



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

PROGRAM SOLICITATION

Small Business Innovation Research Program

Issue Date: February 14, 2003

Closing Date: May 1, 2003

**DOT SBIR Program Office, DTS-22
U.S. DOT/RSPA/VNTSC
55 Broadway
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 United States 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. 103-564, Small Business Research and Development Act of 1992, signed October 28, 1992.

On December 15, 2000, Congress reauthorized the Program by P.L. 106-554. 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 DOT 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 DOT.

B. Three-Phase Program

The DOT 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 (by invitation only).**

Phase II. Phase II is the principal research or research and development (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 Phase I awardees receiving an invitation to submit a Phase II proposal. DOT will accept Phase II proposals under the DOT 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 at the time of award of Phase I and Phase II funding agreements. In addition, **the primary employment of the principal investigator must be with the small business firm at the time of contract award and during the conduct of the proposed research** 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 50 states, the Territories and possessions of the United States, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, the Trust Territory of the Pacific Islands, and the District of Columbia.

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 shall 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 shall 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 shall 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 shall 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 shall 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 shall 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 shall be self-contained and checked carefully by the proposer to ensure that all preparation instructions have been followed.
(See proposal checklist)

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

Joseph Henebury
DOT SBIR Program Director, DTS-22
U.S. DOT/RSPA/VNTSC
55 Broadway
Cambridge, MA 02142-1093

Telephone: (617) 494-2051
Fax: (617) 494-2370
E-Mail Address: henebury@volpe.dot.gov
Volpe Center Web Site:
<http://www.volpe.dot.gov/SBIR>

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 Concern

A small business concern is one that at the time of award of Phase I and Phase II contracts 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; and
- (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 Concern

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 Concern

A women-owned small business concern is one 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

Subcontract means 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

In the Program Year 2003, proposals may be submitted either electronically or in hard copy format.

Please note that:

- (1) SBIR Phase I proposals shall 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, contract pricing proposal and all enclosures or attachments.
- (2) Attachments, appendices and references are included in the 25 page limitation. Proposals in excess of 25 pages will not be considered for review or award.

Electronic Submission Requirements:

- Each proposal shall not exceed 25 pages.
- All proposals must be in text only, (i.e., no graphics, tables, etc.).
- All proposals must be a PDF file attached to e-mail.
- No duplicate proposals shall be sent by any other means.
- Proposals must be sent via e-mail to: henebury@volpe.dot.gov.
- Proposals must be received by 5:00 p.m. on May 1, 2003.
- ***You must submit a completed and signed hardcopy of Appendices A, B, and C postmarked no later than May 1st to: Joseph Henebury, DOT SBIR Program Director, DTS-22, U.S. DOT/RSPA/VNTSC, 55 Broadway, Cambridge, MA 02142-1093***
- The proposal file name shall contain eight (8) characters-the first three shall be the topic number you are proposing to (i.e.,FH3,) and the remaining five characters shall be a unique abbreviation of your company's name.

Your proposal will have the same protection/security as DOT e-mail. It will be available to only the team of DOT

engineers and/or scientists responsible for evaluating your proposal.

If you intend to submit your proposal electronically, you must register at our website: www.volpe.dot.gov/sbir by April 15, 2003.

B. Proposal Cover Sheet

Complete the proposal cover sheet in Appendix A as Page 1 of your proposal. All pages shall be numbered consecutively, beginning with the proposal cover sheet.

C. Project Summary

Complete the form in Appendix B as Page 2 of your proposal. The Project Summary shall 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 shall also be summarized in the space provided. The Project Summary of successful proposals may be published by the DOT and, therefore, shall 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 national transportation system shall be clearly stated.
- (2) **Phase I Technical Objectives.** State the specific objectives of the Phase I research or R&D 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 research or R&D plan. The plan shall indicate what will be done, where it will be done, and how the research or R&D will be managed or

directed and carried out. Phase I research or R&D shall address the objectives and the questions cited in (2) above. The methods planned to achieve each objective or task shall 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 R&D effort.
- (7) **Facilities.** Provide a detailed description, availability and location of instrumentation and physical facilities proposed for Phase I.
- (8) **Consultants.** Involvement of consultants in the planning and research stages of the project is permitted. If such involvement is intended, it shall 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 (Schedule 1) 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 shall note its Data Universal Numbering System (DUNS) identification number on Appendix C, Contract Pricing Proposal, Schedule 1. This number is assigned by Dun & Bradstreet, Inc.

G. Acknowledgement of Proposal Receipt

Proposers shall fill out the proposal acknowledgement form 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 the proposal 25-page 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 DOT 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 research 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 R&D.

C. Prescreening

Each proposal submission will be examined to determine if it is complete and contains an adequate amount of technical and pricing 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 shall 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 of proposals 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 engineers and/or scientists and recommend to the SBIR Program Director the proposals for awards. The SBIR 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. Technical questions pertaining to 2003 SBIR solicitation research topics must be submitted to the SBIR Program Office by e-mail: henebury@volpe.dot.gov. Technical questions will be researched and answers provided in as timely a manner as possible. Technical questions submitted to the SBIR Program Office during the few weeks prior

to the closing date for receipt of Phase I proposals may not be able to be answered before the closing date.

No information on proposal status will be available until the complete list of 2003 Phase I Award Recommendations to receive funding is posted on the DOT SBIR Program Web Page:

<http://www.volpe.dot.gov/sbir>. For planning purposes the notification of 2003 Phase I Award Recommendations is expected to be posted on the DOT SBIR Program Web Page by October 1, 2003.

Phase I proposals which are not included in the October 1st list of 2003 Phase I Award Recommendations will not receive funding. NO WRITTEN CORRESPONDENCE REGARDING PROPOSAL STATUS WILL BE MADE.

After the 2003 Phase I Award Recommendations are posted on the DOT SBIR Program Web Page, a debriefing comprised of the overall comments on the proposal may be provided to the proposer upon request.

Debriefing requests should be submitted to the Contracting Officer by e-mail to: dohertym@volpe.dot.gov, and must include the proposer's name, address, research topic number, and the proposal identification number assigned on the acknowledgement of receipt card. The identity of the evaluators will not be disclosed.

V. CONSIDERATIONS

A. Awards

It is estimated that during Fiscal Year 2003, DOT will award approximately 9 Phase I contracts with an anticipated potential maximum of 10 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 each 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.

DOT's Operating Administrations contribute to SBIR funding. Each Operating 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 Motor Carrier Safety Administration, Federal Railroad Administration, Federal Transit Administration, National Highway Traffic Safety Administration, Research and Special Programs Administration, and/or the U.S. Coast Guard. 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 which consist 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 as described in paragraph B 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 DOT 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**

Contracts. 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 DOT support. The DOT 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 Phase II proposals under the topic areas identified in this solicitation; however, cost-sharing is not required nor will it be a factor in proposal evaluations.

F. Profit or Fee

A profit is allowed on awards to small business concerns 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 concern 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 shall 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. A complete copy of terms and conditions will be provided upon issuance of the model contract for signature prior to award.

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

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

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

4. **Default.** The Government may terminate the contract if the contractor fails to 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 proposer 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, prescribes 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; and/or soliciting or obtaining proprietary or source selection information regarding the procurement. Violations of the statute may result in criminal and/or civil penalties, disqualification of a proposer, cancellation of the procurement, or other appropriate remedy.
 16. **Section 508 Access Board Standards .**
All electronic and information technology deliverables rendered must comply with Section 508 of the Rehabilitation Act and the Access Board Standards available for viewing at <http://www.section508.gov>. Unless otherwise indicated, the contractor represents by signature on a contract that all deliverables will comply with the Access Board Standards.
- 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. previously been, nor is currently being paid for essentially equivalent work by any agency of the Federal government.
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 DOT SBIR Program is not a substitute for existing unsolicited proposal mechanisms. Unsolicited proposals shall not be accepted under the DOT SBIR Program in either Phase I or Phase II. See www.volpe.dot.gov/procure/unsolguide.html for specifics on unsolicited proposal submission requirements.
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
7. When purchasing equipment or a product with funds provided under the DOT 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, Service of Protest, the following Service of Protest procedures shall be followed. Protests, as defined in Section 33.101 of the FAR that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgement of receipt from: Mary E. Doherty, DOT/RSPA/Volpe Center, 55 Broadway, DTS-853, Cambridge, MA 02142-1093.

VI. SUBMISSION OF PROPOSALS

A. Submittal Instructions

For hard copy submissions:

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

Joseph Henebury
DOT SBIR Program Director, DTS-22
U.S. DOT/RSPA/VNTSC
55 Broadway
Cambridge, MA 02142-1093
Telephone: (617) 494-2051

Proposals must be postmarked NO LATER than May 1, 2003 to qualify for acceptance and consideration under the current DOT SBIR Program. Proposals postmarked or received via e-mail later than May 1, 2003 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, 2003.

Electronic Submission Requirements:

- Each proposal shall not exceed 25 pages.
 - All proposals must be in all text, (i.e., no graphics, tables, etc.).
 - All proposals must be a PDF file attached to e-mail.
 - No duplicate proposals shall be sent by any other means.
 - Proposals must be sent via e-mail to: henebury@volpe.dot.gov.
 - Proposals must be received by 5:00 p.m. on May 1, 2003.
- *You must submit a completed and signed hardcopy of Appendices A, B, and C postmarked no later than May 1st to: Joseph Henebury, DOT SBIR Program*

Director, DTS-22, U.S. DOT/RSPA/VNTSC, 55 Broadway, Cambridge, MA 02142-1093.

- The proposal file shall contain eight (8) characters-the first three shall be the topic number you are proposing to (i.e., FH3), and the remaining five characters shall be a unique abbreviation of your company's name.

Your proposal will have the same protection/security as DOT e-mail. It will be available to only the team of DOT engineers and/or scientists responsible for evaluating your proposal.

If you intend to submit your proposal electronically you must register at our website: www.volpe.dot.gov/sbir by April 15, 2003.

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 shall be sent in one package together with the acknowledgement form which appears on the last page 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, 2003. This number will appear on the proposal acknowledgement form which will be sent to the proposer by return mail confirming receipt of the proposal.

Proposers who submitted their proposals electronically will receive their proposal number via e-mail no later than May 21, 2003.

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
1400 Computer Drive
Westborough, MA 01581
(508) 870-0042

Great Lakes Industrial Technology Center
25000 Great Northern Corporation Center
Suite 260
Cleveland, OH 44070-5320
(440) 734-0094

Federal Information Exchange, Inc.
555 Quince Orchard Road, Suite 360
Gaithersburg, MD 20878
(301) 975-0103

Southern Technology Applications Center
University of Florida
1900 SW 34th Street, Suite 206
Gainesville, FL 32608
(352) 294-7822

Midcontinent Technology Transfer Center
Texas Engineering Extension Service
The Texas A&M University System
301 Tarrow Street, Suite 119
College Station, TX 77840-7896
(409) 845-8762

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(800) 553-6847

MidAtlantic Technology Applications Center
University of Pittsburgh
3400 Forbes Avenue, 5th Floor
Pittsburgh, PA 15260
(412) 383-2500

Technology Transfer Center
University of Southern California
3716 South Hope Street, Suite 200
Los Angeles, CA 90007-4344
(213) 743-2353

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/TOPIC	POTENTIAL MAXIMUM FY03 PHASE I AWARDS
RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION (RSPA)	2 AWARDS
03-RS1 Advanced Sensors for Pipeline System Integrity Management	
FEDERAL RAILROAD ADMINISTRATION (FRA)	1 AWARD
¹ 03-FR1 A Software Tool for Human Error Investigations in Railroads	
FEDERAL HIGHWAY ADMINISTRATION (FHWA)	6 AWARDS
03-FH1 Visual and Quantitative Representation of Right of Way Land Acquisition Estimates Within Multiple Natural Hazard Environments	
03-FH2 Enhancing the Usability of an Intersection Collision Avoidance Simulation Method	
03-FH3 Fiber Optic Sensor System for Internal Relative Humidity of Concrete	
03-FH4 Development and Use of Native Plant Sods for Erosion and Sediment Control on Highway Construction Projects	
03-FH5 Real Time Linux Operating System Software for Advanced Traffic Controller to Host Traffic Control Software	
03-FH6 Computer-Design System for Pavement Repair	
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION (NHTSA)	1 AWARD
² 03-NH1 Development of a Restorable Vehicle Occupant Safety System	

¹ Phase I may be up to \$100,000 and Phase II may be up to \$200,000

² Phase I may be up to \$100,000 and Phase II may be up to \$300,000

RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION (RSPA)

03-RS1 ADVANCED SENSORS FOR PIPELINE SYSTEM INTEGRITY MANAGEMENT

America receives over two-thirds of the crude and petroleum products for more than 55 million residential and commercial customers, through pipelines in excess of 160,000 miles based on year 2002 Liquid pipeline operator national mileage information. However, the supply of energy has too often been disrupted by local pipeline leaks.

Historically, mechanical damage is the single largest cause of leaks that develop into failures on pipelines. Mechanical damage usually occurs after a pipeline is constructed and is caused by excavation equipment, which deforms the shape of the pipe, scrapes away metal and coating, and changes the mechanical properties of the pipe.

Phase I research is sought on the use of Advanced Sensors concepts for leak detection and location of liquid and/or natural gas applications. Areas of interest include, but are not limited to:

1. Pipeline leak detection and location using fiber optics technology.

Certain types of optical fibers are capable of detecting sound produced by a leak. Usage of advanced signal processing could determine leakage location while estimating size of leak as small as 1-2 cubic feet per hour for natural gas. This can be done over long lines (5-10km) with a fiber sensor. Use of multiple fiber sensors could allow continuous monitoring over miles of pipeline. Continuous monitoring and rapid leak detection would enhance integrity management for pipeline operating safety and has the potential to reduce accidents resulting from gas leaks.

2. Location detection for pipeline leaks.

Once a pipeline leak is detected, it can take significant effort and time to find the actual location of a small leak. Development of inexpensive probes that measure concentration can be inserted in the ground, and using concentration values, soil models, and triangulation techniques, the exact leak location can be quickly established. This non-intrusive technique would decrease the amount of digging required to locate leaks and thereby reduce additional chances of pipeline contact by earth-moving equipment.

3. Transient-thermal imaging for flaw detection.

Transient-thermal imaging has been used to find flaws in metal cross-sections (like aircraft bodies). This technique has potential for conducting inspections, to determine integrity of pipelines while in service. By obtaining a thermal scan of a pipeline segment, the transient response could identify abnormalities that indicate corrosion, wall thinning, etc. This technique, which is well suited for above ground piping, may be an option for inspecting pipeline segments that cannot be inspected by an instrumented pig. For buried pipelines, a transient-thermal imaging system could potentially be added for improved integrity management of a pig system and used to characterize internal corrosion damage and cracking of the pipeline.

FEDERAL RAILROAD ADMINISTRATION (FRA)

'03-FR1 A SOFTWARE TOOL FOR HUMAN ERROR INVESTIGATIONS IN RAILROADS.

The FRA's data on accidents and incidents indicates that approximately 30% of all accidents and incidents have a human factor cause, and many safety experts feel that human factors may have a contributing role in as many as 90% of all transportation accidents. Regardless of the actual magnitude of the contribution of human factors to accidents, it is clear that a significant improvement in safety could result from the timely identification of the sources of human errors in accidents and incidents. However, systematic investigation of the sources of human errors does not often occur in the railroad industry because the personnel who investigate accidents usually have little background in human factors and tend to focus on hardware issues. Human factors, when they are considered, are often a "catch-all" for situations in which no physical cause for an accident can be found, and when an accident is obviously due to a human error, the sources of that error are not sought.

Are the sources of a human error important? There are two points of view concerning human errors. One point of view is that human error is a cause of accidents (unreliable people in basically safe systems). Therefore, to explain a human factor caused accident a human failure must be found, such as inaccurate assessments, wrong decisions and bad judgments. This view of human factor accidents see complex systems (such as railroads) as basically safe systems that need to be protected from unreliable people. The error, not its sources, are important and investigation is complete when the error has been identified. The system is protected from unreliable people by punishing them or removing them.

A more modern point of view is that human errors are a symptom of problems within the system. These errors are not random. Human error is systematically connected to the features of the operating environment, including tools, tasks and the organizational safety climate. Human errors, as symptoms, are not the conclusion of an accident investigation, they are the commencement of the investigation. An investigation does not try to find where people went wrong. Rather the investigation determines how people's assessments, decisions and judgments would have made sense at the time, given the circumstances within the system. The system is made safer by identifying the sources of human error within the system.

Purpose

The purpose of this project is to develop a software tool that accident investigators in a railroad setting can use to determine the sources of human errors that have contributed to the accident. The software tool should be useable in a field setting on a laptop computer or Personal Data Assistant (PDA). The tool should be compatible with commercially available computer operating systems and other software that might be used in the conduct of analyses (spreadsheets, databases, graphics, statistical packages), and the generation of reports (word processing).

The tool should be based on the recent work of human factors and safety experts concerning the role of human error in accidents. Work by individuals such as James Reason, Sidney Dekker, Douglas Wiegmann, and Scott Shappell should be consulted, as well as work by groups such as the International Civil Aviation Organization and the Transportation Safety Board of Canada.

The tool should guide an investigator through an integrated process for systematically investigating human factors in an accident and provide aids at each step in the process to ensure that important sources of information are collected. The tool should be capable of organizing the information so as to facilitate analysis and reporting.

The tool should be designed in accordance with human-centered principles so as to ensure useability and utility. The tool must specifically apply to the railroad operating environment. Target audiences for the tool include the FRA's Office of Safety, railroads, and the National Transportation Safety Board.

FEDERAL HIGHWAY ADMINISTRATION (FHWA)

03-FH1 VISUAL AND QUANTITATIVE REPRESENTATION OF RIGHT OF WAY LAND ACQUISITION ESTIMATES WITHIN MULTIPLE NATURAL HAZARD ENVIRONMENTS

Provide a visual and quantitative system for analysis of right of way land values where avoidance or mitigation of multiple natural hazard environments is necessary, incorporating Geographic Information Systems (GIS), Global Positioning System (GPS), photogrammetry, Computer Assisted Design (CAD), plus planar and dimensional desktop technology.

Technical Description:

FHWA wishes to improve the analysis and review of right of way costs against the issues of natural hazards. Natural hazards are regional or multi-region wide phenomena. Natural hazards can be a combination of adverse influences from wind, water, and/or soil. The topic seeks a mechanism to enable responsible choices for right of way alignment and construction by using appropriate and sufficient cost analysis and geomorphographic information in decision-making. This research will provide a visual and quantitative system for analysis of right of way land values where avoidance or mitigation of multiple natural hazard environments is necessary. Incorporate GIS, GPS, photogrammetry, CAD, plus planar and dimensional database desktop technology. Sources of multiple hazard constraints are to be derived from State and Federal agency information resources. Include land acquisition estimation procedures based upon existing or projected real property assessment data. Output is to visually depict various expected conditions and potential acceptable land acquisition resolutions for a range of natural hazard conditions within a given geomorphology.

Final Deliverable to include:

Technology tool to support land cost analysis for associated natural hazard conditions; and
Visual representation of resulting analysis.

Relevance of the topic to FHWA strategic goal of Environmental Streamlining and Stewardship:

Visual representation of all analytic elements will enable conversion of large amounts of numeric data into understandable units. The research will provide tools for a thorough analysis of existing natural hazard conditions against alternative costs of right of way alignments. The combination of right of way data, land cost levels, and natural hazard data will allow decision makers to resolve complex problems. The study is fundamental to FHWA's environmental stewardship objectives.

The FHWA Office of Real Estate Services anticipates that technological resources will be a major component of right of way management in the future. This study captures traditional right of way estimate procedures, but extends analysis using high technology. Visual Representation of Right of Way Land Acquisition Estimates within Multiple Natural Hazard Environments converges two complex issues: land acquisition and natural hazardous conditions. Future highway alignment choices will require joint analysis of these issues.

The topic will enable right of way personnel to visually and numerically synthesize acquisition and environmental concerns. The topic outcome will also allow the examination of minor changes in highway right of way alignment where natural hazard concerns are at stake. The ability to visualize outcomes under different scenarios will improve the ability of right of way representatives to negotiate resolutions. The study effectively supports FHWA's goal for environmental streamlining and stewardship.

03-FH2 ENHANCING THE USABILITY OF AN INTERSECTION COLLISION AVOIDANCE SIMULATION MODEL

Use object oriented structured programming techniques and JAVA (a programming language developed by Sun Microsystems) to develop an interactive graphic interface to the TEXAS (proper name of intersection collision simulation package) intersection collision simulation for intersections (stop sign, pretimed and actuated traffic signals).

Technical Description

The TEXAS model is a high quality single intersection simulation model. TEXAS analyzes in sub microscopic detail the behavior of vehicles as they go through intersections and intermix with other traffic flows. Most simulation models discard this level of detail in favor of focusing on the surface street network for congestion mitigation or planning purposes. TEXAS has path following, microscopic car following, visibility restriction features and surrogate safety measures allowing it to be used for intersection collision analysis. However, its user interface is card oriented and thus it is extremely difficult to use. Making it easy to use would encourage its use for operations design of intersections that consider traffic collision and safety potential.

This project would use object oriented structured programming techniques and JAVA to develop an interactive graphical interface to the TEXAS intersection collision simulation for intersections (stop sign, pretimed and actuated traffic signals). The user interface would be based on concepts in the CORSIM interface, but would not use the CORSIM model code. The interface program and all of its code would be copyrighted with the Free Software Foundation copyleft statement. The vendor would be expected to make their profits through support and maintenance of the tool. The model would be programmed in JAVA to achieve platform independence similar to that of the TEXAS model itself. It would run on at least Windows 2000, XP, LINUX and MacOS. The model would be able to import CAD and graphics files to use as templates, backgrounds or data. Phase I would develop a simple interface without the import features. Phase II would add multiple data import features and compatibility with TSIS. Phase II would be staged with interim deliverables. For this reason, experience in traffic simulation modeling, JAVA, data entry, CAD and traffic operations are critical.

Note: Although not required, it would be helpful if you provide a working example to demonstrate your ability to work with Java and user interfaces.

For an overview of TSIS, CORISM and related materials see: http://www.fhwa-tsis.com/TSIS_overview.htm

The following site explains the philosophy of the GPL and copyleft: <http://www.gnu.org/philosophy/free-sw.html>

This site explains categories of software and copyright and the description of the license: <http://www.gnu.org/copyleft/gpl.html>

Relationship to FHWA Strategic Objectives and Vital Few.

Safety: *Continually improve highway safety.* This project will allow engineers to analyze the collision avoidance aspects of intersection design and operations projects to enhance safety.

Mobility: *Continually improve the public's access through ...enhancement of its operations, efficiency, and intermodal connections.* This project will facilitate concurrent analysis of operations and safety surrogate measures for simulation analysis of intersection design and operation.

03-FH3 FIBER OPTIC SENSOR SYSTEM FOR INTERNAL RELATIVE HUMIDITY OF CONCRETE

Develop a sensing system for monitoring the internal relative humidity (RH) of concrete using fiber optic sensors; system should be self-contained; able to operate in alkaline environments for several years; have an operating range of 70-100% RH; and a precision of $\pm 1\%$.

The FHWA is seeking a system for monitoring the internal RH in concrete using fiber optic sensors. The internal RH of concrete is an important variable for several reasons. It determines the development of strength, and affects dimensional changes such as creep and shrinkage. High internal RH can also promote deterioration processes such as steel reinforcement corrosion and alkali-silicate gel formation. Therefore, a sensor system for monitoring internal RH is highly desirable both during construction and afterwards. However, the current methods based on electrical sensors have several drawbacks. They require an air space, which disrupts the properties of the concrete. They are also sensitive to electromagnetic noise. Moreover, the performance tends to degrade over time because of corrosion.

Several promising approaches to sensing internal RH with fiber optics have been proposed. These sensors do not require air spaces. Depending on the specific method, they use hydrogels or alkali-resistant windows that take up much less volume. The fibers themselves are on the order of 100 microns in diameter and thus take up less volume than electrical wiring. There are a number of alternatives for using light waves in the sensor, such as wavelength shift, index of refraction shift, etc., with implications for system costs and performance. Previous research in fiber optic strain sensors conducted by the FHWA has demonstrated, that such fiber optic systems can be safely embedded in fresh concrete during casting or pouring and operated over several years with no degradation.

The system for sensing internal RH should have an operating range of 70-100% RH and a precision of $\pm 1\%$. It should be self-contained, that is, it should not require the replenishment of consumables for continued operation. The sensor system must be able to operate in alkaline environments (pH~13) for several years. Such a sensing system will help to achieve the FHWA's strategic goals of mobility, productivity and safety goals through reductions in construction time and cost for new infrastructure arising from more accurate information on internal condition of fresh concrete. It will also permit optimization of maintenance and repair based on more accurate and detailed information on the condition of concrete in service.

03-FH4 DEVELOPMENT AND USE OF NATIVE PLANT SODS FOR EROSION AND SEDIMENT CONTROL ON HIGHWAY CONSTRUCTION PROJECTS

Explore procedures for the use of native grass and forb (any vascular plant without significant woody tissue; may be annual, biennial or perennial) sod production, followed by evaluated use on highway construction projects, to prevent invasive plant growth and quickly establish erosion control.

Technical Description:

Highway construction projects require the quick establishment of vegetative cover on unpaved areas for erosion and sediment control and to avoid possible water quality problems. Increasingly project sponsors are encouraged to use native plants. Many project designers/managers are not willing to take the risk of non-traditional plant materials for erosion control. Consequently, they use easy-to-grow, but often invasive, plant species. The consequences of these plant choices may have great costs far into the future due to such activities as weed control that may be necessary. To accomplish both invasive plant prevention, and appropriate use of native plants, a solution that is easy, risk-free, and affordable would be beneficial to highway project sponsors. Native sods for erosion control could be such a solution.

Final deliverables to include :

Demonstrated examples of native grass and forb sod production followed by evaluated use on highway construction projects.

Relevance to achieving FHWA strategic goals:

Sods of native grasses and forbs would be invaluable when projects cross natural areas, parklands, other agency lands, etc. These sods could be regionally designed and grown to encourage the use of regional ecotypes, thus reinforcing the ecological concept of growing the right plants in the right place. Their value in terms of economic enhancement could be significant in many regions as sod producers would offer new products in high demand. These results would fit neatly into FHWA's call for environmental stewardship on projects we support and the lands they cross.

Since the 1987 Surface Transportation and Uniform Relocation Assistance Act (STURRA) required the use of native wildflowers, the FHWA has interpreted wildflowers to include both native grasses and native forbs. The use of native grasses and forbs shows promise as erosion control, based on a recent Texas Transportation Institute study. However, many State highway agencies and contractors lack the knowledge and experience in using native plants for erosion control plantings. Developing sods of these plants would allow easy use and likely success to all involved in required quick establishment of erosion control using native plants on construction projects.

Since the 1987 Surface Transportation and Uniform Relocation Assistance Act (STURRA) required the use of native wildflowers, the FHWA has interpreted wildflowers to include both native grasses and native forbs. The use of native grasses and forbs shows promise as erosion control, based on a recent Texas Transportation Institute study. However, many State highway agencies and contractors lack the knowledge and experience in using native plants for erosion control plantings. Developing sods of these plants would allow easy use and likely success to all involved in required quick establishment of erosion control using native plants on construction projects.

03-FH5 REAL TIME LINUX OPERATING SYSTEM SOFTWARE FOR ADVANCED TRAFFIC CONTROLLER TO HOST TRAFFIC CONTROL SOFTWARE

Adapt an open source LINUX for real time applications and provide it with an Applications Program Interface (API) suitable for interfacing with current Advance Traffic Controller (ATC) programs.

Technical Description

The ATC does not have an open source real time operating control system. There are several open source versions of LINUX for preemptive programming. This project would adapt an open source Linux for real time applications and provide it with an API suitable for interfacing with current ATC programs. The software would have to be licensed so that commercial vendors could run their proprietary traffic signal control programs as well as open source software on it.

Phase I would develop and demonstrate prototype software which would embody a simplified version of the real time operating system and demonstrate that the API worked with at least one commercial real time traffic signal control application. Phase I would determine what the "real time" needs are for the operating system and determine which model of LINUX for real time/preemptive programming would be suitable for traffic control applications. The software would be demonstrated using the Controller Interface Device and the CORSIM traffic simulation model. Phase II would enhance the system and interface it to the Los Angeles real time ATC signal control program. Phase II would also debug the API and ensure compatibility with the API standard under development by the ATC project. This project requires significant experience in traffic engineering, real time control, LINUX and programming of traffic signal controllers.

This project is needed to allow maximum benefit from the advanced traffic algorithms developed by FHWA for Intelligent Transportation Systems (ITS). Current ATC controllers have the processing power of minicomputers but still do not have an open source real time operating system to facilitate programming and debugging.

Note: Although not required, it would be helpful if you provide a working real time example to demonstrate your ability to work with Linux.

Relationship to FHWA Strategic Objectives and Vital Few.

Safety: *Continually improve highway safety.* This project will allow engineers to better utilize the ATC and its enhanced algorithms for Intersection Collision Avoidance operations to reduce the possibility of collisions.

Mobility: *Continually improve the public's access through ...enhancement of its operations, efficiency, and intermodal connections.* This project will facilitate concurrent operations of traffic signals for both enhanced safety and enhanced operations.

03-FH6 COMPUTER-DESIGN SYSTEM FOR PAVEMENT REPAIR

Use the latest pavement damage crack prediction algorithms available and develop a user friendly interface to demonstrate the feasibility of incorporating this application into an overall computer design system for pavement repair.

Technical Description:

Every year the FHWA spends billions of dollars repairing highway pavements that have failed well before their design lifetime is reached. The repaired pavements often need attention again too soon. A big reason for these premature failures is the limited knowledge of how to quantify the damaging effects of the size and weight of trucks, particularly for pavements that are already damaged, and the lack of a practical method of utilizing the knowledge we do have.

There is a need for tools to better design pavements for new construction and also for pavement repair. These tools would be part of a computer-based design system that would consider the many factors that influence pavement damage response as well as the current state of damage of the pavement section. Although pavement roughness generally used by State Highway Departments to trigger pavement overlay and repair it is the internal damage to the pavement in terms of permanent deformations and cracks that lead to premature pavement failure. Once cracking damage has occurred it cannot be healed and further damage progresses at an alarming rate. It is, therefore, most prudent to be able to estimate when cracking damage will be initiated and to design the pavement for the longest damage free life possible.

The Phase I research will use the latest pavement damage crack prediction algorithms available and develop a user friendly interface to demonstrate the feasibility for the application of this system for use in an overall computer design system for pavement repair. Upon successful completion of Phase I, the development of the design system together with the development of other damage mechanisms including pavement layer rutting for inclusions in this system would be undertaken.

Essential Need: This topic will satisfy FHWA's need for a comprehensive and automated design system for pavement repair and is essential to meet the public's increasing demand for smoother and stronger roads in the most efficient manner.

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION (NHTSA)

203-NH1 DEVELOPMENT OF A RESTORABLE VEHICLE OCCUPANT SAFETY SYSTEM

The development of crash sensing systems capable of tracking closing objects likely to impact a motor vehicle in the front, side or rear, affords the crashworthiness engineer the opportunity to activate or deploy vehicle safety systems before a crash occurs. So called pre-crash sensing systems can provide the speed, direction, and in some cases the geometry of the vehicle's crash partner, and such information could be used, for example, to deploy an airbag or seat-belt pretensioner earlier in the crash event than conventional accelerometer-based crash detection systems.

Due to unreliability in pre-crash sensing systems, deploying non-renewable safety devices, such as front and side airbags or pyrotechnic seat-belt pretensioners, may prove to be cost-prohibitive and/or distracting to drivers. Thus, there is a need for the development of renewable or restorable restraint systems that could be deployed in anticipation of a crash based upon information from a pre-crash sensor. Such a system could either deploy and mitigate injury to the occupant should a crash occur, or deploy and be restored and re-stowed in its original configuration to be reused in a future crash. Some examples of such safety systems might include, but are not limited to:

- An energy absorbing knee bolster or toe-pan that expands before a crash occurs and will either absorb the impact of the occupant or restore itself to its original position and shape such that it can be reused in a subsequent crash.
- A door-mounted airbag made from a gas impermeable fabric that deploys in anticipation of a pending crash, and evacuates itself if unused in a crash such that it retracts into its original compartment.
- A side impact structural stiffening beam that deploys from beneath the door sill and interposes itself between the crash-partner and vehicle side structure.

General Requirements:

1. This system should deploy as signaled by a pre-crash sensing system. The contractor can assume that the pre-crash sensing system shall provide the probability that the crash will occur and estimated elapsed time-to-crash.
2. The lead time, or the time between pre-crash notification and the first contact with the crash partner, is not specified. Rather, we encourage the proposers to consider carefully the performance and reliability of pre-crash sensing systems in determining the required lead time. A safety device that deploys too early based upon a low

reliability score from the pre-crash sensing system may distract the driver and adversely influence the outcome of the event. A safety system that deploys with very little lead time may injure the out-of-position occupant. With this in mind, we encourage the proposers to set and justify their own lead time for deployment in their proposal.

3. The safety system shall be restorable. That is, the safety system shall be capable of restoring itself to its original pre-crash size, shape and location if no crash actually occurred. If a crash occurred, then the post-crash state of the safety system is not specified.
4. The safety system should mitigate injury. Each proposal should provide a description of a test procedure by which the safety benefit of the device could be evaluated.

Proposals for the Phase I research effort should be based on concepts for utilization of specific hardware and software. The proposal should suggest a viable feasibility study of any proposed concepts to develop and build a restorable vehicle occupant safety system that mitigates injury to one or more body regions. Upon successful completion of Phase I, the actual development of the chosen concept may be undertaken.

¹ Phase I may be up to \$100,000 and Phase II may be up to \$200,000

² 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 | Appendix D |
| 5. | PROPOSAL ACKNOWLEDGEMENT FORM | Appendix E |

**U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. DTRS57-03-R-SBIR**

PROPOSAL COVER SHEET

Project Title _____

Research Topic No. _____ Research Topic Title _____

Submitted by: Name _____

Address _____

City _____ State _____ Zip + _____

Amount Requested (Phase I) \$ _____
(May be up to \$100,000 unless otherwise indicated)

Proposed Duration _____
(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 II.B; and that it meets the eligibility requirement in Section I.C. Yes_____ No_____

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

3. The above concern certifies it _____does_____does not qualify as a women-owned small business as defined in Section II.D. (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. DTRS57-03-R-SBIR**

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. DTRS57-03-R-SBIR**

**APPENDIX C
 (SCHEDULE 1)**

CONTRACT PRICING PROPOSAL

PROPOSAL COVER SHEET			1. SOLICITATION/CONTRACT/MODIFICATION NUMBER			
2a. NAME OF OFFEROR			3a. NAME OF OFFEROR'S POINT OF CONTACT			
2b. FIRST LINE ADDRESS			3b. TITLE OF OFFEROR'S POINT OF CONTACT			
2c. STREET ADDRESS						
			3c. TELEPHONE		3c. FACSIMILIE	
2d. CITY	2e. STATE	2f. ZIP CODE	AREA CODE	NUMBER	AREA CODE	NUMBER
4. TYPE OF CONTRACT OR SUBCONTRACT (<i>Check</i>) <input type="checkbox"/> FFP <input type="checkbox"/> CPFF <input type="checkbox"/> CPIF <input type="checkbox"/> CPAF <input type="checkbox"/> FPI <input type="checkbox"/> OTHER (<i>Specify</i>)			5. <input type="checkbox"/> PRIME OFFEROR <input type="checkbox"/> SUBCONTRACTOR _____ <div style="text-align:right; margin-right: 50px;">PRIME OFFEROR'S NAME</div>			
6. ESTIMATED COST, FEE AND PROFIT INFORMATION						
A. ESTIMATED COST						
B. FIXED FEE						
C. AWARD FEE						
D. PROFIT						
E. TOTAL PRICE						
7. PROVIDE THE FOLLOWING						
NAME OF COGNIZANT CONTRACT ADMINISTRATIVE AGENCY			NAME OF COGNIZANT GOVERNMENT AUDIT AGENCY			
STREET ADDRESS			STREET ADDRESS			
CITY	STATE	ZIP CODE	CITY	STATE	ZIP CODE	
TELEPHONE	AREA CODE	NUMBER	TELEPHONE	AREA CODE	NUMBER	
FACSIMILE	AREA CODE	NUMBER	FACSIMILE	AREA CODE	NUMBER	
NAME OF CONTACT			NAME OF CONTACT			
PROPERTY SYSTEM	<input type="checkbox"/> Reviewed by cognizant contract administrative agency and determined acceptable <input type="checkbox"/> Reviewed by cognizant contract administrative agency and determined not acceptable <input type="checkbox"/> Never reviewed		APPROXIMATE DATE OF LAST AUDIT			
PURCHASING SYSTEM	<input type="checkbox"/> Reviewed by cognizant contract administrative agency and determined acceptable <input type="checkbox"/> Reviewed by cognizant contract administrative agency and determined not acceptable <input type="checkbox"/> Never reviewed		PURPOSE OF AUDIT (e.g. proposal review, establishment of billing rates, finalize indirect rates, etc.)			
			ACCOUNTING SYSTEM <input type="checkbox"/> Audited and determined acceptable <input type="checkbox"/> Audited and determined not acceptable <input type="checkbox"/> Never audited			
			OFFEROR'S FISCAL YEAR			
8a. NAME OF OFFEROR (<i>Typed</i>)			9. NAME OF FIRM			
8b. TITLE OF OFFEROR (<i>Typed</i>)						
10. SIGNATURE				11. DATE OF SUBMISSION		

**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 to 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)

APPENDIX C Con.

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)
24. Tax Identification Number, if available.

**U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. DTRS57-03-R-SBIR**

PROPOSAL CHECKLIST

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

- _____ 1. The proposal reflects the fact that for Phase I a minimum of two-thirds (and for Phase II a minimum of one-half) of the research and/or analytical effort will be performed by the proposing firm as required (see Sections V.H.1 and V.H.2) and the primary employment of the principal investigator (for both Phase I and Phase II) must be with the small business firm at the time of award and during the conduct of the proposed research as required (see Section I.C).
- _____ 2. The proposal is 25 PAGES OR LESS in length. This limitation does not apply to the additional information required by Section III.H.
- _____ 3. The proposal is limited to only ONE of the research topics in Section VIII.
- _____ 4. The proposal budget may be up to \$100,000 unless otherwise indicated and duration does not exceed six months.
- _____ 5. The technical abstract contains no proprietary information, does not exceed 200 words, and is limited to the space provided on the Project Summary sheet (Appendix B).
- _____ 6. The proposal contains only pages of 8 1/2" x 11" size.
- _____ 7. The proposal contains no type smaller than 10 point font size.
- _____ 8. The COVER SHEET (Appendix A) has been completed and is PAGE 1 of the proposal.
- _____ 9. The PROJECT SUMMARY (Appendix B) has been completed and is PAGE 2 of the proposal.
- _____ 10. The TECHNICAL CONTENT of the proposal begins on PAGE 3 and includes the items identified in SECTION III.D of the Solicitation.
- _____ 11. The Contract Pricing Proposal (Appendix C) has been included as the last section of the proposal.
- _____ 12. The acknowledgement of proposal receipt card on the back cover of the solicitation has been detached, filled out and included with the proposal package.
- _____ 13. An original and four copies of the proposal are submitted.
- _____ 14. The additional information on prior Phase II awards, if required, in accordance with Section III.H.
- _____ 15. The proposal must be postmarked (or delivered to the DOT SBIR Program Office) no later than May 1, 2003 as required (see Section VI.A). If submitted electronically, the proposal must be received by May 1, 2003, as well.

APPENDIX E

**DOT SBIR PROGRAM SOLICITATION
DTRS57-03-R-SBIR**

TO BE FILLED OUT BY THE PROPOSER:

Project Title _____

TO BE FILLED OUT BY THE DEPARTMENT OF TRANSPORTATION:

Date Received _____ Proposal No. _____

The form for acknowledging receipt of proposal appears above. Please include it in the same package with the proposal submitted to DOT and provide your address on the reverse side.