

**DTRS57-02-R-SBIR**



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

## **PROGRAM SOLICITATION**

### **Small Business Innovation Research Program**

**Closing Date: May 1, 2002**

**DOT SBIR Program Office, DTS-22  
U.S. DOT/RSPA/VNTSC  
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 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. 102-564, 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 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 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 applicant 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, Kendall Square  
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 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**

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 2002, 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 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](mailto:henebury@volpe.dot.gov)
- Proposals must be received by 5:00 p.m. on May 1, 2002
- ***You must submit a completed and signed hardcopy of Appendices A, B, and C postmarked no later than May 1<sup>st</sup> to: Joseph Henebury, DOT SBIR Program Director, DTS-22, U.S. DOT/RSPA/VTSC, 55 Broadway, Kendall Square, Cambridge, MA 02142-1093***
- The proposal file name shall contain eight (8) characters-the first three shall be the topic # 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 who are responsible for evaluating your proposal.

**If you intend to submit your proposal electronically, you must register at our website:**  
[www.volpe.dot.gov/sbir](http://www.volpe.dot.gov/sbir) by April 15, 2002.

#### 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). 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 specialists 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 2002 SBIR solicitation research topics must be submitted to the SBIR Program Office by e-mail: [henebury@volpe.dot.gov](mailto: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 2002 Phase I Award Recommendations to receive funding is posted on the DOT SBIR Program Web Page: [www.volpe.dot.gov](http://www.volpe.dot.gov) (click on SBIR). For planning purposes the notification of 2002 Phase I Award Recommendations is expected to be posted on the DOT SBIR Program Web Page by October 1, 2002. **Phase I proposals which are not included in the October 1st list of 2002 Phase I Award Recommendations will not receive funding. NO WRITTEN CORRESPONDENCE REGARDING PROPOSAL STATUS WILL BE MADE.**

After the 2002 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 by e-mail to: [dohertym@volpe.dot.gov](mailto: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 2002, DOT will award approximately 8 Phase I contracts with an anticipated potential maximum of 11 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.

### 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; 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.

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](http://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 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 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, Kendall Square, 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, Kendall Square  
Cambridge, MA 02142-1093  
Telephone: (617) 494-2051

Proposals must be postmarked NO LATER than May 1, 2002 to qualify for acceptance and consideration under the current DOT SBIR Program. Proposals postmarked or received via e-mail later than May 1, 2002 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, 2002.

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](mailto:henebury@volpe.dot.gov)
- Proposals must be received by 5:00p.m. on May 1, 2002.
- **You must submit a completed and signed hardcopy of Appendices A, B, and C postmarked no later than May 1<sup>st</sup> to: Joseph Henebury, DOT SBIR Program**

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

- The proposal file shall contain eight (98) characters-the first three shall be the topic # 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 scientist who is responsible for evaluating your proposal.

**If you intend to submit your proposal electronically you must register at our website: [www.volpe.dot.gov/sbir](http://www.volpe.dot.gov/sbir) by April 15, 2002**

### 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 21, 2002. 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, 2002.**

## 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 34<sup>th</sup> 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, 5<sup>th</sup> 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 FY02 PHASE I AWARDS**

#### **RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION (RSPA)..... 1 AWARD**

<sup>1</sup>02-RS1      Advanced Materials for Pipeline System Infrastructure Assurance

#### **UNITED STATES COAST GUARD (USCG)..... 2 AWARDS**

<sup>2</sup>02-CG1      Shipping Container Integrity Monitoring System

<sup>2</sup>02-CG2      Ballast Water Exchange Monitoring System

#### **FEDERAL TRANSIT ADMINISTRATION (FTA) ..... 1 AWARD**

<sup>3</sup>02-FT1      Application of Remote Sensing Technologies to Transit System Infrastructure Security

#### **FEDERAL MOTOR CARRIER SAFETY ADMINISTRATION (FMCSA)..... 1 AWARD**

<sup>3</sup>02-FM1      Portable Data Collection Technology for Roadside Driver/Vehicle Inspections

#### **FEDERAL RAILROAD ADMINISTRATION (FRA)..... 1 AWARD**

<sup>1</sup>02-FR1      Low Cost Transverse Rail Defect Detector

#### **FEDERAL AVIATION ADMINISTRATION (FAA)..... 2 AWARDS**

02-FA1      Low Cost Engine Monitoring System

02-FA2      Energy Efficient Aircraft Ice Protection Technologies

#### **NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION (NHTSA)..... 3 AWARDS**

<sup>4</sup>02-NH1      Software to Calculate Relationships of Automotive Crash Forces to Specific Occupant Injuries in Real-World Crashes

<sup>4</sup>02-NH2      Development of Dynamic 3D Surface Mapping System

<sup>4</sup>02-NH3      Vehicle Based System to Increase Seat Belt Use

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<sup>1</sup> Phase I may be up to \$100,000 and Phase II may be up to \$250,000

<sup>2</sup> Phase I may be up to \$100,000 and Phase II may be up to \$400,000

<sup>3</sup> Phase I may be up to \$100,000 and Phase II may be up to \$500,000

<sup>4</sup> Phase I may be up to \$100,000 and Phase II may be up to \$300,000

## RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION

### **102-RS1    ADVANCED MATERIALS FOR PIPELINE SYSTEM INFRASTRUCTURE ASSURANCE**

America relies heavily on energy products delivered by the nation's pipeline system. It delivers natural gas to more than 55 million residential and commercial customers, and transports over two-thirds of the crude oil and petroleum products that fuel our industry, our vehicles, our economy and our homes. However, the supply of energy has too often been disrupted by pipeline accidents (along with the deaths, injuries, and environmental damage which they bring), and pipelines also make a tempting target for malevolent disruptions.

Historically, mechanical damage is the single largest cause of failures on gas transmission pipelines and a leading cause of failures on hazardous liquid 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 materials to assure the structural integrity and continued, safe, and efficient operation of this nation's pipeline system. This research would focus on advanced materials to prevent or attenuate damage to pipelines by outside forces, including external blast effects, or models to predict the impact of mechanical damage or the remaining pipe strength in lines that have been impacted by mechanical damage. Approaches include stronger, more resistant materials; "self-healing" pipe that pops back when damaged; innovative use of "smart technologies" which have micro/nano or other advanced sensors to detect damage and repair it without further intervention.

## UNITED STATES COAST GUARD

### **202-CG1    SHIPPING CONTAINER INTEGRITY MONITORING SYSTEM**

**Problem:** An extremely high number of ISO shipping containers pass through our maritime ports, such as the Port of New York with 3.6 million containers per year. The USCG and Customs Service inspect less than 2% of these containers when they enter port, and many are transshipped in bond across the country without passing clearance by Customs. These containers are from various ports throughout the world and present a substantial threat for importation of a weapon of mass destruction (WMD) such as a nuclear, biological, chemical or explosive device. Current practice in inspecting these containers is manpower intensive and time consuming, and a 100% inspection using current techniques would severely slow the flow of containers and impede commerce. Opening containers with potential WMDs for inspection also presents a severe personal risk to USCG and Customs inspectors.

**Background:** A three step approach to this problem is needed: (1) increased verification at the point of origin; (2) improved integrity monitoring during shipment; and (3) improved and rapid inspection techniques at the off-load port. This Shipping Container Integrity Monitoring System (SCIMS) addresses step (2). Currently the containers are unlocked and sealed with a small external mechanical seal that has a unique number that is matched with the unique number of the container. These numbers are monitored by a manual paper-based tracking system that interfaces with the Automated Manifest System (AMS) of the Customs Service. An electronic integrity monitoring device in each container would allow automation of the tracking system and incorporate enhanced features such as intrusion detection, shipping history, and WMD threat detection. This device could also potentially be interrogated while the container is aboard ship, thus allowing pre-notification of a potential threat before the ship enters port.

The in-container device needs to be small, inexpensive, and capable of mass production and retrofitting into standard ISO shipping containers in order to gain universal acceptance. It should be capable of detecting intrusion, and sense explosive, biological and nuclear threat contents; capable of remote interrogation incorporating security codes for integrity assurance, tamper-proof and independently powered. A unique security code capable of encoding information such as container number, contents, and port history would provide additional useful information. A complete system consisting of a control system for use at each port, a device installed in each container, and an interface with existing international monitoring

systems such as AMS would enable integrity monitoring of the container from the point of origin to the point where Customs liquidates the container.

## **202-CG2 BALLAST WATER EXCHANGE MONITORING SYSTEM**

Ballast water discharged from ships has been implicated as a major means for introducing non-indigenous aquatic nuisance species (ANS) to the aquatic ecosystems of the United States. In an effort to reduce risk of such introductions, Congress enacted regulations that now include the procedure of mid-ocean ballast water exchange. Most ANS are either fresh or brackish water organisms that cannot survive in high salinity environments found in the open ocean. Ballast water exchange effectively helps eliminate ANS by (1) discharging a percentage of coastal/freshwater organisms into the inhospitable environment of the ocean and (2) exchanging coastal/freshwater organisms for mid-ocean organisms, which are not expected to survive when subsequently released into coastal/freshwater areas. Additionally, the exchange increases the salinity level within the ballast water tank such that remaining coastal/freshwater organisms have a reduced chance of survival.

Two methods of ballast water exchange are currently used. The first is an “empty-refill” method, where a ballast tank is emptied to its lowest level and then refilled with open ocean water. The second method is described as a “flow-through” method, where three tank volumes are pumped through a given ballast water tank, while simultaneously allowing the tank to overflow through an installed discharge.

An effective monitoring system is needed to verify that ballast water exchange has indeed been accomplished, either by empty-refill or flow-through method. One potential system would automatically monitor and record ballast water tank levels, and in addition would link tank levels to the ship’s geographical position. It is envisioned that this monitoring system would be “add-on” equipment to an existing tank level indicating system, providing an electronic and/or paper record of ballast water tank levels and ship positions along the course of any given voyage. The geographical location of the ballast water exchange is vital to confirm that exchange took place outside the 200 nautical mile Exclusive Economic Zone, as regulations state. The system does not necessarily need to continuously monitor and record tank levels, but could possibly activate only when changes in tank levels are detected, or when a ballast water pump or flow switch is energized. Verification of ballast water exchange using the empty-refill method would be shown by a sequential recording of full/empty/full tank levels. Verification of ballast water exchange using the flow-through method would be shown by a 100% full (in fact – overflowing) tank level for a period of time needed to deliver three tank volumes based on pumping rate. Integrating this ballast water exchange monitoring system into commonly installed tank level indicator and other system monitoring equipment would dramatically reduce retrofit costs, improving potential industry acceptance.

Simplicity of installation and operation and the ability to integrate this system into existing shipboard systems will be vital in comparing this system to other proposed ballast water exchange verification systems. It is possible that this system could have wide application across the commercial and cruise shipping industry. Both retrofit and new construction installations are eventual markets for this system.

## **FEDERAL TRANSIT ADMINISTRATION**

### **302-FT1 APPLICATION OF REMOTE SENSING TECHNOLOGIES TO TRANSIT SYSTEM INFRASTRUCTURE SECURITY**

The United States has some of the most efficient and extensive transit systems in the world. These systems are critical for mobility, economic development and quality of life in urban, as well as suburban and rural areas. The infrastructure, vehicles, communications systems and other assets that make up these systems represent a widely dispersed and massive investment that was developed without consideration for the level of threats that they may now face.

One of the most daunting challenges to the nation’s transit systems is the evolution of terrorism and the threat it poses to the nation’s economy and the health and quality of life of its citizens. Achieving the high requirements and expectations for personal mobility and accessibility while ensuring the very highest level of public security and safety is the most important challenge confronting the transit industry today.

Transportation managers must prepare for the potential threat of terrorist activity by acting in advance to prevent incidents, by implementing systems designed to reduce their vulnerability, and by adopting plans, procedures, and resources to

enable a quick and effective response. Effective use of new and emerging remote sensing technologies can be an effective way to achieve these goals.

This Phase I research will respond to the critical need to investigate the technical and commercial feasibility of innovative remote sensing technologies as applied to transit system infrastructure security. Areas of interest include but are not limited to; remote surveillance capabilities, intrusion detection, identification of security threats, incident detection, etc.

## **FEDERAL MOTOR CARRIER SAFETY ADMINISTRATION**

### **<sup>3</sup>02-FM1 PORTABLE DATA COLLECTION TECHNOLOGIES FOR ROADSIDE DRIVER/VEHICLE INSPECTIONS**

There is a need to develop a lightweight, portable, low cost, reliable, and weather-resistant wireless technology for conducting roadside driver/vehicle inspections on commercial motor vehicles, e.g. large trucks and buses. This technology would be used to query various Federal Motor Carrier Safety Administration safety data sources and to collect the data needed to complete required inspections. A personal digital assistant, which employs RF wireless technology to communicate into networked information resources, is an example of type of technologies that are envisioned. The existing roadside driver/vehicle inspection data collection system known as ASPEN, is very sophisticated and fully operational. Currently, ASPEN inspections are done on laptop computers linked to a data transfer and query system known as SAFER. The ultimate goal of this project is to demonstrate that advanced technologies offer convincing performance advances that can be used to supplement the currently employed laptop based system. Potential respondents should strongly consider building an adjunct or “assistant” to the existing ASPEN system rather than replace it. The “assistant” would work within the existing information systems and feed data into the ASPEN system. In addition to the previous characteristics mentioned, unit ruggedness and inspector mobility are important considerations regarding the envisioned device. Respondents are encouraged to check <http://infosys.fmcsa.dot.gov> for more information about roadside/vehicle inspections, SAFER and Query Central.

## **FEDERAL RAILROAD ADMINISTRATION**

### **<sup>1</sup>02-FR1 LOW COST TRANSVERSE RAIL DEFECT DETECTOR**

The FRA is seeking a low cost technique for detecting large transverse defects in the rail head. The successful device will be easily employable during routine track inspections, with full detection capability at speeds from 0 to at least 25 mph. The detection system must be able to find internal transverse cracks (detail fractures and transverse fissures) within the rail head of a size at least as small as 30% of the rail head area: defects roughly equivalent in size to a circle of about 1 inch in diameter. The final system must be available to the railroad industry for a maximum cost of about \$50,000 per unit, with the expected production of 100 to 200 units.

The system must be sized and configured for easy installation on a typical hi-rail inspection truck. The system is roughly envisioned as a sensor positioned above the rail, connected to recording and processing equipment mounted in the truck bed, with a defect indicator (an alarm) mounted in the truck cab which alerts the driver when a defect is found. If necessary, the sensor may be in contact with the top of the rail, or may employ guide wheels which contact the rail, provided these wheels stay clear of turnouts, crossings, and other potential obstructions. The recording and processing equipment must not occupy a space greater than about 4 ft<sup>3</sup>.

The technique must function reliably when adverse rail surface conditions are present, including head checks, shells, and dirt and grease on the rail. It must also perform at full capability when changes in track construction and condition occur. It must operate reliably in the railroad environment, which covers a temperature range of -50° to +130° F and includes the presence of rain, snow, ice, and dirt. In general, the finished system must be industrially rugged for all-weather usage.

The system must provide a clear yes-or-no indication of the presence of a defect. It must be easy to set up at the beginning of an inspection and take down at the end, with minimal and infrequent adjustment, recalibration, maintenance, or other

attention required. False positive indications must be minimized, and missed defects rare; crack closure must not result in failure to detect.

Phase 1 of the effort must: (1) demonstrate the ability to reliably detect large transverse defects regardless of rail surface conditions or changes in track construction and condition, with minimal false positive indications, and (2) show clear evidence that, with further development, all other requirements could be met. Phase 2 would require developing the system to meet the remaining requirements.

## **FEDERAL AVIATION ADMINISTRATION**

### **02-FA1 LOW COST ENGINE MONITORING SYSTEM**

Develop a low cost engine monitoring system to detect loss of engine power (thrust) due to a propulsion malfunction in turbine engines used in commercial aviation. Design a multiple parameter analytical process that can cross correlate sensor data to identify sensor malfunctions versus real engine malfunctions providing a robust system that can support maintenance and safety.

Background- There has been much work done in recent years to assess sudden loss of engine power events due primarily to things like engine compressor surge/stall, bird ingestion, fuel delivery problems, etc. Some aircraft incidents and accidents have occurred due to the inability of the pilot and crew to determine quickly if there was a power loss and then which engine/s experienced the power loss. Some newer aircraft have engine failure detectors and engine surge detectors, however, existing older aircraft do not have any automatic detection of an engine problem. This SBIR would develop a system that could be retrofit into existing aircraft to detect power (thrust) loss, which would prevent a catastrophic aircraft failure.

### **02-FA2 ENERGY EFFICIENT AIRCRAFT ICE PROTECTION TECHNOLOGIES**

Research is needed to pursue more energy efficient methodologies to remove or prevent the adhesion and formation of ice accretions on aircraft surfaces. Current technologies employ various forms of thermal, and/or mechanical energy to remove or debond frozen contaminants from aircraft surfaces. Other technologies employ significant amounts of energy to vaporize supercooled water droplets, prior to adhesion. Other technologies employ freezing point depressant chemicals to prevent the adhesion of supercooled water droplets. Another means is employed in the utilization of materials whose surfaces exhibit ice phobic characteristics to ice adhesions. The thrust of this effort envisions (1) the development/establishment of a technology in which minimal amounts of energy are imparted to supercooled water droplets causing them to be repelled by aircraft surfaces or (2) minimal amounts of energy are imparted to aircraft surfaces causing the debonding of impinged ice accretions. Simple ice phobic materials, electrothermal, pneumatic or other high-energy mechanical device investigations are not deemed responsive to this request. As a ground rule, it is desired that a low energy anti-icing/deicing system technology should require at least an order of magnitudes less energy to effect deicing of aircraft surfaces when compared to current electro-mechanical systems. For, planning purposes, metallic or non-metallic aircraft surfaces may be considered.

## **NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION**

### **<sup>4</sup>02-NH1 SOFTWARE TO CALCULATE RELATIONSHIPS OF AUTOMOTIVE CRASH FORCES TO SPECIFIC OCCUPANT INJURIES IN REAL-WORLD CRASHES**

Nearly 250,000 people suffer serious injuries in crashes each year. The National Highway Traffic Safety Administration (NHTSA) conducts research on such injuries both by laboratory biomechanical studies and by detailed medical & engineering research on several hundred real world crashes each year. The latter research is conducted by universities under NHTSA's Crash Injury Research and Engineering Network (CIREN) program. CIREN research has demonstrated a need for software to aid medical and engineering researchers to more easily and consistently calculate crash forces from

crash reconstructions and observed injuries. High capacity, economical and easy-to-use software for this purpose currently does not exist. Upon development, such software is expected to have wider application in crash injury research.

With the growing availability of vehicle Event Data Recorders (EDRs) that provide crash pulse characteristics to CIREN researchers, it should now be possible to improve crash reconstructions of serious injury mechanisms that occur in fractions of a second. Of particular importance is the ability to relate occupant-vehicle impact dynamics to occupant contact loads and the resulting injuries. Software is needed that can use specific data on crashed vehicles and specific anthropomorphic data on the injured victim to compute occupant kinematics and forces that produced the observed injuries with a reasonable degree of accuracy. The need is for software that integrates knowledge of the biomechanics of crash injuries and simplifies the reconstruction of crash injury mechanisms.

Proposals for the Phase I research effort should be based on concepts for utilization of specific hardware, preferably PC based, and software. The proposal should suggest a viable feasibility study of any proposed concepts. The proposal should describe how the concept would provide an easy-to-use software package that would be capable of using the rich data on crashed vehicles, victim anthropometry, and occupant injuries that is available in CIREN studies. Upon successful completion of Phase I, the actual development of the chosen concept may be undertaken.

#### **402-NH2 DEVELOPMENT OF DYNAMIC 3D SURFACE MAPPING SYSTEM**

NHTSA routinely conducts full-scale vehicle crash tests to determine both the structural crashworthiness of vehicles and their ability to protect vehicle occupants from serious injury. Detailed knowledge of the dynamic intrusion of vehicle structures (e.g., footwell, steering assembly, instrument panels, knee bolsters, side door structures, and brake pedal) would be of significant value to the Agency in evaluating vehicle crash performance. Present techniques available for such measurements are limited in capability.

Thus NHTSA seeks a system which can dynamically and simultaneously track multiple points on an intruding vehicle structure, and which can reconstruct the shape of this intruding structure in 3D.

A typical application of such a system would be to map the surface geometry of an intruding vehicle footwell and foot controls in a frontal offset test, with reference to a coordinate system attached to the undisturbed floorpan of the vehicle.

Availability of line of sight between the measurement system and the surface of interest could be provided, if necessary. For the above case in which the intruding footwell surface is to be tracked, for example, crash test dummies and/or vehicle seats could be selectively removed from the vehicle.

General system performance requirements are as follows:

- 3D tracking capability at each point location
- Accuracy: + or - 3 mm Root Mean Square (RMS)
- Resolution: 2 to 3 inch surface point spacing
- Bandwidth: Consistent with SAE J211 Class 600; estimated required sampling frequency of 5 kHz
- Environmental: 40-120 degrees F; shock tolerance consistent with 25 repeated vehicle crashes at NCAP (New Car Assessment Program) test severity (35mph rigid barrier tests)
- Integral means for self-check and self-calibration
- Integral software for graphical surface reconstruction and plotting

It is desired that the efforts of Phase I will provide clear proof of concept, in the form of working prototype assemblies, so that full development can be pursued in a Phase II effort. The actual development of the chosen concept may be pursued upon successful completion of Phase I.

#### **402-NH3 VEHICLE BASED SYSTEM TO INCREASE SEAT BELT USE**

Seat belt use in the U.S. is currently about 73 percent, compared to much higher use rates in other industrialized nations. The lifesaving benefits of restraint system use are well known, yet a significant proportion of the motoring public chooses not to use restraints, causing unnecessary loss of life, disabling injuries, and significant healthcare, disability, and other costs that are borne by our society. Only 44 percent of fatally injured occupants use safety belts. Current attempts to

increase seat belt use are based on laws requiring restraint use, enforcement of those laws, and public information and education.

Vehicle based systems offer a potential alternative approach to increasing restraint system use. It should be possible to use the well known principles of human factors design and engineering to design vehicle restraint systems that actually encourage restraint system use. Vehicle based systems could take a variety of forms, including enhanced reminder systems (increasingly noticeable sounds and lights), equipment lock-out systems (e.g., sound systems or climate controls), or system access delays (e.g., delayed start), among other approaches. Any vehicle based system designed to increase restraint system use would need to meet public acceptability issues and not inconvenience persons who use their safety belts, not impair driver and passenger response to emergency, life-threatening situations, yet still offer the potential to significantly increase restraint system use. Other constraints on the development of such a system include the need for any approach considered to withstand normal circumvention attempts and not substantially increase the cost of a vehicle.

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 and should describe how the concept would provide real-time identification of vehicles operating illegally. Upon successful completion of Phase I, the actual development of the chosen concept may be undertaken.

<sup>1</sup> Phase I may be up to \$100,000 and Phase II may be up to \$250,000

<sup>2</sup> Phase I may be up to \$100,000 and Phase II may be up to \$400,000

<sup>3</sup> Phase I may be up to \$100,000 and Phase II may be up to \$500,000

<sup>4</sup> 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. DTRS57-02-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 IIB; and that it meets the eligibility requirement in Section IC. 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. DTRS57-02-R-SBIR**

**PROJECT SUMMARY**

Name and Address of Proposer	<b>FOR DOT USE ONLY</b>
	Proposal No.

Name and Title of Principal Investigator

Project Title

Research Topic No.	Research Topic Title
--------------------	----------------------

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

Anticipated Results/Potential Commercial Applications of Results

Provide key 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. DTRS57-02-R-SBIR**

**APPENDIX C  
(SCHEDULE 1)**

**CONTRACT PRICING PROPOSAL**

<b>PROPOSAL COVER SHEET</b>				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. FACSIMILE	
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)

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. DTRS57-02-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 (except as legend on reduced drawings, but not tables).
- \_\_\_\_\_ 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, 2002 as required (see Section VI.A). If submitted electronically, the proposal must be received by May 1, 2002, as well.

**DOT SBIR PROGRAM SOLICITATION  
DTRS57-02-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.