



U. S. Department  
of Transportation

DTRT57-14-R-SBIR2

FY14.2

## **PROGRAM SOLICITATION**

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

**NAICS CODE: 541712**

**Issue Date: July 14, 2014**

**Closing Date: September 15, 2014**

**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**

## **TECHNICAL QUESTIONS**

Technical questions pertaining to the FY14.2 U.S. DOT SBIR solicitation research topics must be submitted to the U.S. DOT SBIR Program Office via email at [dotsbir@dot.gov](mailto:dotsbir@dot.gov). All questions must be submitted by email.

Please note that technical questions will be accepted through September 8, 2014 at 11:59 pm EDT. Questions received after September 8, 2014, but before the solicitation close date and time, may not be answered. The U.S. DOT SBIR Program Office will submit all technical questions to the research topic authors for response. Answers will be posted in the Current Solicitation section of the U.S. DOT SBIR Program website:  
<http://www.volpe.dot.gov/work-with-us/small-business-innovation-research/solicitations>.

## **PRE-PROPOSAL WEBINAR**

A pre-proposal webinar for small business concerns (SBC) interested in applying will be held on Wednesday, **July 29, 2014 at 1:30 pm EDT**. 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 the link below. 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.

**Registration Link:** <https://volpecenter.webex.com/volpecenter/onstage/g.php?d=642462508&t=a>

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# 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>.

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## B. Three Phase Program

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

### **THIS SOLICITATION IS FOR PHASE I PROPOSALS ONLY.**

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

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

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

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

**Sequential Phase II awards.** The SBIR Program Policy Directive permits agencies to issue one additional, sequential Phase II award to continue the work of an initial Phase II award. These awards 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.

**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

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agreement. Phase III is funded by sources other than the set-aside funds dedicated to the SBIR Program. Phase III work is typically oriented toward commercialization of SBIR research or technology and may be for products, production, services, R/R&D or a combination thereof. The following activities are types of SBIR Phase III work:

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

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

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

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



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## D. Contact Information

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

Technical questions pertaining to the FY14.2 U.S. DOT SBIR solicitation research topics must be submitted to the U.S. DOT SBIR Program Office at [dotsbir@dot.gov](mailto:dotsbir@dot.gov).

Please note that technical questions will be accepted through September 8, 2014 at 11:59 pm EDT. Questions received after September 8, 2014, but before the solicitation close date and time, may not be answered. All answers to questions received before September 9, 2014 will be posted to the website.

The U.S. DOT SBIR Program Office will submit all questions to the research topic authors for response. Answers will be posted on the U.S. DOT SBIR Program website (<http://www.volpe.dot.gov/work-with-us/small-business-innovation-research/solicitations>) under Current Solicitations/ Technical Questions and Answers for FY 14.2 Solicitation.

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

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

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

## E. Definitions

1. Research or Research and Development (R/R&D) means any activity which is:
  - A systematic, intensive study directed toward greater knowledge or understanding of the subject studied;
  - A systematic study directed specifically toward applying new knowledge to meet a recognized need; or

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- A systematic application of knowledge toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.

### 2. Small Business Concern (SBC)

SBA has amended the definition for the term “small business concern” by simply referencing its size regulations at 13 C.F.R. § 121.701-705. To view the definition of small business concern, click on the following link:

<http://www.gpo.gov/fdsys/search/pagedetails.action?browsePath=Title+13%2FChapter+I%2FPart+121%2FSubpart+A%2FSubjgrp%2FSection+121.702&granuleId=CFR-2011-title13-vol1-sec121-702&packageId=CFR-2011-title13-vol1>.

The size regulations define the ownership and size requirements for the SBIR and STTR Programs. SBA has recently finalized a rule amending those regulations and the definition of “small business concern” for purposes of the SBIR and STTR Programs as a result of certain provisions of the Reauthorization Act (see *Federal Register* Vol. 77, No. 248, page 76215 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.

### 3. Socially and Economically Disadvantaged Small Business Concern

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

### 4. Women-Owned Small Business Concern

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

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### 5. Veteran-Owned Small Business

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

### 6. Subcontract

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

### 7. Historically Underutilized Business Zone (HUBZone)

The criteria to be a HUBZone Small Business Concern can be found at:

<http://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=9096292d442b42246cbecf21f04833bd&r=PART&n=13y1.0.1.1.21#13;1.0.1.1.21.1.295.4>

### 8. Service Disabled Veteran-Owned Concern

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

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

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

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### 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 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). An automated notice will be sent via email when the proposal is received through the SBIR Program's electronic submission process.

#### B. Proposal Submission Requirements

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

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

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2. Proposal Layout

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

<b>Required Proposal Sections</b>	
<b>Proposal Cover Sheet (Appendix A)</b>	Complete the proposal cover sheet in Appendix A as pages 1 and 2 of the proposal. All pages shall be numbered consecutively beginning with the proposal cover sheet.
<b>Project Summary (Appendix B)</b>	<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>o <u>The technical abstract shall be limited to 200 words in the space provided on the Project Summary sheet.</u> Any words or statements beyond the 200-word limit will not be considered for award purposes.</li> </ul> </li> <li>2. Anticipated results and potential applications of the proposed research</li> </ol>
<b>Technical Content</b>	<p>Submitted proposals must include the following headings in bold (in cases where a section does not apply, please state "Not Applicable"):</p> <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</li> </ol>

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	<p>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.</p> <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 it relates to the proposed effort, and any planned coordination with outside sources. The SBC must persuade reviewers of its awareness of recent key R/R&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,</p>
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	<p>it is unlawful to enter into contracts or grants requiring essentially equivalent effort. If there is any question concerning this, it must be disclosed to the soliciting agency or agencies before award. If an SBC elects to submit similar or identical proposals containing equivalent work under other federal program solicitations, a statement must be included in each proposal indicating:</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> </ul> <p><b>11. Prior SBIR Phase II Awards.</b> 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. <b>Required proposal information in item #11 shall not be counted toward the page limitation.</b></p>
<p><b>Sustainable Acquisition Requirement</b></p>	<p>The SBC's technical proposal will also be used as the Statement of Work (SOW) under any contract award resulting from this solicitation under SBIR Phase I or II. Consistent with FAR Part 23, each SBC is expected to include the following provision in its technical proposal:</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</p>

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	<p>biobased product provided and delivered must meet, but may exceed, the minimum recovered materials or biobased content of an EPA- or USDA-designated product. The sustainable acquisition requirements specified herein apply only to products that are required to be: (1) delivered to the Government during performance; (2) acquired by the contractor for use in performing services (including construction) at Federally-controlled facility; (3) furnished by the contractor for use by the Government; or (4) specified in the design of work, or incorporated during its construction, renovation, or maintenance.</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="#">Biobased website</a>).</p>
<p><b>Cost Breakdown/ Proposed Budget (Appendix C)</b></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. It is important, however, to provide enough information to allow the U.S. DOT to understand how the SBC plans to use the requested funds if a contract is awarded. Phase I contract awards may include profit. Note: Firm fixed price is the type of contract used for Phase I SBIR awards.</p> <p><b>Appendix C</b> is available on our website <a href="#">here</a> in Microsoft Excel 2010 format. Specific <b>instructions for filling out Appendix C</b> are located <a href="#">here</a>. 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 <b>DOT SBIR’s automated proposal site</b> which is located <a href="#">here</a>. 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 EDT no later than September 8, 2014.</p> <p>A firm must note its TIN and DUNS number in Appendix C, in the</p>

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	<p>Cost and Pricing Proposal Coversheet. The DUNS number is assigned by Dun &amp; Bradstreet, Inc. (See III (C) below).</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> <p><b>This required proposal information shall not be counted toward the page limitation.</b></p>
<p><b>SBIR Funding Agreement Certification (Appendix D)</b></p>	<p><b>This required proposal information shall not be counted toward the page limitation.</b></p>
<p><b>SBA Company Registry Confirmation</b></p>	<p>The confirmation from registering in the database should be included at the end as a PDF document. <b>This required proposal information shall not be counted toward the page limitation.</b></p>

**C. Other Proposal Information**

1. Proposals will be available only to the U.S. DOT team of engineers and/or scientists responsible for evaluating the proposal, the U.S. DOT SBIR Program Office, and Volpe Center staff pertinent to the SBIR program, such as the Volpe Center’s Office of Acquisition.
2. **Fraudulent Information.** Submitting plagiarized information and/or false proposal information pertaining to the company, the principal investigator and/or work to be performed may result in:
  - a. Cancellation of the topic within a solicitation;
  - b. A proposal being deemed non-responsive;
  - c. A recommendation for Phase I award being rescinded; or
  - d. Termination of an award.
3. **Discretionary Technical Assistance.** The SBIR Program Policy Directive permits an agency to provide technical assistance to an SBIR awardee in an amount not more than \$5,000 per year. This amount is in addition to the award amount. Also, the SBC can acquire the technical assistance services itself. The SBC must demonstrate that the individual or entity selected can provide the specific technical services needed and provide the details in the proposal. If the SBC demonstrates this requirement sufficiently, the U.S. DOT must allow the SBC to acquire the needed technical assistance itself, as an allowable cost.
4. **National Institute of Standards and Technology (NIST)/Hollings Manufacturing Extension Partnership (MEP).** An SBC may wish to contact its local NIST Hollings

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

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

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

## IV. METHOD OF SELECTION AND EVALUATION CRITERIA

### A. General

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

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

### B. Evaluation Criteria

The evaluation process involves the following factors:

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

### C. Prescreening

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

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

### D. Schedule

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

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

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

### F. Selection of Awardees

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

### G. Time to Award Requirements

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

### H. Debriefing Requests

Debriefing requests must be submitted by e-mail to the SBIR Program Contracting Officer: [Jeanne.Rossetsky@dot.gov](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 through the issuance of a letter by the SBIR

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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 with the possibility for additional or fewer awards. The actual number of contract awards is subject to the availability of funding and the responses from small business firms to the solicited research topics described in Section IX.

1. **Dollar Value of Awards.** The SBIR Program Policy Directive sets the maximum thresholds for Phase I and Phase II awards at \$150,000 and \$1,000,000, respectively. SBA may adjust these amounts every year for inflation and will post the adjusted numbers on [www.sbir.gov](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. **Accounting System Audits.** 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 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



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the DCAA website: <http://www.dcaa.mil>. The Contracting Officer will consider whether a fixed-price type contract or a cost reimbursement type contract is appropriate for the Phase II award.

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

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

### D. Innovations, Inventions, and Patents

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

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

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

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

2. The U.S. DOT prefers that SBC proposals avoid the inclusion of proprietary data. If the inclusion of proprietary data is considered essential for meaningful evaluation of a proposal submission, such data should be provided on a separate page with a numbering system to key it to the appropriate place in the proposal.
3. Rights in Data Developed under SBIR Contracts. Rights in technical data, including software developed under any contract resulting from this solicitation, shall remain with

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the SBC except that the Government shall have the limited right to use such data for Government purposes and shall not release such data outside the Government without permission of the SBC for a period of four years from completion of the project from which the data was generated. However, effective at the conclusion of the four-year period, the Government shall retain a royalty free license for Federal Government use of any technical data delivered under an SBIR contract whether patented or not.

4. Copyrights. With prior written permission of the Contracting Officer, the SBC normally may copyright and publish (consistent with appropriate national security considerations, if any) material developed with U.S. DOT support. The U.S. DOT receives a royalty free license for the Federal Government and requires that each publication contain an appropriate acknowledgement and disclaimer statement.
5. Patents/Invention Reporting. SBCs normally may retain the principal worldwide patent rights to any invention developed with Government support. The Government receives a royalty free license for Federal Government use, reserves the right to require the patent holder to license others in certain circumstances, and requires that anyone exclusively licensed to sell the invention in the United States must normally manufacture it domestically. To the extent authorized by 35 U.S.C. 205, the Government will not make public any information disclosing a Government-supported invention for a two-year period to allow the SBC a reasonable time to pursue a patent.
6. Invention Reporting Process. Awardees shall report SBIR inventions to the U.S. DOT through the iEdison Invention Reporting System, <http://www.iedison.gov>. Use of the iEdison System satisfies all invention reporting requirements mandated by any award.

### **E. Cost Sharing**

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

### **F. Profit or Fee**

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

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

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## 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 numerous Federal Acquisition Regulation (FAR) and Transportation Acquisition Regulation (TAR) contract clauses. The FAR and TAR can be found using the following links:

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

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

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

## J. Summary Statements

1. **Standards of Work.** Work performed under the contract must conform to high professional standards.
2. **Inspection.** Work performed under the contract is subject to Government inspection and evaluation at all times.

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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.** 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.

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14. **Patent Infringement.** The contractor shall report each notice or claim of patent infringement based on the performance of the contract to the SBIR Program Contracting Officer.
15. **Procurement Integrity.** Submission of a proposal under this solicitation subjects the Offeror to the procurement integrity provision (§27) of the Office of Federal Procurement Policy Act (41 U.S.C. 423). This statute, as implemented by Federal Acquisition Regulation (FAR, 48 C.F.R.) §3.104, prohibits the following conduct by competing vendors during an agency procurement: contacting, offering or discussing future employment or business opportunities with an agency procurement official; compensating an agency procurement official; and/or soliciting or obtaining proprietary or source selection information regarding the procurement. Violations of the statute may result in criminal and/or civil penalties, suspension and debarment, cancellation of the procurement, rescission of the contract, or other appropriate remedy.
16. **Section 508 Access Board Standards.** All electronic and information technology deliverables rendered must comply with Section 508 of the Rehabilitation Act and the Access Board Standards available for viewing at <http://www.section508.gov>. Unless otherwise indicated, the contractor represents by signature on a contract that all deliverables will comply with the Access Board Standards.
17. **Government Property.** Equipment either furnished or acquired under this contract is subject to FAR Clause 52.245-1 Government Property (August 2010) and SBIR Program Policy Directive, Section 8 (c).

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

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

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

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

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

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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.

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### L. Corrective Actions

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

### M. Additional Information

1. This solicitation is intended for informational purposes and reflects current planning. Although not expected, there may be inconsistencies between the information contained in the FY14.2 solicitation and the terms and conditions of any resulting SBIR contract. The terms of the contract once executed are controlling.
2. Before award of an SBIR contract, the SBC shall complete an Online Representations and Certifications Application at <https://www.sam.gov>. The SBC shall be certified in the appropriate NAICS code (541712).
3. The Government may request the SBC to submit additional management, personnel, and financial information to assure responsibility of the SBC.
4. The Government is not responsible for any monies expended by the SBC before award of any contract.
5. This solicitation is not an offer by the Government and does not obligate the Government to make any specific number of awards. Also, awards under this program are contingent upon the availability of funds.
6. The U.S. DOT SBIR Program is not a substitute for existing unsolicited proposal mechanisms. Unsolicited proposals shall not be accepted under the U.S. DOT SBIR Program in either Phase I or Phase II. For information pertaining to submission requirements for unsolicited proposals please refer to the U.S.DOT's Guidelines for Unsolicited Proposal Submission: <http://www.volpe.dot.gov/work-with-us/guidelines-unsolicited-proposal-submission>.
7. If an award is made pursuant to a proposal submitted under this solicitation, the SBC will be required to certify that it has not previously been, and is not currently being paid for essentially equivalent work by any agency of the Federal Government.



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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, a copy of 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. EDT on September 15, 2014. Proposals received after that time will be automatically rejected; no exception will be permitted.

### B. Submission Details

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

### C. Submission Address

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

**VII. SCIENTIFIC AND TECHNICAL INFORMATION SOURCES**

Please see the research topic descriptions found in in Section IX.

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

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

- a. MS Word version of [Appendix A](#) available on our website  
([www.volpe.dot.gov/work-with-us/small-business-innovation-research](http://www.volpe.dot.gov/work-with-us/small-business-innovation-research))

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

- a. MS Word Version of [Appendix B](#) available on our website  
([www.volpe.dot.gov/work-with-us/small-business-innovation-research](http://www.volpe.dot.gov/work-with-us/small-business-innovation-research))

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

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

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

(Do not include with proposal – for Offeror’s use only)

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

**U.S. DEPARTMENT OF TRANSPORTATION  
SMALL BUSINESS INNOVATION RESEARCH PROGRAM  
SOLICITATION NO. DTRT57-14-R-SBIR2  
FY14.2  
PROPOSAL COVER SHEET**

Project Title:

Research Topic No.:

Research Topic Title:

Submitted by: Company Name

Address

City, State, Zip

Representations & System for Award Management Valid Until \_\_\_\_\_(Date) <https://www.sam.gov>  
Certifications\*:

Amount Requested \*\*: \$ \_\_\_\_\_

Proposed Duration (in months) (Not to exceed 6 months) : \_\_\_\_\_

Congressional District No.\*\*\*: \_\_\_\_\_

\*If your SAM account has not been validated, please put “pending”

\*\* May be up to \$150, 000 unless otherwise indicated in Section IX

\*\*\* To locate your congressional district number, proceed to the link: <http://www.govtrack.us/congress/members>

By signing and submitting this coversheet under Solicitation No. DTRT57-14-R-SBIR2, Topic No. \_\_\_\_\_, this form certifies that:

1. The above firm, together with its affiliate’s \_\_\_\_\_ is \_\_\_\_\_ is not a small business firm and meets the definition stated in Section I.E; and that it meets the eligibility requirement in Section I.C.
2. The SBIR Applicant is (check one):
  - a.  at least 51% owned and controlled by one or more individuals who are citizens of the United States, or permanent resident aliens in the United States; or
  - b.  at least 51% owned and controlled by another business concern that is itself at least 51% owned and controlled by individuals who are citizens of, or permanent resident aliens in the United States; or
  - c.  a joint venture in which each entity to the venture meets the requirements set forth in 2.a or 2.b above.
3. The above firm, \_\_\_\_\_ will \_\_\_\_\_ will not primarily employ the Principal Investigator at the time of award and during the conduct of research.
4. The above firm \_\_\_\_\_ does \_\_\_\_\_ does not qualify as a socially or economically disadvantaged small business as defined in Section I. E. (The information is for statistical purposes only.)
5. The above firm \_\_\_\_\_ does \_\_\_\_\_ does not qualify as a women-owned small business as defined in Section I. E. (The information is for statistical purposes only.)
6. The above firm \_\_\_\_\_ does \_\_\_\_\_ does not qualify as a HUB Zone-owned small business and meet the definition as stated in this Section I.E.

7. The above firm and/or Principal Investigator \_\_\_\_\_ has, \_\_\_\_\_ has not submitted proposals containing the same, or a significant portion of equivalent or overlapping work to other Federal agencies. (If yes, identify proposals. See Section III. B.)
8. The above firm and/or Principal Investigator \_\_\_\_\_ has, \_\_\_\_\_ has not been funded under any other Federal grant, contract or subcontract program solicitations, or has received other Federal awards to conduct essentially equivalent work or overlapping work. (If yes, identify proposals in Section III. B.)
9. The Principal Investigator's primary employment \_\_\_\_\_ is, \_\_\_\_\_ is not with the above firm.
10. The above firm \_\_\_\_\_ will, \_\_\_\_\_ will not permit the Government to disclose the title and technical abstract of your proposed project, plus the name, address, and telephone number of the Corporate/Business Official and Principal Investigator of your firm, if your proposal is recommended for award, to any party that may be interested in contacting you for further information?
11. By signing and submitting this proposal, you are authorizing the U.S. DOT SBIR Program permission to disclose the title and abstract of the proposed project, as well as the name and other information of the corporate official to appropriate local and state economic development organizations, if the proposal does not result in an SBIR award.

By signing and submitting this proposal in response to Solicitation No. DTRT57-14-R-SBIR1, Topic No. \_\_\_\_\_, I am representing on my own behalf, and on behalf of the SBIR applicant, that the information provided in this certification, the application, and all other information submitted in connection with this application, is true and correct as the date of the submission. I acknowledge that any intentional or negligent misrepresentation of the information contained in this certification may result in criminal, civil or administrative sanctions, including but not limited to: (1) fines, restitution and/or imprisonment under 18 U.S.C. § 1001; (2) treble damages and civil penalties under the False Claims Act (31 U.S.C. § 3729 *et seq.*); (3) double damages and civil penalties under the Program Fraud Civil Remedies Act (31 U.S.C. § 3801 *et seq.*); (4) civil recovery of award funds, (5) suspension and/or debarment from all Federal procurement and non-procurement transactions (FAR Subpart 9.4 or 2 C.F.R. part 180); and (5) other administrative penalties including termination of SBIR awards.

Principal Investigator	Corporate/Business Official
Name _____	Name _____
Title _____	Title _____
Address _____	Address _____
Address _____	Address _____
Telephone No. _____	Telephone No. _____
E-mail _____	E-mail _____
Signature _____ Date _____	Signature _____ Date _____

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

**B. PROJECT SUMMARY (Appendix B)**

**U.S. DEPARTMENT OF TRANSPORTATION  
SMALL BUSINESS INNOVATION RESEARCH PROGRAM  
SOLICITATION NO. DTRT57-14-R-SBIR2  
FY14.2  
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.

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

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## C. CONTRACT PRICING PROPOSAL (Appendix C)

**U.S. DEPARTMENT OF TRANSPORTATION  
SMALL BUSINESS INNOVATION RESEARCH PROGRAM  
SOLICITATION NO. DTRT57-14-R-SBIR2  
FY14.2  
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 EDT no later than September 8, 2014.

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

**U.S. DEPARTMENT OF TRANSPORTATION  
SMALL BUSINESS INNOVATION RESEARCH PROGRAM  
SOLICITATION NO. DTRT57-14-R-SBIR2  
FY14.2  
SBIR FUNDING AGREEMENT CERTIFICATION**

Complete the funding agreement certification on the following pages.

### SBIR Funding Agreement Certification – Time of Award

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

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

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

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

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

1. The business concern meets the ownership and control requirements set forth in 13 C.F.R. §121.702.  
 Yes       No
  
2. If a corporation, all corporate documents (articles of incorporation and any amendments, articles of conversion, by-laws and amendments, shareholder meeting minutes showing director elections, shareholder meeting minutes showing officer elections, organizational meeting minutes, all issued stock certificates, stock ledger, buy-sell agreements, stock transfer agreements, voting agreements, and documents relating to stock options, including the right to convert non-voting stock or debentures into voting stock) evidence that it meets the ownership and control requirements set forth in 13 C.F.R. §121.702.  
 Yes       No       N/A Explain why N/A: \_\_\_\_\_
  
3. If a partnership, the partnership agreement evidences that it meets the ownership and control requirements set forth in 13 C.F.R. §121.702.  
 Yes       No       N/A Explain why N/A: \_\_\_\_\_

4. If a limited liability company, the articles of organization and any amendments, and operating agreement and amendments, evidence that it meets the ownership and control requirements set forth in 13 C.F.R. §121.702.  
 Yes     No     N/A Explain why N/A: \_\_\_\_\_
  
5. The birth certificates, naturalization papers, or passports show that any individuals it relies upon to meet the eligibility requirements are U.S. citizens or permanent resident aliens in the United States.  
 Yes     No     N/A Explain why N/A: \_\_\_\_\_
  
6. It has no more than 500 employees, including the employees of its affiliates.  
 Yes     No
  
7. SBA has not issued a size determination currently in effect finding that this business concern exceeds the 500 employee size standard.  
 Yes     No
  
8. During the performance of the award, the principal investigator will spend more than one half of his/her time as an employee of the awardee or has requested and received a written deviation from this requirement from the funding agreement officer.  
 Yes     No     Deviation approved in writing by funding agreement officer: \_\_\_\_\_%
  
9. All, essentially equivalent work, or a portion of the work proposed under this project (check the applicable line):  
 Has not been submitted for funding by another Federal agency.  
 Has been submitted for funding by another Federal agency but has not been funded under any other Federal grant, contract, subcontract or other transaction.  
 A portion has been funded by another grant, contract, or subcontract as described in detail in the proposal and approved in writing by the funding agreement officer.
  
10. During the performance of award, it will perform the applicable percentage of work unless a deviation from this requirement is approved in writing by the funding agreement officer (check the applicable box and fill in if needed):  
 SBIR Phase I: at least two-thirds (66 2/3%) of the research.  
 SBIR Phase II: at least half (50%) of the research.  
 Deviation approved in writing by the funding agreement officer: \_\_\_\_\_%
  
11. During performance of award, the research/research and development will be performed in the United States unless a deviation is approved in writing by the funding agreement officer.  
 Yes     No     Waiver has been granted
  
12. During performance of award, the research/research and development will be performed at my facilities with my employees, except as otherwise indicated in the SBIR application and approved in the funding agreement.  
 Yes     No

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

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

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

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

Yes     No

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

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

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

<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. DTRT57-14-R-SBIR2  
FY14.2  
PROPOSAL CHECKLIST**

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

- \_\_\_ 1. The proposal reflects the fact that for Phase I a minimum of two-thirds (and for Phase II a minimum of one-half) of the research and/or analytical effort will be performed by the proposing firm as required (see Sections V.H.) and the primary employment of the principal investigator (for both Phase I and Phase II) must be with the small business firm at the time of award and during the conduct of the proposed research as required (see Section I.C).
- \_\_\_ 2. The proposal is submitted according to the requirements described in Section III.
- \_\_\_ 3. The proposal is limited to only ONE of the research topics in Section IX.
- \_\_\_ 4. The proposal budget may be up to \$150,000 **unless otherwise indicated in Section IX of the solicitation** and duration does not exceed six months.
- \_\_\_ 5. The technical abstract contains no proprietary information, does not exceed 200 words, and is limited to the space provided on the Project Summary sheet (Appendix B).
- \_\_\_ 6. The proposal contains no type smaller than ten point font size.
- \_\_\_ 7. The COVER SHEET (Appendix A) has been completed and is PAGE one and two of the proposal.
- \_\_\_ 8. The PROJECT SUMMARY (Appendix B) has been completed and is PAGE three of the proposal.

- \_\_\_ 9. The TECHNICAL CONTENT of the proposal begins on PAGE four and includes the items identified in Section III.B of the Solicitation.
- \_\_\_ 10. The technical proposal includes the Sustainable Acquisition Requirement provision (Section III.B.)
- \_\_\_ 11. The Contract Pricing Proposal (Appendix C) has been completed and saved as a PDF and is included as the last section of the proposal.
- \_\_\_ 12. The additional information on prior Phase II awards, if required, in accordance with Section III.B is included.
- \_\_\_ 13. The Funding Agreement Certification (Appendix D) has been completed and signed.
- \_\_\_ 14. The SBA Company Register Confirmation is included (Section III.B).
- \_\_\_ 15. The proposal must be a PDF file and submitted online by 11:59 pm EDT, September 15, 2014.

**Proposals may only be submitted online, a link to the web form can be found here: <http://www.volpe.dot.gov/sbir/current.html>. Proposals received via email or any other means will not be accepted. Do not send duplicate proposals via email or by any other means.** Instructions for online submission are included on the submission page.

## IX. RESEARCH TOPICS

Solicitation 14.2 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 Aviation Administration (FAA)	14.2-FA1: Commercial Space Vehicle Tracking Using 1090 MHz ADS-B	1	\$100,000	\$300,000
	14.2-FA2: Management System Display to Track Emergency Response Vehicles and Mutual Aid During a Crash Response	1	\$100,000	Pending available funds
Federal Highway Administration (FHWA)	14.2-FH1: Decentralized, Public, and Mobile-Based Sidewalk Inventory Tool	1	\$100,000	\$500,000
	14.2-FH2: Parking-Cruising Caused Congestion & Targeting Public Mitigation Investments	2	\$150,000	\$1,000,000
	14.2-FH3: Modular Building Block Approach to Construction Assembly in Place Mini-Roundabouts	2	\$150,000	\$1,000,000
Federal Motor Carrier Safety Administration (FMCSA)	14.2-FM1: Driver Fatigue and Distraction Monitoring and Warning System	1	\$150,000	\$1,000,000
Federal Transit Administration (FTA)	14.2-FT1: Technology to Improve upon APC Data Counting that will Provide Better Correlation to Service Plan	3	\$150,000	\$750,000



<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>
National Highway Traffic Safety Administration (NHTSA)	14.2-NH1: Device to Address the Competing Needs of Ensuring Lockability of Seat Belts and Mitigating Entrapment Risk in Mis-Use Conditions	1	\$150,000	\$1,000,000
Office of the Secretary of Transportation- Research (OST-R)	14.2-OS1: Using Alternative Energy to Reduce Greenhouse Gas Production in the Transportation Sector	2	\$100,000	TBD
Pipeline and Hazardous Material Safety Administration (PHMSA)	14.2-PH1: New Non-Destructive Evaluation Methods to Quantify Remaining Strength of Line Pipe Steel and or Pipeline Fittings	1	\$150,000	\$1,000,000
<p>* Proposals that exceed the Phase I Estimated Award Amount will not be considered for award.</p> <p>**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.</p>				

## A. Federal Aviation Administration (FAA)

### 14.2-FA1: Commercial Space Vehicle Tracking Using 1090 MHz ADS-B

Commercial space vehicles licensed by the FAA include launch vehicles, re-entry vehicles and manned high altitude balloons. Operations of commercial space vehicles will become increasingly frequent and then routine in various regions of the US. The primary objective of this research is to ensure no degradation to both the safety and efficiency of the National Airspace (NAS) for other NAS users such as commercial general and military aviation occurs as commercial space vehicles become routine. The proposed research will build on existing Automatic Dependent Surveillance-Broadcast (ADS-B) to perform surveillance of commercial space vehicles as they transition through the NAS either on the ascent or descent phases of flight by building on existing, operational, flight- proven 1090MHz Automatic Dependent Surveillance-Broadcast (ADS-B) technology. ADS-B is germane to any nature of flight operations (a characteristic attributed to GPS based technologies); this service could be used to surveil commercial space operations, and provide much needed information to ATM services that are responsible for the associated operational environments and provide them situational awareness of these vehicles above the NAS. Accordingly, while ADS-B is potentially a favorable candidate for surveillance of commercial space operations, extensive research is required to determine the necessary operational, functional and physical system characteristics for development of an adequate spacecraft surveillance platform(s).

ADS-B “Out” equipment transmits position and velocity and other information from a given aircraft to the operating network of ~650 ADS-B ground based receivers for use by Air Traffic Control personnel. It operates at frequencies of 978MHz and 1090MHz. However current ADS-B “Out” equipment for commercial and general aviation is designed to operate below 60,000 feet at subsonic velocities and accelerations below 4Gs, making it of limited value to commercial space vehicles. While a prototype 978 MHz ADS-B Out specifically designed for commercial space vehicles has been flown on high altitude balloons and various rocket powered vehicles (including a commercial launch vehicle), an analogous 1090 MHz ADS-B Out prototype has not been designed, let alone developed. Aside from its transmission frequency, 1090MHz equipment has a different message structure and other characteristics from 978MHz. Equipment in both frequencies offer unique benefits to space transportation operations in the NAS and are needed for test flights to properly evaluate them. Additionally, 978MHz is primarily used in the US whereas 1090 MHz is used internationally so that US-built commercial space vehicles equipped with a functioning 1090 MHz ADS-B Out could more easily operate in these countries. Finally the capability for receipt of ADS-B messages from a commercial space vehicle beyond line of sight of FAA receivers (over broad ocean areas, mountainous areas, deep valleys) is an enabler for continuous seamless tracking of these vehicles. This capability is achievable using existing communications satellite capabilities at low cost but has not been demonstrated with commercial space vehicles and is a necessary research shortfall to be addressed in this effort.

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

- Perform a trade study exploring 1) upgrading existing commercial 1090 MHz ADS-B Out for use on commercial launch vehicles , re-entry vehicles and manned high altitude balloons or 2) “clean sheet design” and deliver study findings. Based on this trade study select a path forward and provide 1) preliminary design information for a 1090 MHz ADS-B Out prototype and one (1) functioning “bread board” level maturity prototype. During Phase I, the delivered prototype will be used for independent function/ performance testing with the FAA GPS altitude/velocity simulator as well as high altitude balloon flights (funded or arranged by FAA) to collect and analyze trajectory data. Trajectory data will be used to evaluate prototype performance and to develop and anchor modeling and simulation exercises.
- In parallel to task described above perform a trade study on optimal means of transmitting ADS-B messages from the payload using an existing communication satellite message format/technology when it is not line of sight of FAA receiving equipment. Study will explore 1) upgrading existing commercial satellite communication equipment that has minimal latency capability and low power, volume and weight for use on commercial launch vehicles, re-entry vehicles and manned high altitude balloons or 2) a “clean sheet design” utilizing readily available COTS technology for this application and deliver study findings. Based on this trade study select a path forward and provide 1) preliminary design information for a commercial satellite communication transmitter to support ADS-B payload described above and one (1) functioning “bread board” level maturity prototype capable of receiving data (i.e.ADS-B messages) from the ADS-B equipment described above and transmitting it for tracking purposes. During Phase I, the delivered prototype will be used for independent function/ performance testing to receive and transmit data as well as high altitude balloon flights and potentially flights on rocket powered vehicles

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

- Design and develop commercial space flight surveillance test bed, as is described within the formulated study plan within phase 1 of this research endeavor. Test bed should include hardware and software development capabilities, as well as full-fidelity simulation tools.
- Deliver TBD (up to a total of 10) 1090MHz ADS-B prototypes for ground testing in the test bed described above and on commercial space transportation platforms (to be arranged by FAA)
  - Initial delivery of TBD (up to 5) early prototypes based on lessons learned from and design of bread board model delivered in phase I for ground testing balloon and suborbital testing TBD months after award of Phase II
  - Follow on delivery of TBD (up to 5) advanced prototypes based on lessons learned from and design of bread board model delivered in phase I for ground testing balloon and suborbital testing TBD (greater than 6 months after award)
- Perform viability and reliability testing to establish whether phase 1 outcomes produce a practical solution for surveillance of commercial space flights within the National Airspace System (NAS).

Viability testing will examine if the provided surveillance data for a commercial space flight satisfies the information requirements needed for air traffic management and airspace accessibility. Reliability testing will seek to identify the integrity of that surveillance information by determining the level of maintained surveillance accuracy and the frequency of “drop-outs” or degradation in signal. From these tests, a preliminary feasibility assessment can be made, and if deemed viable and reliable, the associated philosophy of use for the prototype ADS-B transceiver can then begin formal development (to be eventually captured within a Concept of Operations or a Concept of Use).

- Perform a limited set of operational assessment studies, in which the impacts to safety and efficiency across different environments are identified and examined. The goal of these studies will be to establish an initial set of findings that identify correlative relationships between a commercial space flight transiting an airspace sector and the general effects imposed upon that airspace. To accomplish such, studies could vary traffic levels, traffic configuration, airspace size, and the direction of transit for the commercial spacecraft (i.e. inbound or outbound). Overall, the outcome of this research will begin to identify challenges to full integration of commercial space flights within the NAS.
- Publish a final report capturing the findings of the above outlined activities which, in summary, will provide an initial overall assessment of the ADS-B prototype, including its functionality, operational viability, operational reliability, and operational applicability and a path forward to commercial use

## 14.2-FA2: Management System Display to Track Emergency Response Vehicles and Mutual Aid During a Crash Response

Disaster response at airports involves integration of airport fire rescue with emergency personnel and equipment from the surrounding community. The current response model is built upon the concept of mutual aid. As such, airport command authorities face the task of coordinating and tracking multiple disparate fire rescue units and personnel. Technology could provide an integrated command and control tracking and reporting system designed specifically for the airport incident commander and command authority.

The purpose of this research is to develop a command and control management information prototype for use at airports during crash or disaster responses that aids in facilitating intelligent, coordinated airport and mutual-aid response. A successful outcome shall include the following: Provide real-time situational awareness to airport command authorities through the use of technology that provides a disaster response command and control management information system in a **portable device**, possibly linked to other devices and/or airport systems. Consider integrating Global Positioning System (GPS) or Radio Frequency Identification (RFID) technology to track airport fire rescue vehicles, as well as mutual aid vehicles and personnel during an airport crash or disaster. Consider integration of data available from existing patient and/or victim tracking systems to follow patients in collection, triage, treatment, and transport.

The prototype shall: Integrate pull-down menus that allow command authorities to track aircraft rescue firefighting vehicles (airport and mutual aid) deployed and available, their location, their crew structure, and their current capabilities and capacities. Provide access to existing airport emergency plan documents, mutual-aid agreements, letters of agreement (LOA), and other pertinent emergency response or air traffic plans. Provide command authorities updated airport and air-traffic status (runway status and condition, heliport status etc.) affecting emergency response. Provide the ability to track communications channel use and current status, both mutual aid and airport specific. Provide the ability for command authorities to track and/or input data related to existing hazardous materials, either on the aircraft, or in the vicinity, that may affect the rescue and fire response. Provide the ability for the incident commander and the emergency operations center to track available fire agent and water status, both at the airport or available to the airport through mutual aid. If appropriate to the situation, provide the ability to track water rescue efforts to include tracking of water rescue vehicles available, their status, communications capabilities, and findings during deployment.

Display information and figures in a management ready format in a portable display for command authorities to use in directing the fire attack and victim recovery efforts. Provide for collaboration and sharing of data between incident command and airport emergency operations center staff, to include the provision of template reports and status forms that could be revised by individual airports/EOC authorities to fit local needs.

To be effective the prototype should:

- Be portable and low cost.
- Be adaptable to a variety of airports.
- Address airport specific emergency response.

**Expected Phase I Outcomes:**

- Provide a detailed concept that demonstrates the capabilities of a prototype command and control management information system for airport disaster response use.

**Expected Phase II Outcomes:**

- Identify or develop a product that addresses the command and control needs and requirements listed above.
- Field test product(s) to determine viability of use in real world situations.

## B. Federal Highway Administration (FHWA)

### 14.2-FH1: Decentralized, Public, and Mobile-Based Sidewalk Inventory Tool

Communities throughout the U.S. are increasingly encouraging walking for transportation and recreation in order to meet a range of safety, health, equity, sustainability, and other goals. One way to accomplish this is by actively working to fill gaps in the pedestrian network and to improve sidewalks or other pedestrian pathways that have fallen into disrepair. A significant challenge to working methodically and strategically toward pedestrian network connectivity is a lack of comprehensive GIS-based data on the presence (or lack) of sidewalks or other pedestrian connectors communitywide. In fact, many communities do not have a baseline inventory of their sidewalks because collecting this data can be expensive and difficult to maintain. However, recent advances in mobile technology and cloud-based computing, as well as increasingly sophisticated crowdsourcing applications, have the potential to address this issue.

A prototype is needed to facilitate decentralized public collection of a baseline sidewalk inventory, which can then be compiled into a central dataset to inform decision-making and public policy. Given their broad availability, GPS and database capabilities, and the fact that they are always “in our pocket,” it may make sense for the prototype to be built as a mobile phone application; however, there may be other approaches. The prototype should enable an individual user to simply and efficiently document the presence or lack of a sidewalk. In addition to the inventory, it may be possible to add data features such as an assessment of sidewalk conditions. It may be possible to incorporate information from FHWA’s Road Safety Audit process and build off of and/or incorporate data from existing resources such as Google’s “walking route” application. This prototype will focus on the creation of a baseline sidewalk inventory, and would ideally be integrated with existing services such as *SeeClickFix*, which focus more on the identification of spot-specific issues.

It will be important to build the functionality so that the new application links seamlessly to other existing datasets. For example, the State of Maryland has been a leader in the government-led collection of ADA-related data along State roads. The new application could add a public functionality and interface by displaying this type of information (if it is publicly available) as part of a strategy to “flag issues” with the data and thus keep it updated over time. The new application would also begin to fill in preliminary data on non-State owned roads. It will be important to link the new public crowdsourcing application to the automated Public Rights-of-Way Assessment Process (PROWAP), which was developed through support from the SBIR program (DTFH61-57-10-C-10081). FHWA is also supporting Exploratory Advanced Research to develop technology to allow people who are blind or who have low vision to navigate in the public right-of-way and the proposed new sidewalk inventory application could provide an important locally-verified input to this technology once it is available. There are likely many other synergies between an application that enables decentralized public crowdsourcing of

pedestrian data and the PROWAP and Exploratory Advanced Research project, which should be explored in the research and development process.

A public mobile-based sidewalk inventory application will leverage and maximize the return on investment in recent and ongoing pedestrian data initiatives. It will assist in the creation of more complete sidewalk datasets, which is especially important given the emphasis on performance measures in Federal surface transportation legislation, and the fact that more and more communities are developing communitywide GIS-based prioritization methodologies that will impact, for example, where they choose to build new sidewalks or other pedestrian routes.

By facilitating the creation of connected pedestrian networks, the application will improve safety because research shows that having sidewalks on both sides of the road can contribute to a significant reduction in “walking along the road” pedestrian crashes. By tracking the condition of pedestrian networks, the application will contribute to asset management processes and encourage a state of good repair. By facilitating nonmotorized transportation, it will contribute to climate change and other environmental sustainability-related goals. Finally, it will create an affordable tool that would allow students to engage in primary data collection that is of immediate practical value to local, regional, and State government staff and that also leads directly to important planning, policy, and budgetary decision-making processes central to citizen science, a core element of the STEM Initiative.

A small business that develops this product could sell it to municipalities, Metropolitan Planning Organizations, or State Departments of Transportation. Non-governmental organizations such as community associations also might purchase the end product. An application that contributes to the development of a sidewalk inventory will create value that could be captured by a small business; however, it will only continue to be relevant and valuable if it is maintained and kept up to date. A small business could provide this ongoing service to clients for a fee. A small business could also generate revenue through the sale of advertisements displayed while the application is being used and/or it could offer an ad free version that a user or client could choose to purchase.



**Expected Phase I Outcomes:**

- Development of a prototype mobile-based application to facilitate the decentralized collection of a baseline pedestrian network inventory data.
- Development of a back end application to compile data collected into a central dataset.
- Assessment of other existing data sources and evaluation of strategies to link seamlessly with them (where appropriate).

**Expected Phase II Outcomes:**

- Beta testing and upgrades to the prototype application.
- Improvement of front end user interface and completed linkages to other datasets.
- Other tasks necessary to bring the prototype to market.

## 14.2-FH2: Parking-Cruising Caused Congestion & Targeting Public Mitigation Investments

It is a common perception and concern among city mayors and transportation professionals that an enormous amount of time and fuel is wasted by motorists circling or “cruising” for free or underpriced on-street parking. As an example of such concern, over 70 city parking managers and senior transportation policy officials came to San Francisco in Sept. 2011 to address this topic at a Federal Highway Administration (FHWA)/National Association of City Transportation Officials jointly-sponsored, two-day Best Practices in Parking Management and Pricing Conference, which was led off by San Francisco Mayor Edwin Lee.

Despite such high interest, there is surprisingly almost no research on how drivers actually cruise for parking, which would be critical to understand in order to ascertain the magnitude of this problem. We do not know, for example, whether and/or with what frequency motorists: (1) follow a set pattern for choosing blocks to search; (2) pass up a legal space in hopes of finding another legal space deemed preferable; (3) park in an illegal space even when a legal one may be available nearby, and; (4) aggressively seek or pass up an open space on the opposite side of the street that they are driving requiring either crossing multiple same-direction travel lanes on a one-way road or making a U-turn on a two-way road.

Despite such lack of knowledge, multiple research studies on cruising have been undertaken, which are premised on assumptions about cruising behaviors, with measurements following such assumptions. The results of 16 studies of cruising for on-street parking in 11 cities were summarized in *The High Cost of Free Parking* (Shoup, 2005). The share of city traffic cruising in these studies ranged from 8% to 74%, and averaged 30%, with an average search time of 3.5 minutes to 13.9 minutes, or an “average of the averages” of 8.1 minutes. The accuracy of the results of these studies—conducted independently of each other and deploying different methodologies—is uncertain, but it does seem that circling is a real problem where it has been studied. Of course, studies of cruising are most likely to occur in areas where it is thought to be common, but remedies would be targeted to such areas too, so this bias as to the selection of study sites may not be problematic.

If cruising for parking could somehow be eliminated where it is thought to be a problem, its congestion-reducing benefits would likely be substantial. To eliminate such cruising in San Francisco, FHWA invested \$19 million in the *SFpark* pilot project. This active parking pricing and management project (sometimes also referred to as performance parking) deployed electronic sensors and communications technologies to determine parking utilization rates at all times for on-street and public off-street parking. *SFpark* has been using such data to set and change parking prices to meet availability targets (typically aiming for around 20% of the

number of spaces) and to offer real-time information about parking availability by specific location.<sup>1</sup>

Preliminary research results from three different studies of *SFpark* are showing that, regardless of the research methodology chosen to approximate how cruising actually occurs (using the same methodological assumptions both before and after performance parking deployment to determine relative changes), cruising appears to have declined by about 50%. (Heavy use and suspected abuse of handicapped parking placards which allow unlimited free parking have been identified as the biggest culprit to not realizing even greater declines.) An additional FHWA-directed study is nearing completion to estimate costs of deploying similar systems for other cities (which should be lower than San Francisco's costs, benefiting from lessons learned there).

Today, city and regional transportation professionals do not know if or where the problem may be of a sufficient magnitude to merit a costly solution. For a city or region to make a wise choice about investing in a performance parking system, or indeed any system to reduce congestion, it would need to understand both costs (which, as noted above, will be much better understood after completion of an FHWA-directed cost study) and benefits in absolute terms to make a comparative assessment of alternative congestion-reduction investment options. Cities cannot, though, reasonably estimate benefits until they are first able to quantify with some accuracy the amount of time wasted today by cruising, so that an absolute net benefit, and not just a relative improvement from deploying performance parking to reduce cruising, can be accurately modeled. Development of one or more tools is required to enable total levels of cruising within cities as a whole, and specific areas within them, to be ascertained.

### Forging a Solution

A number of different tools and strategies could be developed or applied to measure actual cruising levels which would be responsive to this solicitation. Some approaches may be "standalone," meaning that they would only require the use of the single proposed approach or tool to determine cruising levels. Other solutions may need to work in concert with differently-sourced, already-available information in combination with the newly proposed tool or approach. As an example of the latter, a respondent could choose to propose a tool or approach to ascertain

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<sup>1</sup> Rather than better managing existing parking, some cities might instead choose to focus on providing more supply, but it is enormously expensive (sometimes exceeding \$50,000 per space in urban parking structures) and its provision at a level sufficient to satisfy peak-of-the-peak demand at no price to the user is very detrimental to the goal of livable community design. Combining relatively low cost technologies with pricing incentives reduces the parking footprint by flattening peak demand, encouraging parking turnover, persuading drivers to use parking that is slightly further away from their destinations, and making transit and non-motorized access competitively more desirable.

actual cruising levels that relies separately upon a city having or developing good parking occupancy data, which could be combined with whatever new tool or approach is developed under this solicitation. In support of this example, a few cities already do a reasonable job ascertaining parking occupancy data using, alone or in combination, parking sensors, payment data, and manual surveys. This solicitation is open to proposals that are either standalone or dependent upon other available information to discern total cruising levels.

Immediately below are a few ideas as to how one might respond to this solicitation. The discussion is provided only for illustrative purposes and should not be construed to suggest that, in the evaluation process, proposed approaches that are not raised here would be at a competitive disadvantage to approaches that are.

One strategy to learn more about the behavior of drivers searching for on-street parking when availability is constrained would entail first obtaining a very large GPS travel database. Using such a database, respondents could offer an approach to determine the prevalence and duration of circling for parking (because of its lack of availability), thus enabling its congestion-causing impacts to be measured.<sup>2</sup> While not required, it would be ideal if a respondent choosing this or a similar approach would be willing and able to contact drivers thought to have been cruising for a follow-up survey. This would enable a confirmation that what looked like circling for parking really was that—and not just someone who was lost—and also to ask related questions, such as how far away the driver had to park from his/her ultimate destination.

Another possible approach would be to test driver behavior in simulators. The street network for one or more areas of a city known for constrained and coveted on-street parking would, as envisioned, be used in the simulator, and drivers who regularly or occasionally drive and park on-street in the simulated areas would be recruited. Traffic conditions and available trade-offs (circling time versus cost for garage parking) should be presented in the simulator environment in as realistic a way as possible. For example, recruits, while rewarded for participation, would be sent home with less cash (but earlier) for electing in the simulator to circle for parking instead of to head to the nearest garage.

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<sup>2</sup> In the unlikely event that such data could be obtained retroactively for San Francisco, corresponding to a time period in calendar year 2013 or before when parking sensors were operational and thus occupancy was measured and recorded as part of the *SFpark* pilot, this would be beneficial as it would enable a direct comparison between measured parking occupancy levels and cruising.

A third approach would be to scale up a technique that was tested in New York City, whereby video cameras were deployed to count the number cars that pass up an on-street parking space immediately after it becomes available to ascertain the percentage of traffic cruising.<sup>3</sup>

This approach would need to be paired with another source of information or another approach to ascertain parking occupancy levels so that the total amount of cruising could be determined.

Regardless of the research approach that is proposed, it is critical that the applicant clearly identifies the source or sources of data to be used, the party or parties that control the data (if it is pre-existing) or whose permission would be required for the applicant itself to gather the data (e.g., the specific government entity that would need to approve the mounting of a camera in public space), and the degree of risk—and the plan to mitigate such risk—that the plan to acquire existing or gather new data might fail. If a third party is required to gather or provide the needed data, the application should demonstrate, or at least describe, the interest and/or support from the third party (such as by including a letter of interest from such party as part of the submission).

**Expected Phase I Outcomes:**

The outcome expected from Phase 1 is a detailed concept that demonstrates the viability of one or more tools and/or systems to ascertain rates of cruising for free or underpriced on-street parking.

**Expected Phase II Outcomes:**

Phase II efforts would include demonstrating a working prototype tool and/or system (which may or may not include the manufacturing of a new product) that ascertains cruising rates in a city (with some, but not overwhelming, preference for San Francisco where the FHWA-funded *SFpark* program has been implemented) and/or area within a city that is thought to have constrained on-street parking that is leading to substantial cruising.

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<sup>3</sup> A driver passing up an open space would be thought not to have been cruising, while cruising is assumed for a motorist who takes the space. If, on average, one driver passes up an open space before the next driver takes it, then it would be estimated that half of drivers in that block at that time are cruising for parking.

## 14.2-FH3: Modular Building Block Approach to Construction Assembly in Place Mini-Roundabouts

Mini-roundabout is a single-lane roundabout with a traversable central island and splitter islands. The inscribed circular diameter of mini-roundabout ranges from 50 ft to 90 ft. This intersection design is suitable for junctions of 2-lane and/or 3-lane high volume collector roads. A well designed mini-roundabout can deliver more than twice the traffic handling capacity when compared to intersections under All-Way-Stop-Control. Limited deployments in the United States show the following types of traffic operation and safety problems can be effectively addressed by mini-roundabout design:

1. Eliminate traffic congestion at All-Way-Stop-Controlled intersections,
2. Reduce major road approaching speed at Two-Way-Stop-Controlled intersections to provide more gaps to minor road traffic.
3. Provide a viable intersection improvement option when a regular sized roundabout is too costly due to costs of purchasing additional land and relocating utility lines and storm drainage system.
4. Calm the traffic and improve safety for both vehicle drivers and pedestrians and bicyclists.

Mini-roundabout is one of the alternative intersection designs being promoted nation-wide by the USDOT under the second round of Every Day Count (EDC2) initiative. The superior traffic handling capability of this intersection design has been proven at multiple sites that used to suffer recurring congestion and speed or congestion induced traffic safety problems. However, the costs of mini-roundabouts vary significantly by location. At some locations, mini-roundabouts were installed in one or 2 days at costs of \$20,000 or less each; at other locations, it took 3 weeks and over \$300,000 to construct a mini-roundabout. Such range of cost variation hinders the wider adoption of mini-roundabout design.

The objective of this project is to develop modular curbing and delineation designs that can be configured to form into sidewalk curbs, central islands, and splitter islands of different sizes (like the building blocks used in landscape projects). These modular blocks must be strong enough to withstand up to 22,000 lb/axle occasional truck load; and durable enough to last 10 years without change in shape or reduction in strength. Ideally, the modular blocks can be manufactured using recyclable material that would otherwise end up into the landfill; the mass production of such “building block” material shall reduce the cost of mini-roundabout installation and make the cost of mini-roundabout construction highly predictable.

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

- Prove that the modular building block concept for mini-roundabout construction is feasible and has significant cost advantage over the cast in place construction method.
- Design and prototype modular blocks that can:
  - Form into central islands of 3 different diameters commonly used in mini-roundabout design
  - Form into corner curbs of 3 different diameters commonly used in urban street curb design
  - Form into splitter islands and bulb-outs (chicanes) commonly used in traffic calming applications
- Develop attachment hardware that can anchor the modular blocks onto the roadway surface
- Develop draining mechanism that facilitates water to drain towards the designated areas.
- Produce complete designs of 3 typical sized mini-roundabouts using assembly in place modular blocks (drawing, shapes of modular blocks needed, number of each type of modular blocks, the completed set of hardware, and the estimated cost).

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

Assuming the Phase I products are satisfactory, the desired outcome of Phase II is to produce enough modular blocks to prove the concept at five to six intersections to explore the level of labor effort and the types of tools needed to construct different sized assembly in place mini-roundabouts, the amount of modular block material needed, and the total costs of such projects.

## C. Federal Motor Carrier Safety Administration (FMCSA)

### 14.2-FM1: Driver Fatigue and Distraction Monitoring and Warning System

Driver fatigue and driver distraction are recognized as a continuing safety issue for commercial drivers. Driver fatigue is a major cause of CMV crashes, but fatigue causes are not well understood. Distraction-affected crashes were reported in ten percent of fatal crashes, 18 percent of injury crashes, and 16 percent of all motor vehicle traffic crashes in 2012 according to the National Highway Traffic Safety Administration. The mission of the Federal Motor Carrier Safety Administration (FMCSA) is to reduce fatalities and injuries associated with truck and bus crashes. Driver Fatigue and Distraction Monitoring and Warning Systems have been developed; however, the systems are not always reliable and accurate in the operating environment. Driver Fatigue and Distraction Monitoring and Warning Systems are systems designed to monitor truck and bus drivers and to recognize and mitigate driver fatigue and distraction with the goal of warning drivers and reducing fatigue-related and distraction-related driving errors. These systems meet FMCSA's strategic goal that requires carriers to maintain high safety standards.

The Driver Fatigue and Distraction Monitoring and Warning System will likely contain several measures to identify fatigue. There are physiological measures such as PERCLOS. PERCLOS is the percent closure of the driver's eyelids. Facial mapping will be used to detect PERCLOS as well as eyes off forward roadway. Another measure uses vehicle kinematics for lane tracking. The system warns the driver when he or she is deviating from the travel lane. Multiple measures of fatigue are desirable to create a more reliable system. In addition, an appropriate human-machine interface will be developed for warning drivers. The Driver Fatigue and Distraction Monitoring and Warning System can also be used to alert the carrier that the driver is fatigued.

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

The Phase I SBIR project should complete a proof of concept for successfully implementing a new Driver Fatigue and Distraction Monitoring and Warning System in an operational environment. It is not sufficient to simply evaluate currently available systems. The deliverable must address reliability and accuracy of the new system.

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

The Phase II SBIR project will have a fully operational system successfully implemented at selected carriers. The system must be reliable and accurate in the operational environment.



## D. Federal Transit Administration (FTA)

### **14.2-FT1: Technology to Improve upon APC Data Counting that will Provide Better Correlation to Service Plan**

Transit agencies traditionally face major issues in rider system utilization and travel patterns.

First, it has been a challenge to accurately count the number of riders that board and alight along stops or stations on a transit route. In the vast majority of transit agencies, this has been traditionally accomplished through “ride checking;” a manual process of counting riders with pen, paper, and punch counters while riding a transit vehicle (most often a bus) in revenue service. Once collected, these data must be manually input into a database and then verified for accuracy to have meaning to the transit agency for planning purposes.

A few transit agencies use advanced methods to count riders using a technology called Automated Passenger Counters or APCs. APCs remove the need to manually count boarding or alighting riders by using a variety of different technologies to include infra-red beams, treadle mats, visioning, heat sensors, low-frequency ultrasound waves, and other technologies working in tandem with a software-based heuristic algorithm. Typically, these data are automatically downloaded to a database system or the data are removed using storage media such as a Flash Drive and then imported to a database for automatic, pre-set analysis and report generation.

Once collected by APCs, these boarding and alighting data are usually correlated with data from an Automatic Vehicle Location (AVL) system or other geographic information systems or GIS file such as a bus stop inventory to match boardings and alightings with the specific, fixed, geographic location of a transit stop or station. Historically, APCs have proven useful to transit agencies for collecting rider boardings and alightings, but APC systems have suffered counting accuracy issues, particularly at high rider load points, and at end-of-line count reconciliation. APCs are mostly used on transit bus front and rear doors with limited use on rail vehicles due to very wide doors; another issue that most APC system technology have been unable to solve.

Second, it has been a challenge for transit agencies to track the origin and destination of riders. In only a few cases transit agencies have the ability to accurately and, anonymously, track the origins and destinations of riders; this mostly occurs in a closed turnstile/gated system used by rail transit. Traditionally, tracking the origin and destination of riders has been done using labor intensive and costly origin and destination surveys, usually using only small sample of riders. These surveys are usually not directly correlated with rider boardings and alightings.

The Federal Transit Administration (FTA) is seeking exploratory proposals that will demonstrate innovative, economic, accurate, and durable technologies, devices, or solutions to improve rider boarding and alighting counting accuracy and rider origin-destination trip-making accuracy, with

special attention given to projects that could significantly improve both the accuracy of this information and correlate them with rider origins and destinations.

Project proposals must include a methodology on how it will use data to quantitatively demonstrate that their recommended technology innovations can provide this capability.

**Expected Phase I Outcomes:**

- A viable concept that demonstrates the technology or solution in a transit environment to improve rider boarding and alighting count accuracy and the accurate tracking of rider origins and destinations
- Efficient and low-cost technology
- Modular, interoperable, plug-and-play and open source (if applicable) device(s)
- Technology assessment with respect to industry best practices
- Feasibility analysis (data proven) for success in developing a working prototype

**Expected Phase II Outcomes:**

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

## E. National Highway Traffic Safety Administration (NHTSA)

### **14.2-NH1: Device to Address the Competing Needs of Ensuring Lockability of Seat Belts and Mitigating Entrapment Risk in Mis-Use Conditions**

The Federal Motor Vehicle Safety Standard (FMVSS) No. 208, “Occupant crash protection,” requires that passenger seating positions of passenger cars and some other passenger vehicles have a seat belt assembly whose lap belt portion is lockable so that the seat belt assembly can be used to tightly secure a child restraint system. FMVSS No. 208 further specifies that the means to lock the lap belt portion of the seat belt assembly shall not consist of any device that must be attached by the vehicle user to the vehicle and shall not require any inverting, twisting, or deforming of the belt webbing.

Vehicle manufacturers have met the lockability requirement in FMVSS No. 208 by two possible means: a switchable retractor (switching from an emergency locking retractor (ELR) to an automatic locking retractor (ALR)) and a locking latchplate. Of the two means, the switchable retractor is most commonly used. However, there have been cases where children in the rear seat have accidentally activated the ALR mode (often by misuse of the seat belt) and caused entanglement of the seat belt around the child’s body parts. In some cases, the belt had to be physically cut to release the occupant. The locking latch plate method is less popular because the lap belt does not automatically adjust to fit snugly around a child restraint system and results in slack in the lap belt portion of the seat belt. Additionally, a seat belt with a locking latch plate may not always retract properly into the stowed position when not in use.

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

The Phase I goal of this research project is a concept development for a device that is attached to the seat belt assembly that:

1. Achieves lockability requirements in FMVSS No. 208 (S7.1.1.5) as tested per Test Procedure 208-14 (data sheet 8) and complies with all applicable FMVSSs (FMVSS No. 208, FMVSS No. 209, and FMVSS No. 210),
2. Is easy to make it lockable – does not require complex manipulation to make the seat belt lockable,
3. Complies with comfort and convenience requirements specified in S7.4 of FMVSS No. 208 - wearing a lap/shoulder belt should be similar to current practice, easy and intuitive to use,
4. Achieves seat belt fit according to current practice (5<sup>th</sup> percentile adult female, and 50<sup>th</sup> percentile adult male) – the shoulder portion of the lap/shoulder belt fits snugly across the chest (away from the neck and face) and the lap portion of the belt should fit snugly low on the hips and away from the abdomen,

5. Stows the seat belt away easily when not in use,
6. Does not pose risk of entrapment when mis-used, and
7. Does not introduce new risks to occupants in a vehicle.

The awardee shall develop one or more concepts for candidate devices that meet the above requirements. Phase I 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 evaluate the candidate devices developed in Phase I and select one of the devices based on demonstrated durability, effective performance under repeated use for the lifetime of the vehicle, cost effectiveness of the device, and its versatility in incorporation into current vehicle seat belt systems. The Phase II proposal must include prototype development. NHTSA will work with the awardee to provide for prototype testing of a successful phase II award. Test costs can be considered outside the costs of the Phase II proposal.

## **F. Office of the Secretary of Transportation- Research (OST-R)**

### **14.2-OS1: Using alternative energy to reduce greenhouse gas production in the transportation sector**

The surface transportation sector is one of the largest contributors to the production of greenhouse gases. The USDOT's Zero Emission Transportation Initiative is looking to push the transportation sector greenhouse gas production to zero by 2050.

Alternative energy sources used to power vehicles have the potential to significantly reduce vehicular production of greenhouse gases. Research into the use of alternative energy could look into innovative or more efficient ways of creating, storing or using alternative energy for light vehicles, motorcycles and bicycles.

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

A technical brief or report describing a proposed prototype that will result in a new or more efficient way to create, store or use alternative energy in light vehicles, motorcycles and bicycles.

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

Prototypes that create, store or use alternative energy more efficiently in light vehicles, motorcycles and bicycles.

## G. Pipeline and Hazardous Material Safety Administration (PHMSA)

### 14.2-PH1: New non-destructive evaluation methods to quantify remaining strength of line pipe steel and or pipeline fittings

The energy transportation network of the U.S. consists of over 2.5 million miles of pipelines. That's enough to circle the earth about 100 times. These pipelines are operated by approximately 3,000 companies, large and small. U.S. operators transport almost two-thirds of the Nation's energy. According to the U.S. Energy Information Administration (EIA), in 2011, oil and gas exploration and production companies operating in the United States added almost 3.8 billion barrels of crude oil and lease condensate proved reserves, an increase of 15 percent, and the greatest volume increase since EIA began publishing proved reserves estimates in 1977. Also, proved reserves of U.S. wet natural gas rose by 31.2 trillion cubic feet in 2011 to a new record high of 348.8 trillion cubic feet.

The Nation's more than two million miles of pipelines safely deliver trillions of cubic feet of natural gas and hundreds of billions of ton/miles of liquid petroleum products each year. Natural gas provides for fully 24% of our country's *total energy consumption*, and petroleum provides for another 39%. These volumes of energy products that pipelines move are well beyond the capacity of other forms of transportation. It would take a constant line of tanker trucks, approximately 750 per day, loading up and moving out every 2 minutes, 24 hours a day, 7 days a week, to move the volume of even a modest pipeline. The railroad-equivalent of this single pipeline would consist of a train of 75, 2,000-barrel tank rail cars traveling the length of the pipeline every day. These alternatives would require significantly more personnel, cost substantially more, produce larger volumes of pollutants, and would subject the public and environment to greater risk when considering overall safety. Pipeline systems are the safest available means to move these hazardous materials in bulk.

The Federal government rededicated itself to pipeline safety in 2012 when the Pipeline Safety, Regulatory Certainty, and Job Creation Act were signed. It raises the bar for pipeline safety and commits the Pipeline and Hazardous Materials Safety Administration (PHMSA) to exploring technologies and methods which could increase the integrity of the U.S. pipeline network.

The mission of PHMSA's Pipeline Safety Research Program is to sponsor research and development projects focused on providing near-term solutions that will improve the safety, reduce environmental impact, and enhance the reliability of the Nation's pipeline transportation system. For pipeline safety, research is being solicited for the development of innovative technologies and methods for hazardous liquids and/or natural gas pipelines. The following area of interest is focused on Non-Destructive Testing NDT towards quantifying the remaining strength of the existing steel pipeline infrastructure.

**Focus Area: Develop and demonstrate new non-destructive evaluation methods to quantify remaining strength of line pipe steel and or pipeline fittings:**

The U.S. Code of Federal Regulations (CFR) Title 49, Parts 192 and 195 stipulates that ASME B31G or RSTRENG be used to assess the remaining strength of corroded pipe. A review of existing burst test data raised some concerns that use of these methods can, in some instances, result in predicted failure pressures that are greater than the recorded burst pressures from actual tests. No burst testing data exist on steel pipeline fittings.

Industry has also researched methods for assessing the remaining strength of corroded pipelines. This has led to the development of new criteria and has extended the range of assessment methods to include numerical analysis. While there has been substantial progress, there are areas where the existing criteria require improvements, including steel pipeline fittings. Issues identified include limitations on the interaction of closely spaced defects, the effects of external loading, and cyclic pressure loading. Furthermore, as operators start to use higher strength materials, there will be an increasing need to assess the integrity of high strength steel pipeline fittings that have been corroded while further validating the application of existing criteria and models for these materials.

Past work by industry and the U.S. Department of Transportation's Pipeline and Hazardous Safety Administration (PHMSA) has funded research to address these issues in recent years on pipeline steels. The work has included a program of materials testing, finite element (FE) analyses, and full scale burst testing to develop methods for assessing corrosion damage in pipelines of strength grade up to X100. Reports from this work are available at:  
<http://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=171>

**Background:**

Corrosion metal loss is one of the major damage mechanisms to transmission pipelines worldwide. A corrosion metal-loss defect further reduces the strength of the damaged pipeline sections while introducing localized stress and strain concentrations. Several methods have been developed for assessing the remaining strength of corroded pipelines, such as the ASME B31G (B31G) and RSTRENG models. These models were derived from experimental tests and theoretical/numerical studies of the failure behavior of corroded pipelines. The test pipes contained either corrosion metal-loss defects or simulated metal-loss defects and featured materials with relatively high toughness properties for X65 and above. The early burst tests used vintage pipe (predominantly X52 or lower) with low toughness properties. Plastic deformation and collapse of the ligament or surrounding material determines the failure behavior of the corroded pipe. In principle, the existing assessment methods are only applicable to pipelines with toughness levels that are sufficient to prevent a toughness-dependent failure.

The research completed did not include analysis of burst test data on steel line pipe with real corrosion defects in strength grades above X65, as the data were not available. To address this gap, a focused program is recommended on higher strength line pipe of strength grades above X65 with electro-chemically induced, simulated corrosion defects. These defects can be produced using electrochemical means to approximate real corrosion in the field, as opposed to flat-bottomed rectangular machined patches.

Mechanical properties of pipe metal help define the principal characteristics of its technical state. Heat input during the coating process may change these properties. Developing new methods for pipeline technical diagnosis and evaluating a line pipe's actual technical state will help ensure the pipe's safe lifetime operation.

Challenge – Proposals are being sought for the development of future guidance and consideration of the background factors described above. The descriptive physical model of impact strength change effect on the pipeline's actual technical state needs to be investigated. The objective of this topic is to determine the next steps after an operator determines the mechanical properties of the steel line pipe in material grade X65 and above and or pipeline fittings are insufficient.

Proposals may consider the following attributes for pipe, grade X65 and above:

1. Can a pipe safe pressure evaluation be conducted using B31G, Modified B31G or other engineering assessment methods for failure pressure
2. Does the yield strength to tensile strength ratio affect the usage of safe pressure evaluations using B31G, Modified B31G or other engineering assessment methods for failure pressure?
3. Does the flow stress or folias factor provide conservatism when being used to assess the failure pressure of pipe grades X65 and higher?
4. Does toughness of the higher pipe grades affects the conservatism? If so, how?
5. How do combined stresses such as maximum (72% SMYS or 80% SMYS) hoop stresses and higher longitudinal stresses up to yield strength or over yield strength affect usage of these failure pressure evaluation methods?
6. What other attributes should be considered and their effects, such as pipe coating application temperature or strain hardening effects?

Proposals may consider the following attributes for fittings (bends):

1. Can pipe bends, hot or forged, be assessed for failure pressure using safe pressure evaluations using B31G, Modified B31G or other engineering assessment methods? If so, what are the limitations of this usage?
2. What should be the required thickness of the fitting to maintain maximum operating pressures and external stresses? Which standards should be used for this determination?



3. How do combined stresses such as maximum (72% SMYS or 80% SMYS) hoop stresses and higher longitudinal stresses up to yield strength or over yield strength affect usage of these failure pressure evaluation methods?
4. What other attributes should be considered and their effects? Fitting grade, heat treatment, fitting coating application temperature, etc.

**Expected Phase I Outcomes:**

A successful Phase I will demonstrate, through mathematical models and scientific analysis, a determination as to whether RSTENG needs to be modified when pipes with X65 and above.

**Expected Phase II Outcomes:**

Phase II will include the validation and testing of potential models that predict the remaining strength of pipe and or pipeline fittings.