AIR FORCE

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

Department of The Air Force
HQ/AFMC/STXB (R. Jill Dickman)
4375 Chidlaw Rd
Suite 6
Wright-Patterson AFB OH 45433-5006

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.

Unless otherwise stated in the topic, Phase I will show the concept feasibility and the merit and Phase II will produce a prototype or at least show a proof-of-principle.

Topic Number	Activity/Mailing Address (Name and number for mailing proposals and for administrative questions)	Contracting Authority (For contractual questions only)
AF 95T001 - AF 95T003	Air Force Office of Scientific Research AFOSR/XPP (John Colon) 110 Duncan Avenue, Suite B115 Bolling AFB, DC 20332-0001 (John Colon, (202) 767-5015)	Harry Haraldsen (202) 767-4990
AF 95T004 - AF 95T005	Armstrong Laboratory AL/XPTT 2509 Kennedy Circle Brooks AFB, TX 78235-5000 (Belva Williams, (210) 536-2103)	Sharon Shen (512) 536-6393
AF 95T006	Rome Laboratory RL/XPX 26 Electronic Parkway Griffis AFB, NY 13441-4514 (Robert Falk, (315) 330-2912)	Mary Lovett (315) 330-2804
AF 95T007 - AF 95T008	Phillips Laboratory - Space & Missile Technology Directorate PL/XPI (Attn: Bob Hancock) Bldg 497 Room 239 3650 Aberdeen Ave S.E. Kirtland AFB, NM 87117-5776 (Robert Hancock, (505) 846-4418)	Mr. Roger Shinnick (505) 846-2664
AF 95T009	Wright Laboratory Flight Dynamics Directorate WL/FIOP BLDG 45 2130 Eighth St, Ste 1 Wright-Patterson AFB, OH 45433-7542 (Madie Tillman, (513) 255-5066)	Terry Rogers or Bruce Miller (513) 255-5830
AF 95T010	WL/MTX BLDG 653 2977 P St, Ste 6 Wright-Patterson AFB, OH 45433-7739 (Marvin Gale, (513) 255-4623)	Terry Rogers or Bruce Miller (513) 255-5830
AF 95T011	WL/POMX Bldg 18 1950 Fifth St, Room 105A Wright-Patterson AFB, OH 45433-7251 (Betty Siferd, (513) 255-2131)	Terry Rogers or Bruce Miller (513) 255-5830

AF 95T001 TITLE:Human Performance and Weapons System Enhancements via Polarization Technology

DESCRIPTION: The present breakthrough in polarization technology (PT) is a force multiplier. The PT will assist special operations aviators in more rapidly accomplishing their search and rescue (SAR) missions. This major enhancement to the special forces mission is made possible by a modular polarized three-line scanning lens (powered by a 9 volt camera battery) that is easily attached to a hand-held camera instead of the existing lens. The polarized scanning lens technology uses proprietary hardware modifications to an existing chip. The PT can be optimized (between 2 and 100 microns) to detect the presence of a small quantity of polarized plastic that is about the size of a credit card or floppy disc. The camera "sees" more than "unaided normal" human vision and easily displays the polarized target as a glowing red-violet color. Consequently, the PT technology allows for rapid identification and location of friendly assets (e.g., troops or equipment) that are concealed out of necessity amongst the background cover. This provides for more expeditious pick up of assets and a decreased probability of fratricide to airborne, ground- or sea-based assets. Additional research is required to benefit from the enhanced speed that would be realized from a totally self-contained chip with software optimized for performance. This additional research would also enhance the signal and reduce the noise resulting in an even clear picture and longer detection ranges. In addition, to the reduction of fratricide and SAR times, the PT technology could be used to mark a landing/drop zone. Other pertinent information would include passive identification of where on the surface ordnance should hit to destroy a concealed (no show) target such as a bunker or underground tunnel without divulging this information to the adversary.

Additional technical information packets may be obtained by calling John Colon, (202) 767-5015.

AF 95T002 TITLE:Stress/Failure Analysis Software for Multi-Material Interfaces

DESCRIPTION: The Air Force utilizes a variety of advanced composite materials in airframe structures and on-board electronic devices, including integrated circuits and multichip modules. Prediction of the expected life, durability and damage tolerance characteristics of structural and electronic components is important in designing and maintaining military equipment. In particular, Multichip Modules (MCM) are currently being developed for Air Force applications by several manufacturers. These modules are the next generation packaging technology. As such they will be present in nearly every piece of equipment used by the Air Force warfighter. They will be subjected to harsh environments (e.g., thermal, electromagnetic, structural). It is imperative that the Air Force have adequate modeling and simulation tools to assure that environmental hardness is built in during the original design. In order to assess the possibility of failure caused by strain and stress of MCM components, it is necessary to accurately calculate such values at multi-material boundaries where many failures are initiated. To date, the accuracy of this assessment has been poor due to singularity issues. Development of computational algorithms and software for the accurate calculation of strains and stresses near singularities remains an undeveloped, but vitally needed, component of complete MCM reliability assessment capability. Accurate and efficient algorithms and software are now being sought for the computation of the generalized stress intensity factors which characterize the temperature and stress fields at multi-material interfaces where stress mismatch drives damage nucleation. The formulation of failure criteria for multi-material interfaces subjected to thermal and mechanical loading involves functionals, the exact values of which are finite and in sensitive to minor variations in topology. Conventional prediction of thermaomechanical responses suffer from a variety of sources of numerical error. Since these functionals incorporate details of the stress and field the software must include a provable sound capability for a posterior error assessment.

Additional technical information packets may be obtained by calling John Colon, (202) 767-5015.

AF 95T003 TITLE:Fusion of Sensors that Interact Dynamically for Exploratory Development for Robust, Fast Object Detection and Recognition

DESCRIPTION: Sensing technology and algorithm design have advanced to a degree that it might be feasible now to reduce to practice the dynamic integration of low-resolution, wide angle sensors with high resolution, narrow angle sensors, in a single, efficient object detection recognition system.

The desirability of integration of inputs from more than a single sensor in order to interpret and analyze scenes has been apparent to researchers for a long time. It has been the object of intense research for the past two decades. To date however, there

are only a few examples of successful sensor fusion system in actual application. The intensity of computation, and the state of computation and sensor technology themselves prevented meaningful realization of such integration.

Low resolution sensors can detect the states of sparse pixels in a scene. Such detection is fast and efficient but not sufficient to provide information for object recognition. However, it is sufficient to detect the existence of an object. High resolution sensors can detect the state of pixels close to one another. They can therefore be efficient in extracting object features in a relatively small neighborhood.

The idea behind the dynamic integration of low and high resolution sensors is that upon detection of the existence of an object, the low resolution sensor transfers this information to the high resolution sensor for further intense investigation. The high resolution sensor in turn, upon identifying an object of interest, could "abstract" its features and signal the low resolution sensor to re-investigate other parts of the scene for possible additional such abstractions.

Additional technical information packets may be obtained by calling John Colon, (202) 767-5015.

AF 95T004 TITLE:Treatment of AFFF-contaminated Soils

DESCRIPTION: Information is required about the impact of Aqueous Film Forming Foam (AFFF) fluorocarbon-surfactant contamination on aerobic bioremediation technologies. These compounds are known to be recalcitrant to biodegradation. All other components of AFFF, such as glycol ether and hydrocarbon surfactants, are readily biodegradable by native soil bacteria. The goal of Phase I and Phase II proposed research is to (1) predict impact of AFFF fluorocarbon surfactants on in situ biodegradation processes; (2) recommend methods to prevent negative impacts on biodegradation processes; and (3) recommend modifications to biodegradation processes to prevent the negative impacts of the fluorocarbon surfactants. The research must establish the effect of soil type on the sorption of fluorocarbon surfactants on unsaturated soils, and the influence of soil contaminants (e.g., petroleum hydrocarbons) on the fluorocarbon surfactants. It must address the sorbed and unsorbed portions of the surfactants, quantify these amounts, and determine how these different surfactant phases and soil types affect bubble formation during aeration. Research should provide information on the influence of the fluorocarbon surfactants in unsaturated soils on the transport of contaminants in those soils, in addition to addressing the movement of the fluorocarbon surfactants through the soil. These questions could be answered in the first phase. This is necessary to develop methods used to prevent or control fluorocarbon surfactants from creating potential problems from bubble formation with remediation technologies such as in situ aerobic bioremediation. Knowledge gained through this research can be incorporated into a treatment process plan for fluorocarbon surfactant-contaminated sites. Knowledge gained from the first effort would be refined in the second phase where methods to reduce the negative impact of AFFF on biodegradation technologies will be applied to sites with surfactant-contaminated vadose soils (e.g., fire training facilities with petroleum hydrocarbon contamination). A model is expected which can be applied to remediation technologies. It may either be a prototype applicable to various sites, or a computer-generated model available for use at both military and civilian fluorocarbon surfactant-contaminated sites (e.g. predict the affect of fluorocarbon surfactants on remediation applications). The knowledge gained from this investment can be utilized in various aerobic bioremediation applications ranging from bioventing and oxygen microbubble treatments to soil vapor extraction and air sparging.

Additional technical information packets may be obtained by calling Belva Williams (210) 536-2103.

AF 95T005 TITLE:Human Systems/Subsystems Research

DESCRIPTION: Ideas are sought to enhance human performance as an integral part of Air Force systems and operations. Environmental research is conducted in the Environics Directorate and the Occupational and Environmental Health Directorate.

a. Innovative research is needed to develop a technique to image underground waste and other objects using electromagnetic and acoustic emitters to probe the earth's surface. Development of mathematical algorithms and a radiating and receiver system that will characterize underground deposits as to position and chemical nature is desired. The final product should be a small above-ground device that could be employed from a small truck or an airborne platform such as a helicopter. This technology will make it possible to search for underground waste using a rapid acting system for environmental surveillance and waste detection.

b. Innovative ideas/concepts are sought for sensors, sensor integration, and data analysis for site characterization and monitoring of sites contaminated with fuels and solvents including Dense Non-Aqueous Phase Liquids, for monitoring for Air Toxic compliance, and for on-line monitoring of industrial waste streams containing metals and other hazardous materials.

Additional technical information packets may be obtained by calling Belva Williams (210) 536-2103.

AF 95T006 TITLE:Innovative C3I Technologies

DESCRIPTION: C3I Technology pursued within Rome Laboratory addresses four mission thrusts: Command, Control & Communications; Electromagnetics & Reliability; Intelligence & Reconnaissance and Surveillance & Photonics. Proposals may address any aspect of C3I technology. Areas of interest may include but are not limited to the following:

a) C3 concepts for fixed, mobile or distributed command centers; mission-support system-planning tools; innovative methods for employing commercial off-the-shelf communications technology; innovative concepts and technologies in computer science (including software engineering, software quality, distributed-computer-systems technology, artificial intelligence and distributed data bases); innovative concepts in information portrayal; and survivable protocols.

b) Science and engineering research that encompasses all aspects of the system life cycle from "cradle to grave," including development and use of tools and techniques such as the following: 1) modeling and simulation; 2) materials and process characterization; 3) operational assessments; 4) assessment and correction of failure modes and effects; 5) development of diagnostic techniques for implementation of cost-effective, logistic support capability.

c) Electromagnetic technology, including the following: 1) adaptive pattern control for high-performance phased-array antennas; 2) innovative target and clutter scattering models for improved radar detection; 3) improved modeling of high frequency propagation for enhanced communications and small target detection; 4) monolithic millimeter wave components; 5) materials for thin, lightweight, conformal, phased arrays; 6) superconducting electronics for improved phased arrays, signal detection, and signal processing; and 7) computational electromagnetics for assessing susceptibility in RF environments.

d) A wide variety of surveillance technologies; including signal processing; airborne radars (bistatic radars and multispectral surveillance radars); advanced algorithm development and testing for airborne surveillance systems; and the application of digital and analog photonics to existing and planned Air Force systems.

Additional technical information packets may be obtained by calling Bob Falk (315) 330-2912.

AF 95T007 TITLE:Innovative Applications Advanced Photonics

DESCRIPTION: The Phillips Laboratory (PL) has corporate responsibility in the Air Force for the development of advanced weapons technologies. This activity includes the development of semiconductor diode lasers, diode-pumped solid-state lasers, mid-infrared lasers, chemical oxygen/iodine lasers, and photolytic iodine lasers. These high-power lasers; as well as related advancements in the development of nonlinear optics, nonlinear coupling of lasers, spatial light modulators, and imaging (active, passive and compensated); offer a wide range of opportunities for innovative, dual-use applications. It should be noted that while PL is not specifically interested in developing fiber-optic network technology, offerers should not be discouraged from submitting proposals which involve the use of fiber-optics or fiber-optic couplings. New and innovative concepts for the development of technologies and or applications in the following fields are sought.

a) Industrial Applications: PL is seeking novel proposals for innovative applications of high power lasers at wavelengths suitable for materials processing. Such applications may include precision measurement, cutting, boring, drilling, and welding as well as computer aided fabrication and assembly. Proposals to develop similar novel applications using emerging imaging technologies may also be appropriate.

b) Medical Applications: PL is also seeking proposals to develop novel diagnostic and surgical products using emerging laser and imaging technologies. Applications are being sought for new high power lasers at wavelengths useful for non-invasive surgical and diagnostic requirements. Proposals to develop medical diagnostic applications based on emerging compensated imaging and hyperspectral sensing techniques or technologies are also sought.

Additional technical information packets may be obtained by calling Robert Hancock (505) 846-4418.

AF 95T008 TITLE:Innovative Applications Of Advanced Spacecraft And Launch Vehicle Technologies

DESCRIPTION: The Phillips Laboratory (PL) has corporate responsibility in the Air Force for the development of advanced spacecraft and launch vehicle technologies. This activity includes the development of advanced space structures concepts; design, analysis and test methodologies of spacecraft and launch vehicle structures; vibration isolation; vibration damping; active and passive structural control; stabilization and precision pointing; smart mechanism and device concepts; sensors and actuators; health monitoring systems, and micro-electronics. New and innovative concepts for the development of technologies and/or applications in the following fields are sought.

a) Industrial Applications: PL is seeking novel proposals for innovative applications of vibration isolation, vibration damping, stabilization, precision control, and smart mechanisms/devices applicable to launch vehicles and spacecraft precision pointing missions. In addition, innovative proposals addressing health monitoring of dynamic systems using expert systems or neural network architectures are sought. Proposals to develop industrial applications of these technologies in the areas of precision machining and manufacturing, precision measurement equipment, semi-conductor fabrication, and health monitoring may also be appropriate.

b) Space Electronics/Packaging: New approaches and concepts for the development of dual-use paradigms in radiation-tolerant and/or radiation-hardened processes. The possibilities of novel exploitation of architectural and shielding features may be worth consideration. Flexibility and longevity are key, due to the dwindling demand base for these types of electronics. Innovation in advanced packaging approaches are also sought, not only for the purposes of miniaturization, but for performance enhancement. Another crucial area of exploration is in cost reduction/yield enhancement. One particular interest area is in finding qualified non-hermetic technologies, as it is felt that these will become synergistic with commercial sector applications that cannot tolerate the expense of hermetic enclosures.

Additional technical information packets may be obtained by calling Robert Hancock (505) 846-4418.

AF 95T009 TITLE:Air Vehicle Technology

DESCRIPTION: Air Vehicle Integration and Flight Dynamics Technology pursued within the Flight Dynamics Directorate of Wright Laboratory reflect the mission of four Divisions: Structures, Flight Control, Aeromechanics and Vehicle Subsystems.

STRUCTURES: Airframe Design Optimization requires the integration of the following engineering disciplines: structures, aerodynamics, controls, and vehicle subsystems; mathematical disciplines; and computer science related disciplines. The Flight Dynamics Directorate has developed a prototype system called "ASTROS" (Automated Structural Optimization System), which runs on most modern work stations and mainframes. ASTRO' comprehensive self-contained system allows easy enhancement and additions of new engineering modules. Any expansion related to airframe and other aircraft subsystems optimization qualifies as a potential topic for this solicitation. In the development of aging aircraft technology the goal is to generate methodologies for determining, assessing, and predicting the effects of various forms of aircraft service damage.

FLIGHT CONTROL: Simulation has proved to be an invaluable tool for aircraft and flight control design. This tool can be used earlier in the design cycle by having near-real-time simulations hosted on personal computers. The critical problem is inputting, in minimum time, aerodynamic data generated from analysis and from multiple wind tunnel tests including rotary balance testing. Generic control law structures, actuator and sensor models should be utilized, and interfaces with standardized control techniques law design software provided. Ideas for improvements to technologies, techniques, or subsystems used in single-site or networked flight simulators are solicited. Hardware or software, which improves performance and fidelity or lowers the cost of simulating an

aircraft subsystem, are of particular interest, as are novel uses of commercially available video and display technology. Ideas are solicited for human factors investigations of effects of network delays on long haul simulations. Areas of special interest include the identification of types of tasks which can be meaningfully simulated as with various amounts of network delays.

AEROMECHANICS: Sol-gel materials because of their unique nonlinear optical properties, can be engineered to optimize applications of interests to the Air Force. These applications include real-time holographic interferometry; high-speed spatial-light modulators; new sensors covering ultraviolet, visible, and infrared wavelengths; and large storage media for use in flow field diagnosis. Advanced sensor concepts for time-resolved pressure measurements in high-speed wind tunnels are sought. Convective scale fluid dynamic phenomena are difficult to access computational. Therefore, they are a fruitful area for experimental research. Current research is hampered by the lack of pressure sensors which respond at frequencies of interest (typically 200kz to 1 MHz) and which will survive the temperatures typical of high spec wind tunnels.

VEHICLE SUBSYSTEMS: Applicator nozzles of cryogenic, CO2 pellet-jet-blast cleaning and surface preparation equipment are of interest to the Air Force and proposals are solicited for their design and development. Current aircraft maintenance surface cleaning methods typically involve environmentally nonhazardous materials such as CO2 pellets, but may not be as efficient or as cost effective as desired. Applicator nozzle optimization should reduce operative costs and improve cleaning efficiency and abate noise of the equipment while ensuring an environmentally safe system. Design should be based on comprehensive understanding of the associated fluid and particle dynamics phenomena achieved through computational flowfield analysis and modern experimental techniques.

a. Infrared detector technologies have been developed that utilize sampling of air for the presence of flammables, by passing it through a short gap of about 1 centimeter. The purpose is to find methods to detect the presence of flammable gases prior to ignition so that preemptive actions can be taken. An improved approach would use an open channel or long optical path to provide direct monitoring of the protected space rather than involving long time delays associated with short gap monitoring.

b. The cooling techniques and heat transport system must be environmentally friendly, interface compatible with lightweight aircraft structures and avionics equipment, be lightweight themselves, affordable, producible, thrifty in terms of fluid flow pressure losses incurred and blower power consumption, with a goal to double the capacity of currently used systems, without sacrifice in thermal control quality. The expanded performance capabilities of modern and retrofitted military aircraft require the transfer of large quantities of waste heat from closely packed internal equipment. Methods need to be developed to greatly increase the heat transfer intensity and capacity of circulating gas systems suitable for cooling aircraft equipment and subsystems.

Technical information packets for the topic may be obtained by calling Madie Tillman at 513-255-5066

AF 95T010 TITLE:Manufacturing Integration/Infrastructure Technologies

DESCRIPTION: Manufacturing technology seeks quality research that will provide solutions to manufacturing integration issues in the supporting infrastructure of engineering and manufacturing application systems. Manufacturing is a team activity and the key success factor to that activity is communication among people and machines. The team can become cohesive and integrated once information is exchanged effectively and efficiently. The following topics are intended to provide general categories and areas of concentration for creative response.

a) Helioimaging Durable Product Generator (HDPG): Develop and demonstrate the manufacture of durable "one of a kind" products to design engineering specifications for function, useful, life, and mean time between failure requirements, etc. This technology represents an uninterrupted life cycle process and continuous electronic information flow from design through yielded product; where the design activity has accounted for product disposal. Media from which the materials for the product are derived require research into micron size materials, production processes, media for suspension, and encapsulation of materials for deposition. The product definition and processes should be based on the International Standards Organization Standard for the Exchange of Product Model Data (ISO STEP) standard with enhancements for demonstration of mechanical and electronic product life cycles.

b) Personal Translator Assistant (PTA): The world is quickly getting smaller with enterprises distributed across the globe. Multiple language translation and explicit understanding is a major barrier in the performance of jobs. A solution is required to this

communications problem through research, development, and demonstrated as a pin-on personal translation capability containing power and communications. This micro/nano sized electronics packaged technology will be state of the art in natural language processing and global information systems communications technology with an evolutionary strategy built into the design.

c) Enterprise Federation Models for Virtual Manufacturing (VM-EFM): Manufacturing is practiced via complex organizational network structures and supported by more complex information systems. Competitive pressures have increased the emphasis on the virtual capability to produce many products in small economic batches. Contained in the definition of virtual manufacturing is an integrated synthetic environment which can be exercised to enhance all levels of decision and control. VM-EFM is an enabler necessary to "perform realizable manufacturing in the computer." Federated models hold the promise of decision support and meaningful communication among disparate enterprises.

d) Virtual Enterprise Distributed Object Management Environment (VEDOME): The open nonintrusive architecture of VEDOME will be open and solve operational issues in the object management manager and object broker standards. This effort will demonstrate distributed management of assured transactions in real time for activities, programs, networks, and multiple data structures in a heterogeneous computing environment. A tailored VEDOME will support different manufacturing applications and end-users in industry and government enterprises. Systems administrators and end-users will automatically be provided their preferred intelligent user interface.

e) Near-netshape Casting Producing Machine (NCPM): The response time for delivery of product to customer's specifications in the global manufacturing market is the competitive edge. The NCPM demonstration will dynamically create precise and predictable near-netshape castings for end-products; derived from the digital product definition data of end products and their features. Resulting die sets can be precision coated (via sensor based plasma spray, etc.) and treated (thermally, etc.) for final tolerance. Design data for NCPM use will support the control of material properties and characteristics during material forming and transformation as design specified directly. Statistical data will be gathered, organized, analyzed, and modeled in categories of quality, cost, and performance and reported against traditional approaches.

Technical information can be obtained by calling Marvin Gale, WL/MTX, (513) 255-7371.

AF 95T011 TITLE:Electro Devices For Propulsion & Power Research

DESCRIPTION: Wright Laboratory's Aero Propulsion & Power Directorate conducts research in airbreathing propulsion, fuels and lubrication, and aerospace power technology. We are soliciting ideas for the following two areas:

a) Ideas for acquiring data optically from large arrays of microsensors measuring pressure, temperature, and wall shear stress are sought. An array of 1000 x 1000 sensors or greater could be of interest. Spatial and temporal resolution of scales which are characteristic of turbine blades and vanes is desired in low temperature (200-500F) research facilities. This capability would likewise be useful for a number of external aerothermal flows on aircraft and missiles. We would like to be able to resolve film cooling flows, film cooling effectiveness, heat transfer, pressure distribution, secondary flows, shocks, shock motion, separation, transition, and reattachment simultaneously with 10 to 30 realizations per blade passage. Temporal resolution capable of at least capturing and freezing the large scale motion in these flows would include scales at least as small as the region of high shear in the boundary layer. A spatial resolution as high as 10 sensors/mm might be desired in some situations. Currently, a number of silicon microsensors are being developed to accomplish many of the above tasks but simultaneous acquisition of a large dense array which depends upon a conventional A to D approach involves the very difficult or impossible task of wiring many individual sensors. An equally difficult task is recording the many channels of information, as is the formidable task of reduction and processing the data from large arrays. The goal of this effort would be to provide data realizations with both spatial and temporal resolutions comparable to the best computations with would be capable of being processed optically.

b) Interdisciplinary proposals for novel energy and power materials and devices with high payoffs in performance, reliability, and cost benefits for nonpropulsive aerospace power applications (e.g. The more Electric Airplane Initiative) and energy storage applications are being sought . Topics of interest include the following:

(1) Conventional and high temperature (>200C) semiconductor power device materials and large area electronic structures (gates, contacts, dopants) and processing methods.

(2) Dielectric coatings for semiconductors and conductors (e.g. conducting polymer wire coating).

(3) Novel soft and hard high temperature, low loss, high strength magnetic materials for aerospace generators, motors, and MHz inductive resonant switching devices.

(4) Lithiated and other conducting polymers for novel battery electrolytes.

(5) EMI suppressing/attenuating coatings and/or composite packaging structures.

(6) Novel high heat flux (100 W/cm^2) thermally stable coolants and high conductive interfaces for high temperature electronic cooling.

(7) Conducting polymers and contacts for power transmission (e.g. lightweight wire) and novel capacitor materials and devices.

Proposals should delineate the benefits envisioned in a quantitative fashion. Proposals addressing both the material development and device embodiment are encouraged.

Technical information packets for each subtopic may be obtained by calling Betty Siferd, 513-255-2131.

ARMY

Submission of Proposals

The responsibility for the implementation, administration, and management of the U.S. Army STTR Program rests with the Army SBIR/STTR Program Management Office. The Army STTR Program Manager is Dr. Kenneth A. Gabriel. You are invited to send your proposals directly to the following address:

U.S. Army Research Office--Washington
ATTN: AMXRO-W
Room 8N23
5001 Eisenhower Avenue
Alexandria, VA 22333
(919) 549-4336

The Army has identified four technical topics, numbered ARMY 95T001 through ARMY 95T004, to which small businesses and their partner research institutes may respond. Please note that these are the only topics for which proposals will be accepted at this time. Unless otherwise stated in the topic, Phase I will show the concept feasibility and the merit and Phase II will produce a prototype or at least show a proof-of-principle.

The four Army STTR topics presented on the following pages were generated by the U.S. Army Research Office. Selection of Phase I proposals for funding is based upon technical merit and the evaluation criteria contained in this solicitation document. Due to limited funding, the Army will only fund those proposals which are of superior technical quality and which present excellent opportunities for dual use and commercialization beyond STTR-funded projects.

Please note that the Army will be limiting Phase I awards to $100,000. Any Phase II contracts resulting from these Phase I efforts will be limited to $500,000.

ARMY 95T001 TITLE: Robust Biomolecular Catalysts

DESCRIPTION: In the form of enzymes, nature provides a wide variety of efficient catalysts for both synthetic and degradative chemical reactions of commercial importance. Capable of accelerating the rate of reaction by many, many orders of magnitude over the rate of an uncatalyzed reaction, while at the same time exhibiting a remarkably high degree of substrate specificity and exacting structural selectivity, enzymes offer a means to effect a number of chemical transformations of interest to the Army as well. To further enhance the range of practical application, say, for activity in solvents other than water, or in an immobilized or suspended state, biocatalytic technology needs to be advanced to a stage where enzymes or other enzyme-like protein molecules, or the environment in which they operate, might be engineered to create catalysts of desired specificity and rugged stability. This engineering might take the form of (1) existing enzyme protein modification by recombinant DNA methods, (2) combinatorially evolved and selected biocatalysts derived from an antibody repertoire, (3) chemical semi-synthetic modification of relevant protein derivatives or wholly synthetic biomimetic peptide-based catalysts, or (4) manipulation of solvent conditions to favor desired reaction thermodynamics, kinetics and stability.

Very recent work in the area of stabilization of enzyme crystals, by chemical crosslinking, serves as an example of the type of technology direction sought by the Army. With crosslinking, the crystalline lattice and constituent enzyme molecules are stabilized in a highly concentrated form able to withstand lyophilization and long term storage at room temperature. Just as importantly, these crosslinked enzyme crystals retain their catalytic activity in environmental extremes.

Areas of interest would include, but not be limited to, (1) catalytic breakdown of energetic materials, chemical agents and various environmental pollutants, (2) synthetic reactions of broad applicability to polymers and other chemicals.

REFERENCE: M.A. Navia and N.L. St. Clair, "Crosslinked enzyme crystals as robust biocatalysts," Proceedings of the Materials Research Society 1993 Symposium, Biomolecular Materials by Design.

ARMY 95T002 TITLE: Optical Sensors for the Cone Penetrometer

DESCRIPTION: Subsurface characterization is a prime requirement for environmental site assessment. This project will involve technical research and development leading to a new suite of optical sensors and sensor systems that can utilize the cone penetrometer as a fielding platform.

The cone penetrometer has been selected by the DOD as its primary tool for site characterization and assessment. This is being implemented under the Site Characterization and Analysis Penetrometer (SCAPS) program. A significant requirement for the SCAPS system is the development of diagnostic methods and technologies that can be accommodated by the 2.5 cm interior diameter of the cone penetrometer shaft. Recent advances in laser fiber optics and optical waveguide technology has provided the capability for novel optical interferometry/spectrometry systems and created an opportunity for improvements in integrated optic sensor technology.

What is sought are innovative opto-electronic chemical sensor systems, based upon the interaction of a guided optical beam with a surrounding medium, that will operate in the interferometer or spectrometer modes. Sensors must be compact and capable of being mounted on the standard geo-environmental cone penetrometer for the rapid, in-situ identification of hazardous substances. The sensor should have the capability of making quantitative assessments of specific or multiple chemical species in both gaseous and liquid media in soil down to the part-per-billion concentration range, exhibit a rapid response and be fully reversible so as to permit real-time analysis, neither generate nor be susceptible to environmental interferences, be of robust character, and have a low cost.

ARMY 95T003 TITLE: Mesoscale Smart Materials

DESCRIPTION: Integrated mesoscale functional materials are sought that have sensor and transducer capabilities. In an Army context, such materials are needed for improved active and passive signal control and suppression; damage evaluation, control, and self-repair; chemical/biological agent detection; automatic destruction/disposal; system failure mitigation, and integrated manufacturing process controls and response capabilities. In this context, rapid response and high capacity/light weight transducer capability are an important priority.

The work should in Phase I successfully complete proof of concept experiments for the new technology and scope out how its integration into an Army or civilian system could be accomplished. A commercialization plan should be outlined with prospective users and their interests identified.

In Phase II, the materials concept should be designed and built into a prototype system or component. Major cost and applicability issues involving Army and civilian commercialization should be explored and documented.

ARMY 95T004 TITLE: Small, Efficient Thermophotovoltaic Power Supply

DESCRIPTION: There is a critical need for compact, lightweight, quiet, and efficient power systems in the 100 to 500 watt range. In an Army context, these would be needed for a number of Soldier System requirements. Currently available power systems are either too large and heavy, or too noisy.

Thermophotovoltaic power systems offer a promising alternative. They are quiet and clean, relying on the combustion of fuels such as natural gas or hydrogen to produce thermal radiation which is then converted into electric power by photovoltaic cells. Thermophotovoltaic power systems have been very inefficient because standard thermal emitters are broadband continuum sources which cover a large region of the spectrum, so that only a fraction of the radiation is matched into the photovoltaic cell and the rest of the energy is wasted as unwanted heat.

Recent advances in composite emitters will significantly overcome this shortcoming and greatly enhance the overall efficiency of thermophotovoltaic systems. Composite emitters constructed from rare earth oxides selectively emit radiation in a narrow frequency band which can be matched to the photovoltaic cells. Research and development are required to further improve the mechanical integrity of the composite emitters, to match the emission spectrum onto appropriate photovoltaic cells, and engineer a system which produces power in the needed 100 to 500 watt range.

BALLISTIC MISSILE DEFENSE ORGANIZATION (BMDO)
SMALL BUSINESS TECHNOLOGY TRANSFER PROGRAM
Submitting Proposals

Send **five** copies of Phase I proposals to:
(Appendix A and B need not be red)
For administrative help **ONLY**:
call **800-937-3150**

Ballistic Missile Defense Organization
7100 Defense Pentagon
ATTN: DTI/STTR
Washington, DC 20301-7100

Proposals delivered by means other than US Mail must be delivered to Room 1D110, The Pentagon, Washington, DC. **WARNING: Only persons with access to the interior of the Pentagon building can reach Room 1D110. Delivery to a Pentagon entrance is not sufficient.** BMDO will acknowledge receipt if the proposal includes a self-addressed stamped envelope.

BMDO seeks the most innovative technology to find and disable a missile in flight -lighter, faster, smarter, more reliable components. Proposers need not know details of possible BMDO systems.

BMDO seeks to invest seed-capital, to supplement private capital, in a product with a future market potential (preferably private sector) and a measurable BMDO benefit. BMDO will not compete with private or government markets in that it will not further develop concepts already mature enough to compete for private capital or government development funds. BMDO prefers projects which move technology from the non-profit institution into the private sector market through a market-oriented small firm. BMDO expects to fund about 20 projects.

Phase I should be only an examination of the feasibility and competitive merit of the concept with an average cost about $60,000. Although proposed cost will not affect selection for negotiation, contracting may be delayed if BMDO reduces the cost ceiling. Phase I competition will give approximately equal weight to degree of innovation and market potential. Phase II competition will give more weight to future market potential. BMDO expects keen competition for both Phases.

Because BMDO seeks the best nation-wide experts in innovative technology, proposers may suggest both technical reviewers and contract technical monitors by enclosing a cover letter with the name, organization, address and phone number (if known), and a rationale for each suggestion. Each must be a government employee. BMDO promises only to consider the suggestion.

BMDO 95T001 TITLE: Sensors

DESCRIPTION: Sensors provide warning of attack, target identification, target discrimination from non-target objects, and determination of kill. New and innovative approaches are sought for sensors in the infrared, visible, and ultraviolet wavelengths for passive, active, and interactive sensors. Examples are: cryogenic cooling, superconducting focal plane elements, low power optical beam steering, passive focal plane imaging, interferometry for imaging, optics, diode pumped lasers, and optical materials.

BMDO 95T002 TITLE: Electronics and Photonics

DESCRIPTION: BMDO needs advances in processing capacity made possible by advances in electronics and opto- electronics. BMDO wants to advance integrated circuits, detectors, sensors, large scale integration, and radiation hardness. Advances are sought in band gap engineering, single crystal diamond, solid state lasers, optical detectors, electronics packaging, and any other related breakthrough technology.

BMDO 95T003 TITLE: Surprises and Opportunities

DESCRIPTION: BMDO recognizes that, at the leading edge of technology, surprises and opportunities may arise from creative minds and entrepreneurs. BMDO will consider proposals in other technologies that present an extraordinary opportunity for BMDO. But proposals will receive a preliminary screening that may reject them without full technical review as not offering enough of an extraordinary opportunity. This open call is for breakthrough technology with great market potential beyond the standards for the topics listed above.

NAVY

Proposal Submission

The responsibility for the implementation, administration and management of the Navy STTR program is with the Office of Naval Research. The Navy STTR Program Manager is Mr. Vincent D. Schaper. Inquiries of a general nature may be brought to the Navy STTR Program Manager's attention and should be addressed to:

Office of Naval Research
ATTN: Mr. Vincent D. Schaper
ONR 412 E
800 North Quincy Street
Arlington, VA 22217-5660
(703) 696-4286

All STTR proposals submitted in response to a Navy STTR topic should be sent to the above address.

This solicitation contains eight technical topics that meet the mission requirements of the Navy to which small R&D businesses together with a research institution may respond. As in SBIR solicitations the Navy will provide potential awardees the opportunity to reduce the gap between Phases I & II by providing a $70,000 Phase I proposal award and a $30,000 Phase I option award or may elect to just submit a Phase I proposal for $100,000. It a potential awardee chooses the former, the option effort should form the initial part of the Phase II work. If the potential awardees choose the latter the ability to reduce the gap may be lost and there is a risk of loosing inn competition when tied with a lower priced proposal (see paragraph 4.2 and paragraph 4.3 - Evaluation Criteria). Only an awardee whose Phase II proposal has been recommended and selected for award will be funded for the Phase I Option. Therefore, those who have finished or almost finished their Phase I should submit their Phase II proposal. The Phase II proposal should contain three elements: 1) a plan of how the proposer will commercialize the technology to the government and the private sector; 2) a Phase II work plan; and 3) a Phase II Option. At the end of the Phase II portion, a determination will be made by the Navy as to whether the proposer has satisfied the commercialization plan sufficiently for the government to fund the "Phase II Option" portion of the proposal. The Phase II option should address the further R&D or test and evaluation aspects of the proposal. The total Phase II funding should not exceed $500,000 with 80% going to the Phase II and 20% for the "option Phase II".

Selection of Phase I proposals is based upon technical merit and evaluation criteria contained in this solicitation document. Due to limited funding, the Navy reserves the right to limit awards under any topic and only those proposals considered to be of superior quality will be funded. For the following topics, Phase I will show the concept feasibility and the merit and Phase II will produce a prototype or at least show a proof-of-principle.

Department of the Navy FY 1995 STTR Topics

NAVY 95T001	General Structural Materials
NAVY 95T002	General Functional Materials
NAVY 95T003	General Nondestructive Evaluation Techniques
NAVY 95T004	Specific Structural Materials Processing
NAVY 95T005	Specific Structural materials in Electronic
NAVY 95T006	Specific Nondestructive Evaluation Techniques
NAVY 95T007	Environmentally Acceptable Processes
NAVY 95T008	Specific Functional Materials

Department of the Navy Topic Descriptions

The following Navy STTR topics encompass ADVANCED MATERIALS & PROCESSES. Concepts for new and innovative materials, processing and characterization methodologies, for structural and functional materials are encouraged.

NAVY 95T001 TITLE: General Structural Materials

DESCRIPTION: Development of innovative processing techniques and equipment for high temperature materials including composites and metal-ceramic hybrids, advanced metallics and intermetallics, and their protection against high temperature oxidation are sought.

NAVY 95T002 TITLE: General Functional Materials

DESCRIPTION: Development of innovative synthesis, equipment and processing techniques for materials with electrical, optical, magnetic or acoustic functionality including metals, ceramics, optics but not semiconductors are sought.

NAVY 95T003 TITLE: General Nondestructive Evaluation Techniques

DESCRIPTION: Development of novel techniques and equipment for the characterization of material integrity, properties, or microstructure through non-destructive and (if possible) non-contact methods are sought.

NAVY 95T004 TITLE: Specific Structural Materials Processing

DESCRIPTION: Development of processing techniques and equipment are required which can be integrated with CAD/CAM in order to produce complex-shaped structures in a cost-effective manner, as well as techniques which result in lowered sintering temperatures, superplastic forming capability, and/or improved mechanical properties.

NAVY 95T005 TITLE: Specific Structural Materials in Electronic Devices

DESCRIPTION: The integration and demonstration of high thermal conductivity materials and composites in electronic devices as part of packaging or heat sinks is desired. The development should also demonstrate the cost effectiveness of processing.

NAVY 95T006 TITLE: Specific Nondestructive Evaluation Techniques

DESCRIPTION: Development of equipment and techniques for the detection and measurement of surface residual stresses in non-ferrous metals by means (portable if possible) of other than x-ray, ionizing radiation or other hazardous techniques are sought.

NAVY 95T007 TITLE: Environmentally Acceptable Processes

DESCRIPTION: Development of processing techniques and equipment are sought which comply with anti-pollution legislation, such as application of zero volatile organic compound paints by the use of affordable supercritical fluids.

NAVY 95T008 TITLE: Specific Functional Materials

DESCRIPTION: Development of equipment and techniques for the processing and synthesis of the following materials are sought:

a. Electromechanical transduction materials-magnetostrictors, piezoelectrics and electrostrictors for structures vibrational control and sonar applications.

b. High temperature superconductors and magnetic ferrites for radar components and magnetic gradiometers.

c. Ferroelectric thin films and integrated ferroelectric/semiconductor structures for electro-optic, high density memory, and non-volatile memory applications.