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FY14.1

U.S. Department of Transportation

PROGRAM SOLICITATION

Small Business Innovation Research (SBIR) Program

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Small Business Innovation Research (SBIR) Program Office, RVT-91
U.S. Department of Transportation (U.S. DOT)
Office of the Assistant Secretary for Research and Technology
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55 Broadway
Cambridge, MA 02142-1093

TECHNICAL QUESTIONS

Technical questions pertaining to the FY14.1 U.S. DOT SBIR solicitation research topics must be submitted to the U.S. DOT SBIR Program Office via email at dotsbir@dot.gov. All questions must be submitted by email.

Please note that technical questions will be accepted through March 28, 2014 at 11:59 EST. Questions received after March 28, 2014, but before the solicitation close date and time, may not be answered. The U.S. DOT SBIR Program Office will submit all technical questions to the research topic authors for response. Answers will be posted in the Current Solicitation section of the U.S. DOT SBIR Program website: http://www.volpe.dot.gov/work-with-us/small-business-innovation-research/solicitations.

U.S. DOT SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH PROGRAM

CONTENTS

I. PROGRAM DESCRIPTION

A. Introduction

The United States Department of Transportation (U.S. DOT) invites small businesses to participate in the U.S. DOT's Small Business Innovation Research (SBIR) program. The purpose of this solicitation is to invite small businesses (with their valuable resources and creative capabilities) to submit innovative research proposals that address high priority requirements of the U.S. DOT as described in Section IX herein. Under the SBIR Program, the U.S. DOT will not accept unsolicited proposals.

The goals and objectives of the SBIR Program are:

- Stimulate technological innovation;
- Meet Federal research and development needs;
- Foster and encourage participation in innovation and entrepreneurship by socially and economically disadvantaged persons; and
- Increase private sector commercialization of innovations derived from Federal research and development funding.

The SBIR Program encourages small businesses to engage in research or research and development (R/R&D) that has the potential for commercialization and meets Federal R/R&D objectives. The Small Business Innovation Development Act of 1982 (P.L. 97-219 codified at 15 U.S.C. 638) established the SBIR program. In October 1986, through Public Law 99-443, Congress amended the Small Business Act, 15 U.S.C. 638, to extend the SBIR program through September 30, 1993. The Small Business R&D Enhancement Act of 1992 (P.L. 102-564), repealed the SBIR Program under the Small Business Innovation Development Act of 1982 and extended the SBIR Program under the Small Business Act through September 30, 2000. The Small Business Reauthorization Act of 2000 (P.L. 106-554) extended the SBIR Program through September 30, 2008. After a series of continuing resolutions, the SBIR/Small Business Technical Transfer (STTR) Reauthorization Act of 2011 under Public Law 112-81, Section E extended the SBIR Program through September 30, 2017.

The SBIR/STTR Reauthorization Act of 2011 required the U.S. Small Business Administration (SBA) to amend the SBIR Program Policy Directive and related regulations. A summary of the key changes can be viewed on the SBA website: http://www.sba.gov/about-sba-info/174308 .

B. Three Phase Program

The U.S. DOT SBIR Program is generally a three phase process.

THIS SOLICITATION IS FOR PHASE I PROPOSALS ONLY.

Phase I. Phase I provides support for the conduct of feasibility-related experimental or theoretical research or R/R&D efforts on research topics described herein. The dollar value of the proposal may be up to $150,000 unless otherwise noted and is subject to the availability of funding. The period of performance is six months. The award will be a firm fixed price type contract. The basis for award is the scientific and technical merit of the proposal and its relevance to U.S. DOT requirements and current research priorities. **Only U.S. DOT SBIR Phase I awardees will be eligible to submit a Phase II proposal.**

Phase II. The objective of Phase II is to continue the R/R&D effort from the completed Phase I. Funding of a Phase II is based upon the results of Phase I and the scientific and technical merit and commercial potential of the Phase II proposal. Commercial potential includes the potential to transition the technology to private sector applications, Government applications, or Government contractor applications.

Phase II proposals may be funded up to $1,000,000 (except where a lower ceiling is specifically identified) and have a period of performance of up to 24 months. The Government is not obligated to fund any specific Phase II proposal.

Effective October 1, 2012, **all U.S. DOT SBIR Phase I awardees are eligible to submit a Phase II proposal.** Federal SBIR agencies may no longer use an invitation, pre-screening, or pre-selection process for determining eligibility for a Phase II award. The U.S. DOT will only review Phase II proposals when funding is available. Further information on the status of funding availability and the Phase II proposal process will be made available to Phase I awardees by the SBIR Program Office and Contracting Officer.

Sequential Phase II awards. The SBIR Program Policy Directive permits agencies to issue one additional, sequential Phase II award to continue the work of an initial Phase II award. These awards, referred to as Phase IIB awards, can be awarded for a period of up to 24 months. The total amount of Phase II and Phase IIB award funding cannot exceed $1.5 million without an approved waiver from SBA. A small business may receive no more than two SBIR Phase II awards for the same R&D project, and the awards must be made sequentially.

Phase III. SBIR Phase III refers to work that derives from, extends, or logically concludes effort(s) performed under a U.S. DOT or another Department's Phase I and/or Phase II funding agreement. Phase III is funded by sources other than the set-aside funds dedicated to the SBIR Program. Phase III work is typically oriented toward commercialization of SBIR research or technology and may be for products, production, services, R/R&D or a combination thereof. The following activities are types of SBIR Phase III work:

- Commercial application of SBIR-funded R/R&D financed by non-Federal sources of capital.
- SBIR-derived products or services intended for use by the Federal Government, funded by non-SBIR sources of funding.
- Continuation of R/R&D that has been competitively selected using peer review or scientific review criteria, supported by non-SBIR funding.

A Phase III award is by its nature a SBIR award and attaches SBIR data rights. The requirements of the Federal Property and Administrative Services Act of 1949, [as amended through P.L. 106–580, Dec. 29, 2000] and the Competition in Contracting Act are satisfied by the competition of the Phase I award. There is no limit on the number, duration, type, or dollar value of Phase III awards made to a small business concern (SBC). The small business size limits for Phase I, Phase II and Phase IIB awards do not apply to Phase III awards.

C. Eligibility

Size Rule. On December 27, 2012, SBA amended its regulations governing size and eligibility requirements for the SBIR and STTR programs. The rule implemented provisions of the National Defense Authorization Act for Fiscal Year 2012 by revising elements of 13 C.F.R. Part 121 that addresses ownership, control, and affiliation for participants in the SBIR program. A summary and explanation of the size rule and changes to program eligibility can be found in the Federal Register, 77 Fed. Reg. 248 (December 27, 2012) pp. 72215-76227 at http://www.sbir.gov/sites/default/files/2012-30809.pdf and SBA's *Guide to SBIR/STTR Program Eligibility* at http://sbir.gov/sites/default/files/elig_size_compliance_guide.pdf.

The rule includes a new provision regarding an agency's option to allow participation by firms that are majority-owned by multiple venture capital operating companies, private equity firms or hedge funds. **The U.S. DOT elects at this time - not to use the authority that would allow venture capital operating companies (VCOCs), hedge funds or private equity firms to participate in the SBIR Program.** Proposals submitted by these parties will not be considered for award.

Each SBC submitting a proposal must qualify as a SBC at the time of award of Phase I, Phase II and IIB contracts (see Section I. E. for definition of SBC). In addition, the following requirements must be met:

- The primary employment of the principal investigator must be with the small business firm at the time of contract award and during the conduct of the proposed research. Primary employment means that more than one-half of the principal investigator's time is spent working for the small business. This precludes full-time employment with another organization.
- For Phase I, a minimum of two-thirds of the research or analytical effort must be performed by the awardee. For Phase II, a minimum of one-half of the research or analytical effort must be performed by the awardee.
- Additionally, for Phase I, Phase II and IIB, the R/R&D work must be performed in the United States. "United States" means the 50 states, the Territories and possessions of the United States, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, the Trust Territory of the Pacific Islands, and the District of Columbia.

Phase II Transition Benchmark. Section 4(a)(3) of the SBIR Policy Directive calls for each Federal agency participating in SBIR to set a Phase II transition rate benchmark in response to Section 5165 of the SBIR/STTR Reauthorization Act of 2011. The rate sets the minimum required number of Phase II awards the applicant must have received for a given number of Phase I awards received during the specified period. This Transition Rate Benchmark applies only to Phase I applicants that have received more than 20 Phase I awards Program-wide . On June 23, 2013, the updated U.S. DOT Phase II Transition Benchmark was published in the Federal Register for a 60-day public comment period; SBA received no adverse comments. The updated benchmark became effective on July 25, 2013. Any subsequent changes in the agency benchmarks must be approved by the SBA. Small businesses can view their transition rate on www.sbir.gov upon completion of registration. When logging in to this website, the Phase I to Phase II transition rate will be displayed in the welcome screen.

The U.S. DOT's benchmark uses a five-year period and counts an applicant's total number of Phase I awards over the last five fiscal years, excluding the most recently completed fiscal year; and the total number of Phase II awards over the last five fiscal years, including the most recently completed year. The U.S. DOT SBIR Phase I to II Transition Benchmark as published in the Federal Register is:

Effective July 25, 2013, for all U.S. DOT SBIR Program Phase I applicants that have received 20 or more Phase I awards over the 5-year period, the ratio of Phase II awards received to Phase I awards received must be at least 0.25.

D. Contact Information

In order to ensure full and open competition and comply with Procurement Integrity Act, 41 U.S.C. Section 423 requirements, contact with U.S. DOT relative to this solicitation during the Phase I proposal preparation and evaluation period is restricted to the officials stated in this solicitation.

Technical questions pertaining to the FY14.1 U.S. DOT SBIR solicitation research topics must be submitted to the U.S. DOT SBIR Program Office at dotsbir@dot.gov.

Please note that technical questions will be accepted through March 28, 2014 at 11:59 EST. Questions received after March 28, 2014, but before the solicitation close date and time, may not be answered. All answers to questions received before March 29, 2014 will be posted to the website.

The U.S. DOT SBIR Program Office will submit all questions to the research topic authors for response. Answers will be posted on the U.S. DOT SBIR Program website (http://www.volpe.dot.gov/work-with-us/small-business-innovation-research/solicitations) under Current Solicitations/ Technical Questions and Answers for FY 14.1 Solicitation.

Contact with U.S. DOT officials from any U.S. DOT agency, other than those identified above, relative to this solicitation during the period this solicitation is open for proposal may result in rejection of the proposal.

INQUIRIES REGARDING PROPOSAL STATUS WILL NOT BE ANSWERED. INFORMATION PERTAINING TO PROPOSAL STATUS WILL NOT BE PROVIDED.

For general SBIR Program inquiries not pertaining to this solicitation, please contact the U.S. DOT's SBIR Hotline by calling (617) 494-2051 or emailing dotsbir@dot.gov.

E. Definitions

1. Research or Research and Development (R/R&D) means any activity which is:

   - A systematic, intensive study directed toward greater knowledge or understanding of the subject studied;
   - A systematic study directed specifically toward applying new knowledge to meet a recognized need; or

- 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.

2. Small Business Concern (SBC)

SBA has amended the definition for the term "small business concern" by simply referencing its size regulations at 13 C.F.R. § 121.701-705. To view the definition of small business concern, click on the following link: http://www.gpo.gov/fdsys/search/pagedetails.action?browsePath=Title+13%2FChapter+I%2FPart+121%2FSubpart+A%2FSubjgrp%2FSection+121.702&granuleId=CFR-2011-title13-vol1-sec121-702&packageId=CFR-2011-title13-vol1.

The size regulations define the ownership and size requirements for the SBIR and STTR Programs. SBA has recently finalized a rule amending those regulations and the definition of "small business concern" for purposes of the SBIR and STTR Programs as a result of certain provisions of the Reauthorization Act (see *Federal Register* Vol. 77, No. 248, page 76215 http://www.sbir.gov/sites/default/files/2012-30809.pdf). The changes made to the definition of "small business concern" became effective on January 28, 2013.

3. Socially and Economically Disadvantaged Small Business Concern

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

4. Women-Owned Small Business Concern

A Women-Owned Small Business Concern is at least 51 percent owned by one or more women; or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and whose management and daily business operations are controlled by one or more women; or a small business concern eligible under the Women-Owned Small Business Program in accordance with 13 C.F.R. Part 127 (see Federal Acquisition Regulation (FAR) subpart 19.15).

5. Veteran-Owned Small Business

A Veteran-Owned Small Business Concern is one that is at least 51% owned by one or more veterans (as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51% of the stock of which is owned by one or more veterans, and the management and daily business operations of which are controlled by one or more veterans.

6. Subcontract

Subcontract means any agreement, except a grant or cooperative agreement, entered into by a Federal Government funding agreement awardee calling for supplies or services required solely for the performance of the original funding agreement.

7. Historically Underutilized Business Zone (HUBZone)

The criteria to be a HUBZone Small Business Concern can be found at: http://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=9096292d442b42246cbecf21f04833bd&r=PART&n=13y1.0.1.1.21#13;1.0.1.1.21.1.295.4

8. Service Disabled Veteran-Owned Concern

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

9. Economically Disadvantaged Women-Owned Small Business (EDWOSB)

An Economically Disadvantaged Women-Owned Small Business Concern is at least 51 percent directly and unconditionally owned and controlled by one or more women who are citizens (born or naturalized) of the United States and who are economically disadvantaged. The EDWOSB automatically qualifies as a women-owned small business eligible for the Women-Owned Small Business (WOSB) Program.

F. Report SBIR Fraud, Waste and Abuse

The Office of Inspector General Hotline (Phone: 800-424-9071, Email: hotline@oig.dot.gov) accepts tips from all sources about potential fraud, waste, abuse and mismanagement in U.S. DOT programs. The reporting individual should indicate that the fraud, waste and/or abuse pertain to an SBIR contract. Additionally, the U.S. DOT SBIR Program website contains information and links to report potential fraud, waste, and abuse: http://www.volpe.dot.gov/work-with-us/small-business-innovation-research/report-fraud-waste-and-abuse.

G. Other Information

Executive Order (EO) 13329, Encouraging Innovation in Manufacturing, February 26, 2004

"Encouraging Innovation in Manufacturing" requires SBIR agencies, to the extent permitted by law and in a manner consistent with the mission of that department or agency, to give high priority within the SBIR Programs to manufacturing-related R&D. "Manufacturing-related" is defined as "relating to manufacturing processes, equipment and systems; or manufacturing workforce skills and protection."

The U.S. DOT SBIR Program solicits manufacturing-related projects through the call for topics distributed to each of the Department's SBIR participating agencies.

Additionally, the SBA requires each agency with a SBIR program to develop a written policy on the implementation of E.O. 13329 and publish an annual report. The U.S. DOT SBIR Program Office Implementation Plan and Annual Report are posted on the Program website: http://www.volpe.dot.gov/work-with-us/small-business-innovation-research/about-sbir .

Energy Independence and Security Act of 2007, December 19, 2007

The Energy Independence and Security Act of 2007 (P.L. 110-140) amends the Small Business Act (15 U.S.C. Section 636(a)) to instruct the SBA Administrator to ensure that certain Federal Departments and agencies give high priority to small business concerns that participate in or conduct energy efficiency or renewable energy system research and development projects.

The U.S. DOT SBIR Program Office solicits energy efficiency or renewable energy system R/R&D projects through the call for SBIR research topics distributed twice annually to each of the Department's SBIR participating agencies. U.S. DOT SBIR projects that focus on conducting R/R&D in energy efficiency and/or renewable energy are reported annually to SBA.

II. CERTIFICATIONS

All SBIR applicants are required to certify size and ownership as well as meet other SBIR Program requirements with the submission of their SBIR proposals, at the time of award, and during the funding agreement life cycle. A copy of the certification must be included with the proposal submission (see Appendix D).

III. PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

A. Overview

This is a solicitation for Phase I R/R&D proposals on advanced, innovative concepts from small business firms having strong capabilities in applied science or engineering. The Phase I R/R&D proposals shall demonstrate a sound approach to the investigation of an important transportation related scientific or engineering problem categorized under one of the research topics listed in Section IX.

A proposal may respond to any of the research topics listed in Section IX herein, but must be limited to one topic. The same proposal may not be accepted under more than one topic. A small business may, however, submit separate proposals on different topics, or different proposals on the same topic under this solicitation. Where similar research is discussed under more than one topic, the SBC shall choose that topic which appears to be most relevant to the SBC's technical concept.

The proposed research must have relevance to the improvement of some aspect of the national transportation system or to the enhancement of the ability of an operating element of the U.S. DOT to perform its mission.

Proposals shall be confined principally to scientific or engineering research, which may be carried out through construction and evaluation. Proposals must be for R/R&D, particularly on advanced or innovative concepts. Proposals shall not be for incremental or scaled up versions of existing equipment or for the development of technically proven ideas. Proposals for the development of already proven concepts toward commercialization, or proposals that offer approaches already developed to an advanced prototype stage or for market research will not be considered.

The proposal shall be self-contained and checked carefully by the Offeror to ensure that all preparation instructions were followed (see Proposal Checklist, Appendix E). An automated notice will be sent via email when the proposal is received through the SBIR Program's electronic submission process.

B. Proposal Submission Requirements

The following requirements must be met for the proposal to be evaluated for award:

1. SBA Company Registry Database – Each SBC applying to the program is required to complete its registration in the SBA's Company Registry (http://sbir.gov/registration) prior to submitting its application. Registration requires at least a Data Universal Numbering System (DUNS) identification number or Tax Identification Number (TIN). Completed registrations will receive a unique SBC Control ID and PDF file to be submitted with the proposal.

2. Proposal Layout
    a. Proposals must be submitted online in PDF format during open solicitation periods only.
    b. Proposals cannot exceed 25 pages, including all appendices, enclosures, or attachments. Certain exclusions apply as noted below.
    c. Font size shall be no smaller than 10 point.
    d. Proposals shall be on standard letter size pages (8.5" by 11") with 1" margins.
    e. All pages shall be numbered consecutively, including the proposal cover sheet.

Required Proposal Sections	
Proposal Cover Sheet (Appendix A)	Complete the proposal cover sheet in Appendix A as pages 1 and 2 of the proposal. All pages shall be numbered consecutively beginning with the proposal cover sheet.
Project Summary (Appendix B)	Complete the Project Summary Sheet in Appendix B as Page 3 of the proposal. The Project Summary of successful proposals may be published by the U.S. DOT and, therefore, shall not contain classified or proprietary information. The Project Summary must include at a minimum:: 1. A technical abstract with a brief statement of the problem or opportunity, project objectives, and description of the effort. o <u>The technical abstract shall be limited to 200 words in the space provided on the Project Summary sheet</u>. Any words or statements beyond the 200-word limit will not be considered for award purposes. Please note the word count at the end of the abstract in parentheses. 2. Anticipated results and potential applications of the proposed research
Technical Content	Submitted proposals must include the following headings in bold (in cases where a section does not apply, please state "Not Applicable": 1. **Identification and Significance of the Problem or Opportunity**. State the specific technical problem or innovative

	research opportunity addressed and its potential benefit to the national transportation system. 2. **Phase I Technical Objectives.** State the specific objectives of the Phase I R/R&D effort; including the technical question(s) it will try to answer to determine the feasibility of the proposed approach. 3. **Phase I Work Plan.** Describe the Phase I R/R&D plan. The plan shall indicate what will be done, where it will be done, and how the R/R&D will be managed or directed and carried out. Phase I R/R&D shall address the objectives and the question(s) cited in No. 2 above. Discuss in detail the methods planned to achieve each objective or task, including the level of effort associated with each task. 4. **Related Research or R&D.** Describe significant R/R&D that is directly related to the proposal including any conducted by the project manager/principal investigator or by the proposing firm. Describe how it relates to the proposed effort, and any planned coordination with outside sources. The SBC must persuade reviewers of its awareness of recent key R/R&D conducted by others in the specific topic area. 5. **Key Personnel and Bibliography of Directly Related Work.** Identify key personnel involved in Phase I including their directly related education, experience, and bibliographic information. Where vitae are extensive, summaries that focus on the most relevant experience or publications are desired and may be necessary to meet proposal page limitations. 6. **Relationship with Future Research and Development.** State the anticipated results of the proposed approach if the project is successful (Phase I and Phase II). Discuss the significance of the Phase I effort in providing a foundation for a Phase II R/R&D effort. 7. **Facilities.** Provide a detailed description of the availability and location of instrumentation and physical facilities proposed for Phase I. 8. **Consultants.** Involvement of consultants in the planning and research stages of the project is permitted. Describe any intended involvement in detail. Consultants are permitted to conduct no more than one-third of the work. 9. **Potential Post Applications.** Briefly describe whether and

	how the proposed project appears to have (1) potential commercial application; and (2) potential use by the Federal Government. 10. **Similar Proposals or Awards.** While it is allowed, with proposal notification, to submit identical proposals or proposals containing a significant amount of essentially equivalent work for consideration under numerous federal program solicitations, it is unlawful to enter into contracts or grants requiring essentially equivalent effort. If there is any question concerning this, it must be disclosed to the soliciting agency or agencies before award. If an SBC elects to submit similar or identical proposals containing equivalent work under other federal program solicitations, a statement must be included in each proposal indicating: • The name and address of the agencies to which proposals were submitted or from which awards were received; • Date of proposal submission or date of award; • Title, number, and date of SBIR Program solicitations under which proposals were submitted or awards received; • The applicable research topics for each SBIR proposal submitted or award received; • Titles of research projects. 11. **Prior SBIR Phase II Awards.** If the SBC has received more than a total of 15 Phase II awards in the prior five fiscal years, submit the name of the awarding agency, date of award, funding agreement number, dollar amount, topic or subtopic title, follow-on agreement dollar amount, source and date of commitment, and current commercialization status for each Phase II. Provide the name and title of the project manager or principal investigator for each proposal submitted or award received. **Required proposal information in item #11 shall not be counted toward the page limitation.**
Sustainable Acquisition Requirement	The SBC's technical proposal will also be used as the Statement of Work (SOW) under any contract award resulting from this solicitation under SBIR Phase I or II. Consistent with FAR Part 23, each SBC is expected to include the following provision in its technical proposal: **Sustainable Acquisition Requirement:** To the maximum extent possible and consistent with FAR Part 23, during the performance of

	the work required under this technical proposal, the Contractor will provide or use products that are: energy efficient (ENERGY STAR® or Federal Energy Management Program (FEMA)-designated); water-efficient; biobased; environmentally preferable (e.g., EPEAT-registered, or non-toxic or less toxic alternatives); non-ozone depleting; or made with recovered materials. Unless otherwise identified in this technical proposal, each recovered materials or biobased product provided and delivered must meet, but may exceed, the minimum recovered materials or biobased content of an EPA- or USDA-designated product. The sustainable acquisition requirements specified herein apply only to products that are required to be: (1) delivered to the Government during performance; (2) acquired by the contractor for use in performing services (including construction) at Federally-controlled facility; (3) furnished by the contractor for use by the Government; or (4) specified in the design of work, or incorporated during its construction, renovation, or maintenance. Inclusion of this general requirement does not relieve the SBC from including in its technical proposal explicit sustainability requirements applicable to the required services being offered (see Biobased website).
Cost Breakdown/ Proposed Budget (Appendix C)	A firm fixed price Phase I Contract Pricing Proposal (Schedule 1) must be submitted in detail using the template provided in Appendix C. Some cost breakdown items of Appendix C **may not apply** to the proposed project. If such is the case, there is no need to provide information for each and every item. It is important, however, to provide enough information to allow the U.S. DOT to understand how the SBC plans to use the requested funds if a contract is awarded. Phase I contract awards may include profit. Note: Firm fixed price is the type of contract used for Phase I SBIR awards. **Appendix C** is available on our website **here** in Microsoft Excel 2010 format. Specific **instructions for filling out Appendix C** are located **here**. Please fill out the spreadsheets as directed and then save the entire workbook as a PDF. (To do this click on the 'Acrobat' tab in the main ribbon of Excel, then choose "entire Workbook" from Conversion Range option at top of window.) You will then need to add that PDF file to your proposal after the proposal is saved as a PDF. You must submit the entire proposal (including all of the appendices) as one document to **DOT SBIR's automated proposal site** which is located **here**. If you have any trouble accessing the

	Appendix C spreadsheet or saving it as a PDF please contact the U.S. DOT SBIR Program Office at 617-494-2051 between the hours of 8:00 am and 5:00 pm EST no later than March 28, 2014. A firm must note its Tax Identification Number (TIN) and DUNS identification number in Appendix C, in the Cost and Pricing Proposal Coversheet. The DUNS number is assigned by Dun & Bradstreet, Inc. (See III (C) below). Proposals that exceed the Phase I Estimated Award Amount listed in Section IX will not be considered for award. **This required proposal information shall not be counted toward the page limitation.**
SBIR Funding Agreement Certification (Appendix D)	**This required proposal information shall not be counted toward the page limitation.**
SBA Company Registry Confirmation	The confirmation from registering in the database should be included at the end as a PDF document. **This required proposal information shall not be counted toward the page limitation.**

C. Other Proposal Information

1. Proposals will be available only to the U.S. DOT team of engineers and/or scientists responsible for evaluating the proposal, the U.S. DOT SBIR Program Office, and Volpe Center staff pertinent to the SBIR program, such as the Volpe Center's Office of Acquisition.
2. **Fraudulent Information.** Submitting plagiarized information and/or false proposal information pertaining to the company, the principal investigator and/or work to be performed may result in:
    a. Cancellation of the topic within a solicitation;
    b. A proposal being deemed non-responsive;
    c. A recommendation for Phase I award being rescinded; or
    d. Termination of an award.
3. **Discretionary Technical Assistance.** The SBIR Program Policy Directive permits an agency to provide technical assistance to an SBIR awardee in an amount not more than $5,000 per year. This amount is in addition to the award amount. Also, the SBC can acquire the technical assistance services itself. The SBC must demonstrate that the

individual or entity selected can provide the specific technical services needed and provide the details in the proposal. If the SBC demonstrates this requirement sufficiently, the U.S. DOT must allow the SBC to acquire the needed technical assistance itself, as an allowable cost.

4. **National Institute of Standards and Technology (NIST)/Hollings Manufacturing Extension Partnership (MEP).** An SBC may wish to contact its local NIST Hollings MEP for manufacturing and other business-related support services. The MEP works with small and mid-sized companies to help them create and retain jobs, increase profits, and save time and money. The nationwide network provides a variety of services, from business development assistance to innovation strategies to process improvements and the identification of commercialization opportunities. MEP is a nationwide network of locally managed extension centers with over 1,400 technical experts, located in every state. To contact an MEP center, call 1-800-MEP-4-MFG (1-800-637-4634) or visit MEP's website, at http://www.nist.gov/mep.

D. System for Award Management (SAM) and Data Universal Numbering System (DUNS) Identification Number

Any business that would like to work with the Federal government under a Federal Acquisition Regulation (FAR)-based contract is **mandated to be registered in the System for Award Management (SAM) before being awarded a contract**. Additional information on SAM and the registration process is provided on the SAM website: https://www.sam.gov. Businesses that already have a DUNS number can register online at https://www.sam.gov by following the prompts. Instructions for obtaining a DUNS number can be found at: http://fedgov.dnb.com/webform/displayHomePage.do.

IV. METHOD OF SELECTION AND EVALUATION CRITERIA

A. General

All Phase I proposals will be evaluated and judged on a competitive basis. Initially, all proposals will be screened to determine responsiveness to the solicitation. Proposals that meet the solicitation requirements will be evaluated to determine the most promising technical and scientific approaches. Each proposal will be judged on its own merit. A Phase I award will be made to the responsive and responsible SBC whose proposal provides the best value to the Government, based on the technical and scientific merit of the proposal. **The U.S. DOT is under no obligation to fund any proposal or any specific number of proposals on a given topic. For any given topic, U.S. DOT may elect to award more or less than the anticipated quantity of awards stated in Section IX.**

A Phase II award will be made to the responsive and responsible SBC who successfully completed a Phase I contract and whose offer provide the best value to the Government, based on the Technical Proposal and Cost Proposal. Phase II awards will be made to those SBCs with the greatest commercialization potential and will be subject to the availability of funding.

B. Evaluation Criteria

The evaluation process involves the following factors:

1. Scientific and technical merit and the feasibility of the proposal's commercial potential, as evidenced by:
    a. Past record of successful commercialization of SBIR or other research;
    b. Existence of Phase III funding commitments from private sector or non-SBIR funding sources; and
    c. Presence of other indicators of the commercial potential of the idea.
2. The work plan and approach to achieving specified work tasks and stated objectives of the proposed effort are well defined and within budgetary constraints and on a timely schedule.
3. Qualifications of the proposed principal/key investigator(s) including demonstrated expertise in a disciplinary field related to the particular R/R&D topic that is proposed for investigation.
4. The supporting staff, facilities, and equipment will provide the necessary support to conduct the proposed R/R&D.

C. Prescreening

Each proposal submission will be examined to determine if it is complete and contains adequate

technical and pricing data. **A proposal that does not meet the requirements of the solicitation as described in Section III.B. will be excluded from consideration, and the SBIR Program Office will send the SBC an email notifying the SBC of its proposal ineligibility for consideration.**

D. Schedule

All U.S. DOT evaluations shall be completed and recommendations for award submitted to the U.S. DOT SBIR Program Office within six weeks of the closing date for Phase I proposals.

E. U.S. DOT Technical Evaluation Process

Each of the Department's participating Operating Administrations will establish technical evaluation teams comprised of Federal staff, including engineers and/or scientists, who will provide written evaluations and recommendations for award to the U.S. DOT SBIR Program Director.

F. Selection of Awardees

Effective October 1, 2012, the U.S. DOT SBIR Program Office will notify each applicant whether it has been selected for a SBIR Phase I award no later than 90 calendar days after the closing date of the solicitation.

G. Time to Award Requirements

Also effective October 1, 2012, the SBIR Program Policy Directive requires all SBIR agencies to make award decisions within 180 days after the close of the solicitation. The purpose of this requirement is to reduce the gap in time between proposal submission and time of award. The U.S. DOT is required to award a Phase I contract in accordance with the timeframes set forth in the National Defense Authorization Act for FY2012 and SBIR Program Policy Directive. The U.S. DOT SBIR Program Office will also post a listing of Phase I proposals recommended for contract award on the U.S. DOT SBIR Program webpage: http://www.volpe.dot.gov/sbir.

H. Debriefing Requests

Debriefing requests must be submitted by e-mail to the SBIR Program Contracting Officer: **Jeanne.Rossetsky@dot.gov**, and must include the SBC's name, address, research topic number, and the proposal identification number assigned and provided through an automated email notification sent to the SBC upon receipt of its proposal. The identity of the evaluators will not be disclosed. Debriefings will be conducted through the issuance of a letter by the SBIR

Program Contracting Officer and will summarize the comments received from the technical evaluation team.

V. CONSIDERATIONS

A. Awards

The Government anticipates awarding approximately **20** Phase I contracts with the possibility for additional or fewer awards. The actual number of contract awards is subject to the availability of funding and the responses from small business firms to the solicited research topics described in Section IX.

1. **Dollar Value of Awards.** The SBIR Program Policy Directive sets the maximum thresholds for Phase I and Phase II awards at $150,000 and $1,000,000, respectively. SBA may adjust these amounts every year for inflation and will post the adjusted numbers on www.sbir.gov. Additionally, the SBIR Policy Directive provides that agencies may not exceed these thresholds by more than 50%, unless the agency requests and is granted a waiver from SBA.
    a. **Phase I contract awards**. All Phase I awards will be firm fixed price contracts and **may be** funded up to $150,000. The period of performance for a Phase I contract is 6 months. Funding levels for each topic are determined by the agency sponsoring the research and are provided in Section IX. Proposals that exceed the Phase I Estimated Award Amount listed in Section IX will not be considered for award.
    b. **Phase II contract awards**. Phase II contracts can be funded up to $1,000,000. Funding estimates are determined by the agency sponsoring the research. The period of performance for a Phase II contract is up to 24 months. Phase II funding estimates are provided in Section IX. Phase II awards may be firm fixed price or cost-plus-fixed-fee contracts.
    c. **Sequential Phase II awards.** The SBIR Program Policy Directive permits agencies to issue one additional, sequential Phase II award to continue the work of an initial Phase II award. These awards are referred to as Phase IIB awards and can be awarded for a period up to 24 months. The total amount of Phase II and Phase IIB award funding cannot exceed $1.5 million without an approved waiver from SBA. A small business may receive no more than two SBIR Phase II awards for the same R&D project, and the awards must be made sequentially.

2. **Accounting System Audits.** Phase II awardees will be required to have an acceptable accounting system in place to receive a cost reimbursement type contract. If a small business has not had an audit of its accounting system by a Federal audit agency, the Defense Contract Audit Agency (DCAA) may conduct an on-site pre-award audit prior to contract award. This process can take several months in addition to the time for processing an award. For information pertaining to DCAA accounting system requirements and audits, please refer to

the DCAA website: http://www.dcaa.mil. The Contracting Officer may consider a fixed-price type contract if a cost reimbursement type contract is not feasible.

3. **U.S. DOT SBIR Program Set-aside Budget**. For FY 2014, the U.S. DOT's Operating Administrations will contribute 2.8% of their agency's Extramural Research Budget for SBIR Program funding. Each U.S. DOT Operating Administration's SBIR contribution may only be used to support research of concern to that Operating Administration. For example, funds furnished by the Federal Highway Administration (FHWA) may not support research solely of concern to the National Highway Traffic Safety Administration (NHTSA). Based on anticipated funding levels, there may not be adequate funding within the U.S. DOT SBIR Program to support Phase I and/or Phase II awards for research which is solely of concern to the following Operating Administrations: Federal Highway Administration (FHWA), Federal Motor Carrier Safety Administration (FMCSA), Federal Railroad Administration (FRA), Federal Transit Administration (FTA), National Highway Traffic Safety Administration (NHTSA), Research and Innovative Technology Administration (RITA), and Pipeline Hazardous Materials Safety Administration (PHMSA). The Phase I and Phase II awards for such research will be subject to the availability of funding.

B. Reports

1. Under Phase I SBIR contracts, three reports will be required, consisting of two interim narrative reports, and a comprehensive final report. These reports are spaced at two month intervals starting at the end of month two.
2. Under Phase II, IIB and Phase III SBIR contracts, monthly progress reports, monthly cost reports (if required), commercialization reports (due every six months), and a summary of results will be required.

C. Payment Schedule

Payments for Phase I contracts will be made in three equal installments upon submission of proper invoices by the SBC in conjunction with or after the submission of acceptable reports as described in above Paragraph B.

The specific payment schedule (including payment amounts) for each contract will be incorporated into the contract upon completion of negotiations between the U.S. DOT and the successful Phase II, Phase IIB and Phase III SBC. Successful SBCs may be paid periodically as work progresses in accordance with the negotiated price and payment schedule.

In all phases, the U.S. DOT must make payment to recipients under SBIR funding agreements in full, subject to audit, or on or before the last day of the 12 month period beginning on the date after the completion of award.

D. Innovations, Inventions, and Patents

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

   If proprietary information is provided by an SBC in a proposal which constitutes a trade secret, proprietary commercial or financial information, confidential personal information or information effecting national security, it will be treated in confidence, to the extent permitted by law, provided this information is clearly marked by the SBC with the terms "confidential proprietary information" and provided the following legend appears on the title page of the proposal:

   > "For any purpose other than to evaluate the proposal, this proprietary information shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed in whole or in part, provided that if a contract is awarded to this offeror as a result of or in connection with the submission of this information, the Government shall have the right to duplicate, use, or disclose the information to the extent provided in the contract. This restriction does not limit the Government's right to use information contained in the document if obtained from another source without restriction. The information subject to this restriction is contained in page(s) _____ of this proposal."

   Any other legend may be unacceptable to the Government and may constitute grounds for return of the proposal without further consideration and without assuming any liability for inadvertent disclosure. The Government will limit dissemination of such information to within official channels.

2. The U.S. DOT prefers that SBC proposals avoid the inclusion of proprietary data. If the inclusion of proprietary data is considered essential for meaningful evaluation of a proposal submission, such data should be provided on a separate page with a numbering system to key it to the appropriate place in the proposal.

3. Rights in Data Developed under SBIR Contracts. Rights in technical data, including software developed under any contract resulting from this solicitation, shall remain with the SBC except that the Government shall have the limited right to use such data for Government purposes and shall not release such data outside the Government without permission of the SBC for a period of four years from completion of the project from which the data was generated. However, effective at the conclusion of the four-year

period, the Government shall retain a royalty free license for Federal Government use of any technical data delivered under an SBIR contract whether patented or not.

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

5. Patents/Invention Reporting. SBCs normally may retain the principal worldwide patent rights to any invention developed with Government support. 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 requires 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 two-year period to allow the SBC a reasonable time to pursue a patent.

6. Invention Reporting Process. Awardees shall report SBIR inventions to the U.S. DOT through the iEdison Invention Reporting System, http://www.iedison.gov. Use of the iEdison System satisfies all invention reporting requirements mandated by any award.

E. Cost Sharing

Cost sharing is permitted for Phase II and Phase IIB proposals under the topic areas identified in this solicitation; however, cost sharing is not required nor will it be a factor in proposal evaluations.

F. Profit or Fee

A profit is allowed on firm fixed price awards to small business concerns under the U.S. DOT SBIR Program.

A fee is allowed on cost-plus-fixed-fee (Phase II and Phase IIB only) awards to small business concerns under the U.S. DOT SBIR Program.

G. Joint Ventures or Limited Partnerships

Joint ventures and limited partnerships are permitted provided the entity created qualifies as a small business concern in accordance with the Small Business Act, 15 U.S.C. 632, and the definition included in this solicitation.

H. Research and Analytical Work

1. For Phase I, a minimum of two-thirds of the research and/or analytical effort must be performed by the SBC unless otherwise approved in writing by the Contracting Officer.

2. For Phase II and IIB, a minimum of one-half of the research and/or analytical effort must be performed by the SBC unless otherwise approved in writing by the Contracting Officer.

I. Awardee Commitments

Upon award of a contract, the SBC will be required to make certain legal commitments through acceptance of numerous Federal Acquisition Regulation (FAR) and Transportation Acquisition Regulation (TAR) contract clauses. The FAR and TAR can be found using the following links:

FAR: https://www.acquisition.gov/far/index.html

TAR: http://www.dot.gov/administrations/assistant-secretary-administration/transportation-acquisition-regulation-tar

The Summary Statements that follow are illustrative of the types of clauses to which the SBC would be committed. This list does not represent a complete list of clauses to be included in Phase I contracts, nor does it provide the specific wording of such clauses. A complete copy of the terms and conditions will be provided upon issuance of the contract for signature prior to award.

J. Summary Statements

1. **Standards of Work.** Work performed under the contract must conform to high professional standards.

2. **Inspection.** Work performed under the contract is subject to Government inspection and evaluation at all times.

3. **Examination of Records.** The Comptroller General (or a duly authorized representative) shall have the right to examine any directly pertinent records of the contractor involving transactions related to this contract.

4. **Default.** The Government may terminate the contract if the contractor fails to adhere to the terms of the contract.

5. **Termination for Convenience.** The contract may be terminated at any time by the Government if it deems termination to be in its best interest, in which case the contractor will be compensated for work performed and for reasonable termination costs.

6. **Disputes.** Any dispute concerning the contract which cannot be resolved by agreement shall be decided by the Contracting Officer with right of appeal in accordance with the Contracts Disputes Act of 1978, 41 U.S.C.601-613.

7. **Contract Work Hours.** The contractor may not require an employee to work more than eight hours a day or 40 hours a week unless the employee is compensated accordingly (i.e., overtime pay).

8. **Equal Opportunity.** The contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

9. **Affirmative Action for Veterans.** The contractor shall not discriminate against any employee or applicant for employment because he or she is a disabled veteran or veteran of the Vietnam era.

10. **Affirmative Action for Handicapped.** The contractor shall not discriminate against any employee or applicant for employment because he or she is physically or mentally handicapped.

11. **Officials Not to Benefit.** No member of or delegate to Congress shall benefit from the contract.

12. **Covenant Against Contingent Fees.** No person or agency has been employed to solicit or secure the contract upon an understanding for compensation except bonafide employees or commercial agencies maintained by the contractor for the purpose of securing business.

13. **Gratuities.** The contract may be terminated by the Government if any gratuities have been offered to any representative of the Government to secure the contract.

14. **Patent Infringement.** The contractor shall report each notice or claim of patent infringement based on the performance of the contract to the SBIR Program Contracting Officer.

15. **Procurement Integrity.** Submission of a proposal under this solicitation subjects the Offeror to the procurement integrity provision (§27) of the Office of Federal Procurement Policy Act (41 U.S.C. 423). This statute, as implemented by Federal Acquisition Regulation

(FAR, 48 C.F.R.) §3.104, prohibits the following conduct by competing vendors during an agency procurement: offering or discussing future employment or business opportunities with an agency procurement official; promising or offering a gratuity to an agency procurement official; and/or soliciting or obtaining proprietary or source selection information regarding the procurement. Violations of the statute may result in criminal and/or civil penalties, suspension and debarment, cancellation of the procurement, or other appropriate remedy.

16. **Section 508 Access Board Standards.** All electronic and information technology deliverables rendered must comply with Section 508 of the Rehabilitation Act and the Access Board Standards available for viewing at http://www.section508.gov. Unless otherwise indicated, the contractor represents by signature on a contract that all deliverables will comply with the Access Board Standards.

17. **Government Property.** Equipment either furnished or acquired under this contract is subject to FAR Clause 52.245-1 Government Property (August 2010) and SBIR Program Policy Directive, Section 8 (c).

    FAR: https://www.acquisition.gov/far/index.html

    SBIR Policy Directive: http://www.sbir.gov/about/about-sbir

K. SBIR Program Small Business Concern (SBC) Requirements

Upon contract award and for the duration of the contract, the SBC will be required to adhere to SBIR Program Requirements. The following list is illustrative of the requirements to which the SBC will be committed. A complete copy of the terms and conditions will be provided upon issuance of the Phase l contract for signature prior to award.

1. The company must meet the SBA requirements for a small business, including being majority American owned and have 500 employees or fewer (see Section I.C.).

2. The principal investigator's primary employment must be with the SBC during the contract period. The principal investigator may not be employed full time elsewhere (see Section I.C.).

3. For Phase I, a minimum of two thirds of the research effort must be performed by the SBC. For Phase II, a minimum of one-half of the research must be performed by the SBC.

Work performed by a subcontractor or university research lab is NOT work completed by the contract awardee.

4. **Disclosures**. Duplicate or overlapping work previously submitted to other agencies may not be submitted without full disclosure to all agencies. See Section III. B.

   University employees participating on a SBIR award shall disclose their involvement and the use of university facilities to the Government. Disclosure should be provided to the university as well regarding as their use of university facilities for government purposes.

5. **Commercialization Databases.** A Commercialization Database is being established by SBA that will store commercialization information for SBCs that have received SBIR awards. This includes information relating to revenue from the sale of new products or services resulting from the R&D conducted under a Phase II award and any business or subsidiary established for the commercial application of a product or services for which an SBIR award is made, among other things. The information contained in this database will be used by SBCs and agencies to determine whether the SBC meets the agency's commercialization benchmarks, discussed above, and for program evaluation purposes. The effective date for implementation of this database will be announced at a later date.

   The U.S. DOT will require SBCs to provide the information directly to the SBA's database at http://www.sbir.gov/registration. The U.S. DOT will use the information to determine if the SBC meets the established commercialization benchmark.

L. Corrective Actions

Fraudulent reports or other deliverables knowingly submitted under an awarded contract may result in termination of an active award. If the contract is terminated for fraud or any other illegal or improper activity, the Government is entitled to recover, in addition to any penalty prescribed by law, the amount expended under the contract.

M. Additional Information

1. This solicitation is intended for informational purposes and reflects current planning. Although not expected, there may be inconsistencies between the information contained in the FY14.1 solicitation and the terms and conditions of any resulting SBIR contract. The terms of the contract once executed are controlling.

2. Before award of an SBIR contract, the SBC shall complete an Online Representations and Certifications Application at https://www.sam.gov. The SBC shall be certified in the appropriate NAICS code (541712).

3. The Government may request the SBC to submit additional management, personnel, and financial information to assure responsibility of the SBC.

4. The Government is not responsible for any monies expended by the SBC before award of any contract.

5. 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 this program are contingent upon the availability of funds.

6. The U.S. DOT SBIR Program is not a substitute for existing unsolicited proposal mechanisms. Unsolicited proposals shall not be accepted under the U.S. DOT SBIR Program in either Phase I or Phase II. For information pertaining to submission requirements for unsolicited proposals please refer to the U.S.DOT's Guidelines for Unsolicited Proposal Submission: http://www.volpe.dot.gov/work-with-us/guidelines-unsolicited-proposal-submission.

7. If an award is made pursuant to a proposal submitted under this solicitation, the SBC will be required to certify that it has not previously been, and is not currently being paid for essentially equivalent work by any agency of the Federal Government.

8. When purchasing equipment or a product with funds provided under the U.S. DOT SBIR Program, purchase only American made equipment and products, to the extent possible in keeping with the overall purposes of the program.

9. In accordance with FAR 52.233-2, Service of Protest, protests, as defined in section 33.101 of the FAR that are filed directly with an agency, and copies of any protests that are filed with the Government Accountability Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgement of receipt from:

   Jeanne Rossetsky, Contracting Officer
   Volpe Center, RVP-32
   55 Broadway
   Cambridge, MA 02142-1001
   (617) 494-3853

a. The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

VI. SUBMISSION OF PROPOSALS

A. Closing Date

Proposals must be received no later than 11:59 P.M. EDT on April 4, 2014. Proposals received after that time will be automatically rejected, no exception will be permitted.

B. Submission Details

Only one proposal shall be submitted. No duplicate proposals shall be sent by any other means. Proposals must be in a PDF file. The proposal file name shall contain eight (8) characters; the first three shall be the topic number to the proposal is associated with (i.e., FH3), and the remaining five characters shall be a unique abbreviation of the company's name.

C. Submission Address

Proposals may only be submitted online at: http://www.volpe.dot.gov/work-with-us/small-business-innovation-research/solicitations. Instructions are provided on the "Proposal Requirements and Guidelines" page.

VII. SCIENTIFIC AND TECHNICAL INFORMATION SOURCES

The following publications are referenced in the research topics found in Section IX.

Federal Highway Administration

14.1-FH3: Suppressing Utility Problems - Protection via Robotic Engineering to the Sub-Surface

National Cooperative Highway Research Program (NCHRP) Report 500 -- Guidance for Implementation of the AASHTO Strategic Highway Safety Plan; Volume 8: A Guide for Reducing Collisions Involving Utility Poles (2004).

14.1-FH4: STEM Education – Increasing awareness about Intelligent Transportation Systems and Connected Vehicle Technologies for High School Students

http://www.usnews.com/news/blogs/stem-education/2013/01/31/report-many-high-schoolers-giving-up-on-stem

14.1-FH5: Visually unobtrusive traffic monitoring for National Park Service Parkways

The terms In-Roadway and Over-Roadway are defined in the Traffic Detector Handbook 3rd Edition. http://www.fhwa.dot.gov/publications/research/operations/its/06108/

The Traffic Control Systems Handbook describes communications structuring and monitoring. http://ops.fhwa.dot.gov/publications/fhwahop06006/

VIII. SUBMISSION FORMS AND CERTIFICATION (Appendices)

A. Proposal Cover Sheet (Appendix A)
   a. MS Word version of Appendix A available on our website (www.volpe.dot.gov/work-with-us/small-business-innovation-research)

B. Project Summary (Appendix B)
   a. MS Word Version of Appendix B available on our website (www.volpe.dot.gov/work-with-us/small-business-innovation-research)

C. Contract Pricing Proposal (Appendix C)

D. SBIR Funding Agreement Certification (Appendix D)

E. Proposal Checklist (Appendix E)
(Do not include with proposal – for Offeror's use only)

A. PROPOSAL COVER SHEET (Appendix A)

U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. DTRT57-14-R-SBIR1
FY14.1
PROPOSAL COVER SHEET

Project Title:	
Research Topic No.:	
Research Topic Title:	
Submitted by:	Company Name
	Address
	City, State, Zip
Representations & Certifications	System for Award Management Valid Until _____(Date) https://www.sam.gov
	Online Representations and Certifications Valid Until _____(Date) https://www.sam.gov
Amount Requested $ (May be up to $150, 000 unless otherwise indicated in Section IX)	
Proposed Duration (in months) (Not to exceed 6 months)	

Congressional District No.*: _____
*To locate your congressional district number, proceed to the link: http://www.govtrack.us/congress/members

By signing and submitting this coversheet under Solicitation No. DTRT57-14-R-SBIR1, Topic No. _____, this form certifies that:

1. The above firm, together with its affiliate's ____is ____ is not a small business firm and meets the definition stated in Section I.E; and that it meets the eligibility requirement in Section I.C.

2. The SBIR Applicant is (check one):
   a. □ at least 51% owned and controlled by one or more individuals who are citizens of the United States, or permanent resident aliens in the United States; or
   b. □ at least 51% owned and controlled by another business concern that is itself at least 51% owned and controlled by individuals who are citizens of, or permanent resident aliens in the United States; or
   c. □ a joint venture in which each entity to the venture meets the requirements set forth in 2.a or 2.b above.

3. The above firm, _____will _____ will not primarily employ the Principal Investigator at the time of award and during the conduct of research.

4. The above firm _____does_____does not qualify as a socially or economically disadvantaged small business as defined in Section I. E. (The information is for statistical purposes only.)

5. The above firm_____does_____does not qualify as a women-owned small business as defined in Section I. E. (The information is for statistical purposes only.)

6 The above firm_____does_____does not qualify as a HUB Zone-owned small business and meet the definition as stated in this Section I.E.

7. The above firm and/or Principal Investigator _____has, ____ has not submitted proposals containing the same, or a significant portion of equivalent or overlapping work to other Federal agencies. (If yes, identify proposals. See Section III. B.)

8. The above firm and/or Principal Investigator _____has, ____has not been funded under any other Federal grant, contract or subcontract program solicitations, or has received other Federal awards to conduct essentially equivalent work or overlapping work. (If yes, identify proposals in Section III. B.)

9. The Principal Investigator's primary employment _____is, _____is not with the above firm.

10. The above firm ____will, _____will not permit the Government to disclose the title and technical abstract of your proposed project, plus the name, address, and telephone number of the Corporate/Business Official and Principal Investigator of your firm, if your proposal is recommended for award, to any party that may be interested in contacting you for further information?

11. By signing and submitting this proposal, you are authorizing the U.S. DOT SBIR Program permission to disclose the title and abstract of the proposed project, as well as the name and other information of the corporate official to appropriate local and state economic development organizations, if the proposal does not result in an SBIR award.

By signing and submitting this proposal in response to Solicitation No. DTRT57-14-R-SBIR1, Topic No. _____, I am representing on my own behalf, and on behalf of the SBIR applicant, that the information provided in this certification, the application, and all other information submitted in connection with this application, is true and correct as the date of the 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 non-procurement transactions (FAR Subpart 9.4 or 2 C.F.R. part 180); and (5) other administrative penalties including termination of SBIR awards.

Principal Investigator	Corporate/Business Official
Name _____	Name_____
Title _____	Title _____
Address_____	Address_____
Address_____	Address_____
Telephone No._____	Telephone No._____
E-mail_____	E-mail_____
Signature_____Date_____	Signature_____Date_____

PROPRIETARY NOTICE (IF APPLICABLE, SEE SECTION V.D.)

B. PROJECT SUMMARY (Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. DTRT57-14-R-SBIR1
FY14.1
PROJECT SUMMARY

Name and Address of Offeror	**FOR U.S. DOT USE ONLY**
	Proposal No.

Name and Title of Principal Investigator

Project Title

Research Topic No.	Research Topic Title

Technical Abstract (Limited to two hundred words in this space only with no classified or proprietary information/data).

Anticipated Results/Potential Commercial Applications of Results.

Provide key word (eight maximum) description of the project useful in identifying the technology, research thrust, and/or potential commercial application.

C. CONTRACT PRICING PROPOSAL (Appendix C)

U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. DTRT57-14-R-SBIR1
FY14.1
CONTRACT PRICING PROPOSAL

Appendix C is available on our website **here** in Microsoft Excel 2010 format. Specific **instructions for filling out Appendix C** are located **here**. Please fill out the spreadsheets as directed and then save the entire workbook as a PDF. (To do this click on the 'Acrobat' tab in the main ribbon of Excel, then choose "entire Workbook" from Conversion Range option at top of window.) You will then need to add that PDF file to your proposal after the proposal is saved as a PDF. You must submit the entire proposal (including all of the appendices) as one document to **DOT SBIR's automated proposal site** which is located **here**.

If you have any trouble accessing the Appendix C spreadsheet or saving it as a PDF please contact the U.S. DOT SBIR Program Office at 617-494-2051 between the hours of 8:00 am and 5:00 pm EST no later than March 28, 2014.

D. SBIR FUNDING AGREEMENT CERTIFICATION (Appendix D)

U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. DTRT57-14-R-SBIR1
FY14.1
SBIR FUNDING AGREEMENT CERTIFICATION

Complete the funding agreement certification on the following pages.

SBIR Funding Agreement 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 box 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 (VCOCs), 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 non-procurement 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	

E. PROPOSAL CHECKLIST (Appendix E)

U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. DTRT57-14-R-SBIR1
FY14.1
PROPOSAL CHECKLIST

This is a CHECKLIST OF REQUIREMENTS for your proposal. Please review the checklist carefully to assure that your proposal meets the U.S. DOT SBIR requirements. Failure to meet these requirements may result in your proposal being returned without consideration. (See Section III.B. of this Solicitation). **Do not include this checklist with your proposal.**

____ 1. The proposal reflects the fact that for Phase I a minimum of two-thirds (and for Phase II a minimum of one-half) of the research and/or analytical effort will be performed by the proposing firm as required (see Sections V.H.) and the primary employment of the principal investigator (for both Phase I and Phase II) must be with the small business firm at the time of award and during the conduct of the proposed research as required (see Section I.C).

____ 2. The proposal is submitted according to the requirements described in Section III.

____ 3. The proposal is limited to only ONE of the research topics in Section IX.

____ 4. The proposal budget **may be up to $150,000 unless otherwise indicated in Section IX of the solicitation** and duration does not exceed six months.

____ 5. The technical abstract contains no proprietary information, does not exceed 200 words, and is limited to the space provided on the Project Summary sheet (Appendix B).

____ 6. The proposal contains no type smaller than ten point font size.

____ 7. The COVER SHEET (Appendix A) has been completed and is PAGE one and two of the proposal.

____ 8. The PROJECT SUMMARY (Appendix B) has been completed and is PAGE three of the proposal.

____ 9. The TECHNICAL CONTENT of the proposal begins on PAGE four and includes the items identified in Section III.B of the Solicitation.

____ 10. The technical proposal includes the Sustainable Acquisition Requirement provision (Section III.B.)

____ 11. The Contract Pricing Proposal (Appendix C) has been completed and saved as a PDF and is included as the last section of the proposal.

____ 12. The additional information on prior Phase II awards, if required, in accordance with Section III.B is included.

____ 13. The Funding Agreement Certification (Appendix D) has been completed and signed.

____ 14. The SBA Company Register Confirmation is included (Section III.B).

____ 15. The proposal must be a PDF file and submitted online by 11:59 p.m., April 4, 2014.
Proposals may only be submitted online, a link to the web form can be found here: http://www.volpe.dot.gov/sbir/current.html. Proposals received via email or any other means will not be accepted. Do not send duplicate proposals via email or by any other means. Instructions for online submission are included on the submission page.

IX. RESEARCH TOPICS

Solicitation 14.1 Phase I research topics for U.S. DOT Operating Administrations are listed below. These topics indicate the specific areas for which proposals are to be considered for acceptance by U.S. DOT. The topics are not listed in any order of priority. Each proposal submitted must respond to one (and only one) topic and/or focus area as described in this section. A proposal may, however, indicate and describe its relevance to other topics.

U.S. DOT Operating Administration	Topic number & Title	Maximum Number of Anticipated Awards	Estimated Award Amount Phase I*	Estimated Award Amount Phase II**
Federal Highway Administration	14.1-FH1:Development of Prestressed Concrete Nondestructive Evaluation (NDE) Inspection Procedures	3	$150,000	$1,000,000
	14.1-FH2: Personalized Driving Data for Insurance Discounts & Public Benefits	2	$150,000	$1,000,000
	14.1-FH3: Suppressing Utility Problems - Protection via Robotic Engineering to the Sub-Surface	2	$150,000	$1,000,000
	14.1-FH4: STEM Education – Increasing awareness about Intelligent Transportation Systems and Connected Vehicle Technologies for High School Students	1	$125,000	$750,000
	14.1-FH5: Visually unobtrusive traffic monitoring for National Park Service Parkways	3	$125,000	$750,000
	14.1-FH6: Corrosion Resistant Prestressing Strand for Prestressed Concrete Bridges	3	$150,000	$1,000,000

Federal Railroad Administration	14.1-FR1: Lightweight, Portable System for Mid-Chord Offset Measurement of Railroad Rails	2	$150,000	$350,000
	14.1-FR2: Wheel Load Cycle Tag for Rail	2	$150,000	$350,000
	14.1-FR3: Easy Access to Freight Locomotives	2	$150,000	$350,000
* Proposals that exceed the Phase I Estimated Award Amount will not be considered for award. **The Phase II funding level noted above is an estimate only, is subject to the availability of funds and/or the technical requirements to accelerate the development of a commercial product and/or innovation. Any changes to the Phase II estimated funding level listed above will be communicated to the small business after the completion of the Phase I project.				

A. Federal Highway Administration (FHWA)

14.1-FH1: Development of Prestressed Concrete Nondestructive Evaluation (NDE) Inspection Procedures

Approximately 66% of existing concrete bridges consist of prestressed concrete components (calculated by deck area). Prestressed concrete is constructed using either pre tensioned or post tensioned steel tendons as tensile reinforcement. Similar to traditional reinforcement (rebar), these tendons experience degradation due to corrosion and carbonation. However, unlike typical structural concrete, prestressed concrete is more difficult to inspect using nondestructive evaluation techniques. This difficulty arises from the fact that tendons cannot be easily distinguished from other reinforcement, are inaccessible, and are often encased in ductwork. There is a need for new and improved methods, techniques, and technologies to efficiently and effectively inspect these components.

There are multiple existing methods to inspect prestressed concrete components. These methods include, but are not limited to, the nondestructive evaluation (NDE) techniques of magnetic methods (magnetic flux leakage (MFL) and the main magnetic flux method (MMFM)), acoustic methods (impact echo, impulse response, etc.), and nuclear methods (gamma ray and x-ray). Although these methods have proven some successes, there reliability and reproducibility is limited.

Additionally, there are a variety of structures and structural elements that are comprised of prestressed concrete. This population includes a variety of configurations. These configurations range from pretensioned concrete girders and slabs to post tensioned concrete girders and column caps (this list is not all inclusive). The pretensioned concrete is comprised of steel tendons that are incased in concrete and are typically surrounded by a dense mesh of traditional reinforcement. Post tensioned configurations typically contain tendons incased in long ducts. These ducts are either incased in the concrete structure or run from adjacent piers on the internal sections of hollow shaped girders (box girders, pie girders, etc.). Thus, it is easier to inspect ducts that are not incased in material. There are currently very few procedures to inspect any of these configurations, especially post tensioned steel tendons incased in concrete.

The Federal Highway Administration's (FHWA) NDE and Long Term Bridge Performance (LTBP) programs have identified, through coordination with key stakeholders, that the improved investigation of prestressed concrete is of great importance to the infrastructure of the United States.

Expected Phase I Outcomes

The objective of this phase is to identify new and improved methods to inspect prestressed concrete nondestructively. The outcome expected from Phase I is a detailed concept that

demonstrates the viability of creating a prototype that satisfies the issues identified above. The four areas of concentration should be:

1. Inspection of tendons incased in concrete (typical of pretensioned concrete configurations),
2. Inspection of grouted tendons in ducts incased in concrete (typical of post tensioned concrete I beam girder and pier cap configurations),
3. Inspection of grouted tendons in ducts not incased in concrete (typical of post tensioned concrete hollow girder configurations), and
4. A risk based approach to inspection of prestressed concrete that will determine element level inspection criteria and assign ratings to each element with regard to high probability of failure and subsequent high consequence of failure. This approach would result in a rating system to be used by bridge inspectors to determine the frequency of required inspection of prestressed concrete elements.

The inspection procedures should focus on identifying cross section loss of individual tendons as well as variation in grout density, if possible. Phase I deliverables should include a demonstration proving the method is field deployable with a high probability of detection. This demonstration should include a statistically significant number of trials showing a high percentage of true positives and true negatives with a low percentage of associated false positives and false negatives proving the probability of detection using this method. Only methods with a high probability of detection will be granted Phase II awards.

Expected Phase II Outcomes

The Phase 2 outcomes build upon the lessons learned in Phase 1 and will result in a full optimization development of the NDE methods identified in Phase 1. The final product would be a technology and associated deployable equipment that could be used for inspection. This technology and equipment would include all appropriate analysis software and decision making framework that could be used by state bridge inspectors to determine the level of section loss of a prestressed tendon.

14.1-FH2: Personalized Driving Data for Insurance Discounts & Public Benefits

Traditional car insurance rates vary little, if at all, based on mileage and observed driving safety, even though they clearly and directly relate to crashes and claims, and charging based on actual risk exposure would improve safety and the environment, reduce energy use, and lessen crash-caused congestion. Brookings Institution research shows that pay-as-you-drive insurance (PAYDI) would lead to an 8% reduction in driving. Other research points to crash reductions, and likely claims' reductions, that would be about 1.4 times that amount, typical infrastructure improvement savings of 3 to 5¢ for every mile not driven, and between $50 and $60 billion in net social benefits in the U.S. from reduced driving related externalities, including congestion reduction that has been shown in many instances to be disproportionately greater than the reduction in traffic. (For example, the Oct. 22, 2008 INRIX report, "The Impact of Fuel Prices on Consumer Behavior and Traffic Congestion," concluded that the price spikes led to a 26% reduction of peak-hour congestion, resulting from a much smaller reduction—i.e., around 3%--in vehicle-miles traveled.) Brookings also projects that 63.5% of households would save an average of 28% on their total premiums or about $496 annually for the households that do save, which would be a huge economic stimulant.

The ability to monitor driving activity for the purpose of improving safety has grown exponentially in recent years. While some personal lines insurance products have begun to use observed exposure data for premium setting, the tremendous potential for PAYDI applications to lead to substantial public and private benefits, and opportunities for small and mid-size businesses, is nevertheless not being realized.

The suggested approach to improve this situation entails enlisting small and mid-size businesses—including vendors of in-vehicle telematics equipment—to work with personal lines insurance companies and environmental and consumer groups to gather data needed for competitive PAYDI pricing. An industry is emerging in the U.S. and internationally to combine telematics and car insurance. Indeed, the "Insurance Telematics USA 2013" conference in Chicago attracted another sellout crowd of 500 participants. The market today for PAYDI telematics technologies and services has technology and data providers selling services and products directly to insurance companies, and the data is not in turn offered back to consumers in a format that would enable them to solicit competitive PAYDI rates as they are able to solicit for traditional car insurance. The result is that the dominant insurance company products that include PAYDI elements offer rates that are informed by driver data, but such data remains in a "black box" to consumers who might otherwise want to share them with competitors to secure lower premiums. The public policy benefits of having consumers appreciate how their driving affects their rates (including the number of miles driven in congested conditions) and then being provided an opportunity to change behavior to save on premiums is lost because of how the market is developing. Therefore, there is a need to create a marketplace that would enable consumers to collect and share their own driving data linked to crash risk—including about driving amounts, conditions (e.g., related to congestion and time of day), and vehicle handling

(e.g., prevalence of hard braking)—which would enable insurance carriers to offer competitive and comparable PAYDI rates.

The product described will satisfy FHWA strategic goals related to system performance, congestion reduction, environmental stewardship, and safety. In addition, it is anticipated that this project may be of interest to the Department of Energy and Environmental Protection Agency for Phase II funding.

Expected Phase I Outcomes

Outcomes expected from the Phase 1 include a detailed concept that demonstrates the viability of one or more consumer telematics products and systems from which at least three insurance companies agree to accept the data to offer competitive premiums.

Expected Phase II Outcomes

Phase II efforts would include demonstrating a working prototype (which may or may not include the manufacturing of a new product) of an in-vehicle telematics device, linked to a data integration and warehousing system, that would gather and inform consumers of their driving data and enable consumers to share such data with insurance companies in exchange for competitive pricing and guidance on reducing risk.

14.1-FH3: Suppressing Utility Problems - Protection via Robotic Engineering to the Sub-Surface

Poles supporting overhead utilities in the right-of-way represent a significant safety hazard for drivers and occupants of vehicles. While other hazards exist on the roadside, vehicles that crash into these utility poles typically suffer serious damage and increase the risk of serious injury or death for the occupants. Over 1,000 fatalities each year are attributed to crashes involving utility poles[1]. Relocating overhead utilities in the right-of-way below the ground surface eliminates this safety hazard, improves the aesthetics of the roadway and adjoining properties, and can increase the reliability of the utilities. However, the cost of relocating existing overhead utilities to the subsurface often prohibits any large scale adoption of the practice. Innovative technological advances may afford the opportunity to significantly reduce this highway safety hazard.

The most significant issue in underground relocation of utilities beyond the cost is avoiding existing subsurface utilities and other obstructions. Particularly in corridors with a cluttered subsurface such as in urban environments, the precise location of existing utilities is often unknown. Even in cases where as-built drawings or other documentation exists, the accuracy and precision may not be good enough to reliably place additional utilities and avoid conflict with existing ones.

Rapidly developing technologies to reliably sense existing underground conditions and the location of existing underground utilities integrated with increasingly affordable robotic technologies may offer a promising and cost-effective solution to the dilemma of relocating overhead utilities. Nondestructive inspection techniques such as ground penetrating radar and thermography can be combined with more traditional location approaches such as magnetic field detection to more accurately locate existing utilities. In cases where trenches are open, advanced 3-dimensional data capture with LiDAR or photogrammetric techniques also provides accurate location information that can be combined into a common 3-dimensional digital model of the subsurface. Significant progress on the detection, location, and mapping of existing underground utilities has been made under the 2nd Strategic Highway Research Program (SHRP2) and research conducted by FHWA and the highway construction industry. These models will provide the necessary information on existing conditions to support accurate placement of overhead utilities into the subsurface.

To minimize cost and disruption, trenchless methods for utility relocation will be required. Horizontal directional boring technology is relatively mature for applications that do not require very accurate 3-dimensional positioning of the drill head. Advances in guided directional

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[1] National Cooperative Highway Research Program (NCHRP) Report 500 -- Guidance for Implementation of the AASHTO Strategic Highway Safety Plan; Volume 8: A Guide for Reducing Collisions Involving Utility Poles (2004).

drilling and microtunneling techniques promise significant improvements in accuracy that may be sufficient and provide the necessary accuracy and control to place utilities in a complex subsurface environment that is characterized by a sufficiently accurate 3-dimensional model.

The desired outcome of the proposed research is a system that can robotically relocate existing overhead utilities to the subsurface in highway and road rights-of-way. The system should be accurate and precise enough to place utilities in complex subsurface environments such as those found in urban corridors. The robotic installation system will depend on an accurate 3-dimensional model of the subsurface that is derived from state-of-the-art remote sensing technology combined with existing information about buried utilities.

Expected Phase I Outcomes

Phase I will explore and identify existing technologies that are capable of, or can be adapted to, the robotic installation of underground utilities. Similarly, Phase I will also examine current and emerging subsurface utility sensing and mapping technology to identify the most applicable technique(s) to exploit for use with a future automated subsurface utility relocation system. Lastly, this phase will determine the feasibility of integrating the identified subsurface sensing/mapping methods with the robotic technology to form a complete, automated subsurface utility relocation system.

Expected Phase II Outcomes

Building on the information developed in Phase I, Phase II will produce a prototype system that can be demonstrated in a realistic environment by robotically installing utility cables in the subsurface where utilities and other obstructions already exist.

14.1-FH4: STEM Education – Increasing awareness about Intelligent Transportation Systems and Connected Vehicle Technologies for High School Students

This topic exposes students to real world transportation problems to demonstrate how transportation planners, technicians and engineers contribute to solving our nation's environmental and livability challenges.

A recent report noted that nearly 60 percent of the nation's students who begin high school interested in science, technology, engineering, and math (STEM) change their minds by graduation. "Tying education to the workforce needs is critical to the future of the nation," said STEMconnector CEO Edie Fraser[2]. Science and engineering careers are expected to grow more than 20 percent by 2018, twice the rate of the U.S. labor force.

This topic is designed to attract and keep middle and high school students' interest in STEM education by linking their classwork to well-paying jobs in intelligent transportation systems (ITS). This topic will provide innovative, hands-on, problem based learning to give students the experience of using their education to meet real-world challenges. Lesson plans are sought that: (1) engage middle and high school students; (2) relate to solving real-world problems in transportation; (3) develop skills needed by the future transportation workforce; (4) deliver internet-based educational resources using innovative media applications such as interactive games; (5) provide awareness and training into the expanding technologies involved with Connected Vehicle research.

The following provides guidance on potential ITS-related lesson plans and/or activity kits, though proposals are not limited to this list:

- Proposals should focus on STEM lesson plans and hands-on activities to provide an introduction to ITS and Connected Vehicle technologies while focusing on careers for middle and high school students.
- Proposals should include innovative, interactive, hands-on activities such as:
    - Citizen science: Collect and analyze traffic data, then propose strategies to improve safety and increase traffic flow in their community. The solutions could be high-tech, low-tech or no-tech.
    - Design contest to alleviate a transportation problem such as distracted driving.
    - Design parking applications for large special events.
    - Brainstorm methods for reducing fuel consumption or reducing emissions from vehicles.

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[2] http://www.usnews.com/news/blogs/stem-education/2013/01/31/report-many-high-schoolers-giving-up-on-stem

- Proposals should include a plan for introducing high technology transportation fields such as, computer simulation and modeling, transportation design engineering, GIS design, automotive and infrastructure electronics.

Expected Phase I Outcomes

Outcomes expected from Phase I funding include detailed lesson plan(s) for introducing careers in advanced transportation technology for middle and high school students. The topic should include a framework for creating a collection of lesson plans that is aligned with academic standards and provide opportunities for students to apply contextualized knowledge in real-world settings. The lesson plans should be created according to the guidelines maintained by http://www.teachengineering.org, a NSF-funded collaborative project sponsored by the American Society for Engineering Education. The outcomes will include the identification of the potential market size and customers for the STEM education lesson plans.

Expected Phase II Outcomes

Future Phase II work may include, but not be limited to, design, deployment, and maintenance of a collection of transportation lesson plans for middle and high school STEM education programs. This collection would include development of goals for high school and postsecondary completion and entry into the workforce for students in the ITS field. It would include a plan for integrating the lessons plans with outside guests and extra-curricular activities. As part of Phase II, the commercial viability (business plan) for the STEM ITS/Connected Vehicle lesson plans and any related products will be updated and further detailed.

SBIR NOTE: The SBIR program at the Institute of Education Sciences within the U.S. Department of Education accepts proposals for the development and evaluation of commercially viable education technology products that support students or teachers. For more information on the specific topics and the timeline for the Fiscal Year 2014 program, visit www.ies.ed.gov/sbir.

14.1-FH5: Visually unobtrusive traffic monitoring for National Park Service Parkways

The mission of the National Park Service (NPS) is to preserve unimpaired the natural and cultural resources and values of the national park system. However, the NPS road network, especially in urban areas is facing congestion issues like those seen around the country. State Departments of Transportation are applying operational strategies to help manage this increasing concern which can be applied NPS roads. Thus, unobtrusive traffic monitoring devices of low profile, with minimal impact to the natural surroundings are needed to assess vehicular flow on two- to four lane Parkways. Information on vehicle speeds, travel times (multiple directions), vehicle type, and volume per lane. Surveillance for incident management response is also important. It is desirable that a strategy for this data to be transmitted to the regional ITS architecture and stored, analyzed and possibly operated and maintained by a state agency.

The device should be developed in a way that allows the FHWA and NPS personnel, involved in this study, to closely monitor it. Use of the George Washington Memorial Parkway (GWMP) maintenance facility and the TFHRC site for preliminary testing of the prototype devices in Phase I and II is required. Cooperation with nearby jurisdictions such as VDOT and MDSHA and their groups that monitor transportation data is recommended so that transfer of data to their systems can be analyzed. The GWMP extends 26 miles between Mount Vernon Estates on the south end to I-495 intersection at the north end. Both in pavement and above pavement sensing technologies may be applicable. However, the final packaging must be visually unobtrusive and blend in with the scenic views of the parkway.

This proposal is also in alignment with USDOT goals of ensuring safety and spurring innovation. Park roads and Parkways in the National Capital Region have 39% of all the crashes that occur in the NPS. The data obtained with this innovative device will allow the NPS to more comprehensively analyze and address traffic safety and deploy a 4 E's approach to reduction of crashes.

Constraints

Device should have:

- Minimal impact to viewsheds or disturbance of the historical, cultural landscape. The NPS Cultural Landscape Inventory can provide guidance on viewsheds within the study area.
- Small profile. If an In-Roadway sensor, the portion of the sensor, not embedded in the roadway, shall be capable of being deployed and operate on existing road signs -and light poles. If an Off-Roadway sensor, the same deployment restrictions apply.
- If an Over-Roadway sensor, the sensor shall be capable of being deployed and operated on median piers of existing bridges and shall be visually unobtrusive.

- Self- powered capability (long-life batteries preferred over solar panels). There is currently no power or communications sources along the right of way of the Parkway.
- Data fusion between 2 or more technologies is permitted but is not required.

Expected Phase I Outcomes

The expected outcome of Phase I is the development of a prototype that can be deployed for testing on the GWMP facility. Testing may include a groundtruth comparison to an existing sensor station or approved radar system. Develop a report on key findings and recommendations for modifications. In the report include, background information on approach to problem statement, project goals and development of device, review of testing and data collection, description of evaluation methods, and conclusions.

Expected Phase II Outcomes

The expected outcome of Phase II is a device or product that has been deployed and tested at multiple locations on the GW Parkway and proven to generate consistent, accurate results. The accuracy of counts between locations and the accuracy of the travel time estimates between the locations will be evaluated. Strategies for transferring data from the sensor to a traffic monitoring center will be developed and demonstrated during Phase II. Develop a report describing the device and associated systems, an implementation plan and cost estimates.

The terms In-Roadway and Over-Roadway are defined in the Traffic Detector Handbook 3rd Edition.

http://www.fhwa.dot.gov/publications/research/operations/its/06108/

The Traffic Control Systems Handbook describes communications structuring and monitoring

http://ops.fhwa.dot.gov/publications/fhwahop06006/

14.1-FH6: Corrosion Resistant Prestressing Strand for Prestressed Concrete Bridges

The number of prestressed concrete bridge structures utilizing high strength 7-wire strand (black strand) has increased steadily since the 1970s. The prestressing strand can be used in both the pre-tensioned and post-tensioned (PT) structures. Two years ago, the University of Texas completed a study where they evaluated various types of prestressing to determine their corrosion-resistance, including black strand as a control. The study concluded that epoxy coted strand performed somewhat better then stainless-clad and stainless steel for both corrosion resistance as well as mechanical properties. Despite these good results on epoxy coated strands, there are number of practical issues for their use in field, and owners are reluctant to adopt this product at present.

For post-tensioned structures, the stressed strands are enclosed in plastic or galvanized ducts and the ducts are filled with cementations grout to provide a barrier system to the enclosed strands. Unfortunately, a number of bridges have still had corrosion issues due to bleed water from the grout being collected at higher end anchorage areas, among other problems including issues with construction, quality control, and environmental concerns. Hence to avoid the inherent deficiency in the cementations grouts, it is desirable to study feasibility of alternate metallic 7-wire strands including epoxy-coated, copper and stainless clad, stainless steel, and other types of alloys to determine their efficacy in preventing corrosion and their cost effectiveness. This study is intended to focus only on metallic alloyed/clad strands, and not fiber-reinforced polymer compositions.

Expected Phase I Outcomes

The objective of this phase is to identify alternatives to conventional high-strength 7-wire strand (black strand) for prestressed concrete bridges. The outcome expected from Phase I is the identification of suitable products which may meet required mechanical and physical properties for their use in post-tensioned bridges with regard to overall improved corrosion resistance and performance, and may be economically manufactured.

Expected Phase II Outcomes

The Phase 2 study will select one or more strand products from Phase I and will perform a detailed evaluation on large scale stressed concrete bridge members for their constructability and long term corrosion performance. Phase 2 will result in the identification of the material/ products that provide high corrosion resistance, perform well in the field, and can be economically manufactured.

B. Federal Railroad Administration (FRA)

14.1-FR1: Lightweight, Portable System for Mid-Chord Offset Measurement of Railroad Rails

A common measurement for quantifying aspects of railroad track geometry is the mid-chord offset (MCO). MCO measurements enable railroads to maintain their track to safe standards that comply with federal regulations. In order to obtain MCO measurements, railroad personnel (as well as federal and state inspectors) use string line measurements to measure right and left rail deviations in both the vertical and lateral plane. Figure 1 shows the typical configuration of an MCO measurement. One end of the string line is placed at a first point, and the second end is placed a distance x away from the first point. The MCO measurement is taken at the center point of the string line, and the MCO measurement is the distance between the string line and the rail at the center point of the string line. Federal regulations call for the use of 31 foot, 62 foot, and 124 foot string line lengths. At the longer stringer line lengths of 62 feet and 124 feet using a string line is problematic due to the "droop" effect of the string.

This topic solicits proposals for the development of a compact, portable mid-chord offset rail measurement system that leverages advanced technologies to overcome the difficulties of longer chord length string line measurements The system must be lightweight (preferably less than 10 lbs), portable, and include a portable power source that can provide power for at least 10 hours of intermittent use. The system may consist of multiple sub-systems or units; for example, the system might consist of a first sub-system placed at a first point, a second sub-system placed at a second point (64 feet or 124 feet away from the first point), and a third sub-system placed at the center point between the first and second subsystems. The device must be easy to use; preferably system setup and data collection could be performed by a single person.

The scope of research projects for this topic shall include laboratory demonstration of developed technologies.

Expected Phase I Outcomes

The scope of research projects for this topic shall include laboratory demonstration of developed technologies.

Expected Phase II Outcomes

Modify the prototype, based on lessons learned in Phase 1. The Phase 2 deliverable should be a prototype that is rugged, portable, and is capable of extended field testing.

14.1-FR2: Wheel Load Cycle Tag for Rail

In the railroad industry, the "age" of rail is measured by the number and severity of wheel loads. Typically the age of the rail is quantified as millions of gross tons (MGT). As rails age, they are more susceptible to developing rolling contact fatigue. Rolling contact fatigue can lead to rail internal defects which, in turn, can lead to rail failure and a train derailment. Therefore, knowing the "age" of a rail, the number and severity of the loads it has carried, is important.

This topic seeks to develop a device that can measure the service life of rail in term of wheel load cycles and, if possible, peak and average wheel loads. It is envisioned that this technology take the form of a tag applied to the rail web, although other practical and innovative configurations may be proposed.

In terms of software, the tag should be programmable with basic rail characteristics and date/location of installation and re-installation, and should be readable by a designated handheld device, laptop computer, or other portable device (such as a tablet pc). The data being read by the receiving handheld device should automatically populate a database. The exact content and data to be included in this database may be discussed with the FRA program manager early in the period of performance. The main purpose of a Phase 1 contract will be to demonstrate feasibility and efficiency of the data transfer rather than focusing on the actual content of the data fields; the exact content of the data fields would be included in a follow-on Phase 2 effort.

With respect to hardware, the device shall be maintenance-free, self-powering (5 year minimum life). Device production cost should be low in consideration of the high volume production that may be needed. The device shall be designed to be removeable and replaceable, and shall not interfere with normal train operations or routine track maintenance activities.

The scope of research projects for this topic shall include laboratory demonstration of developed technologies.

Expected Phase I Outcomes

The scope of research projects for this topic shall include laboratory demonstration of developed technologies.

Expected Phase II Outcomes

Modify the prototype, based on lessons learned in Phase 1. The Phase 2 deliverable should be a prototype that is rugged and is capable of extended field testing.

14.1-FR3: Easy Access to Freight Locomotives

Engineers, Conductors and Brakemen enter and exit from Freight Locomotives several time per trip in the course of the workday. This entails walking on ballast on a slope. Steps allow the worker to climb up to the first step and the remaining steps to the platform., walk towards the cab entry door. Often the step up is conjunction with the locomotive movement at slow speeds. This is “risky” business and many slips and falls can occur. Grab handles facilitate this climb up. The process is not ergonomically friendly. What is desired is an assisted from of the climb up so as to significantly reduce the effort required. Some “elevator system would make the effort a lot easier.

Although locomotive designs vary there are the same common elements—large first step, followed by three or more steps. Ant-skid protection helps but could be further optimized. A kind of stair climber is envisioned. Worker population is aging making it harder for the worker to get on/off locomotives.

An clear understanding of the railroad operations environment is essential. Train Occupant Protection is the principal focus of this topic. Locomotives can be wide body or narrow body. The same basic arrangement would be required. Proposals will be evaluated for innovation, practicality, ease of incorporation into current design locomotives with reasonable design change.

The scope of research projects for this topic shall include design conceptualization, development of mock ups, and laboratory demonstration of developed mock ups. Detail design could be part of Phase II.

Expected Phase I Outcomes

The scope of research projects for this topic shall include laboratory demonstration of developed mock ups.

Expected Phase II Outcomes

Production system capable of extended field testing.