



U. S. Department
of Transportation

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FY17.1

PROGRAM SOLICITATION

Small Business Innovation Research (SBIR) Program

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Closing Date: December 21, 2016, 5:00 PM ET

**Small Business Innovation Research (SBIR) Program Office, V-330A
U.S. Department of Transportation (U.S. DOT)
Office of the Assistant Secretary for Research and Technology
John A. Volpe National Transportation Systems Center (Volpe Center)
55 Broadway
Cambridge, MA 02142-1093**

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

ADMINISTRATIVE AND TECHNICAL QUESTIONS

Administrative questions pertaining to the application process and requirements are listed in the Frequently Asked Questions (FAQs) page on the United States Department of Transportation (U.S. DOT) Small Business Innovative Research (SBIR) Program website:

<http://www.volpe.dot.gov/work-with-us/small-business-innovation-research/frequently-asked-questions>.

If you have any administrative questions not listed in the FAQs, or any technical questions pertaining to the FY17.1 U.S. DOT SBIR solicitation research topics, please submit such questions via email to the U.S. DOT SBIR Program Office at dotsbir@dot.gov. All questions must be submitted by email.

IMPORTANT DATES:

- **Administrative and Technical questions will be accepted through December 6, 2016 at 11:59 pm ET. Questions received after December 6, 2016 may not be answered.**
- **Questions on the Cost Appendix (Appendix C) or saving it as a PDF will be accepted through December 14, 2016. Please contact the U.S. DOT SBIR Program Office at 617-494-2051 between the hours of 8:00 am and 5:00 pm ET no later than December 14, 2016.**

Answers will be posted on the U.S. DOT SBIR Program website

(<http://www.volpe.dot.gov/work-with-us/small-business-innovation-research/171-technical-and-administrative-questions>) They will also be posted on the Federal Business Opportunities website after the conclusion of the question period under the original synopsis.

Closing Date

Proposals must be received no later than 5:00 P.M. ET on December 21, 2016 through our automated proposal website (<https://hostedsites.volpe.dot.gov/SBIR/SubmitProposal.aspx>). Proposals received after that time will be automatically rejected; no exception will be permitted. Please be aware that the submittal process may take several minutes to complete due to a multi-step process. Applicants are encouraged to submit their proposals as early as possible.

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PRE-PROPOSAL WEBINAR

A pre-proposal webinar for small business concerns (SBCs) interested in applying to the FY17.1 U.S. DOT SBIR solicitation will be held on Monday, October 24, 2016 **at 1:30 pm ET**. SBCs will attend virtually via a webinar conference. All SBCs interested in applying are urged to attend this webinar, which will provide information on the application process and featured solicitation topics.

Each SBC interested in attending the webinar shall register at:

<https://volpe-events.webex.com/mw3100/mywebex/default.do?siteurl=volpe-events&rnd=0.3462476902641356>.

You may register any time prior to noon on the day of the conference. Upon receipt of your registration, you will receive information for connecting to the conference.

The webinar recording will be posted to the “Solicitation” section of the U.S. DOT SBIR Program website (<http://www.volpe.dot.gov/work-with-us/small-business-innovation-research/solicitations-0>)

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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 in Section IX and is subject to the availability of funding. The period of performance shall be 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, its commercial potential, and its relevance to U.S. DOT requirements and current research priorities. **All U.S. DOT SBIR Phase I awardees are eligible to submit a Phase II proposal.**

Phase II. The objective of Phase II is to continue the R/R&D effort from the completed Phase I. Funding of a Phase II is based upon the results of Phase I and the scientific and technical merit and commercial potential of the Phase II proposal. Commercial potential includes the potential to transition the technology to private sector applications, Government applications, or Government contractor applications. Phase II proposals may be funded up to \$1,000,000 (except where a lower ceiling is specifically identified) and have a period of performance of up to 24 months. The Government is not obligated to fund any specific Phase II proposal.

Sequential Phase II awards. The SBIR Program Policy Directive permits agencies to issue one additional, sequential Phase II award to continue the work of an initial Phase II award. These awards are referred to as Phase IIB awards and can be awarded for a period up to 24 months. The funding ceiling typically does not exceed the amount of the previous Phase II award. A small business may receive no more than two SBIR Phase II awards for the same R&D project, and the awards must be made sequentially.

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

- Commercial application of SBIR-funded R/R&D financed by non-Federal sources of capital.
- SBIR-derived products or services intended for use by the Federal Government, funded by non-SBIR sources of funding.

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- 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.

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

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

- The primary employment of the principal investigator must be with the small business firm at the time of contract award and during the conduct of the proposed research. Primary employment means that more than one-half of the principal investigator's time is spent working for the small business. This precludes full-time employment with another organization.
- For Phase I, a minimum of two-thirds of the research or analytical effort, measured in labor hours, must be performed by the awardee. For Phase II, a minimum of one-half of the research or analytical effort, measured in labor hours, must be performed by the awardee.

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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 Federal Government, the Commonwealth of Puerto Rico, the Republic of the Marshall Islands, the Federated States of Micronesia, the Republic of Palau, and the District of Columbia.

Performance Benchmark Requirements for Phase I Eligibility

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.

Before responding to this solicitation, all applicants should verify their *Transition Rate* eligibility for Phase I awards on [SBA's SBIR website](#). On June 1st of each year, Phase I applicants that meet the below criteria are eligible to *submit a proposal* for a new Phase I award. General information on the Performance Benchmark requirements is available at <https://www.sbir.gov/faqs/performance-benchmarks>. The SBIR Performance Benchmark requirements are:

- **Phase I to Phase II Transition Rate.** All small business applicants that have received more than 20 Phase I awards Program-wide (from all Federal Agencies with SBIR programs) are subject to the Phase I to Phase II Transition Rate.

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

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

- **Commercialization Rate.** The Commercialization Rate is not a requirement for this Solicitation. It is expected to be introduced in the future by SBA and will apply only to SBIR Phase I applicants that have received more than 15 (16 or more) Phase II awards over the past 10 fiscal years, excluding the last two years. These companies must have realized, to date, an average of at least \$100,000 of sales and/or investments per Phase II award (awarded during this period), or have received a

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number of patents resulting from the SBIR work equal to or greater than 15% of the number of Phase II awards.

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

D. Contact Information

If you have any questions not listed on our website (<https://www.volpe.dot.gov/work-with-us/small-business-innovation-research/frequently-asked-questions>) FAQs, or any administrative or technical questions pertaining to the FY17.1 U.S. DOT SBIR solicitation or research topics, please submit such questions via email to:

U.S. DOT SBIR Program Office
dotsbir@dot.gov

NOTE: All questions must be submitted via email. Inquiries regarding proposal status will not be answered.

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

U.S. DOT's SBIR Hotline
(617) 494-2051
dotsbir@dot.gov

In order to ensure full and open competition and comply with Procurement Integrity Act, 41 U.S.C. Section 2101-2107 requirements, contact with U.S. DOT relative to this solicitation during the Phase I proposal preparation and evaluation period is restricted to the officials stated in this solicitation. Contact with U.S. DOT officials from any U.S. DOT agency, other than those identified in this solicitation during the period of this solicitation particularly when the solicitation is open for proposal may result in rejection of the proposal.

E. Definitions

1. Funding Agreement

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

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

- A systematic, intensive study directed toward greater knowledge or understanding of the subject studied;

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

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

SBA has amended the definition for the term “small business concern.” See 13 C.F.R. § 121.701-705. To view the definition of small business concern, click on the following link:

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

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

4. **SBIR Technical Data**

All data generated during the performance of an SBIR award.

5. **SBIR Technical Data Rights**

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

6. **Socially and Economically Disadvantaged Small Business Concern**

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

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7. Women-Owned Small Business Concern

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

8. Veteran-Owned Small Business

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

9. Subcontract

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

10. Historically Underutilized Business Zone (HUBZone)

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

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

11. Service Disabled Veteran-Owned Concern

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

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

An Economically Disadvantaged Women-Owned Small Business Concern is at least 51 percent directly and unconditionally owned and controlled by one or more women who are citizens (born or naturalized) of the United States and who are economically

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disadvantaged. The EDWOSB automatically qualifies as a women-owned small business eligible for the Women-Owned Small Business (WOSB) Program.

F. Report SBIR Fraud, Waste and Abuse

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

<http://www.volpe.dot.gov/work-with-us/small-business-innovation-research/report-fraud-waste-and-abuse>.

G. Other Information

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

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

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

Additionally, the SBA requires each agency with 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

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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.

Federal Leadership on Climate Change and Environmental Sustainability: Executive Order (EO) 13693 – Planning for Federal Sustainability in the Next Decade

Executive Order 13693 updated and replaced Executive Order 13514 and requires Federal agencies, to give high priority to including sustainability requirements in all federal contracts. DOT strongly encourages all SBIR applicants to include sustainability in their research and development proposals. To learn more visit:

<https://www.whitehouse.gov/administration/eop/ceq/sustainability>.

II. CERTIFICATIONS

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

III. PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

A. Overview

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

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

The proposed research must have relevance to the improvement of some aspect of the national transportation system or to the enhancement of the ability of an operating element of the U.S. DOT to perform its mission. Proposals shall be confined principally to scientific or engineering research, which may be carried out through construction and evaluation. Proposals must be for R/R&D, particularly on advanced or innovative concepts.

The proposal shall be self-contained and checked carefully by the Offeror to ensure that all preparation instructions were followed (see Proposal Checklist, Appendix E).

All proposals must be submitted using the U.S. DOT's SBIR online submittal page: <https://hostedsites.volpe.dot.gov/SBIR/SubmitProposal.aspx>. An automated notice will be sent via email when the proposal is received through the SBIR Program's electronic submission process.

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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, which may be submitted as the first page of the Technical Proposal.
2. Proposal Layout – Proposals must be submitted using the SBIR Program's electronic submission process during open solicitation periods only. Proposals must be submitted as three separate files:
 - a. **Technical Proposal** – The technical proposal must be submitted in PDF format in accordance with the following requirements:
 - i. The Technical Proposal shall not exceed 25 pages; the Prior Phase II Awards and SBA Company registry Confirmation do not count towards the 25 pages.
 - ii. Font size shall be no smaller than 10 point.
 - iii. Proposals shall be on standard letter size pages (8.5" by 11").
 - iv. All pages shall be numbered consecutively.
 - b. **Cost Proposal (Appendix C)** – The Cost Proposal (Appendix C) can be submitted as an Excel document or PDF and must contain the required supporting information described in the table below. It does not count towards the 25-page limit. There is no limit on the number of pages for the cost proposal.
 - c. **Appendices A, B, and D** – All other Appendices (A, B, and D) must be saved as one single PDF file. It does not count towards the 25-page limit.
3. All proposals must be submitted using the U.S. DOT's SBIR online submittal page: <https://hostedsites.volpe.dot.gov/SBIR/SubmitProposal.aspx> . An automated notice will be sent via email when the proposal is received through the SBIR Program's electronic submission process. Proposals received after that time will be automatically rejected; no exception will be permitted. Please be aware that the submittal process may take several minutes to complete due to a multi-step process. Applicants are encouraged to submit their proposals as early as possible.

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Required Proposal Sections

Technical Proposal (PDF file)	
<i>Includes SBA Registry Confirmation, Technical Portion, and Prior Phase II Awards</i>	
<i>SBA Company Registry Confirmation</i>	All SBIR applicants are required to be registered in SBA’s company registry database. The confirmation from registering in the database should be included as the first page of the PDF document. It does not count towards the 25-page limit. See https://www.sbir.gov/registration to register or print your registration confirmation.
<i>Technical portion not to exceed 25 pages</i>	Submitted proposals must include the following headings in bold (in cases where a section does not apply, please state “Not Applicable”): <ol style="list-style-type: none"> 1. Identification and Significance of the Problem or Opportunity. State the specific technical problem or innovative research opportunity addressed and its potential benefit to the national transportation system. 2. Phase I Technical Objectives. State the specific objectives of the Phase I R/R&D effort; including the technical question(s) the research will try to answer to determine the feasibility of the proposed approach. 3. Phase I Work Plan. Describe the Phase I R/R&D plan. The plan shall indicate what will be done, where it will be done, when it will be done, and how the R/R&D will be managed or directed and carried out. Phase I R/R&D shall address the objectives and the question(s) cited 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. 4. Related Research or R&D. Describe significant R/R&D that is directly related to the proposal including any R/R&D conducted by the project manager/principal investigator or by the proposing firm. Describe how related research affects the proposed effort, and any planned coordination with outside sources. The SBC must persuade reviewers of its awareness of recent key R/R&D conducted by others in the specific topic area. 5. Key Personnel and Bibliography of Directly Related Work. Identify key personnel involved in Phase I including their directly related education, experience, and bibliographic information. Where vitae are extensive, summaries that focus on the most

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Required Proposal Sections

Technical Proposal (PDF file) <i>Includes SBA Registry Confirmation, Technical Portion, and Prior Phase II Awards</i>	
<p><i>Technical portion not to exceed 25 pages (cont'd)</i></p>	<p>relevant experience or publications are desired and may be necessary to meet proposal page limitations.</p> <p>6. Relationship with Future Research and Development. State the anticipated results of the proposed approach if the project is successful (Phase I and Phase II). Discuss the significance of the Phase I effort in providing a foundation for a Phase II R/R&D effort.</p> <p>7. Facilities. Provide a detailed description of the availability and location of instrumentation and physical facilities proposed for Phase I.</p> <p>8. Consultants. Involvement of consultants in the planning and research stages of the project is permitted. Describe any intended involvement in detail. Consultants are permitted to conduct no more than one-third of the work.</p> <p>9. Potential Post Applications. Briefly describe whether and how the proposed project appears to have (1) potential commercial application; and (2) potential use by the Federal Government.</p> <p>10. Similar Proposals or Awards. While it is allowed, with proposal notification, to submit identical proposals or proposals containing a significant amount of essentially equivalent work for consideration under numerous federal program solicitations, <u>it is unlawful to enter into contracts or grants requiring essentially equivalent effort</u>. If there is any question concerning this, it must be disclosed to the soliciting agency or agencies before award. If an SBC elects to submit similar or 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"> • The name and address of the agencies to which proposals were submitted or from which awards were received; • Date of proposal submission or date of award; • Title, number, and date of SBIR Program solicitations under which proposals were submitted or awards received; • The applicable research topics for each SBIR proposal submitted or award received; • Titles of research projects; • Name and Title of Principal Investigator or Program Manager for each proposal submitted or award received.

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Required Proposal Sections

Technical Proposal (PDF file) <i>Includes SBA Registry Confirmation, Technical Portion, and Prior Phase II Awards</i>	
<i>Technical portion not to exceed 25 pages (cont'd)</i>	<p>11. Human Factors, Research that involves human subjects may be subject to additional regulations found in 49 C.F.R. Part 11 (Part 11) as well as other applicable federal and state laws and regulations. Research will be considered to involve human subjects under Part 11 if the research obtains (1) data through intervention or interaction with an individual(s), and/or (2) identifiable private information. Unless exempt under 49 C.F.R. §11.101(b) or §11.101(i), human subject research must adhere to the regulations of Part 11, which includes review and approval of the research by a federally approved Institutional Review Board (IRB). To receive funding, a proposal that involves research on human subjects must sufficiently show that the human subject research (1) is exempt from Part 11 or (2) will comply with Part 11 requirements.</p> <p>Vendors may work with an established federally approved IRB or may create a new IRB. It can be a lengthy process to obtain federal approval of a new IRB. Any vendor considering obtaining approval for a new IRB should review 49 C.F.R. §11.103-11.108.</p> <p>The amount of time required for the IRB to review and approve human subject research will vary depending on such things as the IRB's procedures, the complexity of the research, the level of risk to study participants and the responsiveness of the Investigator. The average IRB approval process can last between one and three months. Once the IRB has approved the research, DOT will review the IRB determination to ensure that the research will be conducted in compliance with DOT regulations. Ample time should be allotted to complete both the IRB and DOT approval processes. No funding may be used for research involving human subjects until all applicable Part 11 requirements are met.</p>

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Required Proposal Sections

Technical Proposal (PDF file) <i>Includes SBA Registry Confirmation, Technical Portion, and Prior Phase II Awards</i>	
	<p>12. Sustainable Acquisition Requirement. The SBC’s technical proposal will also be used as the Statement of Work (SOW) under any contract award resulting from this solicitation under SBIR Phase I or II. Consistent with FAR Part 23, each SBC is expected to include and abide by the following provision in its technical proposal:</p> <p>“Sustainable Acquisition Requirement: To the maximum extent possible and consistent with the Federal Acquisition Regulations Part 23, the Government requires during the performance of the work under this Statement of Work (SOW) the Contractor to 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); made with recovered materials; or non-ozone depleting that minimize or eliminate, when feasible, the use, release, or emission of high global warming potential hydrofluorocarbons, such as by using reclaimed instead of virgin hydrofluorocarbons. Unless otherwise identified in this SOW, each recovered materials or biobased product provided and delivered must meet, but may exceed, the minimum recovered materials or biobased content of an EPA- or USDA-designated product. The sustainable acquisition requirements specified herein apply only to products that are required to be: (1) delivered to the Government during contract performance; (2) acquired by the contractor for use in performing services (including construction) at a Federally-controlled facility; (3) furnished by the contractor for use by the Government; or (4) specified in the design of a building or 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 BioPreferred website).”</p>

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<p><i>Prior SBIR Phase II Awards does not count towards the 25-page limit</i></p>	<p>If the SBC has received more than a total of 15 Phase II awards in the prior five fiscal years, submit the name of the awarding agency, date of award, funding agreement number, dollar amount, topic or subtopic title, follow-on agreement dollar amount, source and date of commitment, and current commercialization status for each Phase II. Provide the name and title of the project manager or principal investigator for each proposal submitted or award received.</p>
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Required Proposal Sections

Cost Proposal (Appendix C) (Excel or PDF)	
<p><i>Appendix C is available on our website here in Microsoft Excel 2010 format.</i></p> <p><i>Specific instructions for filling out Appendix C are located here.</i></p> <p><i>See the sample cost proposal here.</i></p>	<p>A firm fixed price Phase I Contract Pricing Proposal (Schedule 1) must be submitted in detail using the template provided in Appendix C. Some cost breakdown items of Appendix C may not apply to the proposed project. If such is the case, there is no need to provide information for each and every item. When completing your cost proposal, please consider the following:</p> <ul style="list-style-type: none">• It is important to provide enough information to allow the U.S. DOT to understand how the SBC plans to use the requested funds if a contract is awarded.• Phase I contract awards may include profit. Note: Firm fixed price is the type of contract used for Phase I SBIR awards.• Travel is not anticipated for Phase I projects.• A firm must note its TIN and Data Universal Numbering System (DUNS) identification number in Appendix C, in the Cost and Pricing Proposal Coversheet. The DUNS is assigned by Dun & Bradstreet, Inc. (See III (D) below). If you are not able to receive a DUNS number before the solicitation deadline, please indicate “Pending” in the DUNS field in the cost proposal. You must have a DUNS number before a contract can be awarded. <p>Please fill out the spreadsheets as directed. If you are submitting supporting information (e.g., price quotes or subcontractor commitments) then save the entire workbook as a PDF. To do this, click on the ‘Acrobat’ tab in the main ribbon of Excel, then choose “entire Workbook” from Conversion Range option at top of window.) If you have any trouble accessing the Appendix C spreadsheet or saving it as a PDF please contact the U.S. DOT SBIR Program Office at 617-494-2051 between the hours of 8:00 am and 5:00 pm ET no later than December 14, 2016.</p> <p>Proposals that exceed the Phase I Estimated Award Amount listed in Section IX will not be considered for award.</p>

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Appendices A, B, and D (PDF)	
<i>Signature Page</i> <i>(Appendix A)</i> <i>Pages 1 of PDF</i>	Complete the signature page in Appendix A. All pages shall be numbered consecutively beginning with the signature page.
<i>Project Summary</i> <i>(Appendix B)</i> <i>Page 2 of PDF</i>	Complete the Project Summary Sheet in Appendix B as Page 2 of the proposal. The Project Summary of successful proposals may be published by the U.S. DOT and, therefore, shall not contain classified or proprietary information. The Project Summary must include at a minimum: <ol style="list-style-type: none"> 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"> 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 may not be considered for award purposes. 2. Anticipated results and potential applications of the proposed research
<i>SBIR Funding Agreement Certification</i> <i>(Appendix D)</i> <i>Pages 3-6 of PDF</i>	All SBIR applicants are required to certify size and ownership as well as meet other SBIR Program requirements with the submission of their SBIR proposals, at the time of award, and during the funding agreement life cycle. A copy of the certification must be included with the proposal submission (see Appendix D).

C. Other Proposal Information

1. Proposals will be available only to the U.S. DOT team of engineers and/or scientists responsible for evaluating the proposal, the U.S. DOT SBIR Program Office, and Volpe Center staff pertinent to the SBIR program, such as the Volpe Center’s Office of Acquisition.
2. **Fraudulent Information.** Submitting plagiarized information and/or false proposal information pertaining to the company, the principal investigator and/or work to be performed may result in:
 - a. Cancellation of the topic within a solicitation;
 - b. A proposal being deemed non-responsive;
 - c. A recommendation for Phase I award being rescinded; or
 - d. Termination of an award.

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3. **Discretionary Technical Assistance.** The SBIR Program Policy Directive permits an agency to provide technical assistance to an SBIR awardee in an amount not more than \$5,000 per year. This amount is in addition to the award amount.

The purpose of the Technical Assistance, as defined by the SBA Policy Directive, is to assist SBIR awardees in: (1) making better technical decisions on SBIR projects; (2) solving technical problems that arise during SBIR projects; (3) minimizing technical risks associated with SBIR projects; and (4) commercializing the SBIR products or processes.

The U.S. DOT SBIR Program will provide assistance to Phase I awardees in the area of commercialization planning and strategy. The program shall be referred to as the DOT SBIR Commercialization Assistance Program (CAP).

U.S. DOT SBIR awardees can receive support through the CAP in one of two ways:

- a. The U.S. DOT SBIR Program Office has a contract with Dawnbreaker Incorporated, 2117 Buffalo Road, Rochester, NY that can provide support to Phase I and Phase II awardees. Once a proposal is recommended for award, the prospective awardees will receive notification from the U.S. DOT SBIR Program Office identifying the services available and guidance on how to obtain these services at no cost to the small business. These services for Phase I include a kick-off meeting with the CAP vendor and an individualized Commercialization Readiness Assessment to support the development of the Phase II proposal's commercialization strategy, OR
 - b. Awardees can receive Technical Assistance outside of the SBIR Program Office; however, this technical assistance must be focused on commercialization. To do so, Offerors must, through its own efforts, obtain its own subcontractor to provide such technical assistance. If recommended for award, the awardee must provide at that time an outline of the specific technical assistance services its proposed subcontractor will provide, and the detailed qualifications and experience of the proposed subcontractor/consultant. If approved by the U.S. DOT SBIR Program Officer and Contracting Officer, the awardee must submit a revised cost proposal (Appendix C) that will provide up to \$5,000 for such technical services.
4. **National Institute of Standards and Technology (NIST)/Hollings Manufacturing Extension Partnership (MEP).** An SBC may wish to contact its local NIST Hollings MEP for manufacturing and other business-related support services. The MEP works with small and mid-sized companies to help them create and retain jobs, increase profits, and save time and money. The nationwide network provides a variety of services, from business development assistance to innovation strategies to process improvements and the identification of commercialization opportunities. MEP is a nationwide network of locally managed extension

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centers with over 1,400 technical experts, located in every state. To contact an MEP center, call 1-800-MEP-4-MFG (1-800-637-4634) or visit MEP's website at <http://www.nist.gov/mep>.

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

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

IV. METHOD OF SELECTION AND EVALUATION CRITERIA

A. General

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

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

B. Phase I and II Evaluation Criteria

The evaluation process involves the following factors:

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

C. Prescreening

Each proposal submission will be examined to determine if it is complete and contains adequate technical data. **A proposal that does not meet the requirements of the solicitation as described**

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in Section III.B. may be excluded from consideration, and the SBIR Program Office will send the SBC an email notifying the SBC of its proposal ineligibility for consideration.

D. Schedule

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

E. U.S. DOT Technical Evaluation Process

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

F. Selection of Awardees

The U.S. DOT SBIR Program Office will notify each applicant whether it has been selected for an SBIR Phase I award no later than 90 calendar days after the closing date of the solicitation. At this time, the U.S. DOT SBIR Program Office will also post a listing of Phase I proposals recommended for contract award on the U.S. DOT SBIR Program webpage: <http://www.volpe.dot.gov/sbir>.

G. Time to Award Requirements

The SBIR Program Policy Directive requires all SBIR agencies to make awards within 180 days after the close of the solicitation. The purpose of this requirement is to reduce the gap in time between proposal submission and time of award. The U.S. DOT SBIR Program Office is required to award a Phase I contract in accordance with the timeframes set forth in the National Defense Authorization Act for FY2012 and SBIR Program Policy Directive.

H. Debriefing Requests

Debriefing requests must be submitted by e-mail to the SBIR Program Contracting Officer: Tammy Taylor, tammy.taylor@dot.gov within 30 days of notification of proposal status. Late requests may be considered on an individual basis. All requests must include: the SBC's name, address, research topic number, and the proposal identification number assigned and provided through an automated email notification sent to the SBC upon receipt of its proposal. The identity of the evaluators will not be disclosed. Debriefings will be provided by the SBIR Program Contracting Officer who will share a written summary of overall comments received from the technical evaluation team.

V. CONSIDERATIONS

A. Awards

The Government anticipates awarding a total of nine Phase I awards but reserves the right to make fewer, more, or no awards if it is in the best interest of the Government. The actual number of contract awards is subject to the availability of funding and the responses from small business firms to the solicited research topics described in Section IX.

1. **Dollar Value of Awards.** The SBIR Program Policy Directive sets the maximum thresholds for Phase I and Phase II awards at \$150,000 and \$1,000,000, respectively. SBA may adjust these amounts every year for inflation and will post the adjusted numbers on www.sbir.gov. Additionally, the SBIR Policy Directive provides that agencies may not exceed these thresholds by more than 50%, unless the agency requests and is granted a waiver from SBA.
 - a. **Phase I contract awards.** All Phase I awards will be firm fixed price contracts and **may be** funded up to \$150,000. The period of performance for a Phase I contract is 6 months. Funding levels for each topic are determined by the agency sponsoring the research and are provided in Section IX. Proposals that exceed the Phase I Estimated Award Amount listed in Section IX will not be considered for award.
 - b. **Phase II contract awards.** Phase II contracts can be funded up to \$1,000,000. Funding estimates are determined by the agency sponsoring the research. The period of performance for a Phase II contract is up to 24 months. Phase II funding estimates are provided in Section IX. Phase II awards are likely to be either Firm-Fixed-Price, Level-of-Effort (FFPLOE) or Cost-Plus-Fixed-Fee (CPFF) type contracts, however, each Phase II award contract type will be determined individually.
 - c. **Sequential Phase II awards.** The SBIR Program Policy Directive permits agencies to issue one additional, sequential Phase II award to continue the work of an initial Phase II award. These awards are referred to as Phase IIB awards and can be awarded for a period up to 24 months. A small business may receive no more than two SBIR Phase II awards for the same R&D project, and the awards must be made sequentially.
2. **Phase II Contract Type and Accounting System Audits.** The Contracting Officer will consider whether a Firm Fixed Price Level of Effort (FFPLOE), Cost Plus Fixed Fee (CPFF), or other contract type is appropriate for each Phase II award. Phase II awardees **MUST** have an acceptable accounting system in place to receive a cost type contract.

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3. U.S. DOT SBIR Program Set-aside Budget. For FY 2017, the U.S. DOT's Operating Administrations will contribute 3.2% 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). Phase I and/or Phase II awards for research, which is subject to the availability of funding, is solely of concern to the following Operating Administrations: FHWA, Federal Motor Carrier Safety Administration (FMCSA), Federal Railroad Administration (FRA), Federal Transit Administration (FTA), NHTSA, the Office of the Secretary (OST), and Pipeline Hazardous Materials Safety Administration (PHMSA). The Federal Aviation Administration (FAA) is exempt from the Competition in Contracting Act (CICA) and is excluded from the SBIR assessment per the DOT and Related Agencies Appropriations Act of 1996, PL 104-50. FAA does participate in DOT's SBIR program voluntarily when funding is available.

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.

Contracts for Phase II, IIB, and/or III contracts will allow for incremental payments to the successful SBC as work progresses dependent on the negotiated contract type and/or payment schedule.

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

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

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

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

2. The U.S. DOT prefers that SBC proposals avoid the inclusion of proprietary data. If the inclusion of proprietary data is considered essential for meaningful evaluation of a proposal submission, such data should be provided on a separate page with a numbering system to key it to the appropriate place in the proposal.
3. Rights in Data Developed under SBIR Contracts. Rights in technical data, including software developed under any contract resulting from this solicitation, shall remain with the SBC except that the Government shall have the limited right to use such data for Government purposes and shall not release such data outside the Government without permission of the SBC for a period of four years from completion of the project from which the data was generated. However, effective at the conclusion of the four-year

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

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

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

The Summary Statements that follow are illustrative of the types of clauses to which the SBC would be committed. This list does not represent a complete list of clauses to be included in Phase I contracts, and does not provide the specific wording of such clauses. A complete copy of the terms and conditions will be provided upon issuance of the contract for signature prior to award.

J. Summary Statements

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

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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 and Safety Standards.** The contractor may not require an employee to work more than eight hours a day or 40 hours a week unless the employee is compensated accordingly (i.e., overtime pay).
8. **Equal Opportunity.** The contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.
9. **Affirmative Action for Veterans.** The contractor shall not discriminate against any employee or applicant for employment because he or she is a disabled veteran or veteran of the Vietnam era.
10. **Affirmative Action for Handicapped.** The contractor shall not discriminate against any employee or applicant for employment because he or she is physically or mentally handicapped.
11. **Officials Not to Benefit.** No member of or delegate to Congress shall benefit from the contract.
12. **Covenant Against Contingent Fees.** No person or agency has been employed to solicit or secure the contract upon an understanding for compensation except bonafide employees or commercial agencies maintained by the contractor for the purpose of securing business.
13. **Gratuities.** The Government may terminate the contract if any gratuities were offered to any representative of the Government to secure the contract.

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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 “Restrictions on Obtaining and Disclosing Certain Information” (41 U.S.C. §§ 2101-2107, commonly known as the Procurement Integrity Act). This statute, as implemented by Federal Acquisition Regulation (FAR, 48 C.F.R.) §3.104, prohibits the following conduct during an agency procurement: prohibits federal employees or government contractors with procurement disclosing contractor bid or proposal information or source selection information (§2102); prohibits obtaining contractor bid or proposal information or source selection information (§2102); requires agency officials to report employment contacts regarding non-Federal employment (§2103); and bans for a definitive period certain personnel from accepting compensation from the vendor and the vendor from compensating such certain personnel during this definitive period (§2104). Violations of the statute may result in criminal and/or civil penalties, and administrative actions (e.g., suspension and debarment, cancellation of the procurement, and/or rescission of the contract).
16. **Section 508 Access Board Standards.** All electronic and information technology deliverables rendered must comply with Section 508 of the Rehabilitation Act and the Access Board Standards available for viewing at <http://www.section508.gov>. Unless otherwise indicated, the contractor represents by signature on a contract that all deliverables will comply with the Access Board Standards.
17. **Property.** Equipment either furnished or acquired under this contract is subject to Federal Acquisition Regulation 52.245-1 Government Property and may also be subject to special clauses specific to certain items of property.
<https://www.acquisition.gov/?q=browsefar>

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 reflects current planning. Although not expected, there may be inconsistencies between the information contained in the FY17.1 solicitation and the terms and conditions of any resulting SBIR contract. The terms of the contract once executed are controlling.
2. Before award of an SBIR contract, the SBC shall complete an Online Representations and Certifications Application at <https://www.sam.gov>. The SBC shall be certified in the designated NAICS code (541712).
3. The Government may request the SBC to submit additional management, personnel, and financial information to assure responsibility of the SBC.
4. The Government is not responsible for any monies expended by the SBC before award of any contract.
5. This solicitation is not an offer by the Government and does not obligate the Government to make any specific number of awards. Also, awards under this program are contingent upon the availability of funds.
6. The U.S. DOT SBIR Program is not a substitute for existing unsolicited proposal mechanisms. Unsolicited proposals shall not be accepted under the U.S. DOT SBIR Program in either Phase I or Phase II. For information pertaining to submission requirements for unsolicited proposals please refer to the U.S. DOT's Guidelines for Unsolicited Proposal Submission: <http://www.volpe.dot.gov/work-with-us/guidelines-unsolicited-proposal-submission>.
7. If an award is made pursuant to a proposal submitted under this solicitation, the SBC will be required to certify that it has not previously been, and is not currently being paid for essentially equivalent work by any agency of the Federal Government.

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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 clause 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):
 - Tammy Taylor, Contracting Officer
 - Volpe Center, V-330A
 - 55 Broadway
 - Cambridge, MA 02142-1001
 - tammy.taylor@dot.gov

Additionally, any protest that is filed with the Government Accountability Office (GAO) shall be copied to the above-identified Contracting Officer to be received within one calendar day of filing a protest with the GAO.

VI. SUBMISSION OF PROPOSALS

A. Closing Date

Complete Proposals must be received in the Government system no later than 5:00 P.M. ET on December 21, 2016. Proposals received after that time will be automatically rejected; no exception will be permitted. Please be aware that the submittal process may take several minutes to complete due to a multi-step process. Applicants are encouraged to submit their proposals as early as possible.

B. Submission Details

Only one proposal shall be submitted. No duplicate proposals shall be sent by any other means.

Proposals must be submitted as three files:

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

The proposal file names shall include the following:

- The first three characters shall be the topic number the proposal is associated with (i.e., FH2)
- The remaining characters must include an abbreviation of the company's name and a distinct character to designate each file (e.g. 1,2,3)

C. Submission Website

All proposals must be submitted using the U.S. DOT's SBIR online submittal page: <https://hostedsites.volpe.dot.gov/SBIR/SubmitProposal.aspx> . An automated notice will be sent via email when the proposal is received through the SBIR Program's electronic submission process. Please be aware that the submittal process may take several minutes to complete due to a multi-step process. Applicants are encouraged to submit their proposals as early as possible.

VII. SCIENTIFIC AND TECHNICAL INFORMATION SOURCES

There are no reference for 17.1 Topics.

VIII. SUBMISSION FORMS AND CERTIFICATION (Appendices)

A. [Proposal Signature Page \(Appendix A\)](#)

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

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

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

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

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

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

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

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

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

A. PROPOSAL SIGNATURE PAGE (Appendix A)

**U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. DTRT57-17-R-SBIR1
FY17.1
SIGNATURE PAGE**

Proposal Information		
Topic No. (see Solicitation): Solicitation No.: DTRT57-17-R-SBIR1		
Topic Title:		
Proposal Title:		
Company Information		
Company:		
Address:		
City:	State:	Zip:

Offeror Certification	
<p>By signing below and submitting this proposal in response to Solicitation No. DTRT57-17-R-SBIR1, Topic Number _____, I(We) am(are) 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 <i>et seq.</i>); (3) double damages and civil penalties under the Program Fraud Civil Remedies Act (31 U.S.C. § 3801 <i>et seq.</i>); (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.</p>	
Principal Investigator Name:	Corporate/Business Official Name:
Title:	
Address:	Address:
Telephone Number:	Telephone Number:
Email:	Email:
Signature:	Signature:
Date:	Date:

B. PROJECT SUMMARY (Appendix B)

**U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. DTRT57-17-R-SBIR1
FY17.1
PROJECT SUMMARY**

Project Summary

Abstract (Limited to two hundred words in this space only. The Project Summary of successful proposals may be published by the U.S. DOT and, therefore, shall not contain classified or proprietary information.).

Anticipated Results/Potential Commercial Applications of Results.

Keywords

C. CONTRACT PRICING PROPOSAL (Appendix C)

**U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. DTRT57-17-R-SBIR1
FY17.1
CONTRACT PRICING PROPOSAL**

Appendix C is available on our website [here](#) in Microsoft Excel 2010 format. Specific **instructions for filling out Appendix C** are located [here](#). Please fill out the spreadsheets as directed in the instructions. You must submit three separate documents (Technical Proposal, Cost Proposal (Appendix C), and Appendices A, B, and D) to **DOT SBIR's automated proposal site** which is located at:

<https://hostedsites.volpe.dot.gov/SBIR/SubmitProposal.aspx>.

Additional information about the cost proposal and its requirements can be found on our website FAQ- <https://www.volpe.dot.gov/work-with-us/small-business-innovation-research/frequently-asked-questions>.

If you have any trouble accessing or have questions about the Appendix C spreadsheet please contact the U.S. DOT SBIR Program Office at 617-494-2051 between the hours of 8:00 am and 5:00 pm ET no later than December 14, 2016

D. SBIR FUNDING AGREEMENT CERTIFICATION (Appendix D)

**U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. DTRT57-17-R-SBIR1
FY17.1
SBIR FUNDING AGREEMENT CERTIFICATION**

Complete the funding agreement certification on the following pages.

SBIR Funding Agreement Certification

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

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

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

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

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

Yes No

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

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

Yes No N/A Explain why N/A: _____

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

Yes No N/A Explain why N/A: _____

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

Yes No N/A Explain why N/A: _____

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

Yes No N/A Explain why N/A: _____

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

Yes No

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

Yes No

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

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

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

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

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

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

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

- Yes No Waiver has been granted

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

- Yes No

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

- Yes No N/A Explain why N/A: _____

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

- Yes No

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

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

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

Signature

Date __/__/__

Print Name (First, Middle, Last)

Title

Business Name

E. PROPOSAL CHECKLIST (Appendix E)

**U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. DTRT57-17-R-SBIR1
FY17.1
PROPOSAL CHECKLIST**

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

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

- ___ 9. The technical proposal includes the Sustainable Acquisition Requirement provision (Section III.B.)
- ___ 10. The additional information on prior Phase II awards, if required, in accordance with Section III.B is included.
- ___ 11. The Contract Pricing Proposal (Appendix C) has been completed and provides the necessary supporting information.
- ___ 12. The proposal must be submitted online and received by the U.S. DOT automated proposal website by 5:00 pm ET, December 21, 2016. **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 17.1 Phase I research topics for U.S. DOT Operating Administrations are listed on the following pages. These nine topics indicate the specific areas for which proposals are to be considered for acceptance by U.S. DOT. The topics are not listed in any order of priority. Each proposal submitted must respond to one (and only one) topic and/or focus area as described in this section. A proposal may, however, indicate and describe its relevance to other topics.

U.S. DOT Operating Administration	Topic Number & Title	Estimated Number of Anticipated Awards	Estimated Award Amount Phase I*	Estimated Award Amount Phase II**
Federal Highway Administration (FHWA)	17.1-FH1 Accurate and Rapid Measurement of Adsorption Capacity of Fly Ash in Concrete Mixtures	1	\$100,000	\$750,000
	17.1-FH2 Rapid Assessment of Air Void System in Fresh Concrete	1	\$100,000	\$850,000
Federal Railroad Administration (FRA)	17.1-FR1 Methods for Remanufacturing Creosote- Railroad Ties	1	\$150,000	\$500,000
	17.1-FR2 Broken Rail Detection from Flashing Rear End Device	1	\$150,000	\$300,000
	17.1-FR3 Resilient Wayside Structures to Reduce Severity of Passenger Equipment Collisions and Derailments	1	\$150,000	\$300,000
	17.1-FR4 Smart Phone Application for Onboard Railroad Passenger Information System	1	\$150,000	\$250,000

* Proposals that exceed the Phase I Estimated Award Amount will not be considered for award.

**The Phase II funding level noted above is an estimate only, is subject to the availability of funds and/or the technical requirements to accelerate the development of a commercial product and/or innovation. Any changes to the Phase II estimated funding level listed above will be communicated to the small business after the completion of the Phase I project.

U.S. DOT Operating Administration	Topic Number & Title	Estimated Number of Anticipated Awards	Estimated Award Amount Phase I*	Estimated Award Amount Phase II**
Federal Transit Administration (FTA)	17.1-FT1 Train Crowding and Information Dissemination for Transit Users	1	\$150,000	\$750,000
National Highway Traffic Safety Administration (NHTSA)	17.1-NH1 Detection of THC Use in Drivers	4	\$150,000	\$500,000
Office of the Secretary of Transportation – Research (OST-R)	17.1-OS1 System and Supply Chain for Recycling Lithium-ion batteries in the Transportation System	2	\$100,000	\$200,000

* Proposals that exceed the Phase I Estimated Award Amount will not be considered for award.

**The Phase II funding level noted above is an estimate only, is subject to the availability of funds and/or the technical requirements to accelerate the development of a commercial product and/or innovation. Any changes to the Phase II estimated funding level listed above will be communicated to the small business after the completion of the Phase I project.

A. Federal Highway Administration (FHWA)

17.1-FH1: Accurate and Rapid Measurement of Adsorption Capacity of Fly Ash in Concrete Mixtures

Air-entraining admixtures (AEAs) are used to stabilize small bubbles of air that are produced in concrete during mixing. These stabilized bubbles, in turn, play an essential role in providing long term freeze-thaw (F-T) durability and scaling resistance for concrete infrastructure constructed in cold regions. Concrete is a porous materials and the porosity in concrete consists of interconnected pore system, microscopic channels in another word that holds water. When temperature drops below freezing, water turns into ice and as a result it gains 9 percent in volume; the expanding ice in turn, forces the unfrozen water to move towards the voids to relieve the pressure, if there is not enough voids or the distance between the voids are too long, the repeated F-T action could weaken and eventually disintegrate the concrete. In concrete pavements and bridge decks, typically 5 to 8 percent air is needed to provide durability against F-T.

Fly ash with high carbon content or powder activated carbon (PAC) when used as substitution for a portion of cement in concrete (typically 20 to 30 percent) has the tendency of adsorbing the AEAs, therefore hindering the bubbles' stabilization and potentially reducing the air content necessary to combat the detrimental effects of F-T. One of the methods of assessing the degree of adsorption is the use of foam index.

Depending on the AEA properties used, the number of drops of AEA that are required to form a stable foam on a sample of fly ash or a fly ash cement slurry is called foam index (FI). The FI is then used as a relative measure of interaction between a specific fly ash and a specific AEA, allowing the practitioners to adjust AEA dosage in a concrete mixture to maintain proper air content. The foam index method however, is a subjective test and has a very high degree of variability depending on the operator's experience and the device used.

There is a need for development of a technology, preferably an automated device that can be used to accurately measure adsorption capacity of fly ash and precisely specify the amount of AEAs needed to satisfy concrete F-T durability.

The main objectives of this SBIR research are:

1. Development of an automated device capable of measuring the adsorption capacity of a fly ash and its ability to identify potential AEA adsorption issues
2. The proposed device is accurate so that it can be used by state DOTs or industry and can be adopted by American Association of State Highway and Transportation Officials (AASHTO) and American Society for Testing and Materials (ASTM).

The product described above when fully developed has the potential of taking the guesswork out of using AEAs and as a result improving concrete performance.

Expected Phase I Outcomes

Outcomes expected from the Phase I include a detailed concept and technical approach that demonstrate the viability of creating and testing a prototype (device) capable of precisely measuring the adsorption capacity of fly ash.

Expected Phase II Outcomes

Phase II efforts include fully developing and demonstrating a working prototype and includes manufacturing, ruggedness and round robin testing of the device. Work in Phase II will also include the implementation of a commercialization plan as described in the Phase II proposal.

17.1-FH2: Rapid Assessment of Air Void System in Fresh Concrete

It is a well-known fact that Freeze-Thaw (F-T) action can inflict irreversible damage to a concrete with inadequate air void parameters. Initially, the damage presents itself in the form of hair-line cracks all over the concrete and over time grows to larger cracks to a point that eventually disintegrates the concrete into pieces and exposes its reinforcement to corrosion. To combat the detrimental effects of F-T, American Concrete Institute (ACI) recommends an air void content of 5-8 percent with a specific surface (SS) of 600 in-1 or greater and with a spacing factor (SF) of less than 0.008 of an inch.

One of the most prevalent methods of assessing air void content in fresh concrete is the pressure meter type B conforming to ASTM C231. This method is an old, but widely used test method that has been around since 1949; however, the pressure meter only measures the total air content and does not provide air parameters values such as SF and SS, which are essential in evaluating F-T durability in concrete.

The ASTM C457, and its automated version, Rapid air 457, provide air parameters, but in hardened concrete. The shortcomings of both these methods are the fact that by the time air void system found inadequate, there is very little one can do to address the problem, unless to remove and replace the concrete, which could be a cost prohibitive proposition. Therefore, to improve the concrete's F-T durability, a new type of device is needed that has the following attributes:

1. It is rapid, reasonably priced and capable of measuring the air void parameter in fresh concrete;
2. It is accurate enough that can be used for quality assurance (QA) testing by state DOTs in the field and can be adopted by AASHTO and ASTM; and
3. It is easy to operate, calibrate and durable enough to withstand repeated testing of fresh concrete in the field.

The product described above is in line with the concept of sustainability as when fully developed has the potential of improving concrete performance.

Expected Phase I Outcomes

Outcomes expected from the Phase I include a detailed concept and technical approach that demonstrate the viability of creating and testing a prototype (device) capable of accurately measuring air void system of fresh concrete.

Expected Phase II Outcomes

Phase II efforts include fully developing and demonstrating a working prototype and includes manufacturing and demonstrating the system as well as a comprehensive ruggedness and round robin testing (establishment of precision and bias statements).

B. Federal Railroad Administration (FRA)

17.1-FR1: Methods for Remanufacturing Creosote-Railroad Ties

The U.S. railroad industry purchases, on average, 16 to 18 million creosote-treated wood ties per year. Creosote-treated wood ties are considered to be environmentally hazardous as harsh chemicals can leach into the ground. The service life of the wood ties has been diminishing with the depletion of high-quality wood and increased axle loads with higher rail car speeds and frequencies. Such reductions in service life are leading to potential derailments, especially at higher speeds, and, thus, creating major safety hazards. The FRA is looking for an economical solution for the safe and effective recycling/remanufacture of creosote-treated wood ties. The ideal solution would be to utilize the remaining serviceability of the wood tie as a core and encasing it within a strength and stiffness enhancing material that will effectively bond to the creosote-treated wood. This would provide improved durability against adverse environmental conditions as well as restore the load-bearing capacity of the tie. This solution should also be adaptable in order to allow for application on newly-manufactured wood ties as well as way of protecting the strength and durability characteristics of standard wood ties prior to entry into revenue service. Ideally, the remanufacturing process through which this product is achieved will not significantly increase the self-weight or the dimensions of the creosote-treated wood tie.

Expected Phase I Outcomes

The outcome in Phase I will be to develop a feasible design for the recycling/remanufacturing of discarded creosote-treated wood ties that would safely increase the service life of the tie. This outcome will be detailed in a proof-of-concept paper that will address, at minimum, the following evaluations for safety and effectiveness: (1) bonding integrity between the discarded creosote-treated wood and the encasing material, (2) strength and stiffness (e.g., center bending), (3) spike pull-out resistance, (4) durability against adverse environmental conditions (e.g., freeze-thaw, moisture ingress), (5) push-out force between the product and ballast, (6) electrical conductivity (impedance) following the remanufacture process, and (7) distress evaluations, including debonding.

Expected Phase II Outcomes

The outcome in Phase II will be to develop an economical remanufacturing process by which both discarded and newly-manufactured creosote-treated wood ties are fully encased in a strength and stiffness enhancing material in order to improve safety and serviceability in revenue service applications. Serviceability will be demonstrated through long-term in-track testing either in a controlled field test environment or within revenue service under 36-ton axle loads (i.e., 286-kip gross car loads). Ideally, in addition to active monitoring of the condition of the tie and fastening system by visual inspection, steps must be taken to evaluate the remanufactured ties ability to maintain track geometry and adequate gage strength long term. This will be detailed in

a final report that will address, at minimum, the following: (1) commercially-applicable process for encasing discarded and new wooden ties, (2) parameters for ensuring quality assurance and control of the remanufacture process, and (3) demonstration of the final manufactured product through additional laboratory (e.g., cyclic-load testing) and/or in-track testing.

17.1-FR2: Broken Rail Detection from Flashing Rear End Device

The goal of this project is to develop a prototype broken rail detection system that can be deployed on the end of a train.

Rails often break under trains but do not lead to immediate derailment until further damage occurs at the fracture. These broken rails or service failures are often detected when the track occupancy signal, a track circuit, does not clear. Occasionally, enough electrical continuity remains that the signal is not lost or the rail is in unsignalized territory leaving an undetected broken rail. Additional damage at the discontinuity from wheel passage will in short order lead to a derailment of subsequent trains. The concept is that vision systems perhaps coupled with acceleration data or some other detection technology could identify broken rail discontinuities and alert railroad operating authorities before the next train arrives.

Many trains are equipped with so called flashing rear end devices (FRED) that are positioned at the end of trains to provide the ability to break a train starting at the rear reducing stopping distances and managing in train longitudinal forces. They also have a flashing red light. These devices have limited electrical power and are generally equipped with batteries and some method of charging the batteries.

The prototype broken rail detection system should consider power requirements but not be constrained by a particular power level. The focus must be on reliably detecting discontinuities in the rail and differentiating these from normally occurring joints. The prototype should also consider how the system reports locations of concern and what processing capability is necessary. The prototype must consider the extreme environmental and physically demanding location and develop strategies for self-diagnostic checks and calibration.

Expected Phase I Outcomes

The expected outcome of Phase I is a proof of concept for a prototype device that can detect the unsupported gap in a rail as would be seen in a broken rail. The proof of concept should identify how the prototype could be integrated into end of train devices as an add-on or as an integrated unit.

Expected Phase II Outcomes

The expected outcome of phase II would be a prototype device that could be deployed in a test environment such as at the FRA-owned FAST track to determine the system's performance in simulated service.

17.1-FR3: Resilient Wayside Structures to Reduce Severity of Passenger Equipment Collisions and Derailments

Recent passenger train accidents have resulted in fatalities and injuries to train occupants due to interactions between colliding or derailling equipment and wayside structures, including catenary poles and discontinuities in third rails at highway grade crossings. The recent Amtrak derailment in Philadelphia (May 2015) resulted in substantial damage to a passenger coach due to its impact with a catenary pole. A recent grade crossing collision in Valhalla, NY (February 2015) resulted in the struck highway vehicle interacting with the exposed end of the third rail, allowing it to thread into the impacting cab car and resulting in fatalities, injuries and fire. In addition, on September 17, 2005, an accident on Chicago's Metra system involved a commuter train overspeed derailment through a switch, and the leading cab car collided with a bridge abutment. The floor of the cab car was deformed in the accident. NTSB recommended strengthening cab car floors, but it might be more effective to load-limit bridge abutments, as is done on highways.

FRA is interested in methods by which the consequences of such accidents might be mitigated. Such methods should consider the role(s) the existing structures must perform when evaluating alternatives for mitigating accident severity.

Expected Phase I Outcomes

At the completion of Phase I, it is expected that the research would yield the following deliverables:

1. Review of accidents in which post-derailment or post-collision passenger car interaction with wayside structures (other than those mentioned here) affected the severity of the accident in terms of number, type and extent of injuries and fatalities.
2. Assessment of the design concepts in use in the U.S. and internationally for catenary poles, third rail terminations and bridge abutments.
3. Development of up to two scenarios to be used for evaluating the performance benefits of the proposed concept versus existing structures.
4. Development and demonstration of computer models or simulations showing the effectiveness of the proposed concept(s). The effectiveness of the proposed solution(s) should include scenario-based evaluations, as defined in Outcome 3, of the performance of those solutions relative to the performance of the existing designs.
5. Final report describing all activities performed and findings derived from the Phase I activities.

Expected Phase II Outcomes

The Phase II proposal work plan should include an early deliverable of a plan for scale model development and testing to demonstrate the effectiveness of the proposed solutions. Other outcomes will include: development and testing of scale model(s), renderings of the proposed solution(s), and testing according to the approved plan.

17.1-FR4: Smart Phone Application for Onboard Railroad Passenger Information System

Providing travel information on commuter and intercity passenger rail trains can improve the travel experience for on-board passengers and provide added value during emergencies. Railroad passenger information systems have historically been trainline public address systems. In some cases, this method of communication has been ineffective. On-board variable message signs are now being used to augment these systems to improve the likelihood of messages being received by the passenger. Today a substantial portion of railroad passengers use smart phones throughout their travel. Many passengers with disabilities use rail transportation to travel around the U.S. Communication is a vital part of the travel experience. However, some passengers with auditory disabilities are unable to receive all information disseminated on the train, or to communicate with on-board crew. Being able to deliver train status and trip information directly to passengers' smart phone would clearly improve the communication between train personnel and the riding public. This would have value both for safety and for passenger convenience, not only for passengers with disabilities but for all passengers on-board.

In addition to train travel information, two way communications with the Train Conductor should be considered for use in emergencies and for the benefit of passengers requiring assistance.

Currently most onboard passenger information systems are of proprietary design. An important part of this research would be to establish a standard interface between informational sign-based and public address-based passenger information systems which would facilitate their introduction without requiring that all existing systems be replaced. Use of cellular data as the primary method to transmit information to the passengers' smart phone is not recommended. Cellular coverage throughout the U.S. varies by carrier and can result in limited to no connection in certain parts of the country. This method of providing info will result in some passengers not receiving vital information during their trip.

Expected Phase I Outcomes

At the completion of Phase I, it is expected that the research would yield the following deliverables:

1. Proof of concept report describing the development and demonstration, including the proposed system model.
2. Prototype for demonstration of screens and user interfaces to stakeholders.
3. Outline of proposed system requirements for consideration by rail industry stakeholders, consisting of passenger service providers, equipment manufacturers and suppliers, owners and operators and appropriate representative from the disability advocacy groups.
4. Identification of and supporting documentation from passenger rail service provider for Phase II prototype field demonstration (if awarded a Phase II).

Expected Phase II Outcomes

The project will aim to achieve successful field demonstration of the prototype(s) on a passenger train with an appropriate commuter/passenger railroad partner. Offeror will identify the most appropriate partner for the demonstration at the end of the Phase I effort. FRA will approve the selected passenger rail service provider partner before demonstration occurs. Evidence of acceptance and support for concept from the disability community is required for Phase II completion. Additionally, the Phase II proposal will include an outline for the business model, describing how systems might be paid for to demonstrate the likelihood of adoption by rail service providers.

C. Federal Transit Administration (FTA)

17.1-FT1: Train Crowding and Information Dissemination for Transit Users

The primary goal of this project is to provide advance information to passengers waiting at a station on the availability of space in each car of the approaching train. This will enable passengers, if they choose, to position themselves at a point on the platform corresponding to a less-crowded car, resulting in a better-balanced passenger distribution along the train. Station platforms at major Metrorail stations are frequently congested particularly at transfer locations and at major escalator and stairway landings. Informal observations suggest that passenger distributions among the cars in a subway consist (i.e., a lineup or sequence of railroad cars) are often substantially uneven. At peak travel times, this can lead to overcrowding of certain cars and several resulting negative consequences:

- Extended duration of passenger alighting and boarding
- Difficulty closing train doors
- Longer dwell times
- Headway/schedule disruption
- Standing-room crush loads in some cars; open seats in other cars
- Frustrated passengers
- Loss of choice riders

This project should result in an effective and economical method for measuring passenger loading on each rail car and information dissemination approaches for communicating the relative degree of crowding in each car on an approaching train so that riders at the next station can act on this information. Project proposal must include some of the potential technical and human-factors issues that could hinder the success of the project, including:

- Apathy or other lack of compliance by passengers when provided with accurate and timely load distribution information.
- Inability of passengers to act on information presented in sufficient time
- Over-compensation – if too many people move to where a less-crowded car will be.
- Security – could car loading/passenger re-direction information be used for evil? How could such risks be minimized?

Project proposals must include a methodology on how the small business will use data to quantitatively demonstrate that its recommended technology innovation can truly improve transit service, system, or applications.

Expected Phase I Outcomes

The Phase I outcome is a viable proof-of-concept that:

1. Describes how the technology, application, or solution can improve service or infrastructure in a transit environment.
2. Proposes use of efficient and low-cost technology, including, but not limited to, modular, interoperable, plug-and-play and open source (if applicable) device(s)
3. Provides a technology assessment with respect to industry best practices
4. Conducts a feasibility analysis (data proven) for success in developing a working prototype

Expected Phase II Outcomes

Phase II efforts include the development of a working prototype that demonstrates the feasibility of the technology/device/application/solution to be manufactured and its commercialization potential while meeting all of the requirements provided in the topic description.

D. National Highway Traffic Safety Administration (NHTSA)

17.1-NH1: Detection of THC Use in Drivers

Decreasing crashes, injuries, and fatalities from impaired driving is a priority for NHTSA. As states move toward legalizing medicinal and recreational use of marijuana, there may be increased use of this drug by drivers. Determination that a drug (especially THC) is present in the body of a suspected drug impaired driver presents challenges for law enforcement, especially in conducting and obtaining results from any type of test close-in-time to the driving event. Use of blood tests to determine the presence of a drug (especially THC) in the body can be time consuming and require a warrant, presenting challenges for law enforcement and prosecution. For reasons such as these, drug-impaired charges may not be pursued, especially if alcohol was also involved - as an alcohol-impaired driving charge is more likely to result in conviction. This may result in some individuals continuing to drive impaired by marijuana (or other drugs), given the lower perceived probability of arrest and conviction.

As marijuana is the drug of most interest, a device that could detect the presence of the active component THC would provide officers and prosecutors crucial information in their decision whether to pursue a drugged driving charge. A portable device, similar to a breath test device, would be a useful tool for law enforcement. The innovative technology could either focus on: 1) determining the presence of THC in the body, or 2) assessing whether a driver is impaired through psychomotor, performance, or cognitive tests. If the device is determining presence, we are looking for a test and procedure that is quick, easy to administer and minimally intrusive. If the device is assessing “impairment,” there must be careful definition of the term, and consideration of validity of the measurement across drivers and compared to individuals’ normative abilities, including in stressful situations. Resulting technology would need to be sensitive to THC, reliable, minimize false positives and false negative tests, and avoid legal issues. A device could be used at roadside, or a police station, however the time from the driving event must be considered as the interest for NHTSA relates to the driving event rather than drug use in general. A device would need to be affordable for law enforcement agencies, and usable by officers with reasonable training.

Expected Phase I Outcomes

1. Proof of Concept paper, including a testing plan to determine (at a minimum) the device's sensitivity, validity, reliability, false positive and false negative rates with sufficient sample size for meaningful analyses. The paper should also discuss the feasibility of use by law enforcement agencies, and any legal issues.
2. Prototype design.

Expected Phase II Outcomes

A device that can be used by law enforcement agencies, at roadside on patrol or at sobriety checkpoints, or at the police station. The device must be affordable for most police agencies, and feasible to an officer to use with a reasonable amount of training.

E. Office of the Secretary of Transportation – Research (OST-R)

17.1-OS1: System and Supply Chain for Recycling Lithium-ion batteries in the Transportation System

The U.S. DOT's Zero Emission Transportation Initiative is looking to push the transportation sector greenhouse gas production to zero by 2050. In the FAST Act section 1413, U.S. DOT is charged with designating alternative energy corridors, increasing accessibility to low emission fuels such as hydrogen fuel cell, electrical vehicle, natural gas and propane. The accessibility will lead to an increased demand and resulting disposal issues for lithium-ion batteries in electric vehicles. Research is needed to develop a supply chain for recycling lithium-ion in the transportation system for such items as electric-bike share systems, traffic signals or any peripheral transportation use.

Expected Phase I Outcomes

A technical brief or report describing a proposed concept for repurposing or recycling lithium-ion electric vehicle batteries for use in transportation system such as electrical-bike batteries, signal lights and other transportation use.

Expected Phase II Outcomes

Develop the concept into a prototype to demonstrate a viable system for reuse or recycled lithium-ion batteries in the transportation system. The outcome must include the development of a supply chain model that can lead to small or large scale operation.