AIR FORCE

PROPOSAL PREPARATION INSTRUCTIONS

The responsibility for the implementation and management of the Air Force SBIR Program is with the Air Force Materiel Command Deputy Chief of Staff for Science & Technology. The Air Force SBIR Program Manager is R. Jill Dickman. Do NOT submit SBIR proposals to the AF SBIR Program Manager under any circumstances. Inquiries of a general nature or problems that require the attention of the Air Force SBIR Program Manager should be directed to her at this address:

Department of The Air Force
HQ/AFMC/STXB (AF SBIR Program Manager)
4375 Chidlaw Rd
Suite 6
Wright-Patterson AFB OH 45433-5006

No additional technical information (this includes specifications, recommended approaches, further refinement, the limiting of topic areas, and the like) can or will be made available by Air Force personnel during the solicitation period. The only source for technical information is the Defense Technical Information Center (DTIC). Information is key to successful proposal preparation and research; however, locating pertinent information is often difficult. For this reason the DoD SBIR Program is working on better ways to serve the small business community with information support. Additional references are available for each topic in the Technical Information Packages (TIP) prepared by DTIC. Please refer to section 7.1 in this solicitation for further information on DTIC.

The maximum amount of SBIR funding used for any Air Force Phase I award shall be $60,000. Also firms are encouraged to submit a proposal for an option task which would be performed during the period between Phase I completion and Phase II contract award not to exceed $20,000. The basic Phase I proposal shall be evaluated exclusive of the option task and must therefore be proposed and priced separately. Any option proposal must be submitted at the same time and place as the basic Phase I proposal and shall not be included in the basic Phase I limitation to not exceed 25 pages. The option shall detail work that would logically transition a feasibility determination during Phase I into a practical application during Phase II. The transition work shall be included as an option in the Phase I contract and evaluated for unilateral Air Force exercise at any time after Phase I award through the conclusion of the Phase I contract reporting period. Exercise of any option shall be at the sole discretion of the Air Force and shall not obligate the Air Force to make a Phase II award. It is anticipated that the option portion of the proposal shall be 10 pages or less, not exceed $20,000, not exceed 3 months in duration, and be evaluated using the same evaluation criteria as for Phase I. Any resultant Phase I contract containing an option shall include a provision that sets forth the Air Force right to obtain the option effort at the previously agreed to price by providing written notice of same on or before the conclusion of the Phase I contract reporting period.

AIR FORCE PROPOSAL SUBMISSION INSTRUCTIONS

For each Phase I proposal, send one original (with red appendices A and B) and three (3) copies to the office designated below. Also, send an additional set of red appendices A and B, which are not stapled or mutilated in any way. Be advised that any overnight delivery may not reach the appropriate desk within one day.

TOPIC NUMBER CONTRACTING AUTHORITY	ACTIVITY/MAILING ADDRESS (Name and number for mailing proposals and for administrative questions)	(For contractual questions only)
AF94-236 thru AF94-247	Technology Transition Office ASC/SMTP (Gerry Cazzell) 2690 C Street, Suite 5 Building 22 Wright-Patterson AFB, OH 45433-7412 (Gerry Cazzell 513-255)	
AF94-248 thru AF94-251	Human Systems Center Armstrong Laboratory (AL/XPTT) SBIR Program Manager 2509 Kennedy Circle Bldg 125, Room 201 Brooks AFB TX 78235-5118 (Belva Williams, 210-536-2103)	Sharon Shen (512) 536-9393

INDEX OF AF FY94 SBIR TOPICS

SUBJECT/WORD INDEX TO THE AIR FORCE SBIR SOLICITATION

AIR FORCE TOPIC DESCRIPTIONS

AF94-236TITLE: Multipurpose Radio Frequency (RF) Test Antenna Coupler

CATEGORY: Exploratory Development

OBJECTIVE: Develop a multipurpose over-the-antenna "hat" for coupling RF avionics signals

DESCRIPTION: This requirement is for the development of non-disruptive, RF-signal injection technology. A hat for coupling RF signals must be placed over antenna apertures. This hat must be RF transparent. RF coupling must be RF transparent with minimal reflections. This system should augment free-space radiation testing and must not interfere with other free-space radiation sources. This coupler should be able to simulate dynamic angles of multiple targets within a beam width of one degree for each target. The angular coverage should be 180 and 90 degrees in azimuth and elevation, respectively. When integrated with a radar target generator and other aircraft systems, this design can be used to support dynamic integrated systems testing. Both signal transmission and reception directions are required.

Phase I will include an analytical study of the feasibility and a proposed system design.

Phase II of the investigation will be a functional demonstration of the system prototype in the Benefield Anechoic Chamber at Edwards AFB CA.

Dual Use Commercialization Potential: Both commercial aircraft and automotive industries could benefit from improved testing capability as well as any other industry with the need to test stand-alone and/or installed RF equipment.

AF94-237TITLE: Compensation of Free-Space Signal Propagation Errors

CATEGORY: Exploratory Development

OBJECTIVE: Develop a methodology to compensate and correct for the corruption of Free-Space Signal Propagation in Anechoic Chambers induced by multipath reflections and other error sources.

DESCRIPTION: This is a requirement for the technology of correcting radio frequency signals for the effects of multipath radiation. One of the main sources of Signal Propagation Errors in Anechoic Chambers are multipath reflections from Radar Absorbing Material. Multipath errors in signal propagation are the result of forward an/or back-scattered signal propagation paths that deviate from the direct path of propagation. When these signals combine together, they may interfere constructively or destructively with the direct path signal. There is a need to develop a methodology or technique to reduce these errors. A correction or compensation process would reduce the level of signal error induced by multipath signal propagation. By reducing these signal propagation errors, the fidelity of free-space signal propagation in anechoic chambers would be greatly enhanced.

Phase I of the investigation will include a concept feasibility analysis and a proposed design of the system components (hardware/software) to compensate for these signal propagation errors.

Phase II of the investigations will include the primary research required and a functional demonstration of the system.

Dual Use Commercialization Potential: Application of radio signal propagation correction techniques may have application in improving the quality and speed of digital signal transmission in commercial microwave and satellite systems.

AF94-238 TITLE: Low-Cost Antenna with Low-Radar Cross Section (RCS) for Radio Frequency (RF) Anechoic Chambers

CATEGORY: Exploratory Development

OBJECTIVE: Develop a low-cost, low-RCS, broadband, controllable antenna system for use in RF anechoic test chambers.

DESCRIPTION: This requirement is for the development of the technology of low-cost, low-RCS, broadband, controllable antenna system for application in RF anechoic test chambers. The goal is to span the 0.5 to 18 GHz frequency spectrum, with selectable polarization and selectable gain and beamwidths. Large anechoic chambers have the need for developing large RF array systems. Due to the large quantity of antennas needed, the unit cost must be low. When these arrays are placed within the chamber, the anechoic properties of the chamber must be preserved by installing antennas of low RCS. The proposed antennas will be installed within a controlled environment.

Phase I will conduct a feasibility analysis and propose a design.

Phase II will complete a final design and construct prototype antennas and demonstrate tests in the Benefield Anechoic Facility at Edwards AFB CA.

Dual Use Commercialization Potential: Low-cost, broadband, controllable antennas have applications in commercial anechoic facilities for testing of satellite systems and other communication devices. Potentially, this type of antenna technology could be applied to direct broadcast home television systems.

AF94-239 TITLE: Navigation/Hypersonic Sled Testing/Radar Cross Section Measurements

CATEGORY: Advanced Development

OBJECTIVE: Develop innovative systems or subsystems for advanced aerospace and weapons applications in support of Navigation/Hypersonic Sled Testing/Radar Cross Section Measurements

DESCRIPTION: Proposers may submit ideas to enhance performance of systems or subsystems specified in a-c below. Two divisions and one test squadron perform a full spectrum of basic and applied research including exploratory and advanced development.

a. The Guidance Test Squadron, also known as the Central Inertial Guidance Test Facility (CIGTF) is the DoD focal point for inertial navigation, guidance, and space-based radio navigation systems (such as Global Positioning System (GPS). Current development initiatives include the Navigation Test and Evaluation Laboratory; Ring-laser and cryogenic gyro development; Submeter Accuracy Reference System; Improved Three-Axis Test Table (a precision rate and positioning fixture used for testing space-based pointing and stabilization gyros and accelerometers); and Stellar Aided Test Capability. The objective is to improve the operational readiness and effectiveness by developing technologies which will enhance or modify current methods of aerospace navigation.

b. The Test Track Division conducts tests on high priority weapon systems for all three military branches of service. Tests include (but are not limited to) aircrew escape systems certification; hypersonic lethality tests to prove performance of theater missile defense warheads against threat warheads; ballistic missile guidance system tests with recovery of test item; hypersonic kinetic energy penetrator tests; aerothermal erosion tests of radome material; weapon dispenser performance; Infrared missile warning receiver effectiveness evaluation. The goals of the Test Track Division include understanding the limitations of mechanical stresses (noise, vibration, thermal, acceleration, and impact); providing design criteria for weapon system development/enhancement, and proposing protection devices.

c. The Radar Target Scatter (RATSCAT) Division performs signature measurements in support of DoD's electronic combat effort. It operates/maintains two signature measurement facilities; provides antenna pattern measurements, range characterization, and radar cross section (RCS) measurements of full-scale rockets, missiles, reentry vehicles, aircraft, ordnance and stores, as well as for radar absorbing materials, chaff, trucks, and other ground-based objects; conducts Phase, GLINT, high range resolution imaging, effective radiated power, antenna gain, and RCS measurements; designs and uses detailed physical and computer models for use in backscatter measurements. To meet the increasing test requirements, advanced materials applications and low observable design/analyses are also performed.

AF94-240 TITLE: Centrifuge Testing of INS/GPS Systems

CATEGORY: Advanced Development

OBJECTIVE: Develop the capability to test a GPS/INS integrated system on a precision centrifuge.

DESCRIPTION: The Central Inertial Guidance Test Facility (CIGTF), Holloman AFB, NM tests inertial navigation systems (INS) that have embedded Global Positioning System (GPS) receivers. Precision centrifuge tests are standard during the qualification of an INS, and are needed for embedded systems. The capability to perform a precision centrifuge test of an embedded system currently does not exist as the centrifuges are contained within metal structures so satellite signals required by the GPS receiver are not available. Both inertial and GPS technologies cannot be exercised simultaneously which leads to a sub-optimal environment for evaluating many types of guidance or navigation system errors. An advancement in the state-of-the-art in test bed equipment and technology is required to provide an adequate solution.

Phase I: Research into the feasibility of testing an integrated INS/GPS system on an existing CIGTF precision centrifuge utilizing revolutionary and innovative methods of exciting the on-board GPS receiver. Since current methods are inadequate, significant advancements in both live and simulated satellite signal scenarios should be pursued.

Phase II: Research into the design of the candidate system including software and hardware design and installation and checkout of a prototype.

Dual Use Commercialization Potential: Potential exists in the inertial industry, commercial aviation industry, and the automotive industry.

AF94-241 TITLE: Light/Flame Penetrating Motion Picture Photography

CATEGORY: Advanced Development

OBJECTIVE: Develop a reliable method to optically observe phenomena obscured by excessive light and heat.

DESCRIPTION: Various types of warhead and impact tests are conducted at the High Speed Test Track. During these tests, it is important to observe the movement of fragments, submunitions or targets while they are totally enveloped in flame and combustion products. The heat and light generated prevent the observation of these items by conventional photographic means. A method to observe the motion of theses items, that is not obscured by the intense light and heat generated, is required.

Phase I: Determine the feasibility of observing the motion of items obscured in light and flame.

Phase II: Design, build and demonstrate a prototype system capable of recording the motion of items obscured in flame and light.

Dual Use Commercialization Potential: The system has application in optically observing phenomena that occurs in blast furnaces, reactors, or in manufacturing processes such as welding or cutting metal.

AF94-242 TITLE: Bistatic Radar Cross-Polarized Calibration Methodology

CATEGORY: Advanced Development

OBJECTIVE: Develop a valid methodology for calibrating the cross-polarized response from an instrumentation radar.

DESCRIPTION: Bistatic radar signature refers to the electromagnetic scattering response of a target in directions other than toward the radiation source. Although a variety of radar calibration techniques have been developed for a bistatic configuration, there is no valid calibration techniques for a bistatic cross-polarized response (transmit one polarization, receive another). The key element of this research will be to develop a calibration device whose theoretical signature can be accurately characterized. Design constraints will include minimal interaction with target-support structures,

adequate background isolation, orientation insensitivities, and usable over a wide frequency range (typically 1-36 GHz).

Phase I: Propose a calibration device, and theoretical model to accurately describe this device. Final a report shall include a proposed methodology for using this device at a static outdoor measurement facility with all design constraints considered.

Phase II: Complete the development and construct a prototype of calibration device. Demonstrate the proposed calibration methodology at the 46 Test Group Radar Target Scatter Division (RATSCAT), Holloman AFB NM. Correlate theoretical values to measure values over the frequency range of interest to validate the proposed methodology.

Dual Use Commercialization Potential: Radars continue to have extensive value to DoD, government, and private industries. Accuracy and precision continue to be driving design factors. Inherent in this is the need for accurate calibration devices and methods. As Bistatic radar signatures become the next radar generation arena, development of bistatic calibration methodologies will have immediate application in developments for both the public and private sectors. Examples include air traffic control and approach radars.

AF94-243 TITLE: RF Radiation Absorbent Material (RAM) Over Heating Detector

CATEGORY: Exploratory Development

OBJECTIVE: Develop a Thermal Imaging System for the early detection of RAM overheating.

DESCRIPTION: The capability of RAM used within anechoic test chambers has reached safety limits to absorb Radio Frequency levels of modern radar systems. As RAM is heated, with RF energy, to their combustion temperature, burning internal to RAM may be initiated and erupt into fires hours after the RF energy has been stopped. To prevent the occurrence of RAM combustion and RAM damage due to overheating, a system to detect the presence of overheating of RAM in large anechoic chambers (over 100' X 100' X 40') is required. The purpose of this effort is to develop a real-time RAM heat monitoring system for the early prediction of RAM overheating. This system must be capable of detecting and locating hot spots in RAM within the anechoic chamber prior to initiation of combustion.

Phase I: Perform a technical feasibility analysis and propose system design.

Phase II: A prototype will be constructed and demonstration tests will be conducted in the Benefield Anechoic Facility of Edwards AFB CA.

Dual Use Commercialization Potential: Technologies of detection of overheating components in large areas has potential application fire prevention systems in commercial facilities. In commercial anechoic facilities this type of system has application to prevent potential fires in overheated RAM.

AF94-244 TITLE: Automatic Reconfiguration of Model Interfaces

CATEGORY: Exploratory Development

OBJECTIVE: Develop a computerized technique for interfacing scientific Models and Simulations (M&S)

DESCRIPTION: This requirement is for development of the technology to automate the data interface between scientific computer models. Most of the veriflex and validated scientific M&S programs. Consequently each model or simulation tends to define its own data and formats such that using models together is difficult. What is needed is a computerized technique for recognizing and capturing the output of each model and reformatting it as necessary for use as Input to other models. Such data sharing must be possible in real-time systems where data are buffered and shared incrementally, not just in non-real-time systems where data might be translated exclusively for only one other model input.

Phase I should result in a technical feasibility analysis and proposed system design.

Phase II should result in development of the option, and a demonstration of a prototype system which can share data among at least three scientific electronic combat M&S programs in real-time. The common (shared) format should support a recognized standard; e.g. J-MASS.

Dual Use Commercialization Potential: A product and schema which will effectively and efficiently translate ADA M&S into data transfer compatible routines would enable over thirty years of valuable software models and simulations to be used in development of improved M&S products.

AF94-245 TITLE: Intelligent Translation of FORTRAN to ADA

CATEGORY: Exploratory Development

OBJECTIVE: Develop a computerized technique for intelligent translation of FORTRAN code to ADA code

DESCRIPTION: This requirement is for the technology of an intelligent FORTRAN to ADA Translator which will incorporate unique ADA language capabilities in the translation. Most of the verified and validated scientific models and simulations (M&S) in current use were written years ago and are in FORTRAN. Today there are many advantages to using ADA. Rewriting millions of lines of FORTRAN in ADA would be labor intensive and error prone and very expensive. Current translators tend to make a "line by line" transliteration sometimes said to be the worst of both languages. An intelligent translator should capture the meaning of large sections of code, e.g., entire FORTRAN subroutines. And it should translate the idioms in FORTRAN to appropriate expressions in ADA. Finally it should impose some of the software engineering capability of ADA on the product.

Phase I should result in a technical feasibility analysis and proposed system design.

Phase II should result in the completion of the system and a demonstration of a prototype translator which converts actual scientific electronic combat M&S FORTRAN code to working ADA code.

Dual Use Commercialization Potential: Effective and efficient FORTRAN to ADA translation would enable over thirty years of valuable software models and simulations to be moved into future technology products.

AF94-246 TITLE: Development of non-chromate coatings for aluminum and magnesium in aircraft applications

CATEGORY: Advanced Development

DOD TECHNOLOGIES: Materials & Environmental Quality

OBJECTIVE: Develop corrosion protection coatings with a minimal environmental impact

DESCRIPTION: Chromate conversion coatings are used for corrosion prevention prior to the painting of aircraft. The Air Force would like to reduce the amount of chromate that is released during the coating and decoating processes by finding an alternative coating material which does not contain chromate compounds. This alternative aircraft coating material must have minimal detrimental impact upon the environment.

Phase I: Phase I will address initial formulation, fabrication, evaluation, and application techniques of specific subjects for proof on concept.

Phase II: Phase II will further develop and optimize the material and/or application techniques, and produce larger samples for a full spectrum of evaluations.

Dual Use Commercialization Potential: The requirements to comply with environmental regulations applies equally to the commercial coating industry. As such, much of the technology developed for compliance of military coating systems could be extended to commercial applications. Commercialization of the technology would involve scale-up to production capacity, and production of sufficient quantities of material to coat aircraft or other large objects using an environmentally complaint and commercially viable application techniques.

AF94-247 TITLE: Non-isocyanate Based Polyurethane Paints

CATEGORY: Exploratory Development

DOD TECHNOLOGIES: Materials & Environmental Quality

OBJECTIVE: Develop polyurethane paints that do not contain isocyanate compounds for Air Force equipment.

DESCRIPTION: The Air Force is interested in the research and development of coatings with minimal detrimental impact upon the environment. Of primary interest is the development of coatings that do not contain isocyanate compounds and are equal to or exceed the performance of Military Specifications, Mil-C-83286. The coating must meet low VOC and IR requirements. The application of these coatings are to include the initial coating procedures and any touch-up. This coating must be able to be applied to aircraft, aircraft ground support equipment and other Air Force equipment.

Phase I: Phase I will address initial formulation, fabrication, evaluation, and application techniques of specific subjects for proof on concept.

Phase II: Phase II will further develop and optimize the material and/or application techniques, and produce larger samples for a full spectrum of evaluations.

Dual Use Commercialization Potential: The requirements to comply with environmental regulations applies equally to the commercial coating industry. As such, much of the technology developed for compliance of military coating systems could be extended to commercial applications. Commercialization of the technology would involve scale-up to production capacity, and production of sufficient quantities of material to coat aircraft or other large objects using an environmentally compliant and commercially viable application techniques.

AF94-248 TITLE: Fugitive Emissions Detection System

CATEGORY: Exploratory Development

DOD TECHNOLOGIES: Environmental Effects

MAJOR S&T THRUST: Environmental Quality

OBJECTIVE: Develop a detection system for fugitive emissions in industrial applications.

DESCRIPTION: This requirement is for an emission detection system that is capable of operating under a wide range on environmental conditions. There is a need for a system that provides early warning of potential seal failures for compressors, valves, pumps, flanges, and other piping facilities which might cause fugitive emissions.

Phase I: Phase I would be to develop a system design specification and to perform preliminary requirement allocation and design for pumps, valves, and flanges that would meet the Federal and California Regulations. Federal Regulation 40 CFR Chapter 1, issued pursuant to the Clean Air Act, requires compressors, valves, pumps, and other piping facilities which might create fugitive emissions to be monitored on a regular basis with appropriate reporting and penalties for excessive failure. In California, even stiffer requirements and penalties (S.C.A.Q.M.D. Rule 1173) are being adopted and other areas are to follow. Present regulations dictate the use of continuous monitoring of seals to detect early failure. A superior system would detect incipient failure and give an electrical, visual, and/or audio signal of a potential problem. This would allow time for preventive action prior to any emission taking place. Detector systems must consider fire, wide temperature excursions, and wide ranging internal/external environments. They should be compatible to the maximum extent possible with existing flange, pump, and valve designs. In addition, they should be more economic than existing monitoring systems.

Phase II: Phase II would provide the risk assessment, develop a prototype design, testing requirements, and perform laboratory and/or field demonstration tests to insure the proposed design works and interfaces with existing piping and equipment.

Dual Use Commercialization Potential: This system will have wide spread use in the commercial field because of its application to industrial/manufacturing equipment.

AF94-249 TITLE: Environmental Engineering Research

CATEGORY: Exploratory Development

DOD TECHNOLOGIES: Environmental Effects

MAJOR S&T THRUST: Environmental Quality

OBJECTIVE: Develop innovative ideas/concepts in the area of compliance and site remediation environmental engineering.

DESCRIPTION: Environmental engineering research includes the following areas: environmental modeling, to include fate and transport in soils and groundwater and air toxins; sensor development, testing, and integration for hazardous waste site characterization and monitoring; chemical/process engineering, including process modification and process control; in-situ and on-site biological treatment technologies, including site remediation and process waste treatment; and chemical/physical treatment technologies, including site remediation and process waste treatment technologies; and concepts to eliminate, substantially reduce, or mitigate environmental consequences of future Air Force weapons systems.

Dual Use Commercialization Potential: Technologies in these areas are common to many DoD and commercial/industrial requirements.

AF94-250 TITLE: Occupational and Environmental Health Research

CATEGORY: Exploratory Development

DOD TECHNOLOGIES: Environmental Effects

MAJOR S&T THRUST: Environmental Quality

OBJECTIVE: Develop ideas/concepts in risk analysis, toxicity, pollution assessment, hazardous materials, and directed energy technology.

DESCRIPTION: This requirement is for the Occupational and Environmental Health Directorate which is responsible for assessment and mitigation of risks to human and environmental health from hazardous materials, noise, and electromagnetic radiation exposures associated with Air Force operational and occupational missions. This work supports, in large part, Air Force compliance with federal, state and local regulations governing environmental, safety, and occupational health, e.g. OSHA, AFOSH, Clean Air Act, Clean Water Act, RCRA, ATSDR, etc. The work is accomplished through seven functional areas: (1) Analytical Chemistry Services provides support to Air Force environmental pollution control programs. They respond to over 250 base level customers who send over 100,000 samples annually. Novel approaches to measuring and analyzing exposure to hazardous materials in air, water, soil, and vegetation (occupational and environmental applications) are sought. (2) Research and development activities for Bioenvironmental Engineering Services support environmental monitoring and compliance technologies for noise, ionizing and nonionizing radiation, toxic emissions into air, water, and soil, and hazardous material handling and abatement. (3) Occupational Medicine requires the ability to rapidly access health hazard information and to employ modern methods for exposure estimation to conduct occupational and environmental hazard assessments. (4) Optical Radiation Division conducts research on high energy density visible light, with special requirements in laser bioeffects and laser eye protection. (5) The Radiofrequency Radiation Division conducts research on the bioeffects of radiofrequency and microwave radiation with requirements in central nervous system effects at the cellular level. (6) The Mathematics Division conducts research on the analytical and modeling aspects of biomedical hazards of directed energy with requirements in tissue level interactions. (7) Toxicology research investigates the hazards of Air Force

chemicals and materials on humans and the environment with requirements in tissue dose estimation and injury mechanisms for hazard analyses.

Dual Use Commercialization Potential: The scope of work of the Occupational and Environmental Health Directorate impacts areas of interest that qualified small businesses work in. e.g., all human centered technology assessments to create a safer work place for Air Force personnel as well as determinations for the general public that the Air Force is a non-polluting "good neighbor." To meet that goal, clean air, clean water, materials toxicity, and directed energy source safety monitoring are required in the form of risk analysis, toxicity, pollution assessment, hazardous materials, and directed energy technology.

AF94-251 TITLE: Non-Aqueous Phase Liquid Detection by Seismic or Electromagnetic Imaging

CATEGORY: Exploratory Development

DOD TECHNOLOGIES: Environmental Effects

MAJOR S&T THRUST: Environmental Quality

OBJECTIVE: Develop methods to detect both light and dense non-aqueous phase liquids (LNAPL and DNAPL).

DESCRIPTION: Past disposal and handling practices for hazardous materials have resulted in subsurface contamination by fuels and solvents at many Air Force sites. Typically, fuels and chlorinated solvents lie on the top (LNAPL) or bottom (DNAPL) of an aquifer and slowly diffuse into groundwater, creating a long-term source of contamination. Currently there is no technology specifically aimed at detecting or monitoring the bulk fuel or solvent material that floats or sinks within the subsurface, in contact with the aquifer. Also, existing characterization/monitoring methods are labor intensive, complex, costly, and may produce invalid and unreliable results. This research will develop a system which characterizes and images LNAPL and DNAPL waste, and other objects within the subsurface. The use of geophysical techniques integrated with the cone penetrometer have potential for meeting this requirement. The proposed system may use pulsed seismic or electromagnetic sources to probe the subsurface. Subsurface radiators associated with the cone penetrometer will direct a seismic or electromagnetic pulse into the earth; and other subsurface receivers emplaced by a cone penetrometer will detect the transmitted pulses. Computer analysis of the detected signals will define the extent and type of underground deposits. An image will be produced through the computation of a pointwise soil dispersion curve (the dielectric constant and conductivity as a function of frequency). Development of such a system will accelerate environmental surveillance and waste location, and greatly reduce the number of soil samples needed to reliably detect contamination. By identifying the source of contamination, remediation efforts will be better targeted, allowing more efficient and cost-effective cleanup of these difficult sites. Cost savings to the Government could easily be millions of dollars annually.

Phase I: Phase I is expected to address Air Force requirements to develop technologies to characterize sites contaminated with fuels and solvents consistent with the tri-service roles and responsibilities established under Project Reliance. Phase II: Due to the magnitude and urgency of these requirements, normal scope and funding limitations do not apply. Dual Use Commercialization Potential: There is a significant commercial market for such a system as this will be a dual-use technology. The DoD uses contractors to conduct remediation at thousands of contaminated sites, as do the DoE and EPA. There is also a large number of contaminated sites created by industry, not associated with activities of any department or agency of the federal government, which will require remediation.