DOT-VNTSC-OST-98-1

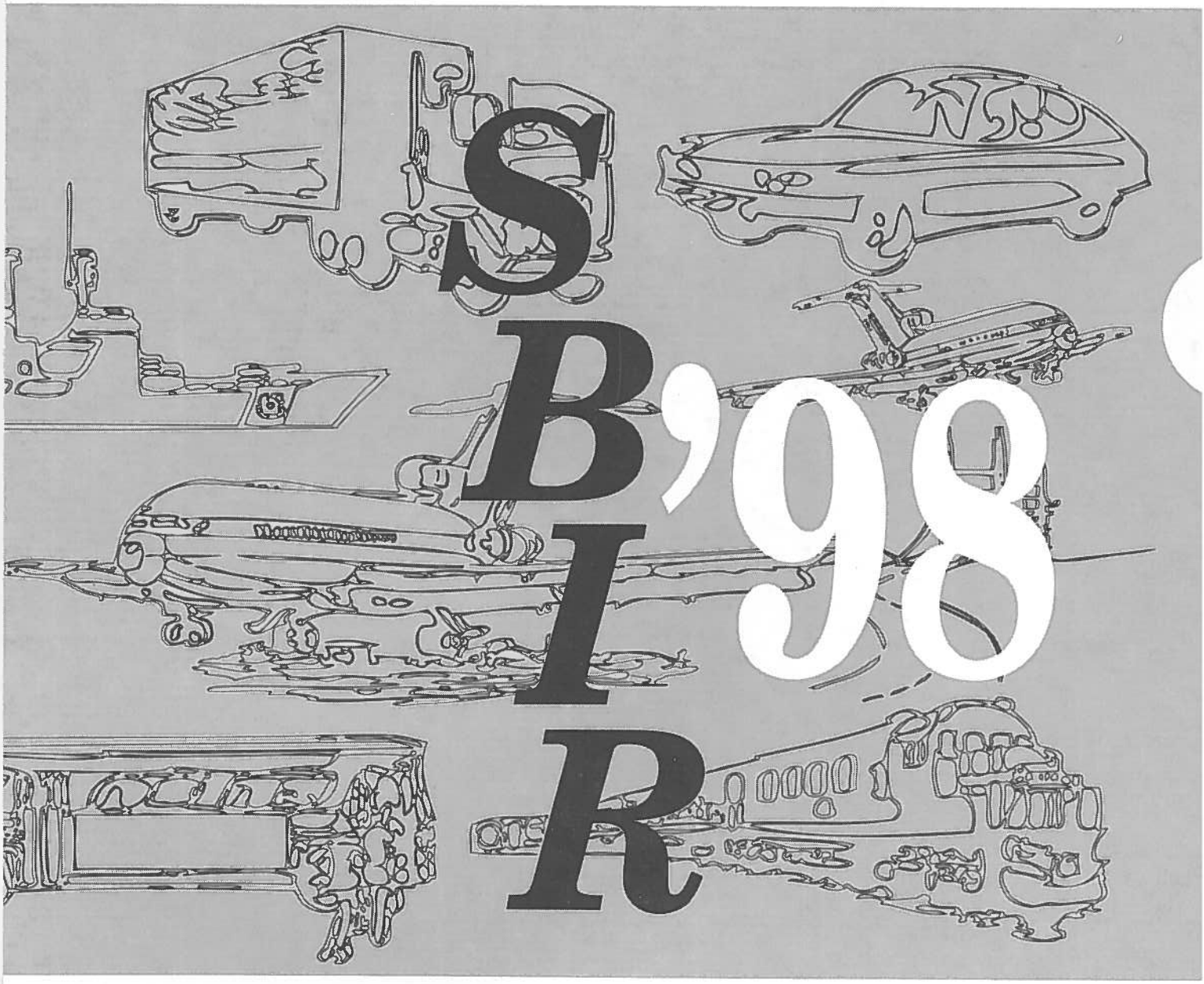
SBIR-98-1

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

Small Business Innovation Research

Program Solicitation

(Closing Date: May 1, 1998)



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

SBIR-98-1

PROGRAM SOLICITATION

Small Business Innovation Research Program

Closing Date: May 1, 1998

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

CONTENTS

SECTION		PAGE
I.	PROGRAM DESCRIPTION	1
II.	DEFINITIONS	3
III.	PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS	5
IV.	METHOD OF SELECTION AND EVALUATION CRITERIA	8
V.	CONSIDERATIONS	10
VI.	SUBMISSION OF PROPOSALS	14
VII.	SCIENTIFIC AND TECHNICAL INFORMATION SOURCES	15
VIII.	RESEARCH TOPICS	16
IX.	SUBMISSION FORMS AND CERTIFICATIONS	28

APPENDICES

A.	PROPOSAL COVER SHEET	29
B.	PROJECT SUMMARY	30
C.	CONTRACT PRICING PROPOSAL (Standard Form 1411)	31

DOT PROGRAM SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH

I. PROGRAM DESCRIPTION

A. Introduction

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

The purposes of the Act are:

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

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

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

B. Three-Phase Program

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

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

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

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

C. Eligibility

Each concern submitting a proposal must qualify as a small business at the time of award of Phase I and Phase II funding agreements. In addition, **the primary employment of the principal investigator must be with the small business firm at the time of award and during the conduct of the proposed research** unless otherwise approved by the contracting officer. Primary employment means that

more than one-half of the principal investigator's time is spent with the small business. Also for both Phase I and Phase II, the research or R&D work must be performed in the United States. "United States" means the several states, the Territories and possessions of the United States, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, the Trust Territory of the Pacific Islands, and the District of Columbia.

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

D. General Information

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

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

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

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

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

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

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

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

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

II. DEFINITIONS

A. Research or Research and Development

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

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

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

(3) A systematic application of knowledge toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.

B. Small Business

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

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

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

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

C. Minority and Disadvantaged Small Business

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

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

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

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

(1) Black Americans.

(2) Hispanic Americans.

(3) Native Americans.

(4) Asian-Pacific Americans.

(5) Subcontinent Asian Americans.

D. Women-Owned Small Business

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

means being actively involved in the day-to-day management.

E. Subcontract

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

III. PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

A. Limitation on Length of Proposal

Please note that:

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

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

B. Proposal Cover Sheet

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

C. Project Summary

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

D. Technical Content

Submitted proposals must include the following:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(e) Titles of research projects; and

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

E. Contract Pricing Proposal

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

F. DUNS Identification Number

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

G. Acknowledgement of Proposal Receipt

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

H. Prior SBIR Phase II Awards

If the small business concern has received more than 15 Phase II awards in the prior 5 fiscal years, submit

name of awarding agency, date of award, funding agreement number, amount, topic or subtopic title, follow-on agreement amount, source and date of commitment and current commercialization status for each Phase II. (This required proposal information shall not be counted toward proposal pages count limitation.)

IV. METHOD OF SELECTION AND EVALUATION CRITERIA

A. General

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

B. Evaluation Criteria

The evaluation process involves the following factors:

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

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

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

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

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

(2) The adequacy of the work plan and approach to achieve specified work tasks and stated objectives of the proposed effort within budgetary constraints and on a timely schedule.

(3) Qualifications of the proposed principal/key investigator(s) including demonstrated expertise in a disciplinary field related to the particular R or R&D topic that is proposed for investigation.

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

C. Prescreening

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

D. Schedule

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

E. Program Selection

A Proposal Review Panel, chaired by the Department's SBIR Program Director and 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 2, 1998. Correspondence relating to proposals should reference the proposal identification number

assigned on the acknowledgement of receipt card and be sent to the DOT SBIR Program Office.

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

V. CONSIDERATIONS

A. Awards

It is estimated that during fiscal year 1998, the Department of Transportation will award approximately 18 Phase I contracts with an anticipated potential maximum of 21 awards, depending on actual funding available and the responses from small business firms to the solicited research topics in Section VIII.

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

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

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

B. Reports

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

C. Payment Schedule

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

D. Innovations, Inventions, and Patents

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

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

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

Any other legend may be unacceptable to the Government and may constitute grounds for return of the proposal without further consideration and without assuming any liability for inadvertent

disclosure. The Government will limit dissemination of such information to within official channels.

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

2. **Rights in Data Developed Under SBIR Funding Agreements**. Rights in technical data, including software developed under any contract resulting from this solicitation, shall remain with the contractor except that the Government shall have the limited right to use such data for Government purposes and shall not release such data outside the Government without permission of the contractor for a period of four years from completion of the project from which the data were generated. However, 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**. The contractor normally may copyright and publish (consistent with appropriate national security considerations, if any) material developed with Department of Transportation support in the SBIR Program. 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. To the extent authorized by 35 U.S.C. 205, the Government will not make public any information disclosing an SBIR Government-supported invention for a four-year period to allow the contractor a reasonable time to pursue a patent.

E. Cost-Sharing

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

F. Profit or Fee

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

G. Joint Ventures or Limited Partnerships

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

H. Research and Analytical Work

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

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

I. Contractor Commitments

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

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

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

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

4. **Default**. The Government may terminate the contract if the contractor fails to perform the work contracted.

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

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

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

8. **Equal Opportunity**. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

9. **Affirmative Action for Veterans**. The contractor will not discriminate against any employee or applicant for employment because he or she is a disabled veteran or veteran of the Vietnam era.

10. **Affirmative Action for Handicapped.** The contractor will not discriminate against any employee or applicant for employment because he or she is physically or mentally handicapped.

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

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

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

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

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

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

J. Additional Information

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

contract, the terms of the contract are controlling.

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

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

4. This solicitation is not an offer by the Government and does not obligate the Government to make any specific number of awards. Also, awards under this program are contingent upon the availability of funds.

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

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

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

8. In accordance with FAR 52.233-2 the following Service of Protest procedures shall be followed. Protests, as defined in section 33.101 of the Federal Acquisition Regulation that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgement of receipt from: Orin Cook, DTS-852, DOT/RSPA/Volpe Center, 55 Broadway, Kendall Square, DTS-852, Cambridge, MA 02142-1093.

VI. SUBMISSION OF PROPOSALS

A. Submittal Instructions

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

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

Proposals must be postmarked NO LATER than May 1, 1998 to qualify for acceptance and consideration under the current DOT SBIR Program. Proposals postmarked later than May 1, 1998 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, 1998.

B. Additional Information

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

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

3. **Confirmation.** The DOT SBIR Program Office will assign an identification number to each proposal received at the above address by May 1, 1998 or postmarked no later than May 1, 1998. This number will appear on the acknowledgement of receipt card (see inside back cover) which will be sent to the proposer by return mail confirming receipt of the proposal.

VII. SCIENTIFIC AND TECHNICAL INFORMATION SOURCES

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

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

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

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

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

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

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

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

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

VIII. RESEARCH TOPICS

Phase I research topics for DOT Operating Administrations are listed below. These topics indicate the specific areas for which proposals ar 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 FY98 PHASE I AWARDS

FEDERAL AVIATION ADMINISTRATION (FAA) ..... 2 Awards

Aircraft Safety

98-FA1 Cosmic Radiation Monitor

Human Factors

98-FA2 Air Traffic Controller Performance

FEDERAL HIGHWAY ADMINISTRATION (FHWA) .....7 Awards

Safety

[1] 98-FH1 Development of a Composite Guardrail System

[1] 98-FH2 Wide Area Intelligent Transportation Systems (ITS) Railroad Grade Crossing Obstacle Sensor

Traffic

[1] 98-FH3 Automatic Vehicle Body Classifier

[1] 98-FH4 Computer Based Instructional Tools for Intelligent Transportation Systems (ITS) Professional Capacity Building

Planning

[1] 98-FH5 Geographic Information System-Based Computer Assisted Interviewing Software

[1] 98-FH6 Development of Destination, Mode and Routing Choice Models for Freight

Pavements

[1] 98-FH7 Low Cost High Resolution Infrared Laser Range Finder for Pavements

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

DOT OPERATING ADMINISTRATION/TOPICS. . . . . POTENTIAL MAXIMUM FY98 PHASE I AWARDS

FEDERAL RAILROAD ADMINISTRATION (FRA) . . . . . 4 Awards

[2] 98-FR1 Automated User-Friendly Advanced Handbrake for Use on Railroad Freight Cars

[2] 98-FR2 Intelligent System for Real-Time Prediction of Railway Vehicle Response to the Interaction with Track Geometry

[3] 98-FR3 Composite Portable Track Loading Fixture

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

[4] 98-NH1 Advanced Frontal Air Bag Technologies

[4] 98-NH2 Enhancing the Detection/Recognition of Bicycles

UNITED STATES COAST GUARD (USCG) . . . . . 5 Awards

[5] 98-CG1 Interoperable Radio

[5] 98-CG2 "Wireless" Differential Global Positioning System (DGPS) Receiver

[5] 98-CG3 Inexpensive Marine Collision Warning Device

[5] 98-CG4 Develop Tool/Decision Criteria for "Most Efficient" Ship Route Passage or Planning

[5] 98-CG5 Optimized Transmission Control Protocol/Internet Protocol (TCP/IP) Stack

[2] Phase I may be up to $100,000 and Phase II may be up to $250,000
[3] Phase I may be up to $ 50,000 and Phase II may be up to $100,000
[4] Phase I may be up to $100,000 and Phase II may be up to $300,000
[5] Phase I may be up to $100,000 and Phase II may be up to $300,000

FEDERAL AVIATION ADMINISTRATION

98-FA1. COSMIC RADIATION MONITOR

A study to assess the feasibility of designing, developing and prototyping a cosmic radiation monitor is proposed. The monitor should detect and measure both the continuous and cumulative ionizing and radiation dose rate being received on civil aircraft flights above 49,000 feet. New aircraft designs are employing advanced digital avionics and flight control systems. These systems are incorporating very large scale integrated circuits which may be susceptible to single event upset (SEU) by high energy particles.

The Phase I research will consist of a feasibility study and the investigation of possible techniques to design a cosmic radiation monitor. Upon successful completion of Phase I, the actual development of the cosmic radiation monitor will be undertaken.

98-FA2. AIR TRAFFIC CONTROLLER PERFORMANCE

The core of the Federal Aviation Administration's Air Traffic Controller (ATC) Human Factors Program is human performance in a complex system. Reliable performance measures are needed to support ATC system simulation studies that provide data for comparisons between proposed approaches to ATC concepts, equipment, and software. The development of reliable and valid measurement tools will enable the FAA to more effectively evaluate controller current performance and estimate potential performance of controllers in training.

The primary objective of this research is to improve performance by advancing the state-of-the-art of ATC performance measurement methods, tools, and practices. This objective is accomplished by developing, refining, and evaluating performance measures that are sensitive to ATC system and controller performance. Measurement tools should be designed and tested for use in evaluating human performance in air traffic control simulation. Such measures will serve for future assessment of new systems and concepts in ATC.

The Phase I research will consist of innovative approaches to the development of ATC performance measurement methods using both available data flows from simulation products and alternative sources of measurement data. Upon successful completion of Phase I, the actual development of new performance metrics that are reliable and have a high probability of validity will be undertaken.

FEDERAL HIGHWAY ADMINISTRATION

98-FH1. DEVELOPMENT OF A COMPOSITE GUARDRAIL SYSTEM

Each year approximately 9,000 vehicle occupants are killed on our nation's roadways in vehicle collisions with fixed roadside objects. To mitigate this annual death rate, improved roadside structures that provide a more "forgiving" response to vehicle collision are sought. One such structure is the common W-beam guardrail system. This guardrail system is used in locations alongside our nation's roadways to protect the occupants of vehicles that have left the roadway and encroached into the roadside from a hazard greater than that which results when the vehicle collides with the guardrail system. Currently, W-beam guardrail systems are fabricated from hot-rolled steel sections which are subsequently galvanized (zinc coated) for corrosion protection. Due to the corrosive nature of the roadside, especially during the winter seasons when the removal of snow and ice from the road surface mandates the use of salt mixtures, the lifetime of a standard guardrail section is approximately 20 years.

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

FEDERAL HIGHWAY ADMINISTRATION

There is a need for a low cost composite guardrail system that has a greater resistance to corrosion than is currently available in the standard steel systems. A suitable composite material may consist of a non-corrosive matrix material strengthened by strands of a second higher strength material imbedded into the matrix. The resultant guardrail system must be crashworthy. Due to occurrence of end-on collisions, the guardrail ends must be crashworthy or have provisions for crashworthy end treatments. The guardrail system must be easily installed by work crews. Replacement of damaged sections due to vehicle collision or other causes must also be easily accomplished. Consideration should be given to curved roadways. Successful applications would either have a manufacturing capability or a close relationship with a manufacturing organization. Later phases of the program would require the involvement of a marketing organization capable of successful marketing to the many state, county, and local departments of transportation.

The Phase I research will consist of a preliminary design study to evaluate the technical and economic feasibility of a composite guardrail system. Time permitting, the construction and testing of the system or of critical components should also be accomplished to demonstrate structural adequacy and to access crash worthiness in a preliminary manner. Upon successful completion of Phase I, the actual development of the composite guardrail system will be undertaken.

98-FH2. WIDE AREA INTELLIGENT TRANSPORTATION SYSTEMS (ITS) RAILROAD GRADE CROSSING OBSTACLE SENSOR

Railroad grade crossings are difficult locations to detect obstacles in the potential path of an oncoming train. Conventional loop sensors have problems with the large amount of metal. Video sensors have difficulty detecting stalled vehicles and other obstacles reliably, and frequently require several video cameras to cover the rail crossing. This research project is for the design of innovative ways to reduce the number of cameras required for obstacle detection, to cover a wide area around the crossing, and to more reliably detect obstacles over the tracks. The sensor should be compatible with the advanced traffic controller and it's mounting cabinet being developed by Texas, California and New York (information on the advanced traffic controller is available from the IST Research Division of the FHWA/phone (703) 285-2408).

The resultant video sensor design should distinguish between different types of blockages and notify traffic and police departments of the location of the crossing and the need to immediately send assistance. It should define National Transportation and Communications for ITS Protocol (NTCIP) message(s) to be sent from the traffic controller to the system master (the NTCIP Overview Report Number NEMA TS3.1 - 1996 is available from NEMA, 1300 N. 17th Street, Rosslyn, VA 22209). It should provide for modification to the Real Time Traffic Control System (RT-TRACS) software to display the NTCIP messages for action by the appropriate personnel.

The Phase I research effort will consist of the development of the algorithms and equipment for a wide area ITS railroad grade crossing obstacle sensor, and a field demonstration of the feasibility of the concept. Upon successful completion of Phase I, the refinement of the algorithms and hardware, linkage of the system to RT-TRACS, and the demonstration of the complete system in field operation would be undertaken.

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

FEDERAL HIGHWAY ADMINISTRATION

[1] 98-FH3. AUTOMATIC VEHICLE BODY CLASSIFIER

When truck studies are carried out by stopping the vehicle manually, a variety of information about trucks, trailers, body types, etc., can be collected. Because this is labor-intensive, automated devices are being used instead. Automated vehicle classification (AVC) devices typically classify vehicles based on axle spacings or vehicle length. Information about the body type of the truck or trailers is not provided. With the advent of video and other "non-intrusive" traffic counting equipment, it may be feasible to classify vehicles automatically based on their body type. Some information about the type of cargo might also be detected automatically; for example, the presence of containers. A device which does this and does not require a land closure for installation would be valuable for studies of truck movements.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of an automatic vehicle body classifier. Upon successful completion of Phase I, the actual development of the automatic vehicle classification device would be undertaken.

[1] 98-FH4. COMPUTER BASED INSTRUCTIONAL TOOLS FOR INTELLIGENT TRANSPORTATION SYSTEMS (ITS) PROFESSIONAL CAPACITY BUILDING

Forty years ago, when construction of the national system of interstate and defense highways began, engineers were given the training they needed. Today, as intelligent transportation systems (ITS) become mainstreamed into our nation's transportation system, we must find ways to train today's and tomorrow's transportation professionals. The transportation professional of the future will incorporate basic knowledge from engineering - civil, electrical, and mechanical - and many other disciplines. Demands on people's time and the cost to travel no longer allows traditional training to be the only instructional option.

A modular interactive CD designed with the ability to update material is needed to enhance educational functionality. The ITS program is changing and evolving with the introduction of technology. Education, training and skills development through an interactive medium will succeed only if information is current, colorful and creative in its delivery. A computer-based instructional tool tied to an expert system such as an interactive CD is needed to showcase both these information-based transportation technologies and the latest educational technology. The topic selected will be part of an innovative series of integrated ITS deployment such as incident, emergency management, software procedure, standards, or systems engineering. The initial development platform will also function as a modular template for "plugging in" additional ITS components as needed. Today's successful training options incorporate instructional methods that offer low cost distance learning at the convenience of the student.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of a modular interactive CD with the ability to update material to enhance educational functionality for ITS professional capacity building. Upon successful completion of Phase I, the actual development of the computer-based instructional tools would be undertaken.

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

FEDERAL HIGHWAY ADMINISTRATION

98-FH5. GEOGRAPHIC INFORMATION SYSTEM-BASED COMPUTER ASSISTED INTERVIEWING SOFTWARE

Travel demand models can be a valuable tool to transportation decision-makers if their results are reliable and accurate. These complex models are heavily reliant on data collected through household travel surveys. Unfortunately, due to the fiscal constraints faced by most metropolitan areas, household travel surveys are typically only performed every 10 to 15 years, and in some areas every 20 years. These long lag times between survey cycles result in decreased confidence in the area's travel models. Historically, geocoding the data has been time consuming, and thus an expensive portion of the survey process. Geocoding involves assigning a specific geographic location to each traveler's trip origins and destinations. In recent years, transportation planners have increasingly been asked to provide model-based information in response to difficult policy questions. This has led to a trend toward much more disaggregate travel models. The result is a corresponding need for travel data accurately geocoded to very fine levels of spatial resolution, and often an increase in associated data collection costs.

A new tool is needed that would allow surveyors to easily geocode trip information as it is received from the traveler. This new tool would facilitate the collection of more detailed, higher quality data at lower costs to Metropolitan Planning Organizations (MPO). This project would develop a computer assisted interviewing software package based on geographic information system technology. The software should be designed to facilitate telephone and face-to-face interviewing using personal computers. It would allow for computerized, simultaneous
data collection and geocoding through the use of georeferenced maps and touch-screen technology. Once developed and field tested, this package would be a valuable resource for transportation agencies and survey contractors throughout the nation.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of geographic information system-based computer assisted interviewing software. Upon successful completion of Phase I, the actual development of the software would be undertaken.

98-FH6. DEVELOPMENT OF DESTINATION, MODE, AND ROUTING CHOICE MODELS FOR FREIGHT

Responding to planning requirements for the inclusion of freight and goods movement into transportation planning and processes, state and Metropolitan Planning Organization (MPO) planners are confronted with the need to update travel demand models to include freight movement. While the state of the art of travel demand forecasting is fairly well established and understood, the nature of goods movement is poorly understood and rapidly changing. The Federal Highway Administration has attempted to develop tools and data for planners to incorporate freight movement in travel demand models, through the advent of such things as the Quick Response Freight Forecasting System (available on Internet at http://www.bts.gov/tmip/papers/freight/quick/toc.htm) and the Characteristics of Urban Freight Systems (CUFS) Manual (available at the Intermodal and Statewide Programs Division of the Federal Highway Administration/phone (202) 366-9236), but many gaps exist in the area of freight forecasting.

A destination mode choice and routing model for freight is needed for state and MPO planners to be able to more accurately model the movement of freight. This model might fit within the traditional "four-step" modeling process (i.e. trip generation, distribution, mode split, and assignment), and should address the following issues: (1) destination choice; (2) mode choice; and 3) route choice. The destination choice element of this model must determine and detail the factors involved in modeling freight movement, such as whether household goods carrier

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

movements would be forecast based on number of household, etc. Mode choice can additionally deal with the break down of trucking into different truck sizes and configurations, complicating issues of multi-modal transportation and transfers. Route choice should examine private sector models for routing, and determine how route selection can be incorporated into an assignment procedure for various types of shipments. This examination should include "trip chaining" behavior in such things as parcel delivery and less-than-truckload movement.

This project would include examination of existing models and methods, detail the important factors and elements of the issues listed above, and develop a model to either fit goods movement into the traditional four-step travel demand model or develop a new approach. The resulting product would be of high commercial viability, given the near-universal need across the U.S. to include goods movement into modeling efforts.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of destination, mode, and routing choice models for freight. Upon successful completion of Phase I, the actual development of the routing choice models would be undertaken.

[1] **98-FH7. LOW COST HIGH RESOLUTION INFRARED LASER RANGE FINDER FOR PAVEMENTS**

The development of a high resolution infrared laser range finder with a minimum range of 12 inches, a maximum range of 36 inches, and with a typical operating range of 20 inches is needed. The laser dot size in this range should not exceed 0.5 millimeters, and the resolution should be at least 0.002 inches at a 20 inch distance from highway pavement. The sampling rate should be greater than 64 kHz. The laser range finder system will be used to determine pavement profile at highway speeds.

The Phase I proposal should contain system tradeoffs for possible optical and signal processing designs, an analysis of the selected optical system design, and a description of digital signal processing techniques expected to be used to meet the above specifications. The dynamic range and the frequency response of the system should also be specified. System calculations in MATHCAD and a list of hardware components and expected costs would be helpful, but are not required.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of an innovative low cost high resolution infrared laser range finder for pavements. Upon successful completion of Phase I, the actual development of the infrared laser range finder would be undertaken.

FEDERAL RAILROAD ADMINISTRATION

[2] **98-FR1. AUTOMATED USER-FRIENDLY ADVANCED HANDBRAKE FOR USE ON RAILROAD FREIGHT CARS**

Research is required to develop an automated handbrake intended to hold cars stationary on level track or on grade to prevent car runaway as with present handbrakes. This advanced brake should be compatible with the present air

[1]Phase I may be up to $100,000 and Phase II may be up to $500,000
[2]Phase I may be up to $100,000 and Phase II may be up to $250,000

brake system and be operationally functional with the newly developed Electronically Controlled Pneumatic (ECP) brake system. The brake must be operable manually and by air or electric means, including remote operation. Also, the brake must be capable of manual activation and release from either the side of the car, or by a person standing on the ground, and must remain operational until intentionally de-activated. The force required for manual operation must be significantly lower than the force required on a majority of the present freight cars. The automated handbrake must be capable of actuation and release with the provision of appropriate air or electric means. A built-in indicator must show clearly when the brake is applied or released. A universal design which may be applied to all types of freight cars is preferred.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of an innovative automated user-friendly advanced handbrake for use on railroad freight cars. Upon successful completion of Phase I, the actual development of the handbrake would be undertaken.

98-FR2. INTELLIGENT SYSTEM FOR REAL-TIME PREDICTION OF RAILWAY VEHICLE RESPONSE TO THE INTERACTION WITH TRACK GEOMETRY

Assuring the safe interaction of railway vehicles to track and its geometry is of paramount importance to the Federal Railroad Administration (FRA). Using a track geometry measurement and recording vehicle, the FRA currently measures the geometry of various tracks around the country in an annual track inspection program that assures track safety and its compliance with designated track classes that govern its maximum allowable operating speeds. It is desirable to investigate the feasibility of an intelligent system that can be mounted on a track geometry recording car, and which can make real-time predictions of the response of a vehicle specified by the inspection staff. The system should accept setup parameters defining the vehicle characteristics, such as carbody and bogie masses, as well as primary and secondary suspension stiffness and damping levels. Once initially set up, the intelligent on-board processor should then produce real-time predictions of the specified vehicle response to the continuously measured track geometry with the objective of identifying locations on track that may produce unsafe vehicle performance.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of an innovative, intelligent system for real-time prediction of railway vehicle response to the interaction with track geometry, and the initial testing of prototype systems. Upon successful completion of Phase I, the actual development of the intelligent system would be undertaken.

98-FR3. COMPOSITE PORTABLE TRACK LOADING FIXTURE

The Volpe National Transportation Systems Center (VNTSC) has developed the Portable Track Loading Fixture (PTLF) for the Federal Railroad Administration (FRA) Office of Research and Development as part of an ongoing track research program. The PTLF is a hand-held device which can be operated by a single person to spot-check the rail restraint capability of track. The original PTLF weighed 40 lbs., which made it too tiring for an inspector to carry while walking the track. More recent developments reduced this weight to 22 lbs. using easily available hydraulic components with a steel chassis.

In brief, the PTLF applies some 4,000 lbs. load between the two rails to measure the gage widening restraint capacity of the track. The gage is the distance between the rails measured 5/8 of an inch below the top of rail, and is typically 56.5 inches. The gage deflection measured between zero load and the full load of 4,000 lbs. is

[2]Phase I may be up to $100,000 and Phase II may be up to $250,000
[3]Phase I may be up to $ 50,000 and Phase II may be up to $100,000

considered to be indicative of the tie's condition in terms of its ability to maintain gage. The PTLF must apply the load, measure the forces applied, and measure the resulting change in gage with a measurement accuracy of 2% for both the load and change in gage measurement. This load is applied at the shear center of the rail that is at the radius between the web and base, to minimize the widening caused by rolling of the rail. The PTLF must apply its load with the gage in a range between 56.0 and 58.5 inches. Also, it must be insulated to prevent interference with a track circuit where it is used to signal the presence of a train.

Research is needed to further develop the PTLF by reducing its weight by at least 30% to approximately 15 lbs. or less using state-of-the-art composite materials. The design of the innovative single prototype composite portable track loading fixture (CPTLF) must equal or exceed the performance of the current PTLF in all relevant performance criteria. The CPTLF must be convenient to store and carry, must not interfere with track signaling by shunting the track, and must be able to withstand the harsh railroad environment. Currently, a few railroads have adopted the PTLF in their own inspection programs. Also, efforts are underway to incorporate the PTLF in the FRA Track Safety Standards as a gage strength assessment tool. The envisioned improvements to the PTLF would facilitate both its widespread use by railroads and its formal adoption as an assessment tool.

The Phase I research effort will consist of a feasibility study and the design and fabrication of a single prototype of an innovative, composite portable track loading fixture. Upon successful completion of Phase I, manufacture of approximately 100 units of the track loading fixture would be undertaken.

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

98-NH1. ADVANCED FRONTAL AIR BAG TECHNOLOGIES

While it is estimated that air bag restraint systems have saved more than 2,500 lives as of September 15, 1997, they have also been attributed to some fatal and serious injuries to a small number of infants in rear-facing child safety seats and to other occupants, primarily unbelted children and adults, in low-to-moderate severity crashes. NHTSA is therefore interested in the development of innovative low-cost advanced air bag technologies which will demonstrate significant improvements in frontal occupant protection over current air bag designs and that will provide a reliable basis for estimating the production cost to achieve them.

Examples of the possible objectives for advanced air bag technologies include: 1) Improve frontal crash protection for occupants of various sizes and ages in close proximity to deploying air bags; 2) Tailor air bag deployment based on rapid information of occupant size, seat position, safety belt use, and/or pre-crash position relative to the air bag; 3) Alter deployment path to mitigate inflation induced injuries to occupants near the air bag without compromising high speed crash protection; 4) Sense and delineate crash severity to allow timely adjustment of deployment initiation timing and/or air bag fill rates to minimize air bag aggressiveness; 5) Develop sensing schemes capable of detecting infants in rear facing child safety seats and all other children seated in front of a passenger air bag system (both statically and dynamically); 6) Achieve pre-crash anticipatory crash sensing and methods of implementing such achievement to provide improved occupant protection in frontal impacts; 7) Develop alternative inflation methodologies to attenuate air bag sound pressure levels currently produced; 8) Improve gas and/or respirable particulate close to the deploying air bags; 9) Development of nonintrusive measurement of internal air bag pressure, temperature, flow rates and particulate distribution during air bag deployment; 10) Other advanced air bag technology objectives. The goal of the research effort would be to develop innovative technology to address one objective (or more) for low-cost advanced air bag technology.

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

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

The Phase I research effort would consist of a feasibility study of the particular air bag technology proposed and the investigation of possible alternatives. Upon successful completion of Phase I, the actual development of the air bag technology would be undertaken.

98-NH2. ENHANCING THE DETECTION/RECOGNITION OF BICYCLES

In 1995, 300 bicyclists were killed in crashes with motor vehicles between the hours of 6 p.m. and midnight and another 17,000 were injured. Past research reported that in many of these crashes the driver was not able to see the cyclist until it was too late to stop or maneuver around the cyclist. Research into identifying ways to make the bicycle/cyclist more visible to oncoming motorists have focused primarily on the use of special retro-reflective materials that are sensitive to the light from oncoming vehicles' headlamps and reflect a portion of the incident light back to the driver. However, past research suggests using this approach does not result in substantial gains over standard reflectors in terms of bicycle/cyclist recognition. Not enough attention has been devoted to the development of novel bicycle detection/recognition systems; however, there is evidence that lights on the bicycle or cyclist, for example, could be detected by oncoming motorists from a much further distance as compared to retro-reflective treatments.

The Phase I research effort would explore the feasibility of developing low cost and low maintenance systems, possibly integrated into the bicycle design, that substantially increase bicycle/cyclist detection and recognition distances from all directions. Issues that need to addressed are minimum detection/recognition distances, use of external systems vs. those integral with the bicycle, battery operated vs. generator operated systems, maintainability, reliability, costs, etc. Upon successful completion of Phase I, the actual development of the proposed system would be undertaken.

UNITED STATES COAST GUARD

98-CG1. INTEROPERABLE RADIO

The development of a portable or base station radio system that will enable Coast Guard units (ships, aircraft, stations) to communicate with other government agencies (federal, state and local), and public safety organizations is needed. The Coast Guard operates on VHF-FM marine frequencies in the range of 156-158 MHz. Other government agencies operate using a variety of frequencies and modulations. They include 153-156 MHz, 162-174 MHz, 450-470 MHz, and 821-824 MHz. Since the frequencies and modulations used by these agencies are not standard throughout the country, the communications system needs to be flexible so that one system can be used throughout the Coast Guard.

The Phase I research effort will consist of a feasibility study and investigation of possible techniques and technological alternatives for the development of an interoperable radio. Upon successful completion of Phase I, the development of a production unit to be used for evaluation would be undertaken.

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

UNITED STATES COAST GUARD

[5] **98-CG2. "WIRELESS" DIFFERENTIAL GLOBAL POSITIONING SYSTEM (DGPS) RECEIVER**

Research is needed to develop an inexpensive, self-powered portable wireless differential GPS (DGPS) receiver system for easy and reliable use aboard all classes of marine vessels. This wireless system should consist of two primary elements; a self powered portable wireless DGPS receiver/transmitter unit that reports position and velocity information to a companion unit that receives these reports and makes them available to shipboard systems through a standard marine National Marine Electronics Association (NMEA) 0183 interface. The companion receiving unit need not be self powered; it is expected to be wired to shipboard systems. The system elements and wireless method should be designed to allow multiple wireless DGPS receivers to report to one or more receiving units. The range of the wireless unit needs to be sufficient to communicate DGPS reports between vessels and barges involved in a towing operation. The wireless unit may contain battery power, but should be designed for extended unattended use. Overall power consumption must be minimized and some form of power replenishment, such as solar cells, should be part of the wireless package.

The Phase I research effort will consist of a feasibility study and investigation of possible techniques and technological alternatives for the development of a "wireless" differential GPS receiver. For each suggested alternative, the Phase I work should include: expected performance comparisons, packaging alternatives, power consumption budgets, a design proposal, production cost estimates, and suggest market price estimates. Upon successful completion of Phase I, the development of a production unit for evaluation would be undertaken.

[5] **98-CG3. INEXPENSIVE MARINE COLLISION WARNING DEVICE**

Research is needed to develop an affordable electronic collision warning device for use by recreational boaters. The U.S. Coast Guard is conducting a large scale test of Automatic Identification System (AIS) technology that is designed to increase the awareness of large vessel location and speed. The AIS transponders that will be installed on large vessels will periodically broadcast data about the vessel. These signals can be received and used by non-AIS equipped vessels. A small inexpensive unit that takes advantage of these signals for the purpose of collision avoidance needs to be developed for the recreational boating community. This commercial product is envisioned as being able to intercept and decode the large vessel's AIS broadcast and combine this information with "own-ship" differential GPS position and velocity measurements to detect and warn of a potential collision. How warnings would be presented to the mariner is also an important part of this research.

The Phase I research effort will consist of a feasibility study and investigation of possible techniques and technological alternatives to developing an inexpensive and effective warning device. For each suggested alternative, the Phase I work should include: an experimental demonstration, performance comparisons, description of warning methods and indicators, design proposal, production cost estimates, and suggest market price estimates. Upon successful completion of Phase I, the actual development of a production unit for evaluation would be undertaken.

For general information about the USCG AIS Program, see the USCG web site at:
http://www.dot.gov/dotinfo/uscg/hq/g-a/pawss/home.htm

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

UNITED STATES COAST GUARD

98-CG4. DEVELOP TOOL/DECISION CRITERIA FOR "MOST EFFICIENT" SHIP ROUTE PASSAGE OR PLANNING

The development of logic and software to ensure the optimal fuel consumption of ships is needed. This logic and software should integrate an automated route planning tool which interfaces with a ship's speed-pilot system. The system should consider factors such as ship fuel consumption characteristics, variations in engineering plant configuration, environmental data such as winds, tide, and currents, and time factors such as minimal and maximum transit times, and earliest and latest departure and arrival times. The tool should be integrated into existing systems, such as the Electronic Chart Display and Information System (ECDIS).

The Phase I research effort will consist of a feasibility study and investigation of possible techniques and technological alternatives for the development of tool/decision criteria for "most efficient" ship route passage or planning. Upon successful completion of Phase I, the actual development of a complete system for field evaluation would be undertaken.

98-CG5. OPTIMIZED TRANSMISSION CONTROL PROTOCOL/INTERNET PROTOCOL (TCP/IP) STACK

The development of a TCP/IP Stack for the Windows NT Operating System (4.0 or later) that is optimized for wireless communication links is needed. The stack should have parameters that are modifiable so that the stack can be optimized for a particular link (slow speed satellite, high speed satellite, high bit error rate (BER) terrestrial, etc.).

The Phase I research effort will consist of a feasibility study and investigation of possible techniques and technological alternatives for the development of an optimized TCP/IP stack. Upon successful completion of Phase I, the development of a unit to be used for evaluation would be undertaken.

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

IX. SUBMISSION FORMS AND CERTIFICATIONS

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

U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. 98-1

PROPOSAL COVER SHEET

Project Title _____

Research Topic No. _____ Research Topic Title _____

Submitted by: Name _____

Address _____

City _____ State _____ Zip + 4 _____

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

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

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

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

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

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

Principal Investigator
Name _____

Title _____

Signature_____Date _____

Telephone No._____

Corporate/Business Official
Name _____

Title _____

Signature _____Date____

Telephone No. _____

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

U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. 98-1

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. 98-1

CONTRACT PRICING PROPOSAL

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

1. SOLICITATION/CONTRACT/MODIFICATION NUMBER

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

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

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

7. PERFORMANCE

PLACE		PERIOD	
a.		a.	
b.		b.	

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

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

9. PROVIDE THE FOLLOWING *(If available)*

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

10. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS WORK? *(If "yes" identify)*	11a. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT? *(If Yes," complete Item 11B)*	11b. TYPE OF FINANCING *(Check one*
☐ YES ☐ NO	☐ YES ☐ NO	☐ ADVANCE PAYMENT ☐ PROGRESS PAYMENTS ☐ GUARANTEED LOANS

12. HAVE YOU BEEN AWARDED ANY CONTRACTS OR SUBCONTRACTS FOR THE SAME OR SIMILAR ITEMS WITHIN THE PAST 3 YEARS? *(If "Yes," identify item(s), customer(s) and contract number(s) on reverse of form.)*	13. IS THIS PROPOSAL CONSISTENT WITH YOUR ESTABLISHED ESTIMATING ANI ACCOUNTING PRACTICES AND PROCEDURES AND FAR PART 31, COST PRINCIPLES? *(If "no," explain on reverse of form)*
☐ YES ☐ NO	☐ YES ☐ NO

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

a. WILL THIS CONTRACT ACTION BE SUBJECT TO CASB REGULATIONS? *(If "No," explain in proposal)*	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 t be adequate)*
☐ YES ☐ NO	☐ YES ☐ NO
c. HAVE YOU BEEN NOTIFIED THAT YOU ARE OR MAY BE IN NONCOMPLIANCE WITH YOUR DISCLOSURE STATEMENT OR COST ACCOUNTING STANDARDS? *(If "Yes," explain in proposal)*	d. IS ANY ASPECT OF THIS PROPOSAL INCONSISTENT WITH YOUR DISCLOSED PRACTICES OR APPLICABLE COST ACCOUNTING STANDARDS? *(If "Yes," explain in proposal)*
☐ YES ☐ NO	☐ YES ☐ NO

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

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

AUTHORIZED FOR LOCAL REPRODUCTION
Previous edition is not usable

STANDARD FORM 1411 (REV. 10-95
Prescribed by GSA - FAR (48 CFR) 53.215-2(

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

Background

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

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

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

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