



U. S. Department  
of Transportation

**DTRT57-15-R-SBIR1**

**FY15.1**

## **PROGRAM SOLICITATION**

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

**NAICS CODE: 541712**

**Issue Date: January 6, 2015**

**Closing Date: March 9, 2015**

**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  
John A. Volpe National Transportation Systems Center (Volpe Center)  
55 Broadway  
Cambridge, MA 02142-1093**

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

## ADMINISTRATIVE AND TECHNICAL QUESTIONS

Administrative questions pertaining to the application process and requirements are listed in the Frequently Asked Questions (FAQs) page on the United States Department of Transportation (U.S. DOT) Small Business Innovative Research (SBIR) Program website: <http://www.volpe.dot.gov/work-with-us/small-business-innovation-research/frequently-asked-questions> .

If you have any administrative questions not listed in the FAQs, or any technical questions pertaining to the FY15.1 U.S. DOT SBIR solicitation research topics, please submit such questions via email to the U.S. DOT SBIR Program Office at [dotsbir@dot.gov](mailto:dotsbir@dot.gov). All questions must be submitted by email.

**IMPORTANT: Please note that administrative and technical questions will be accepted through February 20, 2015 at 11:59 pm ET. Questions received after February 20, 2015 may not be answered.**

Answers will be posted in the “Solicitations” section of the U.S. DOT SBIR Program website (<http://www.volpe.dot.gov/work-with-us/small-business-innovation-research/solicitations>). They will also be posted on the Federal Business Opportunities website ([https://www.fbo.gov/index?s=opportunity&mode=form&id=e26fbd79332b675d621979f6c005a845&tab=core&\\_cview=0](https://www.fbo.gov/index?s=opportunity&mode=form&id=e26fbd79332b675d621979f6c005a845&tab=core&_cview=0)) after the conclusion of the question period.

## **PRE-PROPOSAL WEBINAR**

A pre-proposal webinar for small business concerns (SBCs) interested in applying to the FY15.1 U.S. DOT SBIR solicitation will be held on Thursday, January 8, 2015 **at 1:30 pm ET**. SBCs will attend virtually via a webinar conference. All SBCs interested in applying are urged to attend this webinar, which will provide information on the application process and featured solicitation topics.

Each SBC interested in attending the webinar shall register at: <https://volpecenter.webex.com/volpecenter/onstage/g.php?d=644652232&t=a>. You may register any time prior to noon on the day of the conference. Upon receipt of your registration, you will receive information for connecting to the conference.

The webinar recording will be posted to the “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 ..... 1**

A. Introduction..... 1

B. Three Phase Program ..... 2

C. Eligibility..... 3

D. Contact Information ..... 5

E. Definitions ..... 5

F. Report SBIR Fraud, Waste and Abuse ..... 8

G. Other Information ..... 8

**II. CERTIFICATIONS..... 10**

**III. PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS ..... 11**

A. Overview..... 11

B. Proposal Submission Requirements ..... 11

C. Other Proposal Information..... 17

D. System for Award Management (SAM) and Data Universal Numbering System (DUNS) Identification Number ..... 18

**IV. METHOD OF SELECTION AND EVALUATION CRITERIA ..... 19**

A. General..... 19

B. Evaluation Criteria ..... 19

C. Prescreening ..... 19

D. Schedule..... 20

E. U.S. DOT Technical Evaluation Process..... 20

F. Selection of Awardees ..... 20

G. Time to Award Requirements ..... 20

H. Debriefing Requests ..... 20

**V. CONSIDERATIONS ..... 21**

A. Awards ..... 21

B. Reports ..... 22

C. Payment Schedule ..... 22

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

D. Innovations, Inventions, and Patents..... 23

E. Cost Sharing ..... 24

F. Profit or Fee ..... 24

G. Joint Ventures or Limited Partnerships..... 25

H. Research and Analytical Work..... 25

I. Awardee Commitments ..... 25

J. Summary Statements ..... 25

K. SBIR Program Small Business Concern (SBC) Requirements..... 27

L. Corrective Actions..... 29

M. Additional Information..... 29

**VI. SUBMISSION OF PROPOSALS..... 31**

    A. Closing Date..... 31

    B. Submission Details ..... 31

    C. Submission Address ..... 31

**VII. SCIENTIFIC AND TECHNICAL INFORMATION SOURCES ..... 32**

**VIII. SUBMISSION FORMS AND CERTIFICATION (Appendices) ..... 33**

    A. PROPOSAL COVER SHEET (Appendix A) ..... 34

    B. PROJECT SUMMARY (Appendix B) ..... 36

    C. CONTRACT PRICING PROPOSAL (Appendix C) ..... 37

    D. SBIR FUNDING AGREEMENT CERTIFICATION (Appendix D)..... 38

    E. PROPOSAL CHECKLIST (Appendix E)..... 43

**IX. RESEARCH TOPICS ..... 45**

    A. Federal Highway Administration (FHWA)..... 47

    B. Federal Railroad Administration (FRA)..... 54

    C. Federal Transit Administration (FTA) ..... 65

    D. National Highway Traffic Safety Administration (NHTSA)..... 67

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

## I. PROGRAM DESCRIPTION

### A. Introduction

The United States Department of Transportation (U.S. DOT) welcomes 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>.

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

### 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. **All U.S. DOT SBIR Phase I awardees are 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.

**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 funding ceiling typically does not exceed the amount of the previous Phase II award. 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.

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

- 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 an 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](http://sbir.gov/sites/default/files/elig_size_compliance_guide.pdf).

The rule includes a 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, measured in labor hours, must be performed by the awardee. For Phase II, a minimum of one-half of

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

the research or analytical effort, measured in labor hours, 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 I to Phase II Transition Rate.** 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. Small businesses can view their transition rate on [www.sbir.gov](http://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.**

### **Commercialization Benchmark**

The Commercialization Benchmark requirement applies only to SBIR Phase I applicants that have received more than 15 (16 or more) Phase II awards over the past 10 fiscal years, excluding the last two years. These companies must have achieved at least the minimum required levels of commercialization activity, resulting from their past Phase II work, in order to be eligible to receive a new Phase I award. The current Commercialization Benchmark requirement, agreed upon and established by all 11 SBIR agencies, is that the awardee applicant must have received, to date, an average of at least \$100,000 of sales and/or investments per Phase II award received, or have received a number of patents resulting from the SBIR work equal to or greater than 15% of the number of Phase II awards received during the period.



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

For more information on these performance benchmarks, visit <http://www.sbir.gov/performance-benchmarks>.

### D. Contact Information

If you have any administrative questions not listed in the FAQs, or any technical questions pertaining to the FY15.1 U.S. DOT SBIR solicitation research topics, please submit such questions via email to:

U.S. DOT SBIR Program Office

[dotsbir@dot.gov](mailto:dotsbir@dot.gov) (NOTE: All questions must be submitted via email.)

For general SBIR Program inquiries not pertaining to this solicitation, please contact:

U.S. DOT's SBIR Hotline

(617) 494-2051

[dotsbir@dot.gov](mailto:dotsbir@dot.gov)

In order to ensure full and open competition and comply with Procurement Integrity Act, 41 U.S.C. Section 2101-2107 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. Contact with U.S. DOT officials from any U.S. DOT agency, other than those identified in this solicitation during the period of this solicitation particularly when the 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.**

### E. Definitions

#### 1. Funding Agreement

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

#### 2. 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

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

- 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.

### 3. **Small Business Concern (SBC)**

SBA has amended the definition for the term “small business concern.” See 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 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 or <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.

### 4. **SBIR Technical Data**

All data generated during the performance of an SBIR award.

### 5. **SBIR Technical Data Rights**

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

### 6. **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.

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

### **7. 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).

### **8. 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.

### **9. 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.

### **10. 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>

### **11. 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.

### **12. 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

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

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](mailto: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 an 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

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

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.

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).

**All proposals must be submitted using the U.S. DOT's SBIR online submittal page: <http://volpedb1.volpe.dot.gov/SBIR/submitproposal.aspx>. 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).

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

Completed registrations will receive a unique SBC Control ID and PDF file to be submitted as the last page of the Technical Proposal.

2. Proposal Layout – Proposals must be submitted using the SBIR Program’s electronic submission process during open solicitation periods only. Proposals must be submitted as three separate files:
  - a. **Technical Proposal** – The technical proposal must be submitted in PDF format in accordance with the following requirements:
    - i. The Technical Proposal shall not exceed 25 pages; the Prior Phase II Awards and SBA Company registry Confirmation do not count towards the 25 pages.
    - ii. Font size shall be no smaller than 10 point.
    - iii. Proposals shall be on standard letter size pages (8.5" by 11") with 1" margins.
    - iv. All pages shall be numbered consecutively.
  - b. **Cost Proposal (Appendix C)** – The Cost Proposal (Appendix C) can be submitted as an Excel document or PDF and must contain the required supporting information described in the table below.
  - c. **Appendices A, B, and D** – All other Appendices (A, B, and D) must be saved as one single PDF file.

<b>Required Proposal Sections</b>	
<b>Technical Proposal (PDF file)</b> <i>Includes Technical Portion, Prior Phase II Awards, and SBA Registry Confirmation</i>	
<i>Technical portion not to exceed 25 pages</i>	Submitted proposals must include the following headings in bold (in cases where a section does not apply, please state “Not Applicable”): <ol style="list-style-type: none"> <li>1. <b>Identification and Significance of the Problem or Opportunity.</b> State the specific technical problem or innovative research opportunity addressed and its potential benefit to the national transportation system.</li> <li>2. <b>Phase I Technical Objectives.</b> State the specific objectives of the Phase I R/R&amp;D effort; including the technical question(s) the research will try to answer to determine the feasibility of the proposed approach.</li> <li>3. <b>Phase I Work Plan.</b> Describe the Phase I R/R&amp;D plan. The plan shall indicate what will be done, where it will be done, and how the R/R&amp;D will be managed or directed and carried out. Phase I R/R&amp;D shall address the objectives and the question(s) cited above in No. 2. Discuss in detail the methods planned to achieve each objective or task, including the level of effort associated with each task.</li> </ol>



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

<b>Required Proposal Sections</b>	
	<p>4. <b>Related Research or R&amp;D.</b> Describe significant R/R&amp;D that is directly related to the proposal including any R/R&amp;D conducted by the project manager/principal investigator or by the proposing firm. Describe how related research affects the proposed effort, and any planned coordination with outside sources. The SBC must persuade reviewers of its awareness of recent key R/R&amp;D conducted by others in the specific topic area.</p> <p>5. <b>Key Personnel and Bibliography of Directly Related Work.</b> 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.</p> <p>6. <b>Relationship with Future Research and Development.</b> 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&amp;D effort.</p> <p>7. <b>Facilities.</b> Provide a detailed description of the availability and location of instrumentation and physical facilities proposed for Phase I.</p> <p>8. <b>Consultants.</b> 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.</p> <p>9. <b>Potential Post Applications.</b> Briefly describe whether and how the proposed project appears to have (1) potential commercial application; and (2) potential use by the Federal Government.</p> <p>10. <b>Similar Proposals or Awards.</b> 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, <u>it is unlawful to enter into contracts or grants requiring essentially equivalent effort.</u> 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</p>

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

<b>Required Proposal Sections</b>	
	<p>identical proposals containing equivalent work under other federal program solicitations, a statement must be included in each proposal indicating:</p> <ul style="list-style-type: none"> <li>• The name and address of the agencies to which proposals were submitted or from which awards were received;</li> <li>• Date of proposal submission or date of award;</li> <li>• Title, number, and date of SBIR Program solicitations under which proposals were submitted or awards received;</li> <li>• The applicable research topics for each SBIR proposal submitted or award received;</li> <li>• Titles of research projects;</li> <li>• Name and Title of Principal Investigator or Program Manager for each proposal submitted or award received.</li> </ul> <p>11. <b><u>Sustainable Acquisition Requirement:</u></b> 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 and abide by the following provision in its technical proposal:</p> <p><b><u>“Sustainable Acquisition Requirement:</u></b> 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</p>

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

<b>Required Proposal Sections</b>	
	<p>the contractor for use by the Government; or (4) specified in the design of work, or incorporated during its construction, renovation, or maintenance.</p> <p>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 <a href="#">BioPreferred website</a>).”</p>
<p><i>Prior SBIR Phase II Awards does not count towards the 25-page limit</i></p>	<p>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.</p>
<p><i>SBA Company Registry Confirmation does not count towards the 25-page limit and must be the last page of the Technical Proposal</i></p>	<p>The confirmation from registering in the database should be included at the end as a PDF document.</p>
<b>Cost Proposal (Appendix C) (Excel or PDF)</b>	
<p><i>Appendix C is available on our website <a href="#">here</a> in Microsoft Excel 2010 format.</i></p> <p><i>Specific instructions for filling out Appendix C are located <a href="#">here</a>.</i></p> <p><i>See the sample cost proposal <a href="#">here</a>.</i></p>	<p>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 <b>may not apply</b> to the proposed project. If such is the case, there is no need to provide information for each and every item. When completing your cost proposal, please consider the following:</p> <ul style="list-style-type: none"> <li>• It is important 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.</li> <li>• Phase I contract awards may include profit. Note: Firm fixed price is the type of contract used for Phase I SBIR awards.</li> <li>• If you plan to participate in the U.S. DOT’s Technical Assistance Program (see Section III (C)(3)) using the U.S. DOT’s vendor, your cost proposal should assume a one-day kick-off meeting in Washington, D.C. and necessary travel to attend. Travel is not</li> </ul>

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

<b>Required Proposal Sections</b>	
	<p>anticipated for Phase I projects otherwise.</p> <ul style="list-style-type: none"> <li>• A firm must note its TIN and Data Universal Numbering System (DUNS) identification number in Appendix C, in the Cost and Pricing Proposal Coversheet. The DUNS is assigned by Dun &amp; Bradstreet, Inc. (See III (D) below). If you are not able to receive a DUNS number before the solicitation deadline, please indicate “Pending” in the DUNS field in the cost proposal. You must have a DUNS number before a contract can be awarded.</li> </ul> <p>Please fill out the spreadsheets as directed. If you are submitting supporting information (e.g., price quotes or subcontractor commitments) 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.) 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 ET no later than February 27, 2015.</p> <p>Proposals that exceed the Phase I Estimated Award Amount listed in <a href="#">Section IX</a> will not be considered for award.</p>
<b>Appendices A, B, and D (PDF)</b>	
<p><i>Proposal Cover Sheet</i> (<a href="#">Appendix A</a>)</p> <p><i>Pages 1-2 of PDF</i></p>	<p>Complete the proposal cover sheet in Appendix A. All pages shall be numbered consecutively beginning with the proposal cover sheet.</p>
<p><i>Project Summary</i> (<a href="#">Appendix B</a>)</p> <p><i>Page 3 of PDF</i></p>	<p>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.</p> <p>The Project Summary must include at a minimum:</p> <ol style="list-style-type: none"> <li>1. A technical abstract with a brief statement of the problem or opportunity, project objectives, and description of the effort.             <ul style="list-style-type: none"> <li>○ <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 may not be considered for award purposes.</li> </ul> </li> <li>2. Anticipated results and potential applications of the proposed</li> </ol>

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

<b>Required Proposal Sections</b>	
	research
<i>SBIR Funding Agreement Certification</i> <i>(Appendix D)</i>  <i>Pages 4-7 of PDF</i>	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).

**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.

The purpose of the Technical Assistance, as defined by the SBA Policy Directive, is to assist SBIR awardees in: (1) making better technical decisions on SBIR projects; (2) solving technical problems that arise during SBIR projects; (3) minimizing technical risks associated with SBIR projects; and (4) commercializing the SBIR products or processes. **The U.S. DOT SBIR Program will provide assistance to Phase I awardees in the area of commercialization planning and strategy.**

- U.S. DOT SBIR awardees can receive Technical Assistance in one of two ways:
- a. Awardees can receive Technical Assistance through the U.S. DOT SBIR Program Office. The U.S. DOT SBIR Program Office will have a contract with a company that can provide technical assistance to Phase I or Phase II awardees. Once a proposal is recommended for award, the prospective awardees will receive

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

notification from the U.S. DOT SBIR Program Office identifying the services available and guidance on how to obtain these services at no cost to the small business. These services include a one-day kick-off meeting in Washington, D.C. with the company providing commercialization assistance and the U.S. DOT topic lead, who will serve as the Contracting Officer Representative. OR

- b. Awardees can receive Technical Assistance outside of the SBIR Program Office; however, this technical assistance must be focused on commercialization. To do so, Offerors must, through its own efforts, obtain its own subcontractor to provide such technical assistance. If recommended for award, the awardee must provide at that time an outline of the specific technical assistance services its proposed subcontractor will provide, and the detailed qualifications and experience of the proposed subcontractor/consultant. If approved by the U.S. DOT SBIR Program Officer and Contracting Officer, the awardee must submit a revised cost proposal (Appendix C) that will provide up to \$5,000 for such technical services.

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 by a team of topic experts 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 may 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 may 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

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

technical 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 will be completed and recommendations for award submitted to the U.S. DOT SBIR Program Office within eight 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 evaluate proposals and make recommendations for award to the U.S. DOT SBIR Program Director.

### F. Selection of Awardees

The U.S. DOT SBIR Program Office will notify each applicant whether it has been selected for an SBIR Phase I award no later than 90 calendar days after the closing date of the solicitation. At this time, 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>.

### G. Time to Award Requirements

The SBIR Program Policy Directive requires all SBIR agencies to make awards 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 SBIR Program Office 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.

### H. Debriefing Requests

Debriefing requests must be submitted by e-mail to the SBIR Program Contracting Officer: [Jeanne.Rossetsky@dot.gov](mailto: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. Written debriefings will be conducted 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 fifteen (15) Phase I contracts, but reserves the right to make 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](http://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 level of effort 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. 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. **Phase II Contract Type and Accounting System Audits.** The Contracting Officer will consider whether a firm fixed-price level of effort type contract or a cost reimbursement type contract is appropriate for the Phase II award. Phase II awardees will be required to have an acceptable accounting system in place to receive a cost-plus-fixed-fee 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

## USDOT SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH PROGRAM

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>.

**3. U.S. DOT SBIR Program Set-aside Budget.** For FY 2015, the U.S. DOT's Operating Administrations will contribute 2.9% 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), the Office of the Secretary (OST), 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 invoices, in accordance with instructions in contract award document, 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.

## USDOT SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH PROGRAM

In all phases, the U.S. DOT must make payment to recipients under SBIR funding agreements in full, subject to audit, 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

## USDOT SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH PROGRAM

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, [c](#). 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 SBCs under the U.S. DOT SBIR Program.

# USDOT SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH 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, measured in labor hours, 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, measured in labor hours, 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 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, and does not 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.

## USDOT SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH PROGRAM

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 Government may terminate the contract if the Government deems termination to be in its best interest. In such case, the contractor may submit its costs 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 and Safety Standards.** 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 Government may terminate the contract if any gratuities were offered to any representative of the Government to secure the contract.

## USDOT SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH PROGRAM

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 “Restrictions on Obtaining and Disclosing Certain Information” (41 U.S.C. §§ 2101-2107, commonly known as the Procurement Integrity Act). This statute, as implemented by Federal Acquisition Regulation (FAR, 48 C.F.R.) §3.104, prohibits the following conduct during an agency procurement: prohibits disclosing procurement information (§2102); prohibits obtaining procurement information (§2102); requires agency officials to report employment contacts regarding non-Federal employment (§2103); and bans for a definitive period certain personnel from accepting compensation from the vendor and the vendor from compensating such certain personnel during this definitive period (§2104). Violations of the statute may result in criminal and/or civil penalties, and administrative actions (e.g., suspension and debarment, cancellation of the procurement, and/or rescission of the contract).
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 (April 2012) 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 I contract for signature prior to award.

## USDOT SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH PROGRAM

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.).

For Phase I, a minimum of two-thirds of the research or analytical effort, measured in labor hours, must be performed by the awardee. For Phase II, a minimum of one-half of the research or analytical effort, measured in labor hours, must be performed by the awardee.

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

3. **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 an 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.

4. **Commercialization Databases.** The SBA is establishing a Commercialization Database that will store commercialization information for SBCs that receive 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 can be used by SBCs and will be used by 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.



## USDOT SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH PROGRAM

### 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 reflects current planning. Although not expected, there may be inconsistencies between the information contained in the FY15.1 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 designated 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.

## USDOT SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH PROGRAM

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, shall be served on the Contracting Officer (addressed as follows):
  - Jeanne Rossetsky, Contracting Officer
  - Volpe Center, RVP-32
  - 55 Broadway
  - Cambridge, MA 02142-1001
  - (617) 494-3853

Additionally, any protest that is filed with the Government Accountability Office (GAO) shall be copied to the above-identified Contracting Officer to be received within one calendar 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. ET on March 9, 2015. 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 submitted as three files:

1. **Technical Proposal** – The technical proposal must be submitted in PDF format in accordance with the following requirements:
  - a. The Technical Proposal shall not exceed 25 pages; the Prior Phase II Awards and SBA Company registry Confirmation do not count towards the 25 pages.
  - b. Font size shall be no smaller than 10 point.
  - c. Proposals shall be on standard letter size pages (8.5" by 11") with 1" margins.
  - d. All pages shall be numbered consecutively.
2. **Cost Proposal (Appendix C)** – The Cost Proposal (Appendix C) can be submitted as an Excel document or PDF and must contain the required supporting information described in the table below.
3. **Appendices A, B, and D** – All other Appendices (A, B, and D) must be saved as one single PDF file.

The proposal file names shall contain eight (8) characters; the first three shall be the topic number 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://volpedb1.volpe.dot.gov/SBIR/submitproposal.aspx>. 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 (FHWA)**

*15.1-FH1: Driver Engagement/Status Monitoring Technologies for Vehicle Automation Applications*

NHTSA's Preliminary Statement of Policy Concerning Automated Vehicles (May 30, 2013): <http://www.nhtsa.gov/About+NHTSA/Press+Releases/U.S.+Department+of+Transportation+Releases+Policy+on+Automated+Vehicle+Development>

*15.1-FH2: Community College – Technical School Intelligent Transportation Systems (ITS) Curricula*

American Association of University Professors report, Best Practices for Electronically Offered Degree and Certificate Programs: <http://www.aaup.org/NR/rdonlyres/BBA85B72-20E9-4F62-B8B5-CDF03CD8A53/0/WICHEDOC.PDF>

### **Federal Railroad Administration (FRA)**

*15.1-FR1: Wireless Compatible Digital Train Line (WiDTL) for Passenger Type Vehicles in a Train Consist*

Association of American Railroads, Manual of Standards and Recommended Practices, Section F: <https://www.aarpublications.com/Publications/Manual%20of%20Standards%20and%20Recommended%20Practices/Section%20F.aspx>

### **National Highway Traffic Safety Administration (NHTSA)**

*15.1-NH1: Improving the Ventilation of Motorcycle Helmets*

Federal Motor Vehicle Safety Standards; Motorcycle Helmets: available at <https://federalregister.gov/a/2011-11367> and <http://www.law.cornell.edu/cfr/text/49/571.218>

## VIII. SUBMISSION FORMS AND CERTIFICATION (Appendices)

### A. [Proposal Cover Sheet \(Appendix A\)](#)

- a. MS Word version of [Appendix A](#) available on our website.

### B. [Project Summary \(Appendix B\)](#)

- a. MS Word Version of [Appendix B](#) available on our website.

### C. [Contract Pricing Proposal \(Appendix C\)](#)

- a. MS Excel Version of [Appendix C](#) is available on our website.

### D. [SBIR Funding Agreement Certification \(Appendix D\)](#)

- a. MS Word Version of [Appendix D](#) available on our website.

### E. [Proposal Checklist \(Appendix E\)](#)

(Do not include with proposal – for Offeror’s use 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. DTRT57-15-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. DTRT57-15-R-SBIR1  
FY15.1  
PROJECT SUMMARY**

Name and Address of Offeror	<b>FOR U.S. DOT USE ONLY</b>
	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. DTRT57-15-R-SBIR1  
FY15.1  
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 ET no later than February 27, 2015.

**D. SBIR FUNDING AGREEMENT CERTIFICATION (Appendix D)**

**U.S. DEPARTMENT OF TRANSPORTATION  
SMALL BUSINESS INNOVATION RESEARCH PROGRAM  
SOLICITATION NO. DTRT57-15-R-SBIR1  
FY15.1  
SBIR FUNDING AGREEMENT CERTIFICATION**

Complete the funding agreement certification on the following pages.

## SBIR Funding Agreement Certification

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

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

If the funding agreement officer believes that the business may not meet certain eligibility requirements at the time of award, they are required to file a size protest with the U.S. Small Business Administration (SBA), who will determine eligibility. At that time, SBA will request further clarification and supporting documentation in order to assist in the verification of any of the information provided as part of a protest. If the funding agreement officer believes, after award, that the business is not meeting certain funding agreement requirements, the agency may request further clarification and supporting documentation in order to assist in the verification of any of the information provided. Even if correct information has been included in other materials submitted to the Federal government, any action taken with respect to this certification does not affect the Government's right to pursue criminal, civil or administrative remedies for incorrect or incomplete information given in the certification. Each person signing this certification may be prosecuted if they have provided false information.

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

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

Yes No

(2) If a corporation, all corporate documents (articles of incorporation and any amendments, articles of conversion, by-laws and amendments, shareholder

meeting minutes showing director elections, shareholder meeting minutes showing officer elections, organizational meeting minutes, all issued stock certificates, stock ledger, buy-sell agreements, stock transfer agreements, voting agreements, and documents relating to stock options, including the right to convert non-voting stock or debentures into voting stock) evidence that it meets the ownership and control requirements set forth in 13 C.F.R. §121.702.

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

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

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

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

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

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

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

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

Yes No

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

Yes No

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

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

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

- Has not been submitted for funding by another Federal agency.
- Has been submitted for funding by another Federal agency but has not been funded under any other Federal grant, contract, subcontract or other transaction.
- A portion has been funded by another grant, contract, or subcontract as described in detail in the proposal and approved in writing by the funding agreement officer.

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

- SBIR Phase I: at least two-thirds (66 2/3%) of the research.
- SBIR Phase II: at least half (50%) of the research.
- Deviation approved in writing by the funding agreement officer: \_\_\_\_\_ %

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

- Yes  No  Waiver has been granted

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

- Yes  No

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

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

(14) It is a Covered Small Business Concern (a small business concern that: (a) was not majority-owned by multiple venture capital operating companies (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.

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

## E. PROPOSAL CHECKLIST (Appendix E)

**U.S. DEPARTMENT OF TRANSPORTATION  
SMALL BUSINESS INNOVATION RESEARCH PROGRAM  
SOLICITATION NO. DTRT57-15-R-SBIR1  
FY15.1  
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. All Appendices have been completed.
- \_\_\_ 8. The TECHNICAL PROPOSAL includes all items identified in Section III.B of the Solicitation.

- \_\_\_ 9. The technical proposal includes the Sustainable Acquisition Requirement provision (Section III.B.)
- \_\_\_ 10. The additional information on prior Phase II awards, if required, in accordance with Section III.B is included.
- \_\_\_ 11. The Contract Pricing Proposal (Appendix C) has been completed and provides the necessary supporting information.
- \_\_\_ 12. The proposal must be submitted online by 11:59 pm ET, March 9, 2015.  
**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 15.1 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.

<b>U.S. DOT Operating Administration</b>	<b>Topic Number &amp; Title</b>	<b>Maximum Number of Anticipated Awards</b>	<b>Estimated Award Amount Phase I*</b>	<b>Estimated Award Amount Phase II**</b>
Federal Highway Administration (FHWA)	15.1-FH1: Driver Engagement/Status Monitoring Technologies for Vehicle Automation Applications	1	\$150,000	\$1,000,000
	15.1-FH2: Community College – Technical School Intelligent Transportation Systems (ITS) Curricula	1	\$125,000	\$750,000
	15.1-FH3: Roadway Hazard Alert System for Motorcycles	1	\$150,000	\$1,000,000
	15.1-FH4: From Vehicle Performance to Transportation System Performance – System Impacts of Automated Vehicles	1	\$150,000	\$700,000
Federal Railroad Administration (FRA)	15.1-FR1: Wireless Compatible Digital Train Line (WiDTL) for Passenger Type Vehicles in a Train Consist	1	\$150,000	\$500,000
	15.1-FR2: Active Personal Safety System for Train Yard and Road Crewworkers	1	\$150,000	\$500,000
	15.1-FR3: Next Generation Freight Truck for Autorack Cars	1	\$150,000	\$500,000

<b>U.S. DOT Operating Administration</b>	<b>Topic Number &amp; Title</b>	<b>Maximum Number of Anticipated Awards</b>	<b>Estimated Award Amount Phase I*</b>	<b>Estimated Award Amount Phase II**</b>
Federal Railroad Administration (FRA)	15.1-FR4: Smart Phone Application for Onboard Railroad Passenger Information System	1	\$150,000	TBD
	15.1-FR5: Browser Based Application for Locomotive Inspection Data Collection	1	\$150,000	TBD
	15.1-FR6: Locomotive Flashing Light for Trespassers and Pedestrians Warning	2	\$150,000	\$1,000,000
	15.1-FR7: Long Range ROW Detection and Warning System	3	\$150,000	\$1,000,000
	15.1-FR8: Passive Rail Temperature Control Technology	1	\$150,000	TBD
	15.1-FR9: Portable Rail Suspension Displacement Monitoring System	2	\$150,000	\$300,000
Federal Transit Administration (FTA)	15.1-FT1: Innovative Transit Technology Devices, Applications, or Solutions Focused on Safety, Mobility, or Energy and Sustainability	3	\$150,000	\$750,000
National Highway Traffic Safety Administration (NHTSA)	15.1-NH1: Improving the Ventilation of Motorcycle Helmets	2	\$100,000	\$300,000

\* 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)

### 15.1-FH1: Driver Engagement/Status Monitoring Technologies for Vehicle Automation Applications

Vehicle manufacturers are releasing advanced technology that can be defined as Level 2 (L2) by the vehicle automation level definitions specified in [NHTSA's Preliminary Statement of Policy Concerning Automated Vehicles](#). Level 2 automation refers to capabilities that can sustain automatic lateral and longitudinal control of the vehicle for extended periods of time but requires the driver to remain attentive at all times and be ready to take over manual control of the vehicle immediately when needed.

There are general concerns over how drivers can be kept engaged in the driving task and how their level of engagement could be effectively ensured or at a minimum monitored by onboard technologies.

This project solicits effective vehicle-based methods/approaches that can enforce that the drivers are engaged with the driving task in both manual and automated driving modes, and monitor and detect the driver's status of engagement in the driving task when the vehicle is placed in L2 automated control.

Some of the high level objectives of this project are:

- Define and document driver engagement challenges and needs during L2 automated driving;
- Query driver engagement and monitoring methods employed by early-to-market L2 automation systems;
- Identify potential gaps in existing methods, approaches and available alternatives, which may or may not be employed by these early-to-market systems, that ensure the driver is ready to take over manual control at a moment's notice;
- Identify potential intentional and unintentional misuses of these types of L2 systems and document conceivable ways to defeat/bypass methods put in place to keep drivers in the loop;
- Develop additional technology needs and requirements to either better enforce engagement of drivers in the primary driving task during L2 automation mode, or to more effectively assess whether and when they are ready and able to take over the driving task. ;
- Propose a technology solution or approach towards a prototype concept that can address the identified gaps.

#### **Expected Phase I Outcomes:**

- Research and document findings in:
  - Driver engagement, monitoring methods employed by early-to-market L2 automation systems;

- Potential gaps in existing methods and approaches and available alternatives (that may or may not be employed by these early-to-market systems) to ensure the drivers are ready to take over at a moment's notice;
  - Potential intentional and unintentional misuses of these types of L2 systems and document conceivable ways to defeat/bypass methods intended to keep drivers in the loop when in L2 automation mode;
  - Additional technology needs and requirements to either better enforce the engagement of drivers in the primary driving task during L2 automation mode, or to more effectively assess whether and when they are ready and able to take over the driving task.
- Propose a technology solution or a concept approach that can address identified requirements and needs.

**Expected Phase II Outcomes:**

- Develop a prototype of the concept approach and perform functional testing in controlled environments.
- Revise the requirements and the concept based on prototype testing.
- Develop and produce limited number of second generation prototype which can be tested under the intended use case scenarios.
- Develop and execute a test plan.

## **15.1-FH2: Community College – Technical School Intelligent Transportation Systems (ITS) Curricula**

Implementing and utilizing Intelligent Transportation Systems (ITS) are becoming mainstream activities for state, local, and regional transportation agencies seeking solutions for increasing the safety and efficiency of existing surface transportation infrastructure. A workforce with a specialized set of knowledge, skills, and abilities (KSAs) is necessary for planning, designing, deploying, operating, and maintaining transportation networks that countless state and city departments of transportation have come to rely upon. However, community college, technical and trade school (CC/TS) curricula rarely provide even a basic introduction to ITS and Connected Vehicle (CV) concepts during a course, degree or certificate program. A 2010 survey of community colleges found that while 19.2 percent report having degrees, certificates or courses with “transportation” in the title, the majority were focused on automotive technologies, commercial driving, or supply chain/logistics. The report notes that the broader skills and training needed for transportation jobs expected to become available over the next decade is lacking.

Transportation engineering educators identify the following curricula trends relating to ITS subject matter:

- Curricula do not comprehensively cover ITS topics as standard practice;
- Most ITS learning is at the graduate university level with few CC/TS ITS-CV courses to build upon;
- Comprehensive ITS education must be inter-disciplinary and taught in disciplines other than engineering;
- Materials covering emerging topics such as connected vehicle technology are lacking; and
- ITS educational resources are rarely targeted toward technical or trade working professionals.

This topic is designed to prepare community college students for entry into well-paying, in-demand careers in ITS and CV by developing an internet-based ITS CC/TS curricula that will become part of a shared public ITS resource. Applications are sought that propose a CC/TS ITS curricula that respond to the dynamic needs of the ITS field, and are designed to: (1) build from commonly accepted ITS core competencies; (2) engage CC/TS students using real-world examples; (3) include multiple disciplines such as technology and technical support, information technology networking, and operations and maintenance; and (4) deliver openly available internet-based educational resources using innovative media applications.

The following provides guidance on potential ITS-related CC/TS curricula products, though specific proposals need not address all elements in the list or be limited by this list:

- Develop ITS courses targeted to specific audiences;
- Develop an on-line ITS certificate program;

- Develop a set of online ITS modules for instructors and professors to use in classrooms and/or for students to access for self-paced learning;
- Develop ITS credit courses allowing students or professionals to learn the basic elements of fields other than their own. For example, an auto mechanic student or trade professional learning about ITS-CV related vehicle electro-mechanical basics and systems.
- Develop a game (internet-based or via mobile app) that teaches basic ITS or CV concepts such as using ITS technology to manage traffic flow or stage emergency response vehicles (optional).

### **Expected Phase I Outcomes:**

Initial Phase I outcomes expected from this topic include a detailed framework that demonstrates the viability, implementation, evaluation, and maintenance of an internet-based ITS CC/TS curricula available for shared public use. The framework will identify the potential market size and customers for the ITS curricula products. The potential customer base may include higher education institutions, CC/TS consortiums, transportation technology vendors, aftermarket industries, and other transportation technology or engineering professional organizations. The framework should be informed by, but not limited to, the guidelines contained in the American Association of University Professors report, Best Practices for Electronically Offered Degree and Certificate Programs (<http://www.aaup.org/NR/rdonlyres/BBA85B72-20E9-4F62-B8B5-CDFF03CD8A53/0/WICHEDOC.PDF>).

### **Expected Phase II Outcomes:**

Future Phase II outcomes may include, but not limited to, design, deployment, and maintenance of an internet-based ITS CC/TS curricula program. This may also include hard copy materials, such as posters or educational learning games, or simulation or testing equipment. As part of Phase II, the commercial viability (business plan) for the CC/TS ITS curricula products will be updated and further detailed.

### **15.1-FH3: Roadway Hazard Alert System for Motorcycles**

Motorcycle Fatalities account for over 14% of all traffic fatalities in the United States but only 0.7% of the total vehicle miles traveled. Furthermore, roughly 93,000 people were injured in motorcycle crashes in the United States in 2012. There are a number of factors that contribute to motorcycle crashes. However, the hazards posed to motorcycle riders are often different than those for drivers of passenger vehicles because of the largely unprotected and vulnerable nature of motorcycle riding. There is a need to make motorcyclists aware of the unique hazards in the riding environment and inform the rider when he/she is in a potentially dangerous situation. For instance, when a passenger vehicle enters a sharp curve too fast, the driver can often apply the brakes to slow down while in the curve. However, in a similar situation for a motorcyclist, the physics of a two-wheeled vehicle make it difficult to apply the brakes while maintaining a safe path through the curve. Additionally, motorcyclists are often more susceptible to temporary roadway conditions associated with work zone projects such as grooving in the pavement or the presence of steel plates. More generally, there are often locations that have high motorcycle crash rates as a result of any number of factors. Therefore, it would be a benefit to the rider to have advanced knowledge of these locations and potential hazards. Through the ever expanding availability of data and connectivity, it may be possible to leverage existing technology and data sources to identify these hazardous locations and provide real-time alerts to riders. These data sources may include crash history information, roadway geometry, traffic alerts, or weather data. These combined resources may be used to alert a rider when he/she is approaching an intersection with a history of motorcycle crashes, assign a risk score to a proposed route, warn of an approaching storm, or other potential motorcycle-specific hazards. It may also be possible to leverage a user community or local agencies such as police departments and departments of transportation (DOTs) to provide updates to the hazard warning system. These warnings could be provided while trip planning or while the rider is on the road.

This effort would ultimately produce a hazard warning prototype that is accessible both on and off the road. Possibilities may include a GPS-based device, cell phone app, or other device that provides connectivity to location data in real-time. Examples of the final form of the device may include a mountable display unit, a heads-up display, or an array of hazard indicators positioned appropriately on the motorcycle. Presumably, the project would leverage technology and functionality that supports an end product in a cost range that is acceptable to the average rider. Given that this technology will be used in the riding environment, special attention needs to be paid to the potential for rider distraction. Additionally, attention should be given to the form of the alerts and consider the human factors elements associated with appropriate advance warning times, the riders ability to perceive the warning, how to present the warning in a fashion that is easily understandable to the rider. Additionally, it is critical that the hazard warnings provide useful information to the rider. Therefore, considerable effort will likely be required to accurately define the hazards and the data requirements for effectively processing the existence of the hazards.

### **Expected Phase I Outcomes:**

The objective of this phase is to conduct research and develop the specifications for a prototype device. This will include the development of the hazard identification process, including the data needs and access requirements. Additionally, any hardware and software requirements to support production of a functional prototype in Phase II will be determined. Finally, a final report describing the proposed hazard identification process, data needs and access, prototype development, proposed field testing protocols, and considerations for Phase II will be submitted.

### **Expected Phase II Outcomes:**

The objective of Phase II is to produce a prototype of functional hazard warning device and demonstrate its functionality through appropriate field testing. The functional device should provide the proposed hazard warnings and support access to all identified data elements and connectivity to the necessary data sources. Additionally, testing will be conducted on the type, perceptibility, and comprehension of the warnings. This includes testing of different warning types, the timing of the warnings, and the ability of the warnings to convey the hazard information effectively. Finally, an expanded field test of the fully functional device will be conducted.



## **15.1-FH4: From Vehicle Performance to Transportation System Performance – System Impacts of Automated Vehicles**

The potential impact of automated vehicles (AVs) on the transportation system has recently been a matter of considerable speculation. US DOT and others have been seeking to better understand the performance of both human drivers and AV applications in detail, in terms of measures such as car following distances, reaction times, and gap acceptance.

Meanwhile, the modeling of a regional transportation network tends to be much less detailed, because it may involve 1,000 – 1,000,000 automated vehicles operating at any given time. At the regional level, the state of the art is to use dynamic traffic assignment with time dependent shortest paths, or microsimulation with simple driver and vehicle behavior models. At this level, modelers are interested in intersection and link performance (capacity, and volume vs. delay).

The challenge is to connect the two levels of modeling, to build a model that provides network (intersection and link) performance for a region with reasonable run times, but at the same time is appropriately sensitive to the differences between the behavior of AV applications and human drivers.

### **Expected Phase I Outcomes:**

- Paper that includes a review of existing car following models and regional transportation models, and how they might be connected.
- Prototype model that captures the benefits of the improved longitudinal control that automation might provide, showing how these translate to improved single lane link performance, both uninterrupted and through a signalized intersection. Demonstrate the appropriate sensitivities to changes in vehicle performance parameters. Show that when the vehicle performance parameters match those of human drivers, that it reasonably replicates the observed volume / speed relationship on a lane.
- Commercialization analysis describing the value that the tools and/or approaches that are described would provide to users, and how the products developed under Phase II could become a commercially viable product, or provide enhanced capabilities to existing commercial products.

### **Expected Phase II Outcomes:**

- Add lane changes, merges and intersection gap acceptance to the model.
- Deliver a model that a region (Metropolitan Planning Organization or city) could use to analyze the transportation system impacts of vehicles with automation applications.

## **B. Federal Railroad Administration (FRA)**

### **15.1-FR1: Wireless Compatible Digital Train Line (WiDTL) for Passenger Type Vehicles in a Train Consist**

Trains currently have electrical train lines which utilize 27-pin jumper cables or boxes with multiple contact pins. Compatibility with Locomotives is also fundamental. (Please refer to the Association of American Railroads (AAR) Manual of Standards and Recommended Practices, Section F<sup>1</sup> for more information about the technology currently in use.)

The objectives for this project will be to determine a solution for WiDTL for Passenger Type vehicles in a Train Consist that provides significant advantages over current technology when deployed, such as:

- All-digital secure control, communication, and monitoring
- High-Speed wireless connectivity backhaul for passenger rail service across the entire train
- High-Quality video and audio streaming services for passenger rail interactive services and public address (PA) system services
- Expandability across passenger railcars to span the entire consist
- Major reduction in cabling, which reduces maintenance and risk factors.

Fail-safe operation is a pre-requisite.

#### **Expected Phase I Outcomes:**

Project will define a Wireless Digital Train Line arrangement for communications on a train. A demonstration mock up showing proof of concept is expected. Estimates of installation costs are also needed.

#### **Expected Phase II Outcomes:**

Prototype development and installation on a representative trainset for field testing and demonstration.

---

<sup>1</sup><https://www.aarpublications.com/Publications/Manual%20of%20Standards%20and%20Recommended%20Practices/Section%20F.aspx>

## **15.1-FR2: Active Personal Safety System for Train Yard and Road Crewworkers**

Currently there are no explicit warning systems in place to alert rail personnel of any unforeseen car movement. This topic seeks the development of a product or products that can be worn or carried by yard personnel that would alert them of imminent danger due to car movement.

### **Expected Phase I Outcomes:**

A report detailing the concept development and design for active personal protective equipment would be a system that is aware of approaching and moving equipment in the immediate proximity of railroad worker and would alert them so as not to be hurt or injured.

### **Expected Phase II Outcomes:**

A prototype system should be developed based on Phase I work and deployed in controlled environment to assess its functionality and effectiveness in improving personnel safety for the railroad workers in the yard.

### **15.1-FR3: Next Generation Freight Truck for Autorack Cars**

Automobile shippers typically demand better ride quality and track-train and dynamics to prevent/reduce damage to automobiles being transported in them. This topic seeks to develop a design for a next generation freight truck for Autorack application in order to provide improved track-train dynamics and higher speed operations. The new truck design should reduce lateral instability, carbody twist and roll, carbody pitch and bounce as well as yaw and sway.

Higher Speeds are anticipated in the future if corridors are shared with High Speed Passenger Rail.

#### **Expected Phase I Outcomes:**

A better ride quality truck not only reduces damage to the shipped automobile but also lead increased operational safety due to improved suspension dynamics required for better ride.

Phase I would investigate and outline potential concepts to achieve the stated goal in a proof of concept report.

#### **Expected Phase II Outcomes:**

In the second phase the concept developed in Phase I would be designed and simulated. If deemed a promising system, a set of two prototype trucks would be manufactured. The awardee and FRA would arrange for testing as a part of the Phase II project.

## **15.1-FR4: Smart Phone Application for Onboard Railroad Passenger Information System**

Railroad passenger information systems have historically been trainline public address systems. Onboard variable message signs are now being used to augment these systems to improve the likelihood of messages being received by the passenger. Today a substantial portion of railroad passengers carry Smart Phones with them as they travel. Being able to deliver train status and trip information to passengers directly to their Smart Phone would clearly improve the communication between train personnel and the public. This would have value both for safety and for passenger convenience. This type of service would also have the potential of providing for better passenger service and improved safety for passengers with disabilities.

Two way communications with the Train Conductor should be considered for use in emergencies and for the benefit of passengers requiring assistance.

Currently most onboard passenger information systems are of proprietary design. An important part of this research would be to establish a standard interface between sign based and PA based passenger information systems which would facilitate their introduction without requiring that all existing systems be replaced.

### **Expected Phase I Outcomes:**

- Outline of Proposed system requirements for consideration by rail industry stakeholders, consisting of passenger service providers, equipment manufacturers and suppliers, owners and operators and proof of concept report.
- Prototype for demonstration of screens and user interfaces to stakeholders.
- Outline of business model describing how systems might be paid for using advertising, railroad and/or government funding.

### **Expected Phase II Outcomes:**

- Successful field demonstration of prototype(s) on a train with an appropriate commuter/passenger railroad partner. (FRA and offeror will determine most appropriate partner.)
- Evidence of acceptance and support for concept from the disability community.

### **15.1-FR5: Browser Based Application for Locomotive Inspection Data Collection**

Proprietary handheld systems for the collection of locomotive inspection data have been introduced over the past few years. Unfortunately, it is difficult to keep these systems current with the state of the art in handheld technologies which changes every two to three years or sooner. Because of the substantial capital investment needed to acquire and deploy a complete railroad rolling stock inspection and maintenance data management system, the proprietary handheld units often become obsolete and unsupported too early in their lifetime. By using a browser as the user interface and an open source data base for the back end, it is hoped that a platform independent tool for collecting, managing and reporting railroad rolling stock inspection data can be developed and demonstrated.

#### **Expected Phase I Outcomes:**

The offeror shall propose alternate approaches to building and maintaining an inspection database. The description of the approach shall include the following for consideration:

- Proposed system requirements.
- Prototypes for demonstration of screens and user interfaces.
- Demonstration of proposed data base and data transfer process.
- Demonstration of a rolling stock inspection report which meets the FRA requirements for locomotives.

#### **Expected Phase II Outcomes:**

- Successful field demonstration of prototype(s) in a shop with an appropriate railroad partner. (FRA and the offeror will determine an appropriate partner.)

## **15.1-FR6: Locomotive Flashing Light for Trespassers and Pedestrians Warning**

Although the number of accidents and fatalities of highway-rail grade crossings has decreased by almost 46 percent in the last decade, there are still approximately 500 railroad-related fatalities - annually- in the United States, with trespassers on the Right of Way (ROW) representing the leading cause of all rail-related deaths. In 2012 alone, there were 841 trespass casualties of which 429, excluding known suicides, resulted in fatal injuries. This data does not include trespass at highway-rail grade crossings.

Most trespassing casualties can be avoided. In order to reduce trespassing casualties, the FRA, together with its safety partners, has been tackling this issue on several fronts; including - conducting and sponsoring several research projects in the area.

One of the ideas to reduce the trespassing casualties of careless pedestrians unlawfully walking on or crossing the ROW is to install a Flashing Light Warning System (FLWS) on the locomotive. Research is needed into the development of a reliable and distinctive locomotive-based FLWS, such as the ones used by police to alert violating vehicles and individuals. The envisioned system would provide the following features:

- Capable of generating a non-harming unique and distinctive flashing light (in terms of color, nature, and frequency) in order to be immediately recognized as a locomotive warning flashing light and never be confused with the police or any other flashing light.
- Has a flashing range of , at least, 0.25 mile; preferably half a mile range so it can be used with High-speed Trains,
- Focused longitudinally throughout the ROW, without spreading laterally (perpendicular to the ROW),
- Able to operate effectively in adverse conditions including heavy snow, fog and/or rain, and
- Easily recognized at any time, day or night.

The ideal system should be able to warn Trespassers ahead of the train (0.25 – 0.6 mile) without offending regular individuals/residences in neighboring areas, those who are not close to the ROW.

### **Expected Phase I Outcomes:**

Outcomes expected from the Phase-I include a detailed designed and manufactured working prototype that satisfies the attributes described above. The prototype will be tested to demonstrate effectiveness in the following two scenarios:

- Static test in any extended road, and
- Dynamic test where the developed prototype is installed on any FRA running equipment (R-4, DOTX-218, or DOTX-216).

It should also estimate the cost of the proposed system (with and without installation) per locomotive. Offer should indicate to what degree the offeror has successfully commercialized products of past projects.

**Expected Phase II Outcomes:**

Phase II efforts include manufacturing and demonstrating a working prototype Flashing Light Warning System installed on a running locomotive (running at 60 mph speed or more) and testing the effectiveness of the system over a period of 3-6 months. The vendor will be required to obtain Railroad collaboration for Phase II. It should also illustrate the best proper installation on the locomotive and the in-cab control button and how it is added to the console.



## **15.1-FR7: Long Range ROW Detection and Warning System**

According to the FRA - Office of Safety Calendar Year Report (1), a total of 1,813 train accidents were reported in 2013. The total Railroad fatalities in 2013 are 708; fatalities at Grade Crossings (GC) are 231, while fatalities due to trespassing accidents are 434. These numbers indicate that trespassing and GC fatalities represented about 94% of the total railroad-related fatalities in 2013.

Most trespassing and GC casualties can be avoided if the proper detection and warning systems used efficiently. In order to reduce trespassing and GC casualties, the FRA, together with its safety partners, has been tackling this issue on several fronts; including - conducting and sponsoring several related research projects in the area.

One of the ideas to reduce trespassing and GC casualties of careless pedestrians unlawfully walking on -or crossing- the ROW is to install a long-range Detecting and Warning System (DWS) associated with the locomotive. Research is needed into the development of a reliable and distinctive locomotive-based DWS that could detect any trespasser, obstacle, or vehicle on the ROW within a range of at least 2-3 miles ahead of the train, and provide immediate warning to the locomotive. The envisioned system would provide the following features:

- Capable of detecting any unlawful target (trespasser, obstacle, or vehicle) on the ROW, within 2-3 miles range ahead of the train, that represents a potential cause of accident/risk.
- Report the detected target to the locomotive driver, so he can act accordingly with the proper decision – including stopping the train.
- Focused longitudinally throughout the ROW, without any obstruction to the regular railroad performance,
- Able to operate effectively in adverse conditions including heavy snow, fog and/or rain, and
- Capable of filtering out fault-positive incidents.

The ideal system should be able to warn the locomotive 2-3 miles before reaching the risk target.

### **Expected Phase I Outcomes:**

Outcomes expected from the Phase-I include a detailed designed and manufactured working prototype that satisfies the attributes described above. The prototype will be tested to demonstrate effectiveness in any extended road, with driving vehicle/truck representing the train locomotive.

It should also estimate the cost of the proposed system (with and without installation) per locomotive. Offer should indicate to what degree the offeror has successfully commercialized products of past projects.

**Expected Phase II Outcomes:**

Phase II efforts include manufacturing and demonstrating a working prototype Detecting and Warning System installed on a running locomotive (running at 60 mph speed or more) and testing the effectiveness of the system over a period of 3-4 months. The vendor will be required to obtain Railroad collaboration for Phase II. It should also illustrate the best proper installation on -or connection to- the locomotive and the in-cab control device and how it is added to the console.

## **15.1-FR8: Passive Rail Temperature Control Technology**

Steel railroad rails lengthen and contract in response to thermal changes in their local environment. Excessive heat can cause rails to lengthen to the point where the railroad track becomes unstable and may buckle. Rails can heat to over 130 degrees (F) on warm summer days.

This topic seeks to develop a passive technology to control the peak temperatures in rail. The ideal system would reduce peak rail temperatures by approximately 20 degrees (F) or more. The technology to be developed should be passive (unpowered, or self-powered), maintenance-free, and shall not interfere with rail operations. The best technologies will have low acquisition and life cycle costs to facilitate wide-spread adoption and use by the rail industry.

### **Expected Phase I Outcomes:**

It is expected that the technology proposed be designed, prototyped, and demonstrated in a laboratory and/or simulated railroad environment. A final report demonstrating proof of concept is required.

### **Expected Phase II Outcomes:**

It is expected that the technology from Phase 1 program will be further demonstrated in an active railroad environment for at least 300 yards of railroad track. This will require a railroad's participation and concurrence. The FRA would help by providing initial contacts at the research offices of potential participating railroads. The awardee is responsible for all coordination with the railroad.

## **15.1-FR9: Portable Rail Suspension Displacement Monitoring System**

Monitoring rail car suspension deflection is important for a number of reasons including model validation, qualification testing, and to ensure that suspension systems are maintained in fit for service condition and operate as intended. It can be accomplished using one of many different sensors technologies from which to choose including linear potentiometers, non-contact sensors, and linear variable differential transformer (LVDT) position sensors. Historically, installation and use of such instrumentation was expensive and cumbersome. Advances in electronics and data acquisition systems have made such instrumentation cheaper, portable, and easier to use. The FRA seeks to develop a portable system for monitoring deflection of rail car suspensions. It is highly desirable that the system is designed using wireless technology and such that it can be integrated into existing portable systems currently being used for monitoring suspension performance (in particular accelerometer based ride quality systems).

### **Expected Phase I Outcomes:**

The outcome of Phase I should include a proof-of-concept paper and a prototype. A wired design is acceptable for Phase I.

### **Expected Phase II Outcomes:**

In this phase, a wireless system should be integrated into existing portable systems currently being used by FRA for monitoring suspension performance (in particular accelerometer based ride quality systems).

## C. Federal Transit Administration (FTA)

### 15.1-FT1: Innovative Transit Technology Devices, Applications, or Solutions Focused on Safety, Mobility, or Energy and Sustainability

America's public transportation systems face many current and future challenges that will impact ability to provide safe and reliable service to meet growing demand. Ridership is at its highest level in generations, and growing. At the same time, the national backlog for repairs and maintenance of existing transit infrastructure stands at about \$86 billion and projections indicate the backlog will grow by more than \$2.5 billion per year. These larger trends are happening at a time when the industry faces technological change and a growing demographic that will intensify the demand for innovative technologies to make transit systems even more efficient and readily available to meet this demand.

The FTA, through the U.S. DOT's SBIR program, provides leadership and partnership with the transit industry to meet these challenges while mirroring to the extent possible, the U.S. DOT's strategic goals:

- Safety - Improve public health and safety by reducing transportation-related fatalities and injuries for all users, working toward no fatalities across all modes of travel;
- State of Good Repair - Ensure the U.S. proactively maintains critical transportation infrastructure in a state of good repair;
- Economic Competitiveness - Promote transportation policies and investments that create ladders of opportunity, support strong communities, and bring lasting and equitable economic benefits to the Nation and its citizens;
- Quality of Life in Communities - Foster quality of life in communities by integrating transportation policies, plans, and investments with coordinated housing and economic development policies to increase transportation choices and access to transportation services for all; and,
- Environmental Sustainability - Advance environmentally sustainable policies and investments that reduce carbon and other harmful emissions from transportation sources, reduce our nation's dependence on foreign oil, improve air quality, and promote public health.

#### **Expected Phase I Outcomes:**

For this SBIR solicitation, FTA is seeking exploratory proposals that will demonstrate innovative, economic, accurate, and durable technologies, devices, applications, or solutions to meet one or more goals of the U.S. DOT to significantly improve current transit-related service, system or application, including transit vehicle operation, safety, infrastructure and environmental sustainability, mobility and rider experience, or broadband communication.

Priority will be given to technology devices, applications, or solutions in the following strategic areas:

- Safety – subtopic examples (but not limited to) are Traveler; Pedestrian and Bicycle; Paratransit, Bus, and Rail Safety Technologies;
- Mobility – subtopic examples (but not limited to) are Multimodal Connectivity, Accessibility and Traveler Experience, Ridesharing and Fare Payment technologies; and
- Energy and Sustainability - subtopic examples (but not limited to) are Green and Zero Emissions Transit Vehicles and Accessories, Facilities, and Fleet Technologies.

The innovation must be adaptable to existing bus and rail transit vehicles, systems, and infrastructure and benefit transit riders, agencies, or transit industry, in general. Project proposals must include a methodology on how the small business will use data to quantitatively demonstrate that its recommended technology innovation can truly improve transit service, system, or application. Outcomes include:

1. A viable concept that demonstrates the technology, application, or solution in a transit environment to improve service or infrastructure
2. Efficient and low-cost technology
3. Modular, interoperable, plug-and-play and open source (if applicable) device(s)
4. Technology assessment with respect to industry best practices
5. Feasibility analysis (data proven) for success in developing a working prototype

**Expected Phase II Outcomes:**

Phase II efforts include demonstrating, manufacturing and showing feasibility of commercialization of a working prototype of the technology and device or application or solution with all of the above listed Phase I outcomes.

## **D. National Highway Traffic Safety Administration (NHTSA)**

### **15.1-NH1: Improving the Ventilation of Motorcycle Helmets**

Wearing a motorcycle helmet that meets the Federal Motor Vehicle Safety Standard (FMVSS) No. 218<sup>2</sup>, “Motorcycle helmets,” is one of the most effective measures available to a rider to reduce the risk of a fatality or serious brain injury in the event of a crash. Nonetheless, many riders choose not to wear a helmet for a variety of reasons, one of them being that they find wearing a helmet to be uncomfortable. Helmets may be especially uncomfortable when worn in warm weather. Manufacturing helmets with ventilation systems that improve comfort and also meet safety standards is challenging. For example, helmets that have ventilation holes may not withstand the “penetration test” required by FMVSS No. 218. There are ventilation systems, however, that do not rely on holes in the outer shell.

#### **Expected Phase I Outcomes:**

The Phase I goal of this research project is a concept development for a helmet ventilation system that provides adequate ventilation yet complies with the safety requirements in FMVSS No. 218. The proposed ventilation system should result in a helmet that improves the comfort of the helmet, is convenient and easy to use, affordable, and does not introduce new risks to the rider.

The awardee shall develop a maximum of three concepts for helmets with ventilation systems. One of the candidate helmets must meet all of FMVSS No 218 requirements including the penetration test; the other candidate helmet(s) does not have to meet the penetration test requirement. Phase 1 concept development should include at least a design, supporting documentation and some simulation to evaluate its potential effectiveness. Prototypes will be accepted but are beyond the Phase I requirements.

#### **Expected Phase II Outcomes:**

For Phase II, the awardee will prototype and evaluate the candidate ventilation mechanisms developed in Phase I by developing a prototype helmet(s) that demonstrates the ventilation system. The awardee will evaluate the demonstration helmet(s) in terms of the effectiveness of the ventilation technology, the helmet safety performance, comfort, cost effectiveness and practicality.

---

<sup>2</sup>Available at: <https://federalregister.gov/a/2011-11367> and <http://www.law.cornell.edu/cfr/text/49/571.218>