



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

REF

# Small Business Innovation Research Program Solicitation (Closing Date: May 1, 1991)

SBIR

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



**DOT SBIR MAILING LIST**

If you wish to be retained on or added to the DOT SBIR Mailing List, please complete the following and return to the DOT SBIR Program Office by December 31, 1991.

**- 91 - 1**

Name \_\_\_\_\_

Title \_\_\_\_\_

Firm \_\_\_\_\_

Street \_\_\_\_\_

City/State/Zip \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

SYSID Number \_\_\_\_\_  
*(If available from prior mailing label)*

**Closing Date: May 1, 1991**

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



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# DOT PROGRAM SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH

## I. PROGRAM DESCRIPTION

### A. Introduction

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

The purposes of the Act are:

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

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

The purpose of this solicitation is to invite small businesses with their valuable resources and creative capabilities to submit innovative research proposals that address high priority requirements of the Department.

### B. Three-Phase Program

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

**Phase I.** Phase I is for the conduct of feasibility-related experimental or theoretical research or R&D efforts on research topics as described herein. The dollar value of the proposal should not exceed \$50,000 and the period of performance may be up to six months. The primary basis for award will be the scientific and technical merit of the proposal and its relevance to DOT requirements. Only

awardees in Phase I are eligible to participate in Phase II.

**Phase II.** Phase II is the principal research or R&D effort having a period of performance of approximately two years with a dollar value of up to \$300,000. Phase II proposals must be prepared in accordance with guidelines provided by DOT to all Phase I awardees. DOT will accept Phase II proposals under the SBIR Program only from firms which have previously received a DOT Phase I award. Phase II awards will be based on results of Phase I efforts, technical merit, Agency priority and commercial applications, and the availability of appropriated funds to support the Phase II effort. Special consideration may be given to proposals that have obtained commitments for follow-on funding from non-Federal sources for Phase III.

**Phase III.** Phase III is to be conducted by the small business with non-Federal funds to pursue commercial applications of research or R&D funded in Phases I and II by the Department. Phase III may also involve follow-on non-SBIR funded contracts with components of DOT for products or processes intended for use by the United States Government.

### C. Eligibility

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

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

#### **D. General Information**

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

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

A proposal may respond to any of the research topics listed in Section VIII, but must be limited to one topic. The same proposal may not be submitted under more than one topic. An organization may, however, submit separate proposals on different topics, or different proposals on the same topic, under this solicitation. Where similar research is discussed under more than one topic, the proposer should choose that topic which appears to be most relevant to the proposer's technical concept.

The proposed research must have relevance to the improvement of some aspect of the national transportation system or to the enhancement of the ability of an operating element of the DOT to perform its mission.

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

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

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

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

Attn: Dr. George Kovatch  
Telephone: (617) 494-2051



## II. DEFINITIONS

### A. Research or Research and Development

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

- (1) A systematic, intensive study directed toward greater knowledge or understanding of the subject studied;
- (2) A systematic study directed specifically toward applying new knowledge to meet a recognized need; or
- (3) A systematic application of knowledge toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.

### B. Small Business

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

- (1) Is independently owned and operated, is not dominant in the field of operation in which it is proposing, and has its principal place of business located in the United States and is organized for profit;
- (2) Is at least 51 percent owned, or in the case of a publicly owned business, at least 51 percent of its voting stock is owned by United States citizens or lawfully admitted permanent resident aliens;
- (3) Has, including its affiliates, a number of employees not exceeding 500, and meets the other regulatory requirements found in 13 CFR Part 121. Business concerns, other than investment companies licensed, or state development companies qualifying under the Small Business Investment Act of 1958, 15 U.S.C. 661, *et seq.*, are affiliates of one another when either directly or indirectly (A) one concern controls or has the power to control the other; or (B) a third party or

parties controls or has the power to control both. Control can be exercised through common ownership, common management, and contractual relationships. The term "affiliates" is defined in greater detail in 13 CFR 121.3-2(a). The term "number of employees" is defined in 13 CFR 121.3-2(t). Business concerns include, but are not limited to, any individual, partnership, corporation, joint venture, association or cooperative.

### C. Minority and Disadvantaged Small Business

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

- (1) At least 51 percent owned by one or more minority and disadvantaged individuals; or in the case of a publicly owned business, at least 51 percent of the voting stock of which is owned by minority and disadvantaged individuals; and
- (2) Whose management and daily business operations are controlled by one or more such individuals.

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

- (1) Black Americans.
- (2) Hispanic Americans.
- (3) Native Americans.
- (4) Asian-Pacific Americans.
- (5) Subcontinent Asian Americans.

**D. Women-Owned Small Business**

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

**E. Subcontract**

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

### III. PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

#### A. Limitation on Length of Proposal

Please note that:

- (1) SBIR Phase I proposals should not exceed a total of 25 pages (regular size type - no smaller than elite - single or double spaced, standard 8½" X 11" pages) including proposal cover sheet, budget and all enclosures or attachments.
- (2) Attachments, appendices and references are included in the 25 page limitation. Proposals in excess of 25 pages shall not be considered for review or award.

#### B. Proposal Cover Sheet

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

#### C. Project Summary

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

#### D. Technical Content

Submitted proposals must include the following:

- (1) **Identification and Significance of the Problem or Opportunity.** The specific technical problem or innovative research opportunity addressed and its potential

benefit to the Nation's transportation system should be clearly stated.

- (2) **Phase I Technical Objectives.** State the specific objectives of the Phase I research or research and development effort, including the technical questions it will try to answer to determine the feasibility of the proposed approach.
- (3) **Phase I Work Plan.** Describe the Phase I R, R&D plan. The plan should indicate what will be done, where it will be done, and how the R, R&D will be managed or directed and carried out. Phase I R, R&D should address the objectives and the questions cited in (2) above. The methods planned to achieve each objective or task should be discussed in detail, including the level of effort associated with each task.
- (4) **Related Research or R&D.** Describe significant research or R&D that is directly related to the proposal including any conducted by the project manager/principal investigator or by the proposing firm. Describe how it relates to the proposed effort, and any planned coordination with outside sources. The proposer must persuade reviewers of his or her awareness of key recent research or R&D conducted by others in the specific topic area.
- (5) **Key Personnel and Bibliography of Directly Related Work.** Identify key personnel involved in Phase I including their directly related education, experience, and bibliographic information. Where vitae are extensive, summaries that focus on the most relevant experience or publications are desired and may be necessary to meet proposal page limitation.
- (6) **Relationship with Future Research and Development.**
  - (a) State the anticipated results of the proposed approach if the project is successful (Phase I and Phase II).

- (b) Discuss the significance of the Phase I effort in providing a foundation for Phase II research or research and development effort.
- (7) **Facilities.** A detailed description, availability and location of instrumentation and physical facilities proposed for Phase I should be provided.
- (8) **Consultants.** Involvement of consultants in the planning and research stages of the project is permitted.
  - (a) If such involvement is intended, it should be described in detail.
- (9) **Potential Applications.** Briefly describe:
  - (a) Whether and by what means the proposed project appears to have potential commercial application.
  - (b) Whether and by what means the proposed project appears to have potential use by the Federal Government.
- (10) **Similar Proposals or Awards.** A firm may elect to submit essentially equivalent work under other Federal Program Solicitations, or may have received other Federal awards for essentially equivalent work. In these cases, a statement must be included in each such proposal indicating:
  - (a) The name and address of the agencies to which proposals were submitted or from which awards were received;
  - (b) Date of proposal submission or date of award;
  - (c) Title, number, and date of SBIR Program Solicitations under which proposals were submitted or awards received;

- (d) The applicable research topics for each SBIR proposal submitted or award received;
- (e) Titles of research projects; and
- (f) Name and title of Project Manager or Principal Investigator for each proposal submitted or award received.

#### E. Contract Pricing Proposal

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

#### F. DUNS Identification Number

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

#### G. Acknowledgement of Proposal Receipt

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

## IV. METHOD OF SELECTION AND EVALUATION CRITERIA

### A. General

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

### B. Evaluation Criteria

The evaluation process involves the following factors:

- (1) The soundness of merit of the technical approach to assure successful demonstration of the feasibility of the Phase I R, or R&D project thereby enhancing prospects for an innovative solution to the research problem that is addressed and prospects for commercialization.
- (2) The adequacy of the work plan and approach to achieve specified work tasks and stated objectives of the proposed effort within budgetary constraints and on a timely schedule.
- (3) Qualifications of the proposed principal/key investigator(s) including demonstrated expertise in a disciplinary field related to the particular R, or R&D topic that is proposed for investigation.
- (4) Adequacy of supporting staff and facilities, equipment, and data for the successful completion of the proposed research or research and development.
- (5) In Phase II evaluations of proposals of equal technical and scientific merit, the Department will give special consideration to proposals which demonstrate Phase III non-Federal capital commitments. Phase II proposals may be submitted only by Phase I contract awardees.

### C. Prescreening

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

### D. Schedule

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

### E. Program Selection

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

### F. Contact with DOT

Contact with DOT relative to this solicitation during the Phase I proposal preparation and evaluation period is restricted for reasons of competitive fairness. No information on proposal status will be available until formal notification of award or declination is made. For planning purposes this is expected to occur by October 1, 1991. Correspondence relating to proposals should reference the proposal identification number assigned on the acknowledgement of receipt card and be sent to the DOT SBIR Program Office.

After final award decisions have been announced the technical evaluator's comments on the proposal may be provided to the proposer. The identity of the evaluators shall not be disclosed.

## V. CONSIDERATIONS

### A. Awards

It is estimated that during fiscal year 1991, the Department of Transportation will award approximately 20 Phase I contracts with an anticipated potential maximum of 27 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 at a value of up to \$50,000 each. Phase II awards will be in the form of cost-plus-fixed fee contracts with a value of up to \$300,000 each. Phase II awardees will be required to have acceptable accounting systems.

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

Under the Department of Transportation's implementation of the SBIR Act, the Department's Operating Administrations contribute to SBIR funding. Each Administration's contribution may be used only to support research of concern to that Operating Administration. For example, funds furnished by the Federal Aviation Administration may not support research solely of concern to the Federal Highway Administration. Based on anticipated funding levels, there may not be adequate funding within the SBIR program to support Phase II awards for research which is solely of concern to the following Operating Administrations: Federal Highway Administration, Maritime Administration, National Highway Traffic Safety Administration, United States Coast Guard, and the Urban Mass Transportation Administration. Phase II awards for such research will depend on the actual funding available.

### B. Reports

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

### C. Payment Schedule

Payments will be made in three equal installments

upon presentation of invoices by the contractor in conjunction with the submission of the reports described above.

### D. Innovations, Inventions, and Patents

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

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

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

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

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

2. **Rights in Data Developed Under SBIR Funding Agreements.** Rights in technical data, including software developed under any contract resulting from this solicitation, shall remain with the contractor except that the Government shall have the limited right to use such data for Government purposes and shall not release such data outside the Government without permission of the contractor for a period of two years from completion of the project from which the data were generated. However, effective at the conclusion of the two-year period, the Government shall retain a royalty-free license for Federal Government use of any technical data delivered under an SBIR contract whether patented or not.
3. **Copyrights.** With prior written permission of the contracting officer, the contractor normally may copyright and publish (consistent with appropriate national security considerations, if any) material developed with Department of Transportation support. The Department of Transportation receives a royalty-free license for the Federal Government and requires that each publication contain an appropriate acknowledgement and disclaimer statement.
4. **Patents.** Small business firms normally may retain the principal worldwide patent rights to any invention developed with Government support. The Government receives a royalty-free license for Federal Government use, reserves the right to require the patent holder to license others in certain circumstances, and

requires that anyone exclusively licensed to sell the invention in the United States must normally manufacture it domestically. To the extent authorized by 35 U.S.C. 205, the Government will not make public any information disclosing a Government-supported invention for a two-year period to allow the contractor a reasonable time to pursue a patent.

#### **E. Cost-Sharing**

Cost-sharing is permitted for proposals under this solicitation; however, cost-sharing is not required nor will it be a factor in proposal evaluations.

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

A profit is allowed on awards to small businesses under the DOT SBIR Program.

#### **G. Joint Ventures or Limited Partnerships**

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

#### **H. Research and Analytical Work**

1. **For Phase I a minimum of two-thirds of the research and/or analytical effort must be performed by the proposing firm** unless otherwise approved in writing by the funding agreement officer.
2. For Phase II a minimum of one-half of the research and/or analytical effort must be performed by the proposing firm.

#### **I. Contractor Commitments**

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



such clauses. Copies of complete terms and conditions are available upon request.

1. **Standards of Work.** Work performed under the contract must conform to high professional standards.
2. **Inspection.** Work performed under the contract is subject to Government inspection and evaluation at all times.
3. **Examination of Records.** The Controller General (or a duly authorized representative) shall have the right to examine any directly pertinent records of the contractor involving transactions related to this contract.
4. **Default.** The Government may terminate the contract if the contractor fails to perform the work contracted.
5. **Termination for Convenience.** The contract may be terminated at any time by the Government if it deems termination to be in its best interest, in which case the contractor will be compensated for work performed and for reasonable termination costs.
6. **Disputes.** Any dispute concerning the contract which cannot be resolved by agreement shall be decided by the contracting officer with right of appeal.
7. **Contract Work Hours.** The contractor may not require an employee to work more than eight hours a day or forty hours a week unless the employee is compensated accordingly (i.e., overtime pay).
8. **Equal Opportunity.** The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.
9. **Affirmative Action for Veterans.** The contractor will not discriminate against any employee or applicant for employment because he or she is a disabled veteran or veteran of the Vietnam era.
10. **Affirmative Action for Handicapped.** The contractor will not discriminate against any employee or applicant for employment

because he or she is physically or mentally handicapped.

11. **Officials Not to Benefit.** No member of or delegate to Congress shall benefit from the contract.
12. **Covenant Against Contingent Fees.** No person or agency has been employed to solicit or secure the contract upon an understanding for compensation except bonafide employees or commercial agencies maintained by the contractor for the purpose of securing business.
13. **Gratuities.** The contract may be terminated by the Government, if any gratuities have been offered to any representative of the Government to secure the contract.
14. **Patent Infringement.** The contractor shall report each notice or claim of patent infringement based on the performance of the contract.
15. **Procurement Integrity.** Submission of a proposal under this solicitation subjects the offeror to the procurement integrity provision (§27) of the Office of Federal Procurement Policy Act (41 U.S.C. 423). This statute, as implemented by Federal Acquisition Regulation (FAR, 48 CFR) §3.104, proscribes the following conduct by competing contractors during an agency procurement: offering or discussing future employment or business opportunities with an agency procurement official; promising or offering a gratuity to an agency procurement official; soliciting or obtaining proprietary or source selection information regarding the procurement. Violations of the statute may result in criminal and/or civil penalties, disqualification of an offeror, cancellation of the procurement, or other appropriate remedy.

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



**J. Additional Information**

1. This solicitation is intended for informational purposes and reflects current planning. If there is any inconsistency between the information contained herein and the terms of any resulting SBIR contract, the terms of the contract are controlling.
2. Before award of an SBIR contract, the Government may request the proposer to submit certain organizational, management, personnel, and financial information to assure responsibility of the proposer.
3. The Government is not responsible for any monies expended by the proposer before award of any contract.
4. This solicitation is not an offer by the Government and does not obligate the Government to make any specific number of awards. Also, awards under this program are contingent upon the availability of funds.
5. The SBIR Program is not a substitute for existing unsolicited proposal mechanisms. Unsolicited proposals shall not be accepted under the SBIR Program in either Phase I or Phase II.
6. If an award is made pursuant to a proposal submitted under this solicitation, the contractor will be required to certify that he or she has not previously been, nor is currently being paid for essentially equivalent work by any agency of the Federal Government.

## VI. SUBMISSION OF PROPOSALS

### A. Submittal Instructions

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

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

Attn: Dr. George Kovatch  
Telephone: (617) 494-2051

Proposals must be postmarked NO LATER than May 1, 1991 to qualify for acceptance and consideration under the current DOT SBIR Program. Proposals postmarked later than May 1, 1991 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, 1991.

### B. Additional Information

1. **Bindings.** Please do not use special bindings or covers. Staple the pages in the upper left corner of the cover sheet of the proposal with a single staple.
2. **Packaging.** All copies of the proposal should be sent in one package together with the acknowledgement of receipt card.
3. **Confirmation.** The DOT SBIR Program Office will assign an identification number to each proposal received at the above address by May 1, 1991 or postmarked no later than May 1, 1991. This number will appear on the acknowledgement of receipt card (see back cover) which will be sent to the proposer by return mail confirming receipt of the proposal.

## VII. SCIENTIFIC AND TECHNICAL INFORMATION SOURCES

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

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

Aerospace Research Applications Center  
611 North Capital  
Indianapolis, IN 46204  
(317) 262-5003

Central Industrial Applications Center  
Southeastern Oklahoma State University  
Durant, OK 74701  
(405) 924-6822

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

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

NASA/UK Technology Applications Center  
University of Kentucky  
109 Kinkead Hall  
Lexington, KY 40506  
(606) 257-6322

North Carolina Science and Technology  
Research Center  
P. O. Box 12235  
Research Triangle Park, NC 27709  
(919) 549-0671

NERAC, Inc.  
One Technology Drive  
Tolland, CT 06084  
(203) 872-7000

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

## VIII. RESEARCH TOPICS

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

### DOT OPERATING ADMINISTRATION/TOPICS

POTENTIAL MAXIMUM  
FY91 PHASE I AWARDS

FEDERAL AVIATION ADMINISTRATION (FAA) . . . . . 7 Awards

#### Aeromedicine

91-FA1. Development of Quality Assessment Program for Forensic Toxicology Laboratories

#### Aircraft Safety

91-FA2. Cost-Effective Ground-Based Laser Radar (LIDAR) for Windshear/Wake Vortex  
Detection at Secondary Airports

91-FA3. Methodology Development for Fractography of Composite Honeycomb Structures and  
Joints

91-FA4. Effectiveness of Alternatives to Fluorocarbon Type (Halon) Fire Extinguishing Agents  
for Propulsion and Cargo Applications

#### Airport Technology

91-FA5. Runway Ice Prevention

#### Air Traffic Control/Flight Services Technology

91-FA6. Advanced Radar Computer Simulation

91-FA7. Critical Sector Detector

91-FA8. Pilot Report (PIREP) Dissemination and Processing

#### Avionics

91-FA9. Aircraft Precision Approach and Landing Guidance Using Satellite-Based Navigation  
Information

#### Human Factors

91-FA10. Airborne Datalink Cockpit Management and Display

#### Information Technology

91-FA11. Video Compression/Digital Remoting Technology

#### Flight Inspection

91-FA12. Flight Inspection System Research

FEDERAL HIGHWAY ADMINISTRATION (FHWA) . . . . . 5 Awards

#### Structures

91-FH1. Telemetry System for Remote Data Acquisition

91-FH2. Improvement in Reference Half-Cells for Reinforced Concrete

91-FH3. Fiber Reinforced Plastic Tendon Anchorages, Grips, and Accessories

DOT OPERATING ADMINISTRATION/TOPICS

POTENTIAL MAXIMUM  
FY91 PHASE I AWARDS

Safety

91-FH4. Low Cost Guardrail End Treatments Using Innovative New Designs and Materials

Pavements

91-FH5. Improved Compaction Equipment

MARITIME ADMINISTRATION (MARAD) . . . . . 1 Award

Maritime Operations

91-MA1. Productive Vessel Operations

91-MA2. Productive Terminal Operations

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION (NHTSA) . . . . . 3 Awards

Electronic Monitoring Devices

91-NH1. Electronic Vehicle Identification Number Reader

Crash Avoidance

91-NH2. Motor Vehicle Highway Lane Position Monitor

Accident Investigation

91-NH3. Vehicle Contour Measurement Device

UNITED STATES COAST GUARD (USCG) . . . . . 10 Awards

Electronic Navigation Systems

91-CG1. Dynamic Marine Platform Attitude Determination Using GPS Carrier Phase

91-CG2. High Efficiency Marine Nondirectional Radiobeacons

91-CG3. GPS Antenna with Improved Low Elevation Sensitivity and Increasing Multipath  
Suppression

91-CG4. Locating Origin of Short Duration VHF Signal Transmissions

91-CG5. Integrated Automatic Dependent Surveillance Equipment for Commercial Vessels

Short Range Aids To Navigation

91-CG6. New Minor Light Optic Design

91-CG7. Minor Aid to Navigation Photovoltaic Power Supply

91-CG8. Stabilization of Minor Aid to Navigation Optics

91-CG9. Low Cost, Low Power Position Determination System for Moored Buoys

91-CG10. Minor Aid to Navigation Status Monitor and Reporting System

Marine Safety

91-CG11. Inspection of Fiberglass Hulls on Vessels

91-CG12. Visual Inspection Techniques for Enclosed Spaces on Tank Vessels

Marine Environmental Response

91-CG13. Innovative Training Systems for Spill Response

91-CG14. Mitigating Leakage from Barges and Tank Vessels

91-CG15. Determination of the Contents and Integrity of Damaged Tanks on Tank Vessels

DOT OPERATING ADMINISTRATION/TOPICS

POTENTIAL MAXIMUM  
FY91 PHASE I AWARDS

Law Enforcement

91-CG16. Nonlethal Incapacitation of Aircraft, Vessels or Boats

91-CG17. Covert Tagging of Aircraft from Standoff Positions

Search and Rescue

91-CG18. Air Deployable Self-Locating Surface Drifting Buoy

URBAN MASS TRANSPORTATION ADMINISTRATION (UMTA) . . . . .1 Award

Transit Cost Efficiency

91-UM1. Advanced Fare Payment Media

# FEDERAL AVIATION ADMINISTRATION

## AEROMEDICINE

### 91-FA1. DEVELOPMENT OF QUALITY ASSESSMENT PROGRAM FOR FORENSIC TOXICOLOGY LABORATORIES

The very large numbers of analytical laboratories throughout the United States and other parts of the world have led to significant formal quality assurance programs that primarily rely on formal transmittal of specimens containing targeted unknowns. However, one area has been critically neglected in this quality assurance process, and this is the area of forensic toxicology. Since the traditional quality control programs contain biological specimens that are characteristically "clean" urine and blood, the complications inherent in testing multiple other categories of tissue, and also tissue in various stages of decomposition and degradation are not captured by these "clean" testing schemes. Research is needed to provide the FAA a standardized system of tissue preparation, both unputrefied and putrefied, which includes further impregnation with standard doses of licit and illicit chemicals of interest within forensic toxicology. The proposal should include a standardized distribution scheme for such unknowns, together with a statement of the requisite statistical assessment technique for results from such a program. The research must demonstrate standardized preparation and dosing of the following tissues: liver, spleen, brain, heart, kidney, vitreous humor, skeletal muscle, lung. The standardized dosing must demonstrate the preparation of at least 6 dose levels (from subtherapeutic to toxic) for a minimum of 6 chemicals and their commonly found metabolites. The specific chemical should reflect the chemicals of relevance to aviation toxicology. The 6 chemicals must include 2 illicit drugs, 2 cardiovascular medications, and 2 primary central nervous system therapeutic agents. The standardized preparation of these tissues must encompass a natural tissue state and one that involves putrefaction, including criteria for inducing putrefaction. Standard tissue preparation, dosing, and assessment techniques will be used where appropriate and at least 2 forensic toxicology laboratories would be utilized to assess these samples, and verify their generalized utility within forensic toxicology.

## AIRCRAFT SAFETY

### 91-FA2. COST-EFFECTIVE GROUND-BASED LASER RADAR (LIDAR) FOR WINDSHEAR/WAKE VORTEX DETECTION AT SECONDARY AIRPORTS

Doppler Laser light detecting and ranging (lidar) systems research has demonstrated the ability of lidar to measure wind velocities, i.e., wake-vortices and windshear. While large airports are currently being outfitted with very sophisticated doppler radar systems to protect aircraft from dangerous windshear, there are a large number of smaller airports with significant traffic loads which cannot afford such a radar system. A cost-effective ground-based lidar system is highly desirable which could serve as a windshear and wake-vortex detection sensor for the protection of aircraft on takeoff and landing at these smaller airports.

### 91-FA3. METHODOLOGY DEVELOPMENT FOR FRACTOGRAPHY OF COMPOSITE HONEYCOMB STRUCTURES AND JOINTS

Advanced composite materials are rapidly being incorporated into commercial and military airplane structures. There is a need for fracture and failure analysis data for composite honeycomb structures and joints. The research will entail developing the methodology for characterizing fracture in composite honeycomb structures and joints

## FEDERAL AVIATION ADMINISTRATION

using the scanning electron microscope (SEM). The objectives include determination of fracture initiation site(s) and crack propagation directions in semistructural elements with the eventual goal of extending the methodology to large components.

### 91-FA4. EFFECTIVENESS OF ALTERNATIVES TO FLUOROCARBON TYPE (HALON) FIRE EXTINGUISHING AGENTS FOR PROPULSION AND CARGO APPLICATIONS

Fluorocarbon type (halon) fire extinguishing agents are used in aircraft propulsion system and cargo compartment applications. The chemicals are stored in pressurized containers, and are released into engine and auxiliary power unit (APU) fire zones and lower lobe cargo compartments in response to a fire alarm. In the engine and APU, the small volumes of the fire zones allow for a very high concentration of agent to extinguish the fire. The large volumes of aircraft cargo compartments do not allow for this high level of extinguishing agent. In these applications, a concentration of approximately ten percent agent is quickly established to knock down the fire, and this concentration is allowed to decay to no less than three percent. If the duration of the flight is such that the concentration of agent would fall below three percent, an additional quantity of agent is added every 30 minutes to maintain agent concentration above three percent. Some extended-range airplanes must stay airborne for 120 minutes or more before a landing can be made. Any replacement for the fluorocarbon extinguishing agents would have to be shown to be suitable in these applications. The concentration of the agent needed to knock down a cargo fire and prevent it from rekindling must be established. Toxicity, handling properties, weight, cost, availability, and other similar factors would have to be established. Delivery systems for new agents must be designed and tested. If a new agent is shown to be suitable, flight tests to determine decay characteristics would be necessary.

## AIRPORT TECHNOLOGY

### 91-FA5. RUNWAY ICE PREVENTION

Icy runways present a particularly hazardous condition to aircraft. The most desirable way of contending with this problem is to prevent the formation of ice. Present methods consist of heating the runway with geothermal or other forms of energy, or more commonly, by the application of freezing point depressants on the runway surface. Freezing point depressant chemicals which are not corrosive to aircraft materials are expensive, require equipment and manpower to apply, and are eventually diluted to the point where freezing is again possible. This results in an inefficient means of ice control. Innovative research is required to devise a cost-effective, efficient method of preventing the formation of ice on runways. This may be accomplished, for example, through modification of materials used to construct runways, or through long-term treatment of existing pavement surfaces.

## AIR TRAFFIC CONTROL/FLIGHT SERVICES TECHNOLOGY

### 91-FA6. ADVANCED RADAR COMPUTER SIMULATION

Research and development is needed for a comprehensive air traffic control radar computer simulation that would be useful in establishing and testing radar performance parameters and engineering characteristics. A comprehensive simulator would provide information on radar performance without the high expense of developing and testing radar hardware and software to test new concepts. The radar simulator should allow parameters, such as pulse repetition frequency (PRF), pulse compression, beam width, update rate, and frequency, to be varied against different weather conditions and aircraft traffic load. The simulator should allow for various antenna configurations (reflector- or array-type), tube or solid state transmitters, and various single beam or multiple



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beam transmit and receiver configurations. The simulator should test the model radar against various atmospheric and hazardous weather conditions, such as wet and dry microbursts, heavy rainstorm cells, windshear, and conditions that cause anomalous propagation.

### 91-FA7. CRITICAL SECTOR DETECTOR

A control sector is a volume of airspace for which a radar controller has air traffic control responsibility, normally within an Air Route Traffic Control Center (ARTCC). Sectors are established based on predominant traffic flows, altitude strata, and controller workload. They are manned based on current or anticipated need. During busy periods, the radar controller can have as many as two assistants; during slack periods, two or more sectors can be combined. Except for comparing expected number of aircraft against a value based on experience and judgment, no analytical or computerized tool exists to aid air traffic managers in determining when a critical level of workload will develop. The manager has some information on anticipated traffic levels and the mix of traffic. But workload depends not just on the number of aircraft, but on the routes followed and the timing of the flights. Radical changes sometimes occur, such as an airline developing a new hub at an airport, a military exercise, etc. The Operations Research Service, with the guidance and cooperation of the Air Traffic Management Service and the Air Traffic Requirements Service, is developing a system design analysis tool (SDAT), an automated tool for use by airspace designers in estimating the impact of changes in sector design on controller workload. This is a very complex computer model that uses detailed data on airspace elements and aircraft movements. This model will be installed at ARTCC's and will allow the user to change airspace or traffic data in order to play "what if?" The purpose of this research is to develop a fast-reaction, easy-to-use tool for use by air traffic managers in determining when a critical workload situation will develop, based on sector design, controller manning, and traffic mix and loading. This tool might utilize SDAT, a simplified derivative of it, or a set of equations based on it, as well as experience and judgment. This research will also have application in tactical airspace planning and simulation at the national level.

### 91-FA8. PILOT REPORT (PIREP) DISSEMINATION AND PROCESSING

Pilot reports are currently collected and disseminated in a somewhat haphazard manner. PIREPS are given to Flight Service Station (FSS) specialists, tower, Terminal Area Radar Approach Control (TRACON), and center controllers and are handled as additional, time-permitting duties. A means for automatically collecting these and providing them to the FSS system for dissemination as well as to the appropriate meteorologist is needed to ensure their availability without adversely impacting the controller.

## AVIONICS

### 91-FA9. AIRCRAFT PRECISION APPROACH AND LANDING GUIDANCE USING SATELLITE-BASED NAVIGATION INFORMATION

With satellite-based aircraft navigation becoming a reality, it would improve effectiveness if the satellite-based en route and nonprecision approach navigation equipment could also be used for precision approach and landing. Therefore, innovative research is needed to explore the technical feasibility of using satellite-based positioning signals for precision approach and landing. If a system is technically feasible, it must also be economically viable and meet operational requirements.

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## HUMAN FACTORS

### 91-FA10. AIRBORNE DATA LINK COCKPIT MANAGEMENT AND DISPLAY

Research is needed to assess information transfer requirements in the cockpit to study the effects of additional electronic information on the pilot or flight crew resulting from data link communication. The research should examine the role of communication, navigation, fuel and energy management, and emergency management, as performed by the pilot or flight crew. For these tasks, the research should determine the information requirements associated with each task, and the interdependencies among the tasks. The information requirements should be classified relative to time criticality, how presented (e.g., audio, visual or both), the cognitive sensory channel affected (e.g., tactile, auditory, visual, etc.), alerting/prompting required, and information source; e.g., type of display (analogue, digital readout, etc.). Part of the research should include an analysis of the relative timing task activities with information stimulus as a beginning point, through pilot involvement activities, and ending with the appropriate response to the stimulus. The timing analysis should include the impact of interruptions, additional information loading, and the potential impact to safety or efficiency in the aircraft operation if relative task timings are sufficiently affected. This research should include commercial civil aircraft of thirty seats or more operating in routes over the continental U.S. The research should examine all phases of flight from gate departure through taxiing, departure, en route, arrival, taxiing and ending with the gate arrival. Data Link systems designers will use results of this effort in designing data link services for the cockpit. For example, if an ATC service is defined which uplinks approach vectors in the terminal area, the research will show which information the pilot is using during approach, and the displays providing the information. System designers would use the results in designing the ATC service for compatibility.

## INFORMATION TECHNOLOGY

### 91-FA11. VIDEO COMPRESSION/DIGITAL REMOTING TECHNOLOGY

Air traffic control terminal automation system display data consists of a combination of digital computer generated data and broadband radar data. Conventional remoting of the terminal automation system display data to satellite air traffic control towers requires the use of television microwave links (TML). The existing TML systems are rapidly nearing the end of their life cycle. Replacement or new system establishments are initially expensive and can become very labor intensive with the inclusion of the necessary repeater sites for acceptable path reliability. In recent years significant advancements have been made in the area of video compression/digital remoting technology. These advancements may now make it feasible to apply this technology to remote the terminal automation system display data over telephone circuits without degradation to system update requirements. Significant reductions in labor intensiveness and an increase in ability to provide the automation service to more locations is anticipated. Research is needed for insertion of the described technology into terminal automation system data remoting. This research should include an experimental demonstration of these techniques.

## FLIGHT INSPECTION

### 91-FA12 FLIGHT INSPECTION SYSTEM RESEARCH

The FAA is responsible for insuring the safety of the airways, instrument approach procedures, and supporting navigational and surveillance equipment. Periodic flight inspections are presently carried out to insure the integrity of the airspace system by measuring and analyzing the radio frequency signals in space generated by these systems. Complex aircraft, highly specialized instruments and specially trained aircrews

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and technicians are required. With the introduction of many new procedures and systems, the workload and associated costs of inspection will increase significantly. Research is needed to develop a new system for performing flight inspection. While ground-based methods currently exist to ensure sufficient signal strength, they cannot examine airborne impacts on service volume (protected airspace) and signal quality caused by land mass variations, man-made obstructions, and electromagnetic interference. Research should be undertaken to determine whether flight inspection functions could be accomplished through other means, such as: satellite systems; through flight inspection equipment on commercial airlines or overnight delivery aircraft; through ground-based measuring devices; through building diagnostic equipment into the existing navigation aids to provide feedback to a central location, or through some combination of these or other techniques.

The flight inspection system must provide for the following functional capabilities:

1. The ability to certify Microwave Landing System (MLS), LORAN-C, and Global Positioning System (GPS) installations and instrument flight procedures. There will be an increase of approximately 1300 facilities over those currently extant.
2. The ability to inspect DOD air navigation facilities.
3. To be an upgraded flight inspection system with second generation automated, digital systems using commercially available equipment.
4. The ability to perform flight inspections of nav aids and instrument procedures internationally, based on current international agreements with foreign countries requiring the use of FAR Part 25 aircraft with a range capability of 3500 nautical miles.

# FEDERAL HIGHWAY ADMINISTRATION

## STRUCTURES

### 91-FH1. TELEMETRY SYSTEM FOR REMOTE DATA ACQUISITION

There is a need for a telemetric data acquisition system for in-service highway bridge monitoring. Currently sensors are hardwired to the data control unit. The problem with this approach is that the control unit must be reasonably close to the sensors or extensive lengths of electrical cable must be routed throughout the structural elements of the bridge. What is needed is a system to relay signals from remote sensors to a central data acquisition location. It is envisaged that data stored on computer chips could be interrogated remotely on the bridge and the acquired data taken to a processing center for analysis and storage. The entire system must be portable, light-in-weight, and capable of being positioned in areas where access is difficult to obtain.

### 91-FH2. IMPROVEMENT IN REFERENCE HALF-CELLS FOR REINFORCED CONCRETE

Past research has significantly improved the life and the stability of reference half-cells. Still, their performance is unsatisfactory in terms of delivering the optimum amount of direct current for cathodic protection (CP) installations on reinforced concrete structures. At present, CP systems are either constant current or constant voltage type. With CP now being considered for prestressed concrete structures, research is needed to develop durable, dependable, long-lived (10-15 years) reference cells to avoid overprotection and hydrogen embrittlement of the prestressing steel.

### 91-FH3. FIBER REINFORCED PLASTIC TENDON ANCHORAGES, GRIPS, AND ACCESSORIES

Fiber reinforced plastic (FRP) composite material shows promise for use as the strand element in post-tensioned, prestressed concrete beam fabrication. FRP cables and strands have high tensile strength while being resistant to corrosion induced by both chemical application to roadways and the general environment. Anchorage details including grips and connections are widely recognized as being weak links in post-tensioned applications. Research is needed to develop and characterize an appropriate FRP gripping and loading system that is compatible with FRP strands. The FRP gripping system developed must include the evaluation of the fatigue behavior of the system. Once the feasibility of a promising system is proven, future research would entail large scale testing to prove the concept.

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## SAFETY

### 91-FH4. LOW COST GUARDRAIL END TREATMENTS USING INNOVATIVE NEW DESIGNS AND MATERIALS

Guardrail terminals have always been troublesome and expensive. Turned-down terminals are low cost, but they can launch cars into obstacles or cause rollovers. Some of the upright terminals have speared cars. A number of recently developed terminals, both proprietary and public domain systems, have passed the current crash test criteria; however, these systems tend to be expensive, and may also require additional right-of-way for flair-out space, and additional fill and grading. New materials may be the answer to designing low-cost end treatments for straight sections of guardrail. Research is needed to investigate new low cost guardrail end treatment designs and to explore new materials for use in current or new designs. Promising systems need detailed final design, laboratory investigation, prototype construction, and acceptance crash testing using current test criteria.

## PAVEMENTS

### 91-FH5. IMPROVED COMPACTION EQUIPMENT

Presently, Portland cement concrete pavement (PCCP) is compacted using internal vibrators as the concrete is extruded from the slip form. (In the past, plate vibrators were also used.) Each internal vibrator has a zone of influence, and final densities vary across the pavement. Asphaltic concrete pavement (ACP), on the other hand, is usually extruded and rolled by compaction equipment which might be as far as 500 feet behind the laydown machine. In either case, proper compaction is far too often not being achieved, and more uniform and higher densities are desired. Research is needed to develop improved compaction equipment for paving operations. This need exists for both PCCP and ACP. In the case of ACP, consideration should be given to techniques for achieving final compaction immediately behind the laydown machine. It is preferred, although not required, that the principles developed be applicable to either type of construction.

## **MARITIME ADMINISTRATION**

### **MARITIME OPERATIONS**

#### **91-MA1. PRODUCTIVE VESSEL OPERATIONS**

Innovative research is sought which will result in the development of unique equipment, hardware, or management software that has the potential to significantly improve the productivity of maritime vessel operations in the general cargo, bulk cargo, military sealift or passenger service sectors of the transocean, coastal, Great Lakes or inland waterway service areas of the United States. Innovative devices, systems, or equipment for automation of ship operations including, for example, cargo management, ship systems monitoring, inspection, maintenance, and other procedures to make vessel operations more productive would be of great benefit to U.S. vessel operations. Proposals should show, as appropriate, engineering designs and analyses, as well as software or institutional considerations, expected producibility, marketability, costs and benefits, and tests needed to demonstrate feasibility and consequences for application.

#### **91-MA2. PRODUCTIVE TERMINAL OPERATIONS**

Innovative research is sought which will result in the development of unique equipment, hardware, or management software that has the potential to significantly improve the productivity, efficiency and management of terminal operations in the general cargo, bulk cargo, military sealift or passenger service sectors of the transocean, coastal, Great Lakes or inland waterway service areas of the United States. Current handling methods in ship operations are costly due to the time required to dock a vessel, unload cargo, reload cargo, and exit terminals. Additionally, some types of cargo movements are very labor intensive. Innovations in terminal operations which can safely speed up activity and/or reduce labor demands would be of great benefit to U.S. shipping. Proposals should show, as appropriate, engineering designs and analyses, as well as software or institutional considerations, expected producibility, marketability, costs and benefits, and tests needed to demonstrate feasibility and consequences for application.

# NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

## ELECTRONIC MONITORING DEVICES

### 91-NH1. ELECTRONIC VEHICLE IDENTIFICATION NUMBER READER

An electronic system that could read the manufacturer's unique VIN (vehicle identification number) off moving and standing vehicles would have many traffic safety applications and could offer special benefits to the occupants of outfitted vehicles. Research is needed to apply forms of electronic devices to the harsh vehicle/highway environment. The research is very timely, as the auto industry and the U.S. Department of Transportation are considering the widespread introduction of many electronic devices into noncommercial vehicles as part of a trend toward increased highway safety and congestion relief. Police, motor vehicle, and highway departments are simultaneously looking for more efficient ways to enforce safety laws. An electronic vehicle identification number (EVIN), coupled with roadside detectors and computerized vehicle registration records, could help automate law enforcement and provide benefits to motorists. It would permit electronic enforcement of traffic control laws, detection of stolen vehicles, "congestion pricing," charges according to vehicle/roadway damages, and automated billing for toll road users and customers of drive-in establishments such as gas stations. An EVIN coupled with a portable detector could be used by police and crews of emergency medical services to accurately and quickly enter and print VIN information into police accident and trauma forms, even in post-crash situations. The EVIN detector should be able to transmit and receive information via radio and interface with other computer systems. The proposal should show the engineering design and analyses as well as software and institutional considerations, expected production capability, marketability, costs and benefits, tests for feasibility and consequences, electronic linkage to DMV records, and after-market applications. The proposals should also compare the systems to be developed with existing systems and management institutions. Proposals should address related legal, ethical, or privacy issues that are likely to inhibit public acceptance on both a voluntary basis (where special benefits are provided) and on a regulated basis applicable to all vehicles.

## CRASH AVOIDANCE

### 91-NH2. MOTOR VEHICLE HIGHWAY LANE POSITION MONITOR

The required device is one that will monitor the lateral position of a vehicle moving at highway speed (i.e., 45-65mph) in relation to white/yellow center lines, lane markings, and/or roadway edge markings. The envisioned device would provide a high quality, reliable electronic readout of vehicle lateral position. The proposal should address a critical review of functional goals and requirements, feasibility/tradeoff study of alternative solutions and designs, and conceptual design and feasibility of the proposed



# NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

device. Consideration must be given to the commercial potential for marketing the device for the following types of safety research:

- Vehicle design
  - Visibility systems (windows, mirrors)
  - Four-wheel steering
  - Variable assist steering
- Driver characteristics
  - Fatigue
  - Drug/alcohol intoxication
  - Driver age
- Roadway characteristics

and as a component of a vehicle based crash avoidance system for:

- Driver warning system for all motor vehicles when drifting out of lane

## ACCIDENT INVESTIGATION

### 91-NH3. VEHICLE CONTOUR MEASUREMENT DEVICE

NHTSA has been investigating motor vehicle crashes for more than 20 years. Part of such investigations is to measure the amount of vehicle crush sustained in the crash. NHTSA has used both experienced and highly trained investigators who have been through a six-week training course. A system involving tape measures and a stringline depicting the undamaged vehicle's extreme dimensions have been used. The process usually takes at least 30 minutes to complete. NHTSA is interested in being able to use police officers with no special training to obtain data from crushed vehicles during the normal course of their duties. Research is needed to develop a new technology for measuring vehicle contours (damaged and undamaged) that has the following characteristics:

- Can be used by personnel with little or no training
- Uses inexpensive equipment
- Uses equipment that is small (less than 1 cu. ft.) and light weight (less than 10 lbs)
- Requires less than 30 minutes to set up, make measurements, and take down
- Data should be retainable in a redundant form to prevent loss during a power failure
- The system should lend itself to follow up quality control procedures

Measurements should be taken at the height of the maximum crush and should be able to be correlated with similar measurements from an undamaged vehicle so that the crush can be determined. The final data should be in a machine readable form, either separate or downloadable. Various types of "tapeless rulers" have been marketed recently. Research should include the development of a similar type device making use of sonic, infrared, or other type waves to determine vehicle crush.



# UNITED STATES COAST GUARD

## ELECTRONIC NAVIGATION SYSTEMS

### 91-CG1. DYNAMIC MARINE PLATFORM ATTITUDE DETERMINATION USING GPS CARRIER PHASE

It is possible to receive the signals of the NAVSTAR Global Positioning System (GPS) using several antennae and calculate the orientation of the antennae relative to the NAVSTAR GPS earth-centered, earth-fixed coordinate system. The objective of this research is to develop economical equipment capable of performing this calculation continuously aboard a maneuvering marine platform such as a U.S. Coast Guard cutter in all weather conditions and sea states. The equipment should convert the calculated orientation and present the ship's heading in a manner similar to a gyrocompass. Suitable pitch and roll indicators should also be developed. The accuracy should be equal to or better than current attitude determination devices. Successful completion of this research should result in an attitude determining device that would have uniform accuracy at all latitudes.

### 91-CG2. HIGH EFFICIENCY MARINE NONDIRECTIONAL RADIOBEACONS

The U.S. Coast Guard uses a solid state Nondirectional Beacon (NDB) transmitter as a marine radio beacon. The cost of alternative energy sources, such as solar or diesel, used to power the NDBs can be reduced if the efficiency of the NDB is increased. The objective of this research is to reduce the power required to transmit a radiobeacon signal while maintaining or improving the existing performance level. The research should consider elimination of the power conversion losses by using electronics that can work directly off a number of primary battery voltages as low as 12 volts. Improving the efficiency of the antenna also offers energy savings. Successful completion of this research should allow economic operation of marine radiobeacons from alternative energy sources.

### 91-CG3. GPS ANTENNA WITH IMPROVED LOW ELEVATION SENSITIVITY AND INCREASED MULTIPATH SUPPRESSION

A differential Global Positioning System (GPS) reference station needs to acquire and reliably track satellites close to the horizon as they rise and set. The objective of this research is to develop a stationary "all-in-view" antenna capable of providing enhanced low elevation tracking while improving rejection of multipath signals. A design goal is to be able to acquire satellites within the 0-5 degrees elevation range. The design process should consider a multi-element array, capitalize on the satellites signal polarization, and the use of absorbing material. A small amount of antenna location uncertainty (not to exceed 20 cm) in a multi-element array is acceptable, but measures should be taken to minimize the error this introduces to the station's differential corrections. Successful completion of this research should yield a prototype antenna that reduces operational errors due to multipath signals, minimizes the momentary loss of carrier aided tracking, and improves code tracking by increasing the signal-to-noise ratio.

### 91-CG4. LOCATING ORIGIN OF SHORT DURATION VHF SIGNAL TRANSMISSIONS

The implementation of differential Global Positioning System (GPS) broadcasts in a harbor makes economic clock synchronization at nanosecond levels possible. Coupling this technology with advances made in Digital Signal Processing (DSP) technology

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makes it possible to assign epoch time marks in received signals. The objective of this research is to investigate the potential for using these two technologies and existing or improved direction finding methods to locate the origin of short duration (1-3 sec) VHF signal transmission. The approach should consider the use of a number of these devices in a harbor connected by a data communications link. The signal processing approach should consider the processing of special signal formats designed for this technology and noncooperating signals such as VHF FM voice transmissions. Location of the transmission should consider use of directional and time of arrival measurements. Accuracy on the order of several meters is sought. Successful completion of this research should provide technology and supporting computer software that can be used economically for a number of USCG surveillance activities such as monitoring the location of buoys, as a form of automatic dependent surveillance for vessel traffic systems, and search and rescue operations.

### 91-CG5. INTEGRATED AUTOMATIC DEPENDENT SURVEILLANCE EQUIPMENT FOR COMMERCIAL VESSELS

Vessel Traffic Service (VTS) has a number of means available to monitor the movement of marine traffic in a controlled area. One method is to require a periodic position report from each vessel. The objective of this research is to develop economical equipment for use aboard each vessel to automatically provide this information. The design approach should consider the use of radionavigation sensors such as differential Global Positioning System (GPS) receivers and the National Maritime Electronics Association (NMEA-183) shipboard data transfer standard. The draft recommendation 493-3 (mod F) of the International Radio Consultative Committee (CCIR) "Digital Selective-Calling System for Use in the Maritime Mobile Service" and work being done by the International Association of Lighthouse Authorities VTS subcommittee may be considered in this research, but should not restrict exploration of alternatives. Successful completion of this research should provide equipment that can be used in experimental and operational VTS systems.

## SHORT RANGE AIDS TO NAVIGATION

### 91-CG6. NEW MINOR LIGHT OPTIC DESIGN

The Coast Guard is pursuing a new buoy system concept that would allow integrating the signal, the power, and a monitor and control subsystem into a single module that could be placed on top of the buoy's superstructure. A new lamp has recently been developed for the Coast Guard for use on buoys and other short range aids to navigation with characteristics differing from the tungsten lamp currently in use. The tungsten lamp filament is very close to being a point source, but has poor efficacy. The new lamp is basically a miniature fluorescent lamp that is configurable to a wide range of different sizes and shapes (lines, circles, cylinders) and has a greater efficacy than the tungsten filament lamp. These shapes vary from long thin lamps (24.0" long by 0.0165" diameter) to short thicker lamps (1.5" long by 0.25" diameter). The long thin lamps may be shaped into simple geometric shapes (e.g., circles). Research is needed on a new optic design to take advantage of the high efficacy of the new lamp. The optic must be omnidirectional and must direct light from the lamp into the horizontal plane with a half power vertical divergence of  $\pm 4.5$  degrees. Maximum mean horizontal peak intensity is the primary goal for the new optic design.

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### 91-CG7. MINOR AID TO NAVIGATION PHOTOVOLTAIC POWER SUPPLY

The Coast Guard is pursuing a new buoy system concept that would allow integrating the signal, the power, and a monitor and control subsystem into a single module that could be placed on top of the buoy's superstructure. Research is needed on a new power System for these lighted aides to navigation. The current power system includes conventional lead-acid storage batteries (@100Ah each) and silicon photovoltaic panels (nominal 10W, 20W, and 35W each). The system load varies from 2-60 Watt-Hours/day. The objective of this research is to determine a combination of secondary storage batteries and photovoltaic panels that would enable us to later perform the system integration. The batteries and panels must be highly reliable and nearly maintenance free; the buoy maintenance interval should exceed 1 year.

### 91-CG8. STABILIZATION OF MINOR AID TO NAVIGATION OPTICS

The Coast Guard is pursuing a new buoy system concept that would allow integrating the signal, the power, and a monitor and control subsystem into a single module that could be placed on top of the buoy's superstructure. Current optics are rigidly mounted on lighted Coast Guard navigational buoys and structures. This design is ideal for vertical motionless platforms where the light is easily directed toward the horizontal plane. However, the design is not ideal for moving buoys because the light is often directed above or below the horizontal plane. Research is needed on a new mount design which will keep the optic vertical and the light directed toward the horizontal plane while the buoy moves. The new mount design should stabilize the light within +/- one degree of vertical with buoy motion up to +/- 25 degrees from vertical. The new mount must also be low-cost, nearly maintenance free, and must not require power.

### 91-CG9. LOW COST, LOW POWER POSITION DETERMINATION SYSTEM FOR MOORED BUOYS

The Coast Guard is pursuing a new buoy system concept that would allow integrating the signal, the power, and a monitor and control subsystem into a single module that could be placed on top of the buoy's superstructure. Research is needed on an automated position determination system for certain critical navigation buoys. This positioning system should allow personnel on a properly equipped ship or shore control station to determine if the buoy is on or off station without requiring a ship or boat to actually visit the buoy. It should provide data to the control stations through telemetry provided by a separately developed Buoy Status Monitoring System (BSMS). The positioning system should be programmable, allowing easy entry of buoy station position and tolerances for an off-station alarm. The proposed system should provide extremely reliable and accurate position data; the false alarm rate should be less than 0.1%.

### 91-CG10. MINOR AID TO NAVIGATION STATUS MONITOR AND REPORTING SYSTEM

The Coast Guard is pursuing a new buoy system concept that would allow integrating the signal, the power, and a monitor and control subsystem into a single module that could be placed on top of the buoy's superstructure. Research is needed on a Buoy Status Monitoring System (BSMS) for certain navigation buoys maintained by the Coast Guard. This system must monitor the buoy status and transmit status data to a nearby ship or shore based control point. The system should be able to sense electrical power

## UNITED STATES COAST GUARD

failure, low battery level, lamp status, lampchanger position, and flooding of the buoy hull. The BSMS should receive and transmit positioning data from a separately developed position determination system. The system should transmit information on a prearranged schedule, when an alarm condition exists, or when polled.

### MARINE SAFETY

#### 91-CG11. INSPECTION OF FIBERGLASS HULLS ON VESSELS

Research on a device for wide-area inspection of fiberglass hulls on vessels is needed. A better method to locate and characterize core defects, delaminations and other imperfections in new construction and in existing vessels caused by collisions or groundings is desired. Fiberglass hulls are especially difficult to inspect due to the sandwich-type construction used and other factors, including external paint or gel coat, thickness of the sandwich, material density and variability of construction. In addition, access to the inside of the structure may be inadequate for personnel. Inspection by available techniques such as ultrasonics is very slow, due to the size of the transducer and the need for couplant. Coast Guard inspectors need a more rapid, wide-area inspection technique for fiberglass hulls that will determine both the extent and character of the defect or damage. The equipment must be transportable to a shipyard, be capable of one-sided inspection without couplant and be able to cover large areas in a reasonable time.

#### 91-CG12. VISUAL INSPECTION TECHNIQUES FOR ENCLOSED SPACES ON TANK VESSELS

A means of remote visual inspection is often needed for vessel tankage. Many tanks present a hazard resulting from residual flammable or noxious chemicals. It is desirable to provide marine inspectors with portable equipment which can allow personnel to inspect a tank without entering it. Such equipment might consist of a magnifying lens with illumination which can convey a visual image along a highly flexible fiber optic cable. The cable would conceivably be 200 feet long or more and could be connected to a small video camera to provide both a visual and audio record of the inspection. Magnification of the image could be controlled to vary from 1x to 10x, allowing the inspector to view large areas and then concentrate on possible cracks or surface defects. Also required is the ability to control angular orientation of the objective lens so as to "scan" the immediate area and accurately identify the location of detected flaws. Such equipment obviously needs to be portable, drop resistant, waterproof, chemical proof, and explosion proof. Existing equipment is capable of doing most of the above. The real problem in vessel tank inspections is delivery of the objective lens to the location in three-dimensional space in an empty tank. One system envisioned might be a magnetic traction system which could crawl along a flat surface within the tank trailing fiber optic and power cables. The problem with this system is how to cross corners and move around obstructions such as pipes, ladders, combings, etc.

### MARINE ENVIRONMENTAL RESPONSE

#### 91-CG13. INNOVATIVE TRAINING SYSTEMS FOR SPILL RESPONSE

The Coast Guard needs to upgrade the training of personnel in responding to catastrophic oil and hazardous chemical spills. This involves both training at the individual level and training of the Regional Response Teams through oil spill response exercises. Training of the individual represents a unique challenge in that the time available for resident

## UNITED STATES COAST GUARD

training at the Reserve Training Center at Yorktown, VA is limited. On-the-job training is limited because these spills occur infrequently. The Coast Guard is interested in a computer-based interactive video training system which can be used both in the classroom at Yorktown, and at the individual Marine Safety Office/Captain of the Port (MSO/COTP) to provide expanded training opportunities and refresher courses. Phase I will consist of technical feasibility (architecture, software and hardware). Phase II will include prototype system development.

### 91-CG14. MITIGATING LEAKAGE FROM BARGES AND TANK VESSELS

The Marine Board of the National Research Council is investigating technologies to prevent or mitigate oil spills from tankers. The Coast Guard is interested in developing systems to limit the loss of oil from damaged tanks. Of particular interest are remotely guided plugging and patching systems which could seal a crack or rupture from inside or outside the tank. Phase I will consist of technical feasibility (theory, equipment, installation/deployment). Phase II will include prototype system development and testing.

### 91-CG15. DETERMINATION OF THE CONTENTS AND INTEGRITY OF DAMAGED TANKS ON TANK VESSELS

In dealing with a tanker spill, it is critical that the Coast Guard be able to quickly assess the extent of damage, stabilize the vessel, and off-load product as necessary to prevent further spilling of oil. The EXXON VALDEZ spill demonstrated this as 80% of the oil was off-loaded from the ship using the Coast Guard Air Deliverable Automatic Pump Transfer System (ADAPTS) oil off-loading system, while the 20% that was uncontained largely impacted the shore, causing a massive cleanup problem. To support tanker salvage operations, Phase I research is needed to investigate in-tank and remote (i.e., electromagnetic, acoustic, fibre optic, etc.) methods of determining oil vs. seawater levels in tanks; the location, size, and nature of the tank penetration; and the integrity and strength of the vessel structure. Phase II research would include prototype development and testing.

## LAW ENFORCEMENT

### 91-CG16. NONLETHAL INCAPACITATION OF AIRCRAFT, VESSELS OR BOATS

The Coast Guard has responsibility for maritime law enforcement including possible interdiction of both aircraft and vessels. In some instances, interception of a vessel or aircraft is accomplished by a law enforcement platform which is incapable of stopping a suspect for further inspection or law enforcement action. In these cases, a method is needed to impose nonlethal, persuasive "force" to bring the aircraft, boat or vessel into compliance with law enforcement direction. An innovative approach is needed to disable or "take control" of vehicle systems for the purposes of bringing a suspect into a position of submission for further law enforcement action. Devices or technologies must be usable from law enforcement aircraft, vessels or boats. Operator safety, safety of personnel on the intended target, safety of the propulsion and electronic systems on the law enforcement platform and "overshoot" considerations are important considerations in this research. The sensitivity and potential for damage of taking disabling action against targets suspected of violations of law dictates that any technology employed to enforce laws use the minimum force necessary. In view of that consideration, any means proposed to disable aircraft, vessels or boats must be carefully designed to sustain technical, legal, or policy reviews. Snare, nets, grapples and any similar mechanical devices will not be considered.

## UNITED STATES COAST GUARD

### 91-CG 17. COVERT TAGGING OF AIRCRAFT FROM STANDOFF POSITIONS

The Coast Guard has responsibility for law enforcement including possible interdiction of both air and vessel traffic in U.S. waters and on the high seas. In some instances, interception of a vessel or aircraft is accomplished by a law enforcement platform which is incapable (given current policies on use of force, or the state-of-the-art in weaponry) of stopping a suspect for further inspection or law enforcement action. In these cases, particularly for aircraft, a method is needed to tag or mark the aircraft for later positive identification by authorities. The method of tagging must be deliverable from a standoff range by a law enforcement aircraft at a minimum of 1000 feet and must be covert. The target aircraft should not be aware that a tag, mark, identification or other means, method, device, or signal has been employed. The proposal should consider safety to the operator, operator's aircraft, target aircraft personnel and overshoot. Simplicity, covertness, undetectability of mark or tag, ease of delivery, accuracy, and detectability by proper authority for verification should also be addressed.

### SEARCH AND RESCUE

### 91-CG 18. AIR DEPLOYABLE SELF-LOCATING SURFACE DRIFTING BUOY

The Coast Guard is responsible for search and rescue at sea. The search problem includes determination of the location of the original search datum and the movement of that datum under the influence of sea surface current. In order to plan an effective search, the planners need real time, accurate sea surface current information. Present datum marker buoys use a VHF-DP system and tie up valuable aircraft time in locating the marker buoys. Research is needed on air deployable self-locating surface drifting buoys with design goals for the buoys as follows:

- a) Be low-cost, self powered and expendable.
- b) Be self-locating using GPS or equivalent existing real-time satellite navigation system - either interrogatable or auto-transmitting at selectable intervals.
- c) Use existing real-time satellite based communications link.
- d) Be air deployable from all CG aircraft.
- e) Be deployable from surface vessels.
- f) Track upper one meter of ocean currents.
- g) Have life expectancy in ocean of all components of at least 45 days.
- h) Have size and weight as near as possible to Navy SONOBUOY.
- i) Have ability to read/transmit sea surface temperature and other parameters of interest (e.g., barometric pressure).

# URBAN MASS TRANSPORTATION ADMINISTRATION

## TRANSIT COST EFFICIENCY

### 91-UM1. ADVANCED FARE PAYMENT MEDIA

Present fare collection media consists of coins, currency, tokens, flash passes, and magnetic cards (using bank card technology). To meet the needs of transit patrons in the 1990's, transit fare cards will have to permit the payment of a fare of one dollar or more, for one or more zones (or distance based fare). Research is needed on the design and development of new advanced fare payment media including smart cards that are cost-effective and meet the changing needs of transit systems. The smart card contains a microprocessor that provides better security, processing capability, and storage capacity. Advanced fare payment media provides increased flexibility in payment schedules, method of payment and increased revenue security (reduced handling of funds by employees and more difficult access codes). Phase I will demonstrate technical feasibility. Phase II will develop and demonstrate this technology.





**U.S. DEPARTMENT OF TRANSPORTATION  
SMALL BUSINESS INNOVATION RESEARCH PROGRAM  
SOLICITATION NO. 91-1  
PROPOSAL COVER SHEET**

Project Title \_\_\_\_\_

Research Topic No. \_\_\_\_\_ Research Topic Title \_\_\_\_\_

Submitted By Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Amount Requested (Phase 1) \$ \_\_\_\_\_ Proposed Duration \_\_\_\_\_  
(Not to exceed \$50,000) (In months, Phase 1)(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. 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

Corporate/Business Official

Name \_\_\_\_\_

Name \_\_\_\_\_

Title \_\_\_\_\_

Title \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

Telephone No. \_\_\_\_\_

Telephone No. \_\_\_\_\_

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

**U.S. DEPARTMENT OF TRANSPORTATION  
SMALL BUSINESS INNOVATION RESEARCH PROGRAM  
SOLICITATION NO. 91-1**

**PROJECT SUMMARY**

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

Name and Title of Principal Investigator

Project Title

Research Topic No.

Research Topic Title

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

Anticipated Results/Potential Commercial Applications of Results

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

**U.S. DEPARTMENT OF TRANSPORTATION  
SMALL BUSINESS INNOVATION RESEARCH PROGRAM  
SOLICITATION NO. 91-1  
CONTRACT PRICING PROPOSAL**

<b>CONTRACT PRICING PROPOSAL COVER SHEET</b>		1 SOLICITATION/CONTRACT MODIFICATION NO.		FORM APPROVED OMB NO. <b>3090-0116</b>
NOTE: This form is used in contract actions if submission of cost or pricing data is required. (See FAR 15.804-6(d))				
2 NAME AND ADDRESS OF OFFEROR (Include ZIP Code)		3A NAME AND TITLE OF OFFEROR'S POINT OF CONTACT		3B TELEPHONE NO.
4 TYPE OF CONTRACT ACTION (Check)				
<input type="checkbox"/> A NEW CONTRACT		<input type="checkbox"/> D LETTER CONTRACT		
<input type="checkbox"/> B CHANGE ORDER		<input type="checkbox"/> E UNPRICED ORDER		
<input type="checkbox"/> C PRICE REVISION/REDETERMINATION		<input type="checkbox"/> F OTHER (Specify)		
5 TYPE OF CONTRACT (Check)		6 PROPOSED COST (A+B+C)		
<input type="checkbox"/> FFP <input type="checkbox"/> CPFF <input type="checkbox"/> CPIF <input type="checkbox"/> CPAF		A COST    B PROFIT/FEE    C TOTAL		
<input type="checkbox"/> FPI <input type="checkbox"/> OTHER (Specify)		\$    \$    \$		
7 PLACE(S) AND PERIOD(S) OF PERFORMANCE				
8 List and reference the identification, quantity and total price proposed for each contract line item. A line item cost breakdown supporting this record is required unless otherwise specified by the Contracting Officer. (Continue on reverse and then on plain paper, if necessary. Use same headings.)				
A LINE ITEM NO.	B IDENTIFICATION	C QUANTITY	D TOTAL PRICE	E PEF
9 PROVIDE NAME, ADDRESS, AND TELEPHONE NUMBER FOR THE FOLLOWING (If available)				
A CONTRACT ADMINISTRATION OFFICE		B AUDIT OFFICE		
10 WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS WORK? (If "Yes," identify)		11A DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT? (If "Yes," complete Item 11B)		11B TYPE OF FINANCING (If one)
<input type="checkbox"/> YES <input type="checkbox"/> NO		<input type="checkbox"/> YES <input type="checkbox"/> NO		<input type="checkbox"/> ADVANCE PAYMENTS <input type="checkbox"/> PROGRESS PAYMENTS
12 HAVE YOU BEEN AWARDED ANY CONTRACTS OR SUBCONTRACTS FOR THE SAME OR SIMILAR ITEMS WITHIN THE PAST 3 YEARS? (If "Yes," identify item(s), customer(s) and contract number(s))		13 IS THIS PROPOSAL CONSISTENT WITH YOUR ESTABLISHED ESTIMATING AND ACCOUNTING PRACTICES AND PROCEDURES AND FAR PART 31 COST PRINCIPLES? (If "No," explain)		<input type="checkbox"/> GUARANTEED LOANS
<input type="checkbox"/> YES <input type="checkbox"/> NO		<input type="checkbox"/> YES <input type="checkbox"/> NO		
14 COST ACCOUNTING STANDARDS BOARD (CASB) DATA (Public Law 91-379 as amended and FAR PART 30)				
A. WILL THIS CONTRACT ACTION BE SUBJECT TO CASB REGULATIONS? (If "No," explain in proposal)		B. HAVE YOU SUBMITTED A CASB DISCLOSURE STATEMENT (CASB DS 1 or 2)? (If "Yes," specify in proposal the office to which submitted and if determined to be adequate)		
<input type="checkbox"/> YES <input type="checkbox"/> NO    N/A		<input type="checkbox"/> YES <input type="checkbox"/> NO    N/A		
C. HAVE YOU BEEN NOTIFIED THAT YOU ARE OR MAY BE IN NON-COMPLIANCE WITH YOUR DISCLOSURE STATEMENT OR COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)		D. IS ANY ASPECT OF THIS PROPOSAL INCONSISTENT WITH YOUR DISCLOSED PRACTICES OR APPLICABLE COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)		
<input type="checkbox"/> YES <input type="checkbox"/> NO    N/A		<input type="checkbox"/> YES <input type="checkbox"/> NO    N/A		
This proposal is submitted in response to the RFP contract, modification, etc. in Item 1 and reflects our best estimates and/or actual costs as of this date.				
15. NAME AND TITLE (Type)		16. NAME OF FIRM		
17. SIGNATURE		18. DATE OF SUBMISSION		

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

## Background

The following items, as appropriate, should be included in proposals responsive to the DOT SBIR Program 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)

**U.S. DEPARTMENT OF TRANSPORTATION  
SMALL BUSINESS INNOVATION RESEARCH PROGRAM  
SOLICITATION NO. 91-1  
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 of the research and/or analytical effort will be performed by the proposing firm as required (see Section V.H.1) and the primary employment of the principal investigator must be with the small business firm at the time of award and during the conduct of the proposed research as required (see Section I.C.).
- \_\_\_\_\_ 2. The proposal is 25 PAGES OR LESS in length.
- \_\_\_\_\_ 3. The proposal is limited to only ONE of the research topics in Section VIII.
- \_\_\_\_\_ 4. The proposal budget is for \$50,000 OR LESS 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 elite (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 proposal must be postmarked (or delivered to the DOT SBIR Program Office) no later than May 1, 1991 as required (see Section VI.A.).