DOT-VNTSC-OST-97-1

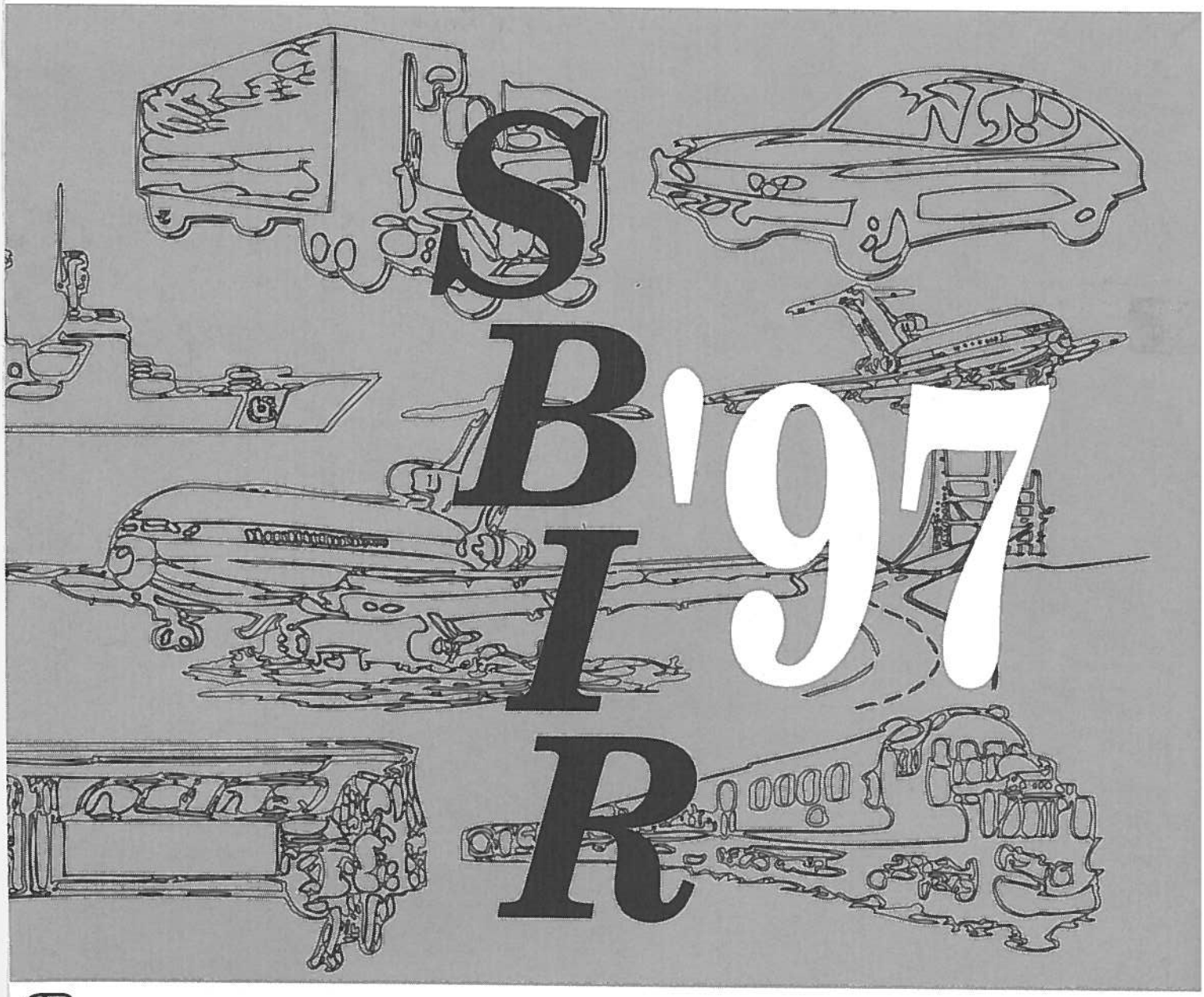
SBIR-97-1

U.S. Department of Transportation
Office of the Secretary of Transportation

Small Business Innovation Research

Program Solicitation

(Closing Date: May 1, 1997)



Research and Special Programs Administration
John A. Volpe National Transportation Systems Center

SBIR-97-1

PROGRAM SOLICITATION

Small Business Innovation

Research Program

Closing Date: May 1, 1997

DOT SBIR Program Office, DTS-22
U.S. Department of Transportation
Research and Special Programs Administration
John A. Volpe National Transportation Systems Center
55 Broadway, Kendall Square
Cambridge, MA 02142-1093

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DOT PROGRAM SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH

I. PROGRAM DESCRIPTION

A. Introduction

This solicitation for research proposals is issued by the Department of Transportation (DOT) pursuant to the Small Business Innovation Development Act of 1982, P.L. 97-219, as amended by P.L. 99-443, and P.L. 102-564, Small Business Research and Development Act of 1992, signed October 28, 1992. The law seeks to encourage the initiative of the private sector and to use small business as effectively as possible in meeting Federal research and development objectives.

The purposes of the Act are:

(1) To stimulate technological innovation;
(2) To use small business to meet Federal research and development needs;
(3) To increase private sector commercialization of innovations derived from Federal research and development; and
(4) To foster and encourage minority and disadvantaged participation in technological innovation.

In consonance with the statutory obligations of the Act, the U.S. Department of Transportation has established a Small Business Innovation Research Program - hereinafter referred to as the DOT 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 Department.

B. Three-Phase Program

The SBIR Program is a three-phase process. **THIS SOLICITATION IS FOR PHASE I PROPOSALS ONLY.**

Phase I. Phase I is for the conduct of feasibility-related experimental or theoretical research or R&D efforts on research topics as described herein. The dollar value of the proposal may be up to $100,000 unless otherwise noted and the period of performance may be up to six months. The primary basis for award will be the scientific and technical merit of the proposal and its relevance to DOT requirements. Only awardees in Phase I are eligible to participate in Phase II.

Phase II. Phase II is the principal research or R&D effort having a period of performance of approximately two years with a dollar value of up to $750,000 unless otherwise noted. Phase II proposals must be prepared in accordance with guidelines provided by DOT to all Phase I awardees. DOT will accept Phase II proposals under the SBIR Program only from firms which have previously received a DOT Phase I award. Phase II awards will be based on results of Phase I efforts, technical merit, Agency priority and commercial applications, and the availability of appropriated funds to support the Phase II effort. Special consideration may be given to proposals that have obtained commitments for follow-on funding from non-Federal sources for Phase III.

Phase III. Phase III is to be conducted by the small business with either non-Federal funds to pursue commercial applications of research or R&D funded in Phases I and II, or non-SBIR government funded contracts for continued research or products or processes intended for use by the United States Government.

C. Eligibility

Each concern submitting a proposal must qualify as a small business for research or R&D purposes. In addition, **the primary employment of the principal investigator must be with the small business firm at the time of award and during the conduct of the proposed research** unless otherwise approved by the contracting officer. Primary employment means that more than one-half of the principal investigator's time is spent with the small business. Also for both Phase I and Phase II, the research or R&D work must be performed in the United States. "United States" means the several states, the Territories and possessions of the United States, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, the Trust Territory of the Pacific Islands, and the District of Columbia.

All types of small business organizations may submit proposals, including high technology, R&D, manufacturing and service firms. Companies with outstanding scientific or engineering competence in highly specialized product, process or service areas may wish to apply their expertise to the research topics in this solicitation through a laboratory prototype. Ideally, the research should make a significant contribution to the solution of an important transportation problem and provide the small business concern with the basis for new products, processes, or services.

D. General Information

This is a solicitation for Phase I research proposals on advanced, innovative concepts from small business firms having strong capabilities in applied science or engineering.

The Phase I research proposals should demonstrate a sound approach to the investigation of an important transportation-related scientific or engineering problem categorized under one of the topics listed in Section VIII.

A proposal may respond to any of the research topics listed in Section VIII, but must be limited to one topic. The same proposal may not be submitted under more than one topic. An organization 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 proposer should choose that topic which appears to be most relevant to the proposer'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 DOT to perform its mission.

Proposals should be confined principally to scientific or engineering research which may be carried out through construction and evaluation. Proposals must be for research or R&D, particularly on advanced or innovative concepts, and should not be for incremental or scaled-up versions of existing equipment or the development of technically proven ideas. Proposals for the development of already proven concepts toward commercialization, or which offer approaches already developed to an advanced prototype stage or for market research should not be submitted. Commercialization is the objective of Phase III, in which private capital or non-SBIR funds are to be used to continue the innovative research supported by DOT under Phase I and Phase II.

The proposal should be self-contained and checked carefully by the applicant to ensure that all preparation instructions have been followed. (See proposal checklist, inside front cover.)

Requests for additional information or questions relating to the DOT SBIR Program may be addressed to:

Dr. George Kovatch
DOT SBIR Program Director, DTS-22
U.S. Department of Transportation
Research and Special Programs Administration
John A. Volpe National
Transportation Systems Center
55 Broadway, Kendall Square
Cambridge, MA 02142-1093

Telephone: (617) 494-2051
Fax: (617) 494-2497
Volpe Center Web Site;
http://www.volpe.dot.gov

Questions of a contractual nature may be addressed to:

Maria J. Nicosia, Chief
Contracts and Small Business Programs Branch, DTS-853
U.S. Department of Transportation
Research and Special Programs Administration
John A. Volpe National
Transportation Systems Center
55 Broadway, Kendall Square
Cambridge, MA 02142-1093

Telephone: (617) 494-2669
FAX: (617) 494-3024

II. DEFINITIONS

A. Research or Research and Development

Research or research and development (R or R&D) means any activity which is:

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

(2) A systematic study directed specifically toward applying new knowledge to meet a recognized need; or

(3) 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.

B. Small Business

A small business concern is one that at the time of award of Phase I and Phase II funding agreements meets the following criteria:

(1) Is independently owned and operated, is not dominant in the field of operation in which it is proposing, and has its principal place of business located in the United States and is organized for profit;

(2) Is at least 51 percent owned, or in the case of a publicly owned business, at least 51 percent of its voting stock is owned by United States citizens or lawfully admitted permanent resident aliens;

(3) Has, including its affiliates, a number of employees not exceeding 500, and meets the other regulatory requirements found in 13 CFR Part 121. Business concerns, other than investment companies licensed, or state development companies qualifying under the Small Business Investment Act of 1958, 15 U.S.C. 661, et seq., are affiliates of one another when either directly or indirectly (A) one concern controls or has the power to control the other; or (B) a third party or parties controls or has the power to control both. Control can be exercised through common ownership, common management, and contractual relationships. The term "affiliation" is defined in greater detail in 13 CFR 121.401. The term "number of employees" is defined in 13 CFR 121.407. Business concerns include, but are not limited to, any individual, partnership, corporation, joint venture, association or cooperative.

C. Minority and Disadvantaged Small Business

A minority and disadvantaged small business concern is one that is:

(1) At least 51 percent owned by one or more minority and disadvantaged individuals; or in the case of a publicly owned business, at least 51 percent of the voting stock of which is owned by minority and disadvantaged individuals; and

(2) Whose management and daily business operations are controlled by one or more such individuals.

A minority and disadvantaged individual is defined as a member of any of the following groups:

(1) Black Americans.

(2) Hispanic Americans.

(3) Native Americans.

(4) Asian-Pacific Americans.

(5) Subcontinent Asian Americans.

D. Women-Owned Small Business

A small business that is at least 51 percent owned by a woman or women who also control and operate it. "Control" in this context means exercising the power to make policy decisions. "Operate" in this context means being actively involved in the day-to-day management.

E. Subcontract

Any agreement, other than one involving an employer-employee relationship, entered into by a Federal Government funding agreement awardee calling for supplies or services required solely for the performance of the original funding agreement.

III. PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

A. Limitation on Length of Proposal

Please note that:

(1) SBIR Phase I proposals should not exceed a total of 25 pages (regular size type - no smaller than 10 point font size - single or double spaced, standard 8 1/2" X 11" pages) including proposal cover sheet, budget and all enclosures or attachments.

(2) Attachments, appendices and references are included in the 25 page limitation. Proposals in excess of 25 pages shall not be considered for review or award.

B. Proposal Cover Sheet

Photocopy and complete the proposal cover sheet in Appendix A as page 1 of each copy of each proposal. All pages should be numbered consecutively, beginning with the proposal cover sheet. Do not add an overlay on the cover sheet.

C. Project Summary

Photocopy and complete the form in Appendix B as page 2 of your proposal. The Project Summary should include a technical abstract with a brief statement of the problem or opportunity, project objectives, and description of the effort. Anticipated results and potential applications of the proposed research should also be summarized in the space provided. The Project Summary of successful proposals may be published by the DOT and, therefore, should not contain classified or proprietary information. The technical abstract must be limited to two hundred words in the space provided on the Project Summary form.

D. Technical Content

Submitted proposals must include the following:

(1) **Identification and Significance of the Problem or Opportunity.** The specific technical problem or innovative research opportunity addressed and its potential benefit to the Nation's transportation system should be clearly stated.

(2) **Phase I Technical Objectives.** State the specific objectives of the Phase I research or research and development effort, including the technical questions it will try to answer to determine the feasibility of the proposed approach.

(3) **Phase I Work Plan.** Describe the Phase I R or R&D plan. The plan should indicate what will be done, where it will be done, and how the R or R&D will be managed or directed and carried out. Phase I R or R&D should address the objectives and the questions cited in (2) above. The methods planned to achieve each objective or task should be discussed in detail, including the level of effort associated with each task.

(4) **Related Research or R&D.** Describe significant research or R&D that is directly related to the proposal including any conducted by the project manager/principal investigator or by the proposing firm. Describe how it relates to the proposed effort, and any planned coordination with outside sources. The proposer must persuade reviewers of his or her awareness of key recent research or R&D conducted by others in the specific topic area.

(5) **Key Personnel and Bibliography of Directly Related Work.** Identify key personnel involved in Phase I including their directly related education, experience, and bibliographic information. Where vitae are extensive, summaries that focus on the most relevant experience or publications are desired and may be necessary to meet proposal page limitation.

(6) **Relationship with Future Research and Development.**

(a) State the anticipated results of the proposed approach if the project is successful (Phase I and Phase II).

(b) Discuss the significance of the Phase I effort in providing a foundation for Phase II research or research and development effort.

(7) **Facilities.** A detailed description, availability and location of instrumentation and physical facilities proposed for Phase I should be provided.

(8) **Consultants.** Involvement of consultants in the planning and research stages of the project is permitted.

(a) If such involvement is intended, it should be described in detail.

(9) **Potential Applications.** Briefly describe:

(a) Whether and by what means the proposed project appears to have potential commercial application.

(b) Whether and by what means the proposed project appears to have potential use by the Federal Government.

(10) **Similar Proposals or Awards.** Warning - While it is permissible, with proposal notification, to submit identical proposals or proposals containing a significant amount of essentially equivalent work for consideration under numerous federal program solicitations, it is unlawful to enter into contracts or grants requiring essentially equivalent effort. If there is any question concerning this, it must be disclosed to the soliciting agency or agencies before award.

If a firm elects to submit identical proposals or proposals containing a significant amount of essentially equivalent work under other federal program solicitations, a statement must be included in each such proposal indicating:

(a) The name and address of the agencies to which proposals were submitted or from which awards were received;

(b) Date of proposal submission or date of award;

(c) Title, number, and date of SBIR Program Solicitations under which proposals were submitted or awards received;

(d) The applicable research topics for each SBIR proposal submitted or award received;

(e) Titles of research projects; and

(f) Name and title of Project Manager or Principal Investigator for each proposal submitted or award received.

E. Contract Pricing Proposal

A firm fixed price Phase I Contract Pricing Proposal (Standard Form 1411) must be submitted in detail as shown in Appendix C. Note: Firm Fixed Price (FFP) is the type of contract to be used for Phase I SBIR awards. Some cost breakdown items of Appendix C may not apply to the proposed project. If such is the case, there is no need to provide information for each and every item. It is important, however, to provide enough information to allow the DOT to understand how the proposer plans to use the requested funds if the contract is awarded. Phase I contract awards may include profit.

F. DUNS Identification Number

If available, a firm should note its DUNS identification number on Appendix C, Contract Pricing Proposal, Standard Form 1411. This number is assigned by Dun & Bradstreet, Inc., and is contained in that Company's Data Universal Numbering System (DUNS).

G. Acknowledgement of Proposal Receipt

Proposers should cut out and fill out the acknowledgement of receipt card on the inside back cover of this solicitation and include it with the proposal to DOT.

H. Prior SBIR Phase II Awards

If the small business concern has received more than 15 Phase II awards in the prior 5 fiscal years, submit name of awarding agency, date of award, funding agreement number, amount, topic or subtopic title, follow-on agreement amount, source and date of commitment and current commercialization status for each Phase II. (This required proposal information shall not be counted toward proposal pages count limitation.)

IV. METHOD OF SELECTION AND EVALUATION CRITERIA

A. General

All Phase I and Phase II proposals will be evaluated and judged on a competitive basis. Initially, all proposals will be screened to determine responsiveness to the solicitation. Proposals passing this screening will be evaluated to determine the most promising technical and scientific approaches. Each proposal will be judged on its own merit. The Department of Transportation is under no obligation to fund any proposal or any specific number of proposals on a given topic or subtopic. It may elect to fund several or none of the proposed approaches to the same topic or subtopic.

B. Evaluation Criteria

The evaluation process involves the following factors:

(1) Scientific and technical merit and the feasibility of the proposal's commercial potential, as evidenced by:

a) past record of successful commercialization of SBIR or other research;

b) existence of second phase funding commitments from private sector or non-SBIR funding sources;

c) existence of third phase, follow-on commitments; and

d) presence of other indicators of the commercial potential of the idea.

(2) The adequacy of the work plan and approach to achieve specified work tasks and stated objectives of the proposed effort 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 or R&D topic that is proposed for investigation.

(4) Adequacy of supporting staff and facilities, equipment, and data for the successful completion of the proposed research or research and development.

C. Prescreening

Each proposal submission will be examined to determine if it is complete and contains an adequate amount of technical and financial data. Proposals that do not meet the basic requirements of the solicitation will be excluded from further consideration. Each organization will be notified promptly by letter of such action.

D. Schedule

All DOT reviews should be completed and awards made within 5 months of the closing date for Phase I proposals.

E. Program Selection

A Proposal Review Panel, chaired by the Department's SBIR Program Director and comprising senior management officials representing the Department's Operating Administrations and the Office of the Secretary, will arrange for review and evaluation by professionals, in their respective organizations, of all Phase I proposals that meet the requirements of this solicitation. The Proposal Review Panel will review the technical evaluations by the specialists and recommend to the Program Director the proposals for awards. The Program Director will announce the awards.

F. Contact with DOT

Contact with DOT relative to this solicitation during the Phase I proposal preparation and evaluation period is restricted for reasons of competitive fairness. No information on proposal status will be available until formal notification of award or declination is made. For planning purposes this is expected to occur by October 2, 1997. Correspondence relating to proposals should reference the proposal identification number assigned on the acknowledgement of receipt card and be sent to the DOT SBIR Program Office.

After final award decisions have been announced, a debriefing comprised of the overall comments on the proposal may be provided to the proposer upon written request. The identity of the evaluators shall not be disclosed.

V. CONSIDERATIONS

A. Awards

It is estimated that during fiscal year 1997, the Department of Transportation will award approximately 30 Phase I contracts with an anticipated potential maximum of 40 awards, depending on actual funding available and the responses from small business firms to the solicited research topics in Section VIII.

All Phase I awards will be firm fixed-price contracts and may be up to $100,000 unless otherwise noted. Phase II awards anticipate cost-plus-fixed- fee contracts with a value of up to $750,000 each unless otherwise noted. Phase II awardees will be required to have acceptable accounting systems to receive a cost-plus-fixed-fee contract.

Only recipients of Phase I contracts will be eligible to compete for Phase II awards.

The Department's Operating Administrations contribute to SBIR funding. Each Administration's contribution may be used only to support research of concern to that Operating Administration. For example, funds furnished by the Federal Highway Administration may not support research solely of concern to the National Highway Traffic Safety Administration. Based on anticipated funding levels, there may not be adequate funding within the SBIR program to support Phase I and/or Phase II awards for research which is solely of concern to the following Operating Administrations: Federal Aviation Administration, Federal Highway Administration, Federal Railroad Administration, Federal Transit Administration, National Highway Traffic Safety Administration, and/or Research and Special Programs Administration. Phase I and Phase II awards for such research will depend on the actual funding available.

B. Reports

Under Phase I SBIR contracts, three reports will be required, consisting of two interim letter reports, and a comprehensive final report.

C. Payment Schedule

Payments for Phase I contracts will be made in three equal installments upon presentation of invoices by the contractor in conjunction with the submission of acceptable reports described above.

D. Innovations, Inventions, and Patents

1. **Proprietary Information.** Information contained in unsuccessful proposals will remain the property of the proposer. 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 proposer in a proposal which constitutes a trade secret, proprietary commercial or financial information, confidential personal information or data affecting the national security, it will be treated in confidence, to the extent permitted by law, provided this information is clearly marked by the proposer with the term "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, these data 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 proposer as a result of or in connection with the submission of these data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the contract. This restriction does not limit the Government's right to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction is contained in pages _____ 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.

The Department of Transportation prefers that proposers avoid inclusion of proprietary data in their proposals. If the inclusion of proprietary data is considered essential for meaningful evaluation of a proposal submission, then such data should be provided on a separate page with a numbering system to key it to the appropriate place in the proposal.

2. **Rights in Data Developed Under SBIR Funding Agreements.** Rights in technical data, including software developed under any contract resulting from this solicitation, shall remain with the contractor 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 contractor for a period of four years from completion of the project from which the data were generated. However, effective at the conclusion of the four-year period, the Government shall retain a royalty-free license for Federal Government use of any technical data delivered under an SBIR contract whether patented or not.

3. **Copyrights.** With prior written permission of the contracting officer, the contractor normally may copyright and publish (consistent with appropriate national security considerations, if any) material developed with Department of Transportation support. The Department of Transportation receives a royalty-free license for the Federal Government and requires that each publication contain an appropriate acknowledgement and disclaimer statement.

4. **Patents.** Small business firms 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 contractor a reasonable time to pursue a patent.

E. Cost-Sharing

Cost-sharing is permitted for proposals under 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 awards to small businesses under the DOT SBIR Program.

G. Joint Ventures or Limited Partnerships

Joint ventures and limited partnerships are permitted provided the entity created qualifies as a small business in accordance with the Small Business Act, 15 U.S.C. 631, and the definition included in this solicitation.

H. Research and Analytical Work

1. For Phase I a minimum of two-thirds of the research and/or analytical effort must be performed by the proposing firm unless otherwise approved in writing by the contracting officer.

2. For Phase II a minimum of one-half of the research and/or analytical effort must be performed by the proposing firm unless otherwise approved in writing by the contracting officer.

I. Contractor Commitments

Upon award of a contract, the awardee will be required to make certain legal commitments through acceptance of numerous contract clauses. The outline that follows is illustrative of the types of clauses to which the contractor would be committed. This list should not be understood to represent a complete list of clauses to be included in Phase I contracts, nor to be the specific wording of such clauses. Copies of complete terms and conditions are available upon request.

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

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

3. **Examination of Records.** The Controller 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 perform the work contracted.

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

6. **Disputes.** Any dispute concerning the contract which cannot be resolved by agreement shall be decided by the contracting officer with right of appeal.

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

8. **Equal Opportunity.** The contractor will 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 will 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 will not discriminate against any employee or applicant for employment because he or she is physically or mentally handicapped.

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

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

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

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

15. **Procurement Integrity.** Submission of a proposal under this solicitation subjects the offeror to the procurement integrity provision (§27) of the Office of Federal Procurement Policy Act (41 U.S.C. 423). This statute, as implemented by Federal Acquisition Regulation (FAR, 48 CFR) §3.104, proscribes the following conduct by competing contractors during an agency procurement: offering or discussing future employment or business opportunities with an agency procurement official; promising or offering a gratuity to an agency procurement official; soliciting or obtaining proprietary or source selection information regarding the procurement. Violations of the statute may result in criminal and/or civil penalties, disqualification of an offeror, cancellation of the procurement, or other appropriate remedy.

Prior to award of an SBIR contract estimated to cost over $100,000 (normally a Phase II award), the competing contractor will be required to execute the Certificate of Procurement Integrity contained in FAR provision 52.203-8, "Requirement for Certificate of Procurement Integrity (SEP 1990)."

J. Additional Information

1. This solicitation is intended for informational purposes and reflects current planning. If there is any inconsistency between the information contained herein and the terms of any resulting SBIR contract, the terms of the contract are controlling.

2. Before award of an SBIR contract, the Government may request the proposer to submit certain organizational, management, personnel, and financial information to assure responsibility of the proposer.

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

4. 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.

5. The SBIR Program is not a substitute for existing unsolicited proposal mechanisms. Unsolicited proposals shall not be accepted under the SBIR Program in either Phase I or Phase II.

6. If an award is made pursuant to a proposal submitted under this solicitation, the contractor will be required to certify that he or she has not previously been, nor is currently being paid for essentially equivalent work by any agency of the Federal Government.

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

8. In accordance with FAR 52.233-2 the following Service of Protest procedures shall be followed. Protests, as defined in section 33.101 of the Federal Acquisition Regulation that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgement of receipt from: Anthony Flaherty, DOT/RSPA/Volpe Center, 55 Broadway, Kendall Square, DTS-853, Cambridge, MA 02142-1093.

VI. SUBMISSION OF PROPOSALS

A. Submittal Instructions

An original and four copies of each proposal submitted under the DOT SBIR Program should be sent to:

Dr. George Kovatch
DOT SBIR Program Director, DTS-22
U.S. Department of Transportation
Research and Special Programs Administration
John A. Volpe National
Transportation Systems Center
55 Broadway, Kendall Square
Cambridge, MA 02142-1093
Telephone: (617) 494-2051

Proposals must be postmarked NO LATER than May 1, 1997 to qualify for acceptance and consideration under the current DOT SBIR Program. Proposals postmarked later than May 1, 1997 will not be accepted.

Proposals delivered to the DOT SBIR Program Office by any means other than the U.S. Postal Service, must be received at the above address on or before May 1, 1997.

B. Additional Information

1. **Bindings.** Please do not use special bindings or covers. Staple the pages in the upper left corner of the cover sheet of the proposal with a single staple.

2. **Packaging.** All copies of the proposal should be sent in one package together with the acknowledgement of receipt card which appears on the back cover of this document.

3. **Confirmation.** The DOT SBIR Program Office will assign an identification number to each proposal received at the above address by May 1, 1997 or postmarked no later than May 1, 1997. This number will appear on the acknowledgement of receipt card (see inside back cover) which will be sent to the proposer by return mail confirming receipt of the proposal.

VII. SCIENTIFIC AND TECHNICAL INFORMATION SOURCES

The following organizations may be sources for providing technology search and/or document services and may be contacted directly for service and cost information:

Center for Technology Commercialization
Massachusetts Technology Park
100 North Drive
Westborough, MA 01581
(508) 870- 0042

Federal Information Exchange, Inc.
555 Quince Orchard Road, Suite 200
Gaithersburg, MD 20878
(301) 975-0103

Midcontinent Technology Transfer Center
Texas Engineering Experiment Station
The Texas A&M University System
237 Wisenbaker Engineering Research Center
College Station, TX 77843-3401
(409) 845-8762

NASA Industrial Applications Center
University of Pittsburgh
823 William Pitt Union
Pittsburgh, PA 15260
(412) 648-7000

NASA Industrial Applications Center
University of Southern California
3716 S. Hope Street #200
Los Angeles, CA 90007
(213) 743-6132

NASA/Southern Technology
Applications Center
University of Florida
One Progress Boulevard
Alachua, FL 32615
(904) 462-3913

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4600

University of Southern California
Technology Transfer Center
3716 South Hope Street
Los Angeles, CA 90007-4344
(213) 743-6132

VIII. RESEARCH TOPICS

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

DOT OPERATING ADMINISTRATION/TOPICS . . . . . POTENTIAL MAXIMUM FY97 PHASE I AWARDS

FEDERAL AVIATION ADMINISTRATION (FAA) . . . . . 10 Awards

Air Technology

97-FA1 Emergency Rescue Vehicle Advance Stability Systems

97-FA2 Reduced Wattage Lamps

97-FA3 High-Efficiency Light Sources

97-FA4 Flashing Light Photometry

97-FA5 Approach Light System Intensity Control

Aircraft Safety

97-FA6 Portable Electronic Device Detector

97-FA7 Thickness Stiffened Composites

97-FA8 Enhanced Technology for Premium Quality Titanium Alloys

Human Factors

97-FA9 Human Factors/Human Performance

Air Traffic Control

97-FA10 Advanced GPS Based Take Off & Landing Warning System

DOT OPERATING ADMINISTRATION/TOPICS . . . . . POTENTIAL MAXIMUM FY97 PHASE I AWARDS

FEDERAL HIGHWAY ADMINISTRATION (FHWA) . . . . . 12 Awards

Structures

97-FH1 Portable Microwave System for Measurement of Fatigue Cracks

Planning

97-FH2 Incorporating Remotely Sensed Data into the Transportation Planning Process

Traffic

97-FH3 Portable Sensor for Accurate Speed Measurements

97-FH4 Development of Breakaway Guy Wires for Utility Poles

97-FH5 Vehicle-Based Animal Deterrent

97-FH6 Pavement Ice Sensors

FEDERAL RAILROAD ADMINISTRATION (FRA) . . . . . 9 Awards

97-FR1 Feasibility of Vehicle Borne Detection of Broken Rail

97-FR2 Innovative Solutions to Reduce Wheel/Rail Forces and Fatigue of Railroad Switch Frogs

97-FR3 Innovative Acoustic Source Location and Identification Methods

97-FR4 Knuckle Coupler with Air and Electric Connections

FEDERAL TRANSIT ADMINISTRATION (FTA) . . . . . 3 Awards

97-FT1 Safety Intrusion Detection Devices - Transit Applications

97-FT2 Improved Maintenance Techniques Linked to Capital Development

97-FT3 Transit Fare Collection Decision Models for Fare Policy and Cost Analysis

[1]Phase I may be up to $100,000 and Phase II may be up to $500,000

DOT OPERATING ADMINISTRATION/TOPICS		POTENTIAL MAXIMUM FY97 PHASE I AWARDS
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION (NHTSA)		**4 Awards**
[2]	97-NH1	Unobtrusive Eyelid Closure and Visual Point of Regard Measurement Device
[2]	97-NH2	School Bus Interior Flame Retardant Materials
[2]	97-NH3	Application of Advanced Technology to Reduce Driving While Suspended
[2]	97-NH4	Automated Crash Scene Documentation
RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION (RSPA)		**2 Awards**
[3]	97-RS1	Innovative Approaches to Maintaining Operability of Intermodal Network Control Systems
[3]	97-RS2	Applications of Nanotechnology to Transportation Physical Infrastructure Maintenance and Renewal

[2]Phase I may be up to $75,000 and Phase II may be up to $300,000
[3]Phase I may be up to $100,000 and Phase II may be up to $300,000

FEDERAL AVIATION ADMINISTRATION

AIR TECHNOLOGY

97-FA1. EMERGENCY RESCUE VEHICLE ADVANCE STABILITY SYSTEMS

The heavy rescue vehicles used on modern airports carrying many thousands of gallons of water have unique design deficiencies, in that they are required to operate under extreme conditions over improved roadways at high speed, as well as off-road capability with severe soft ground and rocky terrain conditions. Added to this dilemma is a requirement to make high speed turns on multiple taxiways and runways at major airports. Their inherent design deficiencies of high center of gravity and operations under severe duty conditions have caused a rise in vehicle stability related roll-over incidents. A reported 25 roll-overs in the last several years put airport fire fighters at great risk to make their necessary responses. In 1996 there were six major airport rescue vehicles involved in roll-over accidents. There is an immediate need to provide a low cost vehicle roll stability system to the over five thousand current airport rescue vehicles in use. At the same time, new designs which carry higher quantities of water at greater speeds with lower centers of gravity are needed.

The Phase I research will consist of a feasibility study and the investigation of possible techniques to modify existing vehicles. Upon successful completion of Phase I, the actual development and installation of several stability vehicle enhancement systems will be installed to several models of existing vehicle designs used on current airports.

97-FA2. REDUCED WATTAGE LAMPS

The use of improved, lower wattage, quartz halogen incandescent lamps in airfield approach lighting systems (ALS) is under consideration. The Medium Intensity Approach Lighting System-Category 1 (MALSR) is a constant voltage system, while the Approach Lighting System Flashing-Category 2 (ALSF-2) is a constant current system.

Preliminary experiments indicate that reducing the wattage of the lamps may have a negative effect on the constant current regulators, constant voltage transformers, and switching contactors when the systems are turned on. Proposals must address in-rush current and impedance.

The Phase I research effort would consist of a study of the negative effects upon fielded ALS when the lamps are replaced with lower wattage versions. Recommended solutions must be described. Laboratory tests must be described. Upon successful completion of Phase I, the actual field evaluation of recommended solutions would be undertaken.

97-FA3. HIGH-EFFICIENCY LIGHT SOURCES

Existing airfield lighting systems and approach lighting systems use relatively inefficient lighting technology. Existing aviation lighting systems need to be optimized such that the total life cycle cost is minimized.

Proposals should address the use of energy efficient light sources in airfield and approach lighting systems for both steady-burning and flashing applications, as appropriate. At a minimum, this will include metal-halide, xenon-metal-halide, and compact fluorescent technologies. Among the technical problems to be solved are intensity adjusting, performance monitoring, and greatest possible Mean Time Between Failure (MTBF).

The Phase I research effort would consist of a feasibility study and the investigation of the relative benefits of light sources that are energy efficient, maintenance efficient, low cost, resistance to environmental elements

(e.g. ice and snow, birds, jet blast), easy to adjust and aim. Upon successful completion of Phase I, development of experimental equipment for field evaluation would be undertaken.

97-FA4. FLASHING LIGHT PHOTOMETRY

Existing FAA requirements regarding the photometry of flashing lights used in Approach Light Systems (ALS) are inadequate. Potential manufacturers of flashing light hardware are uncertain as to the best design for this equipment. Designers, such as A&E firms, are uncertain as to how to specify ALS flashing light hardware, especially in-pavement (semi-flush) flashers.

Proposals should address experience with the methods currently in use to measure the light output of flashing lights. At a minimum, this would include an assessment of the Blondel-Rey-Douglas equation for calculating effective intensity and the applicability of solid state photodetectors.

The Phase I research effort would consist of a study of existing methods of evaluating flashing lights, recommended improvements, and the outline of a new FAA specification. Upon successful completion of Phase I, the actual development of a new specification would be undertaken.

97-FA5. APPROACH LIGHT SYSTEM INTENSITY CONTROL

The feasibility of using large diameter fiber optic light pipes with xenon-metal-halide (Xmh) light sources in airfield Approach Light Systems has recently been established. As the development of these systems proceeds, the technology to attenuate the light from 100 percent to less than 1 percent must be developed.

Proposals should address the many potential methods to attenuate the light beam, including liquid-crystal filters and electro-mechanical means. The capability to operate in the extreme conditions of the airfield environment must be addressed.

The Phase I research effort would consist of a study of methods to attenuate the light output of an Xmh/fiber optic approach light system, a recommended configuration, and the construction of a feasibility model. Upon successful completion of Phase I, the actual development of a complete system for field evaluation would be undertaken.

AIRCRAFT SAFETY

97-FA6. PORTABLE ELECTRONIC DEVICE DETECTOR

Research is needed to develop a portable electronic device (PED) detector which has the capability of detecting excessive electromagnetic interference. This requirement is due to the recent proliferation of portable electronic devices such as calculators, compact disk players, cassette players, and laptop computers that are being used aboard civil aircraft. Due to this increased usage, pilots have reported occurrences of cockpit interference. The verification of these occurrences are low due to the difficult task of duplicating the original conditions with the same device, aircraft location, RF environment, and airborne systems settings. In response to the PED problem, many airlines have banned the use of PEDs during aircraft takeoffs and landings. A detection method needs to be developed which can detect any excessive electromagnetic radiation that may interfere with aircraft electrical and avionics systems. This prototype detector must be nonobtrusive, compatible with the aircraft avionics, and adhere to related standards.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of a portable electronic device (PED) detector. Upon successful completion of Phase I, the actual development of a PED detector would be undertaken.

97-FA7. THICKNESS STIFFENED COMPOSITES

A recent development in composite structures is the introduction of low cost thickness stiffened laminates in which reinforcing fibers and/or pins are passed through the thickness of the composite during the manufacturing process to provide resistance to out-of-plane failures. This type of failure constitutes the most serious technical challenge to greater utilization of composites. This construction technique has the potential for much greater impact damage tolerance. It also would benefit fatigue resistance and reparability of organic matrix composites for airframe applications. A minor cost premium over composites fabricated by conventional processes would be expected. At this time, further progress in the introduction of such materials is hampered by a lack of data on impact and fatigue sensitivity of thickness stiffened laminates which can serve as a basis for certification of specific applications. The proposed effort would be directed toward formulating and carrying out a program involving fabrication, analysis and experimental effort on thickness stiffened composites aimed at providing such data for selected aircraft applications with high commercial potential.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the fabrication, analysis and experimental effort on thickness stiffened composites. Upon successful completion of Phase I, the actual development of thickness stiffened composites would be undertaken.

97-FA8. ENHANCED TECHNOLOGY FOR PREMIUM QUALITY TITANIUM ALLOYS

Research is needed to improve the property standards for the premium grade titanium alloys specified for use on critical rotating components in aircraft turbine engines. These property standards may include any one, a combination of, but not limited to the following: alloy purity, free of metallurgical defects, mechanical, thermal and inspectability. Property enhancements may be achieved through innovative means at alloy stock productions, shaping, forging and final production. The proposed approach should be integrated with raw material suppliers, alloy melters, component manufacturers, designers, and user requirements.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the improvement of property standards for premium grade titanium alloys for use on rotating components in aircraft turbine engines. Upon successful completion of Phase I, the actual development of the enhanced technology for premium quality titanium alloys would be undertaken.

HUMAN FACTORS

97-FA9. HUMAN FACTORS/HUMAN PERFORMANCE

Research is needed on different ways and techniques to reduce maintenance error. The maintenance errors of interest to the FAA are those of human/operator performance and run the gamut from paperwork error to maintenance procedures. One discipline that may be fruitful, and as yet, has not been explored in reducing maintenance error, is that of decision-making aids, "tools" and training. Research which identifies the maintenance areas where decision-making aids and training could reduce error is needed. Such exploratory research should also include rationale for use of the decision-making in the identified areas; how decision-making would reduce error; recommendations for future development.

FEDERAL AVIATION ADMINISTRATION

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the identification of maintenance areas where decision-making aids and training aids could reduce maintenance errors. Upon successful completion of Phase I, the actual implementation of the decision-making aids and training aids would be undertaken.

AIR TRAFFIC CONTROL

97-FA10. ADVANCED GPS BASED TAKE OFF & LANDING WARNING SYSTEM

Research is needed to develop an advanced take off and landing system that integrates available technology into a smart system. Moving map technology can identify the available runway length, and GPS technology can provide aircraft altitude and position allowing the warning system to calculate remaining runway at any point in time. Aircraft speed, gross weight and control positions would be inputs to ensure acceleration is fast enough, flaps are deployed and rudder is centered for take off. The system can enunciate the V1 "must take off" decision point based upon actual stop distance. Weather and runway friction information are highly desirable as inputs to the aircraft stop distance tables. Data collection can provide actual aircraft performance which can track brake and thrust reverser performance on a daily basis.

The system should also be capable of identifying a high and fast approach resulted in an aircraft flying past the nominal stop distance point and should enunciate the go around to the crew.

Phase I research effort would consist of a feasibility study and the investigation of available technologies and techniques to develop an integrated demonstration system plan. The Phase I research effort will consist of a feasibility study and the investigation of possible techniques. Upon successful completion of Phase I, the actual development of a would be undertaken.

FEDERAL HIGHWAY ADMINISTRATION

STRUCTURES

97-FH1. PORTABLE MICROWAVE SYSTEM FOR MEASUREMENT OF FATIGUE CRACKS

It has been demonstrated in the laboratory environment that open ended waveguide microwave probes can locate fatigue cracks in metal under coatings. In addition to crack detection, this technique also provides quantitative information on crack opening width, depth and length and whether the crack is filled with corrosion products.

Research is needed to develop a prototype instrument suitable for use in the field by bridge inspectors. Such a portable instrument would be either entirely handheld or a combination of handheld probe with backpack-mounted components. The system would include automated scanning of the microwave probe in either 1-dimensional (line scan) or 2-dimensional (raster scan) mode. It would also incorporate algorithms for recognition of the characteristic pattern of fatigue cracks in a spatial distribution of the microwave signal. In

[1]Phase 1 may be up to $100,000 and Phase II may be up to $500,000

addition, it would allow automated or semi-automated characterization of the crack by varying the microwave frequency, order or probe angle. The instrument would also include a display that presents a direct visualization of the crack location, dimensions and other features.

The Phase I research would include: a preliminary design study to evaluate the technical and economic feasibility of such an instrument, survey of possible techniques for probe scanning, and computer modeling and analysis of the tradeoffs between system performance and cost. The construction and operation of critical components would also be done as necessary to demonstrate the practicality of novel hardware design features or software modules.

PLANNING

97-FH2. INCORPORATING REMOTELY SENSED DATA INTO THE TRANSPORTATION PLANNING PROCESS

Presently, transportation planning related data are collected through three primary mechanisms: travel surveys, electronic traffic monitoring and aerial photography. Recent advances in both geographic information systems (for data display and analysis) and remote sensing technologies such as satellite imaging (for remote collection of data) have made it feasible to use data collected from very sophisticated technologies to perform transportation planning analysis. The U.S. Geological Survey has demonstrated the feasibility of the concept through the development of a temporal urban mapping project for several regions of the nation. Drawing on 25 years of archived satellite data, regional development including land use and transportation systems have been tracked over time for four urban areas. The satellites currently in orbit can provide images that would allow planners in fast growing areas to constantly monitor land use development. Satellites being launched in the coming months will increase coverage rates and make available an unprecedented degree of data resolution to planners. For example: it may be feasible for an urban area to monitor the truck traffic into, out of and through an urban area at a particular time of day on a weekly or even daily basis. What is needed is a set of "enabling instruments" that would allow planning practitioners to more easily take advantage of the capabilities of these advanced data collection technologies. The instruments to be developed could include data conversion programs, guidance documents, example applications, case studies and data cost information.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for implementation of advanced data collection technologies in transportation planning. Upon successful completion of Phase I, the actual incorporation of remotely sensed data into the transportation planning process would be undertaken.

TRAFFIC

97-FH3. PORTABLE SENSOR FOR ACCURATE SPEED MEASUREMENTS

Current sensors (piezo cable, tape switches, temporary loops, road tubes) for automated traffic data collection for traffic engineering studies require getting into the traffic for deployment, which can be dangerous, time consuming and labor intensive. Small magnetic sensors which are quick and easy to deploy in the traffic lane are available, but only accurate at low speeds. There is a need for a rugged, low cost off road sensor that can be easily transported, quickly set up (several minutes or less) and removed virtually anywhere on the road (two-

[1]Phase 1 may be up to $100,000 and Phase II may be up to $500,000

lane, multilane) and easily interfaced with commercial traffic recorders. The sensor must be able to accurately measure speed (plus or minus 1 percent), arrival time (0.1 second) vehicle type or length, travel lane and lateral placement. For two lane roads, the sensor should be able to measure vehicles in both directions simultaneously, although it is not necessary that all vehicles be captured. An on-road sensor will be considered if it can be deployed in 15 seconds or less and does not provide noticeable audio or tactile feedback to motorists passing the sensor. The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of a portable sensor for accurate speed measurements. Upon successful completion of Phase I, the actual development of the sensor would be undertaken.

97-FH4. DEVELOPMENT OF BREAKAWAY GUY WIRES FOR UTILITY POLES

There are approximately 80 million wooden utility poles in the roadside environment. Many of these utility poles have one or more guy wires that are attached to steel rods embedded in concrete foundations. These guy wires do not break away when impacted by errant vehicles. As a result, vehicles can ramp up them and roll over. Current state-of-the-art has resulted in design, crash test and development of a breakaway guy wire that performed well in crash tests with small cars when impacted at certain angles. However, it does not serve as an omni-directional device. There is a need for a low cost breakaway coupling that can easily be installed and repaired by utility crews. Recent advances in composite materials and finite element analysis offer new tools that can be used to address the problem.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of a low cost breakaway guy wires for utility poles. Upon successful completion of Phase I, the actual development of the breakaway guy wires for utility poles would be undertaken.

97-FH5. VEHICLE-BASED ANIMAL DETERRENT

Over 20 percent of the accidents on two lane rural highways involve collisions with deer and other wildlife. The problem is getting worse with animal accidents increasing about 10 percent a year. Suburban streets and airports nationwide are also experiencing problems with deer. Although the crashes are usually not life threatening to motorists, they do cause substantial property damage to cars and can break the landing gears on planes. Countermeasures such as fencing, reflectors and undercrossings to prevent animal collisions are expensive and have limited effectiveness. Deer whistles currently on the market have shown no effect on the animals. Research is needed to investigate the feasibility of an effective, low cost audio signal or other sensory device that would safely repel deer and other large wildlife away from approaching vehicles and that could be purchased on the aftermarket and installed on vehicles at market acceptable prices.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for an audio signal or other sensory device for repelling wildlife away from approached vehicles. Upon successful completion of Phase I, the actual development of the vehicle-based animal deterrent would be undertaken.

97-FH6. PAVEMENT ICE SENSORS

Current pavement sensors measure temperature and moisture at spot locations. Ice can be formed on the pavement but it may not be at the exact location of the pavement sensor. Research is needed on a wide area pavement sensor that can measure the formation of ice or slippery pavement conditions along a stretch of roadway or on a bridge to adequately warn the motoring public of this hazardous condition when it occurs.

[1]Phase I may be up to $100,000 and Phase II may be up to $500,000

FEDERAL HIGHWAY ADMINISTRATION

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of a wide area pavement sensor for measurement of ice and slippery pavement conditions. Upon successful completion of Phase I, the actual development of an ice sensor would be undertaken.

FEDERAL RAILROAD ADMINISTRATION

97-FR1. FEASIBILITY OF VEHICLE BORNE DETECTION OF BROKEN RAIL

"Dark" track territories refer to track lines that are not equipped with track circuits. Track circuits provide the dual function of detecting train presence for signaling and train control and for the detection of broken rails. In "dark" track territories, the absence of track circuits also affords a situation in which no detection of broken rails is in effect. Furthermore, there is a current and emerging trend towards alternative means of advanced train control which do not require track circuits and which, at a minimum, can provide coverage for all tracks, maximize traffic capacity, and potentially eliminate accidents and collisions due to human errors. These emerging technologies in train control would significantly impact the economics of train circuits due to the elimination of their primary function.

An alternative vehicle or locomotive borne system that can detect the presence of a broken rail up to a few miles ahead of a moving train will significantly enhance the safety of railroad tracks through its ability to extend the detection coverage to all tracks, including "dark" territories. It can also allow a more economic and safe transition into automated advanced train control systems that, in turn, will have other significant impacts on operational safety.

Phase I will consider the feasibility of techniques that rely on sound, ultra-sound, or any other types of waves that can travel reliably within the rail medium, and through the analysis of their measured propagation and/or reflection provide an alternate means for detecting broken rails. Any other novel and economic ideas for detecting broken rails can be addressed in this phase. Phase II will consider the development and laboratory and field testing of a prototype detection system based on the most feasible methods.

97-FR2. INNOVATIVE SOLUTIONS TO REDUCE WHEEL/RAIL FORCES AND FATIGUE OF RAILROAD SWITCH FROGS

A significant percentage of track-related accidents and derailments are due to failures in turnouts and other special track work. Accelerated fatigue and wear of standard fixed-point turnout frogs is still a significant track problem with strong implications to railroad safety and the economics of maintenance of way. This problem has become even worse as a result of increasing axle loads. Due to the gap created by a standard frog on the surface of the running rail, high impact wheel/rail forces are generated with a corresponding significant increase in wear and fatigue.

[1]Phase I may be up to $100,000 and Phase II may be up to $500,000

Phase I will consider the feasibility of innovative, cost-effective techniques for reducing the wheel/rail forces through the frog. Methods and techniques that constitute a retrofit of the existing frog designs should receive the highest priority. Analysis and/or small scale testing may be used to address the feasibility requirements. Phase II will consider the development and laboratory and field testing of one or more prototype retrofits of turnout frogs based on the most feasible methods.

97-FR3. INNOVATIVE ACOUSTIC SOURCE LOCATION AND IDENTIFICATION METHODS

Hazardous materials regulations (HM 201 and 175A) require innovative non-destructive methods for inspection of tank cars in lieu of the present periodic hydrostatic test. For lined and/or insulated tank cars, the Acoustic Emission test method has been used extensively in aircraft and pressure vessel reinspection.

The Phase I research effort will examine, develop and validate an innovative defect mapping and locating test technique for use in the structural integrity evaluation of tank cars. The use of the acoustic emission testing or equivalent methods is preferred. The contractor will employ his procedure in determining its acceptability as a nondestructive test for tank cars for establishing periodic prescribed inspection. Phase II will consider further enhancement of the prototype technology for tank car inspection.

97-FR4. KNUCKLE COUPLER WITH AIR AND ELECTRIC CONNECTIONS

Freight cars are currently equipped with knuckle type couplers which are considered to be the standard couple (Type E, Type F or the passenger car Type H). They have no provision for making the air connection or any electrical connection. Further, these couplers have a limited gathering range (amount of misalignment tolerated) and must be manually prepared for coupling by unlocking the coupler and by throwing the knuckle open. These features introduce a degree of risk to the operator.

Research is required to develop a mechanically compatible knuckle type coupler which will couple to standard couplers, and which, when coupled to a like new design coupler, will provide for air and electrical connections (up to 5 wires), have an expanded gathering range, and be ready for coupling at all times. Side of car uncoupling means or air operated uncoupling means are also desired. Means to preclude coupler overide are also desirable.

In Phase I, conceptual designs of the proposed coupler will be developed and the feasibility established for each of the desired features. In Phase II a detailed design will be completed and prototype proposed couplers will be built and tested.

[1]Phase I may be up to $100,000 and Phase II may be up to $500,000

FEDERAL TRANSIT ADMINISTRATION

97-FT1. SAFETY INTRUSION DETECTION DEVICES - TRANSIT APPLICATIONS

Providing for a safe and secure environment for the general public, customers and employees is a critical goal of all transit agencies. This includes operationally safe equipment and facilities, and protection from personal harm, property loss and damage. Research is needed to develop and demonstrate new and innovative safety and security technologies which will reduce accidents, injuries, fatalities and damages. Research under this topic should focus on determining the feasibility of a variety of devices specifically designed to detect and warn of any intrusion into an area that may affect the safety of transit operations. The specific types of devices to be researched are up to the proposer, however, they should be appropriate for use in a variety of situations, including: heavy and light rail platforms; maintenance yards; and grade crossings.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of safety and security technologies. Upon successful completion of Phase I, the actual development of the safety intrusion detection devices would be undertaken.

97-FT2. IMPROVED MAINTENANCE TECHNIQUES LINKED TO CAPITAL DEVELOPMENT

Increases in the complexity of technology and an increasingly diverse workforce continues to put a heavier burden on maintenance and repair in the transit industry. The traditional approach of vendor produced repair manuals and technical documentation often falls far short of matching the needs of the workforce with the available innovative skill development and job performance aids currently used in the private sector. Employee selection, training and job design are rarely thought of during the capital development process. Therefore, it is not surprising that little incentive exists on the part of the vendors and suppliers to improve support materials and training manuals for use by transit properties. Research is needed to connect the state-of-the-art in innovative maintenance documentation and skill development with the traditional approaches currently taken by both the transit industry and its vendors. Case studies, as well as models focusing on improved performance and increased productivity, would establish new standards and guidelines relating to capital procurements and technology innovations. The results could establish a strong linkage between prime contractors and businesses specializing in innovative skill development and performance enhancements suitable for use by the transit industry.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of maintenance techniques for capital procurements and technology innovations. Upon successful completion of Phase I, the actual implementation of the maintenance techniques would be undertaken.

97-FT3. TRANSIT FARE COLLECTION DECISION MODELS FOR FARE POLICY AND COST ANALYSIS

Transit agencies today face the challenge of providing effective and efficient services under increasingly severe fiscal constraints. One of the most difficult problems facing an operator is establishment of a fare structure that meets the needs of a broad variety of riders while maximizing revenue and ridership and minimizing fare evasion and abuse. Fortunately, recent advances in electronic technologies have made it possible to implement a new generation of fare collection equipment that can handle these sometimes conflicting needs. New fare

[1]Phase I may be up to $100,000 and Phase II may be up to $500,000

collection technology allows a broad range of fare structures, fare instruments and distribution networks, as well as improved revenue control, data collection, operations planning, and fare integration. Every transit agency must make difficult decisions related to fare policy, strategy, structure, technology, and collection. The complex interrelationships between these areas added to the vast array of options offered by the new equipment, makes the development of a rational fare structure and collection system more complicated. Therefore, there is a critical need for computer assisted decision models to address the impacts of alternative fare structures as well as the cost of implementing them with the electronic collection technology available today. These model(s) should be user-friendly and capable of addressing a broad range of fare policy options as well as accurately cost-out various fare collection hardware/software alternatives designed to implement the fare policy options.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of transit fare collection decision models. Upon successful completion of Phase I, the actual development of the models would be undertaken.

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

97-NH1. UNOBTRUSIVE EYELID CLOSURE AND VISUAL POINT OF REGARD MEASUREMENT

Public acceptance of a drowsy driver detection and warning system in commercial and passenger vehicles will depend on the development of an unobtrusive eyelid closure and visual point of regard measurement device. "Unobtrusive" means that the driver is unaware of any component and its operation within the vehicle. Previous basic research has shown that the percentage of eyelid closure is related to the state of driver alertness. However, the percentage of eyelid closure is presently obtained through post hoc coding of video tapes by trained observers. Moreover, existing ocular monitoring systems have fallen short in one or more of the following critical areas. There are 5 basic requirements for obtaining ocular measures in a motor vehicle: (1) The system must reliably compute the percentage of eyelid closure visual point-of-regard angle for any driver with a) normally tinted eyeglasses and b) a height within the 95th percentile male and 5th percentile female ranges; (2) driver exposure to infrared or near-infrared illumination from the device must not exceed national Standard thresholds computed for continuous exposure; (3) percentage of eyelid closure and visual point of regard angle must be computed in real time; (4) the device must operate reliably and accurately through all ranges of level, angle, and direction of illumination within various motor vehicle cabs; and (5) system performance must accommodate transient changes in illumination typical of driving under bridges, through tunnels, daytime/nighttime transitions, and against oncoming vehicle headlights and illuminated roadway signs.

The Phase I effort will successfully defend a feasible concept for the selection and integration of specific sensors, computational methods, and processing components of the system. Upon successful completion of Phase I, the actual development of the unobtrusive eyelid closure and visual point of regard measurement device would be undertaken.

[2]Phase I may be up to $75,000 and Phase II may be up to $300,000

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

97-NH2. SCHOOL BUS INTERIOR FLAME RETARDANT MATERIALS

School bus seat flammability is an issue NHTSA and the industry have grappled with for several years. Recent information suggests that current commercially available fire retardant materials are still too expensive on a per bus basis. To date, NHTSA is not aware of a seat foam or pad that is flame proof, sells for a reasonable cost, and still has all of the padding protection capabilities required of current school bus seats. Research is needed to develop innovative, low cost, fire retardant material alternatives or fire blocking materials (such as those used to protect aircraft seat cushions) that also meet Federal standards on padding protection in school buses.

The Phase I research effort would consist of a feasibility study and the investigation of possible alternatives for the development of fire retardant materials in school buses. Upon successful completion of Phase I, the actual development of the school bus interior flame retardant materials be undertaken.

97-NH3. APPLICATION OF ADVANCED TECHNOLOGY TO REDUCE DRIVING WHILE SUSPENDED

Too many drivers who lose their license continue to drive (estimates vary from 40-60 percent). For example, 14 percent of drivers in fatal crashes are driving without a valid license. Although illegal, it is relatively easy for these drivers to escape detection. It is possible to adopt recent advances in electronic communication and other technologies (e.g., from the military and space programs) to make it much more difficult for persons to drive without a valid license. Research is needed to examine the feasibility of adopting existing technologies to develop innovative ways to aid law enforcement officials in detecting motorists driving with a revoked, suspended or limited license. The most promising approach from the standpoint of technology, practicality of implementation, and cost must be identified. Its feasibility should be established through detailed specification of system requirements, hardware, software, strategies for implementation, and estimated costs and benefits.

The Phase I research effort would consist of a feasibility study and the investigation of possible techniques for the application of advanced technology to reduce driving while suspended. Upon successful completion of Phase I, the actual application of the technology would be undertaken.

97-NH4. AUTOMATE CRASH SCENE DOCUMENTATION

NHTSA has trained researchers, who have been through a six-week training course, to document the site of a highway crash. Currently, measuring wheels and tape measures are used to locate and measure all crash evidence and permanent roadside fixtures, including pavement markings. A reference line and point defines a Cartesian coordinate system used to document their location, and a final pencil scene drawing results from the measurements and documentation. 486 based pen computer systems have recently been introduced by NHTSA to gather field data. Research is needed to use these computers as an interface with a proposed device that would facilitate documentation of locations and measurements in the field with no post processing of the data being necessary.

[2]Phase I may be up to $75,000 and Phase II may be up to $300,000

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

The goal of this project is to develop a new system for locating designated points at the site of a crash and for taking measurements of field objects. It should meet the following criteria:

- Can be used by personnel with little or no training.
- Uses inexpensive equipment that is small (less than 1 cu. ft.) and light weight (less than 10 lbs.).
- Requires less than 20 minutes to setup, make measurements, and take down.
- Data should be formatted in a way that can be input with no conversion into standard diagraming formats for CAD, such as VISIO, and other programs.
- Data should be retainable in a redundant form to prevent loss during a power failure.
- The system should lend itself to follow up quality control procedures.

Various types of "total station surveying systems" and GPS devices have been recently marketed. The development of a similar innovative device to interface with 486 based field pen computers is sought.

The Phase I research effort would consist of a feasibility study and the investigation of possible techniques for the automation of crash scene documentation. Upon successful completion of Phase I, the actual development of the crash scene documentation system would be undertaken.

RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION

[3] **97-RS1.** **INNOVATIVE APPROACHES TO MAINTAINING OPERABILITY OF INTERMODAL NETWORK CONTROL SYSTEMS**

Modern transportation networks make extensive use of electronic routing and control systems. As such control systems increase in complexity, they also continue to expand over more of the transportation network on a multimodal basis. This expansion has also increased the urgency of insuring the continuous, safe operation of these systems. Whether caused by malicious tampering, aging hardware, or failing software, interruption of these services becomes increasingly unacceptable.

Research is needed to develop means to identify and isolate threats to the electronic control systems used in transportation, and implement appropriate countermeasures to neutralize or minimize these threats. Likewise, design strategies for (network) control systems with capabilities of graceful performance degradation, in the presence of failures (soft and/or hard), is paramount to ensuring safety. A built-in capability for fast reconfiguration and system restructuring is also important to this innovation. The ultimate objective of this effort is to find a technology that can be incorporated into any electronic control system to render it "Fail safe, tamper-safe."

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for maintaining operability of intermodal network control systems. Upon successful completion of Phase I, the actual development of the system would be undertaken.

[3]Phase I may be up to $100,000 and Phase II may be up to $300,000

RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION

97-RS2. APPLICATIONS OF NANOTECHNOLOGY TO TRANSPORTATION PHYSICAL INFRASTRUCTURE MAINTENANCE AND RENEWAL

Nanotechnology involves the use of chemistry, engineering and physics to allow machines to be constructed on an atomic scale, in molecular-scale environments. Proponents contend that so-called nanomachines have significant potential for accomplishing tasks that many larger scale machines cannot accomplish.

A significant expenditure is made each year to repair or upgrade physical infrastructure needed by transportation. As such, a great deal of emphasis is placed on (1) developing new, more effective and economical materials to construct infrastructure; (2) monitoring the condition of these structures as they age; and (3) repairing or replacing the structures if they approach failure. Research is needed to identify and apply a nanotechnology to one of these three areas: using nanotechniques to build structural materials like silica aerogel nanocomposites; OR using micromachines to monitor integrity of structural members; OR, using micromachines to repair aging or shock induced damage that threatens the life of transportation structures.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the application of nanotechnology to transportation physical infrastructure maintenance and renewal. Upon successful completion of Phase I, the actual application of the nanotechnology would be undertaken.

[3]Phase I may be up to $100,000 and Phase II may be up to $300,000

IX. SUBMISSION FORMS AND CERTIFICATIONS

1. PROPOSAL COVER SHEET — Appendix A
2. PROJECT SUMMARY — Appendix B
3. CONTRACT PRICING PROPOSAL — Appendix C
4. PROPOSAL CHECKLIST ON INSIDE FRONT COVER
5. PROPOSAL ACKNOWLEDGEMENT CARD ON INSIDE BACK COVER

U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. 97-1

PROPOSAL COVER SHEET

Project Title _____

Research Topic No. _____ Research Topic Title _____

Submitted by: Name _____

Address _____

City _____ State _____ Zip + 4 _____

Amount Requested (Phase I) $ _____ Proposed Duration _____
(May be up to $100,000 unless otherwise indicated) (in months) (Not to exceed six months)

1. The above concern certifies it is a small business firm and meets the definition stated in section 11B; and that it meets the eligibility requirement in Section 1C. Yes_____ No_____

2. The above concern certifies it _____does_____does not qualify as a minority and disadvantaged small business as defined in IIC. (For statistical purposes only.)

3. The above concern certifies it_____does_____does not qualify as a women-owned small business as defined in IID. (For statistical purposes only.)

4. This firm and/or Principal Investigator has submitted proposals containing a significant amount of essentially equivalent work under other federal program solicitations, or has received other federal awards containing a significant amount of essentially equivalent work. (If yes, identify proposals in the section III. D. 10., "Similar Proposals or Awards".) Yes_____ No_____

5. Will you permit the Government to disclose the title and technical abstract of your proposed project, plus the name, address, and telephone number of the Corporate Official and Principal Investigator of your firm, if your proposal does not result in an award, to any party that may be interested in contacting you for further information? Yes_____ No_____

Principal Investigator

Name_____

Title_____

Signature_____Date____

Telephone No._____

Corporate/Business Official

Name _____

Title_____

Signature_____Date____

Telephone No. _____

PROPRIETARY NOTICE (IF APPLICABLE, SEE SECTION V.D.1)

U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. 97-1

PROJECT SUMMARY

Name and Address of Proposer	FOR DOT USE ONLY
	Proposal No.

Name and Title of Principal Investigator

Project Title

Research Topic No.	Research Topic Title

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

Anticipated Results/Potential Commercial Applications of Results

Provide key words (8 maximum) description of the project useful in identifying the technology, research thrust and/or potential commercial application.

U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. 97-1

CONTRACT PRICING PROPOSAL

CONTRACT PRICING PROPOSAL COVER SHEET
(Cost or Pricing Data Required)

1. SOLICITATION/CONTRACT/MODIFICATION NUMBER

OMB No.: 9000-0013
Expires: 09/30/98

Public reporting burden for this collection of information is estimated to average 4 hours per response, including the time f reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewii the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of informatio including suggestions for reducing this burden, to the FAR Secretariat (VRS), Office of Federal Acquisition Policy, GSA, Washingto DC 20405.

2a. NAME OF OFFEROR	3a. NAME OF OFFEROR'S POINT OF CONTACT	3c. TELEPHONE
2b. FIRST LINE ADDRESS	3b. TITLE OF OFFEROR'S POINT OF CONTACT	AREA CODE / NUMBER
2c. STREET ADDRESS	4. TYPE OF CONTRACT *(Check)*	
2d. CITY / 2e. STATE / 2f. ZIP CODE	☐ a. NEW CONTRACT ☐ b. CHANGE ORDER ☐ c. PRICE REVISION/ REDETERMINATION	☐ d. LETTER CONTRACT ☐ e. UNPRICED ORDER ☐ f. OTHER *(Specify)*
5. TYPE OF CONTRACT *(Check)* ☐ FFP ☐ FPI ☐ CPFF ☐ OTHER *(Specify)* ☐ CPIF ☐ CPAF	6. PROPOSED COST *(A + B = C)*	A. COST / B. PROFIT/FEE / C. TOTAL

7. PERFORMANCE

PLACE		PERIOD	
a.		a.	
b.		b.	

8. List and reference the identification, quantity and total price proposed for each contract line item. A line item cost breakdown supporting this recap is required unless otherwise specified by the Contracting Officer. *(Continue on reverse, and then on plain paper, if necessary. Use same headings.)*

a. LINE ITEM NO.	b. IDENTIFICATION	c. QUANTITY	d. TOTAL PRICE	e. PROP. REF. PAG

9. PROVIDE THE FOLLOWING *(If available)*

NAME OF CONTRACT ADMINISTRATION OFFICE	NAME OF AUDIT OFFICE
STREET ADDRESS	STREET ADDRESS
CITY / STATE / ZIP CODE	CITY / STATE / ZIP CODE
TELEPHONE / AREA CODE / NUMBER	TELEPHONE / AREA CODE / NUMBER

10. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS WORK? *(If "yes" identify)*	11a. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT? *(If Yes," complete Item 11B)*	11b. TYPE OF FINANCING *(Check one*
☐ YES ☐ NO	☐ YES ☐ NO	☐ ADVANCE PAYMENT ☐ PROGRESS PAYMENTS ☐ GUARANTEED LOANS
12. HAVE YOU BEEN AWARDED ANY CONTRACTS OR SUBCONTRACTS FOR THE SAME OR SIMILAR ITEMS WITHIN THE PAST 3 YEARS? *(If "Yes," identify item(s), customer(s) and contract number(s) on reverse of form.)* ☐ YES ☐ NO	13. IS THIS PROPOSAL CONSISTENT WITH YOUR ESTABLISHED ESTIMATING ANI ACCOUNTING PRACTICES AND PROCEDURES AND FAR PART 31, COST PRINCIPLES? *(If "no," explain on reverse of form)* ☐ YES ☐ NO	

14. COST ACCOUNTING STANDARDS BOARD (CASB) DATA *(Public Law 91-379 as amended and FAR PART 30)*

a. WILL THIS CONTRACT ACTION BE SUBJECT TO CASB REGULATIONS? *(If "No," explain in proposal)* ☐ YES ☐ NO	b. HAVE YOU SUBMITTED A CASB DISCLOSURE STATEMENT (CASB DS-1 or 2)? *(If "Yes," specify in proposal the office to which submitted and if determined be adequate)* ☐ YES ☐ NO
c. HAVE YOU BEEN NOTIFIED THAT YOU ARE OR MAY BE IN NONCOMPLIANCE WITH YOUR DISCLOSURE STATEMENT OR COST ACCOUNTING STANDARDS? *(If "Yes," explain in proposal)* ☐ YES ☐ NO	d. IS ANY ASPECT OF THIS PROPOSAL INCONSISTENT WITH YOUR DISCLOSED PRACTICES OR APPLICABLE COST ACCOUNTING STANDARDS? *(If "Yes," explain in proposal)* ☐ YES ☐ NO

This proposal is submitted in response to the solicitation, contract, modification, etc., in Item 1 and reflects our estimates and/or actual costs as of this date and conforms with the instructions in FAR 15.804-6(b)(1), and Table 15-2. By submitting this proposal, the offeror, if selected for negotiation, grants the contracting officer or authorized representative(s) the right to examine, at any time before award, those records, which include books, documents, accounting procedures and practices, and other data, regardless of type and regardless of whether such items are in written form, in the form of computer data, or any other form, or whether such support information is specifically referenced or included in the proposal as the basis for pricing, that will permit an adequate evaluation of the proposed price.

15. NAME OF OFFEROR *(Type)*	15. TITLE OF OFFEROR *(Type)*	16. NAME OF FIRM
17. SIGNATURE		18. DATE OF SUBMISSION

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U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
CONTRACT PRICING PROPOSAL

Background

The following items, as appropriate, should be included in proposals responsive this Solicitation.

Cost Breakdown Items (in this order, as appropriate); (See Section III.E)

1. Name of proposer
2. Address of proposer
3. Location where work will be performed
4. Proposer's Project Title
5. Research topic number and title from DOT SBIR Program Solicitation
6. Total dollar amount of the proposal (dollars)
7. Direct material costs
   a. Purchased parts (dollars)
   b. Subcontracted items (dollars)
   c. Other
      (1) Raw materials (dollars)
      (2) Standard commercial items (dollars)
   d. Total direct materials (dollars)
8. Material overhead rate _____ % x total direct material = dollars
9. Direct labor (specify)
   a. Type of labor, estimated hours, rate per hour and dollar cost for each type
   b. Total estimated direct labor (dollars)
10. Labor overhead
    a. Identify overhead rate, the hour base and dollar cost
    b. Total estimated labor overhead (dollars)
11. Special testing (include field work at Government installations)
    a. Specify each item of special testing, including estimated usage and unit cost
    b. Estimated total special testing (dollars)
12. Other special equipment
    a. If direct charge, specify each item of special equipment, including usage and unit cost
    b. Estimated total other special equipment (dollars)

13. Travel (if direct charge)
    a. Transportation (detailed breakdown and dollars)
    b. Per diem or subsistence (details and dollars)
    c. Estimated total travel (dollars)
14. Consultants Service
    a. Identify each consultant, including purpose and dollar rates
    b. Total estimated consultant service costs (dollars)
15. Other direct costs (specify)
    a. Total estimated direct cost and overhead (dollars)
16. General and administrative expense
    a. Percentage rate applied
    b. Total estimated cost of G&A expense (dollars)
17. Royalties (specify)
    a. Estimated cost (dollars)
18. Fee or profit (dollars)
19. Total estimated cost and fee or profit (dollars)
20. The cost breakdown portion of a proposal must be signed by a responsible official of the firm (include typed name and title and date of signature).
21. Provide a yes or no answer to each of the following questions:
    a. Has any executive agency of the United States Government performed any review of your accounts or records in connection with any other government prime contract or subcontract within the past twelve months? If yes, provide the name and address of the reviewing office, name of the individual and telephone/extension.
    b. Will you require the use of any government property in the performance of this proposal? If yes, identify.
    c. Do you require government contract financing to perform this proposed contract? If yes, specify type as advanced payments or progress payments.
22. Type of contract proposed, firm-fixed price.
23. DUNS number, if available_____
    (See Section III.F)