rank the approaches, or combination of approaches, identified in Phase I based on the assurances of identity they provide.

In addition, to the extent feasible, provide a mapping to the levels of identity assurances as articulated by standards organizations such as International Organization for Standardization (ISO) and National Institute of Standards and Technology (NIST). Provide an analysis of the various approaches that take into account identity assurance, data privacy, and user experience. Using data from the analysis, develop, demonstrate, and validate the most promising approaches that provide the best combination of identity assurance, privacy and user experience via a prototype using existing standardized identity protocols such as Security Assertion Markup Language 2.0 (SAML 2.0) or OpenID Connect / OAUTH2.

PHASE III: COMMERCIAL OR GOVERNMENT APPLICATIONS: Potential Homeland Security Enterprise (HSE) Applications of this technology include all digital services delivered by government to its citizens, employees or partners that require remote identity proofing.

Commercial applications include all high assurance applications requiring proof of identity.

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<http://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-63-2.pdf>

ISO/IEC 29115: Information technology -- Security techniques -- Entity authentication assurance framework

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KEY WORDS: identity, proofing, Knowledge Based Verification, KBV, Biometrics

SBIR TOPIC NUMBER: H-SB016.1-011

TITLE: Smartphone/Smart device Toolkit for Virtual and Actual Radiation Detection, Identification, and Localization

TECHNOLOGY AREAS: Radiation Detection; Virtual Radionuclide Identification; Localization, Human-machine interface, Instrumentation, Human Factors, Psychology, Display systems

OBJECTIVE: Successful research would lead to the development and demonstration of a user-friendly and straightforward smartphone/smart device toolkit for radiation detection, identification, and localization based on the presence of a simulated or virtual radiological source. Later phase device will be able to interface with actual detector to provide same functionality using data generated by detector resulting in near-perfect fidelity between training and operations.

DESCRIPTION: DNDO is requesting proposals that lead to the development of a simple-to-use and operate radiation source training and operational toolkit that contains the following:

- A display output with design developed from basic research (survey, observation, SME input) into user needs during actual operational use of fielded instruments. Initial phase will result in optimum user-centered interface responding to a virtual source. Later phase will result in identical interface responding to actual data received from PRD, basic hand held and back pack style detectors.
- Display will have a virtual and active mode.
- Display may be able to either fit over current instrument hardware or be able to be injected directly into hardware.
- Tool is able to track the location of the search personnel compared to the placement of the virtual source for purposes of estimating the detector response, such as through Bluetooth beacons, Wi-Fi, or other equivalent means.
- Selectable ability to change the detector readout types and sensitivity for the purposes of training on multiple detection equipment.
- Output includes estimates of dose and dose rate.

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- Source location, isotopic signature, intensity, and occluding background environment can be programmed for training purposes.
- The application may support several modes of operation within existing detection systems to include detection, localization, and identification.
- Later phase tool able to interface with actual detectors providing identical display with selectable menu based on detector capability using detector generated data.

PHASE I: The Offeror shall provide the basic research into optimum human machine interface. Most useful instrumentation/displays for real-world operations at the State and Local level. Most common information required for most effective warnings. Research shall be used to design instrumentation of user interface/instrument display. Additional research would lead to an innovative virtual mock-up which successfully demonstrates the ability of a smart device application to effectively determine the distance of the user from the virtual source, calculate dose and dose rate, and estimate location, signature, and intensity of a source. Offerors would also deliver a prototype user interface capable of supporting multiple modes of operation as described above. Additionally, the Offeror shall deliver a detailed analysis of predicted performance, establish baseline metrics, and include monthly progress and final technical reports as part of the standard Phase I deliverables.

PHASE II: Phase II efforts shall focus on the validation and verification of simulated results in various operational environments, including those with background occlusion. Further, the Offeror shall be able to demonstrate that the performance of this virtual model exceeds the previously established baseline metrics set forth in Phase I. Efforts should roll into development of digital architecture for app based display that would allow virtual mode interface be duplicated and provide real-time data from actual detectors. The efforts would result in demonstration of a smart device tool that uses same instrumentation as virtual tool, but provides actual detector data. This will lead to the development of open architecture standards for smart device interface with R/N equipment hardware. Open architecture will spawn innovation in turning standard digital data into innovative displays and innovative information transfer solutions that provide near-perfect fidelity between training and operational use.

The end of the second year Phase II efforts should culminate into a robust and standalone smartphone/device app or toolkit, adjustable to emulate detector responses and to interface with actual commonly used detectors (PRD, BHH, Back pack). Display would have selectable features compatible with detector capability standardizing display features for family of commonly used detection equipment.

PHASE III - COMMERCIAL OR GOVERNMENT APPLICATIONS: Efforts should focus on developing partnerships and collaborations with R/N OEMs, other Government, State, and Local emergency response organizations for a successfully transition of the resulting smartphone/device application(s) as a standard all-encompassing equipment solution toolkit to facilitate training, operations and exercises. Developer could commercialize as optimum app based display/ Interface solution that can provide both training and operational functionality. Device could be marketed on near perfect fidelity for training and interface solution that would negate training gaps between commonly used equipment (PRD, Handheld, Back pack). This toolkit could be further expanded to include testing of new and more advanced detection, identification, or localization algorithms developed by DHS research and development efforts. This toolkit could be further expanded to include additional advanced human machine interfaces to support operational constraints.

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REFERENCES:

<http://www.infoworld.com/article/2608498/mobile-apps/what-you-need-to-know-about-using-bluetooth-beacons.html>

KEY WORDS: Virtual; Radiation Source; Smartphone Toolkit; Detection; Identification; Tracking; Localization

SBIR TOPIC NUMBER: H-SB016.1-012

TITLE: Plastic Composite Based Scintillators for Multi-Signature Radiation Detectors

TECHNOLOGY AREAS: Radiation detection, radionuclide identification, plastic scintillators

OBJECTIVE: Demonstrate a simple-to-fabricate-and-integrate detector technology that combines gamma and neutron sensitivity with good efficiency at a reduced cost compare to the current COTS scintillators.

DESCRIPTION: There are considerable benefits in being able to acquire multiple signatures when detecting and identifying radiation sources. While gamma rays can provide highly detailed information alone, they can also be easily masked and misconstrued amongst the many possible sources of industrial, medical and normally occurring sources that might be encountered. For this reason, augmenting with neutron detection is highly valuable, especially in determining the presence of fissionable materials (SNM). Characterizing neutrons by energy is even more powerful, but often requiring distinctly different detector types.

Recent advances in scintillator technology (*e.g.* elpasolite, stilbene-based, or advanced plastic detectors) make possible both gamma and thermal neutron detection with a single element. The sensor material cost is a significant driver of the overall detector cost, therefore a ‘multi-mode’ detector approach can shall provide significant value for its enhanced performance. Nevertheless, these new technologies are relatively expensive for wide-spread deployment.

DNDO seeks plastic-crystal composite solutions that can achieve both multi-modality and substantial cost reductions in sensors that are compatible with backpack and handheld instrumentation. Included in the cost calculation is not only the cost to fabricate the scintillator crystals or plastics, but the cost of integrating these gamma/neutron sensitive materials into a detector.

Proposed composite scintillators shall include, but are not limited to a plastic framework comprised of another radiation sensitive material (larger than molecular scale) distributed into the plastic contributing to multi-modality detector sensitivity. The proposal should address the following objectives:

- Price goals should be \$5/cm³ or less.
- Neutron-gamma discrimination should exceed 10⁻⁶.

APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

- Gamma ray detection performance shall be better than 1" x 1" NaI single scintillators (7% energy resolution FWHM at 662 keV).

Successful solutions shall leverage the cost effective approach and enhanced detector performance of a combined plastic and radiation sensitive material into a plastic-crystal composite. The most successful technology will provide a compelling combination of gamma ray energy spectroscopy (measured at 662 keV), gamma ray and neutron sensitivity, and cost per unit volume.

PHASE I: The Offeror shall propose a plastic-crystal composite material that can demonstrate multi-mode sensitivity to both gamma rays and neutrons (with separable signals, or discrimination). Neutron detection should also be quantified and compared to current commercially available hand held technologies. Provide trade-off studies and modeling of detector sensitivity as a foundation for Phase II development.

Develop a preliminary cost model that describes the Offeror's plan to manufacture the technology and highlight those factors which are most highly impacted by acquisition scale. It is expected that in Phase II, this model will be updated as the underlying processes mature.

PHASE II: Optimize the underlying technologies and demonstrate fully-sized examples of the working detectors. Develop all packaging and ancillary electronics that may be needed to fully evaluate the detectors, including the capability to discriminate signal types (which should be fully integrated). Produce packaged detector sizes capable of supporting gamma and neutron detection requirements for handheld and backpack systems.

Further investigation on how this technology could be made available for instrumentation to OEMs, including consideration of accompanying readout requirements.

PHASE III - COMMERCIAL OR GOVERNMENT APPLICATIONS: Handheld and backpack multi-mode gamma/fast neutron/ thermal neutron detectors will strongly benefit from this technology, which will allow their mass deployment in homeland security applications. In addition, it can be used in control of nuclear material diversion and proliferation, for accountability of the materials in nuclear facilities, and in safeguards applications. Large area, low cost, gamma-neutron monitoring systems can be also realized.

REFERENCES:

- N. D'Olympia, et al "Optimizing Cs₂LiYCl₆ for fast neutron spectroscopy," NIM A, vol. 694, pp. 140 - 146, 2012.
- N Zaitseva, B L. Rupert, I Pawelczak, A Glenn, H. Paul Martinez, L Carman, M Faust, N Cherepy, S Payne, "Plastic Scintillators with efficient neutron/gamma pulse shape discrimination" , Nucl. Instr. Meth. Phys. Res. A 668 (2012) 88 – 93.
- J. Glodo, et al, "Cs₂LiYCl₆:Ce Scintillator for Nuclear Monitoring Applications," IEEE TNS, vol. 56, no. 3, p. 1257, 2009.

APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

KEY WORDS: Radiation detector, gamma rays, neutrons, scintillators, plastic scintillators

SBIR TOPIC NUMBER: H-SB016.1-013

TITLE: Portable Linear Accelerator (linac) for Active Interrogation Systems for Radiological Gamma Isotope Source Replacement

TECHNOLOGY AREAS: Portable accelerators, portable active interrogation, gamma isotope source replacement

OBJECTIVE: Develop and commercialize a portable accelerator for active interrogation systems and approaches. The portable accelerator shall replace radiological gamma isotope sources currently used for commercial non-medical applications.

DESCRIPTION: In the past few years, Congress and various Government agencies have recognized the problem of orphaned radioactive sources worldwide. Such sources pose a security risk in the form of potential material for a “dirty bomb” or for other illicit applications. DNDO is seeking alternatives to the radioactive gamma sources used in commercial off-the-shelf products such as oil well logging and soil density gauges. The goal is to dramatically reduce the amount of radioactive material in the commercial market in order to improve public safety and prevent the threat of Radiation Dispersion Devices (RDD). Solutions must be able to directly replace commercial sealed sources used in industry and be competitive with size and cost. They must also achieve the full capabilities of existing systems, but not require the use of a radioactive nuclear material. Their size, weight, and power requirements must not be so onerous as to prevent their use under the conditions normally envisioned for the application. Lastly, they must be sufficiently robust to withstand the temperatures, pressures, humidity, vibration, and shock encountered in the typical operating environment for the application. Furthermore, these technologies could also have applicability in other aspects of the DNDO mission to include portable active interrogation systems for detection of shielded Special Nuclear Material (SNM).

DNDO is seeking the development of an accelerator specifically for human portable non-medical industrial applications with further applicability to portable active interrogation systems. The proposed accelerator shall meet the following specifications:

- Weight: < 50 pounds (includes all supporting electronics)
- Volume: < 1 ft³
- Output energy: ~1 MeV, with preliminary design capable of 4 MeV operation
- Output radiation: ~1 Rad/min
- Other: Battery operation, ruggedized for industrial use, and low cost (<\$50K per unit).

The Offeror’s proposal shall provide sufficient details on a path towards achieving the accelerator specifications and subsequent integration into a proof-of-concept prototype.

APPENDIX A – RESEARCH TOPIC DESCRIPTIONS

Supporting information (design, data, simulation, analytic calculation, references, etc.) must be provided to justify expectations that program has reasonable chance of successfully achieving its goals.

PHASE I: Demonstrate the feasibility of the proposed technical approach with a benchtop prototype or preliminary design. The physics of critical design elements should be well described.

PHASE II: Development will continue with fabrication and testing of a prototype to demonstrate the viability and capabilities of a radioactive gamma source. Feasibility must be clearly demonstrated in the field or a similar environment.

PHASE III - COMMERCIAL OR GOVERNMENT APPLICATIONS: Homeland Security Application: Commercialization of transformational radiological gamma source replacement techniques and accelerators for portable active interrogation systems and further enhancements of technologies. Production of units for commercial sales through manufacturing, partnering, or licensing for applications such as oil well logging or soil density gauges or portable active interrogation systems.

REFERENCES:

Method and Apparatus for Gamma Ray Well Logging, United States Patent No. 4,524,273, Issued June 18, 1985.

Apparatus and Method for Gamma-Ray determination of Bulk Density of Samples, United States Patent No, 6,492,641, Issued December 10, 2002.

KEY WORDS: Radiation, radiological, radioactive sources, nuclear sources, soil density gauges, oil well logging, Cs-137, Ra-226, or Co-60 replacement, linac, portable accelerator, portable active interrogation

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.

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. See FAR 52.227-20.

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 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.

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

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.

Signature	Date
Print Name (First, Middle, Last)	
Title	
Business Name	

ATTACHMENT 3: BRIEFING CHART TEMPLATE

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

ATTACHMENT 4: SAMPLE NON-DISCLOSURE AGREEMENT

NON-DISCLOSURE AGREEMENT
SOLICITATION HSHQDC-16-R-00012

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