The Department of Defense

DoD DEPARTMENTS/AGENCIES:

Department of the Army

Department of the Navy

Department of the Air Force

Defense Advanced Research Projects Agency

Defense Nuclear Agency

Strategic Defense Initiative Organization

DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM (SBIR)

VOLUME I
ARMY
ABSTRACTS OF PHASE I AWARDS 1991

NATIONAL SBIR CONFERENCES

FEDERAL R&D OPPORTUNITIES
FOR
TECHNOLOGY INTENSIVE FIRMS

Sponsored by:
Department of Defense/National Science Foundation
In Cooperation with
All Federal SBIR Departments and Agencies

- R&D and Technology Marketing Opportunities to 11 Federal Agencies and 20 Major Corporations.
- Seminars in 20 Special Areas Important to Small Technology Firms, Including Procurement, Audit, Accounting, and Proposal Preparation.
- Keynote Speakers and Special Sessions on Commercializing R&D, Tech Transfer, Environmental Opportunities, State Programs, Minority and Woman-Owned Firms.

EAST	WASHINGTON	OCTOBER 27-29, 1992
WEST	PHOENIX	NOVEMBER 17-19, 1992
MID-WEST	MINNEAPOLIS	APRIL 27-29, 1993

For Registration or Further Information:
Contact Foresight Science & Technology, Inc.
Hotline (407) 274-4005 Contractor to NSF/DOD

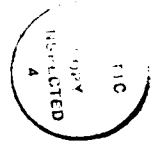
FY 1991 SBIR SOLICITATION

PHASE I AWARD ABSTRACTS

ARMY PROJECTS

VOLUME I

TABLE OF CONTENTS



PREFACE

This report presents the technical abstracts of the Phase I proposals that resulted in contract awards from the Fiscal Year 1991 Solicitations of the Department of Defense (DoD) Small Business Innovation Research (SBIR) Program. The Army, Navy, Air Force, Defense Advanced Research Projects Agency (DARPA), Defense Nuclear Agency (DNA), and Strategic Defense Initiative Organization (SDIO) are the DoD components of the SBIR Program. Two solicitations inviting small business firms to submit proposals under this program were published in FY91. All six DoD components participated in Program Solicitation 91.1 (Closing Date: 11 January 1991), and Army, Navy, and DARPA participated in Program Solicitation 91.2 (Closing Date: 1 July 1991). The selection of proposals for funding was made from proposals received by the Military Services and Agencies.

FY 1991 SBIR PROGRAM

	Number of Topics		Proposals Received		Phase I Awards	
	91.1	91.2	91.1	91.2	91.1	91.2
Army	30	225	806	2033	60	219
Navy	290	77	2683	843	221	85
Air Force	202	–	2340	–	232	–
DARPA	83	160	838	1227	123	158
DNA	20	–	208	–	21	–
SDIO	15	–	632	–	128	–
Total	640	462	7507	4103	785	462
Grand Total	1102		11610		1247	

Of the 1247 Phase I awards, 159 awards went to minority-owned businesses and 105 awards were to woman-owned businesses. Overall, 10.7 percent of the FY91 SBIR proposals were selected for funding.

In order to make information available on the technical content of the Phase I projects supported by the DoD SBIR Program, four volumes containing the abstracts and contracts for the awarded projects are published. The small business information with accompanying abstract are arranged in alphabetical order by firm name. Cross reference indices appear at the back of the volume for quick reference.

- Volume I contains Army Projects
- Volume II contains Navy Projects
- Volume III contains Air Force Projects
- Volume IV contains DARPA, DNA and SDIO Projects

Venture capital and large industrial firms that may have an interest in the research described in the abstracts in this publication are encouraged to contact the firm whose name and address is shown.

INTRODUCTION

In 1982, Congress enacted and the President signed the "Small Business Innovation Development Act of 1982" (Public Law 97-219), which created the Small Business Innovation Research (SBIR) Program to give small, high-technology firms a greater share of the federally-funded research and development contract awards.

Under the SBIR Program, each federal agency with an extramural budget for research or research and development in excess of $100 million per fiscal year must establish an SBIR Program. The program is funded by setting aside 1.25 percent of the participating agency's extramural R&R&D contracting dollars. The agencies participating in the Department of Defense SBIR Program are the Army, Navy, Air Force, Defense Advanced Research Projects Agency (DARPA), Defense Nuclear Agency (DNA), and Strategic Defense Initiative Organization (SDIO).

The objectives of the DoD SBIR Program include stimulating technological innovation in the private sector, strengthening the role of small business in meeting DoD research and development needs, encouraging participation by minority and disadvantaged persons in technological innovation, and increasing the commercial application of DoD-supported research or research and development.

The SBIR Program consists of three distinct phases. Under Phase I, DoD components make awards to small businesses, typically of up to one man-year of effort over a period of six months, subject to negotiation. Phase I is to determine, insofar as possible, the scientific or technical merit and feasibility of ideas or concepts submitted in response to SBIR topics. Proposals selected for contract award are those which contain an approach or idea that holds promise to provide an answer to the specific problem addressed in the topic. Successful completion of Phase I is a pre-requisite for further DoD support in Phase II.

Phase II awards will be made only to firms on the basis of results from the Phase I effort, and the scientific and technical merit of the Phase II proposal. Proposals which identify a follow-on Phase III funding commitment from non-Federal sources will be given special consideration. Phase II awards will typically cover two to five man-years of effort over a period of 24 months, also subject to negotiation. The number of Phase II awards will depend upon the success rate of the Phase I effort and availability of funds. Phase II is the principal research or research and development effort, and requires a comprehensive proposal outlining the intended effort in detail.

In Phase III, an innovation is brought to the marketplace by private sector investment and support. No SBIR funds may be used in Phase III. Also, under Phase III, DoD may award follow-on contracts with non-SBIR funds for products and processes meeting DoD mission needs.

Proposals received in response to a DoD solicitation are evaluated on a competitive basis in the organization which generated the topic, by scientists and engineers knowledgeable in that area. Selections for Phase I are made in accordance with the following criteria:

- The scientific/technical quality of the research proposal and its relevance to the topic description, with special emphasis on its innovation and originality.
- Qualifications of the principal investigator, other key staff, and consultants, if any, and the adequacy of available or obtainable instrumentation and facilities.
- Anticipated benefits of the research to the total DoD research and development effort.
- Adequacy of the Phase I proposed effort to show progress toward demonstrating the feasibility of the concept.

Public Law 99-443, the "Small Business Innovation Act of 1986" was signed by the President on October 6, 1986. This law re-authorized Public Law 97-219 (signed July 22, 1982) to extend the "Sunset Clause" to 1993; to continue 1.25 percent taxation of the extramural research and development budget; and excludes from taxation those amounts of the DoD research and development budget obligated solely for operational systems development.

ABTECH CORP.
700 HARRIS STREET
CHARLOTTESVILLE, VA 22901
Phone: (804) 977-0096
Topic#: 91-036 ID#: 91ARD-080
Office: ARDEC
Contract #:
PI: GERARD J. MONTGOMERY
Title: ABDUCTIVE/EXPERT SYSTEM CONTROLLER
Abstract: THE OBJECTIVE OF THIS EFFORT IS TO DEMONSTRATE A PROTOTYPE CONTROLLER FOR A HOWITZER USING A HYBRID NETWORK AND PRODUCTION RULE SYSTEM. THE RESULTING ADAPTIVE CONTROLLER WILL DEMONSTRATE THE FEASIBILITY OF DEVELOPING A REVOLUTIONARY CONTROLLER CAPABLE OF ADAPTING IN A DYNAMIC ENVIRONMENT, MONITORING AND DIAGNOSING BEHAVIOR, AND PREDICTING FUTURE FAULTS AND MAINTENANCE REQUIREMENTS. ABTECH HAS DEVELOPED AN INNOVATIVE NETWORK APPROACH, CALLED ABDUCTIVE NETWORKS, BASED ON MANY YEARS OF RESEARCH IN NEURAL NETWORKS AND ADVANCED STATISTICS. ABDUCTIVE NETWORKS ARE SIMPLY NETWORKS OF VERY POWERFUL NODE TYPES SUCH AS HIGH-ORDER POLYNOMIAL EQUATIONS. THIS PROPOSAL FIRST INTRODUCES AIM - A PRACTICAL SUPERVISED LEARNING TOOL FOR SYNTHESIZING ABDUCTIVE NETWORKS FROM DATABASES OF EXAMPLES. IT DISCUSSES HOW NETWORKS CAN BE APPLIED TO SUBSTANTIALLY INCREASE THE CONTROL AND DIAGNOSTIC CAPABILITIES OF SYSTEMS IN A PRACTICAL AND VERY COST-EFFECTIVE MANNER. IT THEN DETAILS A SPECIFIC PROJECT TO APPLY THE EXISTING AIM SOFTWARE AND A PRODUCTION RULE SYSTEM TO AN ARTILLERY SUBSYSTEM APPLICATION.

ADIABATICS, INC.
3385 COMMERCE DRIVE
COLUMBUS, IN 47201
Phone: (812) 372-5052
Topic#: 91-104 ID#: 91104-02
Office: TACOM
Contract #:
PI: PATRICK BADGLEY
Title: NOVEL AIR GAP INSULATED PISTON
Abstract: ADIABATICS, INC. IS PLEASED TO PROPOSE A RESEARCH PROGRAM TO DESIGN AN OPTIMUM PISTON FOR A HIGH TEMPERATURE MILITARY ENGINE. ADIABATICS, INC. HAS BEEN CONDUCTING A PROGRAM FOR TACOM TITLED "DEVELOPMENT OF TRIBOLOGICAL SYSTEMS AND ADVANCED HIGH TEMPERATURE IN-CYLINDER COMPONENTS FOR ADVANCED HIGH TEMPERATURE DIESEL ENGINES" FOR THE PAST FIVE YEARS. BASED ON OUR EXPERIENCE WITH DESIGNING COMPONENTS AND TESTING THEM ON A SINGLE CYLINDER AIPS ENGINE IT IS APPARENT THAT THE PISTON AND LUBRICATION SYSTEM ARE THE KEY COMPONENTS FOR THE SUCCESS OF THE ENGINE, AND MOST OF THE PROGRAM EFFORT HAS BEEN ON THESE ITEMS. A NOVEL PISTON DESIGN CONCEPT IS PROPOSED WHICH HAS THE POTENTIAL TO SOLVE SOME KEY PROBLEM AREAS WHICH HAVE BEEN IDENTIFIED DURING THE PROGRAM. THE PROPOSED PROGRAM WILL CONSIST OF EXTENSIVE FINITE ELEMENT ANALYSIS OF THE NEW NOVEL PISTON DESIGN INCLUDING MATERIALS SELECTION. THE NEW PISTON IS DESIGNED TO MEET THE PISTON HEAT REJECTION GOALS WITHOUT REQUIRING A THERMAL BARRIER COATING OR OTHER TYPES OF CERAMIC COMPONENTS.

ADVANCED ENGINEERING
P.O. BOX 1630
ALPINE, CA 91903
Phone: (619) 445-5748
Topic#: 91-081 ID#: 91MIC-060
Office: MICOM
Contract #: DAAH01-92-C-R164
PI: ROBIE FAULKNER
Title: THRUST AUGMENTATION SYSTEM FOR LOW COST EXPENDABLE TURBOJET ENGINE
Abstract: This Phase I program will entail design and development of a compact reheat burner and ejector augmentation system. A heavy wall prototype will be provided to the government for test evaluation.

ADVANCED ROTORCRAFT TECHNOLOGY, INC.
1685 PLYMOUTH STREET, SUITE 250
MOUNTAIN VIEW, CA 94043
Phone: (415) 968-1464
Topic#: 91-175 ID#: 91AVS-008
Office: AVSCOM
Contract #:
PI: HOSSEIN-ALI SABERI
Title: ADVANCED COMPUTATIONAL FLUID DYNAMICS METHODS FOR ELASTIC HELICOPTER BLADES

Abstract: CURRENT RESEARCH IN ROTORCRAFT ANALYSIS DISCIPLINES HAS BEEN EXTENSIVE BUT IN PARALLEL PATHS. SPECIFICALLY, ON GOING RESEARCH CONTINUES IN COMPUTATIONAL FLUID DYNAMICS (CFD) FOR THE NONLINEAR AERODYNAMIC ANALYSIS OF ROTOR BLADES AND COMPUTIONAL STRUCTURAL DYNAMICS (CSD) FOR THE NONLINEAR STRUCTURAL DYNAMIC ANALYSIS OF COMPOSITE ROTOR BLADE. CFD CODES BASED ON TRANSONIC SMALL DISTURBANCE, FULL POTENTIAL, EULER, AND NAVIER-STROKES THEORY BEING DEVELOPED. SIMILARLY, CDS CODES BASED ON MODAL ANALYSIS AND FINITE ELEMENT THEORY RESOLVED. ONE METHOD IS TO "TIGHTLY" COUPLE THE TWO DISCIPLINE. THAT IS, USE THE CFD CODE TO PREDICT THE UNSTEADY AERODYNAMIC FORCES ACTING ON THE STRUCTURE BASED ON THE KNOWN POSITION AND VELOCITY OF THE BLADES. THE OBJECTIVE OF THIS STUDY IS TO PROTOTYPE A "TIGHT" COUPLING METHOD BETWEEN CFD AND CSD CODES. THE FPR CODE HAS BEEN SELECTED TO REPRESENT THE CFD CODES, AND 2GHAS HAS BEEN SELECTED TO REPRESENT THE CSD CODES. DYMORE WILL BE USED IN THE PHASE I ACTIVITY INSTEAD OF 2GHAS. AFTER THE THEORETICAL DEVELOPMENT, A MODULAR SOFTWARE WILL BE DESIGNED AND IMPLEMENTED TO ACCOMPLISH THE "TIGHT" COUPLING BETWEEN FPR AND DYMORE. THE COUPLED CODES WILL BE TESTED FOR NUMERICAL STABILITY AND CONVERGENCE. THE PUMA BLADE MODELED IN [1] WILL BE USED TO DEMONSTRATE THE PROOF OF CONCEPT. FINALLY TASKS IN SIMILAR COUPLING BETWEEN FPR AND 2GHAS CODES WILL BE IDENTIFIED AND A SOLUTION PROCEDURE WILL BE PROPOSED.

ADVANCED TECHNOLOGY AND RESEARCH CO
14900 SWEITZER LANE
LAUREL, MD 20707
Phone: (301) 498-8200

Topic#: 91-033
Office: ARDEC
Contract #:
PI: DR. ANTHONY J. BARBERA

ID#: 91ARD-103

Title: A GENERIC METHODOLOGY & ENVIRONMENT FOR SENSOR BASE CONTROL APPLIED TO MILITARY LOGISTICS

Abstract: IN ORDER FOR ROBOTIC TECHNOLOGY TO MOVE INTO THE NEXT GENERATION, IT MUST EVOLVE FROM STANDALONE COMPONENT OPERATION TO THE CONCEPT OF TOTALLY INTEGRATED SYSTEMS OF MANY CONCURRENTLY EXECUTING SUBSYSTEMS THAT ARE CONSTANTLY EVOLVING. FURTHER, THIS TECHNOLOGY MUST SUPPORT ADDITIONAL SYSTEM ACTIVITIES SUCH AS REAL-TIME DIAGNOSTICS, DECISION AID SUPPORT, BUILT-IN TRAINING, AND REAL-TIME RECONFIGURATION IN THE EVENT OF PARTIAL FAILURE. THIS TECHNOLOGY IS ESPECIALLY APPROPRIATE IN THE DEVELOPMENT OF THE COMPLEX ROBOTIC SUPPORT OPERATIONS FOR BATTLEFIELD LOGISTICS OPERATIONS WHERE INTEGRATED, COORDINATED SYSTEM OPERATIONS ARE ESSENTIAL. TOTAL SYSTEM DEVELOPMENT REQUIRES AN ARCHITECTURAL APPROACH THAT SUPPORTS EVOLUTIONARY SYSTEM GROWTH. THE REAL-TIME CONTROL SYSTEM (RCS) METHODOLOGY IS A PARADIGM FOR THE DESIGN OF COMPLEX REAL-TIME SYSTEMS THAT PROVIDES AN OPEN ARCHITECTURE OF MODULAR, HIERARCHICALLY STRUCTURED COMPONENTS. THIS PROPOSAL IS TO CREATE A DEVELOPMENT AND ANALYSIS ENVIRONMENT FOR THE DESIGN AND IMPLEMENTATION OF ADVANCED COMPLEX CONTROL SYSTEMS, BASED ON THE RCS PARADIGM, AND TO ADDRESS THE ISSUES OF INCORPORATING REAL-TIME DIAGNOSTICS, DECISION AIDING, AND BUILT-IN TRAINING INTO THE PARADIGM. THE PROPOSED ENVIRONMENT WILL SUPPORT THE ANALYSIS, EVALUATIONS, AND TESTING OF VARIOUS CONTROL LOGIC AND PROCESSING ALGORITHMS DIRECTED AT MATERIEL HANDLING AND ASSEMBLY OPERATIONS ASSOCIATED WITH PROJECTILE AND FUZE DEPALLETIZING, INVENTORY MANAGEMENT, FUZING OPERATIONS, AND TRANSPORT.

ADVANCED TECHNOLOGY MATERIALS, INC.
7 COMMERCE DRIVE
DANBURY, CT 06810
Phone: (230) 794-1100

Topic#: 91-137
Office: ETDL
Contract #:
PI: DR. WALTER KOSAR

ID#: 91ETD-045

Title: ORGANOARSINE REPLACEMENTS FOR ARSINE IN MOCVD

Abstract: ORGANOMETALLIC VAPOR PHASE EPITAXY (OMVPE) IS A PROMISING TECHNIQUE FOR PRODUCING ULTRAHIGH PURITY III-V COMPOUND SEMICONDUCTOR. OMVPE CAN PRODUCE COMPLEX LAYERED STRUCTURES WITH THE ABRUPT INTERFACES REQUIRED FOR ADVANCED ELECTRONIC AND PHOTONIC

DEVICES. UNFORTUNATELY, OMVPE CURRENTLY REQUIRES EXTREMELY TOXIC AND/OR PYROPHORIC GASES STORED UNDER PRESSURE IN LARGE VOLUMES. THESE GASES REPRESENT SERIOUS THREATS TO SAFETY IN THE WORKPLACE BECAUSE OF THE POSSIBILITY OF WIDESPREAD DISCHARGE OF THE GASES AND SUBSEQUENT HUMAN EXPOSURE. RECENTLY WE HAVE SHOWN THAT ARSINE FROM AN ON-DEMAND ARSINE GENERATOR YIELDS GAAS AND INGAAS OF QUALITY COMPARABLE TO OR BETTER THAN IS OBTAINED WITH ULTRAHIGH PURITY TANK ARSINE. THE GENERATOR IMPROVES SAFETY BY ELIMINATING LARGE ARSINE INVENTORIES AND PROVIDING A LOW PRESSURE SOURCES. ARSINE IS GENERATOR "JUST-IN-TIME" BY ADDING A LIQUID ACTIVATOR TO A SOLID PRESURSOR AND IS DELIVERED TO THE OMVPE SYSTEM THROUGH A UNIQUE PURIFICATION AND GAS MANAGEMENT SYSTEM. IN PHASE I WE WILL DEMONSTRATE THAT THE ARSINE GENERATION TECHNOLOGY WILL BE DEVELOPED THAT CAN BE USED IN THE CURRENT GENERATOR HARDWARE. THE NEW PHOSPHINE PRECURSOR WILL BE CONVERTED TO PHOSPHINE, WHICH WILL THEN BE PURIFIED, CHEMICALLY ANALYZED AND EVALUATED AS A SOURCE MATERIAL FOR OMPE OF INP AND INGAASP.

ADVANCED TECHNOLOGY MATERIALS, INC.
7 COMMERCE DRIVE
DANBURY, CT 06810
Phone: (203) 794-1100

Topic#: 91-243
Office: SDC
Contract #:
PI: DR. BRIAN VAARTSTRA

ID#: 91SDC-126

Title: BIMETALLIC SOURCE REAGENTS FOR THIN FILM DEPOSITION OF LEAD TITANATE AND PZT

Abstract: METALORGANIC CHEMICAL VAPOR DEPOSITION (MOCVD) HAS BECOME A SUCCESSFUL THIN FILM GROWTH TECHNIQUE DUE TO ITS INHERENT CONTROL OVER FILM COMPOSITION, PURITY, UNIFORMITY AND DEPOSITION RATE. THIN FILM TECHNOLOGY FOR FERROELECTRIC MATERIALS SUCH AS LEAD TITANATE AND PZT IS IN GREAT DEMAND DUE TO MANY APPLICATIONS IN PEIZOELECTRIC AND OPTOELECTRIC DEVICES. THE ELECTRONIC PROPERTIES OF THE THIN FILM ARE CRITICALLY SENSITIVE TO THE ELEMENTAL STOICHIOMETRY WITHIN THE FILM, MAKING MOCVD A TECHNIQUE WHICH IS VERY SENSITIVE TO PRECURSOR FLOW RATES, TEMPERATURES AND PRESSURES. MUCH IS TO BE GAINED BY DIRECT FOCUS ON MOLECULAR ENGINEERING OF PRECURSORS IN ORDER TO OPTIMIZE THE STOICHIOMETRY OF THE THIN FILM. NEW DIMENSIONS OF PURITY AND PROCESS COMPATIBILITY COULD BE REALIZED USING SOURCES WHICH MAINTAIN A 1:1 RATIO OF LEAD TO GROUP IVB METAL TO CONTROL FILM COMPOSITION AT A MOLECULAR LEVEL. IN PHASE I OF THIS PROJECT HETEROBIMETALLIC LEAD-TITANIUM AND LEAD-ZIRCONIUM PRECURSORS WILL BE SYNTHESIZED, CHARACTERIZED AND EVALUATED FOR USE AS VOLATILE PRECURSORS FOR PZT. PHASE II WILL USE THE NEW PRECURSOR MATERIALS FOR THIN FILM DEPOSITION STUDIES AND OPTIMIZE THE PHYSICAL PROPERTIES OF THE FILMS. PHASE III WILL BE THE COMMERCIAL INTRODUCTION OF SOURCE REAGENTS AND PROCESS TECHNOLOGY FOR USE IN DEVICE FABRICATION.

AEGIS RESEARCH CORP.
3225 BOB WALLACE AVE. SW, SUITE G
HUNTSVILLE, AL 35805
Phone: (205) 876-7502

Topic#: 91-084
Office: MICOM
Contract #: DAAH01-92-C-R150
PI: D. BRETT BEASLEY

ID#: 91MIC-089

Title: INFRARED LASER DIODE BASED INFRARED PROJECTOR, PHASE I PROPOSAL

Abstract: The objective of this SBIR effort is to develop an IR screen projector based upon IR laser diodes which can be used in HWIL simulations to test missile systems. The goal of the Phase I effort is to develop a single channel laser diode IR projection system to demonstrate the performance capabilities of the tunable diode lasers. This document presents AEgis Research's proposal for the Phase I effort. The proposal details a design for the Phase I system, the tasks which make up the work plan, and concepts for the operational projector to be developed during Phase II. AEgis' design offers the potential for an IR projection system which has very high speed and sufficient dynamic range to simulate most relevant targets and countermeasures. The projector system can be used to test sensors which operate anywhere within the 3.0-30 um waveband and is especially applicable to missile systems which utilize a linear array of detectors with high speed scanning. The result of the Phase I effort will be a single channel IR projection system, a test report which details its performance capabilities, and a preliminary design for the Phase II projector.

ALPHATECH, INC.
EXECUTIVE PLACE III, 50 MALL ROAD
BURLINGTON, MA 01803
Phone: (617) 273-3388
Topic#: 91-015 ID#: 91HEL-301
Office: HEL
Contract #: DAAA15-91-C-0042
PI: DR. JEAN MACMILLAN
Title: HUMAN-COMPUTER INTERFACE FOR MACHINE-AIDED TARGET ACQUISITION
Abstract: THE PROPOSED PHASE I RESEARCH WILL BUILD ON ALPHATECH'S COMBINED EXPERTISE IN MULTISENSOR DATA FUSION ALGORITHMS AND IN HUMAN ENGINEERING FOR COMMAND AND CONTROL SYSTEMS. THE GOAL OF PHASE I WILL BE TO UNDERSTAND AND DEFINE THE MOST CRITICAL ISSUES FOR THE DISPLAY OF MIILTISENSOR TARGET TRACKING AND TARGET IDENTIFICATION DATA TO HUMAN OPERATORS, AND TO DEVELOP A PLAN FOR TESTING HYPOTHESES ABOUT THE EFFECTIVE DISPLAY OF SUCH INFORMATION TO SUPPORT HUMAN DECISIONS. THE FIRST STEP WILL BE TO DEFINE A GENERIC FRAMEWORK THAT DEFINES THE NATURE OF THE INFORMATION AVAILABLE FROM A MULTISENSOR DATA FUSION PROCESS, AND ITS ASSOCIATED ERRORS AND UNCERTAINTIES. THE NEXT STEP WILL BE TO USE AN OPERATOR FUNCTION MODELING APPROACH TO REPRESENT THE HUMAN DECISIONS TO BE MADE BASED ON THIS INFORMATION, AND TO IDENTIFY THE INFORMATION NEEDED FOR EACH DECISION. WE WILL THEN DEVELOP HYPOTHESES ABOUT THE MOST EFFECTIVE WAY TO DISPLAY THIS ESSENTIAL INFORMATION, AND AN EXPERIMENT PLAN FOR TESTING THOSE HYPOTHESES IN PHASE II. AREAS IDENTIFIED FOR INVESTIGATION INCLUDE METHODS FOR FILTERING OR GATING INFORMATION AS A FUNCTION OF OPERATOR WORKLOAD, METHODS FOR INCREASING OPERATOR CONFIDENCE IN AUTOMATED SUPPORT, AND GRAPHIC METHODS FOR DISPLAYING THE UNCERTAINTY ASSOCIATED WITH SENSOR DATA.

AMCOMP CORP.
28417 QUAILHILL DRIVE
RANCHO PALOS VERD, CA 90274
Phone: (213) 791-2620
Topic#: 91-149 ID#: 91HEL-014
Office: HEL
Contract #:
PI: DR. ANIL K. AGGARWAL
Title: GLOBAL POSITIONING SYSTEM FUZE OSCILLATOR DESIGN SPECIFICATIONS FOR OSCILLATOR FOR DIGITAL GPS TRANSLATOR
Abstract: ONE OF THE MOST CRITICAL COMPONENTS FOR ACCURATE NAVIGATION SOLUTION BY A GPS RECEIVER IS THE FREQUENCY TIME BASE PROVIDED BY THE OSCILLATOR. THE REQUIREMENTS FOR OSCILLATOR ARE EVEN MORE CRITICAL FOR A GPS DIGITAL TRANSLATOR SYSTEM. THE PHASE I STUDY WILL ESTABLISH PERFORMANCE REQUIREMENTS FOR THE OSCILLATOR FOR GPS TRANSLATOR BASED UPON THE REQUIRED SYSTEM ACCURACY GOALS. THE REQUIREMENTS WILL SPECIFY, AT A MINIMUM, OSCILLATOR PARAMETERS FOR FREQUENCY ACCURACY, SETTLING TIME, HYSTERESIS, PHASE NOISE, G-SENSITIVITY AND ENVIRONMENTAL CONDITIONS. THE OTHER DESIGN DRIVERS WILL BE SIZE, POWER, AND COST. THE SECOND PART OF THE STUDY WILL ADDRESS VARIOUS OSCILLATORS WHICH MAY BE SUITABLE FOR THE GPS TRANSLATOR APPLICATION. A REPORT DEFINING THE FEASIBILITY OF ACHIEVING REQUIREMENTS AND SUGGESTING ALTERNATE SOLUTIONS WHERE TECHNOLOGY IS NOT ABLE TO SUPPORT THE VERY HIGH SHOCK ENVIRONMENT FOR THE OSCILLATOR WILL BE PROVIDED.

AMERICAN GNC CORP.
9131 MANSON AVENUE
CHATSWORTH, CA 91311
Phone: (818) 407-0092
Topic#: 91-077 ID#: 91MIC-028
Office: MICOM
Contract #: DAAH02-92-C-R141
PI: CHING-FLANG LIN
Title: MULTISENSORS MULTIFEATURE BASED AUTONOMOUS TARGET RECOGNITION AND TRACKING
Abstract: This proposal responds to the technical needs of the US Army for the development of multisensor-based target acquisition, recognition and tracking systems. Four technical innovations are proposed: 1) development of real-time multiple sensor configuration and operation mode selection logic which have the capability of adapting to external environment changes and re-organizing of internal fusion and tracking subsystems; 2) development of sensor data fusion schemes at different levels of signal/data processing chain; 3) development of optimized target recognition and tracking algorithms by integrating different methods based on a distinct signature domain and knowledge of the targets of interest; and 4) development of target tracking algorithms in the forms of active, passive, or semiactive, depending upon the sensor configuration and mode used, which account

for target maneuvering, measurement origin uncertainty, and nonlinearity. The two-phase research program is proposed with the ultimate goal to develop the multiple sensor based target acquisition, recognition, recognition and tracking system. In Phase I, a detailed design of such a system with the above features will be carried out and complemented with appropriate evaluation capabilities and simulation tools. Capability extension and performance enhancement of the proposed system will be made in Phase II, along with software/hardware implementation and evaluation to demonstrate the effectiveness and technical advantages of the proposed system.

AMERICAN RESEARCH CORP. OF VIRGINIA
P. O. BOX 3406
RADFORD, VA 24143
Phone: (703) 731-0655

Topic#: 91-014 ID#: 91MTL-301
Office: MTL
Contract #: DAAL04-91-C-0060
PI: MR. HOWARD F. GROGER

Title: THIN FILM SENSORS TO EVALUATE CHEMICAL AND BIOLOGICAL THREATS TO ARMY STRUCTURES

Abstract: RECENT DEVELOPMENTS IN INTERNATIONAL RELATIONS HAVE LED TO THE NECESSITY FOR BATTLE READINESS IN A REGION WHERE CHEMICAL OR BIOLOGICAL WARFARE AGENTS HAVE BEEN EMPLOYED IN THE PAST. AT PRESENT, LITTLE ATTENTION HAS BEEN PAID TO METHODS FOR IDENTIFYING THE CHEMICAL OR BIOLOGICAL CONDITIONS OF FREE STANDING STRUCTURES. THIS PROPOSAL SUGGESTS THE DEVELOPMENT OF OPTICAL SENSORS BASED ON THE INTERACTION BETWEEN SELF-ASSEMBLED THIN FILMS AND THE CHEMICAL SPECIES OF INTEREST. THE TARGET OF OPPORTUNITY IN THIS PROPOSAL IS TO DEVELOP OPTICALLY REACTIVE SELF-ASSEMBLED THIN FILMS FOR USE IN CONJUNCTION WITH A VARIETY OF MATERIALS TO IDENTIFY THE CHEMICAL AND BIOLOGICAL STATE OF ARMY STRUCTURES. OBJECTIVES OF THE PROGRAM INCLUDE EVALUATION OF OPTICAL MATERIALS AND COMPONENTS, DESIGN OF OPTICAL DETECTION SYSTEMS, FABRICATION OF FIBER OPTIC EMBEDDED STRUCTURES AND CALIBRATION AND TEST OF THE INSTRUMENT UNDER LABORATORY CONDITIONS. THE SIGNIFICANCE OF THE PROPOSED WORK LIES IN THE AVOIDANCE OF POSSIBLE LOSS-OF-LIFE ASSOCIATED WITH STRUCTURAL CONTAMINATION IN THE CHEMICAL OR BIOLOGICAL WARFARE ENVIRONMENT.

AMERICAN RESEARCH CORP. OF VIRGINIA
P. O. BOX 3406
RADFORD, VA 24143
Phone: (703) 731-0655

Topic#: 91-021 ID#: 91ETL-301
Office: ETL
Contract #: DACA76-91-C-0016
PI: MR. JOHN A. NEAL, III

Title: BATTLEFIELD ASSESSMENT AND DECISION ASSISTANCE SYSTEM USING NEURAL NETWORKS AND AN EXPERT SYSTEM DIRECTOR

Abstract: THE U.S. ARMY HAS IDENTIFIED A NEED FOR COMPUTER-BASED DECISION AIDS FOR BATTLEFIELD PARAMETER ANALYSIS, LOGISTICS ASSESSMENT AND COMMAND DECISION RECOMMENDATION. TO ADDRESS THIS NEED, AMERICAN RESEARCH CORPORATION OF VIRGINIA (ARCOVA) PROPOSES AN ARTIFICIALLY INTELLIGENT ASSESSMENT AND DECISION RECOMMENDATION ASSISTANT CAPABLE OF ANALYZING ENVIRONMENTAL AND TOPOGRAPHICAL PARAMETERS AND PROVIDING RESOURCE DEPLOYMENT SUGGESTIONS AND LOGISTICAL SUPPORT RECOMMENDATIONS. THE PROPOSED SYSTEM IS A SET OF NEURAL NETWORKS CONTROLLED BY AN EXPERT SYSTEM. PROGRAM OBJECTIVES INCLUDE DEVELOPMENT OF ALGORITHMS FOR THE ANALYSIS OF ENVIRONMENTAL AND TOPOGRAPHIC PARAMETERS AS COMPARED WITH RESOURCE PERFORMANCE AND AVAILABILITY, DEVELOPMENT OF NEURAL NETWORK PARADIGMS AND DEVELOPMENT OF AN EXPERT SYSTEM OVERSEER CAPABLE OF COMMAND DECISION RECOMMENDATIONS. SUCCESSFUL COMPLETION OF THESE OBJECTIVES WILL RESULT IN A COMMAND DECISION RECOMMENDATION SYSTEM FOR TACTICAL APPLICATIONS. THE SIGNIFICANCE OF THIS EFFORT IS THE INNOVATIVE COMBINATION OF NEURAL NETWORKS AND EXPERT SYSTEMS FOR DETAILED ANALYSIS OF OPERATIONAL SCENARIOS AND RECOMMENDED RESPONSES. SINCE NEURAL NETWORKS HAVE BEEN DEMONSTRATED TO BE FASTER AND MORE ACCURATE THAN MANY TRADITIONAL DATA ANALYSIS TECHNIQUES AND EXPERT SYSTEMS HAVE PROVEN TO BE WELL SUITED FOR COMPLEX DECISION ASSESSMENT, ARCOVA ANTICIPATES POSITIVE RESULTS IN THE USE OF NEURAL NETWORKS AND EXPERT SYSTEMS AS A TACTICAL COMMAND DECISION RECOMMENDATION SYSTEM.

AMERICAN RESEARCH CORP. OF VIRGINIA
P.O.BOX 3406
RADFORD, VA 24143
Phone: (703) 731-0655

Topic#: 91-155
Office: HDL
Contract #:
PI: DR. M.G. NIIMURA

ID#: 91HDL-022

Title: A HIGH-SPEED OPENING, COMPACT, HIGH REPETITION RATE OPENING SWITCH

Abstract: A COMPACT OPENING SWITCH THAT CAN OPEN (OR TURN-ON) IN SUB-NANOSECOND TIMES WITH PEAK POWER CAPABILITY IN GW REGIME AND AVERAGE POWER CAPABILITY IN 100 KW IS SOUGHT FOR IMPLEMENTING COMPACT PULSARS. THE PHASE I PROGRAM WILL CONDUCT AN INVESTIGATION AND LITERATURE SEARCH TO DETERMINE THE OPENING SWITCH TECHNOLOGY (PLASMA, VACUUM, SOLID-STATE, ETC.) MOST SUITABLE FOR OBTAINING THE TARGET SPECIFICATIONS SET FORTH BY AGENCY. AT PRESENT, TO THE CONTRACTOR'S BEST KNOWLEDGE, PLASMA EROSION OPENING SWITCHES ARE NOT YET COMPACTIZED, VACUUM OPENING SWITCHES ARE NOT SAFE BY PRODUCING X-RAYS WHEN OPERATED AT HIGH VOLTAGES GREATER THAN 30 KV, AND SOLID-STATE OPENING SWITCHES ARE NOT YET SUITABLE AT REQUIRED CURRENT LEVEL GREATER THAN 10 KA. MORE DETAILED INVESTIGATION AND LITERATURE SEARCH WILL BE NEEDED AS TO FIND OUT ANSWERS FOR THE IMPROVEMENT AND INFORMATION FOR THE MOST UP-DATED TECHNOLOGY DEVELOPMENT. AS AN ADDITIONAL WORK FOR PHASE I, THE CONTRACTOR PROPOSES A THROUGH INVESTIGATION OF THE DENSE PLASMA FOCUS (DPF) OPENING SWITCH. THE DPF OPENING SWITCH (DPF-OS) IS LONG KNOWN AS A COMPACT, HIGH-POWER OPENING SWITCH PARTLY BECAUSE OF THE ALL-METAL, PULSE-POWER CONSTRUCTION. THE DPF-OS READILY SATISFIES THE TARGET SPECIFICATIONS OF THE MINIMUM CURRENT, PEAK POWER, AND ENERGY/PULSE. HOWEVER, THE OPENING TIME IS PRESENTLY 1-100 NS AND THE UPPER-LIMIT OF REP-RATE HAS NOT EXPERIMENTALLY BEEN EXAMINED. IN ORDER TO ACCELERATE THE OPENING TIME, THE CONTRACTOR PROPOSES A PLASMA FILLED, NON-FIELD TRAPPING DPF. AND FOR A HIGH REP-RATE PROPOSE IS A FAT (OR SMALL ASPECT RATIO) DPF WHICH SHORTENS THE RUN-DOWN TIME OF CURRENT SHEET. PRELIMINARY INVESTIGATION REVEALS THAT SUB-NANOSECOND OPENING TIMES AND A REP-RATE FASTER THAN 3KHZ ARE FEASIBLE WITH A DPF-OS. THE PHASE I WORK WILL INCLUDE THE THEORETICAL AND EXPERIMENTAL DEMONSTRATION IN A LIMITED BASE.

AMHERST SYSTEMS, INC.
30 WILSON ROAD
BUFFALO, NY 14221
Phone: (716) 631-0181

Topic#: 91-254
Office: PM TRADE
Contract #:
PI: DOUGLAS C. REIF

ID#: 91PM-017

Title: SIMULATOR NETWORKING

Abstract: AMHERST SYSTEMS PROPOSES TO INTERFACE SIMNET TO THE INTEGRATED TEST BED (ITB) FACILITY COCKPIT SIMULATOR AT THE AVIONICS LABORATORY AT WRIGHT LABORATORIES, WRIGHT-PATTERSON AFB. THE AVIONICS LABORATORY IS THE AIR FORCE RESEARCH LABORATORY FOR ADVANCED AVIONICS CONCEPTS, AND IT STRIVES FOR THE CAPABILITY TO TEST SYSTEMS FROM SOFTWARE CONCEPT THROUGH PRODUCTION EQUIPMENT. THE ITB COCKPIT IS AN ENGINEERING SIMULATOR USED TO EVALUATE AVIONICS SYSTEMS AND CONCEPTS. CONNECTION TO SIMNET WILL ALLOW THE AVIONICS LABORATORY TO PERFORM EVALUATIONS IN MULTIPLE-MANNED ENVIRONMENTS. THE INTERFACE BETWEEN SIMNET AND THE ITB COCKPIT SIMULATOR WILL BE ACCOMPLISHED WITH THE DEVELOPMENT OF A FRONT-END PROCESSOR (FP). THE FP IS BASED ON A VME ARCHITECTURE, AND IS MINIMALLY INVASIVE TO THE ITB COCKPIT SIMULATOR. IT WILL PERFORM COMMUNICATION, DATA TRANSLATION, AND OTHER RELATED FUNCTIONS TO SUPPORT THE CONNECTION WITH SIMNET. THE FP IS A NOVEL APPLICATION OF STATE-OF-THE-ART TECHNOLOGY TO HELP SOLVE THE PRACTICAL PROBLEMS OF THE SYSTEMS INTEGRATION. AMHERST SYSTEMS IS IDEALLY SUITED TO PERFORM THIS WORK BECAUSE OF ITS EXTENSIVE EXPERIENCE IN REALTIME SYSTEMS, VME ARCHITECTURES AND SYSTEMS INTEGRATION. AMHERST SYSTEMS IS FAMILIAR WITH THE ITB THROUGH ITS WORK AT WRIGHT LABORATORIES. THIS PROPOSAL IS SUBMITTED WITH THE APPROVAL AND SUPPORT OF WL/AAAS-2, THE SYSTEM AVIONICS DIVISION OF THE AVIONICS LABORATORY.

ANALYTIC POWER CORP.
123 SOUTH ST., 6TH FLOOR
BOSTON, MA 02111
Phone: (617) 542-6352
Topic#: 91-011 ID#: 91ARO-328
Office: ARO
Contract #: DAAL03-91-C-00361
PI: DAVID P. BLOOMFIELD
Title: MOBILE ELECTRIC POWER
Abstract: PRESENTLY AVAILABLE PORTABLE, 300 WATT POWER SOURCE TECHNOLOGY IS LIMITED TO BATTERIES, SOLAR CELLS AND GASOLINE ENGINES. GASOLINE ENGINES SUFFER FROM POOR EFFICIENCY, NOISE AND HIGH MAINTENANCE. TODAY, BATTERIES ALONE CAN PROVIDE RELIABLE POWER. WHILE ADVANCES IN THE LAST 20 YEARS HAVE INCREASED THE POWER DENSITIES OF BATTERIES, THEY ARE STILL LOW ENERGY DENSITY DEVICES NOT SUITABLE FOR PROLONGED OPERATION. AS DEVELOPMENTS IN PORTABLE ELECTRONIC DEVICES AND COMMUNICATIONS PROGRESS, THERE IS AN INCREASING NEED FOR MORE COMPACT, LIGHT WEIGHT SOURCES OF ELECTRIC POWER. THE COMPANY, AND COUNTRY, WHICH IS SUCCESSFUL IN FILLING THIS NEED WILL CLEARLY HAVE AN ECONOMIC AND TECHNOLOGICAL EDGE. ANALYTIC POWER PROPOSES THE DEVELOPMENT OF AN ADVANCED, LIGHTWEIGHT, ION-EXCHANGE HYDROGEN/AIR FUEL CELL STACK. THE DESIGN IS BASED ON OUR 25 WATT HYDRIDE SUPPLIED, FUEL CELL STACKS WHICH ARE CURRENTLY BEING TESTED AT OUR FACILITY. ANALYTIC POWER'S COMMERCIAL CUSTOMERS HAVE ALSO RECOGNIZED THE NEED FOR THE POWER SUPPLY WE PROPOSE, AND HAVE FUNDED ITS DEVELOPMENT FOR SEVERAL YEARS. THE POWER SUPPLIES REQUIRE IMPROVEMENT IN HEAT AND WATER MANAGEMENT TO BE COMMERCIALLY FEASIBLE. OUR PROPOSED PHASE I PROGRAM WILL IDENTIFY AN OPTIMUM CELL STRUCTURE, STACK DESIGN, AND SYSTEMS FOR HEAT AND WATER MANAGEMENT FOR A PHASE II PROTOTYPE.

ANAMET LABORATORIES, INC.
3400 INVESTMENT BLVD.
HAYWARD, CA 94545
Phone: (415) 887-8811
Topic#: 91-187 ID#: 91AVS-082
Office: AVSCOM
Contract #:
PI: ROCKY RICHARD ARNOLD
Title: FIELD REPAIR OF ARMY HELICOPTERS USING CONDUCTIVE POLYMER AND COMPOSITE MATERIALS
Abstract: THE OBJECTIVE OF THIS RESEARCH IS TO DEVELOP FIELD REPAIR TECHNIQUES FOR COMPOSITE HELICOPTER STRUCTURES OPERATED BY THE ARMY. THESE FIELD REPAIR TECHNIQUES MUST MAINTAIN STRUCTURAL INTEGRITY OF THE BASE STRUCTURE WHILE SIMULTANEOUSLY PROVIDING ELECTRICAL CONTINUITY. THE PRIMARY EMPHASIS OF THE PROPOSED RESEARCH IS ON DEVELOPING REPAIR TECHNIQUES WHICH USE INHERENTLY CONDUCTIVE POLYMERS AND FILLERS TO ACHIEVE STRUCTURAL REPAIR WITH A HIGH DEGREE OF ELECTRICAL CONTINUITY. THE USE OF CONDUCTIVE POLYMERS PROVIDES THE POTENTIAL FOR ACHIEVING ARMY GOALS WITHOUT EXTENSIVE MODIFICATION OF EXISTING FIELD REPAIR APPROACHES. THE WORK PROPOSED INCLUDES A REVIEW OF CURRENTLY USED REPAIR TECHNIQUES, THE IDENTIFICATION AND SELECTION OF CONDUCTIVE POLYMERS, CONDUCTIVE FILLERS, AND NONWOVEN AND FIBER MATERIALS WHICH CAN BE MADE COMPATIBLE WITH THE TYPES OF FIELD REPAIR TECHNIQUES CURRENTLY ENVISIONED. SUBSEQUENTLY, SEVERAL MATERIALS AND REPAIR PROCESSES WILL BE REFINED AND ONE SELECTED FOR FEASIBILITY RESEARCH IN PHASE I. FLAT PLATE AND SANDWICH PANELS WILL BE MADE, SOME DAMAGED AND REPAIRED, AND THE VIRGIN AND DAMAGED/REPAIRED PANELS TESTED TO ESTABLISH RESIDUAL STRENGTH, RF SHIELDING, AND OPTICAL TRANSMISSION. BY COMPARING UNDAMAGED WITH DAMAGED/REPAIRED PANELS, IT WILL BE POSSIBLE TO DETERMINE TO WHAT EXTENT THE NEW CONDUCTIVE POLYMER MATERIALS AND REPAIR TECHNIQUES CAN MEET THE ARMY'S REQUIREMENTS.

ANRO ENGINEERING, INC.
FIVE MILITIA DRIVE SUITE 104
LEXINGTON, MA 02173
Phone: (617) 862-3000
Topic#: 91-043 ID#: 91BRD-009
Office: BRDEC
Contract #:
PI: GERALD F. ROSS, PH.D.
Title: "AN ELECTRONICALLY SCANNED IMPULSE RADAR FOR THE DETECTION OF MINES"
Abstract: AN INNOVATIVE ADVANCEMENT IN SCANNING IMPULSE RADAR ARRAY TECHNOLOGY OFFERS A

NEW CAPABILITY TO DETECT BURIED METALLIC AND NONMETALLIC MINES. THE SCANNING IMPULSE RADAR ARRAY SYSTEM WILL INCORPORATE ACTIVE CANCELLATION AND POLARIZATION CONTROL TO ENHANCE THE MINE-SOIL INTERFACE TO PERMIT DETECTION. IN PHASE I OF THIS PROGRAM, A CONCEPT FEASIBILITY DEMONSTRATION WILL BE CONDUCTED. ADVANCED SIGNAL PROCESSING TECHNIQUES WILL BE INCORPORATED IN PHASE II OF THIS PROGRAM TO FURTHER IMPROVE MINE DETECTION PROBABILITIES AND TO REDUCE THE FALSE ALARM RATE. THE SCANNING IMPULSE RADAR ARRAY IS PROJECTED TO BE ABLE TO DETECT MINES FROM A HEIGHT OF UP TO 10 FEET, AND MAY BE CARRIED BY A LOW-FLYING HELICOPTER, OR BE MOUNTED ON BOOM FORWARD OF A MINE-CLEARING VEHICLE.

APA OPTICS, INC.
2950 NE 84TH LANE
BLAINE, MN 55434
Phone: (612) 784-4995

Topic#: 91-146
Office: ETDL
Contract #:
PI: DR. JIM M. VANHOVE

ID#: 91ETD-123

Title: A BURIED ELECTRODE MACH ZEHNDER WAVEGUIDE INTENSITY MODULATOR WITH OPERATION SPEEDS IN EXCESS OF 100 GHZ

Abstract: THIS PROPOSAL DESCRIBES AN APA OPTICS PROGRAM TO DEVELOP A HIGH SPEED (100GHZ) GAAS WAVEGUIDE BASED MACH ZEHNDER MODULATOR. OUR APPROACH CENTERS ON THE USE OF A BURIED ELECTRODE CONFIGURATION TO ACHIEVE VELOCITY MATCHING OF THE RF AND OPTICAL SIGNALS. THIS WE FEEL WILL RESULT IN A DEVICE WITH A BROADBAND RESPONSE FROM DC TO 100GHZ. WE WILL WORK IN CONJUNCTION WITH THE ULTRFAST SCIENCE LAB AT THE UNIVERSITY OF MICHIGAN WHICH WAS THE FIRST GROUP TO PROPOSE THE USE OF SUCH SUPERSTATE CONCEPT FOR VELOCITY MATCHING. THE GOAL OF OUR PHASE I PROGRAM WILL BE TO DEMONSTRATE THE VALIDITY OF OUR TECHNICAL APPROACH. WE WILL USE AN INHOUSE MBE SYSTEM TO FABRICATE THE OPTICAL WAVEGUIDE STRUCTURES. THESE WILL BE METAL (TUNGSTEN, TITANIUM ETC.) COATED AND THEN COVERED WITH THE GAAS SUPERSTRATE BY SUING A MBE PROCESS. THE RF AND OPTICAL VELOCITIES IN THESE STRUCTURES WILL THEN BE MEASURED TO SHOW IF THE NECESSARY SLOWDOWN OCCURRED. THE PHASE I PROGRAM WILL ALSO INCLUDE DEVELOPMENT OF PROCESSING SEQUENCE FOR THE FABRICATION OF THE MACH ZEHNDER DEVICES UNDER A PHASE II PROGRAM. WITH OUR EXPERTISE IN FABRICATING GAAS BASED MACH ZEHNDER MODULATORS FOR A COMMERCIAL PRODUCT (FLAT RESPONSE FROM DC TO 3 GHZ, TOTAL OPTICAL LOSSES 8 DLB) AND AN ONGOING SDI SUPPORTED PROGRAM FOR HIGH SPEED COUPLER DEVICES, WE ARE IN AN EXCELLENT POSITION TO CARRY OUT THE PROPOSED WORK.

APPLIED LOGIC SYSTEMS, INC.
P.O. BOX 90,, UNIVERSITY STATION
SYRACUSE, NY 13210
Phone: (315) 471-3900

Topic#: 91-049
Office: CECOM
Contract #:
PI: KENNETH A. BOWEN

ID#: 91CEC-211

Title: FLEXIBLE EASILY MODIFIABLE MESSAGE PARSING SYSTEMS

Abstract: ARMY UNITS MAKE USE OF A VARIETY OF PSEUDO-FORMATTED MESSAGE TYPES, PARTICULARLY FOR TACTICAL INTELLIGENCE PROCESSING. THESE MESSAGES EXHIBIT CONSIDERABLE VARIATION FROM OFFICIAL FORMATS, REFLECTING DIFFERING OPERATING PROCEDURES OR CHANGING NEEDS. OFFICIAL MESSAGE FORMATS ARE AMENABLE TO STANDARD COMPUTER SCIENCE PARSING TECHNIQUES, BUT SUCH PARSERS ARE RIGID, AND ALTERATIONS ARE VIRTUALLY IMPOSSIBLE TO ACCOMPLISH IN THE FIELD. YET FLEXIBILITY IN PARSING IS VERY DESIRABLE IN THE FIELD. THUS, A NEW APPROACH TO PARSERS FOR FIELD MESSAGE PROCESSING IS NEEDED WHICH IS GROUNDED IN WELL-ESTABLISHED PARSER TECHNOLOGY, BUT WHICH SUPPORTS A MUCH GREATER FLEXIBILITY IN HANDLING MESSAGE FORMAT VARIATIONS AND ERRORS. EQUALLY IMPORTANTLY, IT SHOULD SUPPORT AN ABILITY TO EASILY MODIFY AND REGENERATE PARSERS FOR GIVEN FORMATS IN THE FIELD, INCLUDING CREATION OF NEW FORMATS. APPLIED LOGIC SYSTEMS, INC., HAS PREVIOUSLY DEVELOPED MESSAGE PARSERS WHICH ARE BASED ON ESTABLISHED PARSER TECHNOLOGY, BUT WHICH WERE ABLE TO HANDLE THE TYPES OF VARIATION AND EXCEPTIONS ENCOUNTERED IN THE FIELD. THESE PARSERS WERE IMPLEMENTED IN PROLOG, WHICH ALREADY PROVIDES CONSIDERABLY MORE FLEXIBILITY THAN LOWER-LEVEL LANGUAGES. APPLIED LOGIC

SYSTEMS, INC., PROPOSES TO BUILD ON THIS WORK TO PRODUCE A PROTOTYPE PARSER SYSTEM EXHIBITING THE DESIRED PARSING FUNCTIONALITY AND EFFICIENCY COUPLED WITH A VERY HIGH DEGREE OF FLEXIBILITY AND EASE OF USE FOR FIELD ANALYSTS. THE APPROACH WILL REST ON THE ABILITY OF PROLOG SYSTEMS TO DYNAMICALLY MODIFY, INSERT, OR REMOVE CODE WHILE RUNNING. THE CORE OF THE APPROACH WILL BE TO SUPPLY GRAPHICALLY-ORIENTED PRESENTATIONS OF PARSING RULES IN A SYSTEM WHICH ALLOWS THE FIELD ANALYST TO EDIT AND MODIFY EXISTING PARSERS, OR TO CREATE TOTALLY NEW PARSERS FOR NEW FORMATS. THE PROTOTYPES TO BE PRODUCED WILL EXECUTE ON SUN AND DEC WORKSTATIONS, AND ON 386/486 PCS.

APPLIED RESEARCH ASSOCIATES, INC.
4300 SAN MATEO BOULEVARD, N.E., SUITE A220
ALBUQUERQUE, NM 87110
Phone: (303) 980-8007
Topic#: 91-106 ID#: 91106-01
Office: TACOM
Contract #:
PI: JEROME D. YATTEAU

Title: MODULAR ARMOR ATTACHMENT CONCEPTS

Abstract: FUTURE COMBAT VEHICLES WILL EMPLOY MODULAR ARMOR PROTECTION SYSTEMS THAT CAN BE CHANGED TO MEET DIFFERENT THREAT LEVELS. THESE ADVANCED ARMOR UNITS WILL BE MOUNTED AND DISMOUNTED FROM THE BASIC VEHICLE STRUCTURE, AS NEEDED TO MEET PROTECTION REQUIREMENTS. THE OBJECTIVE OF THIS EFFORT IS TO DEVELOP INNOVATIVE ATTACHMENT CONCEPTS AND METHODS FOR MOUNTING THE MODULAR ARMOR PROTECTION UNITS TO THE BASIC VEHICLE STRUCTURE. THE ARMOR MODULES OF PRIMARY INTEREST ARE THOSE DESIGNED TO COUNTER LARGER CALIBER TANK FIRED PROJECTILES AND ANTI-TANK MISSILES. THE DESIGN THREATS INCLUDE LARGE KINETIC ENERGY AND CHEMICAL ENERGY ANTI-TANK PROJECTILES AS WELL AS LARGE ANTI-TANK GUIDED AND UNGUIDED MISSILES. THE MOUNTING AND ATTACHMENT HARDWARE, AS WELL AS THE REST OF THE VEHICLE STRUCTURE, WILL HAVE TO SURVIVE THE BALLISTIC IMPACT LOADS WHICH ARE TRANSMITTED THROUGH THE ARMOR MODULES. THE ATTACHMENT HARDWARE THAT IS FIXED DIRECTLY TO THE VEHICLE STRUCTURE MUST NOT BE DAMAGED.

APPLIED SCIENCES, INC.
141 WEST XENIA AVENUE, P.O. BOX 579
CEDARVILLE, OH 45314
Phone: (513) 766-2020
Topic#: 91-183 ID#: 91AVS-052
Office: AVSCOM
Contract #:
PI: MAX L. LAKE

Title: DIAMOND-COATED COMPOSITES FOR ABRASION RESISTANCE

Abstract: COMPOSITE MATERIALS ARE ATTRACTIVE FOR USE IN AIRCRAFT AND SPACECRAFT OWING TO PROPERTIES OF HIGH SPECIFIC STRENGTH. A PROBLEM CONFRONTING THE APPLICATION OF COMPOSITE MATERIALS FOR ROTORCRAFT IS THAT UNIMPROVED LANDING AREAS, AS WELL AS LOW ALTITUDE MISSIONS, RESULT IN SEVERE ABRASION OF THE COMPOSITES, PARTICULARLY ON COMPOSITE BLADES. OTHER SOURCES OF ABRASION ON BLADES, AS WELL AS AIRFRAME STRUCTURES, ARE THE EXHAUST FROM ROCKETS AND MISSILES FIRED FROM THE AIRCRAFT. RECENT EXPERIENCE IN OPERATION OF HELICOPTERS IN THE SAUDI ARABIAN DESERT HAS SHOWN THAT OPERATION IN A DESERT ENVIRONMENT RADICALLY SHORTENS THE LIFETIME OF ROTORCRAFT LEADING EDGES WHICH ARE COMPOSED OF COMPOSITES, TO THE DEGREE THAT KEY ARMY ATTACK HELICOPTERS WERE REPORTED TO HAVE BEEN RESTRICTED FROM TRAINING MISSIONS IN THE SAUDI DESERT. TO CIRCUMVENT THIS PROBLEM, HIGH INTEGRITY COATINGS ARE NEEDED FOR HIGH PERFORMANCE COMPOSITE COMPONENTS TO IMPROVE THE LIFE OF ROTORCRAFT BLADES AND OTHER KEY STRUCTURES AGAINST ABRASIONS. IN SUCH CASES THE COATING REPRESENTS AN ENABLING TECHNOLOGY WHICH PERMITS THE OPERATION OF A MULTIMILLION DOLLAR FLIGHT VEHICLE. IT IS PROPOSED TO EXPLOIT RECENT TECHNOLOGY DEVELOPED FOR DIAMOND THIN FILM DEPOSITION ON CARBON/CARBON COMPOSITES AND OTHER MATERIALS FOR THIS PURPOSE.

APPLIED TECHNOLOGY ASSOCIATES
PO BOX 149434
ORLANDO, FL 32814
Phone: (407) 894-6151
Topic#: 91-170 ID#: 91MTL-009
Office: MTL
Contract #:
PI: DR. ROBERT CAVALLERI
Title: FAILURE ENGINEERED HEAVY METAL PENETRATORS
Abstract: TUNGSTEN OR TUNGSTEN ALLOYS ARE USED AS PENETRATORS IN KINETIC ENERGY WEAPONS. USED BY ITSELF, TUNGSTEN IS A BRITTLE METAL AND FRACTURES UNLESS IT IS ALLOYED WITH OTHER METALS. TYPICAL METALS USED IN TUNGSTEN ALLOYS ARE COPPER, IRON, NICHEL AND SILVER. THEY PERMIT THE RESULTING ALLOY TO BE MACHINED. WHEN USED AS A KINETIC ENERGY PENETRATOR, THE TUNGSTEN HAS A TENDENCY TO DEFORM, GIVING A BLUNT NOSE AS IT PROGRESSES THROUGH THE TARGET. THE USE OF A LAYERED TUNGSTEN PENETRATOR WILL BE INVESTIGATED. THIS PENETRATOR WILL BE FABRICATED USING THIN SHEETS OF TUNGSTEN WHICH ARE VACUUM BRAZED TO FORM A SINGLE PART. DIFFERENT TUNGSTEN THICKNESSES WILL BE CONSIDERED AND DIFFERENT FILLER METALS AND FILLER METAL THICKNESS WILL BE EVALUATED. ALSO CONSIDERED WILL BE THE USE OF BUILT-IN MECHANICAL SHEAR LINES TO CAUSE THE PENETRATOR TO ITSELF SHARPEN AS IT PROGRESSES THROUGH THE TARGET.

APPLIED TECHNOLOGY ASSOCIATES, INC.
1900 RANDOLPH ROAD SE
ALBUQUERQUE, NM 87106
Phone: (505) 247-8371
Topic#: 91-045 ID#: 91BRD-016
Office: BRDEC
Contract #:
PI: HENRY SESBESTA
Title: ACTIVE NOISE AND VIBRATION CONTROL FOR AUXILIARY POWER UNITS
Abstract: THIS PROJECT ADDRESSES SYSTEMS TO REDUCE NOISE AND VIBRATIONS EMANATING FROM AUXILIARY POWER UNITS (APUS) WHICH ARE BEING INTEGRATED INTO ARMY VEHICLES AND SHELTERS. EXCESSIVE NOISE AND VIBRATIONS ARE HARMFUL TO AND HINDER THE EFFECTIVENESS OF OPERATORS AND OCCUPANTS. IN MILITARY EQUIPMENT, IT IS ALSO BENEFICIAL TO AVOID EMANATIONS THAT MIGHT BE USED AS DETECTION SIGNATURES . THIS EXPLORATORY DEVELOPMENT WORK WILL INVESTIGATE THE FEASIBILITY OF DESIGNING AN ACTIVE NOISE AND VIBRATION CONTROL (ANVC) MODIFICATION KIT FOR APUS. THE PHASE I ACTIVITY WILL PRODUCE DESIGNS FOR TWO REPRESENTATIVE APU MODELS, THE 10 KW AND 30 KW UNITS. A PRIMARY REQUIREMENT IS THAT INTERNAL AND EXTERNAL NOISE BE REDUCED BY IO DB(A). AFFORDABLE ANVC SYSTEMS ARE ATTAINABLE BY APPROPRIATE INTEGRATION OF CONTRIBUTIONS FROM THREE AREAS. THE FIRST AREA INVOLVES COMPUTER AIDS THAT HELP TO INTERPRET TEST DATA AND OPTIMIZE LOCATIONS OF ACTIVE CONTROL SENSORS AND ACTUATORS. THE COMPUTER AIDS ARE BASED ON ADVANCED MULTIPLE INPUT COHERENCE ANALYSIS ALGORITHMS (DESIGNATED MICARDS) WHICH QUANTIFY, CHARACTERIZE, AND PINPOINT THE CAUSES OF NOISE AND VIBRATION. THE RESULTS FROM MICARDS PROCESSING OF TEST DATA LET THE DESIGNER TAILOR A MODIFICATION KIT DESIGN TO TREAT THE DOMINANT SOURCES AND TRANSMISSION PATHS. THE SECOND CATEGORY OF CONTRIBUTION COMES FROM THE CONTINUING ADVANCES IN THE REQUISITE TECHNOLOGIES WITH WHICH TO IMPLEMENT ANVC . LOWER COST AND MORE POWERFUL SIGNAL PROCESSORS NOW EXIST TO PERFORM THE MEASUREMENTS AND THE COMPUTATION OF ACTUATOR COMMANDS TO CANCEL SOURCES OF NOISE AND TO BLOCK TRANSMISSION PATHS. ADVANCES IN ACTUATORS AND SENSORS ARE ALSO IMPORTANT CONTRIBUTIONS THAT ENHANCE FEASIBILITY OF ANVC. FOR EXAMPLE., NEW PROOF-MASS, REACTIONLESS , ELECTROMAGNETIC ACTUATORS PROVIDE NEW MEANS TO ACTIVELY SUPPRESS THE VIBRATIONS OF SHELTER AND VEHICLE PANELS AND STRUCTURAL NUMBERS. THE FINAL AREA THAT WILL BE CONSIDERED IS MANUFACTURING . THE AFFORDABILITY OF ANVC FOR ARMY APUS IS GREATLY ENHANCED BY THE DEVELOPMENT OF A MARKETING AND MANUFACTURING PLAN WHICH IS FOUNDED ON THE PHILOSOPHY THAT STANDARD ANVC MODULES WILL HAVE APPLICABILITY IN A VERY BROAD TARGET MARKET. THE BENEFITS OF HIGH VOLUME ON KEEPING THE ANV

ARCANUM CORP.
P.O. BOX 1482
ANN ARBOR, MI 48106
Phone: (313) 665-4421
Topic#: 91-091
Office: NATICK
Contract #:
PI: JOHN A. GETSOIAN
ID#: 91NAT-019
Title: MANUFACTURE OF SUPERACTIVATED CARBON
Abstract: ARMY NATICK RESEARCH HAS FOUND THAT A SUPERACTIVATED CARBON WITH BET SURFACE AREAS GREATER THAN 3000 METERS SQUARED PER GRAM HAS POTENTIAL APPLICATION IN THE PRODUCTION OF SUPERIOR CHEMICAL PROTECTION EQUIPMENT FOR BATTLEFIELD PERSONNEL. THIS CARBON, ORIGINALLY DEVELOPED BY AMOCO CORPORATION, IS PRODUCED BY A UNIQUE HIGH TEMPERATURE CAUSTIC ACTIVATION PROCESS AND IS NOT CURRENTLY AVAILABLE FROM DOMESTIC SOURCES. THE OBJECTIVE OF THE WORK PROPOSED IS TO DEVELOP A COMPETENT, SCALABLE, UP-TO-DATE PROCESS DESIGN FOR PRODUCTION OF THIS MATERIAL. THE PROPOSING FIRM (ARCANUM CORP.) HAS ESTABLISHED A WORKING RELATIONSHIP WITH AMOCO CORP., AND HAS ENGAGED THE PROCESS INVENTOR AS A CONSULTANT. THE PLAN OF WORK IS TO MAKE EXTENSIVE USE OF THE INFORMATION CONTAINED IN THE ORIGINAL AMOCO DEVELOPMENT FILES AND TO INVESTIGATE RECENT ADVANCES IN CAUSTIC RECYCLE TECHNOLOGY THAT MAY HAVE SIGNIFICANT IMPACT ON PROCESS ECONOMICS.

ASTRON CORP.
470 SPRING PARK PLACE, SUITE 100
HERNDON, VA 22070
Phone: (703) 471-0600
Topic#: 91-056
Office: CECOM
Contract #:
PI: SCOTT C. KORDELLA
ID#: 91CEC-141
Title: MONOLITHIC SCANNING ANTENNA
Abstract: A NOVEL APPROACH TO LOW COST SHAPED BEAM SCANNING FOR MONOLITHIC STRUCTURES IS PROPOSED. THE TECHNIQUE MAKE USE OF RADOME MATERIAL COSTING OF THE CONVENTIONAL MONOLITHIC STRUCTURE; THE RADOME ITSELF IS COMPOSED OF A COMPOSITE OF HIGH DIELECTRIC CONSTANT/MAGNETICALLY SENSITIVE MATERIAL-REFERED TO AS "DIELECTROMAGNETIC" (DEM) MATERIAL. THE DEM MATERIAL CHARACTERISTICS ARE DESIGNED TO PROVIDE A SHAPED BEAM WHICH CAN BE SCANNED IN AZIMUTH OR ELEVATION BY THE APPLICATION OF ORTHOGONAL MAGNETIC FIELDS. THE USEFULNESS OF THE APPROACH IS THAT: (1) WIDE ANGLE SCANNING BEYOND THE NULLS OF THE MONOLITHIC ELEMENTS CAN BE ACHIEVED, THUS IMPROVING SYSTEM PERFORMANCE; (2) THE OVERALL COST OF REPLACING THE SCANNED BEAM ANTENNA CAN BE DRAMATICALLY REDUCED BY REPLACING THE INDIVIDUAL PHASE SHIFTERS FOR EACH ELEMENT OF THE ARRAY WITH AN ELECTRICALLY SCANNED DEM COVER; (3) THE RADAR CROSS SECTION IS REDUCED USING LOW OBSERVABLE MATERIAL IN THE DEM COMPOSITE; (4) THE OVERALL SIZE OF THE MONOLITHIC ANTENNA IS REDUCED DUE TO THE REFRACTIVE INDEX OF THE DEM MATERIAL.

ATHENA GROUP, INC.
3424 N.W. 31ST STREET
GAINESVILLE, FL 32605
Phone: (904) 371-2567
Topic#: 91-244
Office: SDC
Contract #:
PI: GLENN ZELNIKER, PH.D.
ID#: 91SDC-044
Title: ATHENA SENSOR ARITHMETIC PROCESSOR (ASAP)
Abstract: FUTURE MILITARY SYSTEMS WILL HAVE AN INCREASING NEED TO ACHIEVE A HIGHER AND MORE COMPLETE LEVEL OF SENSOR FUSION THAN CURRENTLY EXISTS. THE RATIONALE FOR SENSOR FUSION IS GENERALLY WELL ACCEPTED AND RELATES TO PERFORMANCE, RELIABILITY, MODULARITY, AND EXTENSIBILITY. IT IS NOW DESIRED TO INTEGRATE DIGITAL PROCESSORS WITH SENSOR ARRAYS TO FORM SMART SENSOR GROUPS. THE PROPOSED TECHNOLOGY, THE ATHENA SENSOR ARITHMETIC PROCESSOR, OR ASAP, WILL ATTEND NOT ONLY TO RF AND OPTICAL SENSOR FUSION IMPLEMENTATION ISSUES, BUT WILL ALSO BE ABLE TO RESPOND TO THE HIGHER ORDER PROBLEM OF SYSTEM INTEGRATION. TO ACHIEVE THE HIGH-BANDWIDTH, ULTRA-COMPACT CHANNELIZER, WE WILL INTEGRATE OUR PROVEN DSP FILTERING CAPABILITIES WITH THE UNPARALLELED ADVANTAGES OF OUR ARITHMETIC PROCESSOR, WHICH IS BASED ON THE RESIDUE NUMBER SYSTEM (RNS). MORE SPECIFICALLY, WE WILL INTEGRATE AN RNS

TECHNOLOGY WHICH WE BELIEVE IS THE MOST ADVANCED IN THE INDUSTRY, AN RNS SYSTEM INTEGRATION AND VLSI EXPERIENCE, AND PROVEN DSP CAPABILITIES. THE NEW RESEARCH THRUST WILL LEAD TO RNS BASED ARCHITECTURES AND SYSTEMS CAPABLE OF WORKING FROM 100MHZ (CMOS) TO 1GHZ (GAAS). THE DEVELOPED ASAP TECHNOLOGY WILL BE EXPECTED TO HAVE AT LEAST A 100-FOLD SPEED-AREA RATIO IMPROVEMENT OVER CONVENTIONAL TECHNOLOGIES. WE WILL DEMONSTRATE, USING SIMULATION AND ANALYSIS, OUR ABILITY TO SUPPORT HIGH-BANDWIDTH SENSOR SIGNAL PROCESSING AS WELL AS DEVELOP ITS VLSI SPECIFICATION. THE RESEARCH ALSO DEVELOPS ASAP AS A FAULT-TOLERANT SENSOR SIGNAL PROCESSOR.

ATLANTIC AEROSPACE ELECTRONICS CORP.
470 TOTTEN POND ROAD
WALTHAM, MA 02154
Phone: (617) 890-4200
Topic#: 91-005 ID#: 91CEC-304
Office: CECOM
Contract #: DAAB07-91-C-K510
PI: TAMAR PELI

Title: MORPHOLOGY-BASED FRONTEND PROCESSING FOR IR-BASED ATR SYSTEMS

Abstract: IT IS PROPOSED TO APPLY AN INNOVATIVE AND REVOLUTIONARY CLASS OF SIGNAL PROCESSING TECHNIQUES TO THE PROBLEM OF FRONTEND PROCESSING FOR IR-BASED ATR SYSTEMS. THESE TECHNIQUES OFFER THE POTENTIAL FOR SUBSTANTIAL REDUCTION IN COMPUTATIONAL REQUIREMENTS AND HARDWARE SIZE AND WEIGHT FOR REAL-TIME TARGET DETECTION AND CLASSIFICATION. THE PROPOSED APPROACH IS BASED ON EXTENSIVE USE OF MORPHOLOGICAL FILTERING OPERATIONS THROUGHOUT THE ATR PROCESSING CHAIN. SPECIAL-PURPOSE MORPHOLOGY-BASED PROCESSORS CAN BE IMPLEMENTED USING PARALLEL ARRAYS OF TRIVIALLY SIMPLE PROCESSING ELEMENTS, LEADING TO ENORMOUS SAVINGS OVER MORE CONVENTIONAL REAL-TIME PROCESSORS. WE PROPOSE TO ADAPT EXISTING MORPHOLOGY-BASED DETECTION AND DISCRIMINATION TECHNIQUES, DEVELOPED BY US IN OTHER DOD-SPONSORED RESEARCH PROGRAMS INVOLVING RADAR, OPTICAL AND ACOUSTIC IMAGING SENSORS, TO THE IR IMAGE DOMAIN. WE WILL DEVELOP A ROBUST MORPHOLOGY-BASED IR TARGET DETECTION ALGORITHM IN WHICH TARGET SIZE AND SHAPE EXPECTATIONS ARE INCORPORATED PRIOR TO THRESHOLDING, I.E., AT THE RAW PIXEL-LEVEL. WE WILL ALSO DEVELOP IR-SPECIFIC FRACTAL SIGNATURES TO BE USED FOR DISCRIMINATING TARGETS FROM FALSE DETECTIONS. THESE SIGNATURES, WHICH HAVE PROVED TO BE HIGHLY EFFECTIVE IN OTHER DATA ENVIRONMENTS, CAN ALSO BE COMPUTED USING HARDWARE-EFFICIENT MORPHOLOGICAL FILTERING TECHNIQUES. FOR TARGET CLASSIFICATION WE WILL DEVELOP ALGORITHMS THAT EXTRACT UNIQUE STRUCTURAL AND TEXTURAL PROPERTIES OF TARGET CLASSES.

ATLANTIC AEROSPACE ELECTRONICS CORP.
6404 IVY LANE, SUITE 300
GREENBELT, MD 20770
Phone: (301) 982-5273
Topic#: 91-016 ID#: 91HDL-301
Office: HDL
Contract #: DAAL02-91-0055
PI: VICTOR C. SANCHEZ

Title: LOW COST CONFORMAL ELECTRONICALLY SCANNED ANTENNA

Abstract: THE OBJECTIVE OF THE PROPOSED PHASE I EFFORT IS TO DESIGN AN SCANNED ANTENNA SYSTEM WHICH MEETS SPECIFIC ELECTROMAGNETIC, WEIGHT AND POWER CONSUMPTION PERFORMANCE CRITERIA AND IS LOW COST. THE PROPOSED SYSTEM WILL CONSIST OF THREE MAIN COMPONENTS, A PIN DIODE BEAM COMMUTATOR, A ROTMAN LENS BEAMFORMING NETWORK, AND A TRAVELLING-WAVE MICROSTRIP ARRAY ANTENNA. THE TWO DIMENSIONAL MICRO-STRIP ARRAY WILL CONSIST OF AN ARRAY OF IDENTICAL, VERTICALLY-ORIENTED TRAVELLING-WAVE ARRAYS. THE ROTMAN LENS WILL BE USED TO APPROPRIATELY PHASE THE INPUTS TO EACH TRAVELLING-WAVE ARRAY, THUS SCANNING THE BEAM IN AZIMUTH. THE PIN DIODE BEAM COMMUTATOR WILL EXCITE THE APPROPRIATE ROTMAN LENS INPUT PORT, THUS ELECTRONICALLY STEERING THE BEAM. THE MODULAR SYSTEM STRUCTURE GIVES RISE TO COST ADVANTAGES, BUT THE PRINCIPAL COST ADVANTAGE RESULTS FROM THE SIMPLICITY OF THE CONTROL CIRCUITRY NEEDED TO SCAN THE BEAM.

AUTOMATED ANALYSIS CORP.
2805 S. INDUSTRIAL, SUITE 100
ANN ARBOR, MI 48104
Phone: (313) 973-1000
Topic#: 91-098 ID#: 91098-03
Office: TACOM
Contract #:
PI: DR. NICKOLAS VLAHOPOULOS

Title: STRUCTURE GENERATED NOISE MODELING, USING FINITE ELEMENT ANALYSIS (FEA) TECHNIQUES

Abstract: THERE IS AN INCREASED EMPHASIS ON THE ACOUSTIC SIGNATURES OF GROUND COMBAT VEHICLES DUE TO THE DEVELOPMENT OF NEW AND EFFECTIVE ACOUSTIC TARGET ACQUISITION SYSTEMS. DURING THE DESIGN STAGE OF A GROUND COMBAT VEHICLE, IT IS IMPORTANT TO REDUCE THE NOISE, EMITTED FROM STRUCTURAL COMPONENTS. THEREFORE, THE DEVELOPMENT OF ACOUSTIC PREDICTION SOFTWARE IS ESSENTIAL. WITHIN THIS PROJECT, THEORETICAL TECHNIQUES FOR ACOUSTIC PREDICTION AND ACOUSTIC SENSITIVITIES WILL BE DEVELOPED, AND IMPLEMENTED INTO ACOUSTIC SOFTWARE. THE SOFTWARE WILL BE VERIFIED BY COMPARING RESULTS TO ANALYTICALLY AVAILABLE EXACT SOLUTIONS AND TEST DATA. THE DEVELOPED SOFTWARE WILL BE CAPABLE OF ACCEPTING INFORMATION FROM CURRENT FINITE ELEMENT ANALYSIS MODELS WITH A KNOWN INPUT FORCING FUNCTION. IT WILL USE THIS INFORMATION TO ACCURATELY PREDICT THE NOISE RADIATED FROM THE VIBRATING STRUCTURE. THE COMPUTER CODE WILL BE A VALUABLE TOOL IN DESIGNING STRUCTURAL COMPONENTS WITH IMPROVED NOISE CHARACTERISTICS, BECAUSE IT WILL ELIMINATE THE REQUIREMENT TO ACTUALLY TEST THE STRUCTURE, IN ORDER TO FIND THE EFFECT OF THE MODIFICATIONS IN THE EMITTED NOISE. IT IS ANTICIPATED THAT THE ABILITY TO STUDY MANY ALTERNATIVE DESIGNS QUICKLY AND ECONOMICALLY CAN LEAD TO SIGNIFICANT NOISE REDUCTION.

AUTOMATED ANALYSIS CORP.
2805 S. INDUSTRIAL, SUITE 100
ANN ARBOR, MI 48104
Phone: (313) 973-1000
Topic#: 91-101 ID#: 91101-03
Office: TACOM
Contract #:
PI: DR. NICKOLAS VLAHOPOULOS

Title: EXHAUST GENERATED NOISE MODELING

Abstract: MILITARY SYSTEMS POWERED BY INTERNAL COMBUSTION ENGINES EMIT NOISE FROM THE EXHAUST SYSTEM. THERE ARE TWO TYPES OF NOISE, AIRBORNE, DUE TO THE PRESSURE WAVE PROPAGATING THROUGH THE EXHAUST SYSTEM AND EXITING AT THE OUTLET AND STRUCTURE - BORNE, RADIATED FROM THE VIBRATING COMPONENTS OF THE EXHAUST SYSTEM. THE OBJECTIVE OF THIS PROJECT IS TO DEVELOP A COMPUTER CODE SIMULATING THE EXHAUST SYSTEM, AND PREDICTING ACCURATELY BOTH STRUCTURE - BORNE AND AIRBORNE NOISE. AN ELASTO-ACOUSTIC MODEL WILL BE DEVELOPED AND IMPLEMENTED IN COMPUTER CODE. THE EFFECTS OF MEAN FLOW, TEMPERATURE GRADIENT, AND MULTI-DIMENSIONALITY WILL BE ACCOUNTED FOR IN THE MODEL. EXPERIMENTAL MEASUREMENTS FROM AN EXHAUST SYSTEM WILL BE USED TO VALIDATE THE CODE. THE DEVELOPED SOFTWARE WILL BE A VALUABLE TOOL IN DESIGNING EXHAUST SYSTEMS WITH IMPROVED NOISE CHARACTERISTICS. IT WILL ALLOW THE STUDY OF DIFFERENT CONFIGURATIONS WITHOUT ACTUALLY CONSTRUCTING AND TESTING THEM. THIS WILL INCREASE THE EFFECTIVENESS IN DESIGNING EXHAUST SYSTEMS. IN THE FUTURE, THIS SOFTWARE CAN BE INCORPORATED INTO NOISE CONTROL TECHNOLOGIES FOR DESIGNING IMPROVED EXHAUST SYSTEMS. ACTIVE NOISE CONTROL, ADAPTIVE EXHAUST SYSTEM DESIGN, AND MUFFLER SHAPE OPTIMIZATION, ARE AREAS WHERE THE DEVELOPED SOFTWARE CAN BE APPLIED.

AUTOMETRIC, INCORPORATED
5301 SHAWNEE ROAD
ALEXANDRIA, VA 22312
Phone: (703) 658-4008
Topic#: 91-200 ID#: 91ETL-003
Office: ETL
Contract #:
PI: Clifford W. Greve

Title: Capability to Assess/Quanitfy Improvements in Operational Performance Versus a Change in Data Base Characteristics

Abstract: A systematic means of studying the models which are currently available in the field for establishing a relationship between Digital Terrain Data accuracy and detail to the ability of a unit to perform its mission is to be determined. The approach involves an analysis of the unit mission into the essential functions to accomplish that mission, and then proceeds to

analyze the effect of the Digital Terrain Data upon the ability of the unit to perform each of these requisite functions. The functional capability is then combined to model the ability to perform the overall mission.

BELMONT INSTRUMENT CORP.
8 COOK STREET
BILLERICA, MA 01821
Phone: (508) 663-0212

Topic#: 91-028
Office: MEDICAL
Contract #: 91-C-1109
PI: DAVID CASSIDY

ID#: 91MED-345

Title: PORTABLE FLUID INFUSION/WARMING DEVICE FOR HEMORRHAGIC SHOCK

Abstract: A MAJOR CAUSE OF COMBAT DEATH IS RAPID HEMORRHAGE. WE PROPOSE DEVELOPMENT OF A COMPACT PORTABLE SYSTEM FOR RAPID INFUSION AND WARMING OF CRYSTALLOID FLUID OR BLOOD SUBSTITUTE FOR VOLUME REPLACEMENT IN HEMORRHAGIC SHOCK. THE SYSTEM WILL BE CAPABLE OF INFUSION RATES EXCEEDING 1 LITER PER MINUTE AND WILL UTILIZE UNIQUE POWER CONVERSION TECHNOLOGY FOR HEATING THE INFUSATE FLUID IN A MUCH MORE COMPACT AND LIGHT WEIGHT PACKAGE THAN HAS PREVIOUSLY BEEN AVAILABLE. THE SYSTEM WILL BE DESIGNED TO OPERATE FROM BATTERY OR VEHICLE POWER AND TO FUNCTION IMMEDIATELY WITHOUT A "WARM UP" PERIOD. IN PHASE I WE WILL DEMONSTRATE FEASIBILITY BY DEVELOPING AND TESTING A PROTOTYPE SYSTEM USING OUR HIGH FREQUENCY MAGNETICALLY COUPLED HEAT EXCHANGER INCORPORATED INTO A SIMPLE INFUSION SYSTEM. USING THE PROTOTYPE WE WILL INVESTIGATE THERMAL EFFICIENCY, AND UNIFORMITY OF INFUSATE HEATING WHILE MINIMIZING SYSTEM WEIGHT. IN PHASE II A COMPLETE INFUSION/WARMING SYSTEM WILL BE DEVELOPED WITH MORE SOPHISTICATED FLOW AND TEMPERATURE CONTROL, USER INTERFACE, FILTRATION, AIR DETECTION, AND INTEGRAL POWER SOURCE. IN ADDITION TO ITS MILITARY APPLICATIONS, THE SYSTEM WILL HAVE APPLICATIONS TO TRAUMA IN THE CIVILIAN SECTOR.

BELTRAN, INC.
1133 EAST 35 STREET
BROOKLYN, NY 11210
Phone: (718) 338-3311

Topic#: 91-192
Office: AVSCOM
Contract #:
PI: MICHAEL R. BELTRAN

ID#: 91AVS-124

Title: ELECTROSTATIC ENHANCEMENT OF FINE PARTICLE REMOVAL IN AXIAL INLET PARTICLE SEPARATORS (IPS)

Abstract: THE OBJECTIVE OF THE PROJECT IS TO DEVELOP AN ELECTROSTATIC PARTICLE SEPARATOR CONCEPT CAPABLE OF ENHANCING THE FINE PARTICLE SEPARATION OF A T800-TYPE INERTIAL IPS. ELECTROSTATIC PRECIPITATION IS AN EFFICIENT PROCESS FOR THE COLLECTION OF FINE PARTICLES AND REQUIRES LOW ENERGY CONSUMPTION FOR THE OPERATION AND PRESSURE LOSS THROUGH THE DEVICE. DIFFICULTIES ARISE FROM THE COLLECTION OF DRY DUSTS WHICH CONSIST OF PARTICULATE OF VERY LOW OR VERY HIGH RESISTIVITY. A DEVICE CAN BE CONSTRUCTED WHERE THE HIGHLY EFFICIENT ELECTROSTATIC PROCESS MAY BE USED TO AGGLOMERATE FINE PARTICULATES SO THE LESS EFFICIENT INERTIAL DEVICES SUCH AS CYCLONES MAY COLLECT THEM. ELECTROSTATIC PARTICLE SEPARATORS HAVE LONG BEEN CONSIDERED AS A GOOD CANDIDATE FOR FINE PARTICLE SEPARATION BUT ELECTROSTATIC SEPARATORS TEND TO COLLECT THE FINE DUST WHICH REDUCES EFFICIENCY SUBSTANTIALLY. THIS EFFORT WILL CONCENTRATE ON TRYING TO DEVELOP AN ELECTROSTATIC DEVICE WHICH CAN ENHANCE INERTIAL IPS'S WITHOUT COLLECTING FINE DUST (I.E., SELF-CLEANING). THE DEVICE COULD BE BUILT TO MOUNT IN FRONT OF THE IPS BUT IT WOULD BE PREFERABLE TO INCORPORATE THE DEVICE INTO THE DESIGN OF AN IPS WITHOUT AFFECTING THE FLOW PATH OR THE IPS ENVELOPE.

BENTHOS, INC.
49 EDGERTON DR.
NORTH FALMOUTH, MA 02556
Phone: (508) 563-1000

Topic#: 91-102
Office: TACOM
Contract #:
PI: SAMUEL H. PATTERSON

ID#: 91102-12

Title: DEVELOPMENT OF AN UNMANNED GROUND VEHICLE LOCOMOTION SYSTEM
Abstract: BENTHOS, A WORLD LEADER IN THE DEVELOPMENT OF REMOTELY OPERATED VEHICLE (ROV) SYSTEMS, HAS CONCEIVED A VEHICLE LOCOMOTION SYSTEM THAT CAN SIGNIFICANTLY IMPROVE SMALL UNMANNED VEHICLE MOBILITY, PERFORMANCE AND STABILITY BY ELIMINATING THE DISADVANTAGES OF WHEELED AND TREADED SYSTEMS. ESSENTIAL TO THE LOCOMOTIVE CONCEPT ARE CLUSTERS OF THREE WHEELS MOUNTED IN A PLANETARY FASHION ABOUT A COMMON AXIS. FOUR OF THESE THREE WHEEL CLUSTERS ARE IN TURN MOUNTED AT THE CORNERS OF A VEHICLE PLATFORM. EACH OF THE THREE WHEELS IN A CLUSTER IS DRIVEN BY A SIMPLE PLANETARY MECHANISM RESULTING IN ALL 12 WHEELS BEING CONTINUOUSLY DRIVEN. AS EACH THREE WHEEL CLUSTER CAN PIVOT FREELY ON ITS CENTRAL AXIS TO ACCOMMODATE TERRAIN VARIATIONS AND OBSTACLES, NUMEROUS DRIVEN WHEELS ARE IN CONTACT WITH THE SUPPORTING SURFACE AT ANY ONE TIME. WHEN A LARGE OBSTACLE IS ENCOUNTERED, THE WHEEL CLUSTERS ROTATE TO PROVIDE LIFTING AND TRACTIVE FORCES. IN LIKE MANNER, WHEN WATER IS ENCOUNTERED, THE CLUSTER ASSEMBLIES HAVE THE POTENTIAL TO "PADDLE WHEEL" ROTATE, PROVIDING MOTIVE FORCE UNTIL WHEEL TRACTION IS AGAIN REESTABLISHED. THE ENVISIONED ADVANTAGES OF THE PROPOSED LOCOMOTIVE CONCEPT HAVE BEEN WITNESSED ON A SMALL WORKING MODEL. BENTHOS PROPOSES TO REFINE THE LOCOMOTIVE ARRANGEMENT AND DEFINE A SUITABLE INEXPENSIVE PROTOTYPE VEHICLE SYSTEM TO FULLY EVALUATE THE CONCEPT.

BERKELEY RESEARCH ASSOCIATES, INC.
P.O. BOX 241
BERKELEY, CA 94701
Phone: (703) 750-3434
Topic#: 91-158
Office: HDL
Contract #:
PI: JEFFRY GOLDEN
ID#: 91HDL-037
Title: STANDARDIZED DIAGNOSTICS FOR DRIFT-TUBE ENHANCED GAMMA-SIMULATOR
Abstract: DIAGNOSTIC PROBES THAT ARE CHARACTERIZED, STANDARDIZED, AND CALIBRATED ARE PROPOSED FOR THE DRIFT TUBE ENHANCED AURORA GAMMA SIMULATOR. THESE PROBES MEASURE THE PRINCIPAL EXPERIMENTAL PARAMETERS IN THE COAXIAL VACUUM FEED, DIODE, AND GAS TRANSPORT CHAMBER OF EACH OF THE FOUR OUTPUT BEAMLINES OF AURORA. UNLIKE PRESENTLY USED PROBES, THE PROPOSED DEVICES WILL BE STUDIED TO OPTIMIZE THE SIGNAL-TO-NOISE RATIO AND TO REDUCE OR ELIMINATE THE PROBES' SPURIOUS RESPONSE INDUCED BY THE HOSTILE ELECTROMAGNETIC AND RADIATION FIELDS. FURTHERMORE, TECHNIQUES WILL BE FOUND TO STANDARDIZE THE PROBES SO THAT THEY CAN BE INTERCHANGEABLY DEPLOYED ON DIFFERENT OUTPUT BEAMLINES. CALIBRATION METHODS WILL BE STUDIED, AND WHERE PRACTICAL, IN SITU CALIBRATION WILL BE PERFORMED.

BIO-TECHNICAL RESOURCES
1035 SOUTH 7TH STREET
MANITOWOC, WI 54220
Phone: (414) 684-5518
Topic#: 91-066
Office: CRDEC
Contract #:
PI: RICHARD P. BURLINGAME, PH
ID#: 91CRD-139
Title: OPTIMIZED PRODUCTION OF BACTERIAL AGENT-DEGRADING ENZYMES
Abstract: A NUMBER OF ORGANOPHOSPHORUS COMPOUNDS ARE HIGHLY TOXIC AS A RESULT OF THEIR ABILITY TO INHIBIT CHOLINESTERASES. THIS TOXICITY HAS LED TO THE WIDESPREAD USE OF THESE COMPOUNDS AS PESTICIDES AND SUGGESTS THEIR POTENTIAL USE AS AGENTS OF CHEMICAL WARFARE. A NUMBER OF BACTERIAL SPECIES ELABORATE ENZYMES, TERMED ORGANOPHOSPHORUS ACID (OPA) ANHYDRASES, CAPABLE OF DETOXIFYING THESE COMPOUNDS. THE GOALS OF THE PROPOSED RESEARCH WILL BE TO DETERMINE UNDER WHAT CONDITIONS OF GROWTH MAXIMUM OPA ANHYDRASE ACTIVITY CAN BE OBTAINED WITH SELECTED BACTERIAL STRAINS AND TO DEVELOP PRELIMINARY METHODS FOR THE ISOLATION OF ENZYMES POSSESSING THIS ACTIVITY FROM THESE STRAINS. THESE GOALS WILL BE ACCOMPLISHED BY: 1) DEVELOPING METHODS FOR THE RAPID AND EFFICIENT SCREENING OF STRAINS FOR THEIR LEVELS OF OPA ANHYDRASE ACTIVITY 2) PERFORMING LARGE SCALE SCREENING OF CULTURES TO DETERMINE THE OPTIMUM GROWTH CONDITIONS FOR HIGH LEVEL ENZYME ACTIVITY, 3) DETERMINING WHETHER THE CONDITIONS SO ESTABLISHED WILL SCALE-UP FROM TUBE OR SHAKE FLASK CULTURES TO SMALL AND MEDIUM SCALE FERMENTORS, AND 4) DEVELOPING PRELIMINARY PROTOCOLS FOR THE

PURIFICATION OF OPA ANHYDRASEES FROM THESE ORGANISMS. SUCCESSFUL COMPLETION OF THIS WORK WILL AID IN ESTABLISHING THE FEASIBILITY OF USING THESE ORGANISMS OR GENES FROM THESE ORGANISMS FOR THE LARGE SCALE PRODUCTION OF ENZYMES FOR DETOXIFICATION OF ORGANOPHORPHORUS COMPOUNDS.

BIOELASTICS RESEARCH, LTD.
1075 SOUTH 13TH STREET
BIRMINGHAM, AL 35205
Phone: (205) 934-9500

Topic#: 91-123
Office: ARO
Contract #:
PI: R. DEAN HARRIS

ID#: 91ARO-002

Title: DEVELOPMENT OF RULES FOR FOLDING OF BIOTECHNOLOGY PRODUCED PROTEIN

Abstract: IN GENERAL, PROTEINS FOLD WITH HYDROPHOBIC RESIDUES BURIED, AWAY FROM WATER. REVERSIBLE PROTEIN FOLDING DUE TO HYDROPHOBIC INTERACTIONS RESULTS FROM INVERSE TEMPERATURE TRANSITIONS WHERE FOLDING OCCURS ON RAISING THE TEMPERATURE. SINCE WARM-BLOODED ANIMALS PROVIDE AN INFINITE HEAT RESERVOIR, THE TRANSITION TEMPERATURE, TT, NOT THE ENDOTHERMIC HEAT, DETERMINES THE FOLDED STATE AT PHYSIOLOGICAL TEMPERATURES. AS THE TEMPERATURE IS RAISED THROUGH THE INVERSE TEMPERATURE TRANSITION, THE POLYPEPTIDE OR PROTEIN FOLDS BY HYDROPHOBIC INTERACTIONS INTO A MORE-ORDERED STATE. THE TEMPERATURE OF THE INVERSE TEMPERATURE TRANSITION, TT, CAN BE SHIFTED BY AN EXTERNAL VARIABLES; THEREFORE IT BECOMES POSSIBLE, ISOTHERMALLY, TO DRIVE THE FOLDING/UNFOLDING TRANSITION: (1) BY A CHANGE IN THE MEAN HYDROPHOBICITY OF THE POLYPEPTIDE (E.G., BY PROTONATION/ DEPROTONATION OF A FUNCTIONAL SIDE CHAIN, BY ENZYMATIC PHOSPHORYLATION/ DEPHOSPHORYLATION OF A SERINE MOIETY, ETC.), (2) BY A CHANGE IN THE SOLVENT COMPOSITION, (3) BY A CHANGE IN PRESSURE, AND, (4) BY A CHANGE IN OXIDATIVE STATE OF A PROSTHETIC GROUP. THE QUANTITATION OF THE CONTRIBUTION OF EACH AMINO ACID TO THE TEMPERATURE OF THE INVERSE TEMPERATURE TRANSITION RESULTED IN A NEW HYDROPHOBICITY SCALE BASED ON THE VALUES OF TT FOR EACH AMINO ACID RESIDUE AS A GUEST IN A NATURAL REPEATING PEPTIDE SEQUENCE, THE HIGH POLYMERS OF WHICH EXHIBIT REVERSIBLE INVERSE TEMPERATURE TRANSITIONS. THE TRANSITION TEMPERATURE SCALE CAN SUCCESSFULLY PREDICT TRANSMEMBRANE HELICES FOR MEMBRANE PROTEINS. TO DEVELOP FURTHER RULES AND METHODOLOGIES FOR EXPERIMENTALLY DIRECTING PROTEIN FOLDING, IT IS NECESSARY SIMILARLY TO QUANTITATE THE EFFECTS OF A RANGE OF SOLVENT COMPOSITIONS ON SHIFTING THE VALUE OF TT FOR EACH RESIDUE, TO DETERMINE DISTANCE EFFECTS OF A RANGE OF SOLVENT COMPOSITIONS ON SHIFTING THE VALUE OF TT FOR EACH RESIDUE, TO DETERMINE DISTANCE EFFECTS IN HYDROPHOBICITY INDUCED PKA SHIFTS, AND TO DETERMINE HOW LARGE AN HYDROPHOBIC DOMAIN IS REQUIRED BEFORE IT CAN FOLD INDEPENDENTLY. THE OBJECTIVES OF THE SBIR PHASE I ARE TO PROVIDE ADDITIONAL INFORMATION ON EACH OF THESE NEW QUANTITATIONS WITH THE PURPOSE OF DEVELOPING RULES FOR CHAPERONING PROTEIN FOLDING WHICH CAN BE GENERAL AND

BIOTEK, INC.
21-C OLYMPIA AVENUE
WOBURN, MA 01801
Phone: (617) 938-0938

Topic#: 91-214
Office: MEDICAL
Contract #:
PI: E.S. NUWAYSER, PH.D.

ID#: 91MED-063

Title: DEVELOPMENT OF BIOPORE BIODEGRADABLE DELIVERY SYSTEM FOR BONE-INDUCTIVE PROTEINS AND GROWTH FACTORS

Abstract: CRANIOFACIAL INJURIES, EITHER CONGENITAL OR ACQUIRED, ARE A MAJOR CAUSE OF DISFIGUREMENT AND LOSS OF FUNCTION. THEY ACCOUNT FOR A SIGNIFICANT FRACTION OF WARTIME CASUALTIES AND OF CIVILIAN INJURIES FROM MOVING VEHICLE ACCIDENTS. CONGENITAL CRANIOFACIAL DEFECTS OCCUR IN CLEFT-PALATE AND ALVEOLAR-CLEFT DEFORMITIES. A FEW DEFECTS ARE ALSO CREATED BY TUMOR RESECTION. RECONSTRUCTION OF CRANIOFACIAL DEFECTS IS BY REPLACEMENT OF THE MISSING BONE STRUCTURE WITH AUTOGENOUS GRAFTS OR ALLOGENEIC BANK BONE, FOLLOWED BY DENTAL RECONSTRUCTION TO RESTORE THE APPEARANCE AND FUNCTION OF THE PATIENT. AUTOGENOUS BONE GRAFTS HAVE BEEN ASSOCIATED WITH CONSIDERABLE POSTOPERATIVE PROBLEMS FOR THE

PATIENT. ALLOGENEIC BONE GRAFTS SUFFER FROM SEVERAL DRAWBACKS INCLUDING INSUFFICIENT SUPPLY OF DONOR BONE, THE POSSIBILITY OF TRANSMISSION OF PATHOGENS SUCH AS HEPATITIS B OR HUMAN IMMUNODEFICIENCY VIRUS (HIV). DEMINERALIZED BONE MATRIX, ALTHOUGH SUCCESSFUL, DO NOT PROVIDE IMMEDIATE STRUCTURAL STABILITY OR ABILITY TO SUPPORT SOFT TISSUE. SYNTHETIC AND NATURALLY OCCURRING POLYMERS, CERAMICS, AND METAL IMPLANTS HAVE ALSO BEEN USED, BUT UNLIKE BONE GRAFTS THEY DO NOT PROMOTE BONE REGENERATION. THE OVERALL OBJECTIVE IS TO DETERMINE THE FEASIBILITY OF UTILIZING BIOTEK'S BIODEGRADABLE POLYMERIC MATRIX "BIOPORE" FOR THE DEVELOPMENT OF A COMPOSITE SYSTEM FOR CRANIOFACIAL RECONSTRUCTION THAT DELIVERS BONE INDUCTIVE PROTEINS AND GROWTH FACTORS. THE BIOPORE SYSTEM SELECTED FOR THIS PROJECT WILL BE DEVELOPED FOR USE IN MAXILLOFACIAL RECONSTRUCTIVE SURGERY TO PREVENT SOFT TISSUE COLLAPSE, PROVIDE A MATRIX FOR BONE REGENERATION, AND TO DELIVER A SUSTAINED DOSE OF OSTEOGENIC BONE INDUCTIVE PROTEIN. GROWTH FACTORS CAN BE ADDED TO THE MATRIX TO ACCELERATE OSTEOGENESIS.

BIOTEK, INC.
21-C OLYMPIA AVENUE
WOBURN, MA 01801
Phone: (617) 938-0938

Topic#: 91-218
Office: MEDICAL
Contract #:
PI: E.S. NUWAYSER, PH.D.

ID#: 91MED-064

Title: PRODUCTION OF POLYCLONAL ANTIBODIES IN RABBITS

Abstract: CHOLINESTERASES ARE WIDELY DISTRIBUTED THROUGHOUT THE BODY. THEY HYDROLYZE ACETYLCHOLINE (ACH), A COMPOUND WHICH SERVES ALSO AS THE NEUROHUMORAL AGENT IN PERIPHERAL JUNCTION TRANSMISSION. CHOLINESTERASES ARE KNOWN TO BE CRUCIAL FOR CHOLINERGIC NEUROTRANSMISSION AND OCCUR AT HIGH CONCENTRATIONS IN THE IMMEDIATE VICINITY OF NERVE ENDINGS WHERE THEY HYDROLYZE ACH IN LESS THAN A MILLISECOND. RESEARCH ON CHOLINESTERASES IS AN IMPORTANT AREA OF MEDICAL RESEARCH. ANOTHER IMPORTANT MEDICAL RESEARCH AREA IS THE DEVELOPMENT OF EFFECTIVE TREATMENTS FOR HUMAN IMMUNODEFICIENCY VIRUS (HIV) DISEASE. THE OBJECTIVE OF THE PHASE I APPLICATION IS TO RAISE ANTIBODIES FROM RABBITS AGAINST CHOLINESTERASE, BUTYRYLCHOLINESTERASE, GLYCOSYLATED BUTYRYLCHOLINESTERASE, SYNTHETIC PEPTIDES THAT MIMIC SELECTED AREAS OF THE HIV VIRUS PROTEINS, AND ALSO AGAINST MONOCLONAL ANTIBODIES WHICH INHIBIT THE CATALYTIC ACTIVITY OF CHOLINESTERASE. THE IMMUNOGENS USED IN THE PREPARATION OF THE ANTIBODIES WILL BE SUPPLIED BY WRAIR. THE BINDING CAPACITY OF THE ANTIBODIES TO THE IMMUNOGEN WILL BE DETERMINED BY ENZYME LINKED IMMUNOSORBANT ASSAY (ELISA). THE ANTIBODIES WILL BE SUBMITTED TO WRAIR FOR USE IN THE DEVELOPMENT OF ASSAY PROCEDURES, LOCALIZATION OF CHOLINESTERASE ACTIVITY, AND UNDERSTANDING THE MECHANISMS OF ACTION IN VARIOUS TISSUES. ANTIBODIES PREPARED AGAINST PEPTIDES THAT MIMIC SELECTED AREAS OF THE HIV VIRUS PROTEINS WILL BE USED TO IDENTIFY THE VIRUS, LOCALIZE IT, AND FOR ELUCIDATING THE MODE OF ACTION OF NEW TREATMENT MODALITIES.

CAPE COD RESEARCH, INC.
P.O. BOX 600
BUZZARDS BAY, MA 02532
Phone: (508) 759-5911

Topic#: 91-024
Office: AMC
Contract #: DAAE07-91-C-R068
PI: FRANK KEOHAN

ID#: 91AMC-353

Title: NOVEL CHROMIUM-FREE SURFACE PRETREATMENT PROCESS FOR CORROSION INHIBITION

Abstract: A PROCESS FOR SURFACE TREATING NON-FERROUS STRUCTURAL METALS SUCH AS ALUMINUM AND TITANIUM IS PROPOSED WHICH CAN DRAMATICALLY SIMPLIFY AND IMPROVE THE PROCESS OF ADHESIVE BONDING AND CORROSION PROTECTION. THE PROPOSED RESEARCH EXPLORES THE FEASIBILITY OF USING NON-AQUEOUS SURFACE ETCHING TECHNIQUES AND REACTIVE PRIMER COATINGS TO YIELD TIGHT, STABLE OXIDE LAYERS SUITABLE FOR STRONG CHEMICAL BONDING TO COMMERCIAL ADHESIVES AND COATINGS. THE ABILITY TO FORM STRONG, DURABLE ADHESIVE BONDS TO TYPICAL AIRCRAFT ALLOYS WITHOUT THE NEED FOR CORROSIVE, TOXIC CHEMICAL ETCHANTS, SOPHISTICATED EQUIPMENT, OR LONG HIGH-TEMPERATURE DRYING PROCEDURES WOULD REPRESENT A SIGNIFICANT ADVANCEMENT

IN ADHESION TECHNOLOGY.

CAPE COD RESEARCH, INC.
P.O. BOX 600
BUZZARD BAY, MA 02532
Phone: (508) 759-5911
Topic#: 91-125
Office: ARO
Contract #:
PI: OSCAR J. ALMEIDA
ID#: 91ARO-057
Title: HIGH TEMPERATURE SMART SENSORS AND ACTUATORS
Abstract: FLUIDS WHICH RAPIDLY AND REVERSIBLY CHANGE TO SOLIDS ON THE APPLICATION OF AN ELECTRIC FIELD WOULD BE VERY USEFUL FOR DAMPING VIBRATIONS. ELECTRORHEOLOGICAL FLUIDS EXIST; HOWEVER, BECAUSE THEY ARE SUSPENSIONS OF SOLIDS IN INERT LIQUIDS, PROBLEMS ARE EXPERIENCED WITH DESIGNING PRACTICAL DEVICES. ELECTROVISCOUS FLUIDS ARE SINGLE PHASE LIQUIDS WHOSE RHEOLOGY CHANGES ON APPLICATION OF AN ELECTRIC FIELD. THIS EFFECT IS NORMALLY VERY SMALL. THIS PHASE I PROPOSAL EXPLORES THE FEASIBILITY OF DESIGNING ELECTROVISCOUS FLUIDS WHICH EXPERIENCE LARGE CHANGES IN VISCOSITY ON APPLICATION OF ELECTRIC FIELDS. THE PHASE I RESEARCH INVOLVES SYNTHESIS OF AND EXPERIMENTAL VERIFICATION OF THE UNUSUAL PROPERTIES OF A NOVEL CLASS OF LUBRICANTS.

CAPE COD RESEARCH, INC.
PO BOX 600
BUZZARDS BAY, MA 02532
Phone: (508) 759-5911
Topic#: 91-172
Office: MTL
Contract #:
PI: FRANCIS L. KEOHAN
ID#: 91MTL-025
Title: CHROMIUM-FREE SURFACE PRETREATMENTS FOR IMPROVED ADHESIVE BONDING
Abstract: A PROCESS FOR SURFACE TREATING NON-FERROUS STRUCTURAL METALS SUCH AS ALUMINUM AND TITANIUM IS PROPOSED WHICH CAN DRAMATICALLY SIMPLIFY AND IMPROVE THE PROCESS OF ADHESIVE BONDING AND CORROSION PROTECTION. THE PROPOSED RESEARCH EXPLORES THE FEASIBILITY OF USING HYDROGEN PEROXIDE SOLUTIONS MODIFIED WITH POLY (METAL OXIDES) FOR ADHERENT SURFACE ETCHING AND SPECIALLY FORMULATED PRIMERS TO YIELD TIGHT, STABLE OXIDE LAYERS SUITABLE FOR STRONG CHEMICAL BONDING TO COMMERCIAL ADHESIVES AND COATINGS. THE ABILITY TO FORM STRONG, DURABLE ADHESIVE BONDS TO TYPICAL AIRCRAFT ALLOYS WITHOUT THE NEED FOR CORROSIVE, TOXIC CHEMICAL ETCHANTS, SOPHISTICATED EQUIPMENT, OR LONG, HIGH-TEMPERATURE DRYING PROCEDURES WOULD REPRESENT A SIGNIFICANT ADVANCEMENT IN ADHESION TECHNOLOGY.

CDS, INC.
PO BOX 292677
KETTERING, OH 45429
Phone: (513) 434-0572
Topic#: 91-067
Office: CRDEC
Contract #:
PI: ANTHONY P. SCHMITZ
ID#: 91CRD-137
Title: ENCAPSULATION OF ENERGETIC MATERIALS
Abstract: THE PRIMARY OBJECTIVE OF THIS PROPOSED PHASE I PROGRAM IS TO PROVIDE A STABLE DELIVERY SYSTEM FOR ENERGETIC MATERIAL(S) WHICH IS DESIGNED TO RELEASE ITS CONTENTS, ON DEMAND, IN SELECTED HOSTILE ENVIRONMENTS. INITIAL EFFORTS WILL FOCUS ON THE DEVELOPMENT OF THE MOST FEASIBLE METHOD(S) FOR ENCAPSULATING A PYROPHORIC COMPOSITION OF HIGH REACTIVITY AND ENERGY CONTENT SUCH AS ALKALI METAL ALKYL BORATES AND ALUMINATES INCLUDING TRIETHYLALUMINUM (TEA), TRIMETHYLALUMINUM (TMA), AND/OR A MIXTURE OF THESE AND OTHER RELATED COMPOUNDS. CHEMICAL DELIVERY SYSTEMS, INC. (CDS) WILL CONSTRUCT A PYROPHORIC DELIVERY SYSTEM WHICH WILL AFFORD THE USER WITH A MATERIAL THAT IS SAFE FOR HANDLING, NONPYROPHORIC, AND STABLE PRIOR TO TRIGGERING THE RELEASE OF THE MICROENCAPSULATED PYROPHORIC MATERIAL(S). MORE SPECIFICALLY, THE OBJECTIVE OF THIS PROPOSAL IS TO PROVIDE THE MILITARY USER COMMUNITY WITH A SPECIFICALLY CONFIGURED PYROPHORIC MICROCAPSULE DELIVERY SYSTEM CAPABLE OF MEETING THE PACKAGING REQUIREMENTS DETAILED IN THIS PROPOSAL.

CERACON, INC.
1101 N. MARKET BLVD., #9
SACRAMENTO, CA 95834
Phone: (916) 928-1933
Topic#: 91-178 ID#: 91AVS-030
Office: AVSCOM
Contract #:
PI: RAMAS RAMAN
Title: AN INNOVATIVE AND ECONOMICAL PROCESSING SCHEME TO FABRICATE COMPLEX NEAR-NET SHAPE ENGINE COMPONENTS
Abstract: THE ARMY AVIATION SYSTEMS COMMAND NEEDS AN INNOVATIVE AND ECONOMICAL PM PROCESS TO PORM NEAR-NET SHAPE TURBINE ENGINE COMPONENTS. THE KEY ISSUES ARE CAPABILITY TO PORM AXI-SYMMETRIC THICK AND THIN SECTIONS, MAINTAIN DIMENSIONAL TOLERANCE, ACHIEVE FULL DENSITY, AND MAINTAIN MICROSTRUCTURAL ADVANTAGES OF PM. INJECTION MOLDING (IM) PROCESS HAS SHOWN THE CAPABILITY TO ADDRESS VERY COMPLEX-SHAPED SMALL SIZED PARTS INCLUDING TURBOCHARGER ROTORS. BUT A MAJOR ISSUE WITH THE INJECTION MOLDING PROCESS IS THAT IN LARGER SIZE PARTS, ACHIEVING FULL DENSITY HAS BEEN A PROBLEM. CERACON'S RAPID CONSOLIDATION PROCESS HAS EMERGED AS A LOWCOST PROCESS FOR PRODUCING FULL DENSITY PARTS OF MODERATE COMPLEXITY UP TO 50 POUNDS IN WEIGHT. A FEASIBILITY DEMONSTRATION OF A PROCESSING SCHEME THAT INVOLVES COUPLING OF ADVANCED METAL INJECTION MOLDING AND CERACON RAPID CONSOLIDATED PROCESS TO ACHIEVE FULL DENSITY WILL BE PROVIDED IN PHASE I. IN PHASE II THIS METHODOLOGY WILL BE EXTENDED TO MORE COMPLEX BLADED-RING COMPONENTS. IN PHASE III COMMERCIALIZATION OF THIS TECHNOLOGY WILL BE PURSUED FOR ARMY USE AND COMMERCIAL AEROSPACE COMPONENT APPLICATIONS.

CERNYLAND OF UTICA
19 GENESEE COURT
UTICA, NY 13502
Phone: (315) 733-2579
Topic#: 91-028 ID#: 91MED-340
Office: MEDICAL
Contract #: 91-C-1102
PI: LAWRENCE C. CERNY, PH.D.
Title: A TETRONIC POLYOL AND HEMOGLOBIN COMPLEX: A POTENTIAL RESUSCITATIVE FLUID
Abstract: BLOOD IS A BIOLOGICAL LIQUID THAT IS CONSTANTLY IN USE FOR PATIENTS UNDERGOING HEART SURGERY, RESUSCITATION OF HYPOVOLEMIC TRAUMA, HEMORRHAGE, ACUTE AND CHRONIC ILLNESSES. THERE ARE APPROXIMATELY TEN (10) MILLION UNITS OF BLOOD COLLECTED EACH YEAR FROM THREE MILLION INDIVIDUALS. HOWEVER, THERE ARE ABOUT ONE HUNDRED (100) MILLION POTENTIAL DONORS. AS A CONSEQUENCE THERE IS AN IMBALANCE BETWEEN THE SUPPLY AND THE GROWING DEMAND. ALTHOUGH ONE METHOD OF CHANGING THIS PATTERN WOULD BE BY INCREASING THE LEVEL OF DONATING, THIS APPROACH HAS NOT BEEN SUCCESSFUL RECENTLY BECAUSE OF THE THREAT OF AIDS. THEREFORE, NEWER, SAFER AND LESS EXPENSIVE METHODS OF PRESERVING OUR CURRENT LEVEL OF BLOOD RESOURCES MUST BE SOUGHT. THE PURPOSE OF THIS RESEARCH PROPOSAL IS TO SYNTHESIZE A BLOOD SUBSTITUTE. THESE COMPOUNDS WILL HAVE THE FOLLOWING ADVANTAGES: 1) MADE FROM AVAILABLE AND INEXPENSIVE STARTING MATERIALS, 2) THE COMPOSITION IS KNOWN AND CAN BE VARIED TO MEET SPECIFIC NEEDS; 3) BLOOD TYPING IS NOT NEEDED; 4) NO DANGER OF HEPATITIS OR OTHER TRANSFUSION-TRANSMITTED DISEASES LIKE AIDS; 5) LARGE VOLUME USAGE IS PRACTICAL; 6) CAN BE STORED AS A POWDER IN FREEZE-DRIED FORM; 7) EXTENDED SHELF-LIFE AT ROOM TEMPERATURE, PERHAPS UP TO 5 YEARS. ULTIMATE GOAL: A SAFE, STABLE AND STERILE PERSONALIZED BLOOD AVAILABLE TO ALL IN NEED.

CFD RESEARCH CORP.
3325-D TRIANA BLVD.
HUNTSVILLE, AL 35805
Phone: (205) 536-6576
Topic#: 91-010 ID#: 91BRL-301
Office: BRL
Contract #: 91-C-0096
PI: DR. ANDRZEJ PRZEKWAS
Title: DEVELOPMENT OF A SCIENTIFIC VISUALIZATION TOOL
Abstract: THE RECENT ADVANCES IN MATHEMATICAL MODELING OF COMPLEX PHENOMENA IN CONTINUUM MECHANICS HAS LED TO LARGE SCALE CALCULATIONS INVOLVING EXTREMELY VOLUMINOUS DATA SETS

(GIGABYTE REGIME). TO EFFECTIVELY ANALYZE THESE DATA SETS, DEVELOPMENT OF 3-D GRAPHICS SOFTWARE WHICH EMPLOYS STATE-OF-THE-ART VOLUME RENDERING TECHNIQUES, AND DESIGNED TO BE INTERACTIVE AND USER-FRIENDLY IS REQUIRED. IN ADDITION, THE NEW TECHNIQUES SHOULD PROVIDE THE CAPABILITY OF PERFORMING ANIMATION AND REAL TIME TRANSFORMATION WHICH FACILITATE INTERPRETATION OF 3-D SOLUTIONS. ANOTHER LEADING BOTTLENECK IS THE DATA TRANSFER BETWEEN COMPUTERS. THE GOAL OF THIS PROJECT IS TO EXPLOIT THE THREE VOLUME RENDERING TECHNIQUES, NAMELY RAY-CASTING, SURFACE CONTOURING, AND RAY TRACING TO DEVELOP A GRAPHICS SOFTWARE TO VISUALIZE A 3-D/4-D DATA FIELD. ANOTHER FEATURE OF THE PROJECT IS TO IMPLEMENT DATA COMPRESSION/EXPANSION ROUTINES. PHASE I WILL EXPLORE ONE VOLUME RENDERING TECHNIQUE AND SEVERAL DATA COMPRESSION TECHNIQUES AND DEMONSTRATE THEIR CAPABILITIES. PHASE II WILL INVESTIGATE RAY TRACING TECHNIQUE FOR VISUALIZATION OF 3-D FIELDS WITH MULTI OBJECTS AND FURTHER DEVELOP USER INTERFACE FEATURES OF THE FINAL GRAPHICS SOFTWARE. PHASE III WILL FOCUS ON FURTHER ENHANCING THE USEFULNESS AND EFFECTIVENESS OF 3-D SIMULATION AND ANIMATION. THE DEVELOPED SOFTWARE WILL BE GENERALIZED OR SEPARATELY OPTIMIZED TO SUIT VERSATILE FEATURES OF VARIOUS GRAPHICS WORKSTATION SYSTEMS.

CHANDLER/MAY, INC.
150 WEST PARK LOOP
HUNTSVILLE, AL 35806
Phone: (205) 722-0175

Topic#: 91-085
Office: MICOM
Contract #: DAAH01-92-C-R106
PI: K. S. HENRY

ID#: 91MIC-101

Title: MULTI SENSOR SUITE PERFORMANCE ANALYSIS FOR TARGET DETECTION AND CLASSIFICATION

Abstract: This proposal identifies innovative methods for conducting sensor suite performance evaluations. The technical approach includes the development of sensor suite functional requirements which will be used in the evaluation of sensor suite performance. Individual sensors are analyzed and evaluated against these functional requirements to determine their performance characteristics. Analytical methods are then used to predict sensor suite performance in a variety of environmental and electronic warfare environments. Results of the sensor suite performance analysis will be used to develop a modular hardware and software conceptual architecture design which could be used to perform sensor fusion algorithms through state-of-the-art signal processing hardware and software.

CHANG INDUSTRY, INC.
1925 MCKINLEY AVE, SUITE F
LA VERNE, CA 91750
Phone: (714) 596-7888

Topic#: 91-147
Office: ETDL
Contract #:
PI: DR. YU-WEN CHANG

ID#: 91ETD-148

Title: LOW COST DUAL-MODE SENSOR TECHNOLOGY

Abstract: INNOVATIVE LOW COST TECHNIQUES WILL BE INVESTIGATED TO DESIGN A FORM FIT GIMBALL-MOUNTED 94 GHZ/INFRARED FOCAL PLANE ARRAY DUAL-MODE MISSILE SEEKER SENSOR BASED ON LOW COST INTEGRATED CIRCUIT FRONTED, COMMON-APERTURE OPTICS, AND FAST PROCESSING ELECTRONICS. HIGH PERFORMANCE WILL BE STRESSED INCLUDING HIGH RANGE RESOLUTION AT 94 GHZ AND A 128X128 ARRAY IR IMAGE PROCESSING FOR AUTONOMOUS TARGET RECOGNITION AND AIMPOINT SELECTION. THE 94 GHZ AND INFRARED ELECTRONICS MINIATURIZATION WILL BE INVESTIGATED. HIGH PERFORMANCE IR DETECTOR TECHNOLOGY WILL BE ALSO BE INVESTIGATED INCLUDING THEIR PROCESSING ELECTRONICS TO ACHIEVE FAST FRAME RATE.

CHARGED INJECTION CORP.
9 DEER PARK DR, PRINCETON CORPORATE PLAZA
MONMOUTH JUNCTION, NJ 08852
Phone: (609) 799-1378

Topic#: 91-186
Office: AVSCOM
Contract #:
PI: DR. ARNOLD J. KELLY

ID#: 91AVS-075

Title: ELECTROSTATIC FUEL INJECTOR

Abstract: THE PROPRIETARY SPRAY TRIODE ATOMIZER IS THE ONLY ELECTROSTATIC SPRAYER CAPABLE OF GENERATING CHARGED DROPLET PLUMES OF INHERENTLY RESISTIVE HYDROCARBON FUELS AT

ARBITRARY FLOW RATES BY PURELY ELECTRICAL MEANS. IT IS ALSO THE ONLY ATOMIZER FOR WHICH A FIRST PRINCIPLES, CONSTANT FREE MODEL EXISTS. IN ADDITION, SINCE A QUANTITATIVELY PRECISE MODEL OF THE ELECTROSTATIC SPRAY PROCESS ALSO EXISTS, MORE IS KNOWN FUNDAMENTALLY ABOUT ELECTROSTATIC ATOMIZATION AND CHARGED SPRAYS THAN ABOUT ANY OTHER MEANS OF DROPLET SIZES AND PATTERNATION CHARACTERISTICS THAT ARE APPROPRIATE FOR FUEL SYSTEM USE. THESE NOZZLES ARE CAPABLE OF PROVIDING INTENSELY SELF-DISPERSIVE, DEEPLY THROTTEABLE, DROPLET SPRAYS OF VISCOUS FUELS AT MODEST VOLTAGES. THIS 6 MONTH ENGINEERING DEVELOPMENT EFFORT IS DIRECTED TOWARD THE DESIGN AND CHARACTERIZATION TESTING OF SUCH A DEVICE OPERATING ON JP-8 FUEL THAT WILL BE SUITABLE FOR SMALL TURBOSHAFT ENGINE USE. PHASE I WILL PROVIDE VALIDATION OF THE SPRAY NOZZLE CONCEPT AND WILL PERMIT THE FUEL SYSTEM TO BE DEFINED DURING PHASE II, DURING WHICH COMBUSTOR TESTING WILL BE UNDERTAKEN.

CHARLES RIVER ANALYTICS, INC.
55 WHEELER STREET
CAMBRIDGE, MA 02138
Phone: (617) 491-3474
Topic#: 91-210 ID#: 91ARI-020
Office: ARI
Contract #:
PI: GREG L. ZACHARIAS
Title: AUTOMATED HOVER TRAINER EXPERT SYSTEM
Abstract: THE PHASE I OBJECTIVE IS TO DESIGN, DEVELOP, AND EVALUATE AN EXPERT SYSTEM (ES) TO PROVIDE RULE-GUIDED SYNTHETIC VOICE FEEDBACK TO STUDENT ROTOCRAFT PILOTS. THE EFFORT WILL FOCUS ON ARI'S EXISTING AUTOMATED HOVER TRAINER (AHT) WHICH USES DISTRIBUTED PROCESSING, COMPUTER IMAGE GENERATION, AND OPTIMAL PILOT MODELING FOR LOW-COST SIMULATOR-BASED INITIAL-ENTRY MANEUVER TRAINING FOR THE UH-1. ES-BASED VOICE FEEDBACK WILL FURTHER REDUCE COST, BY REDUCING DEPENDENCE ON AN INSTRUCTOR PILOT (IP). DEVELOPMENT ISSUES TO BE ADDRESSED INCLUDE: (1) FORMULATING/IMPLEMENTING THE ES KNOWLEDGE BASE TO CAPTURE THE IP'S KNOWLEDGE; (2) FORMATTING/GENERATING MESSAGES TO PROVIDE EFFECTIVE SP FEEDBACK; (3) MODIFYING THE CURRENT AHT WITHIN THE EXISTING HARDWARE/SOFTWARE; AND (4) ENSURING EXTENSIBILITY OF THE APPROACH TO FULL-SCOPE PRIMARY PHASE TRAINING. WE PROPOSE A SIX TASK EFFORT. WE WILL: (1) REVIEW THE CURRENT UH-1TRS SIMULATOR AND RESEARCH BASE; (2) SPECIFY THE REQUIREMENTS FOR SYSTEM ENHANCEMENT VIA REAL-TIME ES/VOICE SYNTHESIS; (3) REVIEW HARDWARE/SOFTWARE OPTIONS IN TERMS OF FUNCTIONALITY, DEVELOPMENT RISK, AND COST; (4) RECONFIGURE THE HARDWARE; (5) HOST THE SOFTWARE; AND (6) EVALUATE PERFORMANCE. A FINAL REPORT WILL SUMMARIZE THE DEVELOPMENT EFFORT AND OUTLINE NEEDED TASKS TO SUPPORT FULL PRIMARY PHASE TRAINER DEVELOPMENT UNDER PHASE II.

CHEMGEN CORP.
16016 INDUSTRIAL DRIVE
GAITHERSBURG, MD 20877
Phone: (301) 330-4101
Topic#: 91-066 ID#: 91CRD-146
Office: CRDEC
Contract #:
PI: DAVID M. ANDERSON, PHD.
Title: OPTIMIZED PRODUCTION OF BACTERIAL AGENT-DEGRADING ENZYMES
Abstract: ORGANOPHOSPHORUS ACID ANYDRASES (OPA) HAVE ENORMOUS POTENTIAL TO BE USED IN THE DECONTAMINATION AND DEMILITARIZATION OF EXTREMELY TOXIC CHEMICALS THAT INHIBIT CHOLINESTERASE. AS THE NUMBER OF OPAS BEING DISCOVERED IS EXPANDING RAPIDLY, IT IS IMPORTANT TO PRODUCE AND PURIFY SAMPLES OF THE MORE INTERESTING OPAS FOR COMPARISION BY DETAILED BIOCHEMICAL AND PHYSICAL ANALYSIS AND CHARACTERIZATION OF THEIR EFFICACY. EVENTUALLY OPAS WITH PROMISING POTENTIAL MUST BE PRODUCED ECONOMICALLY FOR FIELD TESTS AND FULL SCALE APPLICATION. CHEMGEN CURRENTLY IS DEVELOPING SEVERAL NOVEL ENZYMES FOR INDUSTRIAL MARKETS USING NEWLY ISOLATED BACTERIA, INCLUDING ONE PROCESS IN PILOT SCALE PRODUCTION. ACHIEVING A LOW COST FOR ENZYME MANUFACTURE HAS BEEN A SIGNIFICANT FACTOR IN CHEMGEN'S COMMERCIAL SUCCESS AND THIS IS ACCOMPLISHED THROUGH THE APPLICATION OF TRADITIONAL PROCESS IMPROVEMENT TECHNIQUES OR APPLIED MOLECULAR BIOLOGY WHERE APPLICABLE. IN PHASE I, CHEMGEN PLANS TO IDENTIFY AND DEVELOP BENCH-SCALE FERMENTATION AND ENZYME

RECOVERY/PURIFICATION PROCEDURES FOR THE ASSIGNED OPS(S) IN ORDER TO PRODUCE SMALL RESEARCH QUANTITIES OF ENZYME. IN PHASE II, CHEMGEN PLANS TO FURTHER TEST AND IMPROVE THE BENCH-SCALE PROCESS, REFINE PURIFICATION METHODS, AND THEN SCALE THEM UP TO PRODUCE LARGER QUANTITIES OF ENZYME, AS REQUIRED FOR TEST AND EVALUATION STUDIES. IN PHASE III, CHEMGEN WOULD PROPOSE TO EXPAND THE PRODUCTION SYSTEM TO MEET FEDERAL AND/OR COMMERCIAL PRODUCTION DEMANDS FOR THE ENZYME.

CHEMICAL RESEARCH LAB OF AMERICA
SUBSIDIARY OF INTERNATIONAL DIOXIDE, 554 TEN
NORTH KINGSTOWN, RI 02852
Phone: (908) 499-9660
Topic#: 91-219
Office: MEDICAL
Contract #:
PI: DR. JOSEPH M. KELLEY
ID#: 91MED-041

Title: COLD STERILANT FOR FIELD MEDICAL USE

Abstract: EARLIER WORK HAD SHOWN THAT THERE EXISTS A SYNERGISTIC EFFECT BETWEEN QUATERNARY AMMONIUM COMPOUNDS AND CHLORINE DIOXIDE (US PATENT 4,073,888 TO PETTIBONE LABORATORIES, A SUBSIDIARY OF INTERNATIONAL DIOXIDE, INC.) THIS COMPOSITION IS A SOLUTION WHICH RECENTLY WAS SHOWN TO PASS THE SUTURE LOOP TEST (AOAC SPORICIDAL OFFICIAL METHOD) IN 6-9 HOURS INDICATING THE COMPOSITION TO BE SPORICIDAL AND A COLD STERILANT. IN THIS PROJECT, WE PROPOSE TO FORMULATE A POWDERED COLD STERILANT CONSISTING OF (L) A POWDERED QUATERNARY AMMONIUM SALT, (2) A POWDERED CHLORINE DIOXIDE PRECURSOR AND (3) A POWDERED SURFACE ACTIVE AGENT FOR REDUCTION OF SURFACE TENSION. SEVERAL POWDERED QUATS WILL BE EVALUATED IN THE ABOVE FORMULATION AS WILL THE POWDERED SURFACTANTS. THE POWDER FORMULATIONS WILL BE EVALUATED FOR (1) COMPATIBILITY AND LONG TERM STORAGE STABILITY, (2) SOLUBILITY, (3) HOMOGENEITY OF THE SOLUTION (NO IMMISCIBILITY), (4) SPORICIDAL PROPERTIES AS A FUNCTION OF CONCENTRATION AND TIME. THE SPECTRUM OF ACTIVITY (TIME TO KILL) WILL BE CARRIED OUT ON S. AUREUS, P. AERUGINOSA AND S. CHLOLERASIUS BY STANDARD AOAC TESTS AS WELL AS SPORICIDAL TIMES TO KILL ON B. SUBTILIS AND C. SPOROGENES AND COMPARED TO THE COMMON STERILANTS SUCH AS GLUTERALDEHYDES BY THE AOAC SUTURE LOOP TEST. BASED ON THE RESULTS OBTAINED ON THE VARIOUS FORMULATIONS, THE BEST ONE WILL BE TESTED IN THE FULL 60 TUBE SUTURE LOOP TEST FOR SPORICIDAL ACTIVITY AND POSSIBLE REGISTRATION BY THE EPA.

CHI SYSTEMS, INC.
GWYNEDD PLAZA III, BETHLEHEM PIKE
SPRING HOUSE, PA 19477
Phone: (215) 542-1400
Topic#: 91-018
Office: AVSCOM
Contract #: NAS-213487
PI: ALLEN ZAKLAD, PH.D.
ID#: 91AVS-313

Title: INTELLIGENT MAN-MACHINE INTEGRATION FOR ADVANCED ARMY ROTORCRAFT

Abstract: THE INCREASING SPEED AND COMPLEXITY OF MODERN (AND FUTURE) AIR-VEHICLE SYSTEMS ARE PUSHING THE HUMAN OPERATOR TO HIS LIMITS, ESPECIALLY IN COGNITIVE-RELATED TASKS. IT IS THEREFORE OF PARTICULAR IMPORTANCE TO DEVELOP TECHNIQUES THAT ALLOW THE COMPUTER TO HELP THE HUMAN TO EXTEND THESE LIMITS. AN IMPORTANT CLASS OF SUCH ENABLING TECHNOLOGIES IS AN ACTIVE, MIXED-INITIATIVE MAN-MACHINE INTERFACE (MMI), WHICH INTELLIGENTLY AND ACTIVELY SUPPORTS THE HUMAN TO FIND, PROCESS, AND ACT ON THE RICH INFORMATION AVAILABLE. CHI SYSTEMS PROPOSES AN INNOVATIVE APPROACH TO BUILDING AN ACTIVE MMI FOR ADVANCED ARMY ROTOCRAFT, BASED ON A NEW COGNITIVE MODELING METHODOLOGY CALLED COGNET (COGNITION AS A NETWORK OF TASKS) AND A CORRESPONDING SOFTWARE IMPLEMENTATION TECHNIQUE CALLED BATON (BLACKBOARD ARCHITECTURE FOR TASK-ORIENTED NETWORKS). TOGETHER, COGNET AND BATON ALLOW US TO BUILD A POWERFUL COMPUTATIONAL MODEL OF THE OPERATOR AND EMBED THIS MODEL IN THE MMI SOFTWARE, THEREBY PROVIDING AN ESSENTIAL INGREDIENT IN AN ACTIVE MMI. THE PROPOSED PHASE I EFFORT EVALUATES THE APPLICABILITY OF THE COGNET/BATON SYSTEM TO MMI FOR ADVANCED ARMY ROTOCRAFT, IDENTIFIES CANDIDATE FUNCTIONS FOR THIS MMI, PRODUCES A PHASE II SYSTEM ARCHITECTURE AND DEVELOPMENT PLAN, AND BUILDS A RAPID INTERFACE PROTOTYPE.

CHROMEX, INC.
2705-B PAN AMERICAN NE
ALBUQUERQUE, NM 87107
Phone: (505) 344-6270
Topic#: 91-071 ID#: 91CRD-073
Office: CRDEC
Contract #:
PI: DR. GEORGES G. BRET
Title: DEVELOPMENT OF A COMPACT RAMAN SPECTROSCOPY SYSTEM FOR CHEMICAL CONTAMINATION MONITORING
Abstract: CHROMEX HAS DEMONSTRATED CCD ARRAY DETECTOR-BASED RAMAN SPECTROSCOPY EMPLOYING LASER DIODES AND OPTICAL FIBER PROBES CAPABLE OF SENSITIVITIES COMPARABLE TO OR BETTER THAN THE FOURIER TRANSFORM RAMAN (FTR) METHOD. IT IS LIKELY THIS NEW METHOD CAN BE IMPLEMENTED IN A RUGGED COMPACT INSTRUMENT HAVING NO MOVING PARTS, IN A PACKAGE OF LESS THAN 1 FT.3, WEIGHING LESS THAN 50 POUNDS, AND REQUIRING LESS THAN 100 WATTS OF POWER INCLUDING THE LASER AND COOLED CCD. USING AN IMPROVED VERSION OF AN EXISTING 100MM IMAGING SPECTROGRAPH DESIGN, CHROMEX HEREIN PROPOSES A COMPACT CCD ARRAY DETECTOR-BASED RAMAN INSTRUMENT DESIGN THAT, BECAUSE OF ITS HIGH EFFICIENCY OPTICAL FIBER RAMAN PROBE, HIGH THROUGHPUT (F/2), AND IMAGING CAPABILITY (LIMITING THE NUMBER OF REQUIRED VERTICAL PIXELS, HENCE, NOISE), WILL IMPROVE SIGNAL-TO-NOISE BY AT LEAST AN ORDER OF MAGNITUDE COMPARED TO CONVENTIONAL INSTRUMENTS EMPLOYING CCD ARRAY DETECTORS. THIS SYSTEM WILL BE CAPABLE OF OBTAINING SIGNATURES FROM RAMAN SCATTERERS IN FRACTIONS OF A SECOND. THIS PROPOSAL DEVELOPS THEORETICAL ARGUMENTS SUPPORTED BY EXPERIMENTAL RESULTS WHICH SHOW THAT IS REASONABLE TO ANTICIPATE A COMPACT, EVEN PORTABLE, RAMAN SYSTEM CAPABLE OF CONVENIENT AND RAPID DETECTION OF LIQUID AND SOLID CONTAMINANTS ON SURFACES AT COVERAGES OF 1 GRAM/METER2.

COGNITIVE TECHNOLOGIES, INC.
4200 LORCOM LANE
ARLINGTON, VA 22207
Phone: (703) 524-4331
Topic#: 91-150 ID#: 91HEL-027
Office: HEL
Contract #:
PI: MARVIN S. COHEN
Title: HUMAN PERFORMANCE ISSUES IN AUTOMATIC TARGET RECOGNITION
Abstract: THE PROPOSED RESEARCH ASKS HOW DECISION MAKING CAN BE SUPPORTED AND IMPROVED IN THE AUTOMATIC TARGET RECOGNITION ENVIRONMENT, IN THE LIGHT OF (A) BIASES IN HUMAN DECISION BEHAVIOR AND (B) NATURAL HUMAN REPRESENTATIONAL AND REASONING STRATEGIES. WE WILL (1) STUDY ATR DETECTION, IDENTIFICATION, TRACKING, AND PRIORITIZATION TASKS IN TERMS OF THE MIX OF ANALYTICAL, RECOGNITIONAL, AND METACOGNITIVE DEMANDS ON HUMAN INFORMATION PROCESSING; (2) DEVELOP INTERACTIVE DISPLAY CONCEPTS TO IMPROVE HUMAN ATR PERFORMANCE; AND (3) EXPERIMENTALLY TEST HYPOTHESES ABOUT HUMAN PERFORMANCE AND ABOUT THE EFFECTS OF DISPLAYS ON IT.

COHERENT TECHNOLOGIES, INC.
P.O. BOX 7488
BOULDER, CO 80306
Phone: (303) 449-8736
Topic#: 91-124 ID#: 91ARO-093
Office: ARO
Contract #:
PI: R. MILTON HUFFAKER
Title: COHERENT LIDAR SYSTEM FOR HIGH RESOLUTION MEASUREMENT OF ATMOSPHERIC WIND VELOCITY AND WATER VAPOR FIELDS
Abstract: THIS EFFORT IS TO DETERMINE THE DESIGN OF A DIODE-PUMPED SOLID-STATE 2 UM COHERENT LASER RADAR FOR THE HIGH SPATIAL AND TEMPORAL RESOLUTION MEASUREMENT OF WIND VELOCITY AND WATER VAPOR CONCENTRATIONS IN THE ATMOSPHERIC BOUNDARY LAYER. A DETAILED COMPUTER SIMULATION OF THE COHERENT LASER RADAR WIND AND DIAL MEASUREMENT PROCESS WILL BE USED TO DETERMINE SYSTEM DESIGN PARAMETERS. A PERFORMANCE TRADE STUDY WILL BE CONDUCTED TO OPTIMIZE SYSTEM PARAMETERS. AN EXISTING FLASHLAMP-PUMPED 2 UM COHERENT LASER RADAR WILL BE USED TO DEMONSTRATE THE FEASIBILITY OF COMBINED WIND AND WATER VAPOR MEASUREMENT IN THE ATMOSPHERIC BOUNDARY LAYER. AN OVERALL SYSTEM DESIGN WILL BE DETERMINED USING THE RESULTS FROM THE SIMULATION EFFORT AND DEMONSTRATED MEASUREMENT RESULTS IN THE FIELD.

CTI HAS RECENTLY DEMONSTRATED, IN THE LABORATORY, A DIODE-PUMPED 2 UM TM:YAG TRANSMITTER WITH OUTPUT ENERGIES OF APPROXIMATELY 5 MJ/PULSE AND 100 HZ PRF.

COLEMAN RESEARCH CORP.
5950 LAKEHURST DRIVE
ORLANDO, FL 32819
Phone: (407) 249-7717
Topic#: 91-253
Office: PM TRADE
Contract #:
PI: MR. GEORGE BETTS
ID#: 91PM-015
Title: INDIRECT FIRE WEAPON SIMULATION
Abstract: THE OBJECTIVE OF OUR PHASE I EFFORT IS TO EXPLORE TECHNIQUES, AND DEVELOP APPROACHES TO PROVIDE SAFE REAL-TIME AUDIOVISUAL CUES FOR THE INBOUND AND IMPACT NOISES, CONCUSSION, DEBRIS, FLASH (NIGHT VISIBLE), SMOKE, AND DUST OF INDIRECT FIRE WEAPONS USED IN TRAINING AT THE NATIONAL TRAINING CENTER (NTC). THE APPROACHES WILL PERMIT DIRECT INTERACTION OF FIRE SUPPORT TEAMS, BE COMPATIBLE WITH MILES, AND TAKE MAXIMUM ADVANTAGE OF EXISTING TRAINING SUPPORT SYSTEMS. THE EFFORT WILL LOOK AT APPROACHES THAT DO NOT RELY ON VEHICLE OR PREPOSITIONED UNIT LOCATIONS FOR THE CUES. INITIALLY, WORK WILL FOCUS ON EXPLORING TECHNIQUES FOR PROVIDING THE CUES WHILE GATHERING INFORMATION OF RELEVANT EXISTING AND PLANNED TRAINING SUPPORT SYSTEMS THAT CAN HELP SUPPORT THEM. THE ANALYSIS WILL INCLUDE A SURVEY OF KNOWN UNACCEPTABLE METHODS THAT HAVE ALREADY BEEN EXPLORED BY NTC SO THAT TIME WON'T BE WASTED IN THESE AREAS. ANALYSIS WILL FOCUS ON DEVELOPING A SAFE TECHNIQUE OR "FAMILY" OF SAFE TECHNIQUES THAT PROVIDE PERSONNEL IN THE FIELD WITH REALISTIC REAL-TIME INDIRECT FIRE CREW. PROVIDING CASUALTY DETERMINATION WILL BE A PART OF THIS ANALYSIS. THE FINAL REPORT WILL DOCUMENT THIS ANALYSIS AND PROVIDE A RECOMMENDED APPROACH TO IMPLEMENT THE BEST ALTERNATIVE.

COMMONWEALTH COMPUTER RESEARCH, INC.
P.O. BOX 907
ARLINGTON, VA 22216
Phone: (703) 683-7010
Topic#: 91-006
Office: CECOM
Contract #: DAAB10-91-C-0157
PI: DANIEL F. WIENER II
ID#: 91CEC-302
Title: TACTICAL INTELLIGENCE DATA FUSION DECISION AIDS
Abstract: IN SUPPORT OF THE REDEFINED "NON-LINEAR BATTLEFIELD" AND AIRLAND BATTLE STRATEGY, THE ARMY'S NEW COMMAND AND CONTROL DOCTRINE EMPHASIZES A MAJOR SHIFT IN TECHNOLOGICAL NEEDS FOR THE SERVICE WITH GREATLY INCREASED EMPHASIS ON INTELLIGENCE FOR AN INTEGRATED PICTURE OF THE BATTLEFIELD. UNDERLYING THIS NEED IS AN INTEGRATED INTELLIGENCE DATA FUSION SYSTEM, WHICH AUTOMATES THE CURRENT MANPOWER INTENSIVE CORRELATION, ASSESSMENT AND MISSION MANAGEMENT FUNCTIONS, AND INTEGRATES THE DATA FROM MULTIPLE SOURCES. THE UNDERLYING BASIS FOR FUTURE INTELLIGENCE DATA FUSION SYSTEMS WILL BE A SPATIAL DATA BASE MANAGEMENT SYSTEM THAT ENCOMPASSES THE GEOGRAPHIC INFORMATION SYSTEM AND TACTICAL DECISION AIDS. THESE BASES WILL PROVIDE A FRAMEWORK FOR 3-D DISPLAYS AND ARTIFICIAL INTELLIGENCE APPLIQUES. THE PROPOSED APPROACH, MAKING USE OF ADVANCED PROCESSING TECHNOLOGY AND IMAGE PROCESSING ALGORITHMS WILL PROVIDE 3-D SYNTHETIC TERRAIN MODELS AND TACTICAL DECISION AIDS WITHOUT THE LABORIOUS EFFORTS AND RESULTING STATIC DISPLAYS OF TODAY'S APPROACHES. THE PROPOSED EFFORT, IF SUCCESSFUL, WILL PROVIDE BOTH AN ENABLING TECHNOLOGY AND NEAR TERM SOLUTION TO PROVIDING REAL TIME, REALISTIC RENDITIONS OF THE COMBAT SITUATION.

COMMONWEALTH COMPUTER RESEARCH, INC.
2564 IVY ROAD, EDNAM PROFESSIONAL CENTER
CHARLOTTESVILLE, VA 22901
Phone: (804) 977-0600
Topic#: 91-114
Office: TECOM
Contract #:
PI: DONALD E. BROWN
ID#: 91TEC-039
Title: RELIABILITY ESTIMATION FOR KNOWLEDGE BASED SYSTEMS

Abstract: MANY KNOWLEDGE BASED SYSTEMS ARE DESIGNED AND BUILT WITH LITTLE ATTENTION PAID TO RELIABILITY. FAILURE TO PERFORM RELIABILITY ANALYSIS MEANS THAT FIELDED SYSTEMS MIGHT FAIL MORE FREQUENTLY THAN EXPECTED, CUSTOMERS MIGHT NOT BE WILLING TO TRUST KNOWLEDGE-BASED SYSTEMS FOR CRITICAL TASKS, AND DEVELOPERS MAY NEVER FULLY UNDERSTAND THE CAPABILITIES OF THE KNOWLEDGE-BASED TECHNOLOGY THEY ARE USING. THERE ARE TWO MAJOR REASONS BY KNOWLEDGE-BASED SYSTEMS ARE NOT SUBJECT TO RELIABILITY ANALYSIS: THERE ARE NO AVAILABLE METHODS FOR PERFORMING THE ANALYSIS, AND THE RAPID PROTOTYPING STYLE OF DEVELOPMENT MAKES IT DIFFICULT TO FORMULATE NEW RELIABILITY ESTIMATION OF A KNOWLEDGE-BASED SYSTEM DURING ANY STAGE IN A RAPID PROTOTYPING DEVELOPMENT PROCESS. THE APPROACH HAS THREE OBJECTIVES: ESTIMATE RELIABILITY FOR THE CURRENT PROTOTYPE, PREDICT THE FINISHED SYSTEM RELIABILITY, AND AID IN DESIGN DECISIONS DURING PROTOTYPING. THE FOUNDATION FOR OUR APPROACH IS A PARTITIONING OF BOTH THE RULES IN THE KNOWLEDGE-BASED SYSTEM AND THE INPUT SPACE TO THE SYSTEM TO ACCOMPLISH THESE OBJECTIVES.

COMMONWEALTH COMPUTER RESEARCH,INC.
EDNAM PROFESSIONAL CENTER, 2564 IVY ROAD
CHARLOTTESVILLE, VA 22901
Phone: (703) 683-7010

Topic#: 91-052
Office: CECOM
Contract #:
PI: DANIEL F. WIENER II

ID#: 91CEC-030

Title: MODELING & SIMULATION OF SMALL SATELLITE EHF COMMUNICATIONS

Abstract: THE OBJECTIVE OF CCR'S PHASE I EFFORT IS TO PERFORM AN IN-DEPTH SURVEY OF RELEVANT ARCHITECTURAL DATA, TO IDENTIFY VIABLE APPROACHES AND SOLUTIONS, AND TO DEVELOP THE DESIGN FOR A PROTOTYPE MODELING AND SIMULATION TOOLSET TO ASSIST IN THE EVALUATION OF SMALL EHF COMMUNICATIONS ARCHITECTURES. ACCOMPLISHMENT OF THIS OBJECTIVE IS COMPLETION OF SEVEN TASKS: (1) ARCHITECTURE SURVEY; (2) REFINEMENT OF PROJECT SCOPE; 3) DEVELOPMENT OF DESIGN FOR EXTENDED SATELLITE SYSTEM MODEL TOOLSET; (4) DEVELOPMENT OF LIFE CYCLE COST MODEL; (5) INTEGRATED OF MODELS; (6) COLLATION AND EVALUATION OF RESULTS; AND (7) REPORTING. THIS EFFORT MUST CONCENTRATE ON THE DEFINITION OF A COMPUTER BASED MODEL, COMPLETE WITH DESCRIPTIONS OF ANTICIPATED CAPABILITIES AND LIMITATIONS, THAT CAN SIMULATE OPERATION OF THE FULL RANGE OF RELEVANT COMMUNICATION SCHEMES AND ARCHITECTURES, TO INCLUDE OUTPUTS SUCH AS EYE DIAGRAMS, BIT ERROR RATE, LINK BUDGETS AND ANTENNA COVERAGE LOCI IN EACH MODE. APPROPRIATE CONSIDERATION MUST BE GIVEN TO MODE (FDMA, TDMA, ETC.) DATA RATE, ERROR CORRECTION, JAM RESISTANCE, LPI AND LPD, UNIQUE OPERATIONAL NETWORKING, AND GROUND SEGMENT REQUIREMENTS. THE END RESULT WILL BE PRECISE, RECOMMENDED SPECIFICATIONS FOR A SMALL SATELLITE NETWORK/ARCHITECTURE SIMULATION AND MODELING TOOLSET THAT INCORPORATES TECHNICAL AND COST EVALUATION PROCEDURES INHERENT TO OBJECTIVE PERFORMANCE ANALYSES AND EVALUATION OF RELEVANT CANDIDATE ARCHITECTURES.

COMPEER, INC.
1409 GRAYWOOD DRIVE
SAN JOSE, CA 95129
Phone: (408) 255-3950

Topic#: 91-048
Office: CECOM
Contract #:
PI: RICHARD H. MOYER

ID#: 91CEC-209

Title: APPLICATION OF ADAPTIVE NEURAL NETWORKS FOR SPECIFIC EMITTER RECOGNITION/IDENTIFICATION

Abstract: THIS IS THE FIRST PHASE OF A MULTI-PHASE ADVANCED DEVELOPMENT EFFORT TO PROVIDE ADAPTIVE SIGNAL RECOGNITION ALGORITHMS THAT CAN UNIQUELY IDENTIFY AND FOLLOW THE CHANGING NATURE OF COMMUNICATION EMITTERS AND TO IMPLEMENT THESE ALGORITHMS IN A NEURAL NETWORK ARCHITECTURE. IT WILL DEMONSTRATE THE UTILITY OF EXPLOITING ART-E OR SIMILAR NEURAL NETWORKS TO ACHIEVE A GREATLY ENHANCED CAPABILITY TO PERFORM SPECIFIC EMITTER IDENTIFICATION. THIS WILL BE ACCOMPLISHED BY CONDUCTING A PERFORMANCE ANALYSIS USING AN EXISTING SIGNAL RECOGNITION SIMULATOR. THIS INITIAL PHASE WILL ALSO ENHANCE EXISTING SEI METHODS BY DEFINING A NEW NEURAL NETWORK PROCESSING CONCEPT WHEREBY THE RECOGNIZER WILL

NOT ONLY FOLLOW THE SIGNALS IN TIME (AS THEY CHANGE THROUGH NORMAL AGING OF COMPONENTS OR MODE CHANGES), BUT ALSO BE ABLE TO "LEARN" OVER TIME TO PERFORM MORE ACCURATE RECOGNITION.

CREARE, INC.
P.O. BOX 71
HANOVER, NH 03755
Phone: (603) 643-3800
Topic#: 91-023 ID#: 91AMC-313
Office: AMC
Contract #: DAAE07-91-C-R069
PI: DR. PAUL H. ROTHE
Title: ENVIRONMENTALLY ACCEPTABLE CLEANING PROCESSES
Abstract: THE PROPOSED PROJECT ADDRESSES THE REPLACEMENT OF CFC-113 (FREON) AS A CLEANING AGENT, BOTH GENERALLY AND WITH SPECIFIC ATTENTION TO THE CLEANING OF METALS AND COMPOSITES. THE PHASE I WORK WILL PROVIDE A COMPREHENSIVE CHARACTERIZATION OF CLEANING REQUIREMENTS AND KNOWN METHODS. THE APPROACH IS MULTIDISCIPLINARY ENCOMPASSING UTILIZATION OF FORCES OF VARIOUS KINDS, AS WELL AS SIMPLE REPLACEMENT OF THE SOLVENT. THE PHASE I PROJECT WILL DELIVER A REPORT REVIEWING THE STATE-OF-THE-ART OF THE SCIENCE AND TECHNOLOGY.

CREATIVE OPTICS, INC.
ONE DEANGELO DRIVE
BEDFORD, MA 01730
Phone: (617) 275-8823
Topic#: 91-015 ID#: 91HEL-308
Office: HEL
Contract #: DAAA15-91-C-0095
PI: JAMES C. KILIAN
Title: INNOVATIVE ATR-I/O EMULATOR FOR AN ATRMMI EXPERIMENTATION PLATFORM
Abstract: ONE OF THE MORE PRESSING QUESTIONS REGARDING FUTURE COMBAT SYSTEMS IS WHETHER OR NOT A SYMBOLIC RELATIONSHIP BETWEEN THE HUMAN OPERATOR AND ONE ATR PROCESS CAN (A) EXCEED THE TARGET ACQUISITION PERFORMANCE OF EITHER BY ITSELF, AND (B) REDUCE THE TOTAL WORKLOAD ON THE HUMAN OPERATOR. THE DOMAIN OF ATRMMI (AUTOMATIC TARGET RECOGNIZER MAN-MACHINE INTERFACE) BRIDGES ATR BEHAVIOR, AND HUMAN PERFORMANCE AND RESPONSE. THE COMPLEXITY OF ATRMMI QUESTIONS ESTABLISHES THE NEED FOR TIMELY AND MEANINGFUL INTERCHANGE BETWEEN ATR DESIGNERS AND HUMAN ENGINEERS. CREATIVE OPTICS, INC. IS PROPOSING TO DEVELOP AN ATRMMI EXPERIMENTATION PLATFORM FOR CONDUCTING EXPERIMENTS THAT INVESTIGATE THE NATURE OF THE COMMUNICATION THAT A HUMAN + ATR SYSTEM MIGHT SUPPORT. ISSUES LIKE TYPE, CONTENT, HOW, AND TRIGGERS OF INFORMATION EXCHANGED BETWEEN HUMAN AND ATR ARE THE FOUNDATION OF OUR PROPOSED PROGRAM. CONTROL OF ATR BEHAVIOR IS PROVIDED TO THE EXPERIMENTER BY MEANS OF AN INNOVATIVE ATR-I/O EMULATOR CONCEPT. CONTROL AND DEGRADATION OF THE PRESENTATION OF STIMULI IS ALSO PART OF THE ATRMMI EXPERIMENTATION PLATFORM. RESULTS TO BE PRODUCED BY THE PLATFORM INCLUDE ATR DESIGN RECOMMENDATIONS THAT THE EXPERIMENTER CAN HAND ON TO ATR DESIGNERS.

CYBERNET SYSTEMS CORP.
1919 GREEN ROAD SUITE B 101
ANN ARBOR, MI 48105
Phone: (313) 668-2567
Topic#: 91-002 ID#: 91CEC-316
Office: CECOM
Contract #: DAAB07-91-C-B031
PI: BRIAN T. MITCHELL, PH.D.
Title: A GENERALIZED VIDEO DATA COMPRESSION MODEL
Abstract: THIS PROJECT IS DIRECTED AT PRODUCING A GENERALIZED COMPRESSION MODEL FOR SYSTEMATICALLY TRANSMISSION OF VIDEO INFORMATION AT DECREASING DATA RATES WHILE MAINTAINING MAXIMAL INFORMATION. ALTHOUGH MUCH IS STILL UNKNOWN ABOUT THE HUMAN VISUAL SYSTEM, MAJOR PIECES OF THE PUZZLE HAVE RECENTLY BEEN IDENTIFIED AND CAN BE USED AS A BASIS FOR IMPLEMENTING ADVANCED COMPRESSION MODELS WHICH MAXIMIZE THE AMOUNT OF PERCEIVED INFORMATION AT VARYING DATA TRANSMISSION RATES. THE PROPOSED WORK WILL DEVELOP A GENERALIZED COMPRESSION MODEL BASED ON THIS UNDERSTANDING OF THE HUMAN VISUAL

PERCEPTION SYSTEM. PORTIONS OF THE GENERALIZED MODEL WILL BE IMPLEMENTED UNDER THIS EFFORT AND TESTED TO SHOW PROOF OF CONCEPT FOR THIS APPROACH TO VIDEO COMPRESSION. A DETAILED STRATEGY WILL BE DEVELOPED FOR IMPLEMENTATION OF A REAL-TIME PROTOTYPE TO TEST THE FULL MODEL.

DAMASKOS, INC.
P.O. BOX 469
CONCORDVILLE, PA 19331
Phone: (215) 358-0200
Topic#: 91-096 ID#: 91NAT-039
Office: NATICK
Contract #:
PI: WILLIAM J. BITER
Title: CONTROL FOR TENTAGE SYSTEMS
Abstract: DAMASKOS, INC. PROPOSES TO EVALUATE VARIOUS FABRICS SUITABLE FOR INCORPORATION INTO TENTAGE AND SHELTERS TO LOWER THEIR IR SIGNATURES. THE MATERIALS WILL INCLUDE A MICROWAVE TRANSPARENT FABRIC DEVELOPED BY DAMASKOS, INC. WHICH HAS LOW AND CONTROLLED EMISSIVITIES IN THE IR. THE MATERIAL IS DIFFUSELY REFLECTING IN THE IR AND TRANSPARENT AT MICROWAVE FREQUENCIES WITHOUT ANY COMPLEX PROCESSES REQUIRED TO ACHIEVE THIS RADAR TRANSPARENCY. METHODS OF INCORPORATING THE MATERIAL INTO EXISTING SYSTEMS WILL BE EXPLORED ALONG WITH DURABILITY IN HARSH ENVIRONMENTS.

DAMILIC CORP.
6290 MONTROSE ROAD
ROCKVILLE, MD 20852
Phone: (301) 881-5581
Topic#: 91-097 ID#: 91097-03
Office: TACOM
Contract #:
PI: DR. WALTER J. CHAPPAS
Title: RADIATION CURED COMPOSITES MATERIAL EVALUATION
Abstract: THE USE OF IRRADIATION (TYPICALLY ELECTRON BEAM PROCESSING) TECHNIQUES TO CURE COMPOSITE MATERIALS OFFERS SEVERAL ADVANTAGES: (1) CURING AT AMBIENT TEMPERATURES (2) REDUCED CURING TIMES (3) CONTINUOUS OPERATION ALLOWING IMMEDIATE NEXT PROCESS (4) IMPROVED RESIN STABILITY (5) LESS ATMOSPHERIC POLLUTION (6) INCREASED DESIGN FLEXIBILITY THROUGH PROCESS CONTROL A REVIEW AND SELECTION OF MATERIALS FOR LATER PROCESS DEVELOPMENT IS PROPOSED.

DANIEL H WAGNER ASSOCIATES
2 EATON STREET, SUITE 500
HAMPTON, VA 23669
Phone: (804) 727-7700
Topic#: 91-234 ID#: 91SDC-234
Office: SDC
Contract #:
PI: J.W. GREER
Title: INTEGRATED AUTOMATED SEARCH SYSTEMS FOR UNDERWATER SEARCH
Abstract: THIS PROPOSAL DEFINES THE ELEMENTS OF A WHOLLY INTEGRATED AUTOMATED SEARCH SYSTEM, PROVIDING FOR (1) ADVANCE SEARCH PLANNING SUPPORT, (2) TARGET PROBABILITY MAPS GIVEN OBSERVATIONS OF IMPACT, (3) OPTIMAL SEARCH PLANS FOR REAL-TIME SEARCHES, (4) AUTOMATED CONTROL OF SEARCH PLATFORM PATHS, (5) AUTOMATED CONTACT DATA COLLECTION AND REDUCTION, (6) AUTOMATED CONTACT CORRELATION, AND (7) AUTOMATED REPLANNING SUPPORT INCLUDING BAYESIAN UPDATE OF TARGET PROBABILITY MAPS USING UNSUCCESSFUL SEARCH INFORMATION. PHASE I PROPOSES A REQUIREMENTS DEFINITION AND BENEFITS STUDY AND A LABORATORY PROTOTYPE OF THE COMPLETE SOFTWARE AND HARDWARE SYSTEM. THE COMPONENTS OF THE SYSTEM ARE SEPARATE, PROPRIETARY PACKAGES AND THE INTEGRATION CONCEPTS ARE DERIVED FROM A PREVIOUS WAGNER ASSOCIATES PROJECT FOR ONBOARD SEARCH MISSION SUPPORT SOFTWARE FOR THE NAVY'S DEEP SUBMERGENCE RESCUE VEHICLE.

DBA SYSTEMS, INC.
10560 ARROWHEAD DRIVE
FAIRFAX, VA 22030
Phone: (703) 934-6768
Topic#: 91-021 ID#: 91ETL-304
Office: ETL
Contract #: DACA76-91-C-0018
PI: DAVE MUELLER
Title: DBA DATA BASE OPERATIONS CONCEPT SBIR
Abstract: PRODUCTION AGENCIES PROVIDING STANDARD MC&G PRODUCTS DO NOT HAVE SUFFICIENT ASSETS TO MEET ALL REQUIREMENTS. SHORTFALLS EXIST IN AREA COVERAGE, LEVEL OF DETAIL, CURRENCY, AND ACCURACY. PRODUCTS DO NOT NECESSARILY FLOW TO THE FIGHTING FORCES WHEN, WHERE, AND IN THE FORMATS NEEDED. EVOLVING THIRD WORLD CONFLICTS EXACERBATE THE PROBLEM. DATA PRODUCTION SOLUTIONS FALL INTO ELUSIVE OUTYEARS WITH STOPGAP SOLUTIONS REVERTING TO CARTOGRAPHIC SOURCE. THE EVOLUTION OF COMPUTER HARDWARE CAPABILITIES HAS RESULTED IN SYSTEMS WITH SIGNIFICANT PROCESSING CAPABILITIES AT AFFORDABLE PRICES. GENERIC, OFF THE SHELF SYSTEMS ARE CAPABLE OF SATISFYING TACTICAL REQUIREMENTS. SIGNIFICANT AMOUNTS OF SOFTWARE, FOCUSED TOWARD SPECIFIC APPLICATIONS, HAVE BEEN DEVELOPED FOR DATA GENERATION, INTEGRATION, AND EXPLOITATION. EVOLVING DATA SOURCES (E.G., MULTI-SPECTRAL, SAR, AND IE IMAGERY), COMBINED WITH STANDARD MC&G PRODUCTS, INTELLIGENCE, AND WEATHER DATA CAN PROVIDE ENHANCED KNOWLEDGE OF THE SPATIAL SITUATION. DIGITAL EXPLOITATION TECHNIQUES AND RELATIONAL DATA BASE MANAGEMENT SYSTEMS CAN EXPAND THE FUNCTIONALITY OF THESE SOURCES NOW - NOT IN THE OUTYEARS. THIS PROPOSAL PROVIDES A CONCEPT OF OPERATIONS FOR DATA BASE OPERATIONS TO SUPPORT COMBAT FORCES WITH REQUIRED DATA THAT IS FUNCTIONAL WITHIN TACTICAL TIMELINES. IT WILL DEMONSTRATE HOW THIS COULD BE ACCOMPLISHED COST EFFECTIVELY WITHIN NEAR TIME-FRAMES.

DCS CORP.
1330 BRADDOCK PLACE
ALEXANDRIA, VA 22314
Phone: (703) 683-8430
Topic#: 91-185 ID#: 91AVS-058
Office: AVSCOM
Contract #:
PI: MICHAEL MASSIMI
Title: COVERT TERRAIN/OBSTACLE AVOIDANCE SYSTEM FOR HELICOPTERS
Abstract: DCS WILL CONDUCT A STRUCTURED AND SYSTEMATIC RESEARCH PROGRAM INTO NEAR AND MID-TERM OBSTACLE AND TERRAIN AVOIDANCE TECHNOLOGIES. THE GOAL WILL BE TO IDENTIFY THE MOST PROMISING SENSOR TECHNOLOGIES AND CONFIGURATIONS FOR FURTHER DEVELOPMENT AND INCORPORATION INTO ARMY HELICOPTERS. THIS WILL BE ACCOMPLISHED BY CONDUCTING A THREE STEP PROGRAM. FIRST, A REVIEW OF THE SYSTEMS AND LESSONS LEARNED. SECOND, CURRENT SYSTEMS AND VENDORS WILL BE SURVEYED AND REVIEWED. IN THIS STEP, EACH SYSTEM WILL BE ANALYZED FOR PERFORMANCE AGAINST THE OPERATIONAL REQUIREMENTS. FINALLY, THE CRITICAL TECHNOLOGIES WILL BE RESEARCHED TO ESTABLISH THE MOST PROMISING AND LEAST RISKY SENSOR CONFIGURATIONS AND TECHNOLOGY AREAS REQUIRING FURTHER DEVELOPMENT.

DECISION-SCIENCE APPLICATIONS, INC.
1110 N. GLEBE ROAD SUITE 400
ARLINGTON, VA 22201
Phone: (703) 243-2500
Topic#: 91-018 ID#: 91AVS-316
Office: AVSCOM
Contract #: DAAJ02-91-C-0048
PI: NATHANIEL E. BENT
Title: HAVDEM AIR-TO GROUND AND COOPERATIVE BEHAVIOR ENHANCEMENTS
Abstract: THIS PROPOSAL DESCRIBES A PLAN FOR DEFINING THE FUNCTIONAL REQUIREMENTS FOR THE INCORPORATION OF AIR-TO-GROUND AND COOPERATIVE BEHAVIOR CAPABILITIES INTO THE HELICOPTER AIR-TO-AIR VALUE-DRIVEN ENGAGEMENT MODEL (HAVDEM). HAVDEM IS AN ENGAGEMENT LEVEL SIMULATION OF HELICOPTER AIR-TO-AIR COMBAT DEVELOPED BY DSA AND THE AVSCOM AVIATION APPLIED TECHNOLOGY DIRECTORATE (AATD) AT FT. EUSTIS. ITS PHYSICAL MODELS, AERODYNAMICS, WEAPONS, AND SENSORS, ARE DERIVED FROM HELIPAC AND ITS PILOT DECISION LOGIC IS DERIVED FROM DSA'S TAC BRAWLER FIXED-WING COMBAT SIMULATION. HAVDEM'S MOST UNIQUE FEATURE IS THE PILOT DECISION LOGIC'S ABILITY TO EXPLOIT HIGH RESOLUTION DIGITIZED TERRAIN DATA TO AVOID DETECTION

AND PLAN TACTICS. THIS REALISTIC PILOT BEHAVIOR CAN BE APPLIED TO AIR-TO-GROUND MISSIONS AS WELL. OUR PHASE I EFFORT WILL DEFINE THE FUNCTIONAL REQUIREMENTS FOR HELICOPTER AIR-TO-GROUND MISSIONS THAT ARE NOT ALREADY REPRESENTED BY HAVDEM'S AIR-TO-AIR FEATURES AND DEFINE THE FUNCTIONAL REQUIREMENTS WHICH ENABLE THE HELICOPTERS TO MANEUVER COOPERATIVELY. WHILE BEING ABLE TO PROVIDE A SMALL AMOUNT OF MUTUAL SUPPORT, CURRENT HAVDEM PILOTS ARE ESSENTIALLY INDEPENDENT. COOPERATIVE BEHAVIOR ENABLES FLIGHTS OF HELICOPTERS TO PERFORM COORDINATED TACTICS FOR BOTH AIR-TO-AIR AND AIR-TO-GROUND MISSIONS.

DEDICATED ELECTRONICS, INC.
96 LANE ROAD
CHESTER, NH 03036
Phone: (603) 887-3161

Topic#: 91-020 ID#: 91CRR-321
Office: CRREL
Contract #: DACA33-91-C-0030
PI: DENNIS P. GLYNN III

Title: DEVELOPMENT OF A PORTABLE ICE-THICKNESS MEASURING INSTRUMENT

Abstract: A MEASUREMENT INSTRUMENT CAPABLE OF NON-OBTRUSIVELY DETERMINING THE THICKNESS OF A LAYER OF ICE OVER A BODY OF WATER WILL BE DESIGNED AND DEVELOPED. THE INSTRUMENT WILL BE A ONE-PERSON PORTABLE, COMPLETELY SELF-CONTAINED MEASUREMENT SYSTEM. THE INSTRUMENT WILL FEATURE EASE OF MEASUREMENT, VIRTUAL REAL-TIME RESULTS, LOW COST, AND THICKNESS ACCURACY OF +/- ONE-HALF INCH. THE OBJECTIVES OF THIS EFFORT ARE TO EXPERIMENTALLY VERIFY THE THEORETICAL BASIS OF THE CHOSEN APPROACH, TO DETERMINE THE FEASIBILITY OF IMPLEMENTING THE APPROACH BY TESTING CRITICAL COMPONENTS IN THEIR SPECIFIC APPLICATION, TO DEVELOP A WORKING BREADBOARD MODEL, AND TO DOCUMENT THE PERFORMANCE OF THE BREADBOARD MODEL. A MODULAR APPROACH WILL BE TAKEN TO THE DESIGN OF THE INSTRUMENT. A BREADBOARD VERSION OF EACH MODULE WILL BE DESIGNED, BUILT, AND TESTED. AFTER THE PERFORMANCE OF THE INDIVIDUAL MODULES HAS BEEN VERIFIED, THE MODULES WILL BE INTEGRATED, WITH TESTING PERFORMED AFTER EACH LEVEL OF INTEGRATION. THIS TESTING WILL UTILIZE KNOWN MATERIAL SAMPLES AS STANDARDS FOR EVALUATION OF PERFORMANCE. FINALLY, THE COMPLETE BREADBOARD MODEL WILL BE INTEGRATED AND EVALUATED. FINAL TEST WILL CONSIST OF MEASUREMENT OF MATERIAL STANDARDS, ICE IN A CONTROLLED LABORATORY SETTING, AND ICE OVER A NATURAL BODY OF WATER.

DEFENSE GROUP, INC.
606 WILSHIRE BOULEVARD, SUITE 706
SANTA MONICA, CA 90401
Phone: (213) 394-8599

Topic#: 91-041 ID#: 91ARD-054
Office: ARDEC
Contract #:
PI: MORGAN GROVER

Title: NEURAL NETWORK DESIGNATED SPEAKER EXTRACTION FROM NOISE

Abstract: THIS RESEARCH WILL DEVELOP AND DEMONSTRATE INNOVATIVE ARTIFICIAL NEURAL NETWORK (ANN) TECHNIQUES FOR EXTRACTING THE VOICE OF DESIGNATED SPEAKERS FROM VARIABLE NOISE/INTERFERENCE BACKGROUNDS, AND TRANSCRIBING THIS SPEECH TO TEXT. THE TECHNICAL APPROACH IS BASED ON: (1) INNOVATIVE METHODS USING HIDDEN-LAYER IDENTITY-MAPPING ANNS TO CREATE TRAINABLE NONLINEAR TRANSFORMATIONS FROM CORRUPTED SPEECH INPUT PARAMETERS TO CLEAN SPEECH OUTPUT PARAMETERS; (2) THE USE OF OPTIMAL SPEECH PARAMETERS FOR SUCH MAPPINGS, BASED ON MODELS OF VOCAL AND AUDITORY PROCESSING; AND (3) SEAMLESS INTEGRATION OF THESE TECHNIQUES INTO AN EXISTING "CLEAN SPEECH" RECOGNITION DESIGN. IN PHASE I, INITIAL ALGORITHM DEVELOPMENT AND DEMONSTRATION WILL BE ACCOMPLISHED, USING TWO SPEAKERS, A SMALL VOCABULARY, AND A LIMITED RANGE OF INTERFERENCE BACKGROUNDS. PHASE I WILL VALIDATE BASIC FEASIBILITY OF THE APPROACH. A NON-REAL-TIME NOISY SPEECH EXTRACTION AND TRANSCRIPTION CAPABILITY WILL ALSO BE DEMONSTRATED ON LIMITED PROBLEM SETS, AND SPECIFICATIONS FOR A REAL-TIME SYSTEM WILL BE PROVIDED.

DELPHI PHARMACEUTICALS, INC.
505 UNIVERSITY AVENUE
NORWOOD, MA 02062
Phone: (617) 255-0008

Topic#: 91-028 ID#: 91MED-334
Office: MEDICAL
Contract #: 91-C-1104
PI: RICHARD M. EVANS, PH.D.

Title: SELF-CONTAINED JET IRRIGATION SYSTEM FOR WOUND DEBRIDEMENT

Abstract: BASED ON RECENT INFORMATION ON TISSUE DAMAGE CAUSED BY MISSILE WOUNDS AND THE APPROPRIATE EXTENT OF WOUND DEBRIDEMENT, A PRESSURIZED SALINE JET IRRIGATION DEVICE IS PROPOSED. THIS DEVICE WILL BE POWERED BY NITROGEN PRESSURE (NON-CFC AND NO EVAPORATIVE COOLING) AND WILL BE A SELF-CONTAINED, COMPACT, INEXPENSIVE, STERILE SYSTEM THAT WILL BE EASILY USED UNDER BATTLEFIELD CONDITIONS. NOVEL CONCEPTS FOR PRESSURE ADJUSTMENT, WOUND ACCESS AND LATERAL FLOW ARE PROPOSED. FLUID FLOW (MASS FLOW, SPRAY PATTERN, NOZZLE VELOCITY AND PRESSURE EXERTED ON TARGET), STERILITY (USP TEST SECTION 71) AND STABILITY (LEAKAGE AND CORROSION) WILL BE MEASURED USING STANDARD METHODS. AN ORDNANCE GELATIN WOUND MODEL WILL BE USED TO EVALUATE THE EXTENT OF DEBRIDEMENT AND REMOVAL OF BULLET FRAGMENTS.

DELTA INFORMATION SYSTEMS, INC.
BUILDING 3 STE 120, 300 WELSH ROAD
HORSHAM, PA 19044
Phone: (215) 657-5270

Topic#: 91-019 ID#: 91AIR-301
Office: AIRMICS
Contract #: DAKF11-91-C-0033
PI: RICHARD A. SCHAPHORST

Title: ISDN APPLICATIONS IN THE ARMY ENVIRONMENT

Abstract: THIS DOCUMENT IS AN SBIR TECHNICAL PROPOSAL SUBMITTED TO THE US ARMY INSTITUTE FOR RESEARCH IN MANAGEMENT INFORMATION, COMMUNICATIONS, AND COMPUTER SCIENCE BY DELTA INFORMATION SYSTEMS, INC. IN RESPONSE TO TOPIC NUMBER A91-019. THE PURPOSE OF THE PROPOSED PROJECT IS TO DETERMINE THOSE APPLICATIONS IN THE ARMY ENVIRONMENT WHICH WOULD BENEFIT FROM USE OF THE INTEGRATED SERVICES DATA NETWORK (ISDN). THE OBJECTIVES OF PHASE I ARE (1) TO IDENTIFY HIGH PAYOFF APPLICATION(S) THAT CAN TAKE ADVANTAGE OF THE TECHNICAL FEATURES OF ISDN, (2) TO DEMONSTRATE THE USEFULNESS OF SUCH APPLICATION(S) IN AN ISDN LABORATORY ENVIRONMENT. A PROPOSED WORK PLAN IS DEFINED CONSISTING OF THE FOLLOWING TASKS. 1. SUMMARIZE STATUS AND EVALUATION OF THE COMMERCIAL ISDN 2. ANALYZE ARMY COMMUNICATION REQUIREMENTS 3. REVIEW ISDN TERMINAL EQUIPMENT 4. INVESTIGATE ISDN APPLICATIONS 5. PHASE I ISDN DEMONSTRATION 6. PLAN FOR PHASE II DEMONSTRATION 7. FINAL REPORT PROMISING APPLICATIONS CONSIST OF THOSE WHICH CAN TAKE ADVANTAGE OF A SWITCHED 64 KBPS (AND HIGHER) SERVICE AT THE USERS LOCATION. EXAMPLES INCLUDE TELECONFERENCING AND THE RAPID ACCESS OF STILL IMAGERY FROM A DATA BASE. ADVANCED VOICE SYSTEMS (E.G. WIDE BANDWIDTH) ARE ALSO POTENTIALLY IMPORTANT. IT IS PROPOSED TO PROVIDE A PHASE I DEMONSTRATION USING THE ISDN FACILITY AT THE CONTEL LABORATORY.

DYNA EAST CORP.
3201 ARCH STREET
PHILADELPHIA, PA 19104
Phone: (215) 386-4884

Topic#: 91-087 ID#: 91MIC-125
Office: MICOM
Contract #: DAAH01-92-C-R176
PI: ROBERT D. CICCARELLI

Title: DESIGN OF AN ADVANCED TANDEM PENETRATOT SYSTEM

Abstract: We propose to design an anti-armor tandem penetrator consisting of an Explosive-Formed Penetrator (EFP) warhead and kinetic energy (KE) rod. This system will exploit the EFP's penetration efficiency against applique and base armors, thus eliminating KE defeat mechanisms. EFP warhead, kinetic energy penetrator, and tandem system designs will be selected to address a wide range of future armor threats. Tests will be designed to demonstrate concept feasibility. Phase II design, manufacture, and test efforts will be defined.

E-SORB SYSTEMS
285 SOBRANTE WAY, SUITE E
SUNNYVALE, CA 94086
Phone: (408) 730-5633
Topic#: 91-196
Office: CERL
Contract #:
PI: ANDREW WHITTAKER
ID#: 91CER-033

Title: ACTIVE CONTROL OF BUILDING STRUCTURES USING SHAPE-MEMORY ALLOYS

Abstract: SEVERAL PROPERTIES DISPLAYED BY MEMBERS OF THE SHAPE-MEMORY FAMILY OF ALLOYS, INCLUDING: (1) SHAPE-MEMORY BASED ON A TEMPERATURE INDUCED PHASE TRANSFORMATION; (2) PSEUDOELASTICITY BASED ON A STRESS INDUCED PHASE TRANSFORMATION (3) EXCELLENT FATIGUE AND CORROSION RESISTANCE, CAN BE EXPLOITED INDIVIDUALLY AND IN COMBINATION TO PROVIDE BOTH ACTIVE AND PASSIVE ASEISMIC CONTROL FOR ALL SORTS OF STRUCTURES. ACTIVE, PASSIVE, OR COMBINED ACTIVE/PASSIVE DEVICES CAN CONTROL BOTH STRUCTURAL STIFFNESS AND DAMPING IN OPEN LOOP OR CLOSED LOOP CONTROL SCHEMES. DEVICE TYPES INCLUDE LINKAGE DEVICES, MODIFIED JOINT DEVICES, MODIFIED MEMBER DEVICES. THIS STUDY WILL DEVELOP THIS PROMISING ASEISMIC TECHNOLOGY BY PROVIDING: (1) MATERIALS CHARACTERIZATION FOR ALL RELEVANT ALLOYS INCLUDING SHAPE-MEMORY, PSEUDOELASTICITY, AND FATIGUE BEHAVIOR, THERMOMECHANICAL PROCESSING, ETC. (2) ACTUATOR CHARACTERIZATION FOR ALL DEVICE TYPES INCLUDING ACTUATOR FORCE, ACTUATING MECHANISM, CONTROL CHARACTERISTICS INCLUDING DYNAMIC RESPONSE, RELIABILITY, COST, AND EXPECTED LIFE. (3) A DEMONSTRATION OF THE MOST PROMISING DEVICE FOR A FRAMED STRUCTURE ON A SMALL SCALE SHAKE-TABLE FACILITY.

EASTERN ANALYTICAL, INC.
335 PAINT BRANCH DRIVE
COLLEGE PARK, MD 20742
Phone: (301) 314-7818
Topic#: 91-220
Office: MEDICAL
Contract #:
PI: LARRY J. MOORE
ID#: 91MED-068

Title: A GENE PROBE AMPLIFICATION SYSTEM OPTIMIZED FOR DIRECT IMAGING DETECTION

Abstract: THE AVAILABILITY OF POTABLE WATER IS ESSENTIAL TO PROTECT THE HEALTH OF SOLDIERS IN COMBAT AND TRAINING. CURRENT METHODS FOR THE DETECTION OF PATHOGENS OR THEIR INDICATOR ORGANISMS TYPICALLY REQUIRE AT LEAST 24 HOURS, AND PERHAPS AS MUCH AS SEVERAL DAYS. RECENT AND ONGOING ADVANCES IN GENE AMPLIFICATION AND RELATED MEASUREMENT TECHNOLOGIES OFFER THE PROMISE OF DEVELOPING A SYSTEM THAT CAN BE USED TO CHARACTERIZE THESE PATHOGENS OR THEIR INDICATORS IN A FRACTION OF THE TIME NOW REQUIRED. BY BUILDING UPON THIS PREVIOUS RESEARCH AND BY THE ADDITION OF OTHER INNOVATIVE COMPONENTS TO ENHANCE THE TECHNOLOGY, AN ANALYTICAL CHARACTERIZATION SYSTEM MAY BE DERIVED TO PROVIDE EXTREME SENSITIVITY AND SPECIFICITY. THE PURPOSE OF THIS PROJECT IS TO DEMONSTRATE THE REQUISITE FEASIBILITY ELEMENTS LEADING TO THE DEVELOPMENT OF A FIELD PORTABLE METHOD FOR THE CHARACTERIZATION OF PATHOGENS AND THEIR INDICATORS IN WATER. THIS CONCEPT AND THE ATTENDANT DETECTOR TECHNOLOGY IS EXPECTED TO BE CAPABLE OF BEING EXTENDED TO PROVIDE SIMILAR CHARACTERIZATIONS OF A BROAD VARIETY OF PATHOGENIC BIOMOLECULES.

EIC LABORATORIES, INC.
111 DOWNEY STREET
NORWOOD, MA 02062
Phone: (617) 769-9450
Topic#: 91-071
Office: CRDEC
Contract #:
PI: DR. MICHAEL M. CARRABBA
ID#: 91CRD-075

Title: COMPACT RAMAN SPECTROGRAPH WITH FIBER OPTIC SAMPLING

Abstract: THE OVERALL OBJECTIVE OF THIS PROGRAM IS TO DEVELOP A RAMAN SPECTROGRAPH FOR DETECTION AND IDENTIFICATION OF CHEMICAL/BIOLOGICAL CONTAMINATION ON SURFACES, AND WHICH CAN BE ENGINEERED AS A FIELD HARDENED, COMPACT, LIGHTWEIGHT PORTABLE SYSTEM. THE PROPOSED SPECTROGRAPH WILL PERMIT A FULL (4000/CM) RAMAN SPECTRUM OF A SOLID, LIQUID OR GASEOUS SAMPLE TO BE OBTAINED IN A SINGLE RAPID MEASUREMENT WITHOUT INTERNAL MOVING PARTS OR CALIBRATION, SUCH AS ADJUSTMENT OF SLITS OR GRATINGS. THE DESIGN GOAL IS FOR LESS THAN 1/CM RESOLUTION. IN ITS FULLY DEVELOPED FORM, THE SPECTROGRAPH LASER USED FOR RAMAN EXCITATION,

DETECTOR AND COMPUTER WILL BE MAN-PORTABLE. TO ACHIEVE THIS DEGREE OF PORTABILITY, A SMALL HIGH RESOLUTION ECHELLE SPECTROGRAPH HAS BEEN DESIGNED WHICH WILL INCORPORATE A SOLID STATE MICROLASER FOR EXCITATION AND A WIDE FORMAT TWO-DIMENSIONAL CHARGE COUPLED DEVICE (CCD) ARRAY FOR DETECTION. THE INSTRUMENT WILL ALSO EMPLOY A FIBER OPTIC PROBE FOR SAMPLING, WHICH WILL BE PARTICULARLY SUITABLE FOR SCANNING CONTAMINATED SURFACES AND INACCESSIBLE LOCATIONS. THE PROBE INCORPORATES A MICRO-OPTICAL TERMINATING HEAD CONTAINING FILTERS FOR REMOVAL OF SILICA FIBER RAMAN SCATTERING FROM THE SIGNAL. THE GOAL OF PHASE I IS TO CONSTRUCT AND CHARACTERIZE THE SPECTROGRAPH FOR OPERATION WITH CCD DETECTION AND SOLID STATE MICROLASER EXCITATION, AND TO EVALUATE IT FOR DETECTING SEVERAL AGENT STIMULANTS AS NEAT SAMPLES AND DISPERSED ONTO SURFACES WITH SEVERAL DIFFERENT OPTICAL BACKSCATTERING PROPERTIES AT CONCENTRATIONS LESS THAN OR EQUAL TO 1G/M2.

EIC LABORATORIES, INC.
111 DOWNEY STREET
NORWOOD, MA 02062
Phone: (617) 769-9450
Topic#: 91-107 ID#: 91107-03
Office: TACOM
Contract #:
PI: DR. STUART F. COGAN
Title: VARIABLE EMITTANCE DEVICES AND COATINGS
Abstract: THE DEVELOPMENT OF VARIABLE EMITTANCE DEVICES FOR BROADBAND COUNTERSURVEILLANCE APPLICATIONS IN THE NEAR-UV, VISIBLE, NEAR-INFRARED, AND 3-5 UM AND 8-12 UM INFRARED WINDOWS IS PROPOSED. A LARGE EMITTANCE MODULATION THAT CAN BE ELECTRICALLY TUNED TO MATCH THE BACKGROUND EMITTANCE OF DIVERSE TERRAIN TYPES IS ANTICIPATED. THE VARIABLE EMITTANCE SWITCHING IS BASED ON ELECTROCHROMIC REACTIONS IN TRANSITION METAL OXIDES. THE PHASE I OBJECTIVE IS TO IDENTIFY ELECTROCHROMIC MATERIALS AND CORRESPONDING DEVICE DESIGNS THAT ARE APPROPRIATE FOR COUNTERSURVEILLANCE IN EACH WAVELENGTH REGION. A COMPREHENSIVE REVIEW OF ELECTROCHROMIC MATERIALS AND DEVICE CONFIGURATIONS WILL BE UNDERTAKEN AND AN ANALYSIS OF ANTICIPATED EMITTANCE SWITCHING PERFORMANCE MADE. THE REVIEW WILL INCLUDE AN EVALUATION OF OTHER TECHNOLOGIES THAT MIGHT PROVIDE ACTIVE EMITTANCE SWITCHING, INCLUDING POLYMER ENCAPSULATED AND GUEST-HOST LIQUID CRYSTALS. TWO TYPES OF ELECTROCHROMIC DEMONSTRATION DEVICES THAT PROVIDE BROADBAND EMITTANCE MODULATION IN THE INFRARED (2-16 UM) AND EMITTANCE (REFLECTANCE) MODULATION IN THE NEAR-INFRARED (0.7-1.5 UM) WILL BE FABRICATED AS PART OF THE IDENTIFICATION AND EVALUATION PROGRAM. THE DEVICES WILL DEMONSTRATE KEY FEATURES OF THE ELECTROCHROMIC TECHNOLOGY AND AID IN IDENTIFYING TECHNICAL AND MANUFACTURING LIMITATIONS. ANTICIPATED SWITCHING CHARACTERISTICS OF THE DEMONSTRATION DEVICES INCLUDE: A CONTINUOUSLY ADJUSTABLE 3-5 UM AND 8-12 UM EMITTANCE MODULATION OF 0.3 TO 0.8; A NEAR-INFRARED REFLECTANCE MODULATION OF 10% TO 80%; EMITTANCE (REFLECTANCE) CONTROLLED BY A DC VOLTAGE (<1.5V); AND MINIMAL POWER TO SWITCH <0.1 WATT-HR/M2) AND TO MAINTAIN (<0.1 MILLIWATT-HR/M2) A SET EMITTANCE LEVEL.

EIC LABORATORIES, INC.
111 DOWNEY STREET
NORWOOD, MA 02062
Phone: (617) 769-9450
Topic#: 91-145 ID#: 91ETD-115
Office: ETDL
Contract #:
PI: DR. K. M. ABRAHAM
Title: RECHARGEABLE LITHIUM BATTERY WITH SOLID ELECTROLYTES
Abstract: The availability of solid polymer electrolytes with room temperature conductivities of 2 x 10-3 OHM-1 .CM-1 makes if possible to consider the development of rechargeable solid-state LI batteries for military applications. The development of a LI/MNO2 battery utilizing the PAN-EC-PC-LIX solid electrolyte is proposed. The Phase I research will be devoted to assessing the capacity/rate behavior of this cell over the military specified temperature range of -34 to 70C and identifying improved electrolyte and electrode compositions that can lead to a safe battery with the required rate capability and cycle-life.

ELCATECH, INC.
4291 LANTERN DRIVE
WINSTON-SALEM, NC 27106
Phone: (919) 777-3624

Topic#: 91-027 ID#: 91MED-360
Office: MEDICAL
Contract #: 91-C-1103
PI: GEORGE J. DOELLGAST, PHD

Title: ULTRASENSITIVE DETECTION OF TOXINS USING IMMUNOASSAY AMPLIFICATION

Abstract: THE INABILITY TO DETECT TOXINS WITH ADEQUATE SENSITIVITY IS ONE OF THE PRINCIPAL REASONS THAT THEY ARE POTENTIALLY THREATENING, EITHER DUE TO "NATURAL" EXPOSURE OR DELIBERATE AND HOSTILE USE OF THESE AGENTS BY AN ADVERSARY. THIS PROPOSAL OUTLINES A WAY THAT THE DETECTION OF THESE TOXINS CAN BE MADE MUCH MORE SENSITIVE WITHOUT USE OF EXPENSIVE EQUIPMENT OR HIGHLY TRAINED PERSONNEL FOR THE FINAL PRODUCT. THE BASIS OF THE METHOD LIES IN THE USE OF COAGULATION-ACTIVATING SNAKE VENOM ENZYME CONJUGATES OF ANTIBODIES AND ANTIGENS AND THEIR DETECTION BY A NEW, ULTRASENSITIVE COAGULATION ACTIVATOR ASSAY CALLED ENZYME-LINKED COAGULATION ASSAY, OR ELCA. WE EXPECT THAT WE COULD MEASURE TOXINS WITH 100-1000X HIGHER SENSITIVITY THAN OTHER CURRENT METHODOLOGIES, BASED ON OUR CURRENT SUCCESS IN APPLYING THIS ASSAY TO OTHER ANTIGENS. DURING THIS PHASE I EFFORT, WE WOULD DEMONSTRATE THE POTENTIAL OF THE TECHNOLOGY FOR TOXINS OF INTEREST TO THE ARMY, BY LABELING THESE TOXINS AND/OR ANTIBODIES TO THEM, AND DEMONSTRATING THE SENSITIVITY OF DETECTION USING THE ELCA ASSAY. A VARIETY OF PROTOCOLS FOR THE ASSAY WOULD BE TESTED, ALL BEING DEPENDENT ON THE ELCA ASSAY FOR FINAL DETECTION.

ELECTRO MAGNETIC APPLICATIONS, INC.
P.O. BOX 260263
DENVER, CO 80226
Phone: (303) 980-0070

Topic#: 91-159 ID#: 91HDL-040
Office: HDL
Contract #:
PI: DR. RODNEY A. PERALA

Title: PARAMETER TESTING OF MULTI-BRANCHED SHIELDED CABLES

Abstract: CABLE SHIELDS ARE AN IMPORTANT ASPECT OF THE HARDENING OF SYSTEMS TO ELECTRO-MAGNETIC ENVIRONMENTS. THE INTEGRITY OF THESE SHIELDS IS VERY OFTEN CRUCIAL TO THE SURVIVAL OF A CRITICAL SYSTEM TO AN EMF ENVIRONMENT, FOR EXAMPLE. BECAUSE CABLE SHIELD INTEGRITY IS FREQUENCY DIFFICULT TO DETERMINE VISUALLY, AN ALTERNATIVE SIMPLE APPROACH IS REQUIRED. THE OBJECTIVE OF THE PROPOSED WORK IS TO DEVELOP A PROCEDURE WHEREBY CABLE SHIELD INTEGRITY CAN BE OBSERVED IN THE FIELD OR DEPOT LEVEL. A METHOD BASED ON MULTICONDUCTOR CABLE THEORY IS PROPOSED, WHICH INVOLVES INJECTING CURRENT AT SOME CABLE HARNESS LOCATIONS, AND OBSERVING VOLTAGE RESPONSES ELSEWHERE. STATISTICAL VARIATIONS IN CABLE PARAMETERS WILL ALSO BE ADDRESSED.

ELECTRO-OPTEK CORP.
3152 KASHIWA STREET
TORRANCE, CA 90505
Phone: (213) 534-3666

Topic#: 91-232 ID#: 91SDC-185
Office: SDC
Contract #:
PI: E.L. DINES

Title: LASER DETECTION AND RANGING ARRAYS FOR REENTRY AND OUTGOING TARGET TRACKING AT THE KWAJALEIN ATOLL FACILITY

Abstract: WE PROPOSE TO DEVELOP A LASER DETECTION AND RANGING (LADAR) TECHNIQUE FOR AIRBORNE TARGET DETECTION AND TRACKING AT RANGES OF 10 KM OR GREATER. WE WILL DEVELOP THE SEL ARRAY USING INGAAS/GAAS MULTIPLE QUANTUM WELLS (MQWS) SANDWICHED BETWEEN TWO DISTRIBUTED BRAGG REFLECTORS (DBR) OF GAAS/ALAS. THE MQWS AND DBR WILL BE FABRICATED ON GAAS SUBSTRATE IN TANDEM BY MOLECULAR BEAM EPITAXY (MBE). THE TWO-DIMENSIONAL ARRAY OF THE MQW LASERS WILL LASE PERPENDICULAR TO THE SURFACE OF THE SUBSTRATE AND THE EMITTED POWER FROM EACH LASER CAN BE CONTROLLED INDEPENDENTLY AND COHERENTLY. IN ADDITION, WE WILL DEVELOP A PHOTODETECTOR PLACED NEXT TO EACH LASER PIXEL, RESULTING IN A 2-DIMENSIONAL ARRAY OF RADAR ELEMENTS, WHICH WILL TAKE IMAGES OF THE LASER RETURNS FROM TARGETS. THE MAJOR PHASE I TASK IS TO CONCEIVE AND DESIGN THE ARRAY LAYOUT, THE ON-CHIP BIAS/ADDRESS

CIRCUIT AND THE CONTROL PROCESSOR NEEDED FOR THE ARRAY OPERATION AND IMAGE GENERATION AND RANGE COMPUTATION. THIS IS FOLLOWED BY A DELINEATION OF AN MBE PROCESS TO FABRICATE THE MULTIPLE LAYERS FOR THE SEL AND DETECTORS ALL ON A SINGLE GAAS WAFER. THE RESULTANT SEL "RADAR" ARRAY WILL BE USED FOR GENERATING MODULATED IMAGES WITH HIGH RESOLUTION AND HIGH DYNAMIC RANGE, WITH CORRESPONDING RANGE VALUES, THUS MAKING IT IDEAL FOR DETECTING AND TRACKING OF AIRBORNE TARGETS.

ELECTRO-OPTEK CORP.
3152 KASHIWA STREET
TORRANCE, CA 90505
Phone: (213) 534-3666

Topic#: 91-240
Office: SDC
Contract #:
PI: MICHAEL C. LEE

ID#: 91SDC-077

Title: LARGE SCALE BOLOMETER ARRAY FOR FAR IR GLINT RETURN TRACKING

Abstract: WE PROPOSE TO DEVELOP A NOVEL AND INNOVATIVE METHOD OF FABRICATING LARGE-AREA LONG WAVELENGTH INFRARED (LWIR) DETECTOR ARRAYS THAT CAN BE OPERATED AT ROOM TEMPERATURE FOR FAR INFRARED ACTIVE GLINT RETURN TRACKING. THIS TECHNIQUE USES ESTABLISHED TECHNOLOGIES OF MICRO-MACHINING AND MICROELECTRONIC PROCESSING OF SILICON (SI) WAFERS FOR FABRICATING MONOLITHIC ARRAYS OF UNCOOLED LWIR DETECTORS. THE DETECTOR ELEMENTS OF THE ARRAY ARE FORMED BY AN ULTRA-THIN FILM OF A BOLOMETER MATERIAL POSSESSING THE HIGHEST TEMPERATURE COEFFICIENT OF RESISTANCE KNOWN, AND THE READOUT ELECTRONIC MICROCIRCUIT IS FABRICATED ON THE SAME SILICON CHIP NEXT TO THE ELEMENTS. THE RESULTANT DETECTOR ARRAYS WILL THUS POSSESS FEATURES OF HIGH SPEED, HIGH RESOLUTION, LOW COST, LOW WEIGHT, AND HIGH SENSITIVITY. SINCE THE ARRAYS ARE SILICON BASED, LARGE ARRAYS OF LOW RESPONSE TIME ARE POSSIBLE THUS MAKING THEM IDEAL FOR ACTIVE TRACKING SYSTEMS USING PULSED LASERS. THE HIGH RESPONSIVITY WILL PRODUCE HIGH-FIDELITY ACTIVE IMAGES FOR TARGET DETECTION. THE HIGH RESOLUTION WILL PRODUCE ACCURATE RETURN IMAGES FOR TARGET RECOGNITION. THE FAST RESPONSE FEATURE WILL ALLOW THE USE OF A PULSED LASER FOR ACTIVE IMAGING. THE ROOM-TEMPERATURE OPERATION WILL REDUCE THE IMAGING SENSOR COMPLEXITY AND COST.

ELMORE ASSOCIATES
125 BEAR GULCH DRIVE
PORTOLA VALLEY, CA 94028
Phone: (415) 854-1844

Topic#: 91-118
Office: BRL
Contract #:
PI: L. C. Elmore

ID#: 91BRL-012

Title: BLPG Combustion Control by Means of Multipoint Ignition and Chamber Geometry

Abstract: The key potential advantages of the bulk loaded liquid propellant gun (BLPG), relative to the regenerative liquid propellant gun (RLPG), currently under development, include simplicity, reliability, weight, size and performance. The single and limiting disadvantage of the BLPG concept has been lack of assured combustion control which, on occasion, has resulted in unacceptable damage levels in the gun. It has been observed in electrically ignited BLPG firings that extremely precise ignition timing is possible and that associated initial pressure rise rates are highly reproducible. It is the objective of the proposed has Phase I Program to investigate the application of precision multipoint electrical ignition as a means of controlling the BLPG combustion process.

ENERGY COMPRESSION RESEARCH CORP.
990 HIGHLAND DRIVE, SUITE 101
SOLANA BEACH, CA 92975
Phone: (619) 259-3222

Topic#: 91-142
Office: ETDL
Contract #:
PI: DAVID GIORGI

ID#: 91ETD-081

Title: POWER COMBINERS FOR PICOSECOND RISE-TIME MULTI-MEGAWATT PULSES

Abstract: DUE TO THE LIMITED POWER WHICH CAN BE DRAWN FROM A SINGLE MICROWAVE SOURCE, A METHOD TO EFFICIENTLY COMBINE WITH POWER FROM MULTIPLE SOURCES IS REQUIRED IN MANY MILITARY APPLICATIONS. THE POWER COMBINING PROBLEM BECOMES DIFFICULT WHEN THE SOURCES

ARE NOT PHASE MATCHED. ECR CORPORATION HAS BEEN DEVELOPING HIGH POWER MICROWAVE SOURCES BASED ON LIGHT ACTIVATED SILICON JUNCTIONS TRIGGERED BY AN ND:YAG LASER TO OPERATE IN THE LINEAR REGIME. WHEN A CENTRAL LASER IS UTILIZED TO ACTIVATE MANY SOURCES, PHASE MATCHING IS ACHIEVED DUE TO THE INSTANTANEOUS TURN ON TIME OF PHOTOCONDUCTIVE SWITCHES OPERATED IN THE LINEAR REGIME. ECR HAS PREVIOUSLY DESIGNED POWER COMBINERS WHICH HAVE COMBINED POWER FROM TWO INDEPENDENT CIRCUITS WHILE MAINTAINING LESS THAN 100 PS RISE-TIME. THE COMBINED POWER WAS OVER 50 MW. THE GOAL OF THE PHASE I PROGRAM IS TO DESIGN POWER COMBINERS CAPABLE OF COMBINING POWER FROM AT LEAST 15 INDEPENDENT SOURCES. A SMALLER VERSION OF THE FULL SCALE DESIGN WILL BE TESTED TO COMBINE POWER FROM INDEPENDENT SOURCES AT HIGH VOLTAGE EFFICIENCY WHILE MAINTAINING PICOSECOND RISE-TIME AT THE 50-100 MW POWER LEVEL.

ENGINEERED DESIGNS, INC.
PO BOX 8125
WEST CHESTER, OH 45069
Phone: (513) 777-8139

Topic#: 91-190
Office: AVSCOM
Contract #:
PI: JERRY L. CABE, P.E.

ID#: 91AVS-096

Title: ADVANCED BRISTLE SEALS FOR GAS TURBINE ENGINES

Abstract: THE OBJECTIVE OF THIS PROGRAM IS TO CONTINUE THE DEVELOPMENT OF AN ADVANCED BRISTLE SEAL CONCEPT FOR USE IN THE PRIMARY FLOWPATH AND SECONDARY AIR SYSTEMS OF GAS TURBINE ENGINES, BOTH TURBOFAN/JET AND TURBOSHAFT/PROP. THE EXTENSION OF BRISTLE SEAL TECHNOLOGY INTO SEAL APPLICATIONS REQUIRING 1450F AND 1450 FEET PER SECOND TIP SPEED IS THE GOAL OF THIS DEVELOPMENT. THE PROPOSED CONCEPT WILL ALSO ALLOW ENGINE ROTOR EXCURSIONS WITHOUT PERMANENTLY INCREASING THE LEAKAGE OF THE ENGINE SEALS. THE ANALYSIS, MANUFACTURE OF A TEST ARTICLE, AND STATIC PERFORMANCE TESTING OF THE ADVANCED SEAL WILL BE PERFORMED IN PHASE I. DYNAMIC TESTING OF THE SEAL CONCEPT UNDER ADVANCED GAS TURBINE ENGINE CONDITIONS, AS WELL AS THE DEVELOPMENT OF THE DESIGN METHODOLOGY REQUIRED TO APPLY THE ADVANCED SEAL CONCEPT TO DEMONSTRATOR AND PRODUCTION ENGINES, WILL BE PERFORMED IN PHASE II OF THE PROGRAM.

ENSCO, INC.
5400 PORT ROYAL ROAD
SPRINGFIELD, VA 22151
Phone: (703) 321-9000

Topic#: 91-162
Office: HDL
Contract #:
PI: ROBERT GRAY

ID#: 91HDL-062

Title: ADVANCED TECHNOLOGY APPLIED TO HARDNESS MAINTENANCE/HARDNESS SURVEILLANCE

Abstract: THE NEED EXISTS FOR A SIMPLE AND COST EFFECTIVE METHOD TO DETERMINE THE STATUS OF HARDNESS CRITICAL ITEMS (HCI) FOR A WIDE VARIETY OF SYSTEMS WITH E3 SURVIVABILITY REQUIREMENTS. TRADITIONAL METHODS OF TESTING AND MAINTAINING SYSTEMS TO DATE HAVE NOT PROVEN TO BE EFFECTIVE. RECENT TECHNOLOGY ADVANCES MAY PROVIDE THE MUCH NEEDED SOLUTION TO HM/HS FOR E3. FOR EXAMPLE, EXPERT SYSTEMS, UTILIZING ARTIFICIAL INTELLIGENCE INFERENCE ENGINES OPERATING ON APPLICATION SPECIFIC RULES AND INFORMATION, HAVE SUCCESSFULLY BEEN APPLIED TO PRODUCTION LINE QUALITY CONTROL PROBLEMS. ALSO, VIRTUAL SYSTEM HARDWARE TOPOLOGIES MAKE IT POSSIBLE TO IMBED COMPLEX INSTRUMENTS WITHIN LARGE SCALE DIGITAL SYSTEMS. THESE AND OTHER RECENT TECHNOLOGIES ARE TO BE STUDIED IN THE PHASE I EFFORT. FOLLOWING THE ESTABLISHMENT OF DESIGN GOALS FOR THE ADVANCED HM/HS CONCEPT, A TECHNOLOGY ASSESSMENT WILL BE PERFORMED TO IDENTIFY THE MOST PROMISING APPROACHES TO MEETING THE DESIGN GOALS. SEVERAL ALTERNATE SYSTEM CONCEPTS WILL BE DEVELOPED TO AID IN THE EVALUATION PROCESS. THE SELECTED APPROACH WILL THEN BE DEVELOPED INTO A COMPLETE CONCEPTUAL DESIGN. KEY PORTIONS OF THE APPROACH WILL BE DEMONSTRATED IN A RAPID PROTOTYPING EFFORT.

ENZYME TECHNOLOGY RESEARCH GROUP, INC.
710 WEST MAIN STREET
DURHAM, NC 27701
Phone: (919) 683-3133
Topic#: 91-029
Office: MEDICAL
Contract #: 91-C-1111
PI: JUNGUO ZHAO, PH.D.
ID#: 91MED-357

Title: PHASE SEPARATED ENZYME INHIBITOR ELECTRODE FOR MERCURY COMPOUNDS

Abstract: MERCURY IS A HIGHLY TOXIC MATERIAL THAT OCCURS IN BOTH ORGANIC AND INORGANIC FORMS. BECAUSE OF ITS WIDESPREAD INDUSTRIAL USE THE WHOLE POPULATION IS EXPOSED TO MERCURY COMPOUNDS EVERYDAY. THERE IS A NEED FOR A FAST, EASY TO USE, INEXPENSIVE, SENSITIVE METHOD FOR THE DETECTION OF MERCURY TO REDUCE THE RISK OF CHRONIC EXPOSURE. OUR OBJECTIVE IS TO DEVELOP A NEW TECHNIQUE FOR THE SELECTIVE DETECTION OF LOW LEVELS OF ORGANIC MERCURY. WE WILL DEVELOP A PORTABLE DEVICE, BASED ON THE ENZYME INHIBITION BY MERCURY AND THE PHASE SEPARATION OF ORGANIC AND INORGANIC MERCURY, FOR THE SELECTIVE DETERMINATION OF MERCURY, EITHER IN ITS ORGANIC OR INORGANIC FORM, OR IN TOTAL. THE EXPECTED RESULT IS A SENSOR THAT DEMONSTRATES THE FEASIBILITY OF SELECTIVELY DETECTING TRACE AMOUNTS OF TOXIC MERCURY COMPOUNDS (ESPECIALLY THE MOST TOXIC ONE, METHYLMERCURY) WITH EASY TO USE, DISPOSABLE ENZYME ELECTRODES. THE THREE RESEARCHERS SUBMITTING THIS PROPOSAL HAVE COLLABORATED SUCCESSFULLY TO DEVELOP ENZYME-BASED SENSOR TECHNOLOGY WHICH WILL BE A CRUCIAL COMPONENT FOR THIS RESEARCH AND DEVELOPMENT. PRACTICAL PHASE SEPARATED ENZYME INHIBITOR ELECTRODES WILL HAVE GREAT COMMERCIAL POTENTIAL BY PROVIDING SIMPLE INEXPENSIVE MONITORING OF THE ENVIRONMENT FOR TRACE AMOUNTS OF TOXIC METALS.

EPSILON LAMBDA ELECTRONICS CORP.
427 STEVENS STREET
GENEVA, IL 60134
Phone: (708) 232-9611
Topic#: 91-002
Office: CECOM
Contract #: DAAB07-91-C-B757
PI: ROBERT M. KNOX
ID#: 91CEC-301

Title: SURVIVABLE ADAPTIVE TACTICAL MULTIMEDIA COMMUNICATIONS

Abstract: U.S. ARMY CECOM HAS IDENTIFIED THE NEED TO DEVELOP AND DEMONSTRATE IMPROVED TRANSPORT TECHNOLOGIES FOR MULTIMEDIA C3 COMMUNICATION SYSTEMS. BENEFITS TO BE OBTAINED INCLUDE ENHANCED SECURITY AND ANTI-JAM SURVIVABILITY, HIGH DATA FLOW EFFICIENCY AND GREATER USE OF WIRELESS TO REPLACE HARD CABLED NETWORKS. THE PROPOSED PROGRAM BRINGS TOGETHER UNIQUE CAPABILITY AND DOD COMMUNICATIONS SYSTEMS EXPERIENCE OF EPSILON LAMBDA ELECTRONICS AND HARRIS GOVERNMENT COMMUNICATIONS SYSTEMS DIV. TO DEVELOP AND DEMONSTRATE A REAL-TIME MULTIMEDIA NETWORK CONTROL PARADIGM. DURING PHASE I, THE RESEARCH WILL ADDRESS MULTIMEDIA QUEUING THROUGH A CLOSED FORM TYPE OF ANALYSIS RATHER THAN TIME CONSUMING COMPUTER SIMULATION METHODS. THE APPROACH INVOLVES USE OF PROBABILISTIC ROUTING BETWEEN NODES AND MESSAGE CLASSES WHERE NO PARTICULAR TRAFFIC ENTITY TRAVELS ALONG ANY SPECIFIC ROUTE IN THE NETWORK. THE ROUTING ALGORITHM WHICH IS DEVELOPED WILL BE EXERCISED USING A SIMULATION PROGRAM DEVELOPED SPECIFICALLY FOR THAT PURPOSE. A FINAL TASK AREA WILL BE TO DEVELOP A COMPREHENSIVE TEST AND DEMONSTRATION PLAN FOR PHASE II IMPLEMENTATION. DURING PHASE II, THE DEMONSTRATION WILL INVOLVE A TWO MEDIA (VHF-FM AND EHF-FSK) MULTIPLE NODE NETWORK DISBURSED OVER A WIDE AREA HAVING SMALL HIGH SECURITY CELLS. THE DEMONSTRATION WILL INVOLVE NOVEL ANTENNA TECHNOLOGY AS WELL AS INNOVATIVE NETWORK PROCESSING AND MANAGEMENT METHODS.

ESKAY ASSOCIATES
4381 GREEN OAKS BLVD, WEST, SUITE 209
ARLINGTON, TX 76016
Phone: (817) 429-3170
Topic#: 91-093
Office: NATICK
Contract #:
PI: S. "KRISHNA" KRISHNAMURTH
ID#: 91NAT-030

Title: THERMOPLASTIC ELASTOMER (TPE) CHEMICAL PROTECTIVE (CP) GLOVES BY INJECTION MOLDING PROCESS

Abstract: THERMOPLASTIC ELASTOMER (TPE) BY INJECTION MODELING OFFERS AN ALTERNATE METHOD FOR

FORMING CHEMICAL PROTECTIVE GLOVES AS COMPARED TO THE CONVENTIONAL DIP PROCESS USING BUTYL RUBBER SOLUTIONS. THE ADVENT OF VARIOUS TYPES WITH OLEFINIC, STYRENIC, URETHANE, ENGINEERING RESINS AND ALLOYS AND BLENDS OFFER THE ADVANTAGE OF INJECTION MODELING PRODUCTS WHICH HAVE BEEN CONVENTIONALLY MADE BY ELASTOMER COMPOUNDING AND THERMOSET CURING. THE SIZE AND SHAPE OF THE PRODUCT, THE GLOVES REQUIRE INNOVATIVE FORMULATION OF THE RESIN SYSTEM AS WELL INSERT MOLD WITH REMOVABLE CORE FOR FABRICATION. DUE TO THE LARGE AREAS INVOLVED WITH EXTREMELY THIN SECTIONS, TYPES WHICH HAVE VERY LOW VISCOSITIES OVER A WIDE RANGE OF SHEAR RATES AND TEMPERATURES WILL BE REQUIRED. THE DEVELOPMENT OF TPE ALLOYS USING PREVULCANIZED ELASTOMERIC DISPERSIONS IN THERMOPLASTICS OFFERS A VIABLE APPROACH IN DEVELOPING A INJECTION MOLDABLE TPE. STATISTICAL DESIGN METHODS WILL BE USED IN THE FORMULATION OF THE TPE SYSTEMS WHICH WILL MEET OR EXCEED THE PERFORMANCE REQUIREMENTS (MIL-G-43976) OF CURRENTLY USED BUTYL RUBBER GLOVES. A SMALL PROTOTYPE MODEL TOOL WITH MULTIPLE GATES WILL BE USED IN THE EVALUATION OF THE VARIOUS TYPES AND THEIR PROCESSING INTO ITEMS WHICH WILL SIMULATE THE CURRENTLY USED GLOVES.

ESSEX CORP.
1040 WOODCOCK ROAD, SUITE 227
ORLANDO, FL 32803
Phone: (407) 894-5090
Topic#: 91-251
Office: PM TRADE
Contract #:
PI: ROBERT S. KENNEDY
ID#: 91PM-006

Title: SIMULATING THE IMPACT OF MPTF TRADE-OFF DECISIONS BY APPLICATION OF THE ISOPERFORMANCE METHODOLOGY

Abstract: COST-EFFECTIVENESS METHODS MAY PROCEED IN EITHER OF TWO GENERAL WAYS. THE MORE FAMILIAR IS TO FIX COSTS AND MAXIMIZE EFFECTIVENESS. THE ALTERNATIVE IS TO FIX EFFECTIVENESS AND MINIMIZE "COSTS" IN TERMS OF DOLLARS, MUCH-SOUGHT-AFTER PERSONNEL, ADMINISTRATIVE INFEASIBILITY, OR OTHER SCARCE OR UNWANTED CONSIDERATIONS. ISOPERFORMANCE METHODS ARE INTENDED TO BE IMPLEMENTED AS AN INTERACTIVE COMPUTER PROGRAM WHICH SERVES AS AN EXPERT SYSTEM FOR MAKING MPTS TRADE-OFF DECISIONS. THE CENTRAL IDEA IS THE ISOPERFORMANCE CURVE, WHICH REPRESENTS THE TRADE-OFF RELATIONS AMONG PERSONNEL, TRAINING, AND EQUIPMENT CONSIDERATIONS; HEALTH AND SAFETY FACTORS MAY ALSO BE INCLUDED. THE PRESENT PROPOSAL APPLIES THE ISOPERFORMANCE APPROACH TO THE SELECTION OF KEY VARIABLES IN EACH OF THE MANPRINT DOMAINS AS THOSE DOMAINS TAKE SHAPE IN THE DEVELOPMENT AND ACQUISITION OF TRAINING DEVICES. THE KEY STEP WILL BE DETERMINING DEFENSIBLE CRITERIA FOR THE SELECTION OF SOME VARIABLES IN EACH DOMAIN AS KEY. ONCE THIS HAS BEEN DONE, THE EXISTING ISOPERFORMANCE JOB AID (COMPUTER PROGRAM) WILL BE MODIFIED OR REWRITTEN TO IMPLEMENT THE APPLICATION OF THOSE CRITERIA. IN PHASE II, THE JOB AID WILL BE DEVELOPED, DEMONSTRATED, AND BETA TESTED.

FAR WEST SENSOR CORP.
12891 WESTERN AVENUE, SUITE F
GARDEN GROVE, CA 92641
Phone: (714) 893-8899
Topic#: 91-233
Office: SDC
Contract #:
PI: STEVE M. LEWIS
ID#: 91SDC-252

Title: IMPACT DETECTION SYSTEM FOR KWAJALEIN ATOLL APPLICATION

Abstract: THIS PROJECT WILL PROVIDE A PDR-LEVEL DESIGN FOR AN OPTICAL SENSOR SYSTEM FOR THE DETECTION AND LOCATION OF THE SPLASHDOWN POSITION OF REENTRY VEHICLES AT THE KWAJALEIN ATOLL WITH ACCURACIES BETWEEN ONE AND FIVE METERS. THE SYSTEM WILL MAKE USE OF VISIBLE WAVEBAND SENSORS AT MULTIPLE SITES FOR STEREO VIEWING. COINCIDENCE FILTERING AND BACKGROUND SUBTRACTION WILL BE USED FOR TARGET DETECTION. IN ADDITION TO SYSTEM PERFORMANCE ANALYSIS AND DESIGN, A DEVELOPMENT TEST UNIT WILL BE CONSTRUCTED AND USED TO SUPPORT ALGORITHM DEVELOPMENT AND TO VERIFY SENSOR PERFORMANCE.

FASTMAN, INC.
1414 MILLARD STREET
BETHLEHEM, PA 18018
Phone: (215) 691-2577
Topic#: 91-244 ID#: 91SDC-051
Office: SDC
Contract #:
PI: DR. MICHAEL TUCKER
Title: ADAPTIVE WAVELET SIGNAL PROCESSING
Abstract: MODERN SENSORS PRODUCE VAST AMOUNTS OF SIGNAL INFORMATION WHICH MUST BE PROCESSED QUICKLY AND ACCURATELY TO PERFORM SURVEILLANCE AND TARGET TRACKING FUNCTIONS. PREPROCESSING OF THE SENSOR DATA IS PERFORMED FIRST TO REMOVE BACKGROUND SIGNALS, DETECT SPIKES AND PEAKS, FILTER THE SIGNAL, ENHANCE EDGES AND IMPROVE THE SIGNAL-TO-NOISE RATIO. FURTHER PROCESSING IS THEN PERFORMED TO IDENTIFY OBJECT DIRECTION, ORIENTATION AND TO DISCRIMINATE THE OBJECT USING RANGE AND VELOCITY ESTIMATIONS, KALMAN FILTERS AND BY OTHER METHODS. IN PHASE I FASTMAN PROPOSES TO DEVELOP A NEW SIGNAL PREPROCESSOR BASED ON THE ADAPTIVE WAVELET TRANSFORM. THE ADAPTIVE WAVELET TRANSFORM DECOMPOSES A COMPLEX SIGNAL INTO ITS INTEGRAL COMPONENTS ALLOWING KEY SIGNAL FEATURES TO BE READILY EXTRACTED. WE BELIEVE THAT THE ADAPTIVE WAVELET TRANSFORM IS CAPABLE OF ENABLING ORDER-OF-MAGNITUDE IMPROVEMENTS IN SIGNAL PROCESSING PERFORMANCE. IN THIS PROJECT WE WILL: 1) ESTABLISH A MATHEMATICAL BASIS FOR USING THE ADAPTIVE WAVELET TRANSFORM TO REPRESENT COMPLEX SIGNALS, AND 2) DEVELOP STRATEGIES TO EXTRACT TARGET SIGNATURES AND KEY SIGNAL FEATURES FROM THE SIGNAL REPRESENTATION OBTAINED THROUGH THE ADAPTIVE WAVELET TRANSFORM.

FEMTOSCAN CORP.
1834 WEST 4700 SOUTH
SALT LAKE CITY, UT 84118
Phone: (801) 966-2266
Topic#: 91-007 ID#: 91CRD-308
Office: CRDEC
Contract #: DAAA15-91-C-1046
PI: NEIL S. ARNOLD
Title: ADVANCED, DIRECT AIR SAMPLING GAS CHROMATOGRAPHY MODULE FOR ION MOBILITY SPECTROMETRY
Abstract: EXPLORATORY DEVELOPMENT OF AN ADVANCED, DIRECT AIR SAMPLING GAS CHROMATOGRAPHY (GC) MODULE IS PROPOSED. THE GC RIODULE CAN BE READILY COMBINED WITH EXISTING ION MOBILITY SPECTROMETRY (INS) EQUIPMENT FOR DETECTING AND MONITORING CHEMICAL WARFARE AGENTS, E.G., THE CAM (CHEMICAL AGENT MONITOR) CURRENTLY ADOPTED BY SEVERAL NATO MEMBER STATES. THE GC MODULE INCORPORATES A NOVEL, AMBIENT AIR SAMPLING DEVICE COUPLED TO A SHORT CAPILLARY GC COLUMN. THE FEASIBILITY OF ACHIEVING A QUANTUM JUMP IN CAM PERFORMANCE WITH REGARD TO: (1) INTERFERANT REJECTION; (2) QUANTITATIVE RESPONSE; (3) DETECTABILITY OF LOW VOLATILE COMPOUNDS (E.G., INTACT VS AND TRICHOTHECENE MYCOTOXINS); AND (4) SENSITIVITY TO LONG TERM EXPOSURE THRESHOLD LEVELS WILL BE INVESTIGATED IN PHASE I. PHYSICOCHEMICAL PRINCIPLES UNDERLYING THE PERFORMANCE OF THE AIR SAMPLING DEVICE AS WELL AS OF THE CAPILLARY GC COLUMN ARE SUFFICIENTLY WELL UNDERSTOOD TO PERMIT EXTENSIVE USE OF COMPUTER MODELING AND SIMULATION TECHNIQUES IN ADDITION TO SELECTED LABORATORY TESTING, THEREBY GREATLY REDUCING DURATION AND COST OF THE PROPOSED EXPLORATORY DEVELOPMENT EFFORT.

FOSTER-MILLER, INC.
350 SECOND AVENUE
WALTHAM, MA 02154
Phone: (617) 890-3200
Topic#: 91-025 ID#: 91AMC-355
Office: AMC
Contract #: DAAK70-91-C-0043
PI: THOMAS WALTON
Title: NO VOC, PLASMA THERMAL SPRAYED, CARC PAINTING TECHNIQUE FOR ARMY TACTICAL EQUIPMENT
Abstract: FOSTER-MILLER PROPOSES TO INTRODUCE A TECHNOLOGY FOR APPLYING CHEMICAL AGENT RESISTANT COATINGS (CARC) WHICH COULD MAKE SOLVENT-BASED COATINGS OBSOLETE. THE PROCESS DISCHARGES NO VOLATILE ORGANIC COMPOUNDS (VOCS) INTO THE ATMOSPHERE. IN THIS PHASE I PROGRAM, FOSTER-MILLER WILL CONCENTRATE ON USING AN INNOVATIVE PROCESS FOR APPLYING COATINGS SELECTED FOR ENVIRONMENTAL DURABILITY, INCLUDING CARC PROPERTIES, ON TYPICAL EXPOSED SURFACES SUCH AS THOSE FOUND ON ARMY VEHICLES, WEAPONS, SUPPORT EQUIPMENT, AND

SHELTERS. THE POTENTIAL FOR APPLYING THERMOSET AS WELL AS THERMOPLASTIC COATINGS TO MEET ARMY REQUIREMENTS FOR HIGHLY LOADED, LOW PERMEABILITY COATING BINDERS WILL BE EXAMINED BOTH ANALYTICALLY AND EXPERIMENTALLY IN PHASE I OF THE PROPOSED PROGRAM. A FORMULATION TYPICAL OF THAT USED FOR PURPOSES OF CAMOUFLAGE WILL BE INVESTIGATED. DURING PHASE I, THE ECONOMICS OF THE PROCESS WILL BE INVESTIGATED AS WELL. IN PHASE II, THE SELECTED COATING COMPOSITION(S) WILL BE MODIFIED AS REQUIRED TO FULFILL ALL ARMY REQUIREMENTS, AND DELIVERY SYSTEM PARAMETERS WILL BE OPTIMIZED. THE RESULT WILL BE A PROCESS FOR DELIVERING CARC-RATED COATINGS WITH EMISSION OF NO VOLATILE OR POLLUTING ORGANIC SOLVENTS.

FOSTER-MILLER, INC.
350 SECOND AVENUE
WALTHAM, MA 02154
Phone: (617) 890-3200
Topic#: 91-029
Office: MEDICAL
Contract #: 91-C-1110
PI: BRUCE NAPPI
ID#: 91MED-315
Title: MINIATURE ANGULAR MOTION SENSOR
Abstract: THIS PROGRAM ADDRESSES THE DEVELOPMENT OF A MICROMINIATURE ACCELERATION RECORDER FOR MONITORING ANGULAR MOTIONS IN HUMAN SUBJECTS. HYBRID CIRCUITS AND LOW POWER CMOS TECHNOLOGY WILL BE USED TO IMPLEMENT THE RECORDER ELEMENT. THIS WILL BE INTERFACED WITH AN IBM-PC COMPATIBLE SYSTEM FOR DATA ARCHIVE, ANALYSIS AND PRESENTATION. DURING PHASE I, A PROTOTYPE HYBRID WILL BE BUILT AND TESTED. IN PHASE II, A FIELD DEPLOYABLE SYSTEM WILL BE BUILT.

FOSTER-MILLER, INC.
350 SECOND AVE
WALTHAM, MA 02154
Phone: (617) 890-3200
Topic#: 91-089
Office: NATICK
Contract #:
PI: LESLIE S. RUBIN
ID#: 91NAT-008
Title: THREE-YEAR SHELF LIFE, HIGH BARRIER FOOD CONTAINER
Abstract: WE PROPOSE TO DEVELOP POLYMERIC SUBSTRATES THAT CAN BE FABRICATED INTO CONTAINERS FOR THERMOSTABILIZED MEAL TRAY (TMT) RATIONS WHICH PROVIDE A THREE-YEAR SHELF LIFE. THESE POLYMERIC TMTS WILL PROVIDE THE MILITARY WITH A NEW CLASS OF SINGLE SERVING THERMOPROCESSED FOOD CONTAINERS. IN ADDITION, THESE POLYMERIC SUBSTRATES WILL ALSO PROVIDE THE MILITARY WITH AN ALTERNATIVE MATERIAL FOR THE EXISTING EPOXY LINED STEEL HALF STEAM TABLE TRAY PACKS THAT SERVE 12 TO 18 PEOPLE. THE USE OF PREFERRED MATERIALS SUCH AS PLASTICS COMBINED WITH A MORE CONVENIENT INDIVIDUAL SERVING PACKAGE SIZE WILL ENSURE THAT THE GOVERNMENT HAS A LARGER INDUSTRIAL BASE FOR PROCURING REDUCED COST THERMO-PROCESSABLE FOOD CONTAINERS. LIQUID CRYSTAL POLYMERS (LCP) ARE A NEW CLASS OF MATERIALS THAT CAN BE PROCESSED INTO THIN FILMS THAT EXHIBIT OUTSTANDING BARRIER PROPERTIES AND HAVE THE CAPABILITY TO EXTEND SHELF LIFE TO THREE YEARS. IN THIS PHASE I PROGRAM WE WILL USE OUR PROPRIETARY EXTRUSION TECHNOLOGY TO PRODUCE LCP FILMS THAT HAVE BARRIER PROPERTIES THAT ARE 1 TO 3 ORDERS OF MAGNITUDE SUPERIOR THAN TODAY'S BEST COMMODITY BARRIER FILMS SUCH AS PVDC, PAN AND EVOH. THE BARRIER PROPERTIES FOR OUR BIAXIALLY ORIENTED LCP SUBSTRATES ARE AS FOLLOWS: OXYGEN - 0.008 CC-ML/ 100 IN.SQ-DAY-ATM, WATER VAPOR - 0.0036 GM-ML/LOO IN.SQ-DAY-ATM. OUR LCP FILMS ALSO ARE MICROWAVE COMPATIBLE, FDA APPROVED, CHEMICALLY INERT, RETORTABLE, MECHANICALLY STRONG, AND ARE READILY FORMED INTO MULTI-PLY LAMINATES THAT CAN BE THERMOFORMED AND THERMALLY SEALED. WE WILL PRODUCE LCP BARRIER LAMINATES THAT CAN BE EVALUATED FOR OXYGEN AND WATER VAPOR PERMEABILITY, AND SEALABILITY. A PREDICTION OF THE ANTICIPATED SHELF LIFE ALSO WILL BE DEVELOPED USING INDUSTRY DATA AND MEASURED SUBSTRATE PERMEABILITIES.

FOSTER-MILLER, INC.
350 SECOND AVE
WALTHAM, MA 02154
Phone: (617) 890-3200
Topic#: 91-095
Office: NATICK
Contract #:
PI: TOM WALTON
ID#: 91NAT-034
Title: NONPLASTIC SUBSTITUTE FOR THE PLASTIC MILK BLADDER
Abstract: LINEAR LOW DENSITY POLYETHYLENE (LLDPE) AND OTHER PLASTIC WASTES USED FOR FOOD-CONTACT PACKAGING APPLICATIONS SUCH AS MILK BLADDERS ARE CURRENTLY JETTISONED INTO THE SEA FROM OUR NAVY'S 600 VESSEL FIGHTING FLEET BY THE ORDER OF THOUSANDS OF POUNDS EVERY MONTH. THIS IS AN ENVIRONMENTALLY UNACCEPTABLE PRACTICE. CURRENT STORAGE, OF THESE FOOD-CONTACT TYPE PLASTIC PACKAGING WASTES, ON BOARD FOR MORE THAN THREE DAYS CAN PRESENT SIGNIFICANT ODOR AND HEALTH PROBLEMS. WE PROPOSE TO EVALUATE AND SELECT FROM SEVERAL NEW, BARRIER COATED NONPLASTIC BIOPOLYMER FILM CANDIDATES A SUITABLE MILK BLADDER MATERIAL THAT HAS BARRIER PROPERTIES THAT EXCEED THE CURRENT LLDPE MILK BLADDER TO MAINTAIN LONG-TERM ASEPTIC STORAGE FRESHNESS FOR LONGER TIME PERIODS. THE NEW PROPOSED BARRIER COATED FILM MATERIAL WILL PERFORM OPERATIONALLY BETTER THAN THE CURRENT MILK BLADDER AND BE 100% BIODEGRADABLE IN SEA WATER, PRACTICAL AND ECONOMICAL TO PRODUCE, SEALABLE, EDIBLE BY MARINE LIFE AND DENSER THAN SEA WATER. THIS NOVEL MATERIAL,IN LESS THAN ONE MESH GROUND OR CHOPPED FORM, MEETS THE OBJECTIVES OF THE FEDERALLY APPROVED MARPOL 73/78 AGREEMENT AND SUBSEQUENT PUBLIC LAW 100-220 BARRING SHIPS FROM DISCHARGING "SPECIFIC PLASTIC ARTICLES ... WHICH CAUSE DEATH OR INJURY TO FISH OR WILDLIFE."

FOSTER-MILLER, INC.
350 SECOND AVENUE
WALTHAM, MA 02154
Phone: (617) 890-3200
Topic#: 91-140
Office: ETDL
Contract #:
PI: DAVID COPE
ID#: 91ETD-074
Title: MOTIONLESS SUPERCONDUCTING FLUX PUMP
Abstract: MAGNETIC ENERGY CAN BE KEPT FOR AN INDEFINITELY LONG PERIOD OF TIME WITHOUT SIGNIFICANT ENERGY LOSS IN SUPERCONDUCTING ENERGY STORES. EFFICIENT ACCUMULATION AND DELIVERY OF THE ENERGY TO A LOAD, HOWEVER, REMAIN AS TECHNOLOGICAL PROBLEMS. THE SUPERCONDUCTING FLUX PUMP IS ONE DEVICE WHICH HAS BEEN USED IN THE PAST TO ACCUMULATIVE AND DELIVER ENERGY. THE FLUX PUMP ACCUMULATES MAGNETIC FLUX SEQUENTIALLY AND TRANSFERS IT TO A STORAGE COIL. THE FLUX PUMP PROPOSED HERE ALLOWS RECHARGING IN THE FIELD OF THE SUPERCONDUCTING POWER SUPPLY, IS HIGHLY RELIABLE SINCE IT HAS NO MOVING PARTS AND IS PREDICTED TO HAVE A HIGH TRANSFER EFFICIENCY (>80 PERCENT) FOR ENERGY STORAGE AND DELIVERY. THE INADEQUACIES OF PREVIOUS FLUX PUMP DESIGN AS ADDRESSES AND CORRECTED IN THE PROPOSED DESIGN. IT IS PROPOSED TO DEVELOP THE DESIGN FOR A SUPERCONDUCTING FLUX PUMP BY MEANS OF ANALYTICAL AND EXPERIMENTAL STUDIES. THE ANALYTICAL INVESTIGATIONS SHALL INCLUDE MATERIAL, CIRCUIT ANALYSES AND TRADEOFF STUDIES USING ANALYTICAL CIRCUIT AND THERMODYNAMIC MODELS OF SUPERCONDUCTING FLUX PUMPS. FEASIBILITY OF THE SUPERCONDUCTING FLUX PUMP SHALL BE DEMONSTRATED BY TESTING OF INDIVIDUAL COMPONENTS AND FABRICATION OF A FLUX PUMP. THIS PHASE I PROGRAM DEMONSTRATES CONCEPT PROOF-OF-PRINCIPLE. PHASE II WILL DEMONSTRATE SYSTEM INTEGRATION OF A HIGH PERFORMANCE SUPERCONDUCTING FLUX PUMP. PHASE III WILL DEMONSTRATE PRODUCT COMMERCIALIZATION.

FOSTER-MILLER, INC.
350 SECOND AVENUE
WALTHAM, MA 02154
Phone: (617) 890-3200
Topic#: 91-179
Office: AVSCOM
Contract #:
PI: GLENN FREITAS
ID#: 91AVS-037
Title: ADVANCED BRAIDED STRUCTURES
Abstract: BRAIDING IS A POTENTIALLY EFFICIENT COST-EFFECTIVE PROCESS FOR PRODUCING COMPOSITE STRUCTURES. BRAIDING CAN ACCOMMODATE LOCAL BUILD-UPS, PLY DROPOFFS, CONICAL SHAPES, AND

QUICK ANGLE CHANGES. THE INTERLOCKING OF A BRAIDED STRUCTURE HAS BEEN SHOWN TO INCREASE DAMAGE TOLERANCE. SIMPLE MODIFICATIONS TO BRAIDERS CAN ALLOW THE FORMATION OF FLAT FABRICS OR STRUCTURES AND THE FABRICATION OF TOROIDAL STRUCTURES IS POSSIBLE VIA SPLIT RING BRAIDING. THE FULL POTENTIAL OF BRAIDING AS A COMPOSITES MANUFACTURING PROCESS HAS NOT BEEN REALIZED. THIS IS MOSTLY DUE TO MACHINERY DESIGNED IN THE EARLY 1900S STILL BEING USED TODAY. PRIMITIVE CARRIER DESIGNS ARE NOT SUITABLE FOR HIGH PERFORMANCE FIBERS SUCH AS HIGH MODULUS CARBON OR CERAMICS. THE NUMBER AND CAPACITY OF THE CARRIERS ALSO LIMITS THE SIZE OF THE STRUCTURE WHICH CAN BE BRAIDED EFFECTIVELY. POSTER-MILLER PROPOSES TO DEVELOP NEW BRAIDING MACHINERY WHICH WILL PROVIDE TO BE EFFICIENT AND APPLICABLE TO A WIDE RANGE OF STRUCTURES NOT CURRENTLY POSSIBLE. WE WILL ACCOMPLISH THIS BY DEVELOPING AN ADVANCED BRAIDER CARRIER SYSTEM - A BREADBOARD MODEL OF WHICH WILL BE DEMONSTRATED IN PHASE I; AND BY APPLYING A MODULAR BRAIDER BASE CONCEPT THAT CAN BE ASSEMBLED INTO SEVERAL CONFIGURATIONS. DURING PHASE I WE WILL MEET WITH AIRFRAMERS TO DETERMINE COMPONENTS WHICH COULD BEST BENEFIT FROM AN ADVANCED BRAIDING SYSTEM. INITIAL CONTACTS HAVE BEEN MADE WITH SIKORSKY AIRCRAFT, BOEING HELICOPTERS, AND BELL HELICOPTERS TO SOLICIT TECHNICAL INPUT AND GUIDANCE FOR OUR PHASE I EFFORT. PHASE I EFFORTS WILL FEATURE AN ADVANCED BRAIDER CONCEPT CAPABLE OF BRAIDING HIGH MODULUS FIBERS, TOW WIDTHS UP TO 1 IN. WIDE, AND FIBER CARRIERS WITH UP TO THREE DIFFERENT MATERIAL SYSTEMS AND OVER 6 LB OF FIBER.

FU ASSOCIATES, LTD.
2300 CLARENDON BOULEVARD, SUITE 1400
ARLINGTON, VA 22201
Phone: (703) 243-2992
Topic#: 91-207
Office: ARI
Contract #:
PI: EMILY S. ANDREWS, PHD.
ID#: 91ARI-003

Title: ARMY RESERVE FORCE STRUCTURE PLANNING MODEL

Abstract: THE PRIMARY OBJECTIVE OF THE PROPOSED PHASE I PROJECT IS TO EMPIRICALLY MODEL THE RETENTION INTENTION DECISION OF ARMY SELECTED RESERVE OFFICERS AND ENLISTED PERSONNEL. THE MODELING EFFORT WILL IDENTIFY WHICH ECONOMIC, DEMOGRAPHIC, AND ATTITUDINAL FACTORS INFLUENCE THE RETENTION INTENTION DECISION. TWO DATABASES WILL BE USED FOR THE MODELING EFFORT: (1) THE DEFENSE MANPOWER DATA CENTER'S (DMDC) 1986 SURVEY OF RESERVE COMPONENTS FOR SELECTED RESERVE OFFICERS AND ENLISTED PERSONNEL, AND (2) THE 1985 CURRENT POPULATION SURVEY OF MULTIPLE JOBHOLDERS. ADDITIONAL REGIONAL INFORMATION WILL BE MATCHED TO THE RESERVE COMPONENTS SURVEY UNDER THE AUSPICES OF THE DMDC. TWO TYPES OF ECONOMETRIC MODELS WILL BE ESTIMATED: (1) A MULTI-STAGED PROBABILITY MODEL OF RETENTION INTENTION WITH A SELECTIVITY BIAS CONTROL FACTOR, AND (2) A HAZARD FUNCTION MODEL OF THE EXPECTED DURATION OF RESERVE SERVICE.

GELTECH, INC.
TWO INNOVATION DRIVE
ALACHUA, FL 32615
Phone: (904) 462-2358
Topic#: 91-242
Office: SDC
Contract #:
PI: VINAY K. SETH
ID#: 91SDC-017

Title: RADIATION-HARD 100% SILICA OPTICAL FIBER WAVEGUIDES

Abstract: OPTICAL SIGNALS CAN BE TRANSMITTED THROUGH STRANDS OF TRANSPARENT MATERIALS CALLED OPTICAL FIBERS. THESE FIBERS ARE CIRCULAR DIELECTRIC WAVEGUIDES WITH A CENTRAL CORE AND A CONCENTRIC CLADDING. THE LIGHT SIGNALS ARE CONFINED TO THE CORE BY CONTROLLING ITS ANGULAR CONDITION SO THAT TOTAL INTERNAL REFLECTION OCCURS. TO ENABLE THE TOTAL INTERNAL REFLECTION OF LIGHT, THE CORE MATERIAL OF THE FIBER HAS AN INDEX OF REFRACTION HIGHER THAN THAT OF THE CLADDING MATERIAL BY ABOUT 1%. IT IS NECESSARY TO ADD DOPANTS TO SILICA TO ALTER ITS INDEX OF REFRACTION. HOWEVER, DOPANTS AND THE RESULTING DEFECTS INCREASE BOTH SCATTERING LOSS DUE TO EXISTING INHOMOGENEITIES AND SIGNAL ATTENUATION DUE TO ABSORPTION. IN HIGH ENERGY RADIATION ENVIRONMENT THE PROBLEM OF SIGNAL DISTORTION IS EXACERBATED DUE TO INCREASED CONCENTRATION OF COLOR CENTERS. THIS RESEARCH FOCUSES ON THE FABRICATION OF

100% SILIC TICAL FIBER WAVEGUIDES WHEREIN THE COLOR CENTERS WILL BE ABSENT THEREBY MAKING THE FIBER RADIATION-HARD. SOL-GEL TECHNOLOGY WILL BE UTILIZED FOR THE FABRICATION OF THESE NOVEL OPTICAL FIBER WAVEGUIDES.

GENERAL FIBER OPTICS, INC.
98 COMMERCE RD.
CEDAR GROVE, NJ 07009
Phone: (201) 239-3400
Topic#: 91-117 ID#: 91BRL-007
Office: BRL
Contract #:
PI: GREGORY C. BURKE
Title: LASER ORDNANCE IGNITION SYSTEMS
Abstract: A PROPOSAL IS SET FORTH TO INVESTIGATE, DEVELOP, AND DEMONSTRATE IMPROVED METHODS TO COUPLE LASER ENERGY INTO PROJECTILE WEAPONS FOR INITIATION OF PRIMERS, PROPELLANTS, AND OTHER EXPLOSIVE MEDIA. TO INITIATE A PRIMER, PROPELLANT OR OTHER EXPLOSIVE MEDIA, METHODS TO RELIABLY COUPLE AND DIRECT HIGH ENERGY LASER LIGHT THROUGH THE BREACH ARE NEEDED. TO ALLOW CONTINUED RESEARCH INTO THE OPTIMAL WAVELENGTHS NEEDED TO PERFORM THE INITIATION AND TO QUALIFY THE BEST LASER SOURCE, A BREACH PENETRATOR MUST OPERATE REPEATABLY, AND RELIABLY OVER A WIDE RANGE OF OPTICAL WAVELENGTHS AND OPTICAL POWER DENSITIES. WE PROPOSE TO INVESTIGATE AND DEMONSTRATE IMPROVED METHODS TO COUPLE A WIDE VARIETY OF LASER SOURCES THROUGH THE BREACH USING OPTICAL FIBER BASED PENETRATORS FOR THE PURPOSE TO IGNITE BOTH CONVENTIONAL PRIMER AND IGNITER MATERIALS. IN ADDITION, WE WILL INVESTIGATE METHODS TO INTRODUCE CONSUMABLE OPTICAL FIBERS EMBEDDED WITHIN A PROPELLANT CHARGE AND TO REVIEW OTHER METHODS TO INTRODUCE LASER LIGHT INTO SHELL CASINGS. THE DEVELOPMENT OF OPTICAL PENETRATORS ABLE TO WITHSTAND REPEATABLE AND RAPID FIRINGS WOULD YIELD SIGNIFICANT IMPROVEMENT IN METHODS TO SAFELY INITIATE PROPELLANTS WITH IMPROVED FLEXIBILITY AND CONTROL.

GENERAL MICROWAVE CORP.
5500 NEW HORIZONS BLVD
AMITYVILLE, NY 11701
Phone: (516) 226-8900
Topic#: 91-020 ID#: 91CRR-395
Office: CRREL
Contract #: DACA33-91-C-0035
PI: DANNY ADLER
Title: DEVELOPMENT OF A PORTABLE ICE-THICKNESS MEASURING INSTRUMENT
Abstract: PHASE I OF THE PROPOSED STUDY ADDRESSES THE FEASIBILITY OF A NARROW BAND FM-CW MICROWAVE RADAR SENSOR TO MEASURE THE THICKNESS OF ICE WITH GOOD ACCURACY. THE SENSOR HAS THE POTENTIAL TO BE PORTABLE AND LOW COST, BECAUSE OF THE NARROW BAND OF OPERATION AND RECENT ADVANCES IN MICROWAVE INTEGRATED CIRCUITS. THE DEVICE IS BASED ON A PROPRIETARY TECHNOLOGY THAT ACHIEVES A SIGNIFICANT IMPROVEMENT IN ACCURACY COMPARED TO CONVENTIONAL FM-CW SYSTEMS. THE TECHNOLOGY HAS ALREADY BEEN DEMONSTRATED IN AN OBSTACLE DETECTION SENSOR FOR AUTOMOTIVE APPLICATIONS. PHASE I OF THE PROGRAM INVOLVES THE LABORATORY DEMONSTRATION OF THE CAPABILITY TO MEASURE THE THICKNESS OF ICE WITH AN ACCURACY OF 0.5 INCHES. A FULLY PORTABLE DEVICE CAN BE DEMONSTRATED IN PHASE II.

GENERAL MICROWAVE CORP.
5500 NEW HORIZONS BOULEVARD
AMITYVILLE, NY 11701
Phone: (516) 226-8900
Topic#: 91-078 ID#: 91MIC-038
Office: MICOM
Contract #: DAAH01-92-C-R105
PI: MITCHELL TUCKMAN
Title: DYNAMIC PRECISION PHASE/AMPLITUDE CONTROLLER
Abstract: Phase I of the proposed program addresses the feasibility of designing a precision phase and amplitude controller which will provide phase and amplitude accuracy of 0.1 degree and 0.1 dB respectively over an instantaneous bandwidth of 1 GHz. It is shown that this performance can be achieved by utilizing a high dynamic range I-Q vector modulator along with a simplified error correction scheme which minimizes memory requirements. The I-Q vector modulator utilizes proprietary technology as well as a high performance microwave quadrature coupler to obtain broadband performance well in excess of the desired 1 GHz

bandwidth and, in fact, can span a bandwidth ratio of more than three to one in the frequency range from 0.5 GHz to 18.0 z. The phase and amplitude controller will be digitally programmable and a study will be performed to optimize the interface with the VME bus. Phase I of the program will generate the system design and will include a demonstration of a unit with the required amplitude and phase resolution over a limited dynamic range. Requirements for calibration and performance verification will be reviewed as part of this effort. Phase II will include fabrication and testing of complete phase and amplitude controller with the full 30 dB dynamic range and VME bus interface.

GENISYS RESEARCH & DEVELOPMENT, INC.
314 S. JAY STREET
ROME, NY 13440
Phone: (315) 339-5502
Topic#: 91-199
Office: CERL
Contract #:
PI: THOMAS V. EDWARDS
ID#: 91CER-045
Title: GEO-BASED ENVIRONMENTAL AUDIT SUPPORT SYSTEM
Abstract: THE RECENT YEARS HAVE BROUGHT INCREASING DEMANDS ON DOD ENVIRONMENTAL MANAGERS TO SUPPORT UST PROGRAM MAINTENANCE AND COMPLIANCE. THESE DEMANDS ARISE IN PART FROM THE ENORMOUS DATA MANAGEMENT REQUIREMENTS ASSOCIATED WITH THE ENVIRONMENTAL COMPLIANCE AND DECISION SUPPORT; AND IN PART FROM THE INCREASED ENVIRONMENTAL AWARENESS IN GENERAL. A COMPLEX FUSION OF DIVERSE DATA TYPES AND FORMATS IS REQUIRED TO SUPPORT THE DECISION MAKING PROCESS, STRESSING THE CURRENT PREDOMINANTLY MANUAL PROCEDURES FOR DATA ORGANIZATION, MANAGEMENT, RETRIEVAL, AND PROCESSING. IN THIS PROPOSAL, WE ADVANCE A PRELIMINARY SYSTEM CONCEPT AND PLAN FOR (1) REFINING THAT CONCEPT THROUGH THE PHASE I EFFORT, AND (2) THE INVESTIGATION AND ANALYSIS OF THE PROBLEMS WITH THE REALIZATION OF THAT CONCEPT. THE PROPOSED CONCEPT IS TO BE REFINED BY MERGING THE CERL REQUIREMENTS WITH THOSE OF TWO REPRESENTATIVE END-USERS, FT. DRUM AND GRIFFISS AFB, WHICH HAVE CONSENTED TO CONTRIBUTE TO THE PLANED EFFORT. THE PROPOSED ANALYSIS AREAS ADDRESS THE PROBLEMS OF GRAPHIC CONSTRUCTION OF HYBRID GIS/DBMS QUERIES, AND ARCHIVE/RETRIEVE SUBSYSTEM INTEGRATION WITH GRASS TOOLKIT SELECTED AS A BASIS FOR THE PROPOSED APPLICATION.

GEO-MICROBIAL TECHNOLOGIES, INC.
PO BOX 132
OCHELATA, OK 74051
Phone: (918) 535-2281
Topic#: 91-066
Office: CRDEC
Contract #:
PI: GEORGE T. SPERL, PHD.
ID#: 91CRD-142
Title: AN ULTRA HIGH CELL DENSITY TECHNOLOGY FOR THE PRODUCTION OF MICROBIAL NERVE GAS DEGRADING ENZYMES
Abstract: A HIGH CELL DENSITY FERMENTATION TECHNOLOGY IS PROPOSED FOR THE PRODUCTION OF MICROBIAL NERVE GAS DEGRADING ENZYMES. THIS TECHNOLOGY WILL RELY ON THE DEVELOPMENT OF AN ULTRA HIGH CELL DENSITY (GREATER THAN 100 G DRY WEIGHT CELLS/L) CONTINUOUS FERMENTATION FOR THE PRODUCTION OF MICROBIAL ENZYMES KNOWN TO DEGRADE NERVE GASES.

GUIDED SYSTEMS TECHNOLOGIES
430 TENTH STREET, NW, SUITE N107
ATLANTA, GA 30318
Phone: (404) 873-3493
Topic#: 91-174
Office: AVSCOM
Contract #:
PI: J. ERIC CORBAN
ID#: 91AVS-001
Title: ACTIVE CONTROL FOR ROTOR SUSCEPTIBILITY REDUCTION
Abstract: GUIDED SYSTEMS TECHNOLOGIES PROPOSES TO APPLY AN INNOVATIVE COMBINATION OF INDIVIDUAL BLADE CONTROL CONCEPTS, AND EMERGING TECHNOLOGY FOR BLADE ACTUATION USING SMART MATERIALS, TO ACHIEVE DRAMATIC REDUCTIONS IN ROTOR SUSCEPTIBILITY. IN PARTICULAR, CONTROL INPUTS WILL BE TAILORED TO SPECIFIC MISSION SEGMENTS, RELAXING TO SOME DEGREE THE USUAL ROTOR DESIGN TRADE-OFFS BETWEEN PERFORMANCE AND SIGNATURE REDUCTION. BY EXPLOITING THE CAPABILITIES OF MODERN DIGITAL ELECTRONIC ENGINE CONTROLS AND RECENT ADVANCES IN APPLYING PIEZOELECTRIC MATERIALS, ADDITIONAL FREEDOM FOR ROTOR CONTROL CAN

BE INTRODUCED, INCLUDING ACTIVE CONTROL OF ROTOR SPEED, INDIVIDUAL CONTROL OF BLADE PITCH, LIMITED CONTROL OF AIRFOIL SHAPE, AND EVEN CONTROL OF SPANWISE BLADE PROPERTIES. PHASE I WILL FOCUS ON CREATION OF A COMPREHENSIVE DESIGN ENVIRONMENT IN WHICH TO EXPLORE THE LIMITS OF ACTIVE CONTROL TECHNOLOGY FOR ROTOR SUSCEPTIBILITY REDUCTION. STATE-OF-THE-ART TOOLS FOR PREDICTION OF ROTOR BLADE PRESSURE AND TEMPERATURE DISTRIBUTIONS WILL BE COUPLED WITH AVAILABLE ROTOR PERFORMANCE PROGRAMS AND ALGORITHMS FOR OBSERVABLE SIGNATURE PROPAGATION. THE DEVELOPED TOOLS WILL THEN BE USED TO IDENTIFY THE MOST PROMISING CONTROL FOR DEVELOPMENT AND EXPERIMENTAL VALIDATION IN PHASE II.

HIGH PERFORMANCE MATERIALS, INC.
500 WEST NINTH STREET
HERMANN, MO 65041
Phone: (314) 486-3111
Topic#: 91-152
Office: HDL
Contract #:
PI: T.C. PENG
ID#: 91HDL-004

Title: ADVANCED COMPOSITE SOLDER FOR MICROELECTRONICS

Abstract: A DISPERSION AND COMPOSITE STRENGTHENING APPROACH INCORPORATING THE BENEFITS OF RAPID SOLIDIFICATION AND IN-SITU COMPOSITE FORMATION IS PROPOSED FOR THE DEVELOPMENT OF CREEP AND FATIGUE RESISTANT HIGH STRENGTH SOLDER ALLOYS AND COMPOSITES FOR ELECTRONICS PACKAGING APPLICATIONS . THE GOAL OF PHASE I OF THE PROGRAM IS TO DEMONSTRATE THE FEASIBILITY OF PRODUCING BY INDUCTION MELTING AND INERT GAS ATOMIZATION DISPERSION STRENGTHENED TIN-LEAD SOLDER ALLOYS AND COMPOSITES WITH SIGNIFICANT IMPROVEMENTS IN ROOM AND ELEVATED TEMPERATURE STRENGTH, CREEP RESISTANCE AND FATIGUE LIFE OVER CONVENTIONAL SOLDERS. TEN LOTS OF SN-PB-X (X = CU, Y, CE, NI, TI, B) BASED ALLOYS WILL BE PRODUCED BY RAPID SOLIDIFICATION PROCESSING, CONSOLIDATED BY HOT ISOSTATIC PRESSING, AND EXTRUDED TO RODS. MICROSTRUCTURES, MECHANICAL PROPERTIES, AND SOLDERABILITY OF THE ALLOYS WILL BE DETERMINED BY OPTICAL METALLOGRAPHY, SCANNING ELECTRON MICROSCOPY TENSION ,CREEP AND FATIGUE TESTING, AND SOLDER REFLOW CHARACTERIZATION. .

HNC, INC.
5501 OBERLIN DRIVE
SAN DIEGO, CA 92121
Phone: (619) 546-8877
Topic#: 91-197
Office: CERL
Contract #:
PI: GEOFFREY J. HUETER, PH.D.
ID#: 91CER-036

Title: NEURAL NETWORKS FOR PREDICTIVE HEATING VENTILATION AIR CONDITIONING CONTROLS

Abstract: PREDICTIVE MODELS FOR HVAC CONTROL USING FEED-FORWARD NEURAL NETWORKS HAVE SHOWN GOOD PROMISE; HOWEVER, SUCH NETWORK TECHNIQUES ARE NOT DESIGNED FOR USE IN COMPLEX SPATIOTEMPORAL MODELING PROBLEMS SUCH AS PREDICTING TOTAL BUILDING CHILLED WATER DEMAND SINCE FEED-FORWARD MODELS HAVE NO INTERNAL DYNAMICS. IN THIS PROJECT, WE PROPOSE TO EXTEND THE CURRENT WORK WITH NEURAL NETWORK PREDICTIVE MODELS THROUGH THE USE OF RECURRENT NETWORKS. SUCH NETWORKS HAVE SHOWN THE ABILITY TO ACCURATELY MODEL COMPLEX PROCESSES. WE WILL ALSO APPLY ADVANCED NEURAL NETWORK-BASED DATA ANALYSIS METHODS TO DETERMINE WHICH BUILDING PARAMETERS HAVE SIGNIFICANT PREDICTIVE POWER. THESE METHODS WILL BE APPLIED TO THE PROBLEM OF PREDICTING TOTAL CHILLED WATER DEMAND AND CHILLER POWER CONSUMPTION FOR SIMULATED BUILDING USING BLAST. THE BLAST PROGRAM WILL ALLOW EVALUATION OF THE NEURAL NETWORKS UNDER VARYING CONDITIONS, AND TO ACCESS THE ROBUSTNESS OF THESE METHODS TO CHANGES (SUDDEN AND GRADUAL) IN THE BUILDING CHARACTERISTICS. INCREMENTAL TRAINING METHODS WILL BE APPLIED TO ALLOW THE NETWORK TO ADJUST TO THESE CHANGES.

HORIZONS TECHNOLOGY, INC.
700 TECHNOLOGY PARK DRIVE
BILLERICA, MA 01821
Topic#: 91-245
Office: SDC
Contract #:
ID#: 91SDC-101

Phone: (618) 624-2971 PI: JAMES E. REKOWSKI, JR.
Title: VOICE/DATA MULTIPLEXER FOR COMMUNICATIONS (VDMC)
Abstract: SYNCHRONIZE TO ALLOW SECURE COMMUNICATIONS OVER THE NARROW BAND COMMUNICATIONS PATH.

I-KINETICS, INC. Topic#: 91-050 ID#: 91CEC-234
19 BISHOP ALLEN DRIVE Office: CECOM
CAMBRIDGE, MA 02139 Contract #:
Phone: (617) 661-8181 PI: DR. BRUCE H. COTTMAN
Title: A FRAMEWORK FOR DYNAMIC INFORMATION SYSTEM INTEGRATION
Abstract: DEVELOPMENT OF BATTLE MANAGEMENT/COMMAND, CONTROL, AND COMMUNICATION SYSTEMS (BM/C3) PRESENT SIGNIFICANT INTEGRATION, AUTHENTICATION, AND CONCURRENCY CONTROL PROBLEMS. DIFFICULT INTEGRATION PROBLEMS ARE CAUSED BY THE WIDE RANGE OF APPLICATIONS REQUIRED BY BM/C3. SUCH SYSTEMS INCLUDE: OPERATIONAL SUPPORT APPLICATIONS, DATABASES, SIMULATION, TELEMETRY MANAGEMENT, AND NEW TECHNOLOGIES SUCH AS KNOWLEDGE-BASED SYSTEMS. THIS PROPOSAL SPECIFIES BOTH A METHODOLOGY AND A TOOLKIT FOR INTEGRATING HETEROGENEOUS DATA MODELS AND APPLICATIONS. THE DESIGN IS FOCUSED ON THE RUNTIME CONFIGURATION OF DISTRIBUTED BM/C3 INFORMATION SYSTEMS FROM DIFFERENT SUBSYSTEMS. CHARACTERISTICALLY, THESE SUBSYSTEMS HAVE BEEN DEVELOPED BY DIFFERENT ORGANIZATIONS HAVING DIFFERENT CONCEPTUAL FRAMEWORKS AND ADDRESSING DIFFERENT APPLICATION DOMAINS/ THE PROPOSED DEVELOPMENT METHODOLOGY IS BASED ON AN EXPLICIT OBJECT-ORIENTED REPRESENTATION OF BOTH THE DATA SPECIFICATIONS AND OPERATIONS OF THE DISTRIBUTED SYSTEM MODELS, SERVICES AND RESOURCES. SUBSYSTEMS ARE REPRESENTED WITH OBJECT-ORIENTED DESCRIPTIONS OF THEIR COMPONENTS. THIS KEY INNOVATION RESULTS IN A RECONFIGURABLE DISTRIBUTED SYSTEM SPECIFIED BY EXPLICIT, CHANGEABLE DESCRIPTIONS. ADDITIONAL KEY INNOVATIONS OF THIS PROPOSAL ARE: (1) ACCOMMODATION OF EXISTING USER APPLICATIONS AND SOFTWARE; (2) CLASS LIBRARY OF DISTRIBUTED CONTROL MODELS; (3) ICON-BASED, X-WINDOWS SYSTEM CONFIGURATION MANAGEMENT TOOL; (4) AND UNIFORM OBJECT-ORIENTED PROGRAMMING INTERFACES ACROSS HETEROGENEOUS ENVIRONMENTS.

IAP RESEARCH, INC. Topic#: 91-127 ID#: 91ARO-065
2763 CULVER AVENUE Office: ARO
DAYTON, OH 45429 Contract #:
Phone: (513) 296-1806 PI: DR. BHANU CHELLURI
Title: A LASER SPECTROSCOPY TECHNIQUE FOR EVALUATING IN-SITU DEGRADATION OF COMPOSITE MATERIALS
Abstract: ADVANCED MATERIALS ARE BEING IMPLEMENTED IN MANY ARMY SYSTEMS. THESE SYSTEMS REQUIRE NEW NON-DESTRUCTIVE TECHNIQUES FOR ASSESSING IN SERVICE DEGRADATION. SECONDLY, TECHNIQUES ARE REQUIRED TO ASSESS MATERIAL INTEGRITY DURING MANUFACTURING. IAP RESEARCH PROPOSES A NDE TECHNIQUE BASED ON BRILLOUIN SCATTERING THAT IS CAPABLE OF DETERMINING CHANGES IN ELASTIC CONSTANTS OF POLYMER BASED COMPOSITE MATERIALS AND MONOLITHIC COMPOSITE MATERIALS. THE CHANGE IN ELASTIC CONSTANTS CAN THEN BE USED TO PREDICT COMPONENT MECHANICAL PROPERTY DEGRADATION CAUSED BY THERMAL OR LOW VELOCITY COMPACT DAMAGE. IN THE CASE OF PROCESSING FEEDBACK THE TECHNIQUE WILL ALLOW FOR THE IN-SITU EVALUATION OF THE EFFECT OF PROCESSING VARIABLES ON MECHANICAL PROPERTIES.

ILC TECHNOLOGY Topic#: 91-057 ID#: 91CEC-116
399 JAVA DRIVE Office: CECOM
SUNNYVALE, CA 94089 Contract #:
Phone: (408) 745-7900 PI: ROY ROBERTS
Title: CONCENTRATOR FOR EXTENDED INFRARED SOURCES

Abstract: A COMPUTER MODEL WILL BE DEVELOPED USING A 1 KW PARABOLIC XENON LAMP AS THE BASE LINE. USING THIS BASE LINE, THE CONCENTRATOR DESIGN WILL BE INVESTIGATED FOR OPTIMUM COLLECTOR EFFICIENCY AND UNIFORM SOURCE RADIATION IN A CORE ANGLE BETWEEN 5 AND 30 DEGREES. A COMBINATION OF REFLECTIVE AND TRANSMISSIVE OPTICAL ELEMENTS WILL BE CONSIDERED AS PART OF THE INVESTIGATION FOR PURPOSES OF IMPROVING BEAM DISTRIBUTION AND UNIFORMITY. DATA WILL INCLUDE BEAM PROFILE, PLOT DIAGRAM, RAY TABLE AND THE OPTICS TABLE. THE OPTIMUM DESIGN CONSIDERATIONS WILL BE TABULATED AND A LAMP CONSTRUCTED UTILIZING THESE CONSIDERATIONS. THE MODIFIED LAMP WILL BE TESTED AND THE TEST RESULTS COMPARED WITH THE BASE LINE TO DETERMINE OVERALL IMPROVEMENT REALIZED. THE LAMPS WITH THE DATA TAKEN AND A FINAL REPORT WILL BE DELIVERABLE ITEMS AS PART OF THIS PHASE I WORK.

INTEGRATED OPTICAL CIRCUIT CONSULTANTS
10482 CHISHOLM AVE.
CUPERTINO, CA 95014
Phone: (408) 446-9812

Topic#: 91-075 ID#: 91MIC-012
Office: MICOM
Contract #: DAAH01-92-C-R168
PI: RICHARD A. BECKER

Title: RUGGED/LOW-COST PIGTAILING APPROACHES FOR LINBO3 FIBEROPTIC GYROSCOPE "CHIPS" RUGGED/LOW-COST PIGTAILING APPROACHES FOR LINBO3 FIBEROPTIC GYROSCOPE

Abstract: It has been widely recognized that optical techniques offer significant advantages in the fields of communications, sensors, and signal processing. One of the unresolved "real-world" issues is the packaging of the integrated optic (IO) devices. In particular, the attachment of singlemode fiber to the IO device in a compact, rugged, and economical fashion remains unresolved. In this Proposal, we discuss new concepts for the packaging/optical connecting of optical fibers to the fiberoptic gyroscope LiNbO3 "Chips". We propose to demonstrate the micromachining of LiNbO3 mounts and waveguide substrates to achieve robust and economical fiber/waveguide interfaces. This approach will contain both a hybrid and monolithic arrangement. In addition, an "Optical IC" approach will be introduced and analyzed. In summary, the problem considered by this Proposal is the ruggedization and cost reduction of IO devices for application in fiberoptic gyroscopes. This is the primary problem that has been holding up more wide-spread systems usage of IO technology, the solution of which will have a significant impact on other DOD problems as well. The approaches provided here will be applicable to a large class of IO devices.

INTEGRATED TECHNOLOGIES FOR MED.
1113 DENNIS AVENUE
SILVER SPRING, MD 20901
Phone: (301) 681-8307

Topic#: 91-153 ID#: 91HDL-009
Office: HDL
Contract #:
PI: PERRY SKEATH, PHD

Title: MICROSCALE FLUIDIC DEVICES

Abstract: THE PURPOSE OF THIS WORK IS TO DEVELOP THE TECHNOLOGY FOR DESIGNING AND MANUFACTURING HIGH-PERFORMANCE AND HIGH-RELIABILITY MICROFLUIDIC COMPONENTS. IN THE PHASE I PORTION OF THE WORK, THE EMPHASIS IS ON MICROFLUIDIC DEVICE MODELING AND ON MICROFABRICATION METHODS. ONE TECHNOLOGICAL INNOVATION CONSISTS OF THE EXTENSIVE USE OF MICROMACHINING TECHNOLOGY TO CONSTRUCT AN INTEGRATED FLUIDIC SYSTEM. THE MINIATURIZATION AND INTEGRATION OF FLUIDIC DEVICES CAN GREATLY EXPAND THE USEFULNESS OF FLUIDICS.

INTELLIGENT AUTOMATION, INC.
1370 PICCARD DRIVE, SUITE 210
ROCKVILLE, MD 20850
Phone: (301) 990-2407

Topic#: 91-033 ID#: 91ARD-012
Office: ARDEC
Contract #:
PI: LEONARD S. HAYNES PH.D.

Title: GROUND-BASED MOBILE MINE SYSTEM

Abstract: IN ALL RECENT CONFLICTS, MINES HAVE PLAYED VERY SIGNIFICANT ROLES. MINES ARE GENERALLY LOW COST COMPARED TO OTHER TYPES OF WEAPONS, YET THEY CAN CAUSE SEVERE PHYSICAL DAMAGE TO THE ENEMY, AND THEIR PSYCHOLOGICAL IMPACT CAN BE GREAT. WITH MINES, THE ENEMY CAN NEVER FEEL SAFE. ALTHOUGH EFFECTIVE, MINES HAVE ONE MAJOR SHORTFALL IN THAT THE ENEMY MUST COME TO THE MINE. A MINE HAS NO CAPABILITY TO SIGNIFICANTLY CHANGE ITS

POSITION ONCE SET IN PLACE. IF A MINE IS NOT SET IN A USEFUL PLACE, IT IS USELESS. IF THE BATTLE CHANGES, SO A NEW POSITION OF THE MINE WOULD BE PREFERABLE, THERE IS NO WAY TO ALTER THE MINES POSITION. THIS PROPOSAL OUTLINES ALTERATIONS WHICH COULD BE MADE TO THE WIDE AREA MINE SYSTEM WHICH WOULD GIVE THAT MINE THE ABILITY TO MOVE IN RESPONSE TO EITHER PREPROGRAMMED SEQUENCES, OR RADIO TRANSMITTED INSTRUCTIONS. DURING THE CONTRACT, WE WILL FIRST STUDY THE FEATURES AND PERPORMANCE PARAMETERS NEEDED BY A MOBILE MINE. THE PROPOSAL SUGGESTS AN INITIAL MECHANICAL DESIGN, AND A CONTROL APPROACH, AND AFTER THE INITIAL STUDY TO ESTABLISH REQUIREMENTS, WE WILL REFINE AND EVALUATE THE MECHANICAL DESIGN AND CONTROL APPROACH TO DETERMINE IF THE REQUIREMENTS COULD BE FEASIBLY MET.

INTERNATIONAL ELECTRONIC MATERIALS
30275 BAINBRIDGE ROAD
CLEVELAND, OH 44139
Phone: (216) 349-1968

Topic#: 91-152
Office: HDL
Contract #:
PI: JENNIE S. HWANG

ID#: 91HDL-007

Title: ADVANCED COMPOSITE SOLDER FOR MICROELECTRONICS

Abstract: WITH THE CONTINUED INNOVATION AND DEVELOPMENT OF MICROELECTRONIC CIRCUITRY TOWARD HIGHER DENSITY, FASTER SPEED, LIGHT IN WEIGHT AND SMALLER IN SIZE, THE DEMANDS ON SOLDER INTERCONNECTIONS, PARTICULARLY FOR THE BOARD-LEVEL PACKAGING, BECOME INCREASINGLY STRINGENT. THE INCREASED DENSITY AND DECREASED SIZE IN SOLDER JOINTS, PER SE, DRAW CONCERNS ABOUT THE RELIABILITY OF SUCH SOLDER JOINTS WHICH ARE MADE OF CONVENTIONAL SOLDER MATERIALS. FURTHERMORE, IT HAS ALSO BEEN A CONCERN IN THE MANUFACTURING SECTOR THAT A SIGNIFICANT PORTION OF THE COST IN PRODUCING MICROELECTRONIC ASSEMBLIES IS CONTRIBUTED BY THE INSPECTION AND REWORK OF SOLDER JOINTS. THE OBJECTIVES OF THIS PROJECT ARE TO FURTHER ADVANCE THE SCIENCE AND TECHNOLOGY OF SOLDERS BY UTILIZING THE FUNDAMENTAL SCIENTIFIC PRINCIPLES; TO EXPLORE AND ESTABLISH TECHNOLOGY FOR STRENGTHENING SOLDER MATERIALS; TO DEVISE USEFUL PRODUCTS WHICH OFFER SUPERIOR PERFORMANCE TO CONVENTIONAL SOLDERS, AND, CONCURRENTLY, TO EXPLORE THE SCIENTIFIC AND MANUFACTURING FEASIBILITY IN REDUCTION OF LEAD (PB) USAGE IN SOLDER MATERIALS. THE EFFORT OF THE PROPOSED PROGRAM WILL FOCUS ON THE INTEGRATION OF VARIOUS SCIENTIFIC DISCIPLINES IN METALLURGY, CHEMISTRY, PHYSICS, AND ANALYTICAL CHARACTERIZATION TO CREATE A NEW GENERATION OF SOLDER MATERIALS WHICH OFFER SUPERIOR CHARACTERISTICS IN PERFORMANCE. IN ADDITION TO THE DESIGN AND DEVELOPMENT OF BASIC MATERIAL SYSTEMS, THE PROCESS FOR FABRICATING SUCH MATERIALS IS A KEY STEP FOR THE OVERALL SUCCESS OF THE PROJECT. ANOTHER BENCHMARK OF THE PROJECT IS TO DEVELOP AN APPLICABLE FORM OF THE NEW MATERIALS FOR DOD AND COMMERCIAL APPLICATIONS. DUE TO THE INHERENT MERITS OF THE PASTE FORM, A NEW SOLDER PASTE SYSTEM WILL BE DEVELOPED.

INTERNATIONAL POLYMER CORP.
3434 LANG ROAD
HOUSTON, TX 77092
Phone: (713) 686-8468

Topic#: 91-181
Office: AVSCOM
Contract #:
PI: FREDERICK G. LEMME, SR.

ID#: 91AVS-044

Title: HIGH STRENGTH THERMOPLASTIC MATERIALS FOR AIRCRAFT COMPONENTS

Abstract: RESEARCH IS PROPOSED TO SURVEY THERMOPLASTIC AND REINFORCED THERMOPLASTIC MATERIALS CURRENTLY AVAILABLE WHICH HAVE GOOD PROCESSABILITY AND STRENGTH AT ELEVATED TEMPERATURES. IT IS EXPECTED THAT ONE OR MORE ECONOMICAL FABRICATION PROCESSES WILL BE EVALUATED AND A SELECTED AIRCRAFT COMPONENT WOULD BE FABRICATED TO A NET OR NEAR NET SHAPE. THE EMPHASIS WILL BE ON PROCESS ECONOMICS AND MATERIAL PROPERTIES. IT IS PROPOSED THAT THE MATERIALS WILL BE DIRECTLY APPLICABLE TO SEVERAL COMMERCIAL PRODUCTS IN THE PETROCHEMICAL, AIRCRAFT AND OTHER INDUSTRIES WHERE ELEVATED TEMPERATURES AND HIGH STRENGTHS ARE REQUIRED.

IONWERKS
2215 ADDISON
HOUSTON, TX 77030
Phone: (713) 667-1691

Topic#: 91-126
Office: ARO
Contract #: DAAL03-92-C-0002
PI: J. ALBERT SCHULTZ

ID#: 91ARO-060

Title: TECHNIQUE FOR IN-SITU QUANTITATION OF DOPANTS AND MAJOR ELEMENT DURING EPILAYER GROWTH AND PROCESSING

Abstract: A technique will be demonstrated which can provide accurate and quantitative elemental analysis in real time during epilayer growth and processing. The technique will work for all elements in the periodic table but will be applied to those typically used as dopants in Silicon and GaAs based semiconductor devices.

IRVINE SENSORS CORP.
3001 REDHILL AVENUE, BUILDING 3, SUITE 208
COSTA MESA, CA 92626
Phone: (714) 549-8211

Topic#: 91-247
Office: SDC
Contract #:
PI: RAPHAEL R. SOME

ID#: 91SDC-202

Title: MULTI-MODE N-MODULAR REDUNDANT (FAULT TOLERANT) COMPUTER

Abstract: IRVINE SENSORS CORPORATION (ISC) PROPOSES A NEW DESIGN FOR A RADIATION HARDENED RECONFIGURABLE FAULT TOLERANT COMPUTER SUITABLE FOR NEXT GENERATION BM/C3I SYSTEMS. THE COMPUTER WILL COMPRISE 4 IDENTICAL MICROPROCESSORS, I/O AND MEMORY, AND WILL BE CAPABLE OF IMPLEMENTING MULTIPLE FAULT TOLERANT CONFIGURATIONS (MODES) INCLUDING: LOCK-STEP SHADOW, DUAL LOCK-STEP SHADOW, LOCK-STEP SHADOW WITH TIE-BREAKER (PSEUDO-TMR), TRIPLE MODULAR REDUNDANCE (TMR) AND QUAD MODULAR REDUNDANCE (QMR). THE FAULT TOLERANCE WILL BE PROGRAMMABLE AT BUILD, INSTALLATION, INITIALIZATION, OR MISSION TIME(S). BY TAKING ADVANTAGE OF A UNIQUE NEW APPROACH TO 3-DIMENSIONAL PACKAGING, THE ENTIRE FAULT TOLERANT COMPUTER WILL BE PACKAGED WITHIN THE ENVELOPE OF A SINGLE (CURRENT DAY) PROCESSOR, WILL REQUIRE ONLY 25% TO 50% ADDITIONAL POWER, AND WILL HAVE SIGNIFICANTLY HIGHER RELIABILITY AND THROUGHPUT. WHILE THE CONCEPT IS EXTENSIBLE TO ANY COMPUTER, IN ORDER THAT IT BE FULLY DEVELOPED AND TO TAKE ADVANTAGE OF THE BUILT IN ERROR DETECTION CAPABILITY, AND TO PROVIDE MAXIMUM NEAR-TERM MILITARY APPLICABILITY, ISC PROPOSES THAT THE GVSC OR SIMILAR TYPE CHIP SET BE UTILIZED IN THE STUDY/DEMONSTRATION. IN PHASE I, ISC PLANS TO DEVELOP PRELIMINARY SPECIFICATIONS FOR A PHASE II BREADBOARD DEMONSTRATION UNIT, INCLUDING POWER, WEIGHT, VOLUME, AND THERMAL LOAD ESTIMATES.

J.A. WOOLLAM COMPANY
650 J STREET
LINCOLN, NE 68508
Phone: (402) 477-7501

Topic#: 91-046
Office: CECOM
Contract #:
PI: BLAINE JOHS

ID#: 91CEC-259

Title: REAL TIME MONITOR AND CONTROL OF MBE GROWTH OF HGCDTE BY SPECTROSCOPIC ELLIOPSOMETRY

Abstract: II-VI SEMICONDUCTORS, ESPECIALLY HGCDTE, ARE USED EXTENSIVELY IN INFRARED IMAGING AND NIGHT VISION ELECTRONICS. THESE SEMICONDUCTORS HAVE SOFT SURFACES; GROWTH OF DEVICE QUALITY MATERIAL IS DIFFICULT; DEVICE YIELDS ARE LOW, AND COSTS ARE HIGH. THERE IS THUS A GREAT NEED FOR NON-INVASIVE PROCESS CONTROL. RECENTLY OUR COMPANY HAS DEVELOPED IN SITU SPECTROSCOPIC ELLIPSOMETRY FOR THE MONITOR OF AL(X)GA(1-X). AS CRYSTAL GROWTH BY MBE. IN ELLIPSOMETRY LINEARLY POLARIZED LIGHT IS INCIDENT ON THE MATERIAL OF INTEREST AND THE POLARIZATION STATE OF THE REFLECTED LIGHT IS DETERMINED. OUR IN SITU WORK TO DATE HAS BEEN REASONABLY SUCCESSFUL USING ROTATING ANALYZER, FIXED POLARIZER ELLIPSOMETRY; HOWEVER, CONSIDERABLE FURTHER PROGRESS MUST BE MADE BEFORE ELLIPSOMETRY CAN BE ADOPTED FOR IN SITU CONTROL OF HGCDTE CRYSTAL GROWTH. FASTER DATA ACQUISITION AND ANALYSIS METHODS NEED TO BE ADOPTED. FOR THIS PURPOSE WE PROPOSE USING A SOLID STATE OPTICAL MULTIDETECTOR ARRAY, AS WELL AS VERY FAST COMPUTERS AND MORE EFFICIENT SOFTWARE. IN ADDITION, THE OPTICAL CONSTANTS OF HG(1-X)CD(X)TE NEED TO BE MEASURED AT ELEVATED TEMPERATURES AND FOR VARIOUS

X VALUES. THUS IN PHASE I WE WILL BUILD AND TEST A FAST PROTOTYPE SPECTROSCOPIC ELLIPSOMETER AND GAIN EXPERIENCE MAKING MEASUREMENTS AT GROWTH TEMPERATURES. EMPHASIS WILL BE ON MONITORING GROWTH; HOWEVER, WE WILL IMPLEMENT A SIMPLE DEMONSTRATION OF PROCESS CONTROL IN PHASE I. IN PHASE II WE WILL FURTHER PERFECT THE TECHNIQUE FOR CONTROL OF MBE GROWTH OF HGCDTE AND GAIN CONSIDERABLE EXPERIENCE ON AN ACTUAL ARMY GROWTH CHAMBER. AN OPERATING AND WELL DOCUMENTED SPECTROSCOPIC ELLIPSOMETER SYSTEM WILL BE DELIVERABLE AS PART OF THE PHASE II CONTRACT.

J.A. WOOLLAM COMPANY
650 J STREET, SUITE 39
LINCOLN, NE 68508
Phone: (402) 477-9116

Topic#: 91-243
Office: SDC
Contract #:
PI: BLAINE JOHS

ID#: 91SDC-176

Title: ELECTRON CYCLOTRON RESONANCE (ECR) SEMICONDUCTOR ETCHING PROCESS CONTROL BY ELLIPSOMETRY

Abstract: THE NEED FOR SMALLER SEMICONDUCTOR DEVICE STRUCTURES FOR USE IN VERY HIGH SPEED MICROELECTRONICS REQUIRES A NEW GENERATION OF PLASMA ETCHING TECHNOLOGY. ECR PROMISES TO PROVIDE FEATURES AS SMALL AS 0.2 MICRONS IN SIZE, AS WELL AS A HIGH DEGREE OF ETCHING ANISOTROPY, SELECTIVITY, ETCH RATES, AND LOW DAMAGE. FOR MANUFACTURING PROCESS CONTROL INVOLVING ECR ETCHING IN PRODUCTION OF ELECTRONICS AND OPTO-ELECTRONICS ON SILICON AND COMPOUND SEMICONDUCTORS, CONSIDERABLE FURTHER RESEARCH AND DEVELOPMENT IS NEEDED. SPECTROSCOPIC ELLIPSOMETRY USES POLARIZED LIGHT REFLECTANCE, AND HAS SENSITIVITY TO SURFACE AND INTERFACE EFFECTS A FRACTION OF AN ATOMIC MONOLAYER THICK. THUS SURFACE DAMAGE, SURFACE ROUGHNESS, AND SURFACE COMPOUND/ALLOY STOICHIOMETRY CAN BE DETERMINED. WE RECENTLY DEVELOPED THE ABILITY TO CONVERT ELLIPSOMETRIC PSI AND DELTA DATA IN REAL TIME INTO DESIRED MATERIALS PROPERTIES SUCH AS THICKNESS, ALLOY RATIO, SURFACE TEMPERATURE DURING SEMICONDUCTOR CRYSTAL GROWTH. THE PURPOSE OF THE PROPOSED RESEARCH IS TO DEMONSTRATE THAT SPECTROSCOPIC ELLIPSOMETRY WILL BE EFFECTIVE IN MONITORING AND CONTROLLING ECR ETCHING OF III-V (E.G., INGAAS) AND II-VI (E.G., HGCDTE) SEMICONDUCTOR MATERIALS. A MAJOR GOAL IN PHASE I IS TO DEMONSTRATE THAT ELLIPSOMETRIC SENSING CAN DETERMINE ETCH RATES IN REAL TIME, AND TO DEMONSTRATE THE ABILITY TO STOP AN ETCH AT A PRECISE PRESELECTED DEPTH.

JET PROCESS CORP.
25 SCIENCE PARK
NEW HAVEN, CT 06511
Phone: (203) 786-5130

Topic#: 91-133
Office: ETDL
Contract #:
PI: DR. B.L. HALPERN

ID#: 91ETD-008

Title: ADVANCED FABRICATION METHODS FOR HIGH PERFORMANCE THERMAL DETECTORS

Abstract: HIGH DETECTIVITY II-VI SEMICONDUCTOR FAR-IR DETECTOR ARRAYS HAVE EXISTED FOR OVER A DECADE. THEY ARE THE ENABLING COMPONENT IN IR IMAGING DEVICES USED IN CRITICAL MILITARY SURVEILLANCE AND WEAPONS GUIDANCE SYSTEMS. HOWEVER, THERE DETECTORS ARE NOT SUITABLE FOR ALL APPLICATIONS BECAUSE THEY REQUIRE COOLING TO CRYOGENIC TEMPERATURES. CONSEQUENTLY, THERE IS A NEED TO DEVELOP NEW PROCESS TO FABRICATE IMAGING THERMAL DETECTOR ARRAYS BASED ON MATERIALS, SUCH AS PYREELECTRICS, WHICH CAN OPERATE AT AMBIENT TEMPERATURES. WE PROPOSE TO DEVELOP IMPROVED MANUFACTURING METHODS FOR THERMAN DETECTORS. OUR PATENTED JET VAPOR DEPOSITION ("JVD") PROCESS FOR THIN FILMS WILL BE USED FOR KEY FABRICATION STEPS IN MANUFACTURING PROCESS. JVD HAS ALREADY BEEN USED TO PREPARE HIGH QUALITY FERROELECTRIC PZT THIN FILMS WHICH ARE PROMISING MATERIALS FOR THERMAL DETECTORS ARRAYS.

LABTEK CORP.
8 LUNAR DRIVE
WOODBRIDGE, CT 06525
Phone: (203) 389-4001
Topic#: 91-004 ID#: 91CEC-305
Office: CECOM
Contract #: DAAB07-91-C-R512
PI: THOMAS E. GRIEST
Title: REUSABLE AND ADAPTIVE SCHEDULERS FOR ADA REAL-TIME APPLICATIONS
Abstract: THE NEED FOR USER DEFINED SCHEDULING IN THE USE OF THE ADA LANGUAGE HAS BEEN DOCUMENTED BY THE ADA9X PROCESS AND MANY OTHERS IN RECENT YEARS. THE RESEARCH OUTLINED BY THIS PROPOSAL IS ORIENTED TOWARD PROVIDING A REUSABLE APPROACH TO DEVELOPING SEMI-CUSTOM SCHEDULING ALGORITHMS FOR REAL-TIME ADA APPLICATIONS. THE SCHEDULING OF TASKS FOR HARD REAL-TIME APPLICATIONS HAS BEEN THE TOPIC OF CONSIDERABLE RESEARCH. MANY THEORIES HAVE BEEN DEVELOPED TO HELP SOLVE SCHEDULING PROBLEMS AND GUARANTEE THAT PROGRAMS WILL ACHIEVE THEIR TIMING DEADLINE REQUIREMENTS. THE ADA PROGRAMMING LANGUAGE PROVIDES A SIMPLE STANDARD TASK SCHEDULING CAPABILITY BUT IT DOES NOT PROVIDE SERVICES FOR MORE SOPHISTICATED AND FLEXIBLE SCHEDULING APPROACHES THAT CURRENTLY EXIST. THIS PROPOSAL DESCRIBES AN APPROACH TO BUILDING REUSABLE SCHEDULING COMPONENTS BASED ON AN INTERFACE TO THE ADA RUNTIME SCHEDULING PRIMITIVES. THE INTERFACE IS SUFFICIENTLY FLEXIBLE TO ALLOW A VERY WIDE VARIETY OF ALTERNATIVE SCHEDULING ALGORITHMS TO BE BUILT. BY BUILDING THE ALGORITHMS USING A STANDARD COMPONENT FORMAT AND A STANDARD SET OF SPECIFICATIONS, PERFORMANCE CHARACTERISTICS CAN BE GUARANTEED AND REUSE IS ENCOURAGED.

LANGUAGE SYSTEMS, INC.
6269 VARIEL AVENUE, SUITE 200
WOODLAND HILLS, CA 91367
Phone: (818) 703-5034
Topic#: 91-108 ID#: 91108-04
Office: TACOM
Contract #:
PI: CHRISTINE A. MONTGOMERY
Title: DEVELOPMENT AND DEMONSTRATION OF FUNDAMENTAL NATURAL LANGUAGE COMPONENTS
Abstract: THE PROPOSED WORK IS BASED ON EXPLOITATION AND EXTENSION OF A SET OF CORE NATURAL LANGUAGE PROCESSING COMPONENTS AND TOOLS PREVIOUSLY DEVELOPED BY LSI UNDER CONTRACTS FOR OTHER DOD APPLICATIONS. THE NATURAL LANGUAGE COMPONENTS PREVIOUSLY DEVELOPED BY LSI INCLUDE DATA/KNOWLEDGE BASES FOR LEXICAL INFORMATION, GRAMMAR, AND DOMAIN SEMANTICS AND PRAGMATICS FOR A RANGE OF AIR FORCE, ARMY, NAVY, AND DARPA APPLICATIONS. THE TOOLS TO BE DEVELOPED UNDER THIS EFFORT INCLUDE LEXICAL, SYNTACTIC, AND SEMANTIC AIDS FOR MANIPULATING THE ASSOCIATED LINGUISTIC AND DOMAIN KNOWLEDGE BASES.

LB&M ASSOCIATES, INC.
211 SW 'A' AVENUE
LAWTON, OK 73501
Phone: (405) 355-1471
Topic#: 91-248 ID#: 91PM-002
Office: PM TRADE
Contract #:
PI: JAMES E. FERGUSON
Title: ADVANCED IN TRAINING PERFORMANCE ASSESSMENT FOR FORCE ON FORCE TRAINING EXERCISES
Abstract: IN A FEW YEARS, THE NATIONAL TRAINING CENTER (NTC) WILL HAVE NEW SIMULATION SYSTEMS AND UPGRADES TO RDMA AND RMCS. GIVEN EFFECTIVE AND EFFICIENT INTEGRATION, THESE SYSTEMS WILL INCREASE, SIGNIFICANTLY, THE AMOUNT AND FIDELITY OF DATA AVAILABLE TO THE TRAINING ANALYST. HOW EFFECTIVE THESE IMPROVEMENTS ARE DEPENDS ON HOW EFFICIENTLY THE MAN-MACHINE COMBINATIONS AT TRAINING ANALYST WORK STATIONS ARE ABLE TO COLLECT, ANALYZE, PACKAGE, AND DISTRIBUTE THE DESIRED PERFORMANCE DATA. IN PHASE I, WE WILL CONDUCT FUNCTIONAL REQUIREMENTS ANALYSES OF EACH STEP OF A PROPOSED CONCEPT; INVESTIGATE THE FEASIBILITY OF ADVANCED PROCESSING AND DECISION AID TECHNIQUES; AND DEVELOP A TAXONOMY THAT TECHNICALLY, AS WELL OPERATIONALLY, WILL LEAD TO AUTOMATED INTEGRATION OF THE DATA COLLECTED FROM SIMULATION, OBSERVATION (HUMAN AND TELEVISION) AND INSTRUMENTATION, AND THE APPLICATION OF DECISION AID FUNCTIONALITY FOR ORGANIZING AND ANALYZING THE REAL TIME TRAINING PERFORMANCE DATA. IN PHASE II, WE WILL TRANSITION THE TAXONOMY INTO ITS TOTAL CAPABILITY CONTEXT. WE WILL DESIGN, MODEL AND IMPLEMENT THE PHASE I APPROACH IN SUFFICIENT

DETAIL TO DEMONSTRATE THE FEASIBILITY OF THE DATA COLLECTION AND ANALYSIS CONCEPT.

LENTEC CORP.
P.O. BOX 14517
ALBUQUERQUE, NM 87191
Phone: (505) 345-2529

Topic#: 91-241 ID#: 91SDC-178
Office: SDC
Contract #:
PI: BEN C. PLATT, PHD

Title: HIGH ENERGY LASER TARGET PLANE DIAGNOSTIC INSTRUMENTATION (BDI) DEVELOPMENT

Abstract: THE HIGH ENERGY LASER SYSTEM TEST FACILITY (HELSTF) OPERATED BY THE ARMY ON THE WHITE SANDS MISSILE RANGE (WSMR) IN NEW MEXICO IS CONDUCTING VULNERABILITY AND LETHALITY EFFECTS (VLE) TESTS ON NUMEROUS MATERIALS USING HIGH ENERGY LASERS (HEL). IN ORDER TO DETERMINE THE VULNERABILITY OF THESE MATERIALS, IT IS NECESSARY TO KNOW THE INTENSITY PROFILE AND/OR ENERGY PROFILE OF THE LASER BEAM ON THE TARGET. AS THE COMPUTER MODELING IN VLE GETS MORE COMPLICATED, THERE IS AN INCREASED REQUIREMENT ON THE INTENSITY PROFILE MEASUREMENT OF THE BEAM AT THE TARGET PLANE. THE CURRENT BEAM DIAGNOSTICS ARE NOT ADEQUATE FOR THE CURRENT MODELING CAPABILITIES. THE OBJECT OF THIS SBIR TOPIC IS TO: 1) CONDUCT A THOROUGH STUDY OF THE PREVIOUS BEAM DIAGNOSTIC EFFORTS, 2) UNDERSTAND AND DOCUMENT THE PROBLEMS WHICH HAVE PRECEDED THIS EFFORT, AND 3) RECOMMEND AN IMPROVED APPROACH TO BEAM DIAGNOSTICS. THE STUDY WILL BE CONDUCTED BY VISITING WSMR, REVIEWING THE HARDWARE, DOCUMENTATION, AND TEST DATA, WITNESSING TESTS, AND INTERVIEWING GOVERNMENT PERSONNEL. REQUIREMENTS FROM THE VLE MODELERS WILL BE COMPARED TO THE TECHNICAL FEASIBILITY OF AVAILABLE HARDWARE. A TRADE STUDY WILL BE CONDUCTED TO DEVELOP AND SELECT THREE CONCEPTUAL DESIGNS. THIS EFFORT WILL CULMINATE IN THE REVIEW AND DOWN SELECTION OF A SINGLE RECOMMENDED IMPROVED APPROACH TO TARGET PLANE BEAM DIAGNOSTICS. THE GOVERNMENT IS EXPECTED TO BE ACTIVE IN THE WHOLE PROCESS.

LICA SYSTEMS, INC.
10400 EATON PLACE, SUITE 312
FAIRFAX, VA 22030
Phone: (703) 359-0996

Topic#: 91-034 ID#: 91ARD-018
Office: ARDEC
Contract #:
PI: KENNETH M. IRISH, JR.

Title: DESIGN AND DEVELOPMENT OF AN ADAPTIVE VEHICULAR NOISE SUPPRESSION SYSTEM (ANVSS)

Abstract: THE DETECTION, CLASSIFICATION AND IDENTIFICATION RANGE OF ACOUSTIC SENSORS IS INVERSELY PROPORTIONAL TO THE BACKGROUND NOISE LEVEL ALL OTHER FACTORS BEING HELD CONSTANT. BACKGROUND NOISE IS GENERATED BY A WHOLE HOST OF ENVIRONMENTAL CONDITIONS TO INCLUDE MAN-MADE BATTLEFIELD NOISES, NOISE GENERATED BY THE VEHICLE ON WHICH THE ACOUSTIC TRANSDUCERS ARE MOUNTED, AND WIND (WIND BLOWING ACROSS THE TRANSDUCER AND WIND CAUSING LEAVES TO RUSTLE, ETC.). DEPLOYMENT CONCEPTS TO MITIGATE THE EFFECTS OF BACKGROUND NOISE INCLUDE DEPLOYMENT IN "QUIET" AREAS AWAY FROM NOISE MAKERS AND/OR DEPLOYMENT OF THE SENSORS CLOSE TO THE INTENDED TARGET (E.G., FORWARD DEPLOYED EXPENDABLES - DOES NOT REDUCE NOISE BUT INCREASES SIGNAL LEVEL). THESE DEPLOYMENT CONCEPTS WILL WORK WELL IN A STATIC OR SLOW MOVING TACTICAL ENVIRONMENT BUT ARE CERTAINLY NOT SUITABLE FOR AIR LAND BATTLE FUTURE TYPE WARFARE AS DEMONSTRATED IN THE 100 HOUR WAR WITH IRAQ. THE TECHNICAL OBJECTIVE OF PHASE I WILL BE TO DESIGN AN ADAPTIVE VEHICULAR NOISE SUPPRESSION SYSTEM (AVNSS) AND TO DEVELOP THE SIGNAL PROCESSING ALGORITHMS THAT CAN IDENTIFY AND NULL OUT VEHICLE RELATED NOISE SOURCES TO THE DEGREE NECESSARY TO ACHIEVE OPERATIONALLY USEFUL DETECTION RANGES WHEN THE VEHICLE IS MOVING AT TACTICAL SPEEDS. THE BASELINE DESIGN WILL BE BASED UPON MULTI-REFERENCE ANC AND ADAPTIVE BEAM-FORMING ALGORITHMS DEVELOPED UNDER PREVIOUS CONTRACTS. THE ALGORITHMS WILL BE MODIFIED TO ENHANCE PERFORMANCE WHEN THE SENSOR PLATFORM IS MOVING. THE ALGORITHMS WILL BE COMBINED WITH A NEW ALGORITHM TO BE DEVELOPED UNDER THIS PROPOSED EFFORT: MULTI-POLE SUB-ARRAY BEAM FORMING (MP/SA).

LIFECELL CORP.
3606A RESEARCH FOREST DRIVE
THE WOODLANDS, TX 77381
Phone: (713) 367-5368
Topic#: 91-028 ID#: 91MED-317
Office: MEDICAL
Contract #: 91-C-1107
PI: STEPHEN A. LIVESEY, MD
Title: PROLONGED PRESERVATION OF HUMAN PLATELETS FOR COMBAT CASUALTY CARE
Abstract: THE AIM OF THIS PROPOSAL IS TO DEVELOP PROTOCOLS FOR THE LONG-TARTS CRYOPRESERVATION OF HUMAN PLATELETS FOR TRANSFUSION. OPTIMIZATION OF PLATELET ISOLATION AND CRYOPRESERVATION WILL BE COMBINED WITH SPECIFIC MODULATION OF STIMULUS RESPONSE COUPLING MECHANISMS IN THE PLATELET. THE EFFECTIVENESS OF THE PROCESSING PROCEDURE WILL BE MONITORED BY NUMERICAL RECOVERY, MORPHOLOGY AND IN VITRO FUNCTIONALITY. IN ADDITION, ANALYSIS OF SECOND MESSENGER RESPONSE MECHANISMS BY A NEWLY ESTABLISHED CRYOELECTRON MICROSCOPIC TECHNIQUE WILL CONSIDERABLY ENHANCE ANALYSIS AND FACILITATE INTERPRETATION OF PLATELET MODIFICATIONS. THIS APPROACH HAS THE POTENTIAL TO GREATLY EXTEND THE CURRENT LIQUID PRESERVATION OF PLATELETS AND ENABLE LONG-TERM CRYOPRESERVATION, THEREBY ADDRESSING THE MAJOR CURRENT PROBLEMS OF PLATELET TRANSFUSION. CRYOPRESERVATION OF PLATELETS HAS SPECIFIC APPLICATION TO COMBAT MEDICAL SUPPORT AND AUTOLOGOUS PLATELET TRANSFUSION IN CHEMOTHERAPY. CRYOPRESERVATION AND PROLONGED LIQUID PRESERVATION HAS APPLICATION TO PLATELET SUPPLY IN GENERAL.

LYNNTECH, INC.
111 EAST 27TH STREET, SUITE 204
BRYAN, TX 77803
Phone: (409) 822-3149
Topic#: 91-028 ID#: 91MED-332
Office: MEDICAL
Contract #: 91-C-1105
PI: G. DUNCAN HITCHENS
Title: ELECTROCHEMICALLY BASED ADVANCED OZONATION MODULES FOR WATER STERILIZATION AND PURIFICATION
Abstract: THE GOAL OF THIS RESEARCH IS TO DEVELOP SMALL-SCALE ELECTROCHEMICALLY BASED SYSTEMS FOR THE GENERATION OF HIGH CHEMICAL PURITY WATER FOR FIELD MEDICAL APPLICATIONS. POSSIBLE USES FOR THIS TECHNOLOGY INCLUDE STERILIZATION AND REMOVAL OF ORGANIC CONTAMINANTS FROM MEDICAL WASTE WATER AND FOR THE PREPARATION OF STERILE PYROGEN-FREE SOLUTIONS. THE APPROACH IS BASED UPON AN ADVANCED OZONATION PROCESS (I.E., THE COMBINATION OF OZONE WITH HYDROGEN PEROXIDE AND/OR UV LIGHT). AOP'S ARE EFFECTIVE FOR HOSPITAL WASTE WATER TREATMENT AND CAN BE USED FOR THE PREPARATION OF HIGH CHEMICAL PURITY PYROGEN-FREE WATER. HOWEVER, THE COMPLEXITY AND COST OF FORMING OZONE BY THE TRADITIONAL (CORONA DISCHARGE) METHOD RENDER AOP'S IMPRACTICAL FOR MANY MEDICAL APPLICATIONS. LYNNTECH, INC., HAS DEVELOPED AN ELECTROCHEMICAL DEVICE FOR THE PAIRED SYNTHESIS OF OZONE AND HYDROGEN PEROXIDE FROM WATER AND OXYGEN IN A PROTON EXCHANGE MEMBRANE-BASED ELECTROCHEMICAL CELL. THE ELECTROCHEMICAL PROCESS GREATLY SIMPLIFIES OZONE GENERATION AND PROVIDES THE ADDITIONAL BENEFIT OF HYDROGEN PEROXIDE FORMATION. THESE FEATURES ALLOW THE DEVELOPMENT OF COMPACT, MODULAR AND EASY-TO-INSTALL CATALYZED OZONE TREATMENT SYSTEMS FOR USE IN FIELD MEDICAL UNITS. RESEARCH WILL FOCUS ON DEMONSTRATING PROCESS FEASIBILITY FOR REMOVING TRACE ORGANIC CHEMICALS AND PYROGENS FROM WATER IN A LABORATORY TEST SYSTEM. PARAMETRIC TEST DATA WILL BE OBTAINED FOR SCALE-UP ACTIVITIES.

M. L. ENERGIA, INC.
P. O. BOX 1468
PRINCETON, NJ 08542
Phone: (609) 799-7970
Topic#: 91-080 ID#: 91MIC-050
Office: MICOM
Contract #: DAAH01-92-C-R125
PI: DR. MOSHE LAVID
Title: NON-INTRUSIVE TECHNIQUES FOR THE MEASUREMENT OF FLUCTUATING DENSITY, TEMPERATURE, VELOCITY AND SKIN FRICTION IN TURBULENT SUPERSONIC FLOWS
Abstract: The measurement of the high frequency, fluctuating components of density, pressure, temperature and species concentration in high Mach number is needed for the understanding of turbulent fluid mechanics. Current techniques fail at

hypersonic velocities because of the low static pressures and temperatures and the high stagnation temperature in the test section. This is an innovative idea to obtain non-intrusive density measurements based on the spectrally Filtered Rayleigh Scattering (FRS) techniques. To determine the feasibility of the FRS techniques, a Work Plan consisting of three major tasks is proposed. The first task is modeling of density sensitivity under the required flow conditions. The second task is a laboratory verification of the last task is a design of a prototype. If feasibility is shown, the technique will be extended for velocity and temperature measurements. Then, the proposed system will be constructed and tested at a Government wind tunnel facility under a Phase II activity. This will provide the Army with a powerful diagnostic method needed for the understanding of turbulent supersonic flowfields and for the validation of CFD codes.

M. L. ENERGIA, INC.
P. O. BOX 1468
PRINCETON, NJ 08542
Phone: (609) 799-7970
Topic#: 91-117
Office: BRL
Contract #:
PI: DR. MOSHE LAVID
ID#: 91BRL-008
Title: LASER ORDNANCE IGNITION SYSTEMS
Abstract: OVER THE LAST TWO DECADES LASERS HAVE BEEN CONSIDERED AS EXCELLENT SOURCES OF RADIANT ENERGY FOR IGNITION OF PROPELLING CHARGES AND OTHER EXPLOSIVE AND COMBUSTIBLE MIXTURES. THEY OFFER SIGNIFICANT ADVANTAGES IN PERFORMANCE AND SAFETY. HOWEVER, THEIR WIDE RANGE USE IS STILL HAMPERED BECAUSE THE INTENSE LASER POWER CAN CAUSE UNCONTROLLABLE AND POORLY REPRODUCIBLE IGNITIONS WHICH, IN TURN, LEAD TO UNACCEPTABLE PERFORMANCE. THIS PROPOSAL OFFERS THREE INNOVATIVE IDEAS TO ALLEVIATE CURRENT DEFICIENCIES. IT IS BASED ON THE PREMISE THAT THE ATTAINMENT OF BOTH FLAWLESS COUPLING AND PERFECT RESONANCE BETWEEN LASER, FIBER OPTIC AND EXPLOSIVES WILL CIRCUMVENT ALL THE DIFFICULTIES ASSOCIATED WITH THE EXTREMELY HIGH POWER DENSITY INCIDENT ON THE EXPLOSIVES BY THE LASER PULSE. THE PRIMARY OBJECTIVE OF PHASE I IS TO EXPERIMENTALLY DEMONSTRATE THE FEASIBILITY OF THESE NOVEL IDEAS AND TO SELECT THE BEST TECHNIQUE(S) FOR FURTHER DEVELOPMENT. TO THIS END, A THREE-TASK WORK PLAN HAS BEEN PROVIDED. IF FEASIBILITY IS PROVEN, LASER IGNITION SYSTEMS WILL REPLACE MOST OF CURRENT CONVENTIONAL SYSTEMS BY THE END OF THE CENTURY.

MACHINE PERCEPTION INTERNATIONAL
1560 FLAIR ENCINITAS DRIVE
ENCINITAS, CA 92024
Phone: (619) 942-0727
Topic#: 91-018
Office: AVSCOM
Contract #: DAAJ02-91-C-0058
PI: J. MICHAEL OYSTER
ID#: 91AVS-325
Title: NEURAL NETWORK HARDWARE FOR HELICOPTER CONTROL SYSTEM MONITORING
Abstract: A SIGNIFICANT CAUSE OF CATASTROPHIC HELICOPTER FAILURE IS FAULTS IN THE CONTROL SYSTEM. A NOVEL MEANS FOR DIAGNOSING THE HEALTH OF THE CONTROL SYSTEM IS TO MONITOR THE DYNAMIC AND CONTROL PARAMETERS OF THE HELICOPTER. IN ORDER TO COMPUTE THE DYNAMIC AND CONTROL PARAMETERS, A PARAMETRIC MODEL OF THE HELICOPTER IS REQUIRED. RECOVERY OF THE PARAMETERS IS VERY COMPUTATIONALLY EXPENSIVE AND TRADITIONAL METHODS USING LINEAR ANALYSIS ARE UNRELIABLE. NEURAL NETWORKS OFFER THE POTENTIAL OF PROVIDING MORE ROBUST SOLUTIONS TO THE PARAMETER IDENTIFICATION PROBLEM. THE ADVENT OF NEURAL NETWORK INTEGRATED CIRCUITS CREATES A NEW OPPORTUNITY TO IDENTIFY THE PARAMETERS IN THE FIELD. THE FEASIBILITY OF THIS APPROACH WILL BE PROVEN BY DEVELOPING A HELICOPTER MODEL, TRAINING A NEURAL NETWORK TO RECOVER THE DYNAMIC AND CONTROL SYSTEM PARAMETERS, AND DEVELOPING A CONCEPTUAL DESIGN OF A HARDWARE IMPLEMENTATION USING NEURAL NETWORK INTEGRATED CIRCUITS.

MAINSTREAM ENGINEERING CORP.
200 YELLOW PLACE
ROCKLEDGE, FL 32955
Topic#: 91-070
Office: CRDEC
Contract #:
ID#: 91CRD-120

Phone: (407) 631-3550 PI: ROBERT P. SCARINGE, PHD.,
Title: DEMONSTRATION OF AN INNOVATIVE TECHNIQUE FOR POWDERED SORBENT DISPERSION
Abstract: THIS PROPOSAL DESCRIBES SEVERAL POTENTIAL SORBENT DISPERSION SYSTEMS TO DELIVER SORBENTS ONTO SURFACES CONTAMINATED WITH CHEMICAL WARFARE AGENTS. UNDER THIS PHASE I EFFORT, MAINSTREAM ENGINEERS WILL REVIEW THE TECHNOLOGY THAT IS AVAILABLE TO APPLY FREE-FLOWING POWDERS/SORBENTS ONTO SURFACES; DEVELOP A PROTOTYPE SYSTEM; PERFORM PROOF-OF-CONCEPT DISPOSITION STUDIES; AND DEVELOP REALISTIC PERFORMANCE, SIZE, WEIGHT, RELIABILITY, AND MAINTENANCE PROJECTIONS.

MAINSTREAM ENGINEERING CORP. Topic#: 91-092 ID#: 91NAT-024
200 YELLOW PLACE Office: NATICK
ROCKLEDGE, FL 32955 Contract #:
Phone: (407) 631-3550 PI: ROBERT F. SCARINGE, PH.D.
Title: DEMO OF AN INNOVATIVE FOOD/BEVERAGE HEATING/COOLING CONTAINER
Abstract: THIS PROPOSAL DESCRIBES FOUR INNOVATIVE RATION HEATING/COOLING CONCEPTS THAT USE NO MOVING PARTS OR EXTERNAL ELECTRICAL ENERGY. AS PART OF THIS PROPOSAL, AN INITIAL TRADE-OFF STUDY WAS PERFORMED WHICH REVEALED ONE CONCEPT WHICH IS SUPERIOR TO THE OTHERS, IS INEXPENSIVE, AND SATISFIES THE ARMY REQUIREMENTS. THIS PHASE I EFFORT WILL COMPLETELY INVESTIGATE AND DETERMINE THE BEST FOOD HEATING/ COOLING APPROACH WHEN CONSIDERING FACTORS SUCH AS THERMAL PERFORMANCE, COST, EASE OF USE, SAFETY, SIZE AND WEIGHT, MAINTAINABILITY, AND LOGISTICAL SUPPORT OF THE RESULTING DESIGN. THE PHASE I EFFORT INCLUDES THE ANALYSIS, DESIGN, CONSTRUCTION, AND EXPERIMENTAL DEMONSTRATION OF A PROTOTYPE FOOD HEATING/COOLING CANISTER FOR HEATING RATIONS AND COOLING A BEVERAGE WITHOUT AN EXTERNAL POWER SOURCE OF ANY KIND, AND WITHOUT THE USE OF ANY MOVING PARTS. A PRELIMINARY LAYOUT OF AN AUTOMATED MANUFACTURING AND PACKAGING SYSTEM FOR THE PRODUCTION OF THESE FOOD HEATING/COOLING CANISTERS WILL ALSO BE PERFORMED AS PART OF THE PHASE I EFFORT, SO THAT MANUFACTURING COST ESTIMATES, FOR THE SELECTED DESIGN, CAN BE ACCURATELY PERFORMED.

MAK TECHNOLOGIES, INC. Topic#: 91-180 ID#: 91AVS-042
SUITE 1, 32 BRISTOL STREET Office: AVSCOM
CAMBRIDGE, MA 02141 Contract #:
Phone: (617) 876-8085 PI: JOHN MORRISON
Title: INTEGRATING AI INTO AIRNET WITH DISTRIBUTED SIMULATION TECHNOLOGY
Abstract: AI-BASED DECISION AIDS PROMISE TO HELP PILOTS COPE WITH INCREASINGLY COMPLEX HELICOPTER PILOTAGE SYSTEMS. AIRNET CAN BE A TOOL TO HELP MEASURE THE EFFECTIVENESS OF SUCH SYSTEMS, BUT CURRENTLY THERE IS NO WAY TO INTEGRATE SUCH SYSTEMS INTO AIRNET. THIS PROPOSAL SHOWS HOW THE OBJECT-ORIENTED DISTRIBUTED SIMULATION TECHNIQUES, PIONEERED IN LARGE-SCALE SIMULATION OF BATTLEFIELD OPERATING SYSTEMS, ARE APPLICABLE TO THIS SMALL-SCALE SIMULATION OF FLIGHT SYSTEMS. A DISTRIBUTED SIMULATION IS LOW-COST, HIGH-PERFORMANCE, AND SCALABLE TO MEET FUTURE SIMULATION NEEDS.

MAK TECHNOLOGIES, INC. Topic#: 91-254 ID#: 91PM-016
SUITE 1, 32 BRISTOL STREET Office: PM TRADE
CAMBRIDGE, MA 02141 Contract #:
Phone: (617) 876-8085 PI: JOHN MORRISON
Title: A FLEXIBLE DISTRIBUTED INTERACTIVE SIMULATION ADAPTER UNIT (DAU) FOR INTERCONNECTING EXISTING SIMULATORS
Abstract: THE DARPA SIMNET PROGRAM DEMONSTRATED THE VIABILITY OF NETWORKED SIMULATORS. THE GOVERNMENT ALREADY POSSESSES SIMULATORS, WHICH CAN NEITHER NETWORK NOR SHARE DATABASES. THIS PROJECT PROPOSES TO SOLVE THE NETWORKING PROBLEM BY DEVELOPING A PORTABLE, FLEXIBLE

DISTRIBUTED INTERACTIVE SIMULATION (DIS) ADAPTER UNIT (DAU, FOR SHORT). THE PROJECT PROPOSES TO SOLVE THE DATABASE PROBLEM BY CAPITALIZING ON EXISTING AND ONGOING EFFORTS TO DEVELOP A SIMULATOR STANDARD DATABASE (SSDB). THE PROPOSED DAU SEPARATES NETWORKING PROCESSING WHICH GROWS LINEARLY WITH THE NUMBER OF VEHICLES. THIS MODULAR APPROACH INSULATES THE EXISTING SIMULATOR FROM THE HIGH DEMANDS OF NETWORK PROCESSING, INCREASING THE CAPABILITY OF THE EXISTING SIMULATOR. THE FLEXIBLE PROPOSED ARCHITECTURE SUPPORTS SYSTEM-LEVEL, BOARD-LEVEL, AND SOFTWARE-ONLY PRODUCTS FOR INTEGRATION INTO EXISTING SIMULATORS. THIS ALLOWS THE DAU TO BE USED WITH SYSTEMS WITH WIDELY DIFFERENT TECHNICAL CHARACTERISTICS. THE FLEXIBLE DESIGN OF THE SOFTWARE ALSO ALLOWS MODIFICATION TO MET THE INCREASINGLY COMPLEX REQUIREMENTS OF DISTRIBUTED INTERACTIVE SIMULATION, ALLOWING THE EXISTING SIMULATORS TO BE COMPATIBLE WITH EVOLVING DIS STANDARDS. MAK'S SOFTWARE DEVELOPMENT METHODOLOGY EMPHASIZES PORTABILITY OF SOFTWARE, WHICH IS THE KEY TO USING INCREASINGLY POWERFUL NEW GENERATIONS OF HARDWARE.

MANDEX, INC.
8003 FORBES PLACE
SPRINGFIELD, VA 22151
Phone: (703) 321-0200

Topic#: 91-201
Office: ETL
Contract #:
PI: GREGORY JAMES

ID#: 91ETL-004

Title: THREE DIMENSIONAL MODELLING STATION

Abstract: THE OBJECTIVE OF THIS PHASE I EFFORT WILL BE TO STUDY EXISTING THREE DIMENSIONAL MODELING CAPABILITIES CURRENTLY IN USE BY COMMERCIAL AND MILITARY ORGANIZATIONS, AND THOSE NEW CAPABILITIES FROM RELATED FIELDS THAT HAVE POTENTIAL FOR MEETING THE ARMY'S PARTICULAR SIMULATION REQUIREMENTS. ALL ASPECTS OF HARDWARE AND SOFTWARE WILL BE EXPLORED, CULMINATING IN A RECOMMENDED DESIGN APPROACH FOR A THREE DIMENSIONAL MODELING STATION. AN EXTREMELY BENEFICIAL BY-PRODUCT FROM THIS WORK WILL BE A DATA BASE, CREATED FROM THE SURVEY INFORMATION, OF CURRENT HARDWARE, SOFTWARE, AND DATA SOURCES TO AID IN THE CONFIGURATION OF MANY DIFFERENT TYPES OF GRAPHICS WORKSTATIONS, TAILORED TO ANY PARTICULAR APPLICATION.

MARLOW INDUSTRIES, INC.
10451 VISTA PARK ROAD
DALLAS, TX 75238
Phone: (214) 340-4900

Topic#: 91-047
Office: CECOM
Contract #:
PI: E. H. VOLCKMANN

ID#: 91CEC-255

Title: RESONANT DOPED BISMUTH TELLURIDE FOR RELIABLE, EFFICIENT CRYOCOOLING

Abstract: THE UTILITY OF RELIABLE, SOLID-STATE, THERMOELECTRIC COOLING TECHNOLOGY CAN BE EXTENDED TO CRYOGENIC TEMPERATURES (77 DEGREES K) THROUGH THE USE OF NEW THERMOELECTRIC MATERIALS. A UNIQUE AND INNOVATIVE APPROACH TO IMPROVED THERMOELECTRIC MATERIALS CAPABLE OF TRIPLING THE THERMOELECTRIC FIGURE OF MERIT OF BISMUTH-TELLURIDE-BASED THERMOELECTRIC MATERIALS IS PROPOSED. IN ADDITION TO THE CONVENTIONAL DOPANTS USED TO CREATE CHARGE CARRIERS IN BISMUTH TELLURIDE, ADDITIONAL DOPANTS WILL BE INTRODUCED WHICH, THROUGH RESONANT SCATTERING OF THE CHARGE CARRIERS, PRODUCE A DRAMATIC IMPROVEMENT IN THE SEEBECK COEFFICIENT AND THEREFORE IN THE ABILITY OF THE MATERIALS TO CONVERT INPUT ENERGY INTO COOLING POWER. THE PHYSICAL PROPERTIES OF THE MATERIALS WILL BE LITTLE ALTERED AND THEREFORE PRACTICAL CRYOCOOLING DEVICES MAY BE DEVELOPED RELATIVELY EASILY FROM THESE ADVANCED BISMUTH TELLURIDE MATERIALS. EXTENSION OF THERMOELECTRIC COOLING TO CRYOGENIC TEMPERATURES IS EXPECTED TO BE USEFUL TO A WIDE VARIETY OF APPLICATIONS INCLUDING INFRARED SENSORS.

MASSACHUSETTS TECHNOLOGICAL LAB
312 AUSTIN STREET
WEST NEWTON, MA 02165
Phone: (617) 484-2296
Topic#: 91-121 ID#: 91BRL-022
Office: BRL
Contract #:
PI: DR. TA-MING FANG
Title: COMPOSITE COATINGS FOR ACOUSTIC PULSE ABSORPTION
Abstract: ACOUSTIC LINERS CAN BE USED TO ATTENUATE PRESSURE OSCILLATIONS IN REGENERATIVE LIQUID PROPELLANT GUNS IN ORDER TO INCREASE THE LIFETIME OF THE GUN AND MINIMIZE THE IMPACT ON THE PROJECTILES BEING FIRED. THE DESIGN OF THIS TYPE OF ACOUSTIC ABSORBER IS MADE DIFFICULT BECAUSE OF BOTH THE EXTREME CONDITIONS THE LINER MUST WITHSTAND, AND THE BROAD-BANKED NATURE OF THE ACOUSTIC SIGNAL WHICH MUST BE ATTENUATED. IN ORDER TO EFFECTIVELY ATTENUATE THE PRESSURE OSCILLATIONS, THE LOADED COMPOSITE IS DESIGNED WITH A BINDER MATERIAL THAT HAS ITS IMPEDANCE MATCHED TO THE GUN CHAMBER TO ENSURE THAT THE ACOUSTIC TRANSMISSION INTO THE LINER IS MAXIMIZED (AND THEREFORE THE ACOUSTIC REFLECTION FROM THE LINERS IS MINIMIZED) WHILE THE PARTICLES IN THE BINDER ARE DISTRIBUTED SO THAT, DUE TO SCATTERING AND ABSORPTION, THE TRANSMITTED ACOUSTIC WAVE IS COMPLETELY ATTENUATED. THIS TYPE OF BROAD-BANDED, LOADED ABSORBER IS COMMONLY USED IN THE REDUCTION OF RADAR REFLECTIONS FOR STEALTH APPLICATIONS, WHERE A THIN COATING MUST ATTENUATE THE ELECTROMAGNETIC "OSCILLATIONS" OVER A LARGE FREQUENCY RANGE. IN THIS EFFORT WE PROPOSE TO INVESTIGATE THE REFLECTION OF ACOUSTIC PULSES FROM AN ABSORBING LINER USING THE RIGOROUS TECHNIQUES OF ELASTIC MULTIPLE SCATTERING. WE DRAW UPON OUR RECENT EXACT SOLUTION TO THE SCATTERING OF ELASTIC WAVES FROM ELASTIC SPHERES AND OUR EXPERIENCE IN THE DESIGN AND ANALYSIS OF ELECTROMAGNETIC ABSORBING COATINGS. OUR ANALYSIS WILL DETERMINE THE MATERIAL PROPERTIES AND LINER CONFIGURATION REQUIRED FOR THE ABSORPTION OF PRESSURE OSCILLATIONS IN THE HIGH TEMEPRATURE AND HIGH PRESSURE ENVIRONMENT OF REGENERATIVE GUNS.

MATERIALS AND ELECTROCHEMICAL RESEARCH
7960 S. KOLB ROAD
TUCSON, AZ 85706
Phone: (602) 574-1980
Topic#: 91-018 ID#: 91AVS-328
Office: AVSCOM
Contract #: NAS-119438
PI: DR. J. C. WITHERS
Title: ADVANCED COMPOSITE MATERIALS FOR LIGHTWEIGHT ROTOCRAFT/AIR-VEHICLE SYSTEM COMPONENTS
Abstract: CHRONIC NEEDS FOR HIGHER PERFORMANCE IN PRESENT AND FUTURE ARMY ROTOCRAFT/AIR-VEHICLE SYSTEMS MANDATE IMPROVEMENTS IN MATERIALS PROPERTIES. LIGHTWEIGHT METAL MATRIX COMPOSITES (MMC) INCLUDING MAGNESIUM AND ALUMINUM ARE AMONG THE BEST CANDIDATES TO FULFILL THE REQUIREMENTS THAT ENABLE LIGHTWEIGHT STRUCTURES, ADVANCED PROPULSION, TRANSMISSIONS, ROTORS, THRUST DEVICES, ETC. A UNIQUE COATINGS APPROACH FOR SPREAD GRAPHITE FIBERS PERMITS THE APPLICATION OF AN ADHERENT ENGINEERED INTERFACE AS WELL AS APPLICATION OF THE MATRIX AS A COATING THAT PERMITS VERY HIGH VOLUME REINFORCEMENT FRACTION COMPOSITES WITH SPECIFIC STRENGTHS AND MODULUS TWO TO FOUR TIMES PREVIOUSLY ATTAINED. THESE ADVANCED COMPOSITES WILL BE DEMONSTRATED AND THEIR APPLICATIONS IDENTIFIED IN BOTH CURRENT AND FUTURE ARMY ROTOCRAFT/AIR-VEHICLE SYSTEMS.

MATERIALS AND ELECTROCHEMICAL RESEARCH
7690 SOUTH KOLB ROAD
TUCSON, AZ 85706
Phone: (602) 574-1980
Topic#: 91-170 ID#: 91MTL-104
Office: MTL
Contract #:
PI: DR. SUMIT GUHA
Title: DEVELOPMENT OF A TUNGSTEN HEAVY ALLOY THAT FAILS BY AN ADIABATIC SHEAR MECHANISM
Abstract: KINETIC ENERGY PENETRATORS MADE OF DU ALLOYS PERFORM BETTER THAN THE TUNGSTEN HEAVY ALLOYS (WHA). THE IMPROVED PERFORMANCE IN DU ALLOY PENETRATORS IS ATTRIBUTABLE TO FAILURE BY ADIABATIC SHEAR BANDING WHICH HELPS THE PROJECTILE MAINTAIN A SELF-SHARPENED CHISELED NOSE THEREBY PENETRATING FURTHER THAN TUNGSTEN BASED PENETRATORS. RADIOLOGICAL

HAZARDS OF DU ALLOYS, HOWEVER, DICTATE THE IMPROVEMENT IN PERFORMANCE OF WHA PENETRATORS. TWO NOVEL APPROACHES ARE PROPOSED: FIRSTLY, THE NI-FE BASED MATRIX WILL BE REPLACED BY L12 STRUCTURED INTERMATALLIC, NI3AL (AND ALSO NI-12 AT.%AL-40AT.%FE) SINCE THESE ALLOYS EXHIBIT THE GENERAL QUASISTATIC PROPERTY OF DECREASING DUCTILITY WITH INCREASING TEMPERATURES. THE TEMPERATURE ASSISTED EMBRITTLEMENT IS EXPECTED TO NUCLEATE FAILURE MORE READILY ALONG THE ADIABATIC SHEAR BANDS. SECONDLY, BASE ON THE ESTABLISHED SUPERIOR PERFORMANCE OF [100] ORIENTED B.C.C. W SINGLE CRYSTALS IN BALLISTIC IMPACT, IT IS PROPOSED TO IMPACT A [100] TEXTURE TO W PARTICLES IN A B.C.C. MATRIX (MN) TO ACCENTUATE THE POSSIBILITY OF FAILURE ALONG WEAK PLANES. THE ALLOYS WILL BE PROCESSED THROUGH BOTH LIQUID PHASE SINTERING AND HOT PRESSING AND SUBJECTED TO HIGH STRAIN RATE TESTS TO DETERMINE THEIR PENETRATION PERFORMANCE.

MATERIALS SCIENCES CORP.
930 HARVEST DRIVE, SUITE 300
BLUE BELL, PA 19422
Phone: (215) 542-8400

Topic#: 91-164
Office: MTL
Contract #:
PI: CRYSTAL H. NEWTON, PH.D.

ID#: 91MTL-026

Title: INTELLIGENT DATABASE MANAGEMENT SYSTEM FOR POLYMERS AND POLYMER MATRIX COMPOSITES

Abstract: THE DEVELOPMENT OF AN INTELLIGENT DATABASE MANAGEMENT SYSTEM PERMITS ADDRESSING TWO PROBLEMS WITH POLYMER AND POLYMER MATRIX COMPOSITE MATERIALS DATA. THE DATA NEED A DATABASE TO SERVE AS A FOCAL POINT FOR ARCHIVING AND REFERENCE. IN ADDITION, FREQUENTLY A COMPLETE SET OF DATA FROM A MATERIAL IS NOT AVAILABLE. IN THIS CASE, THE INTELLIGENT PART OF THE SYSTEM, THE KNOWLEDGE MANAGEMENT SYSTEM CAN BE USED TO FILL IN THE BLANKS BY PREDICTING VALUES FOR THE MISSING INFORMATION. IN DEVELOPING SUCH A SYSTEM, THE USE OF ASTM E-49 GUIDES FOR DEVELOPING THE DATA RECORDS BOTH FOR MATERIAL IDENTIFICATION AND THE RECORDING OF TEST RESULTS IS IMPORTANT SINCE IT IS ANTICIPATED THAT THIS WILL BE REQUIRED FOR BOTH INDUSTRY AND GOVERNMENT IN THE FUTURE. THE USE OF THE GUIDES PERMITS COMPARISON OF INFORMATION FROM DIFFERENT SOURCES AND THE TRANSFER OF DATA FROM ONE DATABASE TO ANOTHER. DATA VALIDATION CAN BE INCORPORATED INTO THE KNOWLEDGE MANAGEMENT SYSTEM RULES AND DATA QUALITY INDICATORS WILL BE INCORPORATED INTO THE DATABASE DESIGN. THE PHASE I PROGRAM WILL DETERMINE THE FEASIBILITY OF AN INTELLIGENT DATABASE MANAGEMENT SYSTEM FOR NEAT AND FILLED POLYMERS AND DEMONSTRATE THE COUPLING OF THE KNOWLEDGE AND DATABASE MANAGEMENT SYSTEMS.

MAYA DESIGN GROUP, INC.
2100 WHARTON STREET
PITTSBURGH, PA 15203
Phone: (412) 488-2900

Topic#: 91-148
Office: HEL
Contract #:
PI: JAMES H. MORRIS

ID#: 91HEL-004

Title: DYNAMIC DISPLAY GENERATION FOR VISUALIZATION, SEARCH, AND ANALYSIS OF LARGE AMOUNTS OF INFORMATION

Abstract: WE WILL DESIGN A SYSTEM FOR THE AUTOMATIC CREATION OF INFORMATION DISPLAYS TO SUPPORT USERS OF LARGE, INFORMATION-INTENSIVE COMPUTER APPLICATIONS. THE SYSTEM WILL BE BASED ON CURRENT THEORETICAL RESEARCH IN THIS AREA AND WILL BE INTEGRATED WITH ONE OR MORE OF THE FOLLOWING: USER PRESENTATION GRAPHICS PACKAGES, USER INTERFACE MANAGEMENT SYSTEMS, USER INTERFACE BUILDING TOOLKITS, AND DATABASE EXPLORATION AND ANALYSIS SYSTEMS. THE INNOVATION IS IN THE DESIGN OF NEW CAPABILITIES FOR ENABLING USERS TO EFFORTLESSLY CONSTRUCT DISPLAYS CUSTOMIZED TO THE ANALYSIS NEEDS OF EACH NEW SITUATION. WITH THIS PROTOTYPE, INTERFACE BUILDING TIME WILL BE SUBSTANTIALLY REDUCED AND THE RESULTING DISPLAYS WILL BE MORE EFFECTIVE THAN THOSE AVAILABLE COMMERCIALLY TODAY. A CENTRAL PORTION OF OUR WORK WILL BE TO DEVELOP METHODS BY WHICH USERS CAN IDENTIFY THEIR INFORMATION ANALYSIS NEEDS AND PRODUCE DISPLAYS WHICH ADDRESS THEM. DURING THE COURSE OF THIS WORK, WE WILL DEVELOP A CORPUS OF INFORMATION ANALYSIS CASES, WHICH ARE

REPRESENTATIVE OF MANY USED IN THE GOVERNMENT AND INDUSTRY. THESE CAN BE USED TO PROVIDE EVALUATION CRITERIA FOR BOTH THE PROTOTYPE AND EXISTING COMMERCIAL SOFTWARE.

MENTOR TECHNOLOGIES, INC.
12750 TWINBROOK PARKWAY, SUITE 101
ROCKVILLE, MD 20852
Phone: (301) 881-0881
Topic#: 91-009 ID#: 91TEC-301
Office: TECOM
Contract #: DAAD07-91-C-0153
PI: MITCHELL R. BELZER
Title: TEST RANGE TRACKING NETWORK PROCESSORS
Abstract: VLSI (VERY LARGE SCALE INTEGRATION) TECHNOLOGY HAS BEEN DEVELOPED TO THE POINT WHERE SPECIAL PURPOSE PROCESSORS MAY BE CONCATENATED TO FORM COMPACT SUPERCOMPUTERS WITH FAR GREATER THROUGHPUT RATES THAN UNI-PROCESSOR MACHINES. THESE NEW MASSIVELY PARALLEL COMPUTERS PROMISE TO SOLVE THE ARMY'S EVER INCREASING NEED TO PROCESS MORE DATA IN SHORTER TIMES, AND WITH IMPROVED ACCURACY. MTI WILL DETERMINE THE HARDWARE AND SOFTWARE TRADEOFF ISSUES INVOLVED IN USING THESE MACHINES FOR REAL-TIME MULTISENSOR MULTITARGET TRACKING BASED UPON A NEW MTI ALGORITHM FOR CONSTRAINED LEAST SQUARES ESTIMATION IN DISTRIBUTED FORM.

MENTOR TECHNOLOGIES, INC.
12750 TWINBROOK PARKWAY, SUITE 101
ROCKVILLE, MD 20852
Phone: (301) 881-0881
Topic#: 91-086 ID#: 91MIC-118
Office: MICOM
Contract #: DAAH01-92-C-R177
PI: DR. CHUN Y. MOON
Title: REMOTE SENSOR FOR SURVEILLANCE AND DATA COLLECTION
Abstract: The objective is to develop a remote video sensor unit which will be used with a tracking system. MTI has already designed and has constructed a video surveillance unit prototype for a completely automated multiple target/multiple sensor tracking system, under contract to the U.S. Army, White Sands Missile Range (WSMR). Our goal for Phase I of this proposal would be to modify and further develop the present design of the tracking unit to meet new specifications for MICOM. If modifications to the existing prototype are minor, and cost is within budget, it will be possible to evaluate performance of a modified prototype Phase I. This would be equivalent to advancing the schedule of this project to cover some of the Phase II objectives while still in Phase I. A well designed and fully evaluated video tracking unit could be constructed quickly and economically in Phase II.

MENTOR TECHNOLOGIES, INC.
12750 TWINBROOK PARKWAY, SUITE 101
ROCKVILLE, MD 20852
Phone: (301) 881-0881
Topic#: 91-111 ID#: 91TEC-029
Office: TECOM
Contract #:
PI: MITCHELL R. BELZER
Title: REAL-TIME SENSOR DATA FUSION
Abstract: TRACKING SADARM SUBMUNITIONS FOR TEST EVALUATION IS A DIFFICULT TASK. THE RATIO OF THE TOTAL NUMBER OF AIRBORNE EXTRANEOUS TARGETS OF INTEREST IS GREATER THAN 4. IN FACT, THE SAME RATIO, BUT FOR TARGETS WITHIN THE FIELD OF VIEW OF INDIVIDUAL SENSORS DURING THE "EARLY PHASE" OF THE SUBMUNITION'S FLIGHT, CAN BE A LOT HIGHER. DURING THIS TIME, WHICH SPANS EJECTION OF THE SUBMUNITION FROM THE MLRS ROCKET TO THE ONSET OF STABILIZED VERTICAL DESCENT, THE SUBMUNITION UNDERGOES 2 DISTINCTLY VIOLENT MANEUVERS WHEREAS THE CLUTTER TARGETS MOVE ALONG CONTINUOUS AEROBALLISTIC TRAJECTORIES. WE PROPOSE TO INTEGRATE A VARIETY OF TEST RANGE SENSORS INTO A UNIFIED TRACKING NETWORK BASED UPON NEW MTI ALGORITHMS FOR DISTRIBUTED FILTERING AND MANEUVER DETECTION. THE MANEUVER PARAMETERS WILL HELP IN THE DISCRIMINATION OF TARGETS OF EVALUATION FROM CLUTTER, AND THUS REDUCE THE NUMBER OF HYPOTHESES TO CONSIDER FOR DATA ASSOCIATION DURING THE EARLY PHASE.

METAGENE CORP.
PROGRESS CENTER, ONE PROGRESS BLVD., BOX 26
ALACHUA, FL 32615
Phone: (904) 462-3904
Topic#: 91-027
Office: MEDICAL
Contract #: 91-C-1106
PI: DR. RANDY S. FISCHER
ID#: 91MED-303

Title: UNIQUE ENZYME TARGETS FOR GONOCOCCAL ANTIMETABOLITES

Abstract: THE ABILITY OF NEISSERIA GONORRNOEAE TO METABOLIZE LACTATE DERIVED FROM HOST NEUTROPHILS HAS BEEN IMPLICATED IN A PATHOGENIC MECHANISM THAT FAVORS OXYGEN CONSUMPTION BY GONOCOCCI AND REDUCES THE ABILITY OF PHAGOCYTES TO PRODUCE SUPEROXIDE. A MEMBRANE-BOUND LACTATE DEHYDROGENASE (ILDH) AND SOLUBLE LACTATE DEHYDROGENASE (NLDH) PARTICIPATE IN LACTATE METABOLISM. SINGLE AND DOUBLE MUTANTS WILL BE USED TO ASSESS THE EFFECTS OF INHIBITORS OF ILDH AND/OR NLDH UPON GROWTH PHYSIOLOGY AND ENERGY METABOLISM. FEASIBILITY DEMONSTRATED BY THIS APPROACH WILL PROVIDE A RATIONALE FOR STRATEGIES TO ELUCIDATE THE GENE-ENZYME RELATIONSHIPS OF THIS SYSTEM TO ENHANCE INSIGHT INTO THE NATURE OF THE HOST-PATHOGEN INTERACTION. THE GENE SEQUENCES SHOULD, IN TURN, PROVIDE A MOLECULAR-GENETIC BASIS FOR EVENTUAL ATTEMPTS TO ABOLISH SELECTIVELY THE EXPRESSION OF THESE GENES. BY THE END OF THE PROPOSED GRANT PERIOD IT IS ANTICIPATED THAT A STRONG BASIS OF FEASIBILITY WILL BE ESTABLISHED (I) FOR DESIGN OF SELECTIVE INHIBITORS ACTING AT THE ENZYME LEVEL, (II) FOR DESIGN OF SELECTIVE ANTISENSE INHIBITORS ACTING AT THE LEVEL OF MRNA, AND (III) TO DEMONSTRATE DIRECTLY THE UTILITY OF THESE AS TOOLS TO DISRUPT THE PATHOGENIC STATE IN THE MOST APT MODEL SYSTEMS AVAILABLE.

MICRILOR, INC.
17 LAKESIDE OFFICE PARK, NORTH AVENUE
WAKEFIELD, MA 01880
Phone: (617) 246-0103
Topic#: 91-002
Office: CECOM
Contract #: DAAB07-91-C-B028
PI: JOHN H. CAFARELLA
ID#: 91CEC-313

Title: HIGH-DATA-RATE WIRELESS LAN FOR TACTICAL MULTIMEDIA NETWORKS

Abstract: THE REQUIREMENTS FOR HIGH-DATA-RATE CONNECTIVITY IN TACTICAL ARMY DEPLOYMENTS CONTINUES TO EXCEED THE RATES AVAILABLE USING EMERGING COMMUNICATIONS SYSTEMS; THESE SYSTEMS, WHICH NORMALLY ADDRESS THE BATTLEFIELD SURVIVABILITY PROBLEM BY USING CONSIDERABLE SPECTRUM SPREADING, OFFER RELATIVELY LOW DATA RATES AND THEY ALSO ARE VERY EXPENSIVE. AN ALTERNATE ARCHITECTURE FOR ACHIEVING THE DESIRED HIGH-RATE CONNECTIVITY IS TO REDUCE THE AMOUNT OF PROTECTION OBTAINED THROUGH SPREAD-SPECTRUM SIGNALING, AND TO SUBSTITUTE A COMBINATION OF ANTENNA DIRECTIVITY AND ABSORPTIVE PROPAGATION BEHAVIOR. ON THE OTHER HAND, IT IS NOT DESIRABLE TO COMPLETELY REMOVE SPREAD-SPECTRUM SIGNALING FOR SEVERAL REASONS. BY INCLUDING A MODEST AMOUNT OF SPREADING, A HYBRID APPROACH TO REDUCED PROBABILITY OF DETECTION (RFD) CAN BE EFFECTED, AS CAN BE THE REDUCTION OF FADING AND/OR INTERSYMBOL INTERFERENCE. THIS APPROACH COULD LEAD TO ROBUST, SURVIVABLE LINKS WHICH SUPPORT 10-MBIT/SEC WIRELESS LAN OPERATION IN A MULTIMEDIA NETWORK.

MICROSENSOR SYSTEMS, INC.
SUITE 118, 6800 VERSAR CENTER
SPRINGFIELD, VA 22151
Phone: (703) 642-6919
Topic#: 91-073
Office: CRDEC
Contract #:
PI: DR. N. L. JARVIS
ID#: 91CRD-081

Title: CHEMICAL MICROSENSOR FOR AUTOMATED, LONG TERM MONITORING OF CHEMICAL AGENTS AT VERY LOW CONCENTRATIONS

Abstract: A CHEMICAL VAPOR MONITORING SYSTEM, INCORPORATING STATE-OF-THE-ART CHEMICAL MICROSENSOR AND MICROCOMPUTER TECHNOLOGIES, WILL BE DESIGNED AND OPTIMIZED FOR THE AUTOMATIC, CONTINUOUS, LONG TERM, LOW LEVEL MONITORING (BELOW 0.01 MG/M3) OF CHEMICAL AGENTS. THE INITIAL DEMONSTRATION UNIT WILL BE OPTIMIZED FOR HD, GB AND CD (AND THEIR STIMULANTS). SURFACE ACOUSTIC WAVE (SAW) MICROSENSORS WILL BE USED AS THE AGENT DETECTORS, AS THEY MEET ALL REQUIREMENTS FOR RELIABILITY, LOW MAINTENANCE, LONG SHELF LIFE, AND ARE

SENSITIVE TO HD, GB, GD AND MANY OF THEIR PRECURSORS AND DECOMPOSITION PRODUCTS. THE PHASE I INSTRUMENT WILL USE DUAL SAW SENSORS OPTIMIZED FOR HD AND G AGENTS. THE EFFORT WILL INTEGRATE THE SAW SENSORS INTO A SYSTEM THAT INCLUDES A SAMPLE CONCENTRATOR TO INCREASE SENSITIVITY AND A GC COLUMN TO PROVIDE SELECTIVITY. WORK INCLUDES OPTIMIZATION OF THE GC COLUMN TO SEPARATE AND MONITOR BOTH HD AND G AGENTS, OPTIMIZATION OF THE SAMPLE CONCENTRATOR, AND DEVELOPMENT OF SOFTWARE FOR AN ONBOARD MICROCOMPUTER TO OPERATE THE SYSTEM AND REPORT THE DATA. ALL STUDIES IN PHASE I WILL USE AGENT STIMULANTS. INITIAL GC STUDIES WILL BE MADE WITH AC, CK, PHOSGENE, AND THE LEWISITE DECOMPOSITION PRODUCT, ACETYLENE, TO DETERMINE THE FEASIBILITY OF OPTIMIZING THE SAME INSTRUMENT IN PHASE II TO MONITOR FOR THESE CW AGENTS AS WELL.

MILLITECH CORP.
SOUTH DEERFIELD RESEARCH PARK, POST OFFICE BOX 109
SOUT DEERFIELD, MA 01373
Phone: (413) 665-8551
Topic#: 91-134 ID#: 91ETD-013
Office: ETDL
Contract #:
PI: DR. ROBERT J. CORREIA
Title: PASSIVE MILLIMETER WAVE IMAGING
Abstract: MILLITECH PROPOSES TO EXPLORE THE DEVELOPMENT OF AN INNOVATIVE PASSIVE MILLIMETER WAVE (PMMW) SENSOR FOR USE IN ALL-WEATHER, ALL-BATTLEFIELD ENVIRONMENT DETECTION AND TARGETING FOR MISSILE GUIDANCE. CURRENT MILLIMETER WAVE (MMV) MISSILE GUIDANCE IS BASED ON ACTIVE RADAR TECHNOLOGY WHICH IS SUSCEPTIBLE TO POOR PERFORMANCE DUE TO CLUTTER DURING ITS ACQUISITION PHASE, AS WELL AS ITS LACK OF COVERTNESS AND POTENTIAL JAMMING COUNTERMEASURES. ALTHOUGH ACTIVE MMV SENSORS HAVE BEEN AVAILABLE FOR SEVERAL DECADES, THE PASSIVE FOCAL PLANE ARRAY, STARING IMAGER TECHNOLOGY PROPOSED HERE IS NEW AND UNIQUE TO MILLITECH. WE ANTICIPATE THAT THE GREATLY ENHANCED PERFORMANCE THAT THIS TECHNOLOGY PROVIDES WILL MAKE PMMW SENSORS USEFUL, PRACTICAL AND AFFORDABLE FOR MISSILE GUIDANCE. THE OBJECTIVE OF THE PHASE I EFFORT WILL BE TO STUDY THE TRADEOFFS POSSIBLE BETWEEN OPERATING FREQUENCIES AT 35,94 AND 140 GHZ, CONSIDERING THE NOISE TEMPERATURE REQUIREMENTS, IMMUNITY TO JAMMING SOURCES, THE VEHICLE IMPOSED HARDWARE SIZE AND WEIGHT CONSTRAINTS, THE STABILIZATION DEMANDS FOR A TACTICAL MISSILE AS WELL AS POWER CONSUMPTION. A TRADEOFF STUDY WILL ALSO CONSIDER A FUNDAMENTAL VERSUS SUBHARMONIC APPROACH TO THE DESIGN OF THE FOCAL PLANE ARRAY.

MISSION RESEARCH CORP.
735 STATE STREET, P.O.DRAWER 719
SANTA BARBARA, CA 93102
Phone: (703) 339-6500
Topic#: 91-154 ID#: 91HDL-017
Office: HDL
Contract #:
PI: DR. JOHN H. MCADOO
Title: "A PULSE FORMING NETWORK FOR AN EXPENDABLE PULSE GENERATOR."
Abstract: A FEASIBILITY STUDY FOR A COMPACT HIGH-POWER BROADBAND PULSE FORMING NETWORK IS PROPOSED. THE NETWORK WILL CONSIST OF A 1-KJ CAPACITOR BANK AND PASSIVE PULSE SHAPING ELEMENTS. THE CIRCUIT WILL BE CAPABLE OF DISCHARGING THE ENTIRE KJ,EITHER AS A SINGLE 100-GW 10-NS PULSE OR AS A SERIES OF 10 NS PULSES OF LESSER PEAK POWER. PULSE RISE TIMES SHALL BE LESS THAN 1 NS. THE ENTIRE NETWORK SHALL BE PACKAGED INSIDE A STANDARD 155 MM ARTILLERY SHELL.

MISSION RESEARCH CORP.
735 STATE STREET, P.O. DRAWER 719
SANTA BARBARA, CA 93102
Phone: (703) 339-6500
Topic#: 91-157 ID#: 91HDL-036
Office: HDL
Contract #:
PI: DR. RICHARD S. SMITH
Title: "UNOBTRUSIVE AIR CHEMISTRY DIAGNOSTICS FOR AURORA."
Abstract: WE PROPOSE TO INVESTIGATE THE FEASIBILITY OF USING IMPROVED AND ENHANCED VERSIONS OF A PREVIOUSLY DEMONSTRATED (BY OURSELVES) MICROWAVE-INTERFEROMETER TO PROVIDE A

PERMANENTLY AVAILABLE, TURN-KEY, AND UNOBTRUSIVE AIR-CHEMISTRY DIAGNOSTIC SYSTEM FOR AURORA. IN TASK 1 WE WILL DOWN-SELECT FROM A LARGE NUMBER OF IMPROVEMENTS, RANGING FROM EQUIPMENT AND SOFTWARE UPGRADES TO INCORPORATION OF IN-SITU CALIBRATION CAPABILITIES, AND ENHANCED MEASUREMENT CAPABILITIES, RANGING FROM MEASURING THE DEPENDENCE OF AIR-CHEMISTRY PARAMETERS ON APPLIED ELECTRIC FIELDS TO MEASURING DIELECTRIC- AND/OR SOIL-CHEMISTRY PARAMETERS. WE WILL ALSO CONSIDER TWO PHOTONIC TECHNIQUES, AN ELECTRO-OPTIC-RF- PROBE ENHANCEMENT OF THE MICROWAVE INTERFEROMETRY AND A LASER INTERFEROMETER, WHICH ARE ALSO HIGHLY LEVERAGED BY PREVIOUS AND ON-GOING WORK. BECAUSE OF OUR PREVIOUS WORK IN A VARIETY OF RELATED AREAS, AND BECAUSE CONSIDERABLE EQUIPMENT IS ALREADY ON HAND, TASK 2 WILL INCLUDE ACTUAL AURORA TESTS AND DEMONSTRATIONS, WHICH WILL BE PIGGY-BACKED ON SCHEDULED TESTING RUNS (AS WERE OUR PREVIOUS MEASUREMENTS), THUS DEMONSTRATING THE UNOBTRUSIVE NATURE OF THE DIAGNOSTIC(S). IN TASK 3 WE WILL GENERATE A COMPLETE PHASE-II DIAGNOSTIC SYSTEM DESIGN.

MISSION RESEARCH CORP.
735 STATE STREET, P.O.DRAWER 719
SANTA BARBARA, CA 93102
Phone: (703) 339-6500

Topic#: 91-160
Office: HDL
Contract #:
PI: DR. RICHARD S. SMITH

ID#: 91HDL-044

Title: "NON-PERTURBING TIME DEPENDENT ELECTRON BEAM DENSITY DIAGNOSTIC."

Abstract: WE PROPOSE TO INVESTIGATE THE USE OF SENSITIVE AND NON-PERTURBING OPTICAL TECHNIQUES TO MEASURE TIME-DEPENDENT ELECTRON BEAM DENSITIES, PARTICULARLY IN VACUUM RF SOURCES. OUR APPROACH INVOLVES NEW AND INNOVATIVE IMPLEMENTATIONS OF A PREVIOUSLY DEMONSTRATED OPTICAL FREQUENCY-DOMAIN TECHNIQUE, CALLED HETERODYNE SIDEBAND INTERFEROMETRY (HSI), TO MEASURE RF-FREQUENCY FOURIER COMPONENTS OF THE DENSITY. A NEW ENHANCEMENT OF ORDINARY OPTICAL INTERFEROMETRY, UTILIZING THE SAME EQUIPMENT AS HSI, IS PROPOSED TO MEASURE THE DC (TIME AVERAGED) DENSITY COMPONENT. WE POINT OUT HEREIN WAYS BY WHICH CERTAIN QUANTITATIVE DENSITY INFORMATION CAN BE OBTAINED WITH A MINIMUM AMOUNT OF DATA TAKING AND ANALYSIS, BUT WE ALSO PROPOSE TO INVESTIGATE AND VERIFY MORE EXTENSIVE DATA ANALYSIS PROCEDURES WHICH CAN ALLOW COMPLETE CHARACTERIZATION OF BEAM DENSITY AS A FUNCTION OF BOTH TIME AND SPACE. WE ALSO PROPOSE TO MAKE DETAILED, QUANTITATIVE COMPARISONS WITH ALTERNATIVE DENSITY MEASUREMENT TECHNIQUES, AND TO GENERATE A COMPLETE DESIGN OF A PROTOTYPE DENSITY DIAGNOSTIC SYSTEM TO BE BUILT AND TESTED DURING PHASE II. THE SYSTEM WILL BE DESIGNED WITH PARTICULAR HDL DEVELOPMENTAL RF SOURCE IN MIND, BUT WILL ALSO BE DESIGNED TO BE READILY APPLIED TO VIRTUALLY ANY CURRENT OR FUTURE RF-SOURCE OF INTEREST TO THE ARMY.

MO-SCI CORP.
PO BOX 2
ROLLA, MO 65401
Phone: (314) 364-2338

Topic#: 91-067
Office: CRDEC
Contract #:
PI: JOHN BRUCE KOEN

ID#: 91CRD-136

Title: ENCAPSULATION OF ORGANOALUMINUM

Abstract: ORGANOALUMINUM IS AN ENERGETIC MATERIAL WHICH REACTS WITH AIR OR MOISTURE. THE PURPOSE OF THIS PROPOSAL WILL BE TO FIND THE POLYMERIC THIN WALLED ENCAPSULANT WHICH WILL BE ADDRESSED BY: - DEVELOPING ENCAPSULATION TECHNIQUES WITH SEVERAL POLYMERS OR CO-POLYMERS - IDENTIFICATION OF THE PHYSICAL PROPERTIES SUCH AS: SMOOTH, IRREGULAR SHAPE, UNIFORM SIZE, AND GOOD STORAGE - STUDYING THE EXPOSURE RATE TO THE ATMOSPHERE.

MOIRESTRESS, INC.
PO BOX 475
PORT JEFFERSON, NY 11777
Phone: (516) 474-3565

Topic#: 91-171
Office: MTL
Contract #:
PI: F.P. CHIANG, PH.D.

ID#: 91MTL-028

Title: HIGH STRAIN RATE & HIGH TEMPERATURE LASER SPECKLE STRAIN MEASURING DEVICE
Abstract: A DIGITAL SPECKLE METHOD IS PROPOSED FOR RAPIDLY DIGITIZING AND PROCESSING LASER SPECKLE DATA FOR STRAIN CALCULATIONS. ONE BEAM LASER SPECKLE METHOD IS A NON-CONTACT, REMOTE SENSING, STRAIN MEASURING TECHNIQUE WHEREBY THE 2-D STRAIN DISTRIBUTION OF AN ENTIRE SPECIMEN (OR A PART OF A STRUCTURE) SURFACE CAN BE OBTAINED. PREVIOUS WORKS OF THE PRINCIPAL INVESTIGATOR HAVE SHOWN THAT THE TECHNIQUE HAS GREAT POTENTIAL FOR BEING DEVELOPED INTO A RUGGED 2-D STRAIN MEASURING DEVICE FOR HIGH STRAIN RATE AND HIGH TEMPERATURE RATE TESTINGS. THIS PROPOSAL ADDRESSES THE ISSUE OF USING A DIGITAL CAMERA COUPLED WITH A CONTINUOUSLY PULSING LASER TO CAPTURE LASER SPECKLE PATTERNS AND THE NECESSARY SOFTWARE TO PROCESS THE SPECKLE DATA FOR YIELDING DIRECTLY STRAIN INFORMATION. THE WET PHOTOGRAPHIC PROCESS IS THUS ENTIRELY ELIMINATED. FOR HIGH TEMPERATURE APPLICATIONS WE WOULD USE PLASMA SPRAY AND APPROPRIATE OPTICAL FILTERING TO CIRCUMVENT THE POSSIBLE THERMAL EFFECTS.

MONTEREY TECHNOLOGIES, INC.
P.O. BOX 223699, 26350 CARMEL RANCHO LANE, #200
CARMEL, CA 93922
Phone: (408) 625-5285

Topic#: 91-015 ID#: 91HEL-312
Office: HEL
Contract #: DAAA15-91-C-0113
PI: CURTIS A. BECKER

Title: AUTOMATIC TARGET ACQUISITION MAN-MACHINE INTERFACE
Abstract: AUTOMATIC TARGET RECOGNITION (ATR) HAS BEEN IDENTIFIED AS A CRITICAL TECHNOLOGY FOR FUTURE U.S. MILITARY SYSTEMS. NEAR-TERM ATR SYSTEMS IN THE ARMY WILL EMPHASIZE AIDED-SEARCH. THE MAN-MACHINE INTERFACE (MMI) FOR AIDED-SEARCH ATRS HAS BEEN INSUFFICIENTLY EXPLORED AND SPECIFIED. THE OVERALL GOAL IS TO EXAMINE THOROUGHLY THE ATR MMI ISSUES AND TO ESTABLISH RELEVANT DESIGN GUIDELINES OR SPECIFICATIONS. SPECIFIC OBJECTIVES OF THE WORK PROPOSED IN PHASE I ARE: (L) TO RESOLVE AN APPARENT INCONSISTENCY BETWEEN THE RESULTS OF TWO EXISTING STUDIES OF ATR SYSTEM PROPERTIES; AND (2) TO EXPAND THE DOMAIN OF ARMY WEAPON SYSTEMS ADDRESSED BY PREVIOUS ATR MMI STUDIES. THE FIRST OBJECTIVE WILL BE ADDRESSED BY CONDUCTING EMPIRICAL RESEARCH ON THE INTERACTIONS AMONG SEVERAL ATTRIBUTES OF ATR SYSTEMS. THE SECOND OBJECTIVE REQUIRES A SURVEY OF RELEVANT ARMY APPLICATIONS OF AIDED-SEARCH ATR TECHNOLOGY AND A CRITICAL REVIEW OF EXISTING LITERATURE. BOTH OBJECTIVES REQUIRE THE CONFLUENCE OF KNOWLEDGE OF SENSORS, SENSOR FUSION, VIDEO DISPLAYS, HUMAN VISUAL PERFORMANCE, HUMAN SIGNAL-DETECTION CHARACTERISTICS, HUMAN DECISION AIDS, MAN-MACHINE SYSTEM METRICS, EXPERIMENTAL METHODOLOGY, AND THE ARMY TACTICAL CONTEXT.

MOTIVAIR CORP.
325 NORTH CARSON ROAD
BIRMINGHAM, AL 35215
Phone: (205) 854-9985

Topic#: 91-045 ID#: 91BRD-003
Office: BRDEC
Contract #:
PI: CHARLES D. LOCKRIDGE

Title: ACTIVE NOISE AND VIBRATION CONTROL FOR AUXILIARY POWER UNITS
Abstract: THE OBJECTIVE OF THIS PROJECT IS TO DETERMINE THE FEASIBILITY OF DEVELOPING CLASS 28 IO KW (12.5 EVA) AND 30 KW (37.5 KVA) AUXILIARY POWER UNITS THAT ARE LIGHTER THAN PRESENT M D INVENTORY WITH 120 VOLT A.C. - 3% AT 60 HZ AT A .8 POWER FACTOR THAT HAVE MAXIMUM NOISE LEVELS OF 7SDB (A) AT ONE METER OUTSIDE OF THE SHELTER AND SSDB (A) INSIDE THE HUMAN FACTORS COMPARTMENT. VIBRATIONAL OSCILLATION IS NOT TO EXCEED 2 FT/SEC 2 PEAK-TO-PEAK. THE OBJECTIVE WILL BE ACHIEVED BY USE OF TURBOCHARGED LIGHT WEIGHT DIESEL ENGINES WITH A 3600 RPM .8 POWER FACTOR DESIGNED ALTERNATOR FOR THE IO KW APU, AND AN 1800 RPM .8 POWER FACTOR DESIGNED ALTERNATOR FOR THE 30 KW APU. ALL MECHANICAL AND ELECTRONIC GEAR FOR VIBRATION AND SOUND CANCELLATION WILL BE INTEGRATED WITH COMPLEX SOFTWARE INTERFACED TO MECHANICAL ACTUATORS TO ACHIEVE THE OBJECTIVE SET FORTH ABOVE.

MRJ, INC.
10455 WHITE GRANITE DRIVE, SUITE 104
OAKTON, VA 22124
Phone: (703) 934-9235
Topic#: 91-021 ID#: 91ETL-302
Office: ETL
Contract #: DACA76-91-C-0020
PI: STEVEN L. GEYER
Title: PARALLEL ARCHITECTURE FOR REAL TIME KNOWLEDGE-BASED DECISION AIDS
Abstract: TACTICAL DECISION AIDS, TDA, SYSTEMS ARE UTILIZED BY THE BATTLEFIELD COMMANDER IN A DYNAMIC, INFORMATION FILLED ENVIRONMENT. WITH THE CONTINUING INCREASE IN DATA AND INFORMATION AVAILABLE, AND WITH THE CONTINUING SHORTAGE OF EXPERT PERSONNEL, THE CRITICAL REQUIREMENTS OF FUTURE TDA SYSTEMS ARE FOR SPEED AND MORE AUTONOMOUS PROCESSING. THIS PROPOSAL PRESENTS A SOUND ENGINEERING APPROACH FOR DERIVING AND ASSESSING KNOWLEDGE BASED PARALLEL PROCESSING SYSTEM ARCHITECTURES FOR TACTICAL DECISION MAKING. OUR APPROACH, INVOLVING ANALYSIS OF THE DOMAIN APPLICATION, REQUIREMENTS DERIVATION, AND IDENTIFICATION OF SOFTWARE/HARDWARE SYSTEM COMPONENTS, HAS BEEN USED SUCCESSFULLY BY MRJ FOR NUMEROUS GOVERNMENT CUSTOMERS. MRJ IS UNIQUELY STAFFED WITH REQUIRED EXPERTS IN KNOWLEDGE ENGINEERING, PARALLEL PROCESSING AND THE TACTICAL DOMAIN. ADDITIONALLY, WE ARE ABLE TO IDENTIFY, BASED ON OUR PAST AND CURRENT BUSINESS ACTIVITIES, AN INNOVATIVE CONCEPT FOR A POTENTIAL TDA SYSTEM ARCHITECTURE THAT COMBINES THE PROCESSING POWER OF COMMERCIALLY AVAILABLE PARALLEL COMPUTERS WITH AN OPEN SOFTWARE ARCHITECTURE TO PROVIDE ANALYSIS IN NEAR REAL TIME, HIGH USER CONFIDENCE, LITTLE USER EXPERTISE, AND EFFECTIVE USE OF STATIC AND DYNAMIC DATA FROM NUMEROUS SOURCES. THIS STRAWMAN TDA SYSTEM ARCHITECTURE CONCEPT IS PRESENTED HEREIN TO EXEMPLIFY THOSE THAT WE PROPOSE TO ANALYZE DURING PHASE I.

MULTILAYER OPTICS AND XRAY TECH, INC.
7070 UNIVERSITY STATION
PROVO, UT 84602
Phone: (801) 378-5383
Topic#: 91-143 ID#: 91ETD-087
Office: ETDL
Contract #:
PI: J. KEVIN SHURTLEFF
Title: THE FABRICATION OF QUARTZ CRYSTAL RESONATORS BY ATOMIC LAYER EPITAXY
Abstract: THE NEED FOR GREATER STABILITY IN QUARTZ RESONATORS REQUIRES FABRICATION TECHNIQUES THAT PRODUCE FEWER DEFECTS. THE LIMITS OF CURRENT FABRICATION TECHNIQUES TO DECREASE DEFECTS HAS BEEN REACHED. WE PROPOSED AN INNOVATIVE TECHNIQUES FOR FABRICATING DEFECT FREE QUARTZ CRYSTALS BY DEPOSITING THE QUARTZ USING ATOMIC LAYER EPITAXY (ALE). ALE IS A CHEMICAL VAPOR DEPOSITION TECHNIQUES WHICH CAN DEPOSIT A SINGLE LAYER OF QUARTZ DURING EACH CYCLE OF THE DEPOSITION PROCESS. THE TOTAL THICKNESS IS DETERMINED BY THE NUMBER OF CYCLES AND CAN BE CONTROLLED TO WITHIN ONE ATOMIC LAYER. ALE IS CURRENTLY BEING USED IN THE ELECTRONICS INDUSTRY TO DEPOSIT CRYSTALLINE SEMICONDUCTOR. WE BELIEVE THAT HIGH QUALITY CRYSTAL RESONATORS WHICH OPERATE IN GIGAHERTZ RANGE CAN BE FABRICATED USING THIS TECHNIQUE.

NEILLEN TECHNOLOGIES CORP.
P. O. BOX 910
LANHAM, MD 20703
Phone: (301) 805-7266
Topic#: 91-149 ID#: 91HEL-013
Office: HEL
Contract #:
PI: RICHARD C. LAVIGNE
Title: GLOBAL POSITIONING SYSTEM FUZE OSCILLATOR DESIGN
Abstract: NTC OSCILLATORS PERMIT WHAT APPEARS TO BE CONFLICTING REQUIREMENTS (I.E., ACCURACY, STABILITY, AND COST) TO BE REALIZED. IN GENERAL, AS THE NUMBER OF REQUIREMENTS INCREASES, OR THE SEVERITY OF THE REQUIREMENTS INCREASES, THE COST WILL ALSO INCREASE – SOMETIMES BEING PROHIBITIVE. CONVENTIONAL OSCILLATOR DESIGNS (COLPITIS-TYPE CONFIGURATIONS) MAY YIELD ACCEPTABLE PERFORMANCE, ACCURACY, AND STABILITY, PARTICULARLY WHEN EXTENSIVE TEMPERATURE CONTROL OR COMPENSATION IS EMPLOYED, BUT IS COSTLY. ALSO, BY VIRTUE OF COMPENSATION TECHNIQUES, SETTLING TIME AND HYSTERESIS IS COMPROMISED. LOW-FREQUENCY PHASE

NOISE IS STILL PRESENT AND THIS IS THE PRIMARY SOURCE OF ERROR FOR VERY SHORT MEASUREMENT PERIODS. NTC'S NEGATIVE GAIN-ONE POLE RESPONSE OSCILLATORS, REFLECTION OSCILLATORS, AND MODIFIED POSITIVE GAIN-ONE POLE RESPONSE OSCILLATORS ARE ALL LOW COST AND HAVE FAST INITIAL ACCURACY, WITH A MINIMUM SHORT-TERM (1 SEC) STABILITY OF ONE PART IN A BILLION (10 -9). ADVANCED CIRCUITRY PERMITS THESE OSCILLATORS TO RIVAL RUBIDIUM OSCILLATORS. THE FINAL REPORT FOR PHASE I WILL COMPARE CONVENTIONAL OSCILLATORS AND THEIR DETRIMENTAL FACTORS TO NTC OSCILLATORS, AND DEMONSTRATE THE SUPERIORITY AND FEASIBILITY OF NTC'S APPROACH TO OSCILLATOR DESIGN.

NEOTRONICS CORP.
2498 KAYRON LANE
NORTH BELLMORE, NY 11710
Phone: (516) 785-6752

Topic#: 91-020 ID#: 91CRR-358
Office: CRREL
Contract #: DACA33-91-C-0033
PI: GEORGE J. DOUNDOULAKIS

Title: DEVELOPMENT OF A PORTABLE ICE-MEASURING INSTRUMENT

Abstract: THE HEAD PORTION OF THE PROPOSED ICE-MEASURING INSTRUMENT, WHEN SITTING ON THE ICE WILL DISPLAY A BRIM, ABOUT 7 INCHES ACROSS, WITH A SMALLER CONSOLE AT THE TOP, WILL HOLD FOUR TRANSDUCERS ARRANGED AT THE CORNERS OF A SQUARE, IN CONTACT WITH THE ICE SURFACE. THE CONSOLE WILL CONTAIN THE NECESSARY DRIVING, RECEIVING, AND COMPUTING CIRCUITRY AND A BATTERY. A HAND-HELD CONTROL AND DISPLAY UNIT, CONNECTED WITH THE MAIN UNIT THROUGH A RETRACTABLE CORD, WILL PERMIT THE OPERATOR FREEDOM OF STANDING AT A SHORT DISTANCE FROM THE HEAD. THE APPROACH INVOLVES TIMING OF THE TRAVEL OF ACOUSTIC PULSES FIRST GENERATED, THEN DETECTED AT THE ICE SURFACE AFTER BEING REFLECTED AT THE ICE/WATER INTERFACE. EQUATIONS HAVE BEEN DERIVED TO MAKE THE MEASUREMENT INDEPENDENT OF THE ACOUSTIC VELOCITY IN ICE AND CLOCK FREQUENCY. WAYS ARE PROPOSED OF AVOIDING DETECTION OF REFLECTED ACOUSTIC WAVES ON AIR BABBLES. THE INSTRUMENT PROVIDES SEVERAL MODES OF OPERATION, WHICH CAN USE CORRELATION BETWEEN MEASUREMENTS BY DIFFERENT SETS OF TRANSDUCERS TO OFFER A RELIABLE READING OF THE ICE THICKNESS. AS A BY-PRODUCT, THE INSTRUMENT MAY ALSO PROVIDE INFORMATION AS TO THE ICE DENSITY. IN PHASE I THE ELECTRONIC CIRCUIT, WHICH EMPLOYS A CALCULATOR CHIP, WILL BE BUILT AND BE USED IN ACTUAL MEASUREMENTS OF THICKNESS OF BLOCKS OF ICE OF VARIOUS DENSITIES AND WITH SIMULATED AIR BUBBLES. THE PROPOSED EQUIPMENT CAN HAVE COMMERCIAL APPLICATIONS, SUCH AS MEASURING THE ICE THICKNESS ON LAKES WHERE CHILDREN SKATE. VERIFICATION OF THE VALIDITY AND IMPLEMENTATION OF THE PROPOSED CONCEPTS CAN FURTHER THE ART OF NON-INVASIVE MEASUREMENT OF THICKNESSES OF MATERIALS BOTH SOLID AND FLUID.

NIMBLE COMPUTER CORP.
16231 MEADOW RIDGE WAY
ENCINO, CA 91436
Phone: (818) 501-4956

Topic#: 91-060 ID#: 91CEC-161
Office: CECOM
Contract #:
PI: HENRY G. BAKER, PHD

Title: AN ADA OBJECT-ORIENTED DATABASE FOR REAL-TIME MULTIPROCESSOR APPLICATIONS

Abstract: OBJECTIVE: TO DEVELOP A SPECIFICATION FOR AN OBJECT-ORIENTED MAIN-MEMORY SHARED DATABASE FOR A HOMOGENEOUS SHARED-MEMORY MULTI-PROCESSOR WHICH IS HIGHLY INTEGRATED WITH THE ADA LANGUAGE, AND PROGRAMMED AS MUCH AS POSSIBLE IN PORTABLE ADA. THIS IN-MEMORY DATABASE SHOULD PROVIDE FOR THE EXTREMELY EFFICIENT OPERATIONS REQUIRED OF A REAL-TIME, EMBEDDED, INTELLIGENT ROBOTICS MULTI-PROCESSOR-E.G., THE DARPA PILOT'S ASSOCIATE. THE HIGHEST EFFICIENCY IS TO BE OBTAINED BY KEEPING ALL DATA IN RAM MEMORY, USING STANDARD ADA DATATYPE FORMATS, USING SHARED-MEMORY RATHER THAN MESSAGE-PASSING TECHNIQUES WHENEVER POSSIBLE, AND RELYING ON HARDWARE CACHE-COHERENCY TECHNIQUES RATHER THAN SOFTWARE TECHNIQUES WHENEVER POSSIBLE. THE "BLACKBOARD ARCHITECTURE" USED TO IMPLEMENT INTELLIGENT BEHAVIOR WILL BE IMPLEMENTED ON TOP OF THIS OBJECT-ORIENTED MAIN-MEMORY SHARED DATABASE. THIS ADA DATABASE CAN ALSO SERVE AS A HIGHLY EFFICIENT "OBJECT CACHE" FOR

A MORE PERSISTENT, NON-REAL-TIME COMMERCIAL OBJECT-ORIENTED DATABASE.

NOMAC ENERGY SYSTEMS, INC.
22231 MULHOLLAND HWY, SUITE 108
WOODLAND HILLS, CA 91364
Phone: (818) 710-0295

Topic#: 91-191
Office: AVSCOM
Contract #:
PI: JAMES C. NOE

ID#: 91AVS-109

Title: A COMPACT, LIGHT WEIGHT CIRCUMFERENTIAL RECUPERATOR FOR THE ALLISON 250-C20B TURBOCHAFT ENGINE

Abstract: NOMAC ENERGY SYSTEMS, INC. IS DEVELOPING A CIRCUMFERENTIAL RECUPERATOR FOR SMALL GAS TURBINES. IT IS SMALLER, LIGHTER AND SUBSTANTIALLY LESS EXPENSIVE THAN CONVENTIONAL RECUPERATORS. ALTHOUGH THE CURRENT PLANNING IS FOR STATIONARY AND VEHICULAR APPLICATIONS, IT WOULD EASILY BE ADAPTED TO HELICOPTER GAS TURBINES TO IMPROVE THE RANGE AN/OR PAYLOAD. THE FUNDAMENTAL CHANGE WOULD BE TO WELD, RATHER THAN FORM, THE HEAT TRANSFER SURFACE, THUS PERMITTING THE USE OF THINNER GAUGE MATERIAL AND INCREASING THE SURFACE AREA. THE CIRCUMFERENTIAL RECUPERATOR HAS BEEN EVALUATED BE THE GAS RESEARCH INSTITUTE AND IS NOW BEING DEMONSTRATED UNDER A CONTRACT FROM THEM. NOMAC IS ALSO UNDER CONTRACT FROM THE FORD MOTOR COMPANY TO DESIGN A GAS TURBINE USING THE SAME CONCEPT. DELIVERY IS IN THE SUMMER OF 1992. FINALLY, THE RECUPERATOR HAS BEEN THOROUGHLY ANALYZED BY ALLISON GAS TURBINE DIVISION OF GENERAL MOTORS CORPORATION. THEY HAVE AGREED THAT THE CIRCUMFERENTIAL RECUPERATOR WOULD IMPROVE THE EFFICIENCY OF THEIR 250 SERIES, HELICOPTER, GAS TURBINES WITH A MINIMUM EFFECT ON WEIGHT AND FRONTAL AREA. ALLISON WILL SUPPORT NOMAC IF NOMAC WINS THIS SOLICITATION.

NORTH COAST INNOVATION, INC.
8001 SWEET VALLEY DRIVE
CLEVELAND, OH 44125
Phone: (216) 642-5644

Topic#: 91-166
Office: MTL
Contract #:
PI: L. SCOTT DUNCAN

ID#: 91MTL-096

Title: DRY IN-LINE THERMOPLASTIC MATRIX IMPREGNATION

Abstract: APPLICATIONS OF THERMOPLASTIC COMPOSITE TECHNOLOGY HAVE BEEN LIMITED BY THE LACK OF MANUFACTURING EQUIPMENT FOR THERMOPLASTIC MATRIX IMPREGNATION. THE OBJECTIVE OF THIS PROGRAM IS TO DEVELOP AN IN-LINE THERMOPLASTIC MATRIX IMPREGNATION MODULE WHICH CAN BE USED WITH EXISTING AUTOMATED COMPOSITE MANUFACTURING SYSTEMS DESIGNED FOR THERMOSET MATERIALS. TARGET APPLICATIONS INCLUDE AUTOMATED PROCESSES LIKE FILAMENT WINDING, PULTRUSION AND PREPREG PREPARATION. MAJOR TECHNICAL HURDLES TO BE OVERCOME INCLUDE ACHIEVING COMPLETE FIBER WET-OUT, MINIMIZING VOIDS, AND ATTAINING THE HIGH THROUGHPUTS REQUIRED FOR IN-LINE OPERATION WITH HIGH SPEED AUTOMATED FILAMENT WINDING EQUIPMENT. THE PLANNED APPROACH TAKE MAXIMUM ADVANTAGE OF THE THERMAL, FLUID AND MECHANICAL CHARACTERISTICS OF THE COMPONENTS TO ACHIEVE AN OPTIMIZED SYSTEM.

NOVA ELECTRONICS & SOFTWARE
1525 THIRD STREET, SUITE A201
RIVERSIDE, CA 92507
Phone: (714) 781-7332

Topic#: 91-040
Office: ARDEC
Contract #:
PI: DR. TUMAY O. TUMER

ID#: 91ARD-115

Title: AN INNOVATIVE, RADIATION RESISTANT AND HIGH RESOLUTION SYSTEM FOR X-RAY INSPECTION OF MUNITION ITEMS

Abstract: A THEORETICAL AND EXPERIMENTAL PROGRAM IS PROPOSED TO CARRY OUT A FEASIBILITY STUDY OF AN INNOVATIVE RADIATION RESISTANT DETECTOR SYSTEM WITH HIGH SPATIAL AND ENERGY RESOLUTION FOR 2-DIMENSIONAL IMAGING OF 300 KV TO 1 MV X-RAYS. IT WILL BE PRIMARILY DEVELOPED AND DESIGNED FOR X-RAY INSPECTION OF MUNITION ITEMS. IT IS EXPECTED TO HAVE STRONG POTENTIAL TO WORK CONTINUOUSLY UNDER HIGH X-RAY FLUXES WITHOUT SIGNIFICANT DEGRADATION OF ITS

PHYSICAL PROPERTIES. IT HAS EXCELLENT SPATIAL RESOLUTION OF 40 MICRON X 40 MICRON OR LARGER. IT ALSO HAS X-RAY PHOTON DIRECTION MEASUREMENT CAPABILITY WITH AN ANGULAR RESOLUTION OF ABOUT 1 DEGREE. THIS INFORMATION CAN LEAD TO 3-DIMENSIONAL IMAGING CAPABILITY. IT WILL ALSO HELP IDENTIFY AND REDUCE SCATTERED X-RAY PHOTON BACKGROUND. THE ENERGY OF THE X-RAY PHOTONS CAN BE MEASURED WITH AN ENERGY RESOLUTION OF ABOUT 5% AT L MEV. THIS WILL ALSO ENABLE THE IDENTIFICATION AND REJECTION OF THE SCATTERED X-RAY PHOTONS, WHICH WILL SIGNIFICANTLY DECREASE THE BACKGROUND, ESPECIALLY IF MONOENERGETIC X-RAY SOURCES ARE USED. THE PROPOSED DETECTOR ALSO HAS HIGH SENSITIVITY WHICH WILL HELP REDUCE X-RAY SOURCE STRENGTH AND ENABLE THE IMAGING OF HIGH DENSITY AND/OR LARGE MUNITION ITEMS. THE DETECTOR CAN BE EASILY SCALED UP OR DOWN IN SIZE TO ADJUST ITS SENSITIVITY TO MATCH THE SIZE AND DENSITY OF ITEMS UNDER INSPECTION. IT WILL HAVE REAL TIME DATA ANALYSIS AND IMAGING HARDWARE AND SOFTWARE FOR INSTANTANEOUS IMAGING OF MUNITION ITEMS. PRELIMINARY MONTE CARLO CALCULATIONS SIMULATING A GENERIC DETECTOR SHOW HIGH SENSITIVITY, GOOD ANGULAR AND ENERGY RESOLUTIONS FOR 300 KEV TO 30 MEV ENERGY RANGE.

NTI, INC.
4130 LINDEN AVENUE
DAYTON, OH 45432
Phone: (513) 254-3171

Topic#: 91-209 ID#: 91ARI-015
Office: ARI
Contract #:
PI: ROBERT D. O'DONNELL, PH.D

Title: ENHANCING SOLDIER CAPABILITIES: A COMPREHENSIVE LITERATURE ASSESSMENT

Abstract: THIS SBIR PHASE I EFFORT PROPOSES A COMPREHENSIVE REVIEW OF THE LITERATURE TO IDENTIFY ALTERNATIVE MODELS FOR CATEGORIZING THE TRAINING OF THOSE INDIVIDUALS WITH DIFFERING LEVELS OF WORKLOAD TOLERANCE. POSSIBLE INTERVENTION TECHNIQUES WILL BE ANALYZED IN TERMS OF THIS MODEL, AND A TRAINING ENHANCEMENT TECHNIQUE WILL BE PROPOSED. THE MODEL OF SECRIST (1989) WILL PROVIDE A STARTING POINT FOR SYNTHESIZING AN INTERVENTION TECHNIQUE TO IMPROVE WORKLOAD TOLERANCE IN IDENTIFIED LOW TOLERANT SOLDIERS. NEURAL NETWORK USAGE WILL BE USED IN MODEL DEVELOPMENT AND WILL BE CONSIDERED IN DESIGNING AN INTERVENTION TECHNIQUE. PLANS FOR CONDUCTING A PHASE II EFFORT TO CREATE A PROTOTYPE TRAINER WILL BE PROPOSED.

OPHIDIAN PHARMACEUTICALS, INC.
2800 SOUTH FISH HATCHERY ROAD
MADISON, WI 53711
Phone: (608) 271-0878

Topic#: 91-027 ID#: 91MED-302
Office: MEDICAL
Contract #: 91-C-1108
PI: DOUG STAFFORD

Title: PRODUCTION AND CHARACTERIZATION OF AN AVIAN RICIN ANTITOXIN

Abstract: OPHIDIAN PHARMACEUTICALS PROPOSES TO TEST THE FEASIBILITY OF ADAPTING ITS TECHNOLOGY FOR PRODUCING AND PURIFYING THERAPEUTIC ANTIBODIES FROM THE EGG YOLKS OF HYPERIMMUNIZED LAYING HENS TO THE DEVELOPMENT OF RICIN ANTITOXIN. THIS TECHNOLOGY IS WELL SUITED TO THE RAPID DEVELOPMENT OF TOXIN-NEUTRALIZING THERAPEUTICS AGAINST HIGHLY-VARIABLE TOXINS OR A WIDE VARIETY OF TOXIC THREATS. COMMERCIALLY AVAILABLE ANTITOXINS ARE TYPICALLY PARTIALLY FRACTIONATED SERUM ANTIBODIES DERIVED FROM HORSES HYPERIMMUNIZED WITH TOXIN OR TOXOID (HOWEVER NO COMMERCIAL RICIN ANTITOXIN EXISTS). THESE ANTIBODY PREPARATIONS, WHILE EFFECTIVE IN MITIGATING THE TOXIC EFFECTS OF THE POISON, OFTEN ELICIT SERIOUS AND SOMETIMES LIFE THREATENING SIDE EFFECTS. HORSE-DERIVED ANTI-BODIES CAN INDUCE ANTI-COMPLEMENT ACTIVITY AND ANAPHYLAXIS, AND IF LARGE AMOUNTS OF ANTITOXIN ARE REQUIRED, SERUM SICKNESS IS FREQUENTLY OBSERVED. THE AVIAN PRODUCTION SYSTEM HAS BEEN USED TO DEVELOP EFFECTIVE ANTIDOTES AGAINST COMPLEX ANIMAL VENOMS, AND ARE EXPECTED TO SIGNIFICANTLY REDUCE OR ELIMINATE THOSE SIDE EFFECTS ASSOCIATED WITH HORSE (OR MAMMALIAN)-DERIVED IMMUNOTHERAPIES. FURTHERMORE, THE AVIAN MANUFACTURING PROCESS MAKES PRACTICAL THE RAPID DEVELOPMENT AND LARGE SCALE PRODUCTION OF ANTITOXINS AGAINST RICIN AND OTHER TOXINS OF MILITARY CONCERN. THE PROPOSED RESEARCH WILL INCLUDE THE DEVELOPMENT OF A HIGHLY PURIFIED AVIAI RICIN ANTITOXIN AND CHARACTERIZATION OF ITS TOXIN

NEUTRALIZATION CAPABILITIES IN LABORATORY ANIMALS.

OPHIR CORP.
3190 SOUTH WADSWORTH BOULEVARD, SUITE 100
LAKEWOOD, CO 80227
Phone: (303) 986-1512
Topic#: 91-012 ID#: 91ASL-301
Office: ASL
Contract #: DAAD07-91-C-0167
PI: DR. LOREN NELSON
Title: A PORTABLE FM-CW DOPPLER RADAR TO PROVIDE METEOROLOGICAL DATA IN THE FIELD
Abstract: A PORTABLE, LOW COST FM-CW DOPPLER WEATHER RADAR IS PROPOSED TO PROVIDE "REAL-TIME" METEOROLOGICAL DATA IN THE FIELD. SUCH A SYSTEM WOULD ASSIST BATTLEFIELD DECISION MAKING BY MONITORING CONDITIONS PERTINENT TO MICROWAVE DUCTING, ARTILLERY CONTROL, AND DETERMINING LOCAL WEATHER. CURRENT DOPPLER WEATHER RADARS TEND TO BE PULSED, VERY LARGE, AND TO COST MILLIONS OF DOLLARS; THEY REQUIRE A LARGE OPERATIONAL STAFF AND A HUGE DATA PROCESSING INVESTMENT. WE PROPOSE A NEW MICROWAVE HARDWARE AND DATA PROCESSING TECHNOLOGY THAT WILL MAKE IT FEASIBLE FOR INDIVIDUAL METEOROLOGICAL USERS TO HAVE THEIR OWN DEDICATED, LOW-COST, PORTABLE, RANGE-RESOLVED DOPPLER WEATHER RADARS. A SPECIFIC GOAL IS TO USE THIS TECHNOLOGY TO PROVIDE ARMY METEOROLOGISTS WITH AN IMPORTANT TOOL FOR ASSESSING BATTLEFIELD ATMOSPHERIC AND WEATHER PARAMETERS IN "REAL-TIME." THE HARDWARE SOLUTION PROPOSED INVOLVES HOMODYNE SOLID-STATE FREQUENCY-MODULATED CONTINUOUS-WAVE (FM-CW) TRANSMITTERS, LOW-NOISE INTEGRATED CIRCUIT RECEIVERS, AND HIGH SPEED DIGITAL SIGNAL PROCESSING ON 80386 BASED PERSONAL COMPUTERS. THE AVAILABILITY OF A HIGH SPEED SIGNAL PROCESSING CAPABILITY ALLOWS THE ADVANTAGES OF FM-CW HARDWARE SIMPLICITY AND PORTABILITY, WHILE TAKING ON A VERY SUBSTANTIAL RANGE-RESOLVED DOPPLER SIGNAL PROCESSING COMPUTATIONAL LOAD.

OPTECH LABORATORY
22048 SHERMAN WAY #113
CANOGA PARK, CA 91303
Phone: (818) 710-9042
Topic#: 91-128 ID#: 91ARO-030
Office: ARO
Contract #:
PI: DR. SHI-KAY YAO
Title: NOVEL OPTICAL PROCESSORS FOR PHASED ARRAY ANTENNA
Abstract: OPTICAL PROCESSING OF PHASED ARRAY ANTENNA SIGNAL IS PRESENTED. THE MAJOR ISSUE OF SENDING JITTER FREE RF CARRIER TO THE ANTENNA, AND HIGH THROUGHPUT PROCESSING OF MULTI-BEAM PHASED ARRAY SIGNAL AS WELL AS THE INTERFERENCE CANCELLATION LOOP PROCESSORS ARE ADDRESSED. PHASE CONJUGATION PROCESSOR WORKING WITH AN OPTICAL FIBER LOOP IS PROPOSED FOR JITTER FREE RF DELIVERY. AN EXTREMELY HIGH SPEED 2-D IMAGING SLM IS PROPOSED FOR PROCESSING OF PHASED ARRAY ANTENNA DATA. THE PHASE I PROGRAM WILL ESTABLISH THE FEASIBILITY OF THESE PROPOSED TECHNOLOGIES BY PERFORMANCE ANALYSIS, MODELING, AND EXPERIMENTAL DEMONSTRATION. PRELIMINARY DESIGN WILL BE PROVIDED FOR AN ADVANCED OPTICAL PHASED ARRAY PROCESSOR SYSTEM.

OPTICAL E.T.C., INC.
3077 LEEMAN FERRY RD.
HUNTSVILLE, AL 35801
Phone: (205) 880-8207
Topic#: 91-074 ID#: 91MIC-003
Office: MICOM
Contract #: DAAH01-92-C-R170
PI: ARTHUR WERKHEISER
Title: INFRARED SCENE PROJECTOR WITH REAL-TIME FRAME RATES
Abstract: The objective of this research effort is to develop and demonstrate the fundamental technology for an infrared scene projection system that is compatible with military hardware-in-the-loop simulation applications. During the Phase I effort, a working 2-D array of computer controllable pixels will be fabricated and tested. Results of Phase I will be used to configure a complete infrared scene projector.

OPTICAL E.T.C., INC.
3077 LEEMAN FERRY RD.
HUNTSVILLE, AL 35801
Phone: (205) 880-8207
Topic#: 91-082 ID#: 91MIC-063
Office: MICOM
Contract #: DAAH01-92-C-R107
PI: ARTHUR H. WERKHEISER
Title: INFRARED WAVELENGTH BEAM COMBINING TECHNIQUES FOR MULTI-COLOR PROJECTOR APPLICATIONS
Abstract: The objective of this research effort is to develop and demonstrate an infrared wavelength beam combining technique of multiple infrared projectors signals whether multispectral or not. The proposed technique allows low loss combining of these signals in contrast to the conventional methods that exhibit high loss. Phase I efforts include the determination of the IR beam combiner parametric optimization, assessment of alternate fabrication techniques, fabrication of a demonstration combiner, design of an (optional) all reflective collimating telescope for use with the combiner, and laboratory demonstration of the beam combiner. Phase II efforts include fabrication and demonstration of a full-scale beam combiner with projectors suitable for HWIL simulations of multi-color IR missile systems.

OPTIMETRICS, INC.
2008 HOGBACK ROAD, SUITE 6
ANN ARBOR, MI 48105
Phone: (505) 523-4986
Topic#: 91-105 ID#: 91105-04
Office: TACOM
Contract #:
PI: DR. RALPH J. BREWER
Title: ADVANCED MULTI-CHANNEL DIGITAL DATA ACQUISITION AND STORAGE SYSTEM
Abstract: A PHASE I CONCEPT DEVELOPMENT PROGRAM IS PROPOSED FOR A HIGH-SPEED MULTI-CHANNEL DIGITAL DATA ACQUISITION SYSTEM, WITH ARCHIVAL OF DATA IN DATABASE FORMAT ON OPTICAL DISK. THE FOLLOWING ASPECTS OF SYSTEM DEVELOPMENT WILL BE CONSIDERED: EXISTING COMMERCIAL EQUIPMENT, SIGNAL PROCESSING, MICROPROCESSORS AND BUS STRUCTURES, DATA ARCHIVAL, OPTICAL DISK TECHNOLOGY, IMAGERY DATA ACQUISITION, AND SOFTWARE STRUCTURE.

OPTRA, INC.
66 CHERRY HILL DRIVE
BEVERLY, MA 01915
Phone: (508) 921-2100
Topic#: 91-168 ID#: 91MTL-094
Office: MTL
Contract #:
PI: DAVID W. VOORHES
Title: BALANCED NON-CONTRACTING LASER EXTENSOMETER FOR BIAXIAL STRAIN MEASUREMENTS
Abstract: ENHANCEMENTS TO A NON-CONTACTING, LASER BASED EXTENSOMETER FOR REAL-TIME MEASUREMENTS OF BIAXIAL STRAIN ON COMPOSITES, PLASTICS, METALS, CERAMICS, AND A VARIETY OF OTHER MATERIALS INCLUDING ELASTOMERS ARE PROPOSED. THESE ENHANCEMENTS WILL ENABLE RESEARCHERS TO STUDY MULTI-AXIAL STRAIN BEHAVIOR (I.E. AXIAL, TRANSVERSE, AND TORSIONAL) ON MATERIALS SUBJECTED TO UNIAXIAL AND MULTI-AXIAL LOADING CONDITIONS. THIS CAPABILITY WILL SIMPLIFY CALCULATIONS OF YOUNG'S MODULUS, POISSON'S RATIO, AND OTHER MATERIAL PARAMETERS USED FOR DESIGNING COMPOSITES AND ELASTOMER MATERIALS. THE APPROACH DOES NOT REQUIRE MARKINGS ON THE SPECIMEN OR ANY SORT OF SURFACE PREPARATION AND WILL NOT INFLUENCE THE PERFORMANCE OF THE SPECIMEN DURING THE TEST. THE ENHANCEMENTS WILL INCLUDE MODIFICATIONS TO THE OPTICAL SYSTEM OF A NON-CONTACT LASER EXTENSOMETER AND THE IMPLEMENTATION OF NEW SIGNAL PROCESSING ELECTRONICS TO ADDRESS LOW RETURN SIGNALS COMMONLY SEEN ON DARK COMPOSITES AND MATERIALS THAT EXHIBIT POOR LIGHT SCATTERING PROPERTIES. TECHNICAL OBJECTIVES INCLUDE MEASUREMENT RESOLUTION ENHANCEMENTS TO 0.5 MICROSTRAIN, IMPROVED STRAIN RATE CAPABILITY OF 50 INCHES/INCH/SECOND, AND INCREASED STANDOFF DISTANCE OF 16 INCHES FOR BIAXIAL MEASUREMENTS. STRAIN MEASUREMENTS CAN ALSO BE MADE ON MATERIALS ENCLOSED IN ENVIRONMENTAL OR THERMAL CHAMBERS AND SUBJECTED TO EXTREME TEMPERATURES, PRESSURES, OR OTHER ENVIRONMENTAL CONDITIONS.

ORINCON CORP.
9363 TOWNE CENTRE DRIVE
SAN DIEGO, CA 92121
Phone: (301) 290-3280
Topic#: 91-058 ID#: 91CEC-133
Office: CECOM
Contract #:
PI: S. LAWRENCE MARPLE, JR.
Title: SIGNAL DECOMPOSITION
Abstract: A SIGNAL DECOMPOSITION APPROACH BASED ON COMPLEX EXPONENTIAL MODELING OF THE SIGNAL IN NOISE IS PROPOSED HERE FOR USE WITH THE AUTOMATIC TARGET RECOGNITION (ATR) PROBLEM. SUCH AN APPROACH HAS BEEN USED VERY SUCCESSFULLY TO RECOGNIZE NONSTATIONARY SIGNALS FROM UNDERWATER ACOUSTIC SENSORS AND FROM MODULATION-ON-PULSE RADAR WAVEFORMS. THE TECHNIQUE DOES NOT REQUIRE AN A PRIORI KNOWLEDGE OF THE NUMBER OF COMPLEX EXPONENTIAL COMPONENTS OR OTHER MODEL ORDER INFORMATION. FAST COMPUTATIONAL ALGORITHMS EXIST TO EXPLOIT THE STRUCTURE OF THE EQUATIONS TAT ESTIMATE THE PARAMETERS OF THE SIGNAL DECOMPOSITION. SINGULAR-VALUE DECOMPOSITION (SVD) HAS BEEN USED TO ENHANCE THE SIGNAL DECOMPOSITION IN THE PRESENCE OF NOISE. THIS PROPOSAL WILL DEVELOP FURTHER ENHANCEMENTS, INCLUDING THE USE OF TOTAL LEAST SQUARES (TLS) TECHNIQUES, GENERALIZED SINGULAR-VALUE DECOMPOSITION (GSVD) FOR COLORED NOISE SITUATIONS, AND HIGHER-ORDER CORRELATION STATISTICS TO SUPPRESS GAUSSIAN NOISE CONTRIBUTIONS THAT CAN BIAS SIGNAL DECOMPOSITION ALGORITHMS.

PACIFIC RIM ENGINEERING
P.O. BOX 5639, 8055 MANCHESTER AVE.
PLAYA DEL REY, CA 90296
Phone: (213) 823-7234
Topic#: 91-109 ID#: 91TEC-001
Office: TECOM
Contract #:
PI: MR. HARRY NELSON
Title: AERIAL CABLE INSPECTION TROLLEY
Abstract: THE PURPOSE OF THE PHASE I STUDY IS TO DEVELOP A CONCEPTUAL DESIGN FOR A SELF CONTAINED AERIAL CABLE INSPECTION TROLLEY THAT CAN EVALUATE THE CONDITION OF A SUSPENDED 16,000 FOOT, 2 INCH DIAMETER SYNTHETIC CABLE IN 5-10 MINUTES. THE SYSTEM WILL CONSIST OF EXTERNAL AND INTERNAL INSPECTION MODULES FOR DAMAGE OR DETERIORIZATION IN THE CABLE STRUCTURE, AS WELL AS DATA STORAGE, SUSPENSION AND PROPULSION, POWER DISTRIBUTION, MASTER CONTROL, TELEMETRY, AND REMOTE DISPLAYS AND CONTROLS MODULES. IN RECENT YEARS IMAGE PROCESSING AND PATTERN RECOGNITION TECHNIQUES HAVE BEEN DEVELOPED TO RECOGNIZE VARIOUS TYPES OF FLAWS, DEFECTS, OR OTHER TYPES OF DEFINED PATTERNS IN INDUSTRY. THESE REAL TIME INSPECTION SYSTEMS HAVE BECOME FEASIBLE DUE TO THE EVOLUTION OF HIGH-RESOLUTION LINE-SCAN CAMERAS AND HIGH-PERFORMANCE MICRO-PROCESSORS. THE DESIGN APPROACH SELECTED FOR THE AERIAL CABLE INSPECTION TROLLEY IS BASED PRIMARILY ON THIS TYPE OF OPTICAL INSPECTION SYSTEM FOR ACHIEVING A HIGH INTERNAL CONDITION OF THE CABLE AT HIGH SPEED WILL BE INVESTIGATED AND A TRADEOFF EVALUATION PERFORMED. METHODS SUCH AS ULTRASONIC, MICROFOCUS X-RAY, AND CAPACITIVE SENSORS WILL BE SURVEYED FOR THIS APPLICATION. THE INSPECTION MODULES WILL BE INTEGRATED INTO A COMPLETE TROLLEY CONCEPTUAL DESIGN THAT INCLUDES DATA STORAGE, SUSPENSION AND PROPULSION, MASTER CONTROL PROCESSOR, AND DATA TELEMETRY.

PENETRADAR CORP.
6865 WALMORE ROAD
NIAGARA FALLS, NY 14304
Phone: (716) 731-4369
Topic#: 91-043 ID#: 91BRD-035
Office: BRDEC
Contract #:
PI: ANTHONY J ALONGI
Title: DEVELOPMENT OF A RADAR MINE DETECTOR
Abstract: THIS PROPOSAL RELATES TO THE DEVELOPMENT OF A RADAR BASED MINE DETECTOR FOR METALLIC AND NON-METALLIC, BURIED MINES USING EXISTING STATE-OF-THE-ART HIGH RESOLUTION, GROUND PENETRATING RADAR (GPR) FOR VEHICULAR AND MAN-PORTABLE USE. THIS RESEARCH WILL ATTEMPT TO (1) VERIFY THAT GPR IS A VIABLE TECHNIQUE FOR MINE DETECTION BASED ON ANALYTICAL MODELING OF RADIO FREQUENCY PROPAGATION IN LOSSY DIELECTRIC MEDIA, (2) DETERMINE RADAR

EQUIPMENT SPECIFICATIONS NECESSARY FOR SUCCESSFUL MINE DETECTION BASED ON US ARMY REQUIREMENTS, AND EVALUATION OF CURRENT PENETRADAR CORPORATION GPR RADAR EQUIPMENT FOR THIS APPLICATION, (3) DEFINE THE OPTIMUM RADAR SIGNAL PROCESSING TECHNIQUES FOR USE IN PHASE II AND DETERMINE THE REQUIREMENTS FOR SIGNAL PROCESSING HARDWARE/SOFTWARE RELATIVE TO THE CONSTRAINTS RESULTING FROM VEHICULAR AND MAN-PORTABLE USE, AND (4) DEVELOPMENT OF AN EXPERIMENTAL METHOD, TO BE USED IN PHASE II, TO VALIDATE ANALYTICAL RESULTS. FOUNDERS OF THE PROPOSING ORGANIZATION HAVE HAD CONSIDERABLE EXPERIENCE IN RADAR MINE DETECTION WITH THE DEVELOPMENT AND DESIGN OF PREVIOUS EXPERIMENTAL ARMY RADAR MINE DETECTION TECHNOLOGY AND EQUIPMENT. THE PROPOSED EFFORT WILL EXTEND UPON THIS PREVIOUS WORK IN NON-METALLIC MINE DETECTION.

PERCEPTUAL IMAGES
15951 LOS GATOS BLVD, SUITE 7
LOS GATOS, CA 95032
Phone: (408) 356-4562

Topic#: 91-139
Office: ETDL
Contract #:
PI: JOHN L. MILLER

ID#: 91ETD-063

Title: ANALYSIS OF A FLAT PANEL AUTOSTEREOSCOPIC VIDEO DISPLAY AND A SINGLE LENS STERO VIDEO CAMERA

Abstract: THREE-DIMENSIONAL DISPLAYS WITHOUT VIEWING GLASSES (AUTOSTEREOSCOPIC) CAN BE CONSTRUCTED FROM THE PERFECT PIXEL ALIGNMENT FOUND IN RECENTLY DEVELOPED FLAT PANEL DISPLAYS. THESE DISPLAYS CAN BE CONSTRUCTED FROM LIQUID CRYSTAL, GAS PLASMA, CRT OR ELECTROLUNINESCENT TECHNOLOGIES. THE PREFERRED TECHNOLOGY FOR AUTOSTEREOSCPIC USE HAS NOT BEEN DETERMINED. PERCEPTUAL IMAGES PROPOSED TO SIMULATE THE PERFORMANCE OF THE DIFFERENT DISPLAY TYPES USING COMPUTER GRAPHICS. THE PARAMETERS TO BE TESTED INCLUDE PIXEL DENSITY, GRAY SCALE, COLOR CAPABILITY AND BRIGHTNESS. RECENT DEVELOPMENTS IN SINGLE SENSOR 3-D CAMERAS HAVE SHOWN THAT THIS TECHNOLOGY IS WELL SUITED TO AUTOSTEREOSCOPIC DISPLAYS. THE COMPUTER SIMULATION OF THE PROPER DISPLAY TYPE WILL DETERMINE THE SPECIFICATIONS FOR THE CAMERA. PERCEPTUAL IMAGES HAS TWO APPROACHES FOR THE SINGLE SENSOR CONCEPT AND BOTH WILL BE ANALYZED FOR SUITABILITY. THE DISPLAY WILL BE MODELED BY USING A COMMERCIALLY AVAILABLE LENTICULAR OVER A HIGH QUALITY FILM OUTPUT FROM THE COMPUTER. A FULL ANALYSIS WILL BE PERFORMED TO DETERMINED THE SPECIFIC REQUIREMENTS FOR THF DISPLAY AND CAMERA BEFORE HARDWARE IS CONSTRUCTED IN PHASE I.

PHASE IV SYSTEMS, INC.
3405 TRIANA BLVD.
HUNTSVILLE, AL 35805
Phone: (205) 535-2100

Topic#: 91-235
Office: SDC
Contract #:
PI: DR. MICHAEL D. FAHEY

ID#: 91SDC-242

Title: TRACKING RADAR ADVANCED SIGNAL PROCESSING AND COMPUTNG FOR KWAJALEIN ATOLL (KA) APPLICATION

Abstract: AN INEXPENSIVE IMPROVEMENT TO THE AN/FPQ-19 RADAR CAN BE OBTAINED BY THE ADDITION OF A COHERENT ON RECEIVE PROCESSOR (CORP); THIS ADDITION WOULD ALLOW THE COHERENT PROCESSING OF RETURN SIGNALS BY SAMPLING BOTH THE TRANSMIT WAVEFORM AND THE RECEIVE SIGNALS AND PERFORMING COHERENT PROCESSING ON THE INDIVIDUAL RECEIVE/TRANSMIT SIGNALS. THIS FEATURE WILL ENABLE THE KWAJALEIN MISSILE RANGE TO HAVE REAL TIME ACCESS TO THE RANGE/DOPPLER MATRIX FOR TARGETS OF INTEREST. THIS ABILITY WILL ALLOW RANGE OPERATORS TO VIEW THE TARGETS RANGE/VELOCITY PROFILE ALLOWING THE OPERATOR TO VISUALLY DISCERN OBJECT STAGING, OBJECT SEPARATION AND BREAKUP, BODY ROTATION, ETC. THE ADDITION OF THE CORP WILL ALSO PROVIDE EXTENDED RADAR RANGE PERFORMANCE.

PHASEX CORP.
360 MERRIMACK STREET
LAWRENCE, MA 01843
Phone: (508) 794-8686
Topic#: 91-068 ID#: 91CRD-132
Office: CRDEC
Contract #:
PI: JAMES J. WATKINS
Title: SUPERCRITICAL FLUID NUCLEATION FOR IMPROVED DISSEMINATION OF POWDERED MATERIALS
Abstract: SUPERCRITICAL FLUID NUCLEATION (SFN) IS PROPOSED AS THE MECHANISM FOR AN INNOVATIVE, IMPROVED METHOD FOR THE DISSEMINATION OF ULTRA-FINE PARTICLES. THE CONCEPT, AS APPLIED TO THE STATED TOPIC, INVOLVES THE RAPID EXPANSION OF A SOLUTION OF RIOT CONTROL AGENTS IN SUPERCRITICAL OR NEAR CRITICAL CARBON DIOXIDE FROM A SMALL CANISTER TO PRODUCE A FINE AEROSOL OF SOLID PARTICLES WHOSE SIZE CAN BE CONTROLLED BY EXPANSION CONDITIONS. SFN HAS BEEN DEMONSTRATED PREVIOUSLY FOR ITS ABILITY TO PRODUCE PREDICTABLE PARTICLE SIZES RANGING FROM SUBMICRON TO TENS OF MICRONS AND IS CURRENTLY UNDER EVALUATION AS A MEANS OF PROVIDING A SUBMICRON MONODISPERSED PARTICLE GENERATED FOR LASER DOPPLER VELOCIMETRY. EXPLOITING SFN TECHNOLOGY AS A MEANS OF DISPERSING RIOT CONTROL AGENTS HAS A NUMBER OF POTENTIAL ADVANTAGES. FIRST, SUBMICRON PARTICLES, WHICH HAVE BENEFICIAL ADSORPTION AND TRANSPORT PROPERTIES, CAN BE PRODUCED. SECONDLY, CARBON DIOXIDE IS NON-TOXIC AND INFLAMMABLE AND BECAUSE GAS EXPANSION IS THE MECHANISM FOR PARTICLE RELEASE, PYROTECHNIC MATERIAL IS ELIMINATED. FINALLY, BECAUSE THE CONCEPT UTILIZES A SOLUTION OF RIOT CONTROL AGENTS IN CARBON DIOXIDE THE PRODUCTION, HANDLING, AND PACKAGING OF NOXIOUS FINE PARTICLES IS ELIMINATED.

PHONON CORP.
7 HERMAN DRIVE, P.O. BOX 549
SIMSBURY, CT 06070
Phone: (203) 651-0211
Topic#: 91-138 ID#: 91ETD-054
Office: ETDL
Contract #:
PI: DR. TOM MARTIN
Title: SAW FOURIER TRANSFORM SUBSYSTEM WITH DIGITAL CORRECTION
Abstract: THE DOD HAS AN ONGOING REQUIREMENT FOR A REAL TIME SPECTRUM ANALYZER WITH 15 KHZ RESOLUTION, 60 MHZ BANDWIDTH, 60 DB DYNAMIC RANGE (INCLUDING SIDELOBES). PAST ALL SAW AND ALL DIGITAL SOLUTIONS HAVE NOT MET ALL OF THESE REQUIREMENTS. IT IS PROPOSED TO DEVELOP A SAW CHIRP FOURIER TRANSFORMER WITH DIGITAL CORRECTION WHICH IS A HYBRID OF THE DIGITAL AND SAW APPROACHES COMBINING THE BEST FEATURES OF BOTH TECHNOLOGIES. THE PRESENT (PHASE I) OBJECTIVE IS TO STUDY AND MODEL THE APPROACH, AND IN ADDITION DEMONSTRATE A SUBSYSTEM WITH 20 MHZ BANDWIDTH, 40 KHZ RESOLUTION, AND 60 DB SIDELOBES.

PHOTONICS RESEARCH, INC.
1019 PARKLAND PLACE, S.E.
ALBUQUERQUE, NM 87108
Phone: (505) 262-1705
Topic#: 91-242 ID#: 91SDC-033
Office: SDC
Contract #:
PI: GREG R. OLBRIGHT, PHD
Title: THREE-DIMENSIONAL OPTOELECTRONIC SIGNAL PROCESSOR USING SURFACE-EMITTING LASER INTERCONNECTS
Abstract: THE OBJECTIVE OF THIS PROGRAM IS TO DEVELOP AN ULTRA HIGH-SPEED OPTOELECTRONIC SIGNAL PROCESSOR BASED ON OPTICAL INTERCONNECTS TO ACHIEVE ORDERS OF MAGNITUDE IMPROVEMENT IN THE PERFORMANCE OF COMPUTING AND SIGNAL PROCESSING SYSTEMS AND SUITABLE FOR MANY APPLICATIONS SUCH AS: OPTICAL SIGNAL PROCESSING AND COMPUTING, SURVEILLANCE, TRACKING, ACQUISITION, AND KILL ASSESSMENT. THE CLOCK SPEEDS OF ALL-ELECTRONIC COMPUTERS ARE TWO TO THREE ORDERS OF MAGNITUDE SLOWER THAN THE SPEED CAPABILITIES OF THE ELECTRONIC LOGIC DEVICES ON THE CHIPS DUE TO FUNDAMENTAL CONSTRAINTS IN IMPEDANCE MATCHING AND THE VON NEWMANN BOTTLENECK. WE PROPOSE TO OVERCOME THESE SPEED LIMITATIONS BY USING OPTOELECTRONIC INTERCONNECTS. OF THE MANY OPTOELECTRONIC DEVICES AVAILABLE, (E.G. SPATIAL-LIGHT MODULATORS, LEDS, EDGE-EMITTING SEMICONDUCTOR LASERS, ETC.) THE VERTICAL-CAVITY SURFACE-EMITTING LASER PROVIDES AN INTERCONNECTION CAPABILITY HAVING THE

BEST SPEED, POWER, RELIABILITY, AND EASE OF IMPLEMENTATION. FURTHERMORE MONOLITHIC VERTICAL INTEGRATION OF THE MICROLASER WITH ITS DRIVER REDUCES TO NEARLY ZERO THE LENGTH OVER WHICH HIGH-SPEED, RELATIVELY HIGH-POWER SIGNALS MUST PROPAGATE. IN THIS PROGRAM WE PROPOSE TO DEVELOP A VERTICALLY INTEGRATED STRUCTURE WITH SPECIFIC REGIONS SERVING AS RECEIVERS WHILE OTHERS FUNCTION AS TRANSMITTERS AND DESIGN A PROCESSOR BASED ON THIS INTERCONNECTION SCHEME. OUR PROPOSED PROCESSOR WILL INITIALLY CONSIST OF A MULTIPLICITY OF VERTICALLY (THREE-DIMENSIONAL) STACKED PLANES. EACH PLANE WILL BE COMPRISED OF GAAS ELECTRONIC LOGIC AND OPTOELECTRONIC INTERPLANE INTERCONNECTS CONSISTING OF SURFACE-EMITTING LASER TRANSMITTERS AND HIGH-SPEED PHOTOTRANSISTORS AS RECEIVERS. THIS WILL SET THE STAGE FOR DESIGNING NEW CHIPS OPTIMIZED TO TAKE ADVANTAGE OF THE INCREASED SPEED OF THESE INTERCONNECTS AND FOR IMPLEMENTING A HIGH-SPEED THREE-DIMENSIONAL OPTOELECTRONIC SIGNAL PROCESSOR.

PHYSICAL OPTICS CORP.
RESEARCH AND DEVELOPMENT DIV., 20600 GRAMERCY PL.
TORRANCE, CA 90501
Phone: (213) 320-3088

Topic#: 91-071
Office: CRDEC
Contract #:
PI: TOMASZ JANNSON

ID#: 91CRD-064

Title: COMPACT RAMAN DETECTOR FOR CHEMICAL CONTAMINANTS BASED ON NOVEL SIGNAL PROCESSING TECHNIQUES

Abstract: PHYSICAL OPTICS CORPORATION (POC) PROPOSES TO DEVELOP A NOVEL REAL-TIME FIBER OPTIC RAMAN DETECTOR CAPABLE OF DETECTING LIQUID OR SOLID CONTAMINANTS AT SHORT DISTANCES. THIS NEW DETECTOR WILL BE BASED ON NEW OPTICAL COMPONENTS AND NOVEL PROCESSING TECHNIQUES. THE DETECTOR WILL HAVE THE ADVANTAGES OF REAL-TIME OPERATION COMBINED WITH SENSITIVITY EQUAL TO THAT OFFERED BY CONVENTIONAL SPECTROSCOPIC TECHNIQUES, ALL THAT AT SIGNIFICANT COST SAVINGS. THE ADVANTAGES OF POC'S RAMAN DETECTOR DERIVE FROM THE NOVEL TECHNIQUES OF HOLOGRAPHIC FILTERING, NON-IMAGING BEAM TRANSFORMATIONS AND WAVELENGTH DIVISION MULTIPLEXING. THE RESULTING DETECTOR WILL BE EXTREMELY COMPACT AND HIGHLY RUGGED, REQUIRING LITTLE MAINTENANCE. THUS, POC'S DETECTOR WILL BE VERY EASY TO DEPLOY UNDER FIELD CONDITIONS. IT WILL BE CAPABLE OF DETECTING VARIOUS CONTAMINANTS AT LOW CONCENTRATIONS, BELOW THE PART PER MILLION (PPM) RANGE. THE SUCCESS OF THIS PROJECT WILL RESULT IN THE MOST ADVANCED FIELD DEPLOYABLE RAMAN DETECTION TECHNOLOGY.

PHYSICAL OPTICS CORP.
20600 GRAMERCY PLACE, SUITE 103
TORRANCE, CA 90501
Phone: (213) 530-1416

Topic#: 91-144
Office: ETDL
Contract #:
PI: MICHAEL R. WANG

ID#: 91ETD-093

Title: OPTICALLY ASSISTED THREE-DIMENSIONAL PACKAGING FOR MULTICHIP MODULE APPLICATIONS

Abstract: IN THIS PROGRAM, PHYSICAL OPTICS CORPORATION (POC) PROPOSES A NEW APPROACH TO THREE-DIMENSIONAL (3-D) MICROCIRCUIT PACKAGING USING WAVEGUIDE OPTICAL INTERCONNECT TECHNIQUES. THIS WAVEGUIDE INTERCONNECTS INCLUDES ELECTROPTIC MODULATION USING A HIGH SPEED INTEGRATED WAVEGUIDE MODULATOR, WAVEGUIDE MODE PROPAGATION FOR SIGNAL ROUTING AND OPTICAL DETECTION FOR ELECTRONIC SIGNAL REGENERATION. THE PROPOSED INTERCONNECTION CONCEPT USING MONOLITHICALLY INTEGRATED OPTICAL AND ELECTRONIC COMPONENTS WILL SATISFY THE NEED FOR 3-D PACKAGING OF MULTICHIP MODULES. IT WILL PROVIDE HIGHER SYSTEM PACKAGING DENSITY AND COMPLEXITY, LOWER POWER CONSUMPTION, HIGHER SYSTEM SPEED, BETTER RELIABILITY, LARGER INTERCONNECT BANDWIDTHS, LOWER FABRICATION COSTS, AND HIGHER RESISTANCE TO ELECTROMAGNETIC INTERFERENCE THAN OTHER INTERCONNECTION TECHNIQUES. THE PROPOSED PHASE I RESEARCH WILL FORM THE BASE FOR DEVELOPMENT OF A COMPLETELY INTEGRATED SYSTEM IN PHASE II.

PHYSICAL OPTICS CORP.
20600 GRAMERCY PLACE, SUITE 103
TORRANCE, CA 90501
Phone: (213) 530-1416

Topic#: 91-169
Office: MTL
Contract #:
PI: TIN M. AYE, PH.D.

ID#: 91MTL-070

Title: AN AUTOMATED, FIELD PORTABLE, NON-CONTACT NDE SYSTEM BASED ON OPTICAL FOURIER/ELECTRONIC NEURAL NET IMAGE CLASSIFIER

Abstract: PHYSICAL OPTICS CORPORATION (POC) PROPOSES A NOVEL, HIGH SPEED, LARGE AREA, NON-CONTACT NONDESTRUCTIVE/EVALUATION (NDE) SYSTEM BASE ON THREE MATURE TECHNOLOGIES: 1) HIGHLY SENSITIVE OPTICAL (HOLOGRAPHIC) INTERFEROMETRY; 2) HIGHLY PARALLEL, OPTICAL FOURIER TRANSFORM FEATURE EXTRACTION, AND 3) AN ELECTRONIC ARTIFICIAL NEURAL NETWORK CLASSIFIER. THE NOVELTY OF OUR APPROACH LIES IN INTEGRATING THE THREE COMPONENT TECHNOLOGIES SO THAT EACH ON COMPLIMENTS THE OTHERS. A DOUBLE-EXPOSURE HOLOGRAPHIC INTERFEROMETRY TECHNIQUE WILL BE USED, WHERE THE MATERIAL TO BE INSPECTED IS NON-CONTACT THERMALLY OR ACOUSTICALLY STRESSED. HOLOGRAMS ARE THEN RECORDED AT TWO DIFFERENT TIMES AS THE STRESS DECREASES. THIS CAN BE DONE IN REAL-TIME BY USING A PULSE LASER AND REAL-TIME HOLOGRAPHIC MATERIALS AND THUS BE IMMUNE TO VIBRATION. THE RECONSTRUCTED IMAGE, SHOWING A GROSSLY AMPLIFIED STRAIN PATTERN, IS FOURIER TRANSFORMED, THUS SEPARATING THE HIGH-FREQUENCY DEFECT PATTERN FROM SLOWLY VARYING LOW-FREQUENCY BACKGROUND PATTERNS. THIS MAKES IT POSSIBLE TO USE A LOW-DIMENSIONAL FEATURE VECTOR FOR SUBSEQUENT CLASSIFICATION BY USING A COMMERCIAL, LOW COST, ELECTRONIC, ARTIFICIAL NEURAL-NETWORK SYSTEM. THIS NEURAL-NET BASED SYSTEM PROVIDES THE POTENTIAL FOR REAL TIME, FULL-VIEW, FLAW RECOGNITION AND LOCATION WELL BEYOND THE CAPABILITY OF CURRENT INSPECTION TECHNIQUES.

PHYSICAL SCIENCES, INC.
20 NEW ENGLAND BUSINESS CENTER
ANDOVER, MA 01810
Phone: (508) 689-0003

Topic#: 91-057
Office: CECOM
Contract #:
PI: KARL W. HOLTZCLAW

ID#: 91CEC-112

Title: AN EFFICIENT INFRARED PROJECTOR FOR JAMMING APPLICATIONS

Abstract: PHYSICAL SCIENCES INC. (PSI) PROPOSES TO DEVELOP AND DEMONSTRATE AN INNOVATIVE OPTICAL SYSTEM FOR THE EFFICIENT COLLECTION AND PROJECTION OF INFRARED RADIATION FROM A XENON ARC LAMP. THE OPTICAL DESIGN WE WILL DEVELOP IS A COMBINATION OF TWO REFLECTIVE OPTICS, AN EXTREMELY EFFICIENT ELLIPSOIDAL REFLECTOR TO COLLECT RADIATION AND A NON-IMAGING OPTIC KNOWN AS A COMPOUND PARABOLOIDAL CONCENTRATOR (CPC) TO PROJECT THE RADIATION INTO THE FAR-FIELD. THE FINAL OPTICAL DESIGN WILL COMBINE NEAR UNIT COLLECTION EFFICIENCY WITH A UNIFORM AND SHARPLY DEFINED PROJECTED BEAM. THE GOAL OF THE PHASE I EFFORT IS A FINAL OPTICAL DESIGN THAT WILL SERVE AS A FOUNDATION FOR A PROTOTYPE TO BE CONSTRUCTED AND TESTED IN PHASE II. TO DEMONSTRATE FEASIBILITY, QUANTIFY OPTICAL PROJECTION EFFICIENCY, AND TO SUPPORT THE DESIGN EFFORT, WE WILL ALSO BUILD A PHASE I LABORATORY PROTOTYPE THAT WILL BE CHARACTERIZED AND COMPARED WITH A PARABOLOID-BASED PROJECTOR.

PHYSICAL SCIENCES, INC.
20 NEW ENGLAND BUSINESS CENTER
ANDOVER, MA 01810
Phone: (508) 689-0003

Topic#: 91-182
Office: AVSCOM
Contract #:
PI: WILLIAM T. LAUGHLIN

ID#: 91AVS-048

Title: DIRECTED ENERGY DAMAGE ASSESSMENT AND REPAIR

Abstract: A METHODOLOGY FOR UNDERSTANDING DIRECTED ENERGY WEAPON DAMAGE TO ARMY AIRCRAFT, AND TECHNIQUES FOR ASSESSMENT AND REPAIR OF THAT DAMAGE ARE PROPOSED. EXISTING MODELS FOR HIGH POWER LASER INTERACTIONS WITH MATERIALS AND TARGETS WILL BE USED TO MODEL FAILURE MODES OF ALREADY DAMAGED COMPONENTS. A COMPREHENSIVE PLAN WILL BE DEVELOPED DURING PHASE I FOR HIGH ENERGY LASER TESTS ON HELICOPTER COMPONENTS TO BE PERFORMED DURING PHASE II. LASER INTERACTION CODES WILL BE EXPLOITED TO MAKE THE NECESSARY PRE-TEST

PREDICTIONS AND ASSIST IN THE DEFINITION OF TEST PARAMETERS. THE RESULTING UNDERSTANDING OF COMPONENT DAMAGE MODES AND PHEBNOMENOLOGY WILL PROVIDE THE BASES FOR THE DEVELOPMENT OF BATTLE DAMAGE ASSESSMENT METHODS AND THE DEFINITION OF BATTLE DAMAGE REPAIR TECHNIQUES AND EQUIPMENT.

PLANAR SYSTEMS, INC.
1400 NW COMPTON DRIVE
BEAVERTON, OR 97006
Phone: (503) 690-1100
Topic#: 91-137
Office: ETDL
Contract #:
PI: DR. SEY SHING SUN
ID#: 91ETD-041
Title: DESIGNER ORGANOMETALLIC SOURCE MATERIALS FOR OMCVD DEPOSITION OF ELECTROLUMINESCENT DEVICES
Abstract: THIS PROGRAM WILL BUILD A QUANTITY OF THIN FILM ELECTROLUMINESCENT (TFEL) DISPLAYS USING CHIP ON GLASS (COG) TECHNOLOGY. THESE DISPLAYS WILL HAVE A PIXEL FORMAT AND PHYSICAL SIZE OF DISPLAYS CURRENTLY BEING USED BY THE MILITARY. ENVIRONMENTAL TESTS WILL BE CONDUCTED TO GAIN STATISTICALLY SIGNIFICANT DATA ON THE RELIABILITY, MANUFACTURABILITY, AND REPAIRABILITY OF THE ADHESIVE, BONDING AND ENCAPSULATION PROCESS USED.

PLANNING SYSTEMS, INC.
7925 WESTPARK DRIVE
MCLEAN, VA 22102
Phone: (703) 734-3493
Topic#: 91-176
Office: AVSCOM
Contract #:
PI: WALTER S. KOROLJOW
ID#: 91AVS-012
Title: ACOUSTIC ARRAY TECHNIQUE FOR WIND TUNNEL APPLICATIONS
Abstract: THIS IS A PROPOSAL TO PRODUCE AN ACOUSTIC ARRAY DESIGN SUITABLE FOR MAKING ACOUSTIC MEASUREMENTS OF MODEL HELICOPTERS IN A WIND TUNNEL. THIS "FEASIBILITY DESIGN" WILL DEMONSTRATE THE THEORETICAL FEASIBILITY OF SUCH A WIND TUNNEL ARRAY, AND WILL QUANTIFY THE PERFORMANCE OF SUCH AN ARRAY. THE WORK WILL INVESTIGATE THE DESIGN TRADEOFFS AVAILABLE AND WILL ESTABLISH THE COMPUTATIONAL REQUIREMENTS FOR ARRAY SIGNAL PROCESSING AS WELL AS MECHANICAL AND ELECTRICAL TOLERANCES FOR ARRAY FABRICATION. THE REQUIRED ARRAY SIGNAL PROCESSING WILL BE UNIQUE IN THAT IT WILL TAKE INTO ACCOUNT THE SIGNIFICANT MACH NUMBERS OF THE WIND TUNNEL AIRFLOW. IT IS EXPECTED THAT THE DESIGN WILL BE ABLE TO PROVIDE FREQUENCY COVERAGES OF 5 - 6 OCTAVES, SIGNIFICANT REJECTION OF AMBIENT NOISE AND REFLECTED NOISE, AND ACOUSTIC IMAGING CAPABILITY.

PRECISION COMBUSTION, INC.
25 SCIENCE PARK
NEW HAVEN, CT 06511
Phone: (203) 786-5215
Topic#: 91-011
Office: ARO
Contract #: DAAL03-91-C-0037
PI: WILLIAM C. PFEFFERLE
ID#: 91ARO-312
Title: POWER GENERATION: ELECTRIC POWER SOURCES AND DIESEL AND GAS TURBINE ENGINES
Abstract: INTEGRATING A CATALYTIC GLOW PLUG INTO AN AIR BLAST FUEL INJECTOR OFFERS AN OPPORTUNITY TO SIGNIFICANTLY REDUCE SOOT EMISSIONS FROM A GAS TURBINE WHILE SIMULTANEOUSLY PRODUCING IMPROVEMENTS IN TERMS OF ENGINE PERFORMANCE AND FUEL INSENSITIVITY. PREVIOUS WORK BY PRECISION COMBUSTION DEVELOPING A CATALYTIC GLOW PLUG HAS SHOWN THAT THE CATALYTIC PLUG OFFERS SUBSTANTIALLY IMPROVED IGNITION OVER CONVENTIONAL (NON-CATALYTIC) SURFACE IGNITION PLUGS. IN THIS PROJECT WE PROPOSE TO USE THIS IMPROVED IGNITION CAPABILITY TO ACHIEVE AN EFFECTIVE INTEGRAL IGNITOR/INJECTOR SUITABLE FOR IMPROVING GAS TURBINE SOOT AND OTHER PERFORMANCE FEATURES. IN PHASE I AN AIRBLAST INJECTOR WILL BE MODIFIED TO INCORPORATE A CATALYTIC GLOW PLUG. IN-HOUSE TESTING IN A LABORATORY CAN COMBUSTOR WILL EXPLORE IGNITION, SOOT AND OTHER EMISSIONS PERFORMANCE. THESE RESULTS WILL BE USED TO OPTIMIZE THE CATALYTIC PLUG/INJECTOR INTEGRATION SCHEME BEFORE ENGINE COMPONENT TESTING. THE IMPROVED IGNITION AND STABILITY FEATURES OF THE CATALYTIC

IGNITOR/INJECTOR WILL THEN BE TESTED BY A FUEL INJECTOR MANUFACTURER IN AN AGT1500 COMBUSTOR TEST FACILITY. RESULTS WILL INDICATE POTENTIAL FOR IMPROVEMENT BASED ON THIS TECHNOLOGY. PHASE II WILL BE DIRECTED TO DEVELOP AND TEST THE TECHNOLOGY FOR AN ENGINE CURRENTLY USED OR PLANNED FOR USE BY THE ARMY.

PRINCETON COMBUSTION RESEARCH LAB.
4275 U.S. HIGHWAY ONE
MONMOUTH JUNCTION, NJ 08852
Phone: (609) 452-9200
Topic#: 91-035 ID#: 91ARD-083
Office: ARDEC
Contract #:
PI: DR. NEALE A. MESSINA
Title: HIGH PERFORMANCE PROPELLING CHARGES
Abstract: THE TECHNICAL OBJECTIVES OF THE PROJECT ARE TO IDENTIFY CANDIDATE HIGH-ENERGY HAN-BASED WORKING FLUIDS THAT CAN BE FORMULATED BY ON-LINE EMULSIFICATION TECHNIQUES TO PRODUCE STABLE EMULSIONS IN THE ELECTROTHERMAL-CHEMICAL (ETC) GUN CHAMBER. VARIOUS ENERGETIC FUEL COMPONENTS COMBINED WITH CONCENTRATED HAN SOLUTION AS THE OXIDIZER AND AN EMULSIFYING AGENT WILL BE EXAMINED FOR STABILITY AND PERMANENCE. THE EFFORT WILL BE CONDUCTED IN THREE PARTS, THE FIRST BEING A SURVEY OF ENERGETIC FUELS AND EMULSIFYING AGENTS, AND A THEORETICAL EVALUATION OF THERMOCHEMICAL EQUILIBRIUM PERFORMANCE FOR VARIOUS LEVELS OF ELECTRICAL ENERGY INPUT. THE SECOND PART INCLUDES THE EVALUATION OF ON-LINE EMULSIFICATION PROCESSING TECHNIQUES TO PRODUCE THE DESIRED EMULSIFIED WORKING FLUID. THE THIRD PART INCLUDES THE EXPERIMENTAL EVALUATION OF SELECTED PHYSICAL PROPERTIES AND SENSITIVITY CHARACTERISTICS OF PROMISING EMULSIFIED WORKING FLUID CANDIDATES. SUCCESSFUL COMPLETION OF THE SBIR PROGRAM WILL PROVIDE A BASIS FOR FULL SCALE DEVELOPMENT OF THESE NOVEL ENERGETIC WORKING FLUIDS FOR USE IN THE ETC GUN WITH LOGISTICS, SAFETY, ECONOMIC, PERFORMANCE, AND, MOST IMPORTANTLY, BALLISTIC CONTROL AND REPRODUCIBILITY ADVANTAGES OVER CURRENTLY UTILIZED WORKING FLUIDS.

PRINCETON SCIENTIFIC ENTERPRISES
1108 KINGSTON ROAD
PRINCETON, NJ 08540
Phone: (609) 924-0714
Topic#: 91-117 ID#: 91BRL-001
Office: BRL
Contract #:
PI: DAVID W. BLAIR
Title: CONDUCTIVE POLYMER IGNITORS FOR LARGE GUN PROPELLANT CHARGES
Abstract: THE PROBLEM OF IGNITING PROPELLANT CHARGES FOR LARGE CALIBER GUNS INVOLVES CONTROL OF IGNITION TIMING, DISTRIBUTION, AND RELIABILITY; SAFETY; RESISTANCE TO UNINTENDED IGNITION; LONG SHELF LIFE AND SIMPLICITY. ALSO, IF A NEW SYSTEM IS TO BE USED, THE POSSIBILITY OF RETROFIT TO EXISTING WEAPONS IS IMPORTANT. RESEARCH ON LASER IGNITION ADDRESSES THESE REQUIREMENTS IN AN ATTEMPT TO IMPROVE UPON EXISTING CHEMICAL IGNITORS. WE HAVE DEVELOPED A CONCEPT OF ELECTRICAL IGNITION THROUGH THE USE OF ELECTRICALLY CONDUCTING POLYMERS, AND WHILE WE REALIZE THAT THIS SOLICITATION REFERS TO LASER IGNITION WE ARE CONVINCED THAT OUR CONCEPT DESERVES FEASIBILITY WORK AS A VALUABLE ALTERNATIVE THAT OFFERS NUMEROUS ADVANTAGES. CONDUCTIVE POLYMERS HAVE EXPERIENCED RAPID DEVELOPMENT IN RECENT YEARS, AND THEY NOW HAVE PROPERTIES THAT SUGGEST THAT THEY ARE QUITE ATTRACTIVE FOR USE AS IGNITORS. IF SUCCESSFUL, THEY WILL REQUIRE ONLY A HIGH VOLTAGE PULSE FOR IGNITION, COMPLETELY ELIMINATING THE INTERMEDIATE LASER AND OPTICS. THEY OFFER SHOCK INSENSITIVITY, PRECISE DISTRIBUTION OF IGNITION, PRECISE TIMING, SIMPLICITY OF THE ENTIRE IGNITION SYSTEM, LOW COST, ABSENCE OF HARMFUL RESIDUE AND GREAT SAFETY. SIMPLE GROUNDING OF THE INPUT ELECTRODE UNTIL READY TO FIRE WILL PROVIDE IMMUNITY TO ELECTRICAL DISCHARGE, THE ONLY MEANS BY WHICH THEY CAN BE FIRED. THIS IS A PROPOSAL FOR FEASIBILITY WORK ON THE APPLICATION OF ELECTRICALLY CONDUCTIVE POLYMERS AS LARGE GUN PROPELLANT IGNITORS.

PRINCETON SCIENTIFIC INSTRUMENTS
7 DEER PARK DRIVE
MONMOUTH JUNCTION, NJ 08852
Phone: (908) 274-0774
Topic#: 91-116
Office: TECOM
Contract #:
PI: JOHN L. LOWRANCE
ID#: 91TEC-052

Title: DIGITAL ENHANCEMENT AND VIDEO STORAGE OF REAL-TIME FLASH X-RAYS

Abstract: PITCH AND YAW AT THE MOMENT OF LAUNCH ARE IMPORTANT PARAMETERS WHEN CHARACTERIZING THE BALLISTIC PERFORMANCE OF A KINETIC ENERGY PROJECTILE. PRESENTLY, DATA ON PROJECTILE ORIENTATION IS ACQUIRED USING X-RAY CAMERAS INVOLVING PHOTOGRAPHIC FILM WHICH MUST BE DEVELOPED AND THE IMAGES THEN MANUALLY MEASURED TO EXTRACT THE GEOMETRIC DATA. THE PROPOSED STUDY INVESTIGATES THE APPLICABILITY AND DESIGN OF ELECTRONIC IMAGING SYSTEMS CAPABLE OF RECORDING AND REDUCING THESE X-RAY IMAGE DATA DIGITALLY AS WELL AS PROVIDING ADDED DATA ANALYSIS CAPABILITY.

QUANTUM CONSULTANTS, INC.
4660 SOUTH HAGADORN HANNAH, TECHNOLOGY AND RESEARC
EAST LANSING, MI 48823
Phone: (517) 336-6940
Topic#: 91-014
Office: MTL
Contract #: DAAL04-91-C-0033
PI: MOHAMMAD USMAN
ID#: 91MTL-302

Title: SMART MATERIALS FOR ARMY STRUCTURES

Abstract: THIS PROPOSAL IS FOCUSED ON DEVELOPING A NEW GENERATION OF REVOLUTIONARY SMART COMPOSITE STRUCTURES INCORPORATING EMBEDDED HYBRID MULTIPLE ACTUATION SYSTEMS WHICH CAPITALIZE ON THE DIVERSE STRENGTHS OF BOTH ELECTRO-RHEOLOGICAL FLUIDS AND PIEZOELECTRIC MATERIALS, AND EMPLOY FIBER-OPTIC SENSING SYSTEMS. THE GOAL OF PHASE I IS TO EVALUATE THE STATE-OF-THE-ART IN THIS CLASS OF HYBRID SMART MATERIALS, AND TO EXPLORE THE FEASIBILITY OF EXPLOITING THESE MATERIALS TO DEVELOP A NEW GENERATION OF ARMY VEHICLES AND ROTORCRAFT SYSTEMS, LARGE-SCALE STRUCTURES AND MACHINERY. SMART ARMY SYSTEMS WILL FEATURE TREMENDOUS CAPABILITIES TO REDUCE SHOCK AND VIBRATION AND, SENSE BATTLE-FIELD DAMAGE, WHILE DEMONSTRATING EFFECTIVE MAINTENANCE AND LIFE-PREDICTION CAPABILITIES. THE PROPOSED RESEARCH WILL ALSO SIGNIFICANTLY BENEFIT OTHER NATIONAL DEFENSE PROGRAMS INCLUDING THE STRATEGIC DEFENSE INITIATIVE AND THE NATIONAL AEROSPACE PLANE. PHASE II WILL BE FOCUSED ON THE DEVELOPMENT OF A SMART ROTORCRAFT SYSTEM DEMONSTRATOR WHICH CAN RESPOND AUTONOMOUSLY TO UNSTRUCTURED ENVIRONMENTS, AND CHANGES IN AERODYNAMIC LOADING, PAYLOADS, SPEEDS AND AMBIENT HYGROTHERMAL CONDITIONS. THE SIX YEARS EXPERIENCE OF THE QUANTUM RESEARCH TEAM IN THE AREA OF SMART MATERIALS HAS ALREADY CULMINATED IN THE AWARD OF AN ARO INNOVATIVE RESEARCH GRANT AND TWO DOD CONTRACTS DURING 1988-90. THE QUANTUM TEAM HAS CAPITALIZED ON THESE OPPORTUNITIES TO INITIATE THREE COLLABORATIVE VENTURES WHICH WILL TRANSITION FUNDAMENTAL RESEARCH DISCOVERIES INTO SMART COMMERCIAL PRODUCTS.

QUEST INTEGRATED, INC.
21414-68TH AVENUE SOUTH
KENT, WA 98032
Phone: (202) 872-9500
Topic#: 91-130
Office: ASL
Contract #:
PI: DR. PAUL A. HWANG
ID#: 91ASL-001

Title: SALTATION AND SUSPENSION OF SEDIMENT BY TURBULENT WIND

Abstract: PARTICLES IN THE AIR ABSORB AND SCATTER ELECTROMAGNETIC WAVES, CAUSING TRANSMISSION LOSS AND IMAGE OBSCURATION. THE PATTERNS OF SCATTERING AND EXTINCTION ARE FUNCTIONS OF WAVELENGTH AND PARTICLE SIZE. IN ORDER TO CALCULATE THE TRANSMITTANCE AND EXTINCTION COEFFICIENTS OF MULTI-SPECTRAL, FROM VISIBLE TO MILLIMETER WAVELENGTH, TARGET ACQUISITION SYSTEMS, THE SIZE DISTRIBUTION OF PARTICLES ALONG THE TARGET PATH NEEDS TO BE PROVIDED. MOST SEDIMENT TRANSPORT EQUATIONS, HOWEVER, ARE CONCERNED WITH THE TOTAL MASS FLUX OVER THE WHOLE SALTATION LAYER, OR AT MOST GIVE THE VERTICAL CONCENTRATION PROFILES OF SUSPENSION, WITHOUT RESOLUTION OF PARTICLE SIZE. IN PHASE I, WE PROPOSE TO DEVELOP A NUMERICAL

PROCEDURE TO OBTAIN THE SIZE DISTRIBUTION OF SEDIMENT SALTATION AND SUSPENSION. THE COMPUTED RESULTS WILL BE PRESENTED IN SPHERICAL COORDINATES THROUGH MATHEMATICAL TRANSFORMATION.

QUEST INTEGRATED, INC.
21414 - 68TH AVENUE SOUTH
KENT, WA 98032
Phone: (206) 872-9500

Topic#: 91-165 ID#: 91MTL-102
Office: MTL
Contract #:
PI: GARY B. WHITE

Title: A REAL-TIME VISION SYSTEM TO MONITOR/ANALYZE THE CHANGES IN COMPOSITE SPECIMENS DURING MECHANICAL TESTING

Abstract: RECENT ADVANCEMENTS IN MACHINE VISION TECHNOLOGY AND KNOWLEDGE-BASED EXPERT SYSTEMS HAVE RESULTED IN POWERFUL, COMMERCIALLY AVAILABLE SYSTEMS FOR IMAGE ANALYSIS AND INTERPRETATION. COMPOSITE MATERIALS RESEARCH HAS DEMONSTRATED THE EFFECTIVENESS OF EMPLOYING IMAGE PROCESSING TECHNIQUES TO PROVIDE REPEATABLE AND QUANTITATIVE MEASUREMENTS OF MATERIAL PROPERTIES USING MANUAL, INTERACTIVE TECHNIQUES ON DISCRETE IMAGES. PROPOSED IS THE DEVELOPMENT OF AREAL-TIME VISION SYSTEM TO ACQUIRE, ARCHIVE, AND SUBSEQUENTLY ANALYZE IMAGES OF POLYMER COMPOSITE STRATEGIES WILL BE DEVELOPED THAT ALLOW THE OPTIMIZATION OF ACQUISITION SPEED, SPATIAL RESOLUTION, OR STORAGE CAPACITY. ACQUISITION AND STORAGE OF IMAGES DURING MECHANICAL TESTS LASTING SEVERAL HOURS IS POSSIBLE. IMAGES WILL BE ANALYZED BY AN EXPERT SYSTEM TO INTERPRET THE VISUAL CHANGES, WHICH OCCUR DURING TESTING, IN TERMS OF AN APPROPRIATE FAILURE MODEL AND TO DESCRIBE, IN A QUANTITATIVE MANNER, HOW DAMAGE DEVELOPS AND PROPAGATES WITHIN THE MATERIAL. AN EXPERIMENT WILL BE CONDUCTED TO VERIFY THAT A RELATIONSHIP EXISTS BETWEEN THE MECHANICAL CHARACTERISTICS OF THE TEST SPECIMEN AND THE VISUAL INFORMATION CAPTURED BY THE CAMERA. THE RESULTS OF THIS EXPERIMENT WILL BE COMBINED WITH A DISCUSSION OF KNOWLEDGE-BASED EXPERT SYSTEMS TO DESCRIBE HOW THE INTERPRETATION OF TEST SPECIMEN IMAGES WILL TAKE PLACE.

RADIATION MONITORING DEVICES, INC.
44 HUNT STREET
WATERTOWN, MA 02172
Phone: (617) 926-1167

Topic#: 91-131 ID#: 91ASL-009
Office: ASL
Contract #:
PI: DR. CHRISTOPHER ROLLINS

Title: ACOUSTIC SCATTERING BY A VORTEX MODEL OF TURBULENCE

Abstract: DEVELOPMENT OF AN IMPROVED MODEL FOR ACOUSTIC SCATTERING FROM A TURBULENT MEDIUM IS PROPOSED, WHICH WILL USE THE SELF-CONSISTENT FIELD APPROACH TO MULTIPLE SCATTERING. RESULTS WILL BE USED TO PREDICT ACOUSTIC SCATTERING SIGNATURES AS A FUNCTION OF THE ACOUSTIC AND TURBULENCE PROPERTIES OF THE SCATTERING SYSTEM. PROJECT OBJECTIVES INCLUDE A DETERMINATION OF THE COHERENT FIELD (MEAN FIELD) AS WELL AS INCOHERENT FIELDS (SCATTERED ENERGY) ASSOCIATED WITH THE SCATTERED ACOUSTIC RETURN SIGNALS FROM A TURBULENCE REGION WHICH HAS A SPECIFIED SIMPLE GEOMETRY AND PRESUMED STATISTICAL PROPERTIES. THIS APPROACH WILL PROVIDE A GENERAL AND SYSTEMATIC TREATMENT, TO ALL ORDERS IN TURBULENCE, OF THE SCATTERING OF ACOUSTIC WAVES, IN TERMS OF THE PROPERTIES OF THE TURBULENT STRUCTURE OF THE SCATTERING SYSTEM.

RADIX TECHNOLOGIES
4020 MOORPARK AVE SU 212
SAN JOSE, CA 95117
Phone: (408) 246-9908

Topic#: 91-051 ID#: 91CEC-242
Office: CECOM
Contract #:
PI: BRIAN G. AGEE

Title: DETECTION, COPY AND LOCALIZATION OF PULSED EMITTERS USING WAVELET-BASED DOMINANT MODE PREDICTION

Abstract: AN SBIR PROJECT IS PROPOSED TO APPLY THE THEORY OF WAVELETS TO DETECTION, COPY, ND

LOCALIZATION (DF) OF PULSED EMITTERS USING MULTISENSOR ANTENNA ARRAYS. THE PROPOSED SYSTEM COMBINES THE SIMPLIFIED EDGE REPRESENTATION PROVIDED BY WAVELET TRANSFORMS WITH THE MULTIPATH/INTERFERENCE MITIGATING DETECTION, COPY, AND DF CAPABILITIES PROVIDED BY THE RECENTLY ADVANCED DOMINANT MODE PREDICTION (DMP) ALGORITHM. THE DMP ALGORITHM HAS DEMONSTRATED THE ABILITY TO ADAPT ANTENNA ARRAYS TO DETECT AND COPY PULSED EMITTERS IN THE PRESENCE OF BOTH FULLY-COHERENT MULTIPATH AND SEVERS (> 50 DB STRONGER) CO-CHANNEL INTERFERENCE, AND TO PERFORM SUBSEQUENT SUPER-RESOLUTION DF ON THE COPIED EMITTERS, BY EXPLOITING THE ABRUPT ON AND OFF TRANSITIONS (EDGES) OF THE PULSED EMITTERS. HOWEVER, THE CURRENT DMP IMPLEMENTATION HAS A FIXED TEMPORAL (EDGE) RESOLUTION, AND CAN FAIL TO DETECT EMITTERS WITH PULSE EDGES THAT ARE SPREAD OVER AN INTERVAL OF TIME THAT IS GREATER THAN THIS RESOLUTION. THE PROPOSED SYSTEM SIGNIFICANTLY IMPROVES THE RESOLUTION, PERFORMANCE, AND FLEXIBILITY OF THE DMP ALGORITHM, BY USING WAVELET REPRESENTATIONS OF THE RECEIVED DATA WAVEFORM OR OUTER PRODUCT TO PROVIDE ADAPTIVE (DATA-DIRECTED) OR NONADAPTIVE (CLASS-DIRECTED) RESOLUTION OF THE PULSE EDGES. THE PROPOSED SYSTEM ALSO PROVIDES A STRAIGHTFORWARD MEANS FOR EXTENDING THE THEORY OF WAVELETS TO MULTISENSOR PROCESSING APPLICATIONS.

RECOGNITION RESEARCH, INC.
1800 KRAFT DRIVE
BLACKSBURG, VA 24060
Phone: (703) 231-6500

Topic#: 91-204 ID#: 91ETL-034
Office: ETL
Contract #:
PI: Dr. J. Patrick Bixler

Title: Text Identification, Extraction, and Manipulation of Raster Map Images

Abstract: Digital map background displays would be easier to use if key text were rotated so that it is always read right side up regardless of the orientation of the map. This could be accomplished in a pure raster form, where the raster text is identified, extracted, and rotated by converting the raster text to ASCII and re-displaying the interpreted characters. Additional requirements include the ability to fill in the areas beneath the lettering which the proper background color and connect linear features interrupted by the lettering. A method is proposed for identifying, segmenting, and manipulating text from raster-scanned maps. A work plan is also outlined for evaluating the feasibility of incorporating the technology into existing digital map background displays.

REDZONE ROBOTICS, INC.
2425 LIBERTY AVENUE
PITTSBURG, PA 15222
Phone: (412) 765-3064

Topic#: 91-099 ID#: 91099-08
Office: TACOM
Contract #:
PI: CHRIS FROMME

Title: UNMANNED GROUND VEHICLE MOBILITY

Abstract: IN RESPONSE TO DOD SBIR SOLICITATION 91.2, TOPIC A91-099 "UNMANNED GROUND VEHICLE MOBILITY", REDZONE ROBOTICS PROPOSES TO PERFORM A STUDY OF THE UNIQUE MOBILITY REQUIREMENTS OF UNMANNED GROUND VEHICLES, AND TO APPLY THESE REQUIREMENTS TO AN EVALUATION OF ALTERNATIVE VEHICLE TECHNOLOGIES. THE OUTCOME OF THE PHASE I STUDY WILL BE: (1) A COMPREHENSIVE CHARACTERIZATION OF MOBILITY REQUIREMENTS FOR UNMANNED VEHICLES; (2) A METHODOLOGY FOR WEIGHING THESE REQUIREMENTS FOR SPECIFIC MILITARY MISSIONS AND/OR PAYLOADS; (3) A LISTING AND CHARACTERIZATION OF KEY VEHICLE TECHNOLOGIES; (4) A FORMAL EVALUATION OF KEY VEHICLE TECHNOLOGIES AGAINST THE WEIGHTED REQUIREMENTS OF MILITARY UNMANNED VEHICLES; (5) A FORMAL EVALUATION OF EXISTING VEHICLES AND NOVEL VEHICLE CONCEPTS (INTEGRATIONS OF KEY TECHNOLOGIES) AGAINST THE REQUIREMENTS OF A SPECIFIC MILITARY MISSION/PAYLOAD SCENARIO; AND (6) DOCUMENTATION OF THE MOST HIGHLY RATED VEHICLE CONCEPTS SUFFICIENT TO SUPPORT THE GOVERNMENT'S DETERMINATION OF THEIR APPROPRIATENESS TO THE UNMANNED GROUND VEHICLES PROGRAM. PHASE II WILL PROTOTYPE ONE OF THE CONCEPTS FROM PHASE I, AND PHASE III WILL FURTHER THE DEVELOPMENT OF THE PROTOTYPE TO FIELD WORTHINESS AND MILITARY SPECIFICATIONS TOWARD COMMERCIALIZATION.

REDZONE ROBOTICS, INC.
2425 LIBERTY AVENUE
PITTSBURG, PA 15222
Phone: (412) 765-3064
Topic#: 91-102
Office: TACOM
Contract #:
PI: ALAN D. BERGER
ID#: 91102-08
Title: THE DEVELOPMENT OF SINGLE BOARD VEHICLE CONTROLLER
Abstract: REDZONE ROBOTICS, INC. PROPOSES TO DEVELOP A STANDARDIZED, HIGHLY-INTEGRATED, SINGLE-BOARD VEHICLE CONTROLLER IN RESPONSE TO DOD SBIR SOLICITATION 91.2 TOPIC A91-102. THE PROPOSED CONTROLLER WILL INTEGRATE THE ELECTRONICS NECESSARY TO CONTROL AN AUTOMATED OR SEMI-AUTOMATED VEHICLE ON A SINGLE 6U VME BOARD, WITH AN UPGRADE PATH TO MEET THE SAVA STANDARD. THIS BOARD WILL SIMPLIFY THE TASK OF AUTOMATING EXISTING VEHICLES BY PROVIDING A COMMON PLATFORM FROM WHICH MANY DEVELOPERS CAN WORK. IN ADDITION, A HIGHLY ENGINEERED AND MASS PRODUCED BOARD WILL LOWER DEVELOPMENT TIME AND COST OF NEW REMOTE VEHICLES AND STANDARDIZE VEHICLE SOFTWARE ACROSS MULTIPLE PLATFORMS AND APPLICATIONS. APPLICATIONS FOR THE SINGLE BOARD CONTROLLER INCLUDE RECONNAISSANCE, DECOY DEPLOYMENT, MINE DETECTION AND REMOVAL, AND ROBOTIC CONVOYING. THE PROPOSED WORK WILL RESULT IN VERIFIED SOFTWARE ALGORITHM DESIGNS AND HARDWARE SCHEMATICS AT THE END OF PHASE I, DEMONSTRATED AND REFINED PROTOTYPES AT THE END OF PHASE II, AND A COMMERCIALLY MARKETED PRODUCT AT THE END OF PHASE III.

REKENTHALER TECHNOLOGY ASSOC CORP.
P.O. BOX 5267
SPRINGFIELD, VA 22150
Phone: (703) 418-8014
Topic#: 91-203
Office: ETL
Contract #:
PI: JEFFREY S. BRUSH
ID#: 91ETL-032
Title: PROJECT 2851 DATA FORMATTING UTILITIES
Abstract: THE DEVELOPMENT OF A TRI-SERVICE DATABASE FOR USE IN SIMULATORS AND MISSION PLANNING SYSTEMS HAS LONG BEEN A GOAL OF MANY GOVERNMENT AGENCIES, AND COULD SIGNIFICANTLY ENHANCE THE OVERALL USEFULNESS OF ALL SUCH SYSTEMS. HOWEVER, THE ABILITY TO TRANSFER DATA BETWEEN THESE SYSTEMS IS HAMPERED BY THE FACT THAT MANY DIFFERENT DATABASE FORMATS ARE EMPLOYED. AT RTA, WE ENVISION AN INTEGRATED SYSTEM FOR HANDLING SCENE DATA, WHICH WOULD UTILIZE BOTH TERRAIN AND FEATURE DATA IN A STANDARD DATABASE FORMAT AND IMAGE DATA. IT WOULD BE FOCUSSED TOWARD ASSISTING IN THE MISSIONS PLANNING AND REHEARSAL PROCESS, FOR SCENE GENERATION AND MODELING IN SIMULATORS AND FOR TERRAIN FOLLOWING AND TARGETING. IN THIS PHASE I EFFORT FOR THE ETL, RTA WILL EXPLOIT THE RESULTS OF PREVIOUS WORK IN AFE, ATR AND DATABASE STUDIES EFFORTS TO PRODUCE A PRELIMINARY DESIGN OF SUCH A SYSTEM. IN ADDITION, WE WILL DEVELOP PROTOTYPE SOFTWARE DEMONSTRATING THE ABILITY OF THIS SYSTEM TO ACCEPT DATA FROM AND GENERATE DATA FOR DIVERSE SOURCES.

RESEARCH APPLICATIONS, INC.
824 WEST 10TH STREET, SUITE 200
AUSTIN, TX 78701
Phone: (512) 474-1884
Topic#: 91-007
Office: CRDEC
Contract #: DAAA15-91-C-0133
PI: AARON SELTZER
ID#: 91CRD-303
Title: FIBER-OPTIC INTERFEROMETRIC SENSOR FOR CHEMICAL AGENTS
Abstract: CURRENT GAS MEASUREMENT TECHNIQUES ARE INADEQUATE TO DETECT GASES USED IN CHEMICAL WARFARE WITH ENOUGH ACCURACY AND RELIABILITY IN THE HOSTILE WAR ZONE ENVIRONMENTS. IT IS NECESSARY TO HAVE A SENSOR THAT WILL PROVIDE INSTANTANEOUS AND CONTINUOUS MEASUREMENT OF THE POISONOUS GASES. IT MUST OPERATE IN A HOSTILE ENVIRONMENT, INCLUDING THOSE OF HIGH SMOKE, DUST, AND OTHER VAPOR/PARTICULATE CONTAMINATION. THE PROPOSED APPROACH UTILIZES DR. BUCHMAN'S NEW FUNDAMENTAL CIRCUIT IMPROVEMENT TO FIBER OPTIC INTERFEROMETRIC TECHNOLOGY THAT GIVES DRAMATICALLY IMPROVED SIGNAL TO NOISE AND SENSITIVITY (BETTER THAN 10 TO 1 IMPROVEMENT). THIS TECHNOLOGY WAS DEVELOPED AT THE UNIVERSITY OF TEXAS AND ENHANCED BY RESEARCH APPLICATIONS FOR ACOUSTIC SENSORS. UNDER THIS

PROPOSAL THE FUNDAMENTAL INTERFEROMETRIC TECHNOLOGY IS BEING ENHANCED AND ADAPTED TO A GENERALIZED PHOTO-ACOUSTIC SENSOR. THE SENSOR IS BEING BUILT AS A GENERALIZED GAS SPECIE MEASUREMENT; HOWEVER, ONE GAS WILL BE SELECTED TO RUN COMPLETE PERFORMANCE TESTS. THE PHASE I MILESTONES ARE: - THEORETICAL STUDY OF SENSITIVITY/RESPONSE TRADEOFFS - OPTIMIZATION OF SIGNAL PROCESSING FOR SPECIFIC INTERFEROMETER - BUILD TEST PHOTO-ACOUSTIC OPTRODE - BUILD ENHANCED BUCKMAN INTERFEROMETER - INTEGRATE OPTRODE WITH INTERFEROMETER - TEST FOR PERFORMANCE WITH SAMPLE GAS

RESEARCH TECHNOLOGY ASSOCIATES
1230 NORTH MESA DRIVE #232
MESA, AZ 85201
Phone: (602) 891-5324
Topic#: 91-251
Office: PM TRADE
Contract #:
PI: DANIEL L. HILL
ID#: 91PM-007
Title: MANPRINT ASSESSMENT ISSUES PROJECT
Abstract: RESEARCH TECHNOLOGY ASSOCIATES (RTA) IDENTIFIED AND EXAMINED THE RELATIONSHIPS BETWEEN ALL MANPRINT FUNCTIONAL DOMAIN VARIABLES COMMON TO THE DESIGN, DEVELOPMENT, FIELDING AND APPLICATIONS OF ALL TYPES OF TRAINING DEVICES. RTA PROVIDED A METHODOLOGY FOR DETERMINING THE MOST SIGNIFICANT OF THESE VARIABLES AND GUIDELINES FOR DETERMINING VARIABLE PRECEDENCE. RTA ALSO DESIGNED AN AUTOMATED METHODOLOGY THAT WILL ALLOW FOR PRECEDENCE SELECTION IN THE TRADE-OFF PROCESS TO SUPPORT THE INTEGRATION OF THE MAN-MACHINE INTERFACE METHODOLOGIES.

RETICULAR SYSTEMS, INC.
4095 CALGARY AVENUE
SAN DIEGO, CA 92122
Phone: (619) 457-0709
Topic#: 91-053
Office: CECOM
Contract #:
PI: DAN R. BALLARD
ID#: 91CEC-035
Title: MICROCHIP-BASED INFERENCING MECHANISM FOR HIGH PERFORMANCE DIAGNOSTICS - TESTMASTER(R)
Abstract: ELECTRONIC SYSTEMS ARE BECOMING INCREASINGLY MORE COMPLEX. ADVANCES IN PACKAGING TECHNOLOGY AND INCREASING DEVICE COMPLEXITY ARE DEMONSTRATING THAT CURRENT TECHNIQUES OF IN-CIRCUIT TESTING AND FAULT DIAGNOSIS ARE INADEQUATE. INDUSTRY AND DOD HAS INITIATED SEVERAL EFFORTS TO HELP SOLVE THIS PROBLEM. DOD ISSUED MIL-STD-2165 WHICH INDICATES THE INCORPORATION OF TEST AND MAINTENANCE CRITERIA IN ALL NEW HARDWARE DEVELOPMENTS. THE JOINT TEST ACTIO GROP (JTAG) WAS FORMED TO FIND A SOLUTION TO INCREASING PROBLEMS OF SYSTEM TESTING. UNFORTUNATELY, IMPROVEMENTS IN TESTABILITY PROVIDED BY MIL-STD-2165 AND IEEE P.1149.1 DO NOT LEAD TO IMPROVEMENTS IN FAULT DIAGNOSIS OR FALT PROGNOSIS. AI/EXPERT SYSTEMS TECHNIQUES HAVE PROVEN TO BE EXTREMELY EFFECTIVE IN SOLVING COMPLEX SYSTEM DIAGNOSIS PROBLEMS. HOWEVER, THESE DIAGNOSTIC SYSTEMS HAVE HISTORICALLY REQUIRED EXPENSIVE AMOUNTS OF COMPUTATIONAL RESOURCES AND WERE NOT SUITABLE FOR EMBEDDING IN HARDWARE IN DEPLOYED WEAPONS SYSTEMS. RETICULAR SYSTEMS, INC. WILL DEVELOP AN AI/EXPERT SYSTEM MICROCHIP WE CALL TESTMASTER WHICH SATISFIES OPERATIONAL AND PERFORMANCE REQUIREMENTS OF TACTICAL MILITARY SYSTEMS. THE TESTMASTER MICROCHIP CONTAINS KNOWLEDGE OF THE LIKELY FAILURE MODES OF THE BOARD WHICH SIGNIFICANTLY IMPROVES THE SPEED AND ACCURACY OF ITS TEST DIAGNOSIS. TEST MASTER PROVIDES A UNIQUE OPPORTUNITY TO USE PROVEN AI/EXPERT SYSTEM TECHNOLOGIES FOR ENHANCING MAINTAINABILITY AND SUPPORTABILITY OF COMPLEX SYSTEMS WHILE REDUCING LIFE-CYCLE COSTS.

RETICULAR SYSTEMS, INC.
4095 CALGARY AVENUE
SAN DIEGO, CA 92122
Phone: (619) 457-0709
Topic#: 91-185
Office: AVSCOM
Contract #:
PI: DAN R. BALLARD
ID#: 91AVS-063

Title: IMPROVED OBSTACLE AVOIDANCE THROUGH ENHANCED PILOT AWARENESS
Abstract: ARMY HELICOPTERS CONDUCT EXTENSIVE NIGHT OPERATIONS WHICH PROVIDE SIGNIFICANT OPERATIONAL ADVANTAGES. HOWEVER, OBSTACLE AVOIDANCE SYSTEMS (OASS) ARE REQUIRED TO HELP THE PILOT DETECT, LOCATE, AND AVOID OBSTACLES SUCH AS WIRES, CABLES, TOWERS, ANTENNAE, TREES, AND TERRAIN FEATURES. THE CENTRAL PROBLEM ASSOCIATED WITH OBSTACLE AVOIDANCE TECHNOLOGY IS NOT WITH SENSORS, SIGNAL PROCESSING OR IMAGE PROCESSING; IT IS HOW TO PRESENT LARGE AMOUNTS OF DATA FROM MULTIPLE SENSORS TO THE PILOT. THE RESEARCH FOCUS WILL DETERMINE METHODS FOR IMPROVING SITUATIONAL AWARENESS IN FUTURE OASS. THE OAS CAN IMPART SITUATIONAL AWARENESS BY PROVIDING ACCURATE AND COHERENT DESCRIPTIONS OF EXTERNAL ENTITLES (TERRAIN AND OBSTACLES) THAT CAN ADVERSELY AFFECT THE MISSION. INFORMATION MUST BE PRESENTED SUCH THAT IT DOES NOT DISTRACT THE PILOT FROM OTHER TASKS YET CATCHES THE PILOT'S ATTENTION WHEN REQUIRED. WE WILL INVESTIGATE THE REQUIREMENTS FOR A REASONING SYSTEMS WHICH CAN ASSIST THE PILOT BY DRAWING INFERENCES ABOUT TERRAIN AND OBSTACLES. INCORPORATING KNOWLEDGE-BASED PROCESSING TECHNOLOGY WILL RESULT IN AN INTELLIGENT OAS. OUR RESEARCH WILL LEAD TO A SOLUTION WHICH PROVIDES A FUNDAMENTALLY NEW APPROACH TO THE OBSTACLE AWARENESS AND MANAGEMENT PROBLEM THROUGH THE USE OF INTELLIGENT SITUATION AWARENESS AND SENSOR MANAGEMENT. THIS APPROACH WILL YIELD TO BREAKTHROUGHS IN MISSION SAFETY, AND THUS SUCCESS.

RETICULAR SYSTEMS, INC.
4095 CALGARY AVENUE
SAN DIEGO, CA 92122
Phone: (619) 457 9709

Topic#: 91-188
Office: AVSCOM
Contract #:
PI: DAN R. BALLARD

ID#: 91AVSCOM-091

Title: TASK MASTER (TM): A REAL-TIME KNOWLEDGE PROCESSING EXECUTIVE
Abstract: NUMEROUS ARMY COMMAND AND CONTROL APPLICATIONS HAVE REQUIREMENTS FOR REAL-TIME EXECUTION OF KNOWLEDGE-BASED SYSTEMS. HOWEVER, EXISTING COMPUTER HARDWARE PLATFORMS AND SOFTWARE SYSTEMS (LANGUAGE, TOOLS, SHELLS, ETC.) ARE NOT ADEQUATE FOR APPLICATIONS REQUIRING REAL-TIME KNOWLEDGE-BASED PROCESSING. KNOWLEDGE-BASED SYSTEMS HAVE HISTORICALLY BEEN DEVELOPED WITH NON-REAL-TIME APPLICATIONS AS THEIR PRIMARY FOCUS (E.G., EXPERT MEDICAL CONSULTANTS, OFFLINE DIAGNOSTICS, AND ADVISORS). THE FUNDAMENTAL DESIGN CONCEPTS NECESSARY FOR REAL-TIME PERFORMANCE WERE NOT CONSIDERED IN THE DESIGN OF THE LANGUAGES, SHELLS AND TOOLS USED FOR KNOWLEDGE-BASED PROCESSING. TO IMPLEMENT REAL-TIME KNOWLEDGE PROCESSING SYSTEMS, IT IS NECESSARY TO IDENTIFY AND SOLVE THE UNIQUE ENGINEERING PROBLEMS ASSOCIATED WITH REAL-TIME APPLICATIONS. THE SPECIFIC OBJECTIVE OF THIS RESEARCH IS TO DEVELOP A SOFTWARE EXECUTION ENVIRONMENT FOR REAL-TIME KNOWLEDGE PROCESSING APPLICATIONS. THIS EXECUTION ENVIRONMENT WILL PROVIDE THE NECESSARY CONTROL FEATURES REQUIRED TO MANAGE REAL-TIME PROBLEM SOLVING. WE TERM THIS REAL-TIME KNOWLEDGE PROCESSING EXECUTIVE TASKMASTER.

S-TRON
303 RAVENDALE DRIVE
MOUNTAIN VIEW, CA 94043
Phone: (415) 903-4949

Topic#: 91-064
Office: CECOM
Contract #:
PI: OLIVER J. EDWARDS

ID#: 91CEC-072

Title: HUMAN FACTORS SOLUTIONS FOR SOLDIER'S COMPUTER
Abstract: THIS PROPOSAL ADDRESSES THE HUMAN FACTORS AND HUMAN ENGINEERING OF THE DESIGN, INTERFACE AND APPLICATION OF THE SOLDIER'S COMPUTER: A LIGHTWEIGHT, SHIRT-POCKET SIZED COMPUTER WITH INPUT/OUTPUT AND CONTRO INTERFACES APPROPRIATE TO THE FIELD. THE CRITICAL PROBLEM IS PROVISION OF A MAN-MACHINE INTERFACE WHICH WILL BE TRANSPARENT TO THE USER, AND WHICH WILL EFFECTIVELY LINK HIS OBSERVATION, PERSONAL INPUT/OUTPUT, AWARENESS AND THINKING WITH HIS PERSONAL SILICON INTELLIGENCE AND THE DATA FROM HIS WORLD, AND WHICH WILL SUPPORT THE SOLDIER AS A NODE IN A NETWORK.

SARCOS RESEARCH CORP.
261 EAST 300 SOUTH SUITE 150
SALT LAKE CITY, UT 84111
Phone: (801) 531-0559
Topic#: 91-222 ID#: 91MED-009
Office: MEDICAL
Contract #:
PI: D. KENT BACKMAN
Title: INTEGRATION OF INSTRUMENTATION FOR MEASURING VITAL SIGNS
Abstract: THE PRIMARY OBJECTIVE OF THIS PROJECT IS TO INTEGRATE PHYSIOLOGICAL MONITORING COMPONENTS INTO WEARABLE, MODULAR SYSTEMS WHICH WILL DETECT, RECORD AND TRANSMIT VITAL SIGNS DATA TO ASSIST IN MANAGEMENT OF FIELD CASUALTIES. ALL COMPONENTS WILL CONSIST OF RELIABLE, COMMERCIALLY AVAILABLE INSTRUMENTATION WHICH MAY OR MAY NOT REQUIRE MODIFICATIONS, AND WILL NON-INVASIVELY MEASURE HEART RATE, RESPIRATORY RATE, BLOOD PRESSURE AND TEMPERATURE. THE INSTRUMENTATION WILL BE SO CONFIGURED AS TO SUPPLY CLINICALLY USEFUL DATA UNDER THE MOST EXACTING OF ALL FIELD CONDITIONS, I.E., INJURED PERSONS WEARING FULLY SUITED AND CONTAMINATED CHEMICAL PROTECTIVE ENSEMBLES (MOPP SUITS). SECURE, AUTOMATIC COMMUNICATIONS WILL BE USED TO LOCATE AND ACCESS FIELD CASUALTIES. IT IS ANTICIPATED THAT THIS PROJECT WILL RESULT IN GUIDELINES AND RECOMMENDATIONS FOR THE IMPLEMENTATION OF COMPACT, CONVENIENTLY WEARABLE VITAL SIGNS MODULES THAT CAN SUPPLY ESSENTIAL CLINICAL DATA UNDER ALL EXPECTED FIELD CONDITIONS. IN ADDITION, ALGORITHMS TO ASSIST IN TRIAGE WILL BE DEVELOPED FROM COMBINATIONS OF PULSE RATES, PULSE PRESSURES, BLOOD PRESSURES, 02 SATURATION VALUES AND RESPIRATORY RATES. TRACEABLE MEDICAL RECORDS WILL ALSO BE GENERATED.

SATCON TECHNOLOGY CORP.
12 EMILY STREET
CAMBRIDGE, MA 02139
Phone: (617) 661-0540
Topic#: 91-018 ID#: 91AVS-337
Office: AVSCOM
Contract #: DAAJ02-91-C-0054
PI: DR. MARTHINUS C. VAN SCHO
Title: INTEGRATED ACTUATION SYSTEM FOR INDIVIDUAL CONTROL OF HELICOPTER ROTOR BLADES
Abstract: FUTURE ARMY ROTORCRAFT/AIR-VEHICLE SYSTEMS WILL REQUIRE ADVANCES IN SURVIVABILITY, OPERABILITY AND SUPPORTABILITY. SATCON TECHNOLOGY CORPORATION PROPOSES TO DESIGN, FABRICATE, AND DEMONSTRATE AN INTEGRATED ACTUATION SYSTEM FOR INDIVIDUAL CONTROL OF HELICOPTER ROTOR BLADES WHICH WILL ALLOW IMPROVEMENTS IN ALL THREE AREAS. THIS SYSTEM WILL IMPROVE OPERABILITY BY IMPROVING MANEUVERABILITY, AGILITY, AND SPEED; IMPROVE SUPPORTABILITY BY INCREASING RELIABILITY; AND IMPROVE SURVIVABILITY BY DECREASING SIGNATURE (NOISE AND VIBRATION). IN CONVENTIONAL HELICOPTERS, CONTROL OF THE ROTOR IS ACHIEVED BY THE USE OF A SWASHPLATE. FOR A NUMBER OF ROTOR CONTROL PROBLEMS, HOWEVER, THE HYDRAULICALLY ACTUATED SWASHPLATE IS INADEQUATE. BECAUSE A SWASHPLATE CAN COMMAND ONLY THREE DEGREES OF FREEDOM, INDIVIDUAL BLADE CONTROL (IBC) CANNOT BE ACCOMPLISHED WITH A SWASHPLATE FOR FOUR (OR MORE) BLADED ROTORS. SWASHPLATES HAVE INSUFFICIENT BANDWIDTH TO PROVIDE ACTIVE CONTROL OF HELICOPTER ROTOR VIBRATION. FINALLY, IT IS DESIRABLE IN SOME APPLICATIONS TO CONTROL THE LIFT DISTRIBUTION ALONG THE SPAN OF EACH BLADE WHICH IS NOT POSSIBLE WITH SWASHPLATES. THE BLADE MOUNTED, INTEGRATED ACTUATION SYSTEM WILL OVERCOME ALL THESE DEFICIENCIES WHILE PROVIDING SUBSTANTIALLY IMPROVED RELIABILITY. PHASE I WILL CONSIST OF CONCEPT DEFINITION, INITIAL INVESTIGATION, AND DETAILED PLANNING FOR PHASE II. PHASE II WILL CONSIST OF DESIGN, FABRICATION, AND TESTING OF THE PROTOTYPE HARDWARE CONCEPT.

SAVI TECHNOLOGY, INC.
260 SHERIDAN AVE., SUITE 200
PALO ALTO, CA 94306
Phone: (415) 328-4323
Topic#: 91-167 ID#: 91MTL-082
Office: MTL
Contract #:
PI: ROBERT S. REIS
Title: INTELLIGENT SENSOR SYSTEM FOR REMOTE ENVIRONMENTAL MONITORING
Abstract: THE DEVELOPMENT OF AN AUTOMATED, INTELLIGENT SENSOR FOR USE IN MONITORING PREPREG

ENVIRONMENTAL CONDITION IS PROPOSED. THIS SYSTEM USES A LOW COST, MINIATURE, REUSABLE AND PROGRAMMABLE DEVICE, CALLED SENSORTAG, THAT IS PACKAGED ALONG WITH THE PREPREG. THIS DEVICE WILL MONITOR THE AMOUNT OF TIME THAT THE PREPREG IS EXPOSED TO ADVERSE CONDITIONS, SUCH AS EXCESS TEMPERATURE, HUMIDITY AND LIGHT, AND STORE THIS DATA FOR LATER DISPLAY AND ANALYSIS. THE SENSORTAG IS ALSO EQUIPPED WITH RADIO COMMUNICATIONS CAPABILITY WHICH CAN BE USED TO REMOTELY MONITOR PREPREG CONDITION IN REAL-TIME.

SCHWARTZ ELECTRO-OPTICS, INC.
3404 N. ORANGE BLOSSOM TRAIL
ORLANDO, FL 32804
Phone: (407) 298-1802
Topic#: 91-112
Office: TECOM
Contract #:
PI: ROBERT A. OLSEN
ID#: 91TEC-035
Title: LINE OF SIGHT VERIFICATION
Abstract: AT PRESENT, THERE IS NO METHOD FOR THE ACCURATE AND RELIABLE VERIFICATION OF THE EXISTENCE OF A CLEAR LINE-OF-SIGHT BETWEEN MULTIPLE WEAPON SYSTEM PLATFORMS AND MULTIPLE TARGETS. SCHWARTZ ELECTRO-OPTICS PROPOSES TO DEVELOP A LINE-OF-SIGHT VERIFICATION SYSTEM EMPLOYING QUASI-LAMBERTIAN OPTICAL SOURCES MOUNTED TO WEAPON SYSTEM PLATFORMS AND HEMISPHERICAL-FIELD-OF-VIEW DETECTOR ARRAYS MOUNTED TO TARGETS. OPTICAL SOURCE OUTPUTS WOULD BE CODED FOR IDENTIFICATION PURPOSES. LINE-OF-SIGHT VERIFICATION DATA WOULD BE RADIOED FROM TARGETS TO AN OPERATIONS CONTROL CENTER IN REAL TIME. A CONCEPTUAL DESIGN OF THE LINE-OF-SIGHT VERIFICATION SYSTEM WILL BE DEVELOPED DURING PHASE I, AND A FIELD-CAPABLE PROTOTYPE WILL BE DESIGNED, FABRICATED, AND TESTED DURING PHASE II.

SCHWARTZ ELECTRO-OPTICS, INC.
3404 N. ORANGE BLOSSOM TRAIL
ORLANDO, FL 32804
Phone: (407) 298-1802
Topic#: 91-173
Office: VAL
Contract #:
PI: R.J. WANGLER
ID#: 91VAL-001
Title: HIGH DUTY CYCLE, HIGH BRIGHTNESS PULSED LASER DIODE
Abstract: THE PROPOSED EFFORT IS TO ANALYZE, DESIGN, AND FABRICATE A PROTOTYPE NEAR-IR (800-900 NM) SEMICONDUCTOR LASER WHICH WILL HAVE HIGH RADIANCE AND HIGH DUTY CYCLE AND WILL MEET THE REQUIREMENTS OF A RAIL JAMMER. FROM WORK DONE BY SEO AND OTHERS, IT HAS NOT BEEN CONCLUSIVELY PROVEN WHETHER LASER DEGRADATION IS DUE TO HIGH CURRENT DENSITY OR EXCESSIVE OPTICAL FLUX AT THE LASER FACETS. THERE ARE CASES WHERE THERE IS NO DETECTABLE FACET DAMAGE. IN THE SINGLE QUANTUM WELL (SQW) SEMICONDUCTOR LASER, THE CURRENT DENSITY AND OPTICAL FLUX CAN BE VARIED INDEPENDENTLY BY EMPLOYING DIFFERENT LASER CAVITY LENGTHS. SEO WILL OBTAIN A SAMPLE LOT OF FOUR SQW LASERS HAVING DIFFERENT CAVITY LENGTHS. THESE WILL BE DIVIDED INTO THREE LOTS. THE FIRST LOT WILL HAVE THE NORMAL HIGH-REFLECTANCE COATING ON ONE FACET AND THE NORMAL UNCOATED CLEAVED FACET. THE SECOND LOT WILL BE THE SAME EXCEPT THAT THE UNCOATED FACET WILL BE COATED FOR VARIOUS REFLECTIVITIES WITH HIGH-DAMAGE-LEVEL, MULTILAYER, DIELECTRIC COATINGS. THE THIRD LOT WILL HAVE BOTH FACETS ANTI-REFLECTION COATED, AND THESE DIODES WILL BE USED IN AN EXTERNAL CAVITY. A PERFORMANCE PREDICTION WILL BE MADE USING A LASER MODELING SOFTWARE PROGRAM. THE EXPERIMENTAL MEASUREMENTS WILL BE COMPARED WITH THOSE PREDICTED BY THE LASER MODEL. THE RESULTS OF THIS PROGRAM WILL BE A BASIS FOR PHASE II, WHICH WOULD BE CONCERNED WITH THE DESIGN OF A PRODUCTION UNIT AND THE EXTENSION OF LASER WAVE LENGTH TO LONGER VALUES.

SCHWARTZ ELECTRO-OPTICS, INC.
3404 N. ORANGE BLOSSOM TRAIL
ORLANDO, FL 32804
Phone: (407) 298-1802
Topic#: 91-249
Office: PM TRADE
Contract #:
PI: STEVE PRESTON
ID#: 91PM -003
Title: REALTIME CASUALTY ASSESSMENT (RTCA) UNDER OBSCURED BATTLEFIELD CONDITIONS

Abstract: THE ARMY'S PRIME FORCE ON FORCE TRAINING SYSTEM (MULTIPLE INTEGRATED LASER ENGAGEMENT SYSTEM (MILES)) OPERATES AT .904 MICRONS. THIS WAVELENGTH IS LIMITED BY EYE SAFETY AND ATTENUATION BY BATTLEFIELD OBSCURANT CONSIDERATIONS. NEW ARMY WEAPON SYSTEMS ARE DESIGNED TO OPERATE OUT TO RANGES IN EXCESS OF 8 KM UNDER ALL BATTLEFIELD VISIBILITY CONDITIONS. MILLIMETER WAVE SENSOR AND GUIDANCE/CONTROL SYSTEMS AND THERMAL SIGHTS DICTATE THAT ENGAGEMENT TRAINING SYSTEMS (MILES) MUST HAVE IMPROVED OPERATIONAL CAPABILITY TO EFFECTIVELY SIMULATE THESE NEW WEAPON SYSTEMS. SCHWARTZ ELECTRO-OPTICS, INC. (SEO) HAS DEVELOPED NEW SOLID STATE LASERS OPERATING IN THE 2 TO 3 MICRON REGION. SINCE THESE WAVELENGTHS ARE RELATIVELY EYESAFE AND ARE NOT HEAVILY ATTENUATED BY BATTLEFIELD OBSCURANT, A MILES SYSTEM OPERATING IN THIS REGION COULD RETAIN THE SMALL SIZE AND WEIGHT OF CURRENT MILES WHILE PROVIDING THE INFORMATION TRANSMISSION (6KZ) RATE AND RANGE NEEDED TO SIMULATE THE NEW WEAPON SYSTEMS. SEO PROPOSES TO ASSEMBLE AN ENGAGEMENT SIMULATION SYSTEM OPERATION IN THE 2 TO 3 MICRON REGION AND TEST IT DURING SMOKE WEEK AT EGLIN AFB OR OTHER GOVERNMENT FACILITY.

SCHWARTZ ELECTRO-OPTICS, INC.
3404 N. ORANGE BLOSSOM TRAIL
ORLANDO, FL 32804
Phone: (407) 298-1802
Topic#: 91-252 ID#: 91PM-012
Office: PM TRADE
Contract #:
PI: STEVE PRESTON
Title: WEAPON TRAINING INSTRUMENTATION
Abstract: THE PROPOSED SOLDIER/CREW WEAPON INSTRUMENTATION SYSTEM WILL PROVIDE A NON INTRUSIVE INSTRUMENTATION CAPABILITY THAT WILL RECORD THE SOLIDER/CREW INTERACTIONS AND PERFORMANCE FOR POST EXERCISE ANALYSIS AND CRITIQUE BY AN INSTRUCTOR. THE SOLDIER/CREW INSTRUMENTATION SYSTEM PROPOSED WOULD RECORD SIGHT PICTURE, WEAPON SPATIAL ORIENTATION AT TIME OF FIRE, AND THE PHYSICAL INTERACTIONS BETWEEN THE SOLDIER/CREW AND WEAPON. THE SYSTEM WOULD BE SMALL AND LIGHTWEIGHT SO AS NOT TO INTERFACE WITH THE SOLDIER/CREW PERFORMANCE AND WOULD BE SUITABLE FOR BOTH LIVE FIRE AND FORCE ON FORCE TRAINING. IT WOULD NOT INTERFERE WITH INSTALLED MILES EQUIPMENT. SEO PROPOSES TO PURCHASE OFF THE SHELF COMMERCIAL EQUIPMENT AND DESIGN AND FABRICATE THE NECESSARY CONTROLS AND INTERFACE CIRCUITRY TO DEMONSTRATE SYSTEM OPERATION AND FUNCTIONAL CAPABILITY.

SCIENCE RESEARCH LABORATORY, INC.
15 WARD STREET
SOMERVILLE, MA 02143
Phone: (617) 547-1122
Topic#: 91-079 ID#: 91MIC-043
Office: MICOM
Contract #: DAAH01-92-C-R104
PI: DR. STEPHEN FULGHUM
Title: INNOVATIVE HEAD DESIGNS FOR COMPACT, FLASHLAMP-PUMPED DYE LASERS
Abstract: This SBIR proposes two innovatives laser head designs, based on waveguide and zig-zag optical cavities, for Army flashlamp-pumped dye laser systems. These designs will significantly reduce the deleterious effects of refractive index changes due to dye solvent heating. Analyses indicate that 50% increases in laser efficiency, near-diffraction-limited optical beams, factors of two increases in laser power and significantly reduce dye flow requirements can be achieved. An analytical comparison of the two designs will be made in Phase I, leading to an engineering design for a single prototype head design for Phase II implementation.

SCIENTIFIC RESEARCH ASSOCIATES, INC.
P.O. BOX 1058, 50 NYE ROAD
GLASTONBURY, CT 06033
Phone: (230) 659-0333
Topic#: 91-141 ID#: 91ETD-078
Office: ETDL
Contract #:
PI: M. MEYYAPPAN
Title: A PROCESS MODEL AND COMPLEMENTARY EXPERIMENTS FOR THE ELECTRON CYCLOTRON RESONANCE (ECR) TECHNOLOGY: APPLICATION TO DEPOSITION AND ETCHING
Abstract: THIS PROPOSAL DESCRIBES A PROGRAM TO DEVELOP A PROCESS MODEL FOR THE ELECTRON

CYCLOTRON TECHNOLOGY (ECR). A COMPLEMENTARY EXPERIMENTAL PROGRAM IS ALSO PROPOSED. ECR IS RECEIVING MUCH ATTENTION IS PLASMA PROCESSING WITH APPLICATIONS TO DEPOSITION AND ETCHING. IT ALLOWS DEPOSITION OF DIELECTRIC AND OTHER THIN FILMS AT LOW TEMPERATURES. IN ETCHING, ECR OPERATES AT PRESSURES BELOW 1MTORR TO PERMIT ANISOTROPIC ETCH OF EXTREMELY FINE FEATURES WITH LOW RESIDUAL DAMAGE. AS THE TECHNOLOGY IS AT ITS EARLY STAGES, A THROUGH UNDERSTANDING IS NEEDED TO ASCERTAIN THE UTILITY OF ECR IN DEVICE FABRICATION EFFORTS. THE MODEL PROPOSED IN PHASE I WILL PROVIDE DEPOSITION AND ECH RATES AS FUNCTION OF SYSTEM PARAMETERS. THE MODEL WILL BE DEMONSTRATED FOR THE ECR DEPOSITION OF SILICON MITRIDE AND ECR ETCHING OF GAAS. THE EXPERIMENTAL PROGRAM WILL INVOLVE DIAGNOSTICS OF THE PLASMA, ANALYSIS OF THE WAFER SURFACE AND EVALUATION OF THE FILM QUALITY (DEPOSITION) OR ETCHED SURFACE DAMAGE. THE COMBINED MODELING AND EXPERIMENTAL PROGRAM IS EXPECTED TO AID IN DEVELOPING USEFUL ECR PROCESSES, EXPLORE LIMITATIONS IF ANY AND SUGGEST APPLICATIONS IN DEVICE FABRICATION. THE PROPOSED EFFORT IS AN OUTGROWTH OF A SIMILAR PROGRAM ON MAGNETRON ETCHING CONDUCTED BY THE PROPOSER FOR THE U.S. ARMY.

SCIENTIFIC SYSTEMS COMPANY
500 WEST CUMMINGS PARK, SUITE 3950
WOBURN, MA 01801
Phone: (617) 933-5355

Topic#: 91-003 ID#: 91CEC-303
Office: CECOM
Contract #: DAAB07-91-C-J005
PI: DRS. RAMAN MEHRA/SHAH MAH

Title: TARGET CLASSIFICATION IN HIGH CLUTTER ENVIRONMENT: A SYSTEM IDENTIFICATION BASED TARGET CLASSIFICATION TECHNIQUE IN A HIGH CLUTTER ENVIRONMENT.

Abstract: RADAR TARGET CLASSIFICATION CAN ENABLE IMPROVED ALLOCATION OF BATTLEFIELD RESOURCES, SUCH AS ASSIGNING WEAPONS TO THE MOST IMPORTANT CLASSES OF TARGETS. EXPERIMENTS HAVE SHOWN THAT GROUND VEHICLES AND HELICOPTERS HAVE DISTINGUISHING SPECTRAL COMPONENTS IN THEIR DOPPLER SIGNATURES. THESE KEY SPECTRAL FEATURES CAN BE MUCH WEAKER THAN THE UNWANTED CLUTTER ECHOES. CONSEQUENTLY, TARGET CLASSIFICATION IN A HIGH CLUTTER ENVIRONMENT REQUIRES FREQUENCY SELECTIVE FILTERING TO SEPARATE WEAK SPECTRAL FEATURES FROM THE STRONG CLUTTER. IT IS ALSO DESIRABLE TO RESOLVE SIGNALS AND CLUTTER WHICH ARE CLOSELY SPACED IN FREQUENCY AS MIGHT OCCUR WITH SLOWLY MOVING VEHICLES. EXISTING CLUTTER REJECTION TECHNIQUES, WHICH USE WEIGHTED FAST FOURIER TRANSFORM (FFT) PROCESSING, SUFFER FROM DEGRADED FREQUENCY RESOLUTION. A NEW POWERFUL TECHNIQUE OF SPECTRUM ANALYSIS BASED ON STOCHASTIC REALIZATION CONCEPT IS PROPOSED HERE WHICH IS EXPECTED TO PROVIDE HIGHER RESOLUTION SO THAT SLOWER-MOVING TARGETS CAN BE CLASSIFIED IN A HIGH CLUTTER ENVIRONMENT. THE PERFORMANCE OF THE RESULTING ALGORITHM WILL BE COMPARED TO THE STANDARD FFT APPROACH. THE PROPOSED STEPS TOWARD THE MAJOR OBJECTIVE ARE (1) MATHEMATICAL MODELING OF THE PROCESS, (2) PERFORM STATE-OF-THE-ART SURVEYS ON KEY RADAR TECHNOLOGY AREA, (3) ALGORITHM DEVELOPMENT AND TESTING, AND (4) SURVEY AND EVALUATE CLASSIFICATION ALGORITHMS. RAYTHEON CO AT WAYLAND, A LEADER IN RADAR TECHNOLOGY, WILL SUBCONTRACT IN THIS EFFORT.

SCIENTIFIC SYSTEMS COMPANY
500 WEST CUMMINGS PARK, SUITE 3950
WOBURN, MA 01801
Phone: (617) 933-5355

Topic#: 91-129 ID#: 91ARO-019
Office: ARO
Contract #:
PI: R.K. MEHRA/S. MAHMOOD

Title: ON-LINE IDENTIFICATION AND CONTROL ALGORITHMS FOR LINEAR AND NONLINEAR SYSTEMS USING SVD'S ON SYSTOLIC ARRAYS

Abstract: IN THE PROPOSED STUDY, A NEW CLASS OF ALGORITHMS BASED UPON A GENERALIZED SINGULAR VALUE DECOMPOSITION (SVD) IS CONSIDERED FOR SYSTEM IDENTIFICATION, STATISTICAL MODEL ORDER DETERMINATION, MODEL ORDER REDUCTION, AND PREDICTIVE CONTROL. THE EXTENSION OF THESE ALGORITHMS TO NON-LINEAR POLYNOMIAL SYSTEMS FOR APPROXIMATING ARBITRARY NONLINEAR SYSTEMS IS PROPOSED. CURRENTLY AVAILABLE ALGORITHMS FOR SYSTEM IDENTIFICATION AND CONTROL

ARE NOT COMPLETELY RELIABLE FOR AUTOMATIC IMPLEMENTATION ON MICROPROCESSORS IN REAL TIME. IN THE GENERALIZED SVD APPROACH, THE ALGORITHMS ARE COMPUTATIONALLY STABLE AND NUMERICALLY ACCURATE AND CAN BE IMPLEMENTED ON SYSTOLIC ARRAY PROCESSORS USING RECENTLY DEVELOPED ALGORITHMS RESULTING IN A CONSIDERABLE SPEEDUP. THE PROPOSED RESEARCH APPROACH IS BASED UPON A RECENT GENERALIZED CANONICAL BARIATE ANALYSIS (CBA) METHOD FOR DETERMINING THE OPTIMAL STATE OF A RESTRICTED ORDER IN A SYSTEM IDENTIFICATION, REDUCED ORDER STOCHASTIC FILTERING, AND MODEL PREDICTIVE CONTROL. THIS PERMITS A UNIFIED APPROACH TO THE SOLUTION OF THESES PROBLEMS FROM THE VIEWPOINTS OF PREDICTION AND AS AN APPROXIMATION PROBLEM. THE RESULTS GENERALIZE REALDISY TO NONLINEAR SYSTEMS USING POLYNOMIAL APPROXIMATIONS. THE EXPECTED RESULTS FROM THE PHASE I RESEARCH ARE THE DETERMINATION OF DETAILED METHODS AND ALGORITHMS TO DEMONSTRATE THE FEASIBILITY OF ONLINE COMPUTATION FOR IDENTIFICATION, FILTERING, AND CONTROL FOR HIGH ORDER LINEAR MULTIVARIABLE SYSTEMS AND POLYNOMIAL NONLINEAR SYSTEMS. IN PHASE II, SOFTWARE WILL BE DEVELOPED FOR IMPLEMENTING THESE ALGORITHMS ON PARALLEL PROCESSORS AND HIGH SPEED SERIAL PROCESSORS.

SCS TELECOM, INC.
85 OLD SHORE ROAD - SUITE 200
PORT WASHINGTON, NY 11050
Phone: (516) 883-0760
Topic#: 91-006 ID#: 91CEC-460
Office: CECOM
Contract #: DAAB10-92-G0016
PI: MARVIN KULLBACK
Title: THE HIGH I-Q EXPENDABLE JAMMER
Abstract: THE OBJECTIVE OF THIS PROPOSAL IS THE DEVELOPMENT OF A SMART EXPENDABLE JAMMER. USING THE PROPOSED APPROACH THE US ARMY WILL HAVE AVAILABLE A JAMMER WHICH IS FAR SUPERIOR IN PERFORMANCE TO THE EXPENDABLE JAMMERS CURRENTLY AT ITS DISPOSAL. THE PROPOSED "HIGH I-Q" EXPENDABLE JAMMER IS AN INEXPENSIVE, LOW POWER, JAMMER WHICH ENABLES A FREQUENCY HOPPING SIGNAL TO BE FOLLOWED SO THAT THE TOTAL JAMMING POWER CAN BE CONCENTRATED OVER A SPECIFIED NARROW BANDWIDTH. IN ADDITION, THIS JAMMER CAN FOCUS ON A TARGET WITHIN A ADAPTIVELY CONTROLLED 60 DEGREE SECTOR. THUS, THIS INNOVATIVE APPROACH GREATLY INCREASES THE EFFECTIVENESS OF AN EXPENDABLE JAMMER. THE PROPOSED EFFORT WILL INCLUDE A HIGH LEVEL DESIGN, A SIMULATION TO DEMONSTRATE THE EFFICIENCY OF THE DESIGN APPROACH, AND A MORE DETAILED DESIGN FOR THE PURPOSE OF DETERMINING COST. THE HIGH I-Q EXPENDABLE JAMMER WILL BE BUILT AND TESTED IN PHASE II.

SEARCH TECHNOLOGY, INC.
4725 PEACHTREE CORNERS CIRCLE, SUITE 200
NORCROSS, GA 30092
Phone: (404) 441-1457
Topic#: 91-188 ID#: 91AVS-089
Office: AVSCOM
Contract #:
PI: JOHN H. HAMMER
Title: REAL TIME ASSOCIATE SYSTEM TECHNOLOGY
Abstract: REAL TIME PERFORMANCE IN ASSOCIATE SYSTEMS IS A TECHNICAL RISK BECAUSE ARTIFICIAL INTELLIGENCE TECHNIQUES ARE USED, WHICH ARE TYPICALLY SLOW. OTHER METHODOLOGIES FOR THIS PROBLEM ADDRESS ONLY ONE PROBLEM ASPECT (E.G., EFFICIENCY) OR SIMPLY FIX AN EXISTING IMPLEMENTATION. THE PROPOSED RESEARCH WILL DEVELOP A DESIGN METHODOLOGY THAT ADDRESSES ALL ASPECTS OF THE PROBLEM PRIOR TO IMPLEMENTATION.

SENSOR PLUS, INC.
2211 MAIN STREET
BUFFALO, NY 14214
Phone: (716) 831-0091
Topic#: 91-212 ID#: 91MED-056
Office: MEDICAL
Contract #:
PI: MUSTAFA E. KUTLUBAY
Title: REAL-TIME, LIGHT WEIGHT, X-RAY IMAGER
Abstract: THE DEVELOPMENT A REAL-TIME DIGITAL IMAGER, TO REPLACE CURRENT X-RAY FILM CASSETTES, IS PROPOSED. X-RAY WILL BE DETECTED BY A METAL/FLUORESCENT SCREEN AND READ OUT BY AN AREA

OF CHARGE-COUPLED-DEVICES WHICH ARE CONTROLLED BY A HIGH SPEED MICROCOMPUTER. THE IMAGE WILL THEN BE DISPLAYED ON A HIGH RESOLUTION DISPLAY. THIS PROJECT ALSO INVOLVES DEVELOPMENT OF NUMBER OF DATA PROCESSING ALGORITHMS TO ALLOW HIGH QUALITY IMAGE OUTPUT.

SEPARATION SYSTEMS TECHNOLOGY, INC.
4901 MORENA BLVD., SUITE 809
SAN DIEGO, CA 92117
Phone: (619) 581-3765

Topic#: 91-001 ID#: 91BRD-344
Office: BRDEC
Contract #: 91-C-0065
PI: ROBERT L. RILEY

Title: IDENTIFICATION AND EVALUATION OF BIOCIDES FOR ROWPU SYSTEMS

Abstract: A PHASE I FEASIBILITY PROGRAM IS PROPOSED TO IDENTIFY AND EVALUATE EXISTING AND NOVEL ANTIMICROBIAL AGENTS (I.E., BIOCIDES) FOR PRESERVATION OF REVERSE OSMOSIS (RO) MEMBRANE ELEMENTS USED IN ROWPU SYSTEMS. CANDIDATE BIOCIDES WILL BE SELECTED FOR LABORATORY EVALUATION BASED ON THEIR REPORTED DISINFECTION ACTIVITIES, KNOWN OR SUSPECTED EFFECTS ON RO MEMBRANE INTEGRITY AND PERFORMANCE, SAFETY AND ENVIRONMENTAL PROPERTIES, CHEMICAL STABILITY AND SHELF LIFE, EASE OF HANDLING AND COMMERCIAL AVAILABILITY AND COST. THE SPECIFIC PHASE I OBJECTIVES INCLUDE (1) IDENTIFICATION OF KNOWN BIOCIDES OR OTHER CHEMICAL COMPOUNDS (OR MIXTURES OF COMPOUNDS) THAT MAY HAVE POTENTIAL AS MEMBRANE PRESERVATIVES, (2) SELECTION OF CANDIDATE BIOCIDES BASED ON REPORTED TOXICOLOGICAL PROPERTIES, MICROBICIDAL ACTIVITY AND OTHER CRITERIA, (3) SELECTION AND/OR DEVELOPMENT OF APPROPRIATE METHODS AND TESTING PROTOCOLS FOR EVALUATING CANDIDATE BIOCIDES FOR THEIR ACTIVITY AND COMPATIBILITY, (4) PRELIMINARY ACTIVITY AND COMPATIBILITY TESTING TO VALIDATE TESTING PROTOCOLS AND (5) PREPARATION OF A FINAL REPORT SUMMARIZING ALL PHASE I RESULTS. THE PHASE I REPORT WILL CONTAIN A DISCUSSION OF THE FEASIBILITY OF EXTENDING THE PHASE I RESEARCH IN A PHASE II PROGRAM TO INCLUDE MORE THOROUGH LABORATORY AND FIELD EVALUATION OF CANDIDATE BIOCIDES.

SETS TECHNOLOGY, INC.
300 KAHELU AVENUE #10
MILILANI, HI 96789
Phone: (808) 625-5262

Topic#: 91-021 ID#: 91ETL-303
Office: ETL
Contract #: DACA76-91-C-0013
PI: PAMELA BLAKE

Title: DEVELOPMENT OF A HYPERSPECTRAL GAS ANALYSIS SYSTEM (HYGAS)

Abstract: THIS PROPOSAL RESPONDS TO TECHNICAL SUBTOPIC A91-021: TOPOGRAPHY, IMAGE INTELLIGENCE, AND SPACE EXPLOITATION, WHICH REQUESTS THAT UNIQUE APPROACHES FOR A REAL TIME KNOWLEDGE ENGINEERING BASED TACTICAL DECISION AIDS SYSTEM BE DEVELOPED INVOLVING PARALLEL COMPUTER ARCHITECTURES. THE OPPORTUNITY IS TO DEVELOP A SYSTEM THAT ACQUIRES AND TRANSLATES THE EXPERT'S KNOWLEDGE INTO A REPRESENTATION UTILIZABLE BY A MODERATELY-TRAINED ANALYST UNDER A ROBUST SET OF SCENARIOS, INCLUDING PROBABILITY CONSTRAINTS. THE CONCEPTUAL DESIGN FOR A KNOWLEDGE-BASED SYSTEM THAT UTILIZES HYPERSPECTRAL DATA FOR THE REMOTE DETECTION AND IDENTIFICATION OF GASEOUS MATERIALS (CALLED HYGAS) IS TO BE DEVELOPED. THE KNOWLEDGE BASE FOR THE SYSTEM SHALL BE A DATABASE OF HIGH RESOLUTION SPECTRA AND THE ASSOCIATED TABLES OF DIAGNOSTIC SPECTRAL PARAMETERS, AS DEFINED BY EXPERT ANALYSTS. THE SYSTEM IS TO USE HYPERSPECTRAL PROCESSING METHODS IN A PARALLEL-PROCESSING COMPUTER ENVIRONMENT. THE OBJECTIVES OF PHASE I ARE TO DEVELOP A DETAILED CONCEPTUAL DESIGN FOR THE ENTIRE KNOWLEDGE-BASED SYSTEM, AND TO DEFINE THE REQUIREMENTS, SOURCES, AND METHODS FOR POPULATING THE GAS DATABASE. SETS TECHNOLOGY, INC. PERSONNEL HAVE MANY YEARS EXPERIENCE DEVELOPING AND USING IMAGE PROCESSING SYSTEMS THAT ACCESS MULTIPLE SPECTRAL DATABASES OF DIVERSE MATERIALS, AND PROCESS DATA AT VARIABLE SPECTRAL RESOLUTIONS.

SI, DIVISION OF SPECTRUM 39
P. O. BOX 10970-0970
BALTIMORE, MD 21234

Topic#: 91-008 ID#: 91TAC-301
Office: TACOM
Contract #: DAAE07-91-C-R087

Phone: (301) 661-7109 PI: DR. WILLIAM J. SCHUMAN
Title: CONCEPTS FOR LIGHTER & SMALLER GROUND COMBAT VEHICLES
Abstract: THE OBJECT OF THIS PROJECT IS TO DEVELOP A SET OF STRUCTURAL CONCEPTS THAT WILL LEAD TO LIGHTER/ SMALLER GROUND COMBAT VEHICLES. IN ADDITION, A PRELIMINARY DESIGN OF TEST METHODS FOR EVALUATING THE CONCEPTS WILL BE DEVELOPED. AVAILABLE DATA FROM THE VARIOUS STUDIES OF ADVANCED VEHICLES WILL BE UTILIZED. THE PROJECT EFFORT WILL CONSIST OF SIX TASKS: 1) SURVEY OF PROMISING WEIGHT REDUCTION TECHNOLOGIES 2) DEVELOPMENT OF STRUCTURAL CONCEPTS 3) PRELIMINARY ANALYSIS OF CONCEPTS 4) PERFORM COST/WEIGHT COMPARISONS 5) PRELIMINARY DESIGN OF TEST METHODS 6) FINAL REPORTS IN TASK 1 THE SURVEY WILL INCLUDE NEW AND POTENTIAL MATERIALS, STRUCTURAL DESIGNS, SURVIVABILITY METHODOLOGY, LETHAL MECHANISMS, CREW REDUCTION AND AUTOMATION. IN TASK 2 THE RESULTS OF THE SURVEY AND THE EXPERIENCE OF SI IN THE AREA OF DESIGN AND TESTING OF EQUIPMENT FOR THE TACTICAL NUCLEAR BATTLEFIELD WILL BE USED TO DEVELOP A SET OF STRUCTURAL CONCEPTS. IN TASK 3 THE PRELIMINARY ANALYSES OF THE CONCEPTS WILL BE PERFORMED. COST/WEIGHT COMPARISONS OF THE SET WILL BE MADE IN TASK 4. IN TASK 5 A PRELIMINARY DESIGN OF TEST METHODS FOR EVALUATING THE SET OF STRUCTURAL CONCEPTS WILL BE DEVELOPED. A FINAL REPORT WILL BE PREPARED IN TASK 6.

SIMEX SYSTEMS & SOFTWARE CORP. Topic#: 91-062 ID#: 91CEC-088
2546 N. FLANWILL BLVD. Office: CECOM
TUCSON, AZ 85716 Contract #:
Phone: (602) 621-2108 PI: BERNARD P. ZIEGLER
Title: MODEL FUSION
Abstract: WE PROPOSE TO DEVELOP AN EXPERT GUIDED APPROACH TO CONSTRUCTING HIGH LEVEL MODELS USING DETAILED MODELS OF ARMY COMMUNICATIONS SYSTEMS IN THE CECOM INVENTORY AS THE GROUND LEVEL BASIS. SPECIFIC OBJECTIVES INCLUDE: TO IDENTIFY CHARACTERISTICS OF THE CECOM MODEL INVENTORY RELEVANT TO SUCH MODEL FUSION, IDENTIFY APPLICABLE MODEL FUSION METHODS, AND IDENTIFY CRITERIA FOR, AND DOMAIN OF APPLICABILITY OF VALID MODEL FUSION METHODS. ON THIS BASIS, WE WILL DEVELOP A DESIGN APPROACH FOR A MODEL FUSION SUPPORT ENVIRONMENT AND DETERMINE THE TECHNICAL FEASIBILITY OF THE PROPOSED DESIGN APPROACH. THE DESIGN APPROACH WILL PROVIDE SPECIFICATIONS FOR THE PHASE II IMPLEMENTATION OF THE PROPOSED SYSTEM. THE EFFORT WILL BE BASED ON THE DEVS MODELLING FORMALISM OF SEIGLER'S, WHICH IS ESPECIALLY SUITABLE FOR THE TASK AND WILL BE PERFORMED BY BERNARD ZEIGLER WHO HAS CONTRIBUTED SIGNIFICANTLY TO THE AREA OF MODELLING THEORY AND MODEL FUSION.

SIMPEX TECHNOLOGIES, INC. Topic#: 91-161 ID#: 91HDL-046
732 N DIAMOND BAR BLVD., SUITE 116 Office: HDL
DIAMOND BAR, CA 91765 Contract #:
Phone: (714) 396-0720 PI: BERNARD K. SIU
Title: AUTOMATED COMPOSITE MATERIAL INSPECTION SYSTEM
Abstract: OVER THE PAST TWO DECADES, ADVANCED COMPOSITE MATERIALS HAVE PROGRESSED FROM THE LABORATORY TO A PRODUCTION REALITY. COMPOSITE APPLICATIONS HAVE RANGED FROM LIMITED AIRCRAFT PARTS TO MUNITION DELIVERY LAUNCH TUBES. THOUGH COMPOSITE MATERIAL COMPONENTS HAVE A SUCCESSFUL TRACK RECORD IN THE FIELD, PRODUCTION QUANTITY REMAINS LOW. AUTOMATION FOR THE MANUFACTURING AND INSPECTION OF THESE COMPONENTS IS NOT READILY AVAILABLE. QUALITY LEVEL FOR COMPOSITE MATERIAL COMPONENTS IS A GROWING CONCERN AMONG THE DEFENSE AND COMMERCIAL INDUSTRY. COMPOSITE MATERIALS ARE INSPECTED IN TWO STAGES, EXTERNALLY AND INTERNALLY. EXTERNAL INSPECTION IS NORMALLY PERFORMED MANUALLY AND THE INTERNAL INSPECTION IS PERFORMED WITH THE AID OF ULTRASONIC TECHNIQUES. BOTH OF THESE METHODS ARE SLOW AND CUMBERSOME. WITH GROWING POPULARITY OF COMPOSITE MATERIAL COMPONENTS, A MORE EFFICIENT AND FASTER INSPECTION STATION IS NEEDED TO PERFORM BOTH OF THE INSPECTION TASKS IN A SINGLE PASS. AS PROPOSED BY SIMPEX, THIS AUTOMATED COMPOSITE MATERIAL INSPECTION

SYSTEM (ACMIS) USES THE LATEST HIGH SPEED MACHINE VISION AND REAL TIME X-RAY TECHNOLOGIES FOR INTERNAL AND EXTERNAL INSPECTION OF COMPOSITE MATERIAL COMPONENTS IN A SINGLE PASS AT A SPEED OF 120 MILLISECONDS PER FIELD OF VIEW. THIS SYSTEM WILL HAVE THE INTELLIGENCE TO LOCATE AND IDENTIFY THE FLAWS WITHIN THAT TIME FRAME. AS AN OPTION, AN IDENTIFICATION SYMBOL WILL BE MARKED ON THE COMPOSITE SURFACE INDICATING THE LOCATION AND TYPE OF THE FLAW BY AN INK JET MARKER AUTOMATICALLY. SIMPEX WILL INTEGRATE AND DEMONSTRATE THE PERFORMANCE OF THIS INSPECTION SYSTEM, USING ACTUAL SAMPLES, TO THE GOVERNMENT REPRESENTATIVES AND GUESTS.

SIMULA, INC.
10016 S. 51ST STREET
PHOENIX, AZ 85044
Phone: (602) 893-7533
Topic#: 91-018 ID#: 91AVS-330
Office: AVSCOM
Contract #: DAAJ02-91-C-0057
PI: STEPHEN M. ARNDT
Title: INERTIA REEL CALIBRATION TESTER
Abstract: THIS PROPOSAL IS FOR AN ADJUNCT TO FLIR SENSORS TO REDUCE THE NOISE EQUIVALENT TEMPERATURE DIFFERENCE AND MINIMUM RESOLVABLE TEMPERATURE DIFFERENCE EACH BY A FACTOR OF FOUR (4). THE PROPOSED ADJUNCT CAN BE APPLIED TO EXISTING FLIRS WITHOUT MODIFYING THE FLIR IN ANY WAY. THIS PROCESSOR WILL ENABLE CURRENT FLIRS TO PROVIDE SAIRS TYPE PERFORMANCE AT A SMALL FRACTION OF THE COST OF A NEW FLIR. THE NOISE REDUCTION PROCESSOR REDUCES THE NOISE BY REDUCING THE EFFECTIVE BANDWIDTH. THIS IS ACCOMPLISHED WITHOUT LOSS OF SPATIAL RESOLUTION OR REDUCTION OF FRAME RATE BY THE APPLICATION OF THE PROCESSING METHODS PROPOSED. THE INNOVATION IN THE PROPOSAL IS IN THE APPROACH TO ACHIEVING THE NOISE REDUCTION FOR DYNAMIC SCENES AT THE FULL FRAME RATE.

SOFTWARE PRODUCTIVITY SOLUTIONS, INC.
122 NORTH 4TH AVENUE
INDIALANTIC, FL 32903
Phone: (407) 984-3370
Topic#: 91-059 ID#: 91CEC-151
Office: CECOM
Contract #:
PI: VINCENT J. KOVARIK, JR.
Title: A RECONFIGURABLE AUTOMATED SOFTWARE METRICS ENVIRONMENT (RASME)
Abstract: THE OBJECTIVE OF THIS EFFORT IS TO TARGET THREE DISTINCT, YET RELATED CHALLENGES IN THE PRACTICAL APPLICATION OF SOFTWARE METRICS TO MISSION CRITICAL DEFENSE SYSTEMS: (1) METRICS CYCLE TIME DELAYS; (2) METRICS DEPENDENCIES ON THE SOFTWARE PROCESS MODEL; AND (3) METRICS TAILORING TO THE MISSION DOMAIN. A ROBUST, YET HIGHLY ADAPTABLE AUTOMATED SOLUTION IS PROPOSED IN ORDER TO ADDRESS THESE CHALLENGES. THE PROPOSED RECONFIGURABLE AUTOMATED SOFTWARE METRICS ENVIRONMENT (RASME) PROVIDES AN INNOVATIVE, YET HIGHLY PRACTICAL PROCESS AND SUPPORTING TOOLSET FOR THE COST-EFFECTIVE IMPLEMENTATION OF SOFTWARE MANAGEMENT METRICS. RASME IS BASED ON THE CONCEPT OF AN AUTOMATED TIE-IN TO THE DEVELOPMENT SOFTWARE ENGINEERING ENVIRONMENT (SEE) USING LOW COST, HIGH YIELD DTA COLLECTION FILTERS. THESE FILTERS WILL ADDRESS THE CRITICAL NEED FOR TIMELY AND COST-EFFECTIVE METRICS DATA COLLECTION. RASME IS DYNAMICALLY RECONFIGURABLE IN THREE DIMENSIONS: THE METRICS, THE DEVELOPMENT PROCESS MODEL, AND THE APPLICATION DOMAIN. A USER EXTENSIBLE KNOWLEDGE-BASE PROVIDES FOR ADAPTABILITY TO PROCESS MODEL REFERENCES AND APPLICATION DOMAIN SPECIFICS. RULES FOR METRIC ASSESSMENT/INTERPRETATION AND CORRECTIVE ACTION INSERTION ARE ALSO MAINTAINED IN THE KNOWLEDGE-BASE. THIS RULE BASE IS ALSO USER EXTENSIBLE SO THAT NEW LESSONS LEARNED CAN BE ADDED IN SUPPORT OF ON-GOING PROCESS IMPROVEMENT.

SPACE APPLICATIONS CORP.
6632 S 191 PLACE, SUITE E-103
KENT, WA 98032
Topic#: 91-061 ID#: 91CEC-171
Office: CECOM
Contract #:

Phone: (206) 656-0140 PI: MIKE WOOD
Title: PROCESS AND MODEL FOR DETERMINING THE REUSABILITY OF AN EXISTING SOFTWARE ASSET
Abstract: DOD WILL DEVELOP AND RE-ENGINEER BILLIONS OF LINES-OF-CODE OVER THE NEXT FEW YEARS TO MEET OPERATIONAL REQUIREMENTS. SOFTWARE REUSE CAN BE A MAJOR FACTOR IN REDUCING THE COST OF DEVELOPMENT, RE-ENGINEERING, AND QUALITY IMPROVEMENT. KEY TO SOFTWARE REUSE IS THE ABILITY TO COST EFFECTIVELY IDENTIFY AND RE-ENGINEER EXISTING SOFTWARE ASSETS FOR REUSE AS WELL AS TO COST EFFECTIVELY DEVELOP NEW ASSETS FOR FUTURE REUSE. THIS STUDY ADDRESSES THE PROBLEM OF CHARACTERIZING SOFTWARE ATTRIBUTES THAT DETERMINE THE REUSABILITY OF SOFTWARE ASSETS AND FORMULATING NUMERICAL FACTORS THAT ARE PREDICTIVE INDICATORS OF REUSE. THE STUDY INCLUDES FORMULATION OF AN EXPERIMENTAL LINEAR REGRESSION MODEL THAT PROVIDES ESTIMATORS BASED ON DEFINED METRICS FOR A SET OF REUSE INDICATORS AS WELL AS AN OVERALL MEASURE OF REUSABILITY. THE REUSE INDICATORS MEASURE THE SUITABILITY OF THE ASSETS FOR REUSE AND POINT TO THE STRATEGY FOR RE-ENGINEERING THE ASSET FOR REUSE. THE MODEL ALSO PROVIDES A SINGLE REUSE FACTOR SUMMARIZING THE INDICATORS THAT PROVIDE A PREDICTION OF REUSE SUCCESS. THE MODEL CAN ALSO BE USED TO ESTIMATE THE REUSE INDICATORS AND OVERALL REUSE FACTOR AT ANY POINT DURING THE DEVELOPMENT PROCESS. THE DEVELOPMENT PROCESS CAN THEN BE MODIFIED TO IMPROVE THE FUTURE REUSABILITY OF THE ASSET.

SPECTRA RESEARCH, INC. Topic#: 91-194 ID#: 91AVS-140
PO BOX 495 Office: AVSCOM
DAYTON, OH 45459 Contract #:
Phone: (513) 435-4184 PI: PAUL D. ZIDEK
Title: COHERENT AVIONICS SOFTWARE SUPPORT TOOLS (CASST) SYSTEM
Abstract: FUTURE ARMY AIRCRAFT, AVIONICS, AND WEAPONS SYSTEM WILL BE REQUIRED COMPLEX STATE-OF-THE-ART MULTIPROCESSING COMPUTER SYSTEM. NEW COMMUNICATION AND PROCESSOR TECHNOLOGIES PERMIT MULTITASKED PROCESS OPERATION ACROSS MULTIPLE PROCESSING ELEMENTS REDUCING OVERALL COSTS, MINIMIZING PACKAGING REQUIREMENTS, AND IMPROVING RELIABILITY AND MAINTAINABILITY. AS A RESULT, RIGOROUS TIMING, SIZING AND PROCESSING REQUIREMENTS WILL BE PLACED ON EMBEDDED SOFTWARE SYSTEMS. RECENT DOD STANDARDIZATION DIRECTIVES MANDATED FOR SOFTWARE DEVELOPMENTS PROGRAMS COMBINED WITH COMPLEX AND EXACTING SYSTEM REQUIREMENTS WILL SIGNIFICANTLY INCREASE SOFTWARE DEVELOPMENT AND MAINTENANCE COSTS. COMPLETE SOFTWARE DEVELOPMENT LIFE CYCLE IN PHASE I, S*R WILL IDENTIFY INNOVATED SOFTWARE DEVELOPMENT METHODOLOGIES, PROCEDURES, AND TOOLS WHICH WILL SATISFY THE ARMY'S CURRENT AND FUTURE REQUIREMENTS FOR REAL TIME SOFTWARE APPLICATIONS. S*R WILL DEVELOP A DETAILED OPERATIONAL CONCEPT DOCUMENT (OCD) FOR THE PROPOSED COHERENT AVIONICS SOFTWARE SUPPORT TOOLS (CASST) SYSTEM. THE CASST OCD WILL PROVIDE THE FRAMEWORK FOR THE DESIGN OF A COMPREHENSIVE "SOFTWARE DEVELOPMENT ENVIRONMENT" THAT WILL ALLOW THE ARMY TO DEVELOP A NEW EMBEDDED SOFTWARE SYSTEM ON TIME AND WITHIN BUDGET. MOREOVER, THE CASST SYSTEM WILL PROVIDE SUPPORT FOR PROVEN SOFTWARE ENGINEERING PRINCIPLES TO DEVELOP ROBUST REUSABLE AND STANDARDIZED AVIONICS SOFTWARE SYSTEMS.

SPECTRAL SCIENCES, INC. Topic#: 91-132 ID#: 91ASL-013
99 SOUTH BEDFORD STREET, #7 Office: ASL
BURLINGTON, MA 01801 Contract #:
Phone: (617) 273-4770 PI: DR. ALEXANDER BERK
Title: WATER AND TEMPERATURE PROFILES IN THE TURBULENT SURFACE LAYER
Abstract: THIS PROPOSAL RESPONDS TO THE NEED FOR A DYNAMIC MODEL OF VERTICAL TEMPERATURE AND WATER VAPOR PROFILES IN THE TURBULENT SURFACE LAYER (TSL). THE MODEL WILL INCLUDE DIURNAL EFFECTS, RECENT WEATHER HISTORY, AND TSL RESPONSE TO SHORT-TERM CHANGES IN INCIDENT FLUX CAUSED BY TEMPORARY CLOUD OCCULTATION, SUNRISE, OR SUNSET. MODULES WILL BE DEVELOPED TO CALCULATE THE VERTICAL GRADIENT OF THE RADIATIVE FLUX IN THE TSL, TO MODEL

THE EXCHANGE OF HEAT AND WATER AMONG THE SOIL, VEGETATION AND THE TURBULENT SURFACE LAYERS, AND TO SOLVE THE TIME-DEPENDENT 1-D HEAT AND MASS FLOW EQUATIONS IN THE TSL. AVAILABLE EXPERIMENTAL DATA WILL BE EVALUATED TO DETERMINE ITS ADEQUACY FOR MODEL VALIDATION. BASED ON THESE STUDIES, PHASE II MODEL UPGRADES WILL BE RECOMMENDED AND A VERIFICATION OF FIELD EXPERIMENT WILL BE DESIGNED.

SPIRE CORP.
PATRIOTS PARK
BEDFORD, MA 01730
Phone: (617) 275-6000

Topic#: 91-026 ID#: 91AMC-356
Office: AMC
Contract #: DAAL04-91-C-0050
PI: PIRAN SIOSHANSI, PH.D.

Title: ION BEAM ASSISTED DEPOSITION: A REPLACEMENT FOR WET CHEMICAL PLATING

Abstract: IN RECENT YEARS, CORROSION AND OXIDATION RESISTANT PLATING PROCESSES HAVE COME UNDER CRITICISM FROM THE GOVERNMENT REGULATORY BODIES (E.G., ENVIRONMENTAL PROTECTION AGENCY, EPA, AND OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION, OSHA). IN PARTICULAR, CADMIUM AND CHROMIUM PLATING PRACTICES ARE UNDER SEVERE PRESSURE. THE PLATING OPERATIONS ARE PERFORMED IN A CHEMICAL BATH (WET PROCESS) AND DISPOSAL OF THE CHEMICALS AND EXPOSURE TO THE FUMES DURING OPERATION ARE MAJOR AREAS OF CONCERN. IT IS EXPECTED THAT WITHIN 10 YEARS THESE PLATING PROCEDURES WILL BE PROHIBITED. ACCORDINGLY, ENVIRONMENTALLY FRIENDLY COATING PROCESSES MUST BE RESEARCHED AND ADOPTED. SPIRE PROPOSES TO INVESTIGATE THE FEASIBILITY OF USING THE ION BEAM ASSISTED DEPOSITION (IBAD) PROCESS AS A REPLACEMENT FOR THESE OPERATIONS. THE IBAD PROCESS IS A CLEAN, REPRODUCIBLE VACUUM-BASED COATING PROCESS WHICH HAS SHOWN GREAT PROMISE FOR COATING A WIDE VARIETY OF SUBSTRATE MATERIALS. SPIRE IS PIONEERING RESEARCH IN ADVANCING IBAD TO AN EFFECTIVE WIDE-SCALE INDUSTRIAL COATING PROCESS. THE PROCESS HAS THE POTENTIAL TO NOT ONLY ELIMINATE THE HAZARDOUS WASTE ASSOCIATED WITH WET CHEMICAL PLATING, BUT ALSO TO PROVIDE TECHNICALLY SUPERIOR HIGH PERFORMANCE COATINGS.

SPIRE CORP.
ONE PATRIOTS PARK
BEDFORD, MA 01730
Phone: (617) 275-6000

Topic#: 91-063 ID#: 91CEC-091
Office: CECOM
Contract #:
PI: FEREYDOON NAMAVAR, SC.D.

Title: HIGH RESISTIVITY ION-IMPLANTED GAAS BUFFER LAYERS FOR INTEGRATED PHOTONICS

Abstract: THE PERFORMANCE OF GAAS-INTEGRATED CIRCUITS HAS BEEN LIMITED BY BACKGATE OR SIDEGATE EFFECTS WHICH CAN LEAD TO UNDESIRABLE CROSS-TALK BETWEEN NEIGHBORING DEVICES AND IMPOSE LIMITS ON DEVICE PACKING DENSITY. RECENT RESEARCH HAS SHOWN THAT INCORPORATING A GAAS BUFFER LAYER GROWN AT LOW TEMPERATURES BY MOLECULAR BEAM EPITAXY (MBE) CAN RESULT IN MANY PERFORMANCE IMPROVEMENTS, INCLUDING ELIMINATION OF BACKGATING. ONE OF THE DOMINANT CHARACTERISTICS OF THE MBE-GROWN BUFFER LAYERS IS AN EXCESS OF AS IN THE FILM. WE PROPOSE THE FORMATION OF AS-RICH BUFFER LAYERS BY ION IMPLANTATION OF AS+ INTO GAAS. ION IMPLANTATION OFFERS MANY BENEFITS INCLUDING REPRODUCIBILITY AND CONTROLLABILITY. THE PROPOSED PROGRAM WILL COMBINE ION IMPLANTATION AND METALORGANIC CHEMICAL VAPOR DEPOSITION (MOCVD) TECHNIQUES TO DEVELOP A METHOD TO ISOLATE ACTIVE GAAS DEVICE REGIONS IN THREE DIMENSIONS. IN PHASE I, WE WILL GROW EPAXIAL GAAS LAYERS BY MOCVD AND IMPLANT AS UNDER VARIOUS CONDITIONS (INCLUDING MEV IMPLANTATION) TO FORM BURIED BUFFER LAYERS FOR VERTICAL ISOLATION AND AS-RICH WALLS BETWEEN ACTIVE REGIONS FOR HORIZONTAL ISOLATION. TEST PATTERNS WILL BE FABRICATED AND THE ELECTRICAL ISOLATION PROPERTY OF AS+-IMPLANTED LAYERS EVALUATED. PHASE II WORK WILL OPTIMIZE THE PROCESSES DEVELOPED IN THE PHASE I PROGRAM AND WILL INCLUDE FABRICATION OF DEVICES SUCH AS MESFETS AND PHOTODIODES IN ACTIVE GAAS REGIONS ISOLATED BY ION-IMPLANTED BUFFER LAYERS.

STEINBRECHER CORP.
185 NEW BOSTON STREET
WOBURN, MA 01803
Phone: (617) 935-8460
Topic#: 91-013 ID#: 91ETD-301
Office: ETDL
Contract #: DAAL01-91-C-0134
PI: DR. DEAN F. PETERSON
Title: MILLIMETER WAVE POWER AMPLIFICATION AND FREQUENCY MULTIPLICATION
Abstract: ADVANCEMENTS IN SOLID-STATE DEVICE TECHNOLOGY MAKE POSSIBLE NEW SOLUTIONS FOR MM-WAVE POWER SOURCES. A VARIETY OF MODERN THREE-TERMINAL DEVICES INCLUDING PSEUDOMORPHIC HIGH ELECTRON MOBILITY TRANSISTORS (PHEMTS), GAAS FETS, AND HETEROJUNCTION BIPOLAR TRANSISTORS (HBTS) ARE EMERGING AS THE PREFERRED DEVICES TO MEET THE POWER GENERATION REQUIREMENTS IN MODERN MILITARY AND COMMERCIAL MM-WAVE SYSTEMS. ADDITIONALLY, AN IMPORTANT TWO-TERMINAL DEVICE, THE EPITAXIALLY-STACKED VARACTOR (ISIS-DIODE) OFFERS SUBSTANTIAL POWER OUTPUT CAPABILITY AT THESE FREQUENCIES. BENEFITS ASSOCIATED WITH THE USE OF THESE DEVICES FOR MM-WAVE POWER GENERATION INCLUDE HIGHER EFFICIENCY, IMPROVED RELIABILITY, REDUCED SIZE AND LOWER COST WHEN COMPARED TO CURRENT IMPATT-DIODE-BASED SOLUTIONS. APPLICATION OF THIS NEXT GENERATION OF DEVICES TO TRANSMITTERS, PARTICULARLY AT Q-BAND (44 GHZ) FOR COMMUNICATIONS AND AT W-BAND (94 GHZ) FOR SMART MUNITIONS (RADAR), WILL POSITIVELY IMPACT PERFORMANCE IN TERMS OF RELIABILITY, MAINTAINABILITY, PRODUCIBILITY AND COST. WE PROPOSE TC IDENTIFY NEW BUILDING BLOCKS USING THESE DEVICES WHICH COULD DELIVER POWER LEVELS IN THE 1-3 WATT RANGE FOR THESE DEVICES WHICH COULD BE POWER-COMBINED FOR HIGHER OUTPUT LEVELS. USE OF THESE BASIC BUILDING BLOCKS COULD HAVE A SIGNIFICANT AND NEAR-TERM IMPACT ON THE DESIGN AND IMPLEMENTATION OF PORTABLE COMMUNICATION TERMINALS, 94 GHZ SEEKER DESIGNS AND OTHER IMPORTANT SYSTEMS.

STERIS CORP.
9450 PINENEEDLE DRIVE
MENTOR, OH 44060
Phone: (216) 354-2600
Topic#: 91-219 ID#: 91MED-058
Office: MEDICAL
Contract #:
PI: RAYMOND C. KRALOVIC
Title: DEVELOPMENT OF A COLD STERILANT FOR FIELD MEDICAL USE
Abstract: FIELD MEDICAL USE OF MANY SURGICAL INSTRUMENTS, INCLUDING DELICATE INSTRUMENTS SUCH AS ENDOSCOPES, REQUIRES COLD STERILIZATION, COLD BEING DEFINED AS A TEMPERATURE CHANGE BETWEEN AMBIENT (25C) AND MODERATELY ELEVATED (UP TO 60C). BECAUSE OF HAZARDS IN TRANSPORTING AND USING ETHYLENE OXIDE, IT HAS BEEN ELIMINATED FROM FIELD MEDICAL USE; AND GLUTARALDEHYDE, A DISINFECTANT WHICH HAS "ANY UNDESIRABLE CHARACTERISTICS INVOLVING LOGISTICS SUPPORT, USER SAFETY AND PRODUCT EFFECTIVENESS, IS CURRENTLY BEING USED AS A REPLACEMENT. REQUIRED IS A SAFE AND EFFECTIVE DRY POWDER STERILANT THAT CAN BE ADDED TO WATER TO EFFECT THE COLD STERILIZATION OF INSTRUMENTS. IT SHOULD BE PACKAGED AS AN INERT POWDER THAT CAN BE SAFELY AND EFFICIENTLY TRANSPORTED AND STORED; AND THE WASTE SOLUTION SHOULD NOT POSE A TOXIC HAZARD TO USERS.. IT IS PROPOSED TO FORMULATE ONE OR MORE POWDERED COLD CHEMICAL STERILANTS FOR FIELD MEDICAL USE BASED UPON PROPRIETARY 1OW TEMPERATURE CHEMICAL STERILIZATION TECHNOLOGY DEVELOPED BY THE OFFEROR FOR USE IN AUTOMATED HOSPITAL EQUIPMENT, AND DEMONSTRATE THAT THESE PRODUCTS: 1) ARE EFFECTIVE AGAINST BACTERIAL ENDOSPORES AND VIRAL, BACTERIAL AND FUNGAL CONTAMINANTS; AND, 2) OTHERWISE MEET MEDICAL FIELD USE STERILIZATION REQUIREMENTS SET FORTH BY THE UNITED STATES ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND.

STOTTLER HENKE ASSOCIATES, INC.
2205 HASTINGS DRIVE, SUITE 38
BELMONT, CA 94002
Phone: (415) 595-1692
Topic#: 91-021 ID#: 91ETL-307
Office: ETL
Contract #: DACA76-91-C-0026
PI: RICHARD H. STOTTLER
Title: INTELLIGENT TDA SYSTEMS USING NEURAL NETWORKS
Abstract: WE PROPOSE TO DEVELOP AN INTELLIGENT TACTICAL DECISION AIDS (TDA) SYSTEM NEURAL

NETWORK BY DEVELOPING A PROTOTYPE EXPERT SYSTEM, AND CONVERTING IT TO A NEURAL NETWORK REPRESENTATION USING AN AUTOMATIC TRANSLATOR. EXPERT SYSTEMS TECHNOLOGY IS REQUIRED TO REPRESENT A HIGH DEGREE OF INTELLIGENCE AND THE TRANSLATION IS REQUIRED TO ACHIEVE DRAMATICALLY IMPROVED PROCESSING TIME AND OTHER BENEFITS OF NEURAL NETWORKS. THIS PROTOTYPE WILL ABSOLUTELY DEMONSTRATE THE FEASIBILITY OF THE CONCEPT AND CLEAR THE WAY FOR DEVELOPMENT OF A COMPLETE SYSTEM IN PHASE II. WHILE EXPERT SYSTEMS ARE AMONG THE MOST COMMON AND SUCCESSFUL ARTIFICIAL INTELLIGENCE SYSTEMS, THEIR SLOWNESS AND FRAGILITY TEND TO LIMIT THEIR APPLICABILITY. HOWEVER, BY TRANSLATING A RULE AND FRAME BASED SYSTEM INTO A NEURAL NETWORK REPRESENTATION, PERFORMANCE IS DRAMATICALLY IMPROVED THROUGH PARALLELIZATION AND WE DERIVE THE COMBINED BENEFITS OF EXPERT SYSTEMS AND NEURAL NETWORKS. THE RESULTING SYSTEM IS ADAPTABLE, FAULT TOLERANT AND EASY TO UNDERSTAND BECAUSE OF ITS EXPERT SYSTEM ORIGIN. THE NEURAL NETWORK REPRESENTATION CAN BE IMPLEMENTED ON PARALLEL PROCESSING MACHINES OR NEURAL NETWORK HARDWARE.

STOTTLER HENKE ASSOCIATES, INC.
2205 HASTINGS DRIVE, SUITE 38
BELMONT, CA 94002
Phone: (415) 595-1692

Topic#: 91-198
Office: CERL
Contract #:
PI: RICHARD H. STOTTLER

ID#: 91CER-041

Title: AN ENVIRONMENTAL KNOWLEDGE BASE SYSTEM

Abstract: THE OVERALL PHASE I OBJECTIVE IS TO PROVE THE FEASIBILITY OF THE ENVIRONMENT KNOWLEDGE BASE SYSTEM. THIS PROOF OF FEASIBILITY WILL BE ACCOMPLISHED BY KNOWLEDGE ENGINEERING, PROTOTYPE DEVELOPMENT, AND A PHASE II SOFTWARE DESIGN. BECAUSE THE REQUIRED KNOWLEDGE IS BOTH EXTENSIVE AND DIVERSE, IT CANNOT BE COMPLETELY ELICITED IN A PHASE I EFFORT. WE WILL EMPHASIZE BREADTH OVER DEPTH IN INITIAL KNOWLEDGE ENGINEERING AND PROTOTYPE DEVELOPMENT. THEREFORE WE HAVE ASSEMBLED A VERY DIVERSE TEAM OF DOMAIN EXPERTS AND PLAN TO ELICIT AND USE KNOWLEDGE WHICH SPANS THE GAMUT OF THE LIFE-CYCLE AND ENVIRONMENTAL EFFECTS. THIS EFFORT IS DIRECTED TOWARD AN ENVIRONMENTAL, KNOWLEDGE-BASED MODEL FOR FACILITIES DESIGN, OPERATION, AND CONSTRUCTION. TO ACHIEVE ACCEPTANCE IT WILL BE DESIGNED AND IMPLEMENTED IN CLOSE COOPERATION WITH THE END-USERS-FACILITIES MANAGERS, DESIGNERS, AND GENERAL CONTRACTORS. IT MUST INCLUDE THE ADVERSE ENVIRONMENTAL EFFECTS OF BUILDING MATERIALS, SYSTEMS, AND PROCESSES ACROSS THE ENTIRE LIFE-CYCLE OF THE BUILDING. IT MUST PRESENT ITS INFORMATION IN A WAY THAT FACILITIES DESIGNERS, MANAGERS, AND CONTRACTORS CAN ACCEPT AND USE.

SURFACES RESEARCH & APPLICATIONS
8330 MELROSE DRIVE
LENEXA, KS 66214
Phone: (913) 541-1221

Topic#: 91-100
Office: TACOM
Contract #:
PI: PAUL SUTOR, PH.D.

ID#: 91100-03

Title: HIGH TEMPERATURE MILITARY DIESEL TRIBOLOGY SYSTEM

Abstract: ADVANCED LOW HEAT REJECTION (LHR) ENGINE LIFE EXPECTANCY HAS BEEN LIMITED ALMOST ENTIRELY BY PERFORMANCE OF THE LIQUID LUBRICANT COMPONENT OF THE TRIBOLOGY SYSTEM. THE ADVANCED INTEGRATED PROPULSION SYSTEM (AIPS) DIESEL ENGINE IS A LEADING CANDIDATE FOR THE ARMY'S BLOCK III ENGINE, TO BE USED IN THE NEXT-GENERATION MAIN BATTLE TANK. CURRENT LUBRICANTS ARE INCAPABLE OF MEETING 1000 HOUR LIFE GOALS FOR THE UNCOOLED VERSION OF THE AIPS DIESEL ENGINE. THEY DO NOT POSSESS THE EXCEPTIONAL OXIDATIVE STABILITY NEEDED IN THE SEVERE HIGH-TEMPERATURE ENVIRONMENT OF THE UNCOOLED AIPS ENGINE. IN THE WORK PROPOSED HERE, WE WILL DEVELOP AND DEMONSTRATE A FULLY FORMULATED AROMATIC ESTER LUBRICANT SUITABLE FOR ACHIEVING 1000 HOUR LIFE EXPECTANCY IN ADVANCED MILITARY LHR ENGINES. INNOVATIVE LUBRICANTS BASED ON HIGHLY STABLE AROMATIC ESTERS SHOW EXTRAORDINARY POTENTIAL FOR MEETING THE AIPS SYSTEM REQUIREMENTS. THIS PROGRAM WILL MAKE USE OF SRA'S PREVIOUS EXPERIENCE WITH SUCCESSFUL U.S. ARMY LUBRICANT DEVELOPMENT. A NOVEL ASPECT WILL

BE MOLECULAR MODELING TO PREDICT AND CORRELATE STRUCTURE/PROPERTY RELATIONSHIPS TO OPTIMIZE THE PROPERTIES OF LUBRICANT FLUIDS AND ADDITIVES. THE PHASE I ACTIVITIES WILL INCLUDE MOLECULAR DESIGN, SYNTHESIS OF THE NEW FLUID, ADDITIVE INCORPORATION, CHARACTERIZATION OF OXIDATIVE LIFE AND DEPOSIT-FORMING TENDENCIES, AND DETERMINATION OF WEAR AND FRICTION PERFORMANCE WITH ADVANCED CHROMIUM OXIDE RING/LINER MATERIALS.

SURVICE ENGINEERING COMPANY
1003 OLD PHILADELPHIA ROAD, SUITE 103
ABERDEEN, MD 21001
Phone: (301) 273-7722
Topic#: 91-022 ID#: 91AMC-354
Office: AMC
Contract #: DAAE07-91-C-R067
PI: RONALD B. LEVY
Title: ALTERNATING FOR HALON 1301 IN TACTICAL VEHICLE FIREFIGHTING SYSTEMS
Abstract: THIS PHASE I EFFORT WILL PRODUCE A LIST OF TECHNICAL AND SCIENTIFIC MERITS AND DETERMINE THE FEASIBILITY OF CANDIDATE HALON 1301 REPLACEMENT AGENTS TO FILL ITS ENVIRONMENTAL REQUIREMENTS. BECAUSE OF ITS HIGH EFFECTIVENESS AND LOW TOXICITY, HALON 1301 IS THE ARMY'S PRINCIPAL TACTICAL VEHICLE FIREFIGHTING AGENT, BUT INCREASED ENVIRONMENTAL CONCERNS HAVE LED TO ITS MANDATORY ELIMINATION. SINCE NO THOROUGH SEARCH FOR SUCH AN AGENT HAS BEEN CONDUCTED FOR OVER FORTY YEARS, AND THERE ARE NOW MANY NEW AGENTS AVAILABLE, NEW RESEARCH IS REQUIRED TO IDENTIFY AGENTS TO REPLACE IT. THESE AGENTS MUST BE EFFECTIVE FIREFIGHTING AGENTS IN THE ROLES CURRENTLY FILLED BY HALON 1301, BE COMPATIBLE WITH HARDWARE DELIVERY AND STORAGE SYSTEMS, AND HAVE ACCEPTABLE TOXICITY AND ENVIRONMENTAL IMPACT. SINCE THERE ARE DIFFERENT REQUIREMENTS FOR FIRE EXTINGUISHING SYSTEMS, THE LIST MUST INCLUDE AGENTS HAVING A WIDE RANGE OF PHYSICAL PROPERTIES. A SYSTEM WILL BE DEVELOPED TO HELP RANK AGENTS WHICH MEET THE INITIAL SET OF CRITERIA FOR EACH SPECIFIC APPLICATION BY FACTORS SUCH AS FIREFIGHTING CAPABILITY AND ENVIRONMENTAL IMPACT. OTHER FACTORS WILL BE INCLUDED AS NEEDED FOR SPECIFIC APPLICATIONS.

SYMBIOTECH, INC.
8 FAIRFIELD BLVD.
WALLINGFORD, CT 06492
Phone: (203) 284-7465
Topic#: 91-225 ID#: 91MED-016
Office: MEDICAL
Contract #:
PI: EDWARD M. DAVIS
Title: CYANIDE POISONING PROPHYLACTICS
Abstract: THERE IS A NEED TC DEVELOP A PRETREATMENT AGAINST THE CHEMICAL WARFARE AGENTS HYDROGEN CYANIDE AND CYANOGEN CHLORIDE. THE PROPOSED WORK AIMS TO USE SULFURTRANSFERASES AND SYNTHETIC CHELATING AGENTS TO COMBAT CYANIDE POISON.

SYSTEMS & PROCESSES ENGINEERING CORP.
1406 SMITH ROAD
AUSTIN, TX 78721
Phone: (512) 385-0379
Topic#: 91-031 ID#: 91ARD-033
Office: ARDEC
Contract #:
PI: NEWTON B. PENROSE
Title: DEEP STRIKE SECURITY EXPERT PLANNER (DSSEP)
Abstract: SYSTEMS & PROCESSES ENGINEERING CORPORATION (SPEC) IS PROPOSING TO DEVELOP A DEEP STRIKE SECURITY EXPERT PLANNER (DSSEP). DSSEP IS A HIGH PERFORMANCE EXPERT SYSTEM DECISION AID THAT ASSISTS COMMANDERS TO PLAN FOR THE SECURITY OF U.S. ARMY MANEUVER ELEMENTS, PROVIDING INCREASED ECONOMY OF FORCE AND FLEXIBILITY IN SUPPORT OF AIRLAND OPERATIONS DOCTRINE. THE PROPOSED SYSTEM INTEGRATES A GEOGRAPHIC INFORMATION SYSTEM (GIS) AND KNOWLEDGE BASE APPLYING ARTIFICIAL INTELLIGENCE (AI) TECHNOLOGY TO ASSIST IN THE PLANNING FOR SECURITY OF MANEUVER ELEMENTS DRIVING DEEP INTO ENEMY REAR AREAS DURING AGGRESSIVE OFFENSIVE OPERATIONS. IN THE PHASE I PROGRAM, SPEC WILL: 1) DEMONSTRATE A DSSEP VISUAL PROTOTYPE ON A MACINTOSH II COMPUTER USING MACROMIND DIRECTOR TO PROVIDE SAMPLE SCREENS WITH ANIMATION OF A SAMPLE EXECUTION SCENARIO OF DSSEP; 2) CONDUCT A TRADE STUDY OF

CANDIDATE GIS PACKAGES, AND KEY WEAPON SYSTEMS AND OTHER COUNTERMOBILITY SECURITY BARRIER DEVICES AND TECHNIQUES AVAILABLE FOR EMPLOYMENT BY DSSEP; AND 3) DEVELOP A DETAILED SYSTEM SPECIFICATION AND PHASE II IMPLEMENTATION PLAN. PHASE II PROGRAM WILL YIELD A DSSEP PROTOTYPE FOR FIELD EVALUATION BY ARMY USERS.

SYSTEMS & PROCESSES ENGINEERING CORP.
1406 SMITH ROAD
AUSTIN, TX 78721
Phone: (512) 385-0082
Topic#: 91-083 ID#: 91MIC-073
Office: MICOM
Contract #: DAAH01-92-C-R112
PI: GARY B. MCMILLIAN
Title: DIGITAL RF MEMORY MODULATOR
Abstract: Systems & Processes Engineering Corporation (SPEC) has developed two alternative designs that meet or exceed the functional and timing requirements of the digital modulator. The first implementation is centered around a high performance 1.0 um CMOS application specific integrated circuit (ASIC), designed and simulated at SPEC, that uses eight 8-bit multipliers operating in parallel to provide the 250 MHz throughput required by the memory system. One ASIC is required for each I and Q channel, along with external interface logic to the digital RF memory and digital-to-analog converter. The second implementation proposed is based on SPEC's GaAs datapath compiler technology developed under contract to DARPA. In this highly integrated design, SPEC proposes to implement the complete digital RF memory system (excluding ADCs, DACs, and RAM) in a single GaAs integrated circuit. The GaAs ASIC would control the ADCs, DACs, and RAM, and modulate both the I and Q channels by multiplying the delayed RF signals by independently synthesized waveforms. Either integrated circuit approach can meet the 100 nsec maximum signal delay requirement, operate at an effective throughput of 250 MHz or beyond, and provide eight or more bits of resolution.

SYSTEMS & PROCESSES ENGINEERING CORP.
1406 SMITH ROAD
AUSTIN, TX 78721
Phone: (512) 385-0211
Topic#: 91-206 ID#: 91WES-002
Office: WES
Contract #: DACA39-91-C-0119
PI: GEORGE Q. PHAN
Title: DIGITAL GAIN CONTROLLED INSTRUMENTATION AMPLIFIER - A GENERIC MIXED MODE IC FOR DATA CONDITIONING
Abstract: Systems & Processes Engineering Corporation (SPEC) has developed a digital gain controlled instrumentation amplifier ASIC system design for interfacing a transducer to an analog-to-digital converter. This ASIC building block will fulfill the Army's requirements for generic mixed mode integrated circuits for data conditioning The proposed Generic Mixed Mode ASIC consists of a programmable gain controlled auto-zero instrumentation amplifier, an anti-aliasing filter, a low output impedance buffer, and power down circuit. In the Phase I program, SPEC proposes to design, layout and simulate an ASIC digital gain controlled instrumentation amplifier targetable to CMOS technologies. The performance of CMOS analog circuits is comparable to their conventional bipolar counterparts, while maintaining the advantage of lower power dissipation. SPEC's ASIC Design Center has an expansive CAE environment for target multiple IC technologies and foundries for future implementations of the Generic Mixed Mode ASIC's.

SYSTEMS CONTROL TECHNOLOGY, INC.
2300 GENG ROAD
PALO ALTO, CA 94303
Phone: (415) 494-2233
Topic#: 91-021 ID#: 91ETL-305
Office: ETL
Contract #: DACA76-91-C-0022
PI: RICHARD VARGUS
Title: DECISION AIDS FOR INTEGRATED AIR DEFENSE PLANNING
Abstract: BATTLEFIELD COMMANDERS ARE CONSTANTLY FACED WITH THE PROBLEM OF HOW TO BEST EMPLOY LIMITED ASSETS TO DEFEND OR ATTACK THE ENEMY. INTELLIGENCE PREPARATION OF THE BATTLEFIELD (IPB) IS THE KEY FOR PREPARING FOR THE NEXT BATTLE. IPB INTEGRATES THE IMPACT OF ENEMY, TERRAIN, AND WEATHER ON OPERATIONS AND GRAPHICALLY PORTRAYS THE OPERATIONS ORDER, WHICH ALLOWS THE COMMANDER TO DICTATE RATHER THAN REACT TO THE BATTLE. THERE ARE PRESENTLY LOW LEVEL TOOLS WHICH ASSIST THE PLANNING STAFF IN EVALUATING PROBABLE COURSES

OF ACTION AND PROVIDE THE CAPABILITY TO PERFORM "WHAT IF" ANALYSIS. THESE TOOLS ARE REACTIVE TO THE PLANNING PROCESS, RATHER THAN PROACTIVE. THE COMBINATION OF AN EXPERT SYSTEM UTILIZING A PLANNING PROCESS KNOWLEDGE BASE, MULTIPLE DATA SOURCES, AND PARALLEL PROCESSORS, CAN PRODUCE TACTICAL DECISION AIDS (TDAS) WHICH INTEGRATE IPB PRODUCTS AND DOCTRINAL PHILOSOPHY TO AUTOMATICALLY PRODUCE CANDIDATE SOLUTIONS FOR THE CURRENT MISSION AND BATTLEFIELD SITUATION. THE BASIS OF THIS EXPLORATORY DEVELOPMENT EFFORT WILL BE DESIGN TWO HIGHER LEVEL AIR DEFENSE TDAS THAT WILL RESPOND TO A FOUR DIMENSIONAL COVERAGE MISSION ORDER (CMO) ISSUED BY AN AIR DEFENSE COMMANDER.

SYSTEMS TECHNOLOGY, INC.
13766 S. HAWTHORNE BLVD.
HAWTHORNE, CA 90250
Phone: (415) 961-4674

Topic#: 91-018
Office: AVSCOM
Contract #: NAS-213486
PI: WARREN F. CLEMENT

ID#: 91AVS-347

Title: ATMOSPHERIC TURBULENCE MODELING FOR REAL-TIME SIMULATION OF NAP-OF-THE-EARTH (NOE) FLIGHT

Abstract: SINCE ATMOSPHERIC DISTURBANCES CAN HAVE A LARGE IMPACT ON THE FLYING QUALITIES OF FIXED- AND ROTARY-WING AIRCRAFT, REAL-TIME AIRCRAFT TRAINING AND RESEARCH SIMULATORS MUST INCORPORATE MODELS OF THESE DISTURBANCES THAT ARE APPROPRIATE TO THE VEHICLES AND FLYING TASKS. IN SIMULATING NAP-OF-THE-EARTH (NOE) OPERATIONS IN PARTICULAR, THE DISTURBANCE MODELS SHOULD REPRESENT NONUNIFORM DISTRIBUTIONS IN THE DETERMINISTIC WIND VELOCITY (E.G., WIND SHEARS) AS WELL AS THE STOCHASTIC CHANGES IN THE WIND (E.G., TURBULENCE) OVER THE EXTENT OF THE VEHICLE. THE SPECIFIC PHASE I TECHNICAL OBJECTIVE OF THE WORK PROPOSED HEREIN WILL BE TO DEVELOP A COMPUTATIONAL PROCEDURE FOR SYNTHESIZING A REALISTIC LOW-ALTITUDE ATMOSPHERIC DISTURBANCE MODEL THAT CAN BE USED DURING REAL-TIME ROTORCRAFT SIMULATIONS OF SPECIFIC EXAMPLES OF NOE FLIGHT CONDITIONS. THE MODEL IS INTENDED TO BE USED WITH A COMPLETE ROTORCRAFT MODEL INCORPORATING DISTRIBUTED ROTOR BLADE ELEMENTS AND HOVERING IN OR SLOWLY PASSING THROUGH THE ATMOSPHERIC DISTURBANCES. NONUNIFORM DISTRIBUTIONS OF DETERMINISTIC WIND VELOCITIES AND TURBULENCE CORRELATED WITH SPECIFIC FEATURES OF THE TERRAIN WILL BE REPRESENTED IN THE LOW ALTITUDE ATMOSPHERIC DISTURBANCE MODEL.

TACAN CORP.
2330 FARADAY AVENUE
CARLSBAD, CA 92008
Phone: (619) 438-1010

Topic#: 91-156
Office: HDL
Contract #:
PI: MARK E. TUCKER/S.R. SCHAE

ID#: 91HDL-025

Title: RF DIODE LASER MODULATOR

Abstract: BASED ON OUR RELATED EXPERIENCE IN THE DEVELOPMENT OF ULTRA-WIDE BANDWIDTH LASER DIODE DRIVERS AND MULTIPLE QUANTUM WELL (MQW) OPTICAL MODULATORS, WE PROPOSE TO PERFORM A DESIGN STUDY FOR AN RF LASER DIODE MODULATOR. THIS STUDY WILL COMPARE THE OPERATING CHARACTERISTICS AND DESIGN CONSIDERATIONS OF LASER DIODE MODULATORS BASED ON THE MODULATION OF THE LASER INJECTION CURRENT VERSUS DESIGNS AN USING EXTERNAL MQW DEVICE APPLIED TO A TRANSPARENT SUBSTRATE. THIS EVALUATION WILL INCLUDE THERMAL ANALYSES, AN EVALUATION OF THE ELECTRICAL POWER CONSUMPTION, CIRCUIT SIMULATIONS, CONSTRUCTION OF A BREADBOARD SYSTEM, AND PROJECTIONS FOR THE DEVICE DIMENSIONS USING HYBRID THIN-FILM AND SURFACE MOUNT TECHNOLOGIES. RECOMMENDATIONS AND CONCLUSIONS DERIVED FROM THIS INVESTIGATION WILL SERVE FOR A PRELIMINARY DESIGN OF A FUNCTIONAL DEVICE, TO BE BUILT, TESTED, AND DELIVERED IN PHASE II.

TC SPECIALTY PRODUCTS CO.
345 NUTMEG ROAD SOUTH
SOUTH WINDSOR, CT 06074

Topic#: 91-183
Office: AVSCOM
Contract #:

ID#: 91AVS-050

Phone: (203) 875-2853 PI: SHEK C. HONG
Title: COMPOSITE MATERIALS TREATMENT TO IMPROVE ABRASION RESISTANCE - NEW RESIN SYSTEMS
Abstract: THE RAIN AND SAND EROSIONS OF COMPOSITE MATERIALS IN THE HELICOPTER STRUCTURES HAVE BEEN WELL KNOWN. THE RECENT EXPERIENCE DURING THE DESERT STORM OPERATIONS SHOWED SERIOUS DEFICIENCIES IN THE USE OF EXISTING PROTECTION SYSTEMS. THIS AUTHOR PROPOSES TO INVESTIGATE SEVERAL NEW RESIN SYSTEMS WHICH HAVE DEMONSTRATED EXCELLENT ABRASION RESISTANCE IN OTHER APPLICATIONS. FOR EXAMPLE, A LONG RUN LITHOGRAPHIC PRINTING PLATE MAY ENDURE UP TO ONE MILLION IMPRESSIONS WITHOUT FAILURE, IN AN ENVIRONMENT WHICH IS FULL OF WATER AND GREASY INKS. IT IS ALSO BEING SHEAR ABRADED AT VERY HIGH SPEED ON A HIGH SPEED PRINTING PRESS. AS FOR DENTAL COMPOSITES, THE MATERIALS NEED TO ENDURE DAILY CHEWING, AND GRINDING IN A VERY MOIST ORAL ENVIRONMENT. THUS, THE MATERIALS THAT SURVIVED THE ABOVE TWO APPLICATIONS HAVE VERY GOOD CHANCE OF BEING HYDROLYTICALLY STABLE AND HIGHLY ABRASION RESISTANT. THIS AUTHOR HAS PERSONALLY WITNESSED SOME OF THE MOST ABRASION RESISTANT MATERIALS. IT IS BELIEVED THAT THE TECHNOLOGIES USED IN THE ABOVE MENTIONED MATERIALS CAN BE EASILY CONVERTED FOR USE IN IMPROVING THE ABRASION RESISTANCE OF THE HELICOPTER COMPOSITE MATERIALS. SPECIFICALLY, A NEW CLASS OF POLYMERIZABLE URETHANE-MODIFIED CELLULOSE ESTER WILL BE EVALUATED WITH OTHER MODIFYING INGREDIENTS TO ACHIEVE THE EXTREMELY HIGH ABRASION RESISTANCE NEEDED.

TDA RESEARCH, INC. Topic#: 91-007 ID#: 91CRD-301
12421 WEST 49TH AVE. Office: CRDEC
WHEAT RIDGE, CO 80033 Contract #: DAAA15-91-C-0125
Phone: (303) 420-4239 PI: DR. WILLIAM L. BELL
Title: NOVEL SORBENTS FOR CHEMICAL WARFARE AGENTS
Abstract: WHILE ACTIVATED CARBON IS A COMMONLY USED SORBENT FOR CHEMICAL WARFARE (CW) AGENTS, IT HAS TWO DISADVANTAGES: (L) ITS PERFORMANCE IS DEGRADED BY EXPOSURE TO WATER, AND (2) IT BINDS BUT DOES NOT DESTROY THE CW AGENT. A NEW FORM OF CARBON (C60, CALLED BUCKMINSTERFULLERENE) HAS RECENTLY (LATE 1990) BEEN CHARACTERIZED, AND THIS HAS LED TO A PERIOD OF INTENSE INVESTIGATION INTO THE PHYSICAL AND CHEMICAL PROPERTIES OF THIS MATERIAL. TDA RESEARCH HAS AN ONGOING RESEARCH EFFORT IN THE PREPARATION AND PROPERTIES OF C60, AND IS DEVELOPING A ROUTE TO THE MATERIAL WITH THE POTENTIAL TO SHARPLY REDUCE COSTS. AVAILABLE DATA SUGGEST THAT C60 SHOULD BE AN EFFECTIVE SORBENT FOR CW AGENTS, AND THAT ITS PERFORMANCE SHOULD NOT BE AFFECTED BY WATER. IN PHASE I WORK TDA RESEARCH WILL DETERMINE THE ADSORPTIVE CAPACITY OF C60 BY MEASURING ADSORPTION ISOTHERMS FOR C60 WITH SIMULANTS FOR CW AGENTS. A HIGH SURFACE AREA MATERIAL CONTAINING C60 WILL BE PREPARED BY INTRODUCING C60 ONTO AN ACTIVATED CARBON. TO TEST THE ABILITY OF THIS MODIFIED ACTIVATED CARBON AS A FILTER MATERIAL, WE WILL PASS A GAS STREAM CONTAINING SIMULANTS FOR CW AGENTS THROUGH IT AND MEASURE BREAKTHROUGH CURVES. THE MODIFIED ACTIVATED CARBON WILL BE EVALUATED WITH RESPECT TO ITS SORPTIVE PROPERTIES AND RESISTANCE TO DEGRADATION BY WATER, COMPARED WITH UNMODIFIED MATERIAL. GRAPHITIC CARBON IS ALSO WELL KNOWN AS A CATALYST SUPPORT, AND WE BELIEVE THAT C60 WILL HAVE UNIQUE ADVANTAGES IN THIS AREA. IF PHASE I WORK DEMONSTRATES THAT C60 HAS POTENTIAL TO EFFECTIVELY ADSORB CW AGENTS, PHASE II RESEARCH WILL PREPARE AND TEST MATERIALS USING THIS SORBENT, AND WILL ALSO PREPARE TRANSITION METAL DERIVATIVES OF C60 AND EVALUATE THEIR POTENTIAL TO DESTROY CW AGENTS BY CATALYZING OXIDATION AT AMBIENT OR ELEVATED TEMPERATURES. THE GOAL OF THIS PROJECT IS TO IDENTIFY NEW MATERIALS WHICH ARE MORE EFFECTIVE AT ADSORBING AND DESTROYING CHEMICAL AGENTS.

TECHNETICS CORP. Topic#: 91-018 ID#: 91AVS-349
1600 INDUSTRIAL DRIVE Office: AVSCOM
DELAND, FL 32724 Contract #: NAS-26319
Phone: (904) 736-7373 PI: HAROLD HOWE

Title: CERAMIC BRUSH SEALS
Abstract: THE PURPOSE OF THIS PROPOSAL IS TO SECURE FUNDING FOR THE BUILDING AND INITIAL TESTING OF A CERAMIC BRUSH SEAL. THE TECHNICAL OBJECTIVES OF THE PROPOSED WORK ARE TO IDENTIFY APPROPRIATE CERAMIC MATERIALS FOR THE MANUFACTURE OF BRUSH SEALS, DEMONSTRATE THAT A CERAMIC BRUSH SEAL CAN BE BUILT AND TO TEST THE INTEGRITY OF THE CERAMIC SEAL. THE CERAMIC INDUSTRY WILL BE CALLED UPON TO PROVIDE BOTH CERAMIC FIBERS AND CERAMIC MATERIALS WITH WHICH TO BUILD THE SEAL. TWO METHODS OF ACHIEVING A CERAMIC BRUSH SEAL WILL BE TRIED. A MECHANICALLY HELD BRISTLE SEAL WILL BE COMPARED TO A BONDED BRISTLE SEAL TO EVALUATE THEIR RESPECTIVE BENEFITS. THE PROPOSED WORK WILL PRODUCE A CERAMIC BRUSH SEAL THAT WILL BE TESTED FOR WEAR AND SEALING CAPABILITIES. THE TEST DATA WILL BE COMPARED TO THAT OF SIMILAR METALLIC BRUSH SEALS. IT IS EXPECTED THAT CERAMIC BRUSH SEALS WILL PROVE TO BE SUPERIOR TO THEIR METALLIC COUNTERPARTS IN BOTH WEAR AND TEMPERATURE CAPABILITIES. THESE SUPERIOR ATTRIBUTES OF CERAMIC BRUSH SEALS CAN GREATLY ENHANCE THE INDUSTRY ACKNOWLEDGED PERFORMANCE AND EFFICIENCY OF BRUSH SEALS.

TECHNICAL EVALUATION RESEARCH, INC.
200 WHITE ROAD, SUITE 207/208
LITTLE SILVER, NJ 07739
Phone: (908) 219-0020
Topic#: 91-054
Office: CECOM
Contract #:
PI: JAYADEV R. HIREMATH
ID#: 91CEC-081
Title: VOICE PROCESSING FOR COMMAND AND CONTROL APPLICATION
Abstract: DEMONSTRATE THE FEASIBILITY OF A WIDE RANGE OF ARMY PERSONNEL VERBALLY COMMUNICATING WITH ARMY COMMAND AND CONTROL APPLICATIONS AS A REPLACEMENT FOR OR ADJUNCT TO THE MORE TRADITIONAL INPUT/OUT DEVICES (I.E., KEYBOARD, TOUCH-SCREEN, TRACKBALL, JOYSTICK, ETC.). COMMON MILITARY LANGUAGE INPUT WILL BE RECOGNIZABLE AND ACTED UPON BY THE C2 APPLICATION; DEVELOPED INTERFACE DRIVERS WILL INTERPRET COMMANDS USING AN ATCCS UNIVERSAL APPLICATION PROGRAM INTERFACE. A MICROCHIP WILL BE DEVELOPED CONTAINING THE VOICE RECOGNITION SYSTEM, BRIDGING THE GAP BETWEEN THE APPLICATION PROGRAM AND THE COMPUTER HARDWARE, THEN VOICE RECOGNITION TECHNIQUES CAN BECOME MORE FLEXIBLE FOR PORTABLE AND REMOTE USER ACCESS. THE COMMON HARDWARE AND SOFTWARE ENVIRONMENT IS AN EXTREMELY SIGNIFICANT OPPORTUNITY SINCE DEVELOPMENT OF THE VOICE RECOGNITION SYSTEM CAPABILITY FOR IT WILL ENABLE OTHER PLANNED COMPATIBLE COMPUTER FAMILY MEMBERS TO HAVE VOICE INPUT AS AN ALTERNATIVE WAY OF INTERFACING WITH THE BROAD SPECTRUM OF ATCCS APPLICATIONS. THE VOICE RECOGNITION SYSTEM TOGETHER WITH THE APPLICATION PROGRAM INTERFACE WILL BE ABLE TO TRANSLATE VOICE INPUT INTO A SUITABLE FORMAT FOR MOST C2 APPLICATIONS INCLUDING BATTALION AND BELOW C2 AND SOLDIERS' COMPUTER INPUT/OUTPUT INTERFACE MINIATURIZATION. COMPUTER GENERATED VOICE OUTPUT WILL DEMONSTRATE COMPETITIVE CANDIDATE METHODS, INCLUDING: UNLIMITED TEXT-TO-SPEECH SYNTHESIS, A PREDEFINED LIBRARY, AND HIGH QUALITY DIGITAL REPRODUCTION CAPABILITY.

TECHNO-SCIENCES, INC.
7833 WALKER DRIVE, SUITE 620
GREENBELT, MD 20770
Phone: (301) 345-0375
Topic#: 91-032
Office: ARDEC
Contract #:
PI: DR. WILLAM H. BENNETT
ID#: 91ARD-102
Title: NONLINEAR ADAPTIVE CONTROL OF WEAPONS SYSTEMS
Abstract: RECENT RESEARCH IN CONTROL THEORY HAS LED TO NONLINEAR CONTROL LAWS CAPABLE OF COMPLETELY DECOUPLING ESSENTIAL COMPONENTS OF THE NONLINEAR DYNAMICS OF MULTIBODY SYSTEMS INCLUDING COMPLEX/HYBRID BODIES - E.G., WITH BOTH FLEXIBLE AND RIGID BODY MODES. THESE ALGORITHMS EXHIBIT OUTSTANDING PERFORMANCE IN SIMULATIONS. THE NONLINEAR CONTROL LAWS HAVE BEEN TESTED IN FLIGHT CONTROL EXPERIMENTS AT NASA AMES, IN A LIMITED SET OF EXPERIMENTS IN ROBOTICS AND IN OUR OWN WORK ON THE SLEWING AND POINTING CONTROL OF ARTICULATED STRUCTURES. HOWEVER, WE ARE AWARE OF NO STUDIES OR EXPERIMENTS TESTING THE

EFFECTIVENESS OF THESE LAWS FOR CONTROL OF WEAPONS PLATFORMS. THE PRIMARY GOAL OF OUR RESEARCH EFFORT IS TO ASSESS THE PERFORMANCE OF THE NONLINEAR DECOUPLING CONTROL LAWS FOR WEAPONS SYSTEMS. THE STARTING POINT WILL BE OUR EXTENSIVE EXPERIENCE WITH THE NONLINEAR, ADAPTIVE CONTROL OF MULTI-FLEX-BODY SYSTEMS.

TECHNOLOGY INTERNATIONAL, INC.
429 WEST AIRLINE HIGHWAY, SUITE S
LAPLACE, LA 70068
Phone: (504) 652-1127
Topic#: 91-055
Office: CECOM
Contract #:
PI: SAM ABOLROUS
ID#: 91CEC-095
Title: AN EXPERT ESTIMATION TOOL FOR ACOUSTIC SENSOR PERFORMANCE EFFECTIVENESS
Abstract: PARAMETERS REQUIRED FOR ESTIMATING RANGE PERFORMANCE WILL BE DEFINED AND METHOD FOR OBTAINING SUCH PARAMETERS FROM MODELS AND MEASUREMENTS WILL BE IDENTIFIED. PROPAGATING EFFECTS WILL BE INCORPORATED IN LOCKUP TABLES, AND MODIFIED GRAFTING INTERPOLATION ALGORITHMS WILL PROVIDE THE PROPAGATION INFORMATION. THIS WILL BE INCORPORATED IN AN INTELLIGENT OBJECT-ORIENTED DATABASE UTILIZING EXPERT SYSTEM, HYPERTEXT TECHNOLOGY AND GENETIC ALGORITHMS FOR DATA STORAGE AND ACCESS. AN EXPERT SYSTEM WILL BE USED IN THE ACQUISITION OF DATA AND IN MERGING PROPAGATION EFFECTS INFORMATION IN A FORMAT USEABLE BY TACTICAL DECISION MAKERS IN ACOUSTIC PERFORMANCE ESTIMATION, INCLUDING GRAPHICAL DISPLAY OF INFORMATION. DESIGN OF THE HARDWARE AND SOFTWARE WILL BE PROVIDED FOR IMPLEMENTATION IN PHASE II.

TECHQUEST, INC.
50 NYE ROAD
GLASTONBURY, CT 06033
Phone: (203) 659-9471
Topic#: 91-212
Office: MEDICAL
Contract #:
PI: YONG-SHENG CHAO
ID#: 91MED-021
Title: REAL TIME, LIGHT WEIGHT X-RAY IMAGER
Abstract: A COMPACT, LIGHT WEIGHT, LARGE AREA, HIGH RESOLUTION TWO-DIMENSIONAL REAL-TIME DIGITAL X-RAY IMAGING SYSTEM, BASED ON THE DEVELOPMENT OF AN INTEGRATED A-SI:H PHOTODIODE ARRAY AS IMAGE SENSOR IS PROPOSED. THE FIRST PROTOTYPE IMAGE SENSOR WILL HAVE A SENSITIVE AREA 8" X 10" WITH 1024 X 1280 PIXELS COUPLED TO AN OPTIMIZED SCINTILLATOR SUCH AS GD2O2S:TB AS AN X-RAY CONVERTER. EACH DIODE ELEMENT IS CONNECTED THROUGH A INTEGRATED POLY-SILICON NMOS THIN FILM TRANSISTOR TO A COLUMN AND A ROW ANALOG SHIFT REGISTERS WHICH IS CONTROLLED BY 13 MHZ CLOCK PULSES. THE INTEGRATION TIME IS CONTROLLABLE THROUGH A COMPUTER. WITH A DATA TRANSFER TIME 0.1 SEC/FRAME, AND WITH A DISPLAY TIME LESS THAN 1 SEC., THE OUTPUT DATA IS FURTHER DIGITIZED BY A FRAME GRABBER SUD DISPLAYED OR FURTHER PROCESSED BY COMPUTER. THE DIGITAL IMAGE SYSTEM HAS A SENSITIVE AREA AND A IMAGE RESOLUTION COMPARABLE TO THE TRADITIONAL SCREEN FILM COMBINATION; THE SYSTEM CAN HAVE A MUCH HIGHER SENSITIVITY AND DYNAMIC RANGE THAN THE EXISTING SCREEN FILM COMBINATION.

TERA RESEARCH, INC.
1344 BORDEAUX DRIVE
SUNNYVALE, CA 94089
Phone: (408) 734-3096
Topic#: 91-205
Office: ETL
Contract #:
PI: DR. JACK LIU
ID#: 91ETL-044
Title: URBAN FEATURE DIGITAL DATABASE
Abstract: THE PHASE I EFFORT WILL DESIGN AN URBAN FEATURE DIGITAL DATABASE AND DEMONSTRATE A COST-EFFECTIVE IMPLEMENTATION THAT WILL SUPPORT MILITARY OPERATIONS OVER URBAN TERRAIN (MOUT). PHASE II WILL ASSEMBLE A PC-BASED PROTOTYPE AND PRODUCE A SAMPLE DATA SET OVER AN URBAN AREA TO VALIDATE THE APPROACH. THE PROPOSED PROGRAM WILL JOIN THREE KEY ELEMENTS REQUIRED FOR MEETING THE OBJECTIVES. THE FIRST WILL BE THE APPLICATION OF URBAN TERRAIN ZONE (UTZ) CLASSIFICATION FOR ASSESSING MOUT CHARACTERISTICS BY URBAN AREAS AND FOR FORMING A

SPATIAL ORGANIZATIONAL FRAMEWORK. THE SECOND ELEMENT WILL USE BUILDING CONSTRUCTION ATTRIBUTE CLASSIFICATION FOR UNDERSTANDING MOUT ISSUES AT THE INDIVIDUAL STRUCTURE LEVEL. THE FINAL COMPONENT WILL EXTRACT AND LINK URBAN FEATURES FROM IMAGERY AND OTHER DATA SOURCES BY USING COMMERCIAL OFF-THE-SHELF HARDWARE AND SOFTWARE FOR MAPPING/IMAGERY PROCESSING AND DATABASE MANAGEMENT. THE PROPOSED APPROACH ELIMINATES THE EXTENSIVE STORAGE REQUIREMENTS OF RASTER IMAGERY BY ADOPTING THE UTZ REPRESENTATION METHOD AND LIKING BUILDING ATTRIBUTE/MOUT FEATURE DATABASES TO ACHIEVE SIGNIFICANT REDUCTIONS IN STORAGE REQUIREMENTS. THIS EFFICIENCY OF REPRESENTATION SHOULD ENABLE DIRECT DATABASE ACCESS FROM THE BATTLEFIELD.

TETRA CORP.
3701 HAWKINS STREET NE
ALBUQUERQUE, NM 87109
Phone: (505) 345-8623
Topic#: 91-159
Office: HDL
Contract #:
PI: MICHAEL G. WHITE
ID#: 91HDL-042
Title: SHIELDED CABLE ASSESSMENT SYSTEM
Abstract: SHIELDED CABLES USED WITHIN ARMY SYSTEMS PROVIDE PROTECTION TO ELECTRONIC EQUIPMENT AGAINST ELECTROMAGNETIC PULSE (EMP) RADIATION, ELECTROMAGNETIC INTERFERENCE EMI), AND OTHER EXTERNAL ELECTRIC OVER STRESS (EOS). HARSH OPERATING ENVIRONMENTS AND ABUSE DEGRADE THE SHIELDED CABLES WITH TIME. MAINTENANCE TESTING OF SINGLE CABLE LENGTHS AS A TWO PORT DISTRIBUTED PARAMETER NETWORK WILL PROVIDE THE IMPEDANCE TRANSFER FUNCTION WHICH IS THEN EASILY USED FOR FREQUENCY ANOMALY ANALYSIS. MULTI-BRANCHED, MULTI-WIRE SHIELDED CABLES INTRODUCE AN ORDER OF COMPLEXITY SINCE THE PROBLEM BECOMES ONE OF MULTI-PORT NETWORK ANALYSIS WITH TERMINATION INTO MISMATCHED LOADS. THE INTRODUCTION OF MULTI-TWISTED WIRE LENGTHS. BOTH SHIELDED AND/OR INSULATED, FURTHER COMPOUNDS THE PROBLEM. WE PROPOSE TO DEVELOP AN ELECTRICAL SENSOR/NEURAL NETWORK BASED SYSTEM TO IDENTIFY AND ISOLATE FAULTS IN MULTI-BRANCHED, MULTI-WIRE CABLES.

TEXAS RESEARCH INSTITUTE AUSTIN, INC.
9063 BEE CAVE ROAD
AUSTIN, TX 78733
Phone: (512) 263-2101
Topic#: 91-127
Office: ARO
Contract #:
PI: DR. ALAN BRAY/DAVID WHITE
ID#: 91ARO-061
Title: ESTIMATING REMAINING LIFE IN BIOLOGICAL/CHEMICAL SUIT AND ENCLOSURE MATERIALS
Abstract: A METHOD IS PROPOSED FOR ESTIMATING REMAINING LIFE OF TEFLON COMPOSITE CHEMICAL/BIOLOGICAL (C/B) SUIT AND ENCLOSURE MATERIALS. THE TECHNIQUE IS BASED UPON THE RELATIONSHIP BETWEEN C/B MATERIAL PERMEABILITY RATE AND SURFACE FRACTURE DENSITY OF FATIGUED MATERIAL. DETECTION OF REMAINING LIFE IS MADE USING SPECIAL NDT PENETRANT MEASUREMENTS WHOSE RESULTS ARE CORRELATED TO PERMEATION RATE VIA FRACTURE DENSITY MEASUREMENTS MADE ON WORN FATIGUED MATERIAL SAMPLES. THE BASIS FOR AN INSPECTION AND RECERTIFICATION PROGRAM FOR C/B SUITS AND ENCLOSURES WILL BE DEMONSTRATED UPON SHOWING PHASE I FEASIBILITY.

THERMACORE, INC.
780 EDEN RD
LANCASTER, PA 17601
Phone: (717) 569-6551
Topic#: 91-193
Office: AVSCOM
Contract #:
PI: DR. WILLIAM G. ANDERSON
ID#: 91AVS-129
Title: HEAT PIPE COOLING OF TURBOSHAFT ENGINES
Abstract: THE PROPOSED WORK PLAN WILL EXAMINE THE USE OF HEAT PIPE COOLING IN TURBOSHAFT ENGINES TO INCREASE PERFORMANCE BY REDUCING OR ELIMINATING THE COMPRESSOR DISCHARGE BLEED AIR REQUIRED TO COOL ENGINE COMPONENTS. AREAS TO BE EXAMINED INCLUDE VANES, SHROUD, AND THE INTER-TURBINE DUCT. FOR TURBOSHAFT ENGINES, ENGINE CYCLE ANALYSIS PREDICTS THAT

THE USE OF HEAT PIPES WILL INCREASE NET SHAFT HORSEPOWER WHILE DECREASING FUEL CONSUMPTION. FOR EXAMPLE, USING HEAT PIPES TO COOL THE HIGH AND LOW PRESSURE TURBINE STATORS COULD INCREASE SHAFT HORSEPOWER BY 8 PERCENT, WHILE DECREASING FUEL CONSUMPTION BY 3.8 PERCENT. IN ADDITION, SINCE THE HEAT PIPES WILL REPLACE THE CURRENT COOLING PASSAGES, PROBLEMS DUE TO BLOCKAGE OF COOLING PASSAGES BY SAND AND DUST WILL BE ELIMINATED. IN PHASE I OF THE PROGRAM, ENGINE COMPONENTS THAT CAN BENEFIT FROM THIS INNOVATIVE HEAT PIPE COOLING METHOD WILL BE IDENTIFIED AND EVALUATED. INFORMATION ON THERMAL BOUNDARY CONDITIONS AND PHYSICAL SIZE CONSTRAINTS WILL BE SUPPLIED BY THE SUBCONTRACTOR, GARRETT ENGINE DIVISION (GED). IN PHASE II, HARDWARE WILL BE FABRICATED TO TEST THE MOST PROMISING COOLING CONCEPTS. COMPONENTS WILL BE TESTED AT GED IN A RIG TEST DESIGNED TO SIMULATE THE APPROPRIATE ENGINE ENVIRONMENT.

THERMAL SPRAY TECHNOLOGIES, INC.
201 FREDERICK ST.
WATERTOWN, WI 53094
Phone: (414) 261-0131

Topic#: 91-177
Office: AVSCOM
Contract #:
PI: WILLIAM J. LENLING

ID#: 91AVS-017

Title: HIGH TEMPERATURE, ABRADABLE COATINGS FOR TURBINE ENGINE COMPRESSORS

Abstract: THE COMPRESSION SYSTEMS OF CURRENT AND FUTURE GAS TURBINE ENGINES REQUIRE EXTREMELY TIGHT CLEARANCES IN THE HIGH PRESSURE COMPRESSOR IN ORDER TO OBTAIN AND MAINTAIN HIGH PERFORMANCE AND EFFICIENCY. MANY OF THE CURRENT COMPRESSORS USE THERMAL SPRAY COATINGS DEPOSITED ONTO THE COMPRESSOR SHROUDS WHICH ARE DESIGNED TO BE EASILY ABRADED BY THE TURBINE BLADE TIPS, THUS ACHIEVING TIGHT CLEARANCES. UNFORTUNATELY THE CURRENT STATE OF THE ART OF THESE COATINGS CANNOT WITHSTAND THE INCREASING HIGH TEMPERATURE ENVIRONMENTS OF NEXT GENERATION HIGH PERFORMANCE TURBINE ENGINE SYSTEMS. THERMAL SPRAY TECHNOLOGIES ALONG WITH THE SUBCONTRACTOR, ALLIED-SIGNAL AEROSPACE GARRETT ENGINE DIVISION, PROPOSE TO DEVELOP AND EVALUATE NEW PLASMA SPRAY COATINGS DESIGNED TO BE ABRADABLE TO TEMPERATURES UP TO 1200F. THESE COATINGS WILL BE DEPOSITED ONTO SHROUDS IN THE TURBINE ENGINE COMPRESSOR SECTION. THE COATINGS ABRADABILITY WILL BE EVALUATED BY THIN TITANIUM AIRFOILS AT ROOM TEMPERATURE AND 700F. THE COATINGS ABILITY FOR THERMAL STABILITY/SURVIVABILITY (TEMPERATURES UP TO 1200F), COMPATIBILITY WITH COMMONLY FOUND ENGINE FLUIDS, ADHESION TO THE SUBSTRATE, AND THE ABILITY TO MACHINE A SMOOTH SURFACE FINISH TO MINIMIZE TURBULENT FLOW IN THE COMPRESSOR WILL ALSO BE DETERMINED. ALL COATINGS WILL BE DEPOSITED BY THERMAL SPRAY TECHNOLOGIES USING NOVEL PLASMA SPRAY TECHNIQUES DEVELOPED BY THERMAL SPRAY TECHNOLOGIES. ABRADABILITY TESTS WILL BE RUN BY ALLIED-SIGNAL AEROSPACE COMPANY.

TOYON RESEARCH CORP.
75 AERO CAMINO, SUITE A
GOLETA, CA 93117
Phone: (805) 968-6787

Topic#: 91-233
Office: SDC
Contract #:
PI: HAROLD JACOBSON

ID#: 91SDC-256

Title: IMPACT DETECTION SYSTEM FOR KWAJALEIN ATOLL APPLICATION

Abstract: A RANGE-TRILATERATION SCHEME USING RADARS IS PROPOSED FOR DETECTING THE SPLASH OF REENTRY VEHICLES (RVS) IMPACTING AT KWAJALEIN ATOLL (KA). RANGE TRILATERATION CAN PROVIDE THE DESIRED POSITION MEASUREMENT ACCURACY, AREA COVERAGE, ALL-WEATHER PERFORMANCE, AND RELIABILITY REQUIRED OF THE RV IMPACT SCORING FUNCTION. IT ALSO PROVIDES OCEAN SURFACE SURVEILLANCE FOR WATER CRAFT. FOUR CONCEPTS ARE TO BE INVESTIGATED DURING THE PHASE I PROGRAM, AS REGARDS THEIR FEASIBILITY AND SUITABILITY FOR KA. AT THE END OF PHASE I A RECOMMENDATION WILL BE MADE AS TO THE MOST SUITABLE CONCEPTS. THE PHASE II EFFORT WILL PERFORM DETAILED COST AND PERFORMANCE EVALUATIONS OF THE REMAINING CONCEPTS, DOWNSELECT TO A SINGLE ONE, AND DEVELOP A DESIGN SPECIFICATION FOR THE RECOMMENDED CONCEPT.

TPL, INC.
3754 HAWKINS, NE
ALBUQUERQUE, NM 87109
Phone: (505) 345-5668

Topic#: 91-038 ID#: 91ARD-065
Office: ARDEC
Contract #:
PI: DR. RICHARD W. BROTZMAN

Title: A NOVEL CERAMIC, THIN FILM COATING AS A MOISTURE BARRIER FOR AMMUNITION CONTAINERS

Abstract: CURRENT MOISTURE BARRIERS FOR AMMUNITION CONTAINERS CONSIST OF LAYERS OF ASPHALT IMPREGNATED PAPER AND ALUMINUM FOIL. ALUMINUM FOIL IS NOTED FOR ITS PINHOLE LEAKS. MOISTURE WILL DIFFUSE THROUGH ASPHALT IMPREGNATED PAPER. CONSEQUENTLY, MOISTURE-INDUCED CORROSION OF AMMUNITION AND DEGRADATION OF FUZE AND PROPELLANT CAN FREQUENTLY OCCUR OVER LONG TIME PERIODS. A NOVEL SOL-GEL-DERIVED 47 WT% ALUMINOSILICATE COMPOSITION HAS BEEN DEVELOPED WITH HERMETIC PROPERTIES. A VERY LOW SURFACE AREA, A RESULT OF A UNIQUE CLOSED CELL STRUCTURE, PRODUCES THE HERMETIC PROPERTIES. THESE PROPERTIES ARE PRODUCED UNDER EXTREMELY MILD, APPROXIMATELY 100 DEGREES C, PROCESSING TEMPERATURES. THE THIN COATING, APPROXIMATELY 1.5 NM, IS EXTREMELY STRONG, TOUGH, AND DURABLE. A REACTIVE PRIMER HAS BEEN DEVELOPED TO ASSURE CHEMICAL BONDING OF THE COATING TO A VARIETY OF SUBSTRATES. THIS COATING WILL BE EVALUATED FOR CONTAINER APPLICATIONS. SOL-GEL PROCESS CONDITIONS WILL BE DETERMINED FOR CONTAINER BOARD SUBSTRATES. COATED SPECIMENS WILL BE PREPARED. MECHANICAL TESTS WILL INCLUDE ADHERENCE, FLEXURE, AND IMPACT. HERMETIC TESTS WILL BE PERFORMED. COATING OF COMPLEX GEOMETRICAL SURFACES WILL BE INVESTIGATED. COATED TUBES WILL BE DELIVERED TO ARDEC. TPL IS ACTIVE IN THE DEVELOPMENT OF THIS MATERIAL SYSTEM. COMPLETE RESOURCES EXIST TO ACHIEVE PROGRAM OBJECTIVES. TECHNICAL CAPABILITIES ARE ENHANCED VIA TPL'S ASSOCIATION WITH THE CENTER FOR MICRO-ENGINEERED CERAMICS.

TPL, INC.
3754 HAWKINS NE
ALBUQUREQUE, NM 87109
Phone: (505) 345-5668

Topic#: 91-039 ID#: 91ARD-066
Office: ARDEC
Contract #:
PI: H. M. STOLLER

Title: IMPROVED PYROTECHNIC COMPOSITIONS FOR HIGH PERFORMANCE AMMUNITION

Abstract: THE NEWEST SMALL ARMS SYSTEMS, 5.56 MM SQUAD AUTOMATIC WEAPON, WITH ITS TRACER CARTRIDGE HAS UNACCEPTABLE DAYLIGHT LUMINOSITY LEVELS. ANTICIPATED FUTURE SUBCALIBER SYSTEMS, WITH HIGHER SPIN RATES, FASTER VELOCITIES, AND SMALL ORIFICES, WILL PRESENT EVEN MORE CHALLENGING PROBLEMS TO PYROTECHNIC FORMULATIONS. A NEED EXISTS TO DEVELOP IMPROVED PYROTECHNIC COMPOSITIONS FOR NEAR-TERM AND ANTICIPATED WEAPON SYSTEMS. RECENT DATA HAS SHOWN THAT IMPROVED PROCESSING PROCEDURES APPLIED TO CONVENTIONAL PYROTECHNIC COMPOSITIONS CAN RESULT IN SIGNIFICANTLY IMPROVED LUMINOSITY LEVELS, AS MUCH AS A THREE-FOLD IMPROVEMENT. SUCH APPROACHES MAY REPRESENT A SOLUTION TO THE NEAR-TERM PROBLEM AND EVEN FUTURE REQUIREMENTS. MORE EXOTIC CHEMILUMINESCENCE MATERIALS, EXTENSIVELY INVESTIGATED FOR CHEMICAL LASER APPLICATIONS, ARE NOTED FOR THEIR EXTREMELY HIGH LUMINOSITY LEVELS. SIX-FOLD IMPROVEMENTS APPEAR FEASIBLE. SUCH MATERIALS, IF DEVELOPED FOR PYROTECHNIC APPLICATIONS, MAY REPRESENT THE ANSWER TO FUTURE REQUIREMENTS. THE PHASE I APPROACH WILL EVALUATE BOTH APPROACHES. MISSION SPECIFICATIONS WILL BE ESTABLISHED AND CANDIDATE PYROTECHNIC MATERIALS WILL BE IDENTIFIED. MODIFIED CONVENTIONAL COMPOSITIONS WILL BE FORMULATED AND SPECTROSCOPICALLY CHARACTERIZED. CHEMILUMINESCENCE WILL ALSO BE FORMULATED AND SPECTROSCOPICALLY CHARACTERIZED. REPRESENTATIVE CANDIDATES WILL BE PREPARED FOR SPIN TESTING IN TRACER AMMUNITION CONFIGURATION. SPIN TESTS WILL BE CONDUCTED AT ARDEC. RECOMMENDATIONS FOR FURTHER DEVELOPMENT WILL BE MADE.

TPL, INC.
3754 HAWKINS NE
ALBUQUERQUE, NM 87109

Topic#: 91-136 ID#: 91ETD-028
Office: ETDL
Contract #:

Phone: (505) 345-5668 PI: DR. RICHARD W. BROTZMAN
Title: A NONLINEAR, HIGH ENERGY DENSITY DIELECTRIC MATERIAL SYSTEM FOR DISCHARGE CAPACITORS
Abstract: CURRENT CAPACITOR SYSTEMS ARE MATERIALS LIMITED. CURRENT MATERIALS HAVE LOW ENERGY STORAGE DENSITIES AND ARE GENERALLY LARGER, HEAVY, AND DIFFICULT TO MAINTAIN. A SYNTHETIC PROGRAM IS PROPOSED TO "MOLECULARLY ENGINEER" AN ORGANIC/INORGANIC GRAFT COPOLYMER MATERIAL TO HAVE HIGH, NONLINEAR DIELECTRIC STRENGTH; HIGH, NONLINEAR DIELECTRIC CONSTANT; AND LIGHT WEIGHT FOR USE AS IMPREGNANTS IN CAPACITORS AND DIELECTRIC FILMS. THE SYNTHETIC PROGRAM WAS DEVELOPED BY CONSIDERING MATERIAL GUIDELINES WHICH INCLUDE: 1) INTRINSIC DIELECTRIC STRENGTH, 2) DIELECTRIC CONSTANT, 3) LOW DISSIPATION FACTORS, 4) PROCESSABILITY, 5) USE IN A BROAD RANGE OF APPLICATION ENVIRONMENTS, AND 6) MECHANICAL STRENGTH. THE NONLINEAR DIELECTRIC POLYMERS THAT ARE SYNTHESIZED AND WILL BE FABRICATED INTO A UNIQUE MORPHOLOGY THAT ENHANCES THEIR UTILITY. THE DIELECTRIC PROPERTIES OF THIS NOVEL MATERIAL/MORPHOLOGY SYSTEM WILL BE EVALUATED ON A LABORATORY SCALE. DEVELOPMENT OF THIS TECHNOLOGY WOULD GREATLY REDUCE THE SIZE, WEIGHT, AND COMPLEXITY OF CAPACITORS. THE ANTICIPATED RESULTS OF PHASE I WILL BE MATERIALS CAPABLE OF ENERGY DENSITIES OF TENS OF KJ/KG, DIELECTRIC CONSTANTS GREATER THAN 10, LOW DISSIPATION FACTORS, AND CAPACITY OF IN THE MULTI-MEGAJOULE RANGE.

TRANSDUCER RESEARCH, INC. Topic#: 91-073 ID#: 91CRD-083
999 CHICAGO AVENUE Office: CRDEC
NAPERVILLE, IL 60540 Contract #:
Phone: (708) 357-0004 PI: J. R. STETTER
Title: AN OPTIMIZED CONTACT-FILTER CONVERTER FOR LONG TERM MONITORING OF CW-AGENTS
Abstract: A SIMPLE CONTACT FILTER HAS BEEN DEVISED THAT WILL CONVERT G-TYPE CHEMICAL AGENTS TO HYDROGEN CYANIDE, WHICH CAN BE MEASURED BY A SENSITIVE AMPEROMETRIC DETECTOR. THE CONTACT FILTER SEPARATES THE CONVERSION AND DETECTION PROCESSES, ALLOWING EACH TO BE OPTIMIZED SEPARATELY. IN PRELIMINARY EXPERIMENTS, WE HAVE DETECTED 2.5 PPB (0.014 MG/M3) G-AGENT SIMULANT, WITHOUT SPECIAL EFFORTS TO OPTIMIZE THE FILTER. MUCH SCOPE REMAINS TO ACHIEVE GREATER SENSITIVITY FROM THE FILTER, AS WELL AS TO THOROUGHLY CHARACTERIZE ITS SELECTIVITY. WE WILL STUDY THE EFFECT OF VARYING PHYSICAL, CHEMICAL, AND MANUFACTURING PARAMETERS ON FILTER PERFORMANCE, AND PRODUCE A SIMULATION MODEL OF ITS OPERATION. THIS WILL GIVE INSIGHT INTO THE MECHANISMS OF THE CONVERSION, AS WELL AS ALLOW US TO RAPIDLY ACHIEVE AN OPTIMUM DESIGN. WHEN COMBINED WITH AN ALREADY-EXISTING SELECTIVE MONITOR FOR THIOETHERS (H-AGENTS), THE G-AGENT DETECTOR WILL FORM THE NUCLEUS OF A LONG-TERM MONITORING SYSTEM FOR CHEMICAL AGENTS IN TREATY VERIFICATION, STORAGE, TRANSPORTATION, AND STORAGE APPLICATIONS.

TRIDENT SYSTEMS, INC. Topic#: 91-113 ID#: 91TEC-036
10201 LEE HIGHWAY, SUITE 300 Office: TECOM
FAIRFAX, VA 22030 Contract #:
Phone: (703) 273-1012 PI: JOHN D. CASKO
Title: INTERFERENCE ENGINE TEST METHODOLOGY
Abstract: TRIDENT SYSTEMS INCORPORATED PROPOSES TO DEFINE, DEVELOP SPECIFICATIONS FOR AND DEMONSTRATE PROOF-OF-CONCEPT FOR AN EXPERT SYSTEM BASED, AUTOMATED SOFTWARE TOOL TO ASSIST IN THE MEASUREMENT OF PERFORMANCE AND CORRECTNESS OF INFERENCE ENGINES. THE PROJECT INCLUDES DEFINITION OF A SET OF INFERENCE ENGINE CHARACTERISTICS AND THE PARAMETERS BY WHICH TO RECOGNIZE THEM, A SET OF QUANTIFIABLE METRICS, A SET OF TEST CASE SUITES, A DESCRIPTION OF THE METHODOLOGY BY WHICH TO AUTOMATE THE TESTING, FUNCTIONAL SPECIFICATIONS FOR A PROTOTYPE TOOL AND A LIMITED-SCALE WORKING DEMONSTRATION.

UNITED SIGNALS & SYSTEMS, INC.
P. O. BOX 2374
CULVER CITY, CA 90231
Phone: (213) 838-3369

Topic#: 91-076 ID#: 91MIC-020
Office: MICOM
Contract #: DAAH01-92-C-R140
PI: DR. M. SHIVA

Title: MULTIPATH SUPPRESSION TECHNIQUES BASED ON HIGHER-ORDER SPECTRA

Abstract: This project will address the development of multipath suppression techniques that are needed to support radar-guided close-combat missile applications. Underscoring this effort are advanced signal processing algorithms based on higher-order spectra (HOS) techniques, such as the bispectrum. HOS-based techniques have shown a great promise in terms of accuracy, robustness and performance improvement over autocorrelation (or power spectrum)-based methods in the face of statistical uncertainties of multipath environments. Consequently, the development and application of HOS-based algorithms to the radar missile guidance problem has become timely. Three directions are covered during this exploratory development: (1) development of higher-order spectra algorithms for identification and suppression of multipath with emphasis on bicepstral approaches; (2) development of real-time serial and parallel signal fusion techniques to achieve signal reconstruction after multipath suppression; and (3) verification of the performance and complexity of the new algorithms using realistic synthetic data.

UTILITY DEVELOPMENT CORP.
112 NAYLON AVENUE
LIVINGSTON, NJ 07039
Phone: (201) 994-4334

Topic#: 91-088 ID#: 91NAT-003
Office: NATICK
Contract #:
PI: HARRY 6. KATZ

Title: THERMOPLASTIC ELASTOMER (TPE) COATED FABRIC FOR TOXICOLOGICAL AGENTS PROTECTIVE SUIT

Abstract: DURING THE PHASE I PROGRAM, WE PROPOSE TO DEVELOP A RELATIVELY THIN LAMINATE THAT WILL HAVE GOOD PERMEATION BARRIER AND DECON CHARACTERISTICS, ALONG WITH EASE OF PROCESSING, HEAT SEALING AND LOW COST. WE WILL MAKE THIN LAMINATES OF VARIOUS THERMOPLASTIC ELASTOMERS (TPE) WITH FABRIC. THESE LANINATES WILL BE TESTED FOR ADHESION BETWEEN THE TPE FILM AND FABRIC. TESTS WILL ALSO BE CONDUCTED AFTER LONG-TERM EXPOSURE IN A QUV WEATHEROMETER. THE BOND STRENGTH OF HEAT-SEALED JOINTS OF THE LAMINATES WILL BE DETERMINED. CHEMICAL AGENT AND DECON TESTING BY THE SPONSORING AGENCY WILL HELP US TO SELECT THE BEST MATERIALS FOR PRODUCING TAP SUITS. DURING PHASE II OF THIS PROGRAM, WE WILL MAKE A SHORT PRODUCTION RUN (MINIMUM 300 YARDS) OF TPE COATED FABRIC WITH THE BEST MATERIAL SELECTED AT THE END OF OUR PHASE I PROGRAM. WE WILL ALSO PROVIDE SAMPLES OF BONDED JOINTS AND DEMONSTRATE EFFECTIVE METHODS FOR FABRICATING THE TAP SUIT.

VENTURE SCIENTIFIC, INC.
2304 BRITSTOL, ATTN: DR. PETER F. STILLER
BRYAN, TX 77802
Phone: (409) 822-4193

Topic#: 91-010 ID#: 91BRL-302
Office: BRL
Contract #: 91-C-0097
PI: DR. PETER F. STILLER

Title: SCIENTIFIC VISUALIZATION

Abstract: VENTURE SCIENTIFIC WILL INVESTIGATE THE FEASIBILITY OF DEVELOPING A DATA ANALYSIS AND VISUALIZATION ENVIRONMENT FOR LARGE SCALE SCIENTIFIC COMPUTATION. A MULTIDIMENSIONAL COMPUTATIONAL GEOMETRIC APPROACH TO DATA VISUALIZATION AND DATA GEOMETRY INTERROGATION IS PROPOSED. THE OBJECTIVE IS TO PROVIDE A POSTPROCESSING ENVIRONMENT FOR SCIENTIFIC COMPUTATION WHICH PERMITS ACCURATE EVALUATION AND VISUALIZATION OF THE VARIOUS PARAMETERS AT ANY POINT OR TIME AND GIVES ACCESS TO THE DATA'S INTERNAL GEOMETRY, E.G. EQUIPRESSURE SURFACES, LEVEL SETS, PARTICLE TRACES, OR MEASUREMENTS ALONG SELECTED CURVES OR SURFACES. IN ADDITION, WAVELET TECHNOLOGY FOR DATA COMPRESSION AND RECONSTRUCTION WILL BE DEVELOPED.

VERITAY TECHNOLOGY, INC.
4845 MILLERSPORT HIGHWAY, P.O. BOX 305
EAST AMHERST, NY 14051
Phone: (716) 689-0177

Topic#: 91-007 ID#: 91CRD-302
Office: CRDEC
Contract #: DAAA15-91-C-0121
PI: ROBERT L. TALLEY

Title: DEVELOPMENT OF INSTRUMENTED CHEMICAL/BIOLOGICAL (CB) INDIVIDUAL PROTECTIVE CLOTHING TO ESTABLISH FABRIC DYNAMIC PARAMETERS

Abstract: OPERATION DESERT SHIELD HAS EMPHASIZED THE VERY REAL THREAT OF CHEMICAL WARFARE. CONCERN HAS RECENTLY BEEN VOICED WITHIN BOTH THE DEVELOPER AND USER COMMUNITIES THAT THE CURRENT STATIC TESTING METHODOLOGIES DO NOT ADEQUATELY PREDICT THE BEHAVIOR OF CB PROTECTIVE CLOTHING IN THE DYNAMIC BATTLEFIELD ENVIRONMENT. A TESTING STANDARD (SIMILAR TO MIL-STD-810D) THAT INCORPORATES FABRIC TEST METHODOLOGIES CAPABLE OF MORE REALISTICALLY CORRELATING DEVELOPER TESTING AND USER REQUIREMENTS IS CLEARLY INDICATED. THE OBJECTIVE OF THE PROPOSED PHASE I PROGRAM IS TO DERIVE MECHANICAL FORCE PROFILES REPRESENTATIVE OF THE RANGE OF FORCES LIKELY TO BE EXPERIENCED BY SOLDIERS ENGAGED IN ACTIVITIES DURING WHICH CB PROTECTION WILL BE REQUIRED. THESE PROFILES, DEVELOPED IN ACCORDANCE WITH ACTIVITY CATEGORIES DEFINED BY THE U.S. ARMY HUMAN ENGINEERING LABORATORY (HEL) AND ROUTINELY USED BY HUMAN FACTORS ENGINEERS AT THE HEL OBSTACLE COURSE, WILL FORM THE BASIS FOR THE DESIGN AND DEVELOPMENT OF AN INSTRUMENTED CHEMICAL/BIOLOGICAL (CB) PROTECTIVE (MOPP-IV) ENSEMBLE DURING PHASE II, WHICH WILL PERMIT THE "MAN-IN-THE-SUIT" TESTING ESSENTIAL TO THE PROMULGATION OF MORE REALISTIC FABRIC TESTING METHODOLOGIES.

VERITAY TECHNOLOGY, INC.
4845 MILLERSPORT HIGHWAY, P.O. BOX 305
EAST AMHERST, NY 14051
Phone: (716) 689-0177

Topic#: 91-118 ID#: 91BRL-014
Office: BRL
Contract #:
PI: ROBERT L. TALLEY

Title: INVESTIGATION OF BULK LOADED LIQUID PROPELLANT GUN CONCEPTS

Abstract: THE BULK-LOADED LIQUID-PROPELLANT GUN (BLPG) CONCEPT IS AN ATTRACTIVE CANDIDATE FOR MEDIUM AND SMALL CALIBER SYSTEMS BECAUSE THE MECHANISM IS INHERENTLY SIMPLE AND LIQUID PROPELLANTS HAVE POTENTIALLY FAVORABLE LOGISTICS, COST, AND VULNERABILITY ADVANTAGES OVER SOLID PROPELLANT WEAPONS. PREVIOUS ATTEMPTS TO DEVELOP BLPG SYSTEMS HAVE BEEN UNSUCCESSFUL PRIMARILY BECAUSE OF THE INABILITY TO ACHIEVE SATISFACTORY PERFORMANCE UNIFORMITY AND SAFETY. BLPG RESEARCH AND DEVELOPMENT OVER THE LAST SEVEN YEARS HAS DEVELOPED A BODY OF EXPERIENCE AND A DATA BASE OF RESULTS THAT INVOLVES EXPERIMENTAL WORK IN BOTH FIRING AND DIAGNOSTIC FIXTURES. THIS WORK HAS PROMOTED UNDERSTANDING OF BLPG PHENOMENA AND HAS LED TO THE FORMULATION OF CONCEPTS THAT HAVE THE POTENTIAL TO CONTROL OR AT LEAST MODIFY OBJECTIONABLE INTERIOR BALLISTIC PROCESS CHARACTERISTICS. THE PROPOSED PROGRAM WILL TAKE ADVANTAGE OF THIS EXPERIENCE BASE IN THE FORMULATION AND EXPERIMENTAL EVALUATION OF A BLPG CONCEPT(S) TO BE SELECTED FROM SEVERAL APPROACHES AND DEFINED DURING THE PROGRAM WITH THE AID OF COMPUTER ANALYSES. BECAUSE THE UNDERSTANDING OF OBSERVATIONS IS CONSIDERED TO BE A CRITICAL PART OF THE FEASIBILITY DEMONSTRATION, THE EXPERIMENTAL WORK WILL BE AUGMENTED WITH MODELING AND ANALYSIS.

VERITAY TECHNOLOGY, INC.
4845 MILLERSPORT HWY., P.O. BOX 305
EAST AMHERST, NY 14051
Phone: (716) 689-0177

Topic#: 91-119 ID#: 91BRL-020
Office: BRL
Contract #:
PI: EDWARD B. FISHER

Title: DOWN BARREL PROPELLANT INJECTION

Abstract: INTERIOR BALLISTIC PERFORMANCE FOR SYSTEMS THAT ONLY INCLUDE COMBUSTION IN THE CHAMBER IS LIMITED BECAUSE MUCH OF THE CHEMICAL ENERGY IS CONVERTED INTO GAS KINETIC ENERGY. BURNING PROPELLANT NEAR THE PROJECTILE BASE, AS IN THE TRAVELING CHARGE CONCEPT, IS A METHOD FOR CIRCUMVENTING THIS PROBLEM. THAT CONCEPT HAS HAD ONLY MARGINAL SUCCESS

AND IT IS CURRENTLY NOT BEING PURSUED. SOME OF THE BENEFITS ATTRIBUTED TO THE TRAVELING CHARGE CONCEPT CAN BE OBTAINED BY INJECTING PROPELLANT AT ONE OR MORE BARREL LOCATIONS AFTER THE PROJECTILE HAS PASSED. WHILE THE PROPELLANT IS BURNED AT VARIOUS DISTANCES FROM THE PROJECTILE BASE, A DISADVANTAGE, PROBLEMS SUCH AS PARASITIC WEIGHT, IGNITION TIMING AND COMBUSTION CONTROL ARE GREATLY REDUCED. THE PROPOSED PROGRAM CONSISTS OF FORMULATING A DOWN-BARREL PROPELLANT CONCEPT(S) AND ALSO DEVELOPING A 2-D INTERIOR BALLISTICS SIMULATION OF THE INJECTION PROCESS. FEASIBILITY OF THE CONCEPT WILL BE SHOWN THEORETICALLY BY THE ABILITY OF THE CODE TO SHOW THAT A PERFORMANCE INCREASE OF 25 PERCENT IS POSSIBLE.

VERITAY TECHNOLOGY, INC.
4845 MILLERSPORT HWY., P.O. BOX 305
EAST AMHERST, NY 14051
Phone: (716) 689-0177

Topic#: 91-211
Office: MEDICAL
Contract #:
PI: ROBERT L. TALLEY

ID#: 91MED-090

Title: COMPACT, FAST-RESPONSE ENVIRONMENTAL HEALTH MONITOR/ TEMPERATURE SENSOR SUITE

Abstract: OPERATIONS DESERT SHIELD AND DESERT STORM EMPHASIZED THE VERY REAL THREAT OF CHEMICAL WARFARE AND THE CONCOMITANT NEED FOR TROOPS TO BE ABLE TO FUNCTION IN FULL MOPP IV INDIVIDUAL PROTECTIVE CLOTHING WITHOUT SUCCUMBING TO HEAT STRESS. SINCE THE CHEMICAL WARFARE ENSEMBLE INHIBITS THE EFFECTIVENESS OF THE BODY'S EVAPORATIVE COOLING MECHANISM, MEDICAL CASUALTIES INDUCED BY AN INAPPROPRIATE BALANCE BETWEEN ENVIRONMENTAL CONDITIONS AND THE WORK LOAD CAN JEOPARDIZE MISSION EFFECTIVENESS. THE OBJECTIVE OF THE PROPOSED PHASE I PROGRAM IS TO DEVELOP AN OPERATIONALLY VIABLE, HAND-HELD ENVIRONMENTAL HEALTH MONITOR/TEMPERATURE SENSING SUITE CAPABLE OF PROVIDING AN EARLY WARNING OF IMPENDING HEAT-STRESS PROBLEMS. THE PROPOSED SUITE OF SENSORS WILL ACCURATELY, RELIABLY, AND RAPIDLY PROVIDE THE ENTIRE SPECTRUM OF ENVIRONMENTAL PARAMETERS (I.E. , WET BULB, DRY BULB, BLACK GLOBE TEMPERATURES) AND SUPPORTING DATA NEEDED TO MINIMIZE HEAT-STRESS CASUALTIES AND PERFORMANCE DEGRADATION. AS OUR EXPERIENCE WITH THE APPLICATION OF BLACK-GLOBE THERMOMETER TECHNOLOGY INDICATES A PRESSING NEED TO REDUCE THE TIME REQUIRED TO DEFINE HEAT-STRESS CONDITIONS—FROM 15 TO 20 MINUTES TO A MATTER OF SECONDS RESPONSE. CONSEQUENTLY, RESPONSE TIME WILL BE AN IMPORTANT FACTOR IN SENSOR DESIGN. WITH A CAPABILITY TO CONTINUOUSLY MONITOR ENVIRONMENTAL CONDITIONS, MODELING MAY BE APPLIED TO PREDICTING HEAT STRESS EFFECTS TO INDIVIDUAL MILITARY PERSONNEL (I.E.) SPECIAL OPERATIONS). HARDWARE CONCEPT(S) DERIVED FROM AN INTEGRATED SYSTEMS APPROACH WILL FORM THE BASIS FOR PHASE II DEVELOPMENT OF AN ENVIRONMENTAL HEALTH MONITOR.

VIASAT, INC.
6120 PASEO DEL NORTE, SUITE J2
CARLSBAD, CA 92009
Phone: (619) 438-8099

Topic#: 91-115
Office: TECOM
Contract #:
PI: MARK JOHNSON

ID#: 91TEC-104

Title: UNMANNED GROUND VEHICLE (UGV) INDOOR TRACKING SYSTEM

Abstract: A PRECISION VEHICLE TRACKING SYSTEM (PVTS) THAT PROVIDES VERY ACCURATE POSITION INFORMATION FOR UGV'S IN A ROBOTICS TEST FACILITY IS PROPOSED. THE PVTS RELIES ON A SMALL (LESS THAN 10 CUBIC INCHES), LIGHTWEIGHT (LESS THAN 1 LB.) FREQUENCY HOPPED TRANSMITTER WHICH IS ATTACHED TO THE UGV. NO TETHER OR HARD-WIRE CONNECTION FROM THE UGV TO THE CONTROL STATION IS REQUIRED. THIS SYSTEM WILL SUPPORT TRACKING OF MULTIPLE UGV'S SIMULTANEOUSLY AND CAN PROVIDE ORIENTATION INFORMATION IN ADDITION TO X, Y POSITION DATA. THE SYSTEM IS DESIGNED TO COUNTERACT THE SEVERE MULTIPATH INTERFERENCE ENVIRONMENT RESULTING FROM OPERATION WITHIN A METAL BUILDING. THE DESIGN IS CONSISTENT WITH THE RUGGEDIZATION REQUIRED FOR OPERATION IN A SEVERE PHYSICAL ENVIRONMENT. THE OVERALL PROPOSED SYSTEM IS DESIGNED TO MINIMIZE PROCUREMENT AND LIFE CYCLE COST, ELIMINATE ACCURACY DEGRADATION WITH TIME AND TEMPERATURE, AND NOT INTERFERE WITH OTHER TEST FACILITY SYSTEMS. PHASE I PROGRAM OBJECTIVES ARE TO DESIGN, SIMULATE, EVALUATE, DOCUMENT AND PROVIDE A PROOF OF

CONCEPT DEMONSTRATION FOR THE PVTS. IF SUCCESSFUL, THE PROGRAM WOULD LEAD TO INSTALLATION OF THE PVTS INTO A ROBOTICS TEST FACILITY IN PHASE II.

VIASAT, INC.
6120 PASEO DEL NORTE, SUITE J2
CARLSBAD, CA 92009
Phone: (619) 438-8099
Topic#: 91-245 ID#: 91SDC-110
Office: SDC
Contract #:
PI: MARK D. DANKBERG
Title: VOICE/DATA MULTIPLEXER FOR COMMUNICATIONS
Abstract: VIASAT, INC. IS PLEASED TO PRESENT THIS PROPOSAL TO DEVELOP A VOICE-DATA MULTIPLEXER TO IMPROVE EFFICIENT UTILIZATION OF COMMERCIAL TELEPHONE LINES FOR THE U.S. ARMY STRATEGIC DEFENSE COMMAND. OUR PROPOSAL DESCRIBES A CANDIDATE SYSTEM THAT SUPPORTS FULL DUPLEX NEAR-TOLL-QUALITY SECURE DIGITAL VOICE AND 19.2 KBPS (OR MORE) OF SECURE DIGITAL DATA ON A SINGLE 3 KHZ STANDARD NARROWBAND COMMERCIAL TELEPHONE LINE. OUR CONCEPT BUILDS ON VIASAT'S EXPERTISE ON ALL OF THE TECHNOLOGIES RELATED TO THE VOICE-DATA MUX, INCLUDING: SOURCE CODING, HIGH SPEED WIRELINE MODULATION AND CODING, AND EMBEDDED ENCRYPTION DEVICES. THE PROPOSAL ALSO CONSIDERS ARCHITECTURAL ISSUES, OFFERING EITHER STAND-ALONE, INDIVIDUAL BLACK BOX IMPLEMENTATIONS, OR A RACK-BASED SOLUTION THAT CAN BE SHARED BY MANY USERS AT A SITE. PHASE I IS PART OF A MULTI-PHASED PLAN FOR FEASIBILITY ANALYSIS, PROOF-OF-CONCEPT DEMONSTRATION AND FULL SCALE DEVELOPMENT OF THE VOICE-DATA MUX. THE PROPOSED WORK ALSO BENEFITS FROM ON-GOING VIASAT PROGRAMS INVOLVING HIGH PERFORMANCE MODEMS, SOURCE CODING, LAND EMBEDDED ENCRYPTION. THE PROPOSED WORK INCLUDES SIMULATION TO QUANTIFY MUX CAPACITY AND PERFORMANCE UNDER A VARIETY OF OPERATING CONDITIONS. FINALLY, VIASAT IS WELL POSITIONED TO APPLY THIS CRITICAL TECHNOLOGY TO BOTH COMMERCIAL AND GOVERNMENT MARKETS BASED ON OUR VENTURE CAPITAL BACKING AND ONGOING COMMERCIAL BUSINESSES.

XONTECH, INC.
6862 HAYVENHURST AVENUE
VAN NUYS, CA 91406
Phone: (714) 894-2286
Topic#: 91-235 ID#: 91SDC-241
Office: SDC
Contract #:
PI: STANLEY COTTRILL
Title: TRACKING RADAR ADVANCED SIGNAL PROCESSING COMPUTING
Abstract: THE MISSION OPERATIONS DIRECTED AT USAKA OFTEN INVOLVE COMPLEX TARGET CONFIGURATIONS UNDER OBSERVATION BY NUMEROUS RADARS, OPTICS SENSORS, AND TELEMETRY STATIONS. IN NON-NOMINAL MISSIONS, AND IN COMPLEX NOMINAL MISSIONS, THE REAL TIME ACTIVITIES UNFOLD RAPIDLY WHICH TAXES THE ABILITIES OF THE OPERATORS TO REACT OPTIMALLY WITH THE ATTENDANT THREAT OF DATA LOSS. THESE CONTINGENCIES ARE OFTEN NOT APPARENT UNTIL LONG AFTER THE TARGET COMPLEX HAS CROSSED THE RADAR HORIZON WHICH LIMITS THE TIME AVAILABLE TO INSTALL MITIGATION ACTIONS. THE REQUIREMENTS ARE IDENTIFIED THEN TO PROVIDE EXTENDED SENSOR DETECTION AND TRACKING CAPABILITIES AND TO IMPROVE SENSOR DATA WHICH WOULD BE FED INTO REAL-TIME FEATURE EXTRACTION AND DISCRIMINATION FUNCTIONS. THE LATTER FUNCTIONS WOULD THEN AID THE RANGE OPERATORS, CONFIRM TARGET IDENTIFICATIONS, AND DETERMINE OPTIMUM SENSOR ASSIGNMENTS. THE PROPOSED EFFORT WILL DEVELOP CONCEPTS WHEREBY USAKA RADAR OPERATIONS MAY BE IMPROVED THROUGH THE USE OF REAL-TIME COHERENT SIGNAL PROCESSING TECHNIQUES. THESE TECHNIQUES INCLUDE COHERENT INTEGRATION, DOPPLER-AIDED RANGE TRACKING, ENHANCED RANGE AND DOPPLER RESOLUTION, AND PHASE-DERIVED-RANGE TRACKING FUNCTIONS. THE REAL-TIME DATA PRODUCTS RESULTING FROM THESE TECHNIQUES MAY THEN BE FED INTO A FUTURE DISCRIMINATION FUNCTION.

ZEREN RESEARCH, INC.
261 MORRIS AVENUE
MOUNTAIN LAKES, NJ 07046
Phone: (201) 335-6744

Topic#: 91-037
Office: ARDEC
Contract #:
PI: FEVZI ZEREN, PH.D.

ID#: 91ARD-017

Title: DEVICE FOR MEASURING THE DECOMPOSITION SHEAR RATE OF HIGHLY SOLIDS FILLED ENERGETIC MATERIALS

Abstract: A NOVEL VISCOMETER DESIGN WHICH HAS THE CAPABILITY TO PROVIDE A DIRECT READING OF ON-SET OF CRITICAL SHEAR RATES AT WHICH HIGHLY FILLED MATERIALS START TO DECOMPOSE IS DISCUSSED. A DEVICE SIMILARLY TO ONE PROPOSED IN THIS PROGRAM HAS ALREADY BEEN BUILT AND EFFECTIVELY USED AT OIL COMPANIES. THE CRITICAL SHEAR RATE IS DETERMINED BY MEASURING TOTAL STRESSES (DYNAMIC & PRESSURE) OF THE MATERIAL FLOWING AT CONSTANT FLOWRATE BUT AT DIFFERENT SHEAR RATES ACROSS THE DEVICE (SECTIONS), WHILE RETAINING DEFORMATION HISTORY AND ITS ASSOCIATED RHEOLOGICAL PARAMETERS SIMULTANEOUSLY WITHOUT INTERRUPTION OF THE FLOW. THE PROPOSED SYSTEM IS SIMPLE AND HAS WELL DEFINED MATHEMATICS (FLOW EQUATIONS, STRESS/RATE RELATIONSHIPS, ETC.) WITHOUT ANY ASSUMPTION SUCH AS ENTRANCE EFFECTS. THE DEVICE CAN BE USED AS AN IN-LINE RHEOMETER/QUALITY CONTROL TOOL BY CONNECTING IT TO THE EXTRUDER DIE BLOCK (WITHOUT INTERRUPTION OF THE PRODUCT) OR AS A LAB INSTRUMENT. IT HAS NO MOVING OR ROTATING PARTS AND IS CONSIDERED TO BE VERY SAFE IN AN EXTRUSION LINE (EXPLOSIVE DOUGHS) ESPECIALLY FOR CLEANING LEFT OVER DOUGH WITHIN THE DEVICE. WITH PROPER INSTRUMENTATION, THE PROPOSED SYSTEM HAS THE CAPABILITY TO MEASURE AND/OR PREDICT SOME VISCOELASTIC PROPERTIES (IF ANY) INCLUDING RELAXATION TIME, AND NORMAL STRESSES IN ADDITION TO DETERMINING THE CONVENTIONAL RHEOLOGICAL PROPERTIES IN SHEAR.

ARMY COMMANDS:

ARMY TOPIC NUMBERS:

(Note: This reference contains the firm names and topic numbers for the DoD SBIR Phase I awards listed in this volume and the other three volumes.)

FIRM NAME: