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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

**DEFENSE
SMALL BUSINESS
INNOVATION
RESEARCH PROGRAM (SBIR)**

DTIC
SELECTED
OCT 1 1986
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PREFACE

During Fiscal Year (FY) 1984 and FY 1985 the Military Services, the Defense Advanced Research Project Agency (DARPA), and the Defense Nuclear Agency (DNA) selected 152 proposals for funding in Phase II of the Small Business Innovation Research (SBIR) Program. These proposals were selected from those submitted by small research and development (R&D) firms awarded Phase I contracts from the FY 1983 solicitation.

In order to make information available on the technical content of the Phase II projects supported by the Department of Defense SBIR Program, this report presents the abstracts of those proposals which have resulted in contract awards. Further, the name and address of each firm performing the work is given for those who may desire additional information about the project.

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 SBIR firm whose name and address are shown.



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INTRODUCTION

On July 22, 1982 the President signed the "Small Business Innovation Development Act of 1982" (Public Law 97-219). This law, effective October 1, 1982, is designed to give small high technology firms a greater share of Federal R&D contract awards.

The Act mandates that all Federal Agencies establish an SBIR program if their FY 1982 extramural budgets for R&D exceeded a threshold figure of \$100 million. (There are eleven government agencies meeting this requirement.) Beginning in FY 1983, DoD must make available the following percentages of its extramural R&D budget for this program:

	<u>FY 1983</u>	<u>FY 1984</u>	<u>FY 1985</u>	<u>FY 1986</u>	<u>FY 1987</u>	<u>FY 1988</u>
Percentage	0.1	0.3	0.5	1.0	1.25	1.25
Estimated Dollars	16.7M	43M	79M	160M	240M	262M
Actual Awarded Dollars	20.6M	44.6M	78.2M			

Objectives:

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, fostering and encouraging participation by minority and disadvantaged persons in technological innovation, and increasing the commercial application of DoD-supported research or research and development results.

The SBIR Program consists of three distinct phases. Under Phase I, DoD Components make awards to small businesses, typically of one half to one man-year effort over a period generally not to exceed 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. All DoD topics address specific R&D needs to improve our defense posture. 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. The successful completion of Phase I is a prerequisite 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. In addition, 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 generally not to exceed 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 will require a more comprehensive proposal which outlines the intended effort in detail.

Phase III is expected to involve private-sector investment and support for any necessary development that will bring an innovation to the marketplace. Also, under Phase III, DoD may award follow-on contracts not funded by the SBIR Program for products or processes meeting DoD mission needs.

FY 1983 Program

For the FY 83 Phase I SPIR program, the three military Services and the Defense Agencies selected more than 400 R&D topics which were included in the solicitation. The following is a breakout of the proposals received and the number of selected proposals on which Phase I contracts were awarded. Also shown are the projects that are currently being funded in Phase II. Funds for the two-year Phase II effort can be made available incrementally.

	<u>Number of Topics</u>	<u>Proposals Received</u>	<u>Phase I Awards</u>	<u>Phase II Awards</u>
Army	182	1121	98	48
Navy	131	944	66	45
Air Force	75	496	99	49
DARPA	8	128	12	8
DNA	<u>10</u>	<u>88</u>	<u>8</u>	<u>2</u>
	406	2777	283	152

Presentation of the technical abstracts which describe the nature of the funded FY 1983 Phase II SBIR projects is the main purpose of this report. Proprietary information is not provided in these abstracts, therefore, technical details may be missing. For this reason, the report supplies the names of individuals in the small business firms who may be contacted should more information be needed on a specific project.

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A.K. ENGINEERING /CAMBRIDGE ROBOTICS ARMY
73 FRESH POND PARKWAY
CAMBRIDGE, MA 02138
D. ALEXANDER KOSO
TITLE:
TERRAIN HAZARD DETECTION SENSOR
TOPIC: 5c OFFICE: BRDC

LASER BASED OBSTACLE IDENTIFICATION REPRESENTS THE ESSENCE OF SUBJECT DESIGN, DEVELOPMENT AND TESTING A TERRAIN HAZARD DETECTOR SENSOR (HAZARD DETECTION SENSOR), SMALL BUSINESS INNOVATION RESEARCH (SBIR), PHASE II EFFORT. THE HAZARD DETECTION SENSOR SYSTEM WILL CONSIST OF HARDWARE AND FIRMWARE PERFORMING CONTINUOUS, FORWARD OBSTACLE ANALYSIS. HARDWARE SHALL CONSIST OF A GYRO STABILIZED LASER TERRAIN SCANNING SYSTEM WITH CHARGE COUPLED DISPLAY VIDEO CAMERA FOR OFF ROUTE OBSTACLE DETECTION. IMAGE PROCESSING OF VIDEO WILL BE CONDUCTED IN NEAR REAL TIME (<0.2 SEC) BY RELATIONAL ALGORITHMS, RESULTING IN IDENTIFICATION OF TRACKED VEHICLE OBSTACLES SUCH AS TREES, RAVINES AND MOBILE VEHICLES, ETC. WHEN COMPLETED, THIS EFFORT WILL PROVIDE A MAJOR DEVELOPMENT TOWARD AUTONOMOUS TRACKED VEHICLE OPERATION.

ABARIS NAVY
1254 ST. ALBERTS
RENO, NV 89503
W L MURPHY
TITLE:
COMPOSITE MATERIAL DESIGNS FOR ASROC LAUNCHER MK112
TOPIC: 71 OFFICE: NAVSEA

UNDER PHASE I ABARIS CONDUCTED A CONCEPTUAL AND PRELIMINARY DESIGN STUDY OF THE APPLICATION OF ADVANCED COMPOSITES TO THE ASROC LAUNCHER MK 112 FOR WEIGHT REDUCTION AND CORROSION RESISTANCE. THE MAJOR COMPONENT ANALYZED WAS THE GUIDE, SPECIFICALLY THE ALUMINUM HONEYCOMB PANELS. THREE ALTERNATIVE CONCEPTS WERE DEVELOPED AND ANALYZED, WHICH ESTABLISHED THE FEASIBILITY OF REPLACING THE ALUMINUM HONEYCOMB PANELS WITH ONES FABRICATE OF CORROSION RESISTANT ADVANCED COMPOSITES. THE ANALYSIS INDICATES THAT THE DESIGNS PROVIDE ADEQUATE STRENGTH, STIFFNESS, REDUCED WEIGHT, AND IMPROVED CORROSION RESISTANCE. A

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STRUCTURAL CONCEPT OF A CUSTOM CORE USING HYBRID MATERIALS (PREPREG FIBERGLASS AND GRAPHITE) WAS SELECTED AS THE MOST COST EFFECTIVE. UNDER PHASE II, ABARIS PROPOSES TO CONDUCT DETAIL DESIGN AND ANALYSIS FOLLOWED BY FABRICATION OF ADVANCED COMPOSITE PANELS. SELECTED CRITICAL COMPONENTS AND A REPRESENTATIVE PANEL WOULD BE STRUCTURALLY TESTED. A COMPLETE SET OF PANELS WOULD THEN BE FABRICATED, AND ASSEMBLED AT NOD LOUISVILLE, KY TO ASSURE THAT THE DESIGN WAS COMPATIBLE WITH EXISTING OVER HAUL PROCEDURES. A DETAILED TEST PLAN FOR FOLLOW-ON STRUCTURAL AND OPERATIONAL TESTS WOULD BE PREPARED IN CONJUNCTION WITH NUSC, NEWPORT, RI.

ABEL COMPANY
PEMBROKE, VA 24136
KENNETH ABEL

DARPA

TITLE:
FEASIBILITY STUDY LEADING TO THE DEVELOPMENT OF A LIGHT WEIGHT, COMPACT SOLAR WATER DISTILLATION PURIFICATION DEVICE
TOPIC: 8 OFFICE: DARPA

DESIGN A FULL-SIZE, INFLATABLE, PLASTIC FILM SOLAR STILL USING CHARCOAL ABSORBERS TO BE USED FOR DESERT SURVIVAL, 2. FABRICATE AND TEST THE DESIGN UNDER SIMULATED AND ACTUAL SOLAR SUMMERTIME CONDITIONS, 3. BASED ON THE RESULTS OF THE TEST, FINALIZE THE DESIGN AND FABRICATE MULTIPLE COPIES FOR MILITARY FIELD TESTING. IN PHASE I OF THIS SBIR EFFORT, THE FOLLOWING WAS ACCOMPLISHED: 1. THE PARAMETERS REQUIRED TO ACHIEVE A SIMPLE, SUITABLE METHOD TO CONTROL IMPURE WATER INFLOW RATE TO THE EVAPORATED WERE DETERMINED; 2. THE UTILITY OF CHARCOAL CLOTH AS A COMBINED SOLAR ABSORBER AND WATER WICK WAS ESTABLISHED; 3. THE UTILITY OF CHARCOAL CLOTH IN PREVENTING THE CO-DISTILLATION OF OFFENSIVE ODORS OR CHEMICALS AND THE SURFACE MIGRATION OF MICROBIAL CONTAMINANTS INTO THE DISTILLATE WAS DETERMINED.

ADLER CORPORATION
4801 MASSACHUSETTS AVE NW SUITE 360
WASHINGTON, DC 20016
R. E. ADLER

NAVY

TITLE:
EMISSION STRATEGIES AND OPERATIONS IN MODERN NAVAL COMBAT SYSTEMS
TOPIC: 40 OFFICE: NAVSEA

THE OBJECTIVE OF THE PHASE II WORK IS TO FORMULATE AND SELECT

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PREFERRED EMISSION CONTROL STRATEGIES FOR MODERN COMBAT SYSTEMS, USING THE DEVELOPED AND TESTED DECISION AID. THESE EMISSION CONTROL STRATEGIES ARE PRIMARILY INTENDED FOR SYSTEM ACQUISITION DECISIONS. AS A FOLLOW-ON AND BASED ON THE PHASE I RESULTS, ADLER CORPORATION WILL SELECT EMISSION STRATEGIES AND DEVELOP THIS DECISION AID IN FOUR STEPS: 1. DEVELOPMENT OF GAME-THEORETIC MACROEVALUATION MODELS FOR THE ANALYSIS OF BATTLE MANAGEMENT USING EFFECTIVE EMISSION CONTROL STRATEGIES. THE OBJECTIVES AT THIS LEVEL FOCUS ON THE RIGOROUS DERIVATION OF EMISSION CONTROL STRATEGIES AS A FUNCTION OF ENEMY SURVEILLANCE AND TARGETING STRATEGIES. 2. DEVELOPMENT OF GAME-THEORETIC MICROEVALUATION MODELS FOCUSING ON THE EMPLOYMENT OF RADAR MODES AND COVER AND DECEPTION TO CONFUSE AND DECEIVE ENEMY SURVEILLANCE AND TARGETING. THE OBJECTIVES AT THIS LEVEL FOCUS ON TECHNICAL AND OPERATIONAL RULES WHICH PERMIT MANIPULATION OF THE PERCEIVED TACTICAL PICTURE. 3. INTEGRATION OF MACROEVALUATION AND MICROEVALUATION MODELS INTO A UNIFIED GAME-THEORETIC BATTLE-MANAGEMENT DECISION AID. 4. SELECTION OF EFFECTIVE EMISSION CONTROL STRATEGIES FOR ACQUISITION DECISIONS, USING THE DEVELOPED AND TESTED DECISION AID.

ADVANCED FUEL RESEARCH, INC.
87 CHURCH STREET
EAST HARTFORD, CT 06108
PETER R. SOLOMON

AF

TITLE:

EXPERIMENTS AND MODELING OF MULTI-COMPONENT FUEL BEHAVIOR IN COMBUSTION

TOPIC: 13e OFFICE: AFWAL/XRP-PO

AN IMPORTANT AIR FORCE OBJECTIVE IS TO DEVELOP TECHNOLOGY TO ALLOW THE UTILIZATION OF AVIATION FUELS WITH A BROADER RANGE OF PROPERTIES INCLUDING LOWER HYDROGEN CONTENT AND HIGHER AROMATICITY. THE OBJECTIVES OF THIS PROGRAM ARE TO DEVELOP A DATA BASE AND MODELING CAPABILITIES TO RELATE VAPORIZATION, PYROLYSIS, AND SOOT FORMATION TO THE PROPERTIES OF THE FUEL, THE ATOMIZER AND COMBUSTION CONDITIONS. DURING PHASE I, EXCELLENT RESULTS WERE OBTAINED USING FT-IR EMISSION AND TRANSMISSION FOR ON-LINE MONITORING OF SOOT AND GAS CONCENTRATIONS AND TEMPERATURES. THE STUDY OF FOUR FUELS HAS LED TO THE IDENTIFICATION OF A CONTROLLING FACTOR IN SOOT FORMATION WHICH PROVIDES A BETTER CORRELATION WITH SOOTING BEHAVIOR THAN TOTAL HYDROGEN OR AROMATICITY. A MAJOR FOCUS OF THE PROGRAM WILL BE TO IDENTIFY HOW THIS PARAMETER CAN BE MEASURED, THE MECHANISMS BY

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WHICH IT AFFECTS SOOT PRODUCTION AND METHODS FOR CONTROLLING SOOT. A PARTICULARLY IMPORTANT FEATURE OF THE EXPERIMENTAL WORK PROPOSED IN PHASE II IS THE CAPABILITY OF MEASURING THE FORMATION OF SOOT UNDER CONDITIONS WHERE THE CONCENTRATION OF FUEL AND OXYGEN AND THE TEMPERATURE ARE INDEPENDENTLY CONTROLLED, THUS ELIMINATING THE COMPLICATIONS OF SEPARATING THESE FACTORS WHEN SOOT MEASUREMENTS ARE PERFORMED UNDER COMBUSTION CONDITIONS. THE PHASE II WORK WILL STUDY THE PYROLYSIS AND COMBUSTION OF WELL CHARACTERIZED DROPLET STREAMS. IN ADDITION, THE DROPLET DISTRIBUTION IN SPRAYS AT HIGH PRESSURES WILL BE STUDIED. THESE COMPONENTS WILL BE COMBINED IN PHASE III WHICH WILL STUDY THE PYROLYSIS AND COMBUSTION OF SPRAYS AT HIGH PRESSURE.

ADVANCED INFORMATION & DECISION SYSTEMS ARMY
201 SAN ANTONIO CIRCLE, SUITE 286
MOUNTAIN VIEW, CA 94040
ROBERT J. DRAZOVICH
TITLE:
KNOWLEDGE BASED INTELLIGENCE DATA ANALYSIS
TOPIC: 1a OFFICE: CECOM/SWL

AI&DS PROPOSES TO DEVELOP A PROTOTYPE INFORMATION FUSION SYSTEM. WITH CURRENT SYSTEMS, THE FUSION PROCESS IS LARGELY MANUAL; AI&DS PROPOSES TO DEVELOP A SOFTWARE SYSTEM WHICH WILL SUBSTANTIALLY AUTOMATE THIS PROCESS. THE SYSTEM WILL UTILIZE SIMULATED ELINT, COMINT, IMINT, AND ACTIVE RADAR REPORTS TO DETERMINE THE NATURE, RELATIONSHIP, AND DEPLOYMENT OF THE MILITARY FORCES UNDER OBSERVATION. THIS PROJECT WILL INTEGRATE THE WORK DONE ON THE IDA I PROJECT AND OTHER INDORMATION FUSION RESEARCH PERFORMED AT AI&DS. THE SYSTEM WILL FORM AND MAINTAIN MULTIPLE ALTERNATIVE HYPOTHESES ABOUT THE SCENE BEING OBSERVED; IT WILL ALSO MAINTAIN AN EXPLICIT REPRESENTATION OF UNCERTAINTY TO PROVIDE CONFIDENCE MEASURES ON THE HYPOTHESES BEING GENERATED. THE SYSTEM WILL MAKE HEAVY USE OF CONTEXTUAL INFORMATION TO GUIDE THE FUSION PROCESS. IT WILL PROVIDE EXPLANATIONS TO THE USER OF THE DECISIONS IT HAS MADE. THE SYSTEM TO BE DEVELOPED WILL BE BASED ON AN AI BLACKBOARD ARCHITECTURE.

ADVANCED INFORMATION & DECISION SYSTEMS ARMY
201 SAN ANTONIO CIRCLE, SUITE 286
MOUNTAIN VIEW, CA 94940
J.R. PAYNE/D.G. SHAPIRO
TITLE:
DISTRIBUTED PROCESSING FOR BALLISTIC DEFENSE SYSTEMS
TOPIC: 8c OFFICE: BMDSC

BALLISTIC MISSILE DEFENSE (BMD) REQUIRES THE USE OF COMPUTATIONAL

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AND MORE ACCURATE DYNAMIC SYSTEM IDENTIFICATION TECHNIQUES TO ACCURATELY DETERMINE THE DYNAMIC EQUATIONS OF MOTION FROM DYNAMIC RESPONSE DATA FOR SYSTEMS WITH HIGH MODAL DENSITY. TWO TECHNIQUES, ONE BASED ON TIME DOMAIN AND THE OTHER BASED ON THE FREQUENCY DOMAIN, WERE DEVELOPED AND DEMONSTRATED TO BE FEASIBLE. THE LOCATION OF CRACKS AND CRACK SIZE WERE DEMONSTRATED TO EXHIBIT THEIR EFFECTS IN OBSERVED CHANGES TO STIFFNESS, MASS AND DAMPING MATRICES AND WELL AS IN CHANGES IN THE POWER SPECTRAL DENSITY AND RESONANT FREQUENCIES. THE PROPOSED PHASE II EFFORT IS A LOGICAL CONTINUATION OF THE PHASE I EFFORT WITH THE OBJECTIVE OF APPLYING THE TECHNIQUES TO IDENTIFY THE LOCATION AND TRACK THE GROWTH OF CRACKS IN COMPOSITE MATERIALS TYPICAL OF THOSE USED IN AIRCRAFT STRUCTURES. FOR EXAMPLE, RANDOM EXCITATIONS FROM ACOUSTIC LOADS CAN LEAD TO CRACK INITIATION AND RESULTANT SONIC FATIGUE FAILURES. IT IS PROPOSED TO APPLY THE SYSTEM IDENTIFICATION TECHNIQUE TO THE FATIGUE TESTING OF SIMPLE CANTILEVER BEAM SPECIMENS AND CORRELATE THE DAMAGE WITH CHANGES IN THE SYSTEM PARAMETERS AS A FUNCTION OF RANDOM VIBRATION-TIME AND NUMBER OF CYCLES. CORRELATION OF DAMAGE RESULTING FROM PARTICLE IMPACTS WILL ALSO BE INVESTIGATED.

AIRTECH PRECISION SHOT PEENING, INC.
36656 COMMERCE RD.
LIVONIA, MI 48150
ROGER S. SIMPSON

AF

TITLE:

DEVELOPMENT OF A MATHEMATICAL MODEL FOR PREDICTING THE PERCENTAGE FATIGUE LIFE INCREASE RESULTING FROM SHOT PEENED COMPONENTS
TOPIC: 10a OFFICE: AFWAL/XRPF

CURRENT MILITARY AND INDUSTRY SHOT PEENING SPECIFICATIONS ARE EXAMINED IN THE LIGHT OF PHASE I RESEARCH AND OTHER AVAILABLE LITERATURE AND ARE FOUND IN MANY AREAS TO BE VAGUE AND/OR INACCURATE. A TEST PROGRAM FOR DETERMINING THE EFFECT OF WORKPIECE CHEMICAL AND PHYSICAL VARIABLES, SHOT PEENING EQUIPMENT AND PROCESS VARIABLES, AND WORKLOAD ENVIRONMENT VARIABLES, ON THE LIFE OF WORKPIECES OF NINETEEN DIFFERENT MATERIALS IS OUTLINED. TO BE QUANTIFIED ARE THE QUALITATIVE METALLURGICAL EFFECTS CAUSAL TO LIFE IMPROVEMENTS FROM SHOT PEENING, HOW EACH VARIABLE STUDIED AFFECTS THESE METALLURGICAL EFFECTS, AND WHAT THE INTERRELATIONSHIP OF THESE VARIABLES IS IN AFFECTING WORKPIECE LIFE. THE PRIMARY GOAL OF THE PROJECT IS TO UTILIZE THIS DATA IN FORMULATING A MULTIPLE REGRESSION OF HIGH

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STATISTICAL SIGNIFICANCE IN PREDICING THE PERCENTAGE OF LIFE BENEFITS WHICH ARE GENERATED BY PEENING, AND SUBSEQUENTLY WRITE COMPUTER SOFTWARE BASED ON THIS MATHEMATICAL FORMULA FOR USE BY PRODUCT DESIGN ENGINEERS IN USING PEENING AS A DESIGNED IN STRENGTH. THIS WOULD RESULT IN LIGHTER, STRONGER, MORE COST EFFECTIVE COMPONENTS AND PRODUCTS.

AMERCOM, INC.
8948 FULLBRIGHT AVENUE
CHATSWORTH, CA 91311
CURTIS V. BURKLAND
TITLE:
A HIGH TEMPERATURE CERAMIC COMPOSITE
TOPIC: 11d OFFICE: AFWAL/XRPM

AF

IN THE PHASE I SBIR PROGRAM, THE FEASIBILITY OF FABRICATING FIBER REINFORCED CERAMIC MATRIX COMPOSITES VIA CHEMICAL VAPOR INFILTRATION (CVI) WAS INVESTIGATED. THE GOAL WAS TO IDENTIFY PROCESSING TECHNIQUES CAPABLE OF YIELDING COMPOSITE MICROSTRUCTURES THAT COULD PROVIDE THE DESIRED PROPERTIES (ESPECIALLY TOUGHNESS) SUITABLE FOR ROTATING AND/OR STATIC TURBINE ENGINE COMPONENTS AT TEMPERATURES ABOVE 1100 DEGREES C. THE PHASE I PROGRAM DEMONSTRATED THAT IT IS TECHNICALLY FEASIBLE TO PRODUCE A HIGH TEMPERATURE, NON-BRITTLE CERAMIC COMPOSITE WITH GOOD STRENGTH BY CHEMICAL VAPOR DEPOSITING SILICON CARBIDE INTO CONTINUOUS CERAMIC COMPOSITE WITH GOOD STRENGTH BY CHEMICAL VAPOR DEPOSITING SILICON CARBIDE INTO CONTINUOUS CERAMIC FIBER PREFORMS. THE OBJECTIVE OF THE PHASE II PROGRAM WILL BE TO DEVELOP A CVI PROCESSED SILICON CARBIDE MATRIX COMPOSITE MATERIAL THAT CAN DEMONSTRATE THE MICROSTRUCTURAL STABILITY, OXIDATION RESISTANCE AND THERMAL SHOCK RESISTANCE SUFFICIENT TO MAINTAIN STRENGTH AND TOUGHNESS PROPERTIES TO 1350 DEGREES C. THE PROGRAM WILL INCLUDE FIBER/MATRIX INTERFACE STUDIES, CERAMIC FIBER PREFORM EVALUATION, CHEMICAL VAPOR INFILTRATION PROCESS DEVELOPMENT AND PHYSICAL PROPERTY CHARACTERIZATION OF THE MATERIAL.

AMERICAN RESEARCH CORPORATION OF VA.
642 FIRST STREET, P.O. BOX 3406
RADFORD, VA 24143
DR. R. J. CHURCHILL

NAVY

TITLE:
ELECTROMAGNETIC DETECTION OF STRESS AND CRACK PROPAGATION IN CRITICAL AIRCRAFT COMPONENTS
TOPIC: 99 OFFICE: NAVAIR

ELECTROMAGNETIC NDT METHODS ARE WIDELY USED IN INDUSTRY FOR DETECTION

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OF DEFECTS IN METALS. THE PURPOSE OF THE WORK CONDUCTED UNDER THE PHASE I SBIR PROGRAM WAS THE DETERMINATION OF ELECTROMAGNETIC NDT PROBE SENSITIVITY TO THE PRESENCE OF STRESS, FATIGUE DAMAGE PRIOR TO CRACKING AND CRACK GROWTH IN MATERIALS USED IN CRITICAL AIRCRAFT COMPONENTS. WORK CONDUCTED TOWARD THIS OBJECTIVE INVOLVED OBSERVING SINGLE-FREQUENCY EDDY CURRENT, MAGNETIC RELUCTANCE AND CURRENT PERTURBATION PROBES IN MONITORING TENSILE AND FATIGUE TESTS ON ALUMINUM, STEEL AND COMPOSITE SAMPLES. RESULTS OF THESE TESTS SHOWED THAT STRESS, FATIGUE DAMAGE PRIOR TO CRACKING AND CRACK GROWTH ALL AFFECT THE PERMEABILITY AND ELECTRICAL CONDUCTIVITY OF THE MATERIALS. SINCE ELECTROMAGNETIC NDT METHODS ARE SENSITIVE TO CHANGES IN PERMEABILITY AND/OR ELECTRICAL CONDUCTIVITY, THEY CAN SERVE AS DETECTORS OF SUBTLE MATERIAL PROPERTY CHANGES ACCOMPANYING CYCLICAL FATIGUE PHENOMENA IN CRITICAL AIRCRAFT PARTS. IN PARTICULAR, EDDY CURRENT PROBES ARE SENSITIVE BOTH TO PERMEABILITY AND CONDUCTIVITY SO ARE NOT LIMITED ONLY TO THE TESTING OF FERROMAGNETIC MATERIALS. EDDY CURRENT PROBE TYPES AND GEOMETRIES HAVE BEEN SELECTED FOR EXTENSIVE TESTING IN THE PHASE II PROGRAM WHICH CALLS FOR THE EXTENSION OF EDDY CURRENT/MATERIAL INTERACTION THEORY AND APPLICATION, DEVELOPMENT OF NOVEL AUTOMATED PROBE SCANNING TECHNIQUES, APPLICATION AND EXTENSION OF FINITE ELEMENT MODELING TECHNIQUES AND THE ACQUISITION OF FAMILIES OF DATA ON FATIGUE DAMAGE OF STANDARD TEST SPECIMENS AND AIRCRAFT COMPONENTS. THE PHASE II PROGRAM WILL INCLUDE THE DESIGN AND OPTIMIZATION OF AN INTELLIGENT EDDY CURRENT TEST SYSTEM WHICH WILL FORM THE BASIS OF THE ENGINEERING MODEL TO BE DEVELOPED IN PHASE III OF THE PROGRAM. ANTICIPATED BENEFITS INCLUDE THE AVAILABILITY OF RELIABLE TEST EQUIPMENT FOR USE IN MILITARY NDE PROGRAMS. POTENTIAL COMMERCIAL APPLICATIONS ARE EXPECTED IN THE AREA OF AIRCRAFT QUALITY ASSURANCE.

AMHERST SYSTEMS, INC
1 AMERICAN DRIVE
BUFFALO, NY 14225
CHARLES E. DOWDELL

NAVY

TITLE:
ECM EFFECTIVENESS ASSESSMENT CONCEPT STUDY
TOPIC: 92(1) OFFICE: SPAWAR

THE PHASE I STUDY SHOWED THAT ESM DATA PROCESSING ALGORITHMS COULD SENSE THE EFFECTIVENESS OF ECM AGAINST MISSILES TARGETED AT THE SHIP. THE OBJECTIVES OF THE PHASE 2 EFFORTS ARE TO REFINE THE ASSESSMENT

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ALGORITHMS AND TEST THEM, USING MISSILE DATA AVAILABLE FROM THE NAVAL RESEARCH LABORATORY. AN ALGORITHM TEST PLAN WILL BE DEVELOPED IN COORDINATION WITH NRL PERSONNEL TO EVALUATE THE VALIDITY AND CAPABILITY OF THE ASSESSMENT ALGORITHMS. GRAPHICAL REPRESENTATION OF THE ENGAGEMENT PROCESSES WILL BE DEVELOPED. APPLICATIONS TO NAVY EW SYSTEM PROCESSES WILL BE INVESTIGATED.

AMTEC ENGINEERING INC
10001 NE 4TH ST - STE 105
BELLEVUE, WA 98004
DONALD W. ROBERTS

NAVY

TITLE:

THE DEVELOPMENT OF A 3D VISCOUS FLOW ANALYSIS FOR THE
EVALUATION OF HYPERSONIC INLETS

TOPIC: 33 OFFICE: NAVSEA

THE NEED EXISTS FOR AN EFFICIENT 3D HYPERSONIC INLET FLOW ANALYSIS CODE THAT WILL MODEL BOTH EXTERNAL AND INTERNAL FLOW FIELDS INCLUDING VISCOUS EFFECTS. THE OBJECTIVE OF THE PROPOSED EFFORT IS TO DEVELOP A PRACTICAL CODE BASED UPON THE CAPABILITIES DEVELOPED UNDER PHASE I. THE ANALYSIS SOLVES THE PARABOLIZED NAVIER-STOKES EQUATIONS. IN REGIONS WITH STRONG STREAMWISE ELLIPTIC PRESSURE EFFECTS A 3D PRESSURE RELATION IS COUPLED INTO THE ALGORITHM. THE APPROACH IS TO EXTEND AND ENHANCE THE PHASE I PROTOTYPE CODE. A BLUNT BODY CODE WILL BE ADDED TO PROVIDE STARTING SOLUTIONS FOR THE EXTERNAL FLOW FIELD TURBULENCE AND REAL GAS MODELS WILL BE INCORPORATED TO IMPROVE THE PHYSICS OF THE CODE. IMPROVED COMPUTATIONAL MESH GENERATION PROCEDURES WILL BE DEVELOPED. ROUTINES WILL BE INCLUDED TO AUTOMATICALLY IDENTIFY AND ISOLATE THE ELLIPTIC REGIONS SUCH THAT USER INTERVENTION IS MINIMIZED. THE ANALYSIS WILL ALSO BE EXTENDED TO MODEL REGIONS WITH FLOW SEPARATION BUBBLES. TO IMPROVE THE EFFICIENCY AND ACCURACY OF THE CODE A NEW FORMULATION FOR THE 3D PRESSURE RELATION WILL BE DEVELOPED AND SOLVED USING A MULTIGRID METHOD. A FLUX SPLIT DIFFERENCING SCHEME WILL BE INVESTIGATED FOR ENHANCING THE SHOCK CAPTURING CAPABILITIES. INLET TEST CASES WITH ADEQUATE EXPERIMENTAL DATA WILL BE USED TO VALIDATE AND DEMONSTRATE THE CODE.

ANALYTIC SCIENCES CORP
ONE JACOB WAY
READING, MA 01867
JOHN C SEAQUIST

NAVY

TITLE:

TACTICAL WEAPONS EFFECTIVENESS STUDY OF AN ANTI-SHIP MISSILE
SYSTEMS USING AUTOMATIC TARGET RECOGNITION

TOPIC: 131 OFFICE: JCMPO

THE ANALYTIC SCIENCES CORPORATION (TASC) PROPOSES HERE TO EXPAND THE

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METHODOLOGY DEMONSTRATED UNDER PHASE I OF A SMALL BUSINESS INNOVATIVE RESEARCH INITIATIVE, ENTITLED TACTICAL WEAPONS EFFECTIVENESS STUDY OF ANTI-SHIP MISSILE SYSTEMS USING AUTOMATIC TARGET RECOGNITION, CONTRACT NO. N00032-83-C-3361. THIS METHODOLOGY PROVIDES A SIMULATION BASIS FOR EVALUATION OF AUTOMATIC TARGET RECOGNITION CAPABILITIES FOR ANTI-SHIP CRUISE MISSILES IN REPRESENTATIVE ENGAGEMENT SCENARIOS. THE PRINCIPAL OBJECTIVE OF THE PROPOSED EFFORT IS TO DEVELOP A FLEXIBLE SIMULATION TOOL THAT CAN SERVE AS THE BASIS FOR EVALUATING CANDIDATE TARGET RECOGNITION CAPABILITIES, CONDUCTING DESIGN TRADEOFFS, AND DEFINING MISSION REQUIREMENTS FOR THE ANTI-SHIP CRUISE MISSILE. THE PHASE I EFFORT WAS TO DEVELOP A METHODOLOGY AND DEMONSTRATE THE FEASIBILITY OF CONDUCTING TACTICAL WEAPONS EFFECTIVENESS STUDIES USING THE METHODOLOGY. IN PHASE II, THE METHODOLOGY WILL BE EXPANDED TO PROVIDE THE NECESSARY DETAIL IN THE AREAS OF TARGET POSITION LOCATION ESTIMATION, ALTERNATIVE MISSILE NAVIGATION SYSTEMS, THE DEVELOPMENT OF REALISTIC SCENARIOS, MORE EXTENSIVE ON-BOARD DECISION LOGIC, AND TREATMENT OF CRUISE MISSILE SURVIVABILITY. ALSO IN PHASE II, A TARGET DETECTION AND CLASSIFICATION PERFORMANCE DATA BASE WILL BE ESTABLISHED FOR CANDIDATE TARGET RECOGNITION SENSOR TECHNOLOGIES. IT WILL INCLUDE WEATHER AND COUNTERMEASURES EFFECTS. THE RESULTING SIMULATION MODEL WILL BE USED TO QUANTIFY THE OPERATIONAL EFFECTIVENESS BENEFITS OF TARGET RECOGNITION TECHNOLOGY AND TO PROVIDE A RELATIVE ASSESSMENT OF ALTERNATIVE APPROACHES IN REALISTIC OPERATIONAL SCENARIOS.

ANALYTICS INCORPORATED
2500 MARYLAND ROAD
WILLOW GROVE, PA 19090
THOMAS MCCANN

AF

TITLE:

USER FRIENDLY SOFTWARE SYSTEM FOR APPLICATION OF UNDERLYING LEARNING CURVE ANALYSIS

TOPIC: 19b OFFICE: ASD/YZD

THE UNDERLYING LEARNING CURVE (ULC) ANALYSIS TECHNIQUE CAN OFFER SUBSTANTIAL BENEFIT TO PERSONNEL INVOLVED WITH EVALUATION OF THE EFFECTIVENESS OF MANUFACTURING OPERATIONS. USE OF THE TECHNIQUE IS IMPEDED BY THE AMOUNT OF COMPUTATION REQUIRED AND BY THE LEVEL OF UNDERSTANDING OF THE CONCEPT BY USERS. THIS PROJECT WILL COMPLETE THE DEVELOPMENT OF A USER FRIENDLY SOFTWARE SYSTEM TO ACCOMPLISH THESE EVALUATIONS AT CONTRACT ADMINISTRATION ORGANIZATIONS (CAO). THE

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SYSTEM WILL BE MENU DRIVEN AND LEAD THE USER THROUGH THE NECESSARY INPUT DATA GENERATION AND COMPUTATION. THE SYSTEM WILL BE IMPLEMENTED IN A FASHION THAT IS TRANSPORTABLE TO THE TYPES OF EQUIPMENT WHICH IS AVAILABLE IN THE DOD CAOS. THIS PROPOSAL EFFORT WILL BUILD UPON AND EXTEND THE SUCCESS OF THE TWO PHASE I AWARDEES TO DEVELOP A POWERFUL, COST EFFECTIVE ANALYSIS TOOL.

ANCO ENGINEERS, INC
9937 JEFFERSON BOULEVARD
CULVER CITY, CA 90230
PAUL IBANEZ

ARMY

TITLE:
AN INEXPENSIVE PEAK ACCELERATION INDICATOR FOR AIR CRASH
MONITORING
TOPIC: 9c OFFICE: AVSCOM

EACH YEAR A NUMBER OF AIRCRAFT CRASH. THE GOAL OF THIS PROJECT IS TO DEVELOP AN INEXPENSIVE PASSIVE AND SMALL INDICATOR THAT COULD BE PLACED IN ALL AIRCRAFT AND, IN THE EVENT OF A CRASH, THAT WOULD INDICATE THE PEAK ACCELERATION EXPERIENCED AT VARIOUS POINTS IN THE STRUCTURE. THIS DATA WOULD BE HELPFUL IN ASSESSING PERFORMANCE OF CRASH-WORTHY VEHICLES AND DEVICES AND WOULD CONTRIBUTE TO EFFORTS TO REDUCE LOSS OF LIFE, INJURY, AND EQUIPMENT DAMAGE. PHASE I RESEARCH HAS LED TO THE PRELIMINARY DESIGN OF SUCH A DEVICE AND HAS EXPERIMENTALLY DEMONSTRATED ITS PERFORMANCE. THE DEVICE, WHICH IS BASED ON THE MOVEMENT OF SMALL WEIGHTS THROUGH A WEAK MATERIAL, IS CAPABLE OF INDICATING SIX LEVELS OF ACCELERATION (IN THREE ORTHOGONAL DIRECTIONS) IN THE 10 - 100 G RANGE AND FITS INSIDE A 2-1/2 IN. CUBE. THE DEVICE IS ISOLATED SO AS TO BE UNAFFECTED BY HIGH-FREQUENCY SHOCKS (ABOVE 100 HZ) THAT HAVE LIMITED DAMAGE POTENTIAL. PHASE II SHALL PERFORM STUDIES AND SIMULATIONS, AND CREATE A FINAL DESIGN SUITABLE FOR MANUFACTURING.

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AF

TITLE:
NOVEL APPROACHES TO FASIL POLYMERS
TOPIC: 11c OFFICE: AFWAL/XRPM

FLUOROALKYLARYLENESILOXANE (FASIL) POLYMERS POSSESS EXCELLENT THERMAL

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STABILITY, LOW TEMPERATURE ELASTICITY, AND HYDROCARBON RESISTANCE. POLYMERS BASED ON FASIL HAVE EXTENSIVE PROMISE FOR MILITARY AND COMMERCIAL AEROSPACE APPLICATIONS, IF THE DESIGNED PROPERTIES OF THE ELASTOMERS COULD BE ACHIEVED. IN PHASE I STUDIES, METHODS WERE DEVELOPED FOR THE SYNTHESIS OF HIGH MOLECULAR WEIGHT FASIL POLYMERS. IN THIS PROGRAM, THE PHYSICAL PROPERTIES OF THESE POLYMERS WILL BE IMPROVED BY PROVIDING CROSSLINKING SITES AND COPOLYMERIZATION OF FASIL-DIOL WITH OTHER MONOMERS. ALSO, NEW FORMULATIONS AND CURING TECHNIQUES WILL BE DEVELOPED TO OPTIMIZE THE COMPOSITIONS FOR EXTRUSION STUDIES. THE ELASTOMERS DEVELOPED IN THIS PROGRAM WILL BE CHARACTERIZED FOR THEIR PHYSICAL PROPERTIES AND EVALUATED FOR THEIR VIABILITY FOR COMMERCIAL APPLICATIONS.

ARTEC ASSOCIATES INC
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JOHN D. WATSON

AF

TITLE:
FIFTY GIGAWATT PLASMA MHD POWER SUPPLY
TOPIC: 8c OFFICE: AFWAL

A NEED EXISTS FOR A TRANSPORTABLE REPETITIVE PULSED POWER SUPPLY TO PROVIDE .5MJ PULSES AT 50GW POWER LEVELS. OF SEVERAL POSSIBLE APPROACHES PULSED PLASMA MHD (PPMHD) IS A LEADING CANDIDATE FOR A COMPACT HIGH PERFORMANCE PRIME POWER SOURCE. DESIGNED TO OPERATE LIKE A RAPID-FIRE GUN, REPETITIVELY PULSED OPERATION AND SHORT HIGH POWER PULSES ARE MAJOR ATTRIBUTES. PPMHD IS BASED ON THE EFFICIENT CONVERSION OF THE ENERGY OF EXPLOSIVES TO AN ENERGETIC PLASMA AND THEN TO PULSED ELECTRICAL ENERGY IN A FARADAY MODE MHD GENERATOR. IN PROGRAMS TO DATE 10GW 0.5MJ PULSES HAVE BEEN ACHIEVED. INDUCTIVE STORAGE SYSTEMS HAVE THE POTENTIAL FOR A SUBSTANTIAL INCREASE IN ENERGY DENSITY OVER CAPACITIVE SYSTEMS. THE TWO MAJOR PROBLEMS IN INDUCTIVE STORAGE SYSTEMS ARE THE CHARGING CIRCUIT AND THE OPENING SWITCH DESIGN. THE PHASE II SBIR PROGRAM PROVIDE THE OPPORTUNITY TO BUILD AND DEMONSTRATE A REUSEABLE PPMHD GENERATOR TEST BED FACILITY CAPABLE OF RAPIDLY CHARGING AN INDUCTIVE STORAGE SYSTEM. THE TEST BED WILL EMPHASIZE HIGH QUALITY DIAGNOSTICS AND BE UPGRADEABLE BY THE ADDITION OF IMPROVED COMPONENTS.

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SPRINGFIELD, VA 22151
JOSEPH R. JAHODA

ARMY

TITLE:
BROADBAND TRANSMITTING ANTENNA
TOPIC: 1d OFFICE: CECOM/SWL

UNDER THE PHASE I BROADBAND HF TRANSMITTING PROGRAM ASTRON DEVELOPED A SERIES OF INNOVATIVE FORESHORTENED ANTENNA ELEMENTS. SEVERAL EFFICIENCY ENHANCING TECHNIQUES WERE ALSO DEVELOPED. THESE INCLUDED DIELECTRIC LOADING, NON-LINEAR WINDINGS AND RF CURRENT REDISTRIBUTION METHODS. IT IS PROPOSED UNDER THE PHASE II PROGRAM TO APPLY THESE ADVANCED TO THE FOLLOWING PRACTICAL BROADBAND TRANSMITTING ANTENNAS: MINIATURIZED ROTATABLE LOG-PERIODIC, FIELD DEPLOYABLE GROUND INSENSITIVE, 8 FOOT WHIP AND LOOP ANTENNAS. THESE ANTENNAS WOULD NOT REQUIRE THE USUAL RF HIGH POWER COUPLERS TO OPERATE OVER THE FULL HF BAND. THUS, THE ANTENNAS, BESIDES BEING MINIATURIZED, COULD OPERATE WITH FREQUENCY HOP AND WIDE BAND AGILE JAMMERS. THIS WILL RESULT IN GREATLY INCREASED FREQUENCY CHANGE CAPABILITY (SPEEDS NOT POSSIBLE WITH PRESENTLY AVAILABLE COUPLERS) AND GREATLY INCREASED RELIABILITY AND DECREASED COST.

ATEK CORPORATION
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BOULDER, CO 80301
DR. GEOFFREY E. HILL

ARMY

TITLE:
AN EXPENDABLE DEVICE FOR MEASURING SUPERCOOLED LIQUID WATER
IN CLOUDS
TOPIC: 7ff OFFICE: COL/CRREL

IN THE PROPOSED RESEARCH AN EXPENDABLE BALLOON-CARRIED DEVICE FOR MEASURING SUPERCOOLED LIQUID WATER IN CLOUDS WILL UNDERGO FINAL LABORATORY AND FIELD TESTING SO THAT THE DEVICE WILL BE READY FOR OPERATIONAL USE. PREVIOUS TESTS HAVE SHOWN THAT THE EXPENDABLE INSTRUMENT IS INDEED A FEASIBLE WAY TO OBTAIN LOW COST MEASUREMENT OF SUPERCOOLED LIQUID WATER IN CLOUDS. THE PROPOSED LABORATORY TESTS WILL BE DIRECTED AT CONFIRMING PREVIOUS WORK AND DELINEATING CONDITIONS WHEN THE SYSTEM MAY YIELD DIFFERENT RESULTS FROM INDEPENDENT LABORATORY

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MEASUREMENTS. IN THE FIELD PHASE, COMPARISONS BETWEEN MEASUREMENTS MADE WITH THE EXPENDABLE DEVICE AND WITH A PASSIVE MICROWAVE RADIO-METER WILL BE MADE DURING EPISODES OF SUPERCOOLED CLOUDS. SUCH FIELD TESTS WILL PROVIDE THE BASIS FOR ASSESSMENT AS TO THE OBTAINABILITY OF QUANTITATIVE INFORMATION FROM THE DEVICE. OTHER ASPECTS OF THE RESEARCH INCLUDE A PRODUCTION PHASE WHEREIN A HUNDRED EXPENDABLE UNITS WILL BE PRODUCED FOR CRREL'S USE. A GROUND BASED RECEIVER WILL ALSO BE MODIFIED TO BE COMPATIBLE WITH THE TRANSMITTED DATA FROM THE EXPENDABLE DEVICES. DATA RECEIVED WILL BE PROCESSED AUTOMATICALLY TO YIELD CONCENTRATIONS OF SUPERCOOLED LIQUID WATER VERSUS ALTITUDE.

ATOM SCIENCES, INC.
POB 138, 114 RIDGEWAY CENTER
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DR. JAMES E. PARKS

AF

TITLE:
DEPTH PROFILING IN AlGaAs AND LiNbO3 USING SPUTTER INITIATED
RESONANCE IONIZATION SPECTROSCOPY
TOPIC: 12a OFFICE: AFWAL/XRPA

A NEW ANALYTICAL TECHNIQUE CALLED SPUTTER INITIATED RESONANCE IONIZATION SPECTROSCOPY (SIRIS) IS BEING DEVELOPED FOR COMMERCIAL USE BY ATOM SCIENCE, INC. THE FEASIBILITY OF INCORPORATING DEPTH PROFILING INTO THIS TECHNIQUE HAS BEEN DETERMINED AND WE NOW PROPOSE A SET OF DEMONSTRATION MEASUREMENTS TO ESTABLISH THIS NEW CAPABILITY AS A RELIABLE, SENSITIVE DEPTH PROFILING TECHNIQUE. SAMPLES WITH SILICON IMPLANTED IN GALLIUM ARSENIDE AND WITH TITANIUM DIFFUSED INTO LITHIUM NIOBATE ARE PROPOSED FOR DEMONSTRATION MEASUREMENTS. THESE MATERIALS ARE REPRESENTATIVE OF ALL MATERIALS AND ARE OF INTEREST TO THE AIR FORCE VHSIC AND ELECTRO-OPTIC DEVELOPMENT PROGRAMS. IN SIRIS, AN ARGON ION BEAM SPUTTERS A SMALL QUANTITY OF SOLID SAMPLE INTO THE GAS PHASE. A LASER THEN SELECTIVELY AND EFFICIENTLY IONIZES ATOMS OF A PARTICULAR ELEMENT, USING RESONANCE IONIZATION SPECTROSCOPY. RESULTING IONS ARE ANALYZED IN A MAGNETIC MASS SPECTROMETER, THUS ADDING ISOTOPIC SELECTIVITY. THE RESOLUTION OF THE DEPTH PROFILING TECHNIQUE WILL BE OPTIMIZED BY MAKING HARDWARE CHANGES AND BY VARYING SUCH PARAMETERS AS THE ION BEAM ENERGY, MASS, AND INTENSITY. THE TITANIUM IN LITHIUM NIOBATE RESULTS WILL BE USED IN THE CHARACTERIZATION OF OPTICAL WAVEGUIDES FABRICATED FROM THE SAME MATERIAL.

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BAND, LAVIS & ASSOCIATES, INC.
670 RITCHIE HIGHWAY
SEVERNA PARK, MD 21146
EDWARD G.U. BAND

NAVY

TITLE:
EXTREME SEAWAY LOADS CHARACTERIZATION FOR SHIP STRUCTURE
TOPIC: 49 OFFICE: NAVSEA

DURING PHASE I OF THIS EFFORT, IT WAS DEMONSTRATED THAT THE HALF-CYCLE MATRIX (HACYM) METHOD PROVIDED A GRAPHIC MEANS OF DISPLAYING RANDOM DATA. THE DISPLAY ALLOWS THE NATURE OF THE DATA TO BE READILY CHARACTERIZED. FOR EXAMPLE, IN THE CASE OF SHIP LOADS AND MOTIONS, THE METHOD ALLOWS WAVE-INDUCED DATA TO BE CHARACTERIZED AS LINEAR OR NONLINEAR, NARROW-BAND OR BROAD-BAND. EPISODIC, UNEXPECTEDLY LARGE, EXTREME VALUES CAN BE READILY IDENTIFIED. IT WAS CONCLUDED THAT A REAL-TIME, ON-BOARD DISPLAY COULD BE OF VALUE TO THE SHIP'S OFFICERS AS AN AID TO MAKING DECISIONS WITH REGARD TO SHIP SPEED AND HEADING TO ALLEVIATE LOADS AND MOTIONS; TIMING OF SPECIAL OPERATIONS SUCH AS HELICOPTER LANDING OR WEAPON FIRING; ADJUSTMENT OF STABILIZING DEVICES SUCH AS FINS OR RIDE-CONTROL SYSTEMS. THE OBJECTIVE OF PHASE II IS TO DEVELOP A WORKING "BREAD-BOARD" HACYM DISPLAY SYSTEM AND TO DEMONSTRATE ITS USE ON-BOARD A NAVY SHIP. THE SYSTEM WILL INCLUDE A PRINTER SO THAT THE SITUATION PERTAINING DURING PARTICULAR EVENTS CAN BE RECORDED FOR FUTURE REFERENCE.

BEND RESEARCH, INC.
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WALTER C. BABCOCK

ARMY

TITLE:
CHLORINE-RESISTANT HOLLOW-FIBER REVERSE-OSMOSIS MEMBRANE ELEMENTS
TOPIC: 7e OFFICE: BRDC

THE PHASE I EFFORT WAS SUCCESSFUL IN ITS INTENDED OBJECTIVE OF DEVELOPING TWO CHLORINE-RESISTANT REVERSE OSMOSIS MEMBRANES. THESE BEND MEMBRANES ARE PROPRIETARY AND THIS FIRM HAS THE EXCLUSIVE SOURCE OF EXPERTISE IN FABRICATING AND LINING HOLLOW POLYETHERSULFONE FIBERS. THE PHASE II EFFORT WILL ATTEMPT TO ACCOMPLISH THE FOLLOWING OBJECTIVES: (1) FURTHER REFINE THESE MEMBRANES, IMPROVE THEIR

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WATER FLUX, SALT REJECTION AND CHLORINE-RESISTANCE. (2) OPTIMIZE THE BEND INSIDE-COATED HOLLOW FIBERS BY PERFECTING THE TECHNIQUE OF INCORPORATING THE COMPOSITE CHLORINE-RESISTANT INTERFACIAL MEMBRANE AS A LINER IN THE FIBERS. (3) OPERATE THE RESULTING COMPOSITE HOLLOW FIBER ELEMENTS ON VARIOUS CHLORINATED AND UNCHLORINATED FEED STREAMS FOR LONG PERIODS OF TIME. (4) DEVELOP AND TEST PROTOTYPE LARGE SCALE COMPOSITE HOLLOW FIBER ELEMENTS.

CAPE COD RESEARCH, INC.

DARPA

P.O. BOX 600

BUZZARDS BAY, MA 02532

DR. MYLES WALSH

TITLE:

SEA WATER ROPE BATTERIES

TOPIC: 1a OFFICE: DARPA

CAPE COD RESEARCH WILL DESIGN, FABRICATE AND TEST A SERIES OF ROPE SEA WATER BATTERIES. TWO DESIGN TYPES WILL BE COMPARED: A ROPE WITH INTERNAL BUNDLE OF CORRODING WIRES AND AN OUTER LAYER OF SUPPORTING WIRES WHICH EVOLVE HYDROGEN; AND "FUSE" WIRE ROPE BATTERY WHERE THE MAGNESIUM IS SLOWLY EXPOSED USING A CORROSIVE FUSE MECHANISM. A SERIES OF SINGLE AND MULTIPLE STRAND 3 AND 10 METER BATTERIES WILL BE FABRICATED AND TESTED BY CAPE COD RESEARCH AND NOSC. IN ADDITION, EXPERIMENTAL WORK IN IDENTIFYING CATHODE MATERIAL WHICH ACTS AS A HYDROGEN EVOLUTION CATALYST WHILE PROVIDING STRENGTH WILL BE CARRIED OUT.

CERAMATEC, INC.

AF

163 WEST 1700 SOUTH

SALT LAKE CITY, UT 84115

JAMES R. RASMUSSEN

TITLE:

HIGH ENERGY HIGH POWER DENSITY SODIUM/MIXED CHALCOGENIDE BATTERIES FOR SPACE POWER APPLICATIONS.

TOPIC: 13a OFFICE: AFWAL/XRP-PO

A TWO YEAR PROGRAM IS PROPOSED TO GATHER DATA FOR THE DESIGN AND OPERATION OF SEVERAL EXPERIMENTAL SODIUM/SULFUR-SELENIUM STORAGE CELLS. PROPOSED WORK INCLUDES (1) STUDIES OF THE VISCOSITY OF THE

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CATHOLYTE; (2) CONDUCTANCE AND SPECIFIC VOLUME OF THE CATHOLYTE; (3) DEVELOPMENT OF CORROSION RESISTANT CONTAINERS; (4) FABRICATION OF HIGH QUALITY ELECTROLYTES; (5) DELIVERY OF HIGH PURITY SODIUM; (6) EVALUATION OF NEW HIGH TEMPERATURE SEAL GLASSES; (7) STUDIES OF THE WETTING CHARACTERISTICS OF THE CATHOLYTE ON HIGH PURITY GRAPHITE FELTS; AND (8) TWENTY FULL CELL TESTS. IT IS EXPECTED THAT THE SUCCESSFUL COMPLETION OF THE WORK WILL RESULT IN A COMPLETE SPECIFICATION FOR THE DESIGN AND OPERATION OF AN OPTIMIZED SODIUM/SULFUR-SELENIUM STORAGE CELL FOR HIGH ENERGY DENSITY STORAGE OF ELECTRICAL ENERGY IN ORBITAL FLIGHT VEHICLES.

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SAN MATEO, CA 94402
DAVID REED/JOHN C. HUNEKE

DARPA

TITLE:
EVALUATION AND DEVELOPMENT OF MODULATED REFLECTANCE INSTRUMENTATION
FOR THE RAPID MICROSCOPIC CHARACTERIZATION OF COMPOUND SEMICONDUCTOR
TOPIC: 7 OFFICE: DARPA

A TWO YEAR RESEARCH PROGRAM IS PROPOSED TO DEVELOP AND EVALUATE AN INSTRUMENT FOR THE RAPID, IN-DEPTH ELECTROREFLECTANCE CHARACTERIZATION OF COMPOUND SEMICONDUCTOR MATERIALS. THE PHASE I RESEARCH ACTIVITY HAS DEMONSTRATED THAT THE DEPTH PROFILING CAPABILITIES OF ION BEAM SPUTTERING CAN BE COMBINED WITH MODULATED REFLECTANCE SPECTROMETRY (MRS)/ELECTROREFLECTANCE TO PROVIDE ACCURATE, IN-DEPTH STOICHIOMETRIC ANALYSIS. THE PROPOSED INSTRUMENT WILL CONSIST OF A WELL CONTROLLED BOMBARDING ION BEAM, LIGHT OPTICS FOR THE MODULATED REFLECTANCE MEASUREMENTS, AND A VACUUM CHAMBER FOR PERFORMING THE MEASUREMENTS. THE EVALUATION EFFORTS WILL COMPARE THE RESULTS OBTAINED ON THIS PROTOTYPE SYSTEM WITH STANDARD MRS RESULTS IN ORDER TO INSURE RELIABLE BOMBARDMENT DAMAGE UNDER THE OPERATING CONDITIONS IMPOSED BY THE GEOMETRY OF A COMBINED SPUTTERING/MRS SYSTEM. CENTRAL TO THIS EVALUATION EFFORT WILL BE ESTABLISHING THAT MODULATED ELECTRON BOMBARDMENT OF THE SURFACE IN A HIGH VACUUM ENVIRONMENT WILL PROVIDE THE THIRD DERIVATIVE SPECTRUM SIMILAR TO THOSE PRODUCED BY THE SOLUTION PHASE IN ELECTROLYTE ELECTROREFLECTANCE (EER). THE FINAL PROTOTYPE SYSTEM WILL HAVE UNIQUE APPLICATIONS TO III-V AND II-VI SEMICONDUCTOR MATERIALS CHARACTERIZATIONS. THESE APPLICATIONS WHICH ARE DISCUSSED IN MORE DETAIL BELOW.

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COMBUSTION ELECTROMAGNETICS INCORPORATED

ARMY

32 PRENTISS ROAD

ARLINGTON, MA 02174

DR. MICHAEL A. V. WARD

TITLE:

MORE EFFICIENT UTILIZATION OF FUEL IN LIGHT TRUCKS AND OFF-ROAD VEHICLES

TOPIC: 7m OFFICE: CDR, TACOM

CURRENT DIESEL ENGINES SUFFER FROM EXCESSIVE WEIGHT AND SIZE, AND ARE NOT OPTIMIZED WITH RESPECT TO FUEL EFFICIENCY AND MULTI-FUEL CAPABILITY. SIGNIFICANT IMPROVEMENTS IN EFFICIENCY CAN BE MADE THROUGH REDUCTION IN ENGINE AIR-PUMPING LOSS, HEAT TRANSFER LOSS AND FRICTIONAL LOSS THROUGH LOWER COMPRESSION RATIO (CR) OPEN CHAMBER QUIESCENT TYPE COMBUSTION. SUCH OPERATION ALSO LEADS TO SUBSTANTIAL WEIGHT AND SIZE REDUCTION. THIS CAN BE ACCOMPLISHED THROUGH DEVELOPMENT AND USE OF CEI'S PROPRIETARY PULSED PLASMA IGNITION/ELECTROMAGNETIC (EM) STIMULATION TECHNOLOGY (THE "AMPP" SYSTEM) FOR SPECIFIC APPLICATION TO THE DI ENGINE OPTIMIZED WITH RESPECT TO: CR (REDUCED), SWIRL AND SQUISH (LOW), AND SIMPLE OPEN COMBUSTION CHAMBER. THE MAIN EFFORT WILL GO INTO ENGINE PROTOTYPING OF THE PULSED IGNITION/EM SYSTEM ON A PROTOTYPE SINGLE CYLINDER ENGINE. ANTICIPATED RESULTS INCLUDE HIGH EFFICIENCY, LOW HEAT TRANSFER, MULTI-FUEL CAPABILITY AND LOW WEIGHT AND SMALL SIZE.

COMPUTATIONAL MECHANICS CONSULTANTS, INC

ARMY

3601A CHAPMAN HIGHWAY

KNOXVILLE, TN 37920

R.L. ANDREWS

TITLE:

AUTOMATED AMMUNITION LOADING OF COMBAT VEHICLE

TOPIC: 5d OFFICE: BRDC

PHASE II RELATES TO RESEARCH AND DEVELOPMENT OF A PROTOTYPE DEVICE WHICH IS CAPABLE OF DEMONSTRATING THE APPLICABILITY OF A SENSITIVE ROBOTIC END EFFECTOR SYSTEM IN THE FIELD REPACKAGING OF AMMUNITION. AN INTELLIGENT END EFFECTOR SYSTEM WILL BE DEVELOPED WHICH UTILIZES CLUSTER OF SENSORS (PADS) MOUNTED ON AN END EFFECTOR. THE CONCEPT EMPLOYS A HIERARCHIAL MODULAR STRUCTURE OF SENSOR PADS, EACH CONTAINING A MATRIX OF SENSITIVE CELLS. AT THE CELL LEVEL, PRESSURE,

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TEMPERATURE, PROXIMITY AND TOUCH CAN BE DETERMINED. IT IS ANTICIPATED THAT THE AMMUNITION SENSITIVE END EFFECTOR SYSTEM, BEING DEVELOPED IN PHASE II, WILL BE ABLE TO LOCATE AN AMMUNITION PALLET, LOCATE AMMUNITION BOXES ON A PALLET, OPEN THESE BOXES, AS WELL AS ADDITIONAL TASKS NEEDED FOR THE FIELD REPACKAGING OF AMMUNITION.

COMPUTER & INFORMATION SCIENCES/NDΛ
2316 ANDERSON AVE
MANHATTAN, KS 66502
PAUL S. FISHER

ARMY

TITLE:

THE DESIGN OF AN INDEPENDENT, OPERATIONAL, DECISION MAKING CONTROL UNIT FOR AUTOMATIC RECOGNITION

TOPIC: 3n OFFICE: LABCOM/HEL

IT IS PROPOSED TO INVESTIGATE, BY A SERIES OF PRACTICAL EXPERIMENTS, THE DESIGN AND USE OF A STORAGE AND CONTROL MECHANISM CALLED A RULING. A RULING, A MATHEMATICAL CONCEPT IMPLEMENTABLE ON A COMPUTER, PERMITS LEARNING IN A REAL-TIME, UNKNOWN ENVIRONMENT, WITH CONTROL BASED UPON PAST AND PRESENT LEARNED EXPERIENCE. TYPICALLY, A RULING CONSUMING 10 TO THE 11TH POWER BITS IS EQUIVALENT TO A DATA BASE OF 10 TO THE 54TH POWER BITS. UTILIZING RULINGS, VAST AMOUNTS OF NEW DATA CAN BE ASSIMILATED INTO A RELATIVELY SMALL SYSTEM IN A FORM WHICH CAN BE UTILIZED TO CONTROL PERFORMANCE OF ACTIVITIES TO ACHIEVE GOALS BASED UPON AN ENORMOUS EXPERIENCE POOL. THIS EFFORT WILL INVOLVE USE OF A LASER SCANNING DEVICE TO OBTAIN TERRAIN DATA, CONSOLIDATION OF SIGNIFICANT NEW DATA INTO A RULING, AND USE OF THE RULING TO ACCOMPLISH RECOGNITION TASKS, PLANNING TASKS, AND CONTROL TASKS NECESSARY TO ACCOMPLISH A MISSION. THE OBJECTIVE OF THIS EFFORT IS TO DEMONSTRATE THE PROCESS OF ACCEPTING AND CONSOLIDATING REAL-TIME ENVIRONMENTAL INFORMATION INTO A RULING, AND THEN USING THAT CONSOLIDATED EXPERIENCE TO MAKE DECISIONS NECESSARY TO CONTROL MOTION TO ACHIEVE GOALS. MICROBOT DEMONSTRATIONS OF "MATERIAL HANDLING" AND "LOCAL PILOTING" TASKS WILL DEMONSTRATE AN ABILITY TO PERFORM VARIABLE NON-REPETITIVE TASKS IN UNPLANNED AND UNANTICIPATED SITUATIONS.

COMPUTER COGNITION
225 W 30TH STREET
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DR. P COKER/M UNDERWOOD

ARMY

TITLE:

DEVELOPMENT OF A KNOWLEDGE BASED SYSTEM FOR MULTI-SENSOR CORRELATION

TOPIC: 1a OFFICE: LABCOM/HDL

COMPUTER COGNITION HAS DEVELOPED A CONCEPT FOR A COMPUTING DEVICE

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ESPECIALLY DESIGNED FOR VERY HIGH PERFORMANCE EXPERT KNOWLEDGE SYSTEMS: THE CONTEXT ACTIVATED MEMORY DEVICE (CAMD). THIS DEVICE IS BOTH A HARDWARE AND SOFTWARE INNOVATION. FOR THIS PHASE OF THE RESEARCH AND DEVELOPMENT OF THE CAMD, COMPUTER COGNITION WILL IMPLEMENT IN SOFTWARE ONLY A SCALED-DOWN VERSION OF THE CAMD WHICH WILL COMMUNICATE WITH TRADITIONAL COMPUTER SYSTEM ARCHITECTURES. THE FEASIBILITY AND SUITABILITY OF THE PRINCIPLES OF THE CAMD FOR BATTLEFIELD INFORMATION PROCESSING WILL BE EXAMINED BY IMPLEMENTING A BATTLEFIELD INFORMATION PROCESSING SCENARIO ON A CONVENTIONAL COMPUTER ARCHITECTURE.

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ENGLEWOOD, CO 80111
DUANE R. COCHRAN

AF

TITLE:

THE DESIGN OF A RAPID, INTELLIGENT PROTOTYPING LANGUAGE (RIPL)

TOPIC: 4 OFFICE: AMD/RDO

DESIGN OF EFFECTIVE MAN-MACHINE INTERFACES (MMIS) IS CRITICAL TO THE OPERATIONAL DESIGN EFFECTIVENESS OF INTERACTIVE COMPUTERIZED SYSTEMS. UNFORTUNATELY, MMI DESIGN FLAWS USUALLY ARE NOT UNCOVERED UNTIL LATE IN THE IMPLEMENTATION PHASE WHEN THEIR CORRECTION IS VERY EXPENSIVE OR IMPOSSIBLE. RAPID PROTOTYPING TOOLS HAVE BEEN USED TO ALLEVIATE THESE PROBLEMS BY ALLOWING MMI DESIGNS TO BECOME VISIBLE AND MODIFIABLE EARLY IN THE SYSTEM DEVELOPMENT PROCESS. CTA WILL BUILD A RAPID INTELLIGENT PROTOTYPING LANGUAGE (RIPL) SYSTEM THAT EXTENDS RAPID PROTOTYPING TECHNOLOGY IN FOUR DISTINCT AREAS: 1) ARTIFICIAL INTELLIGENCE APPLIED TO COGNITIVE ENHANCEMENT AND AN EXPERT SYSTEM FOR MMI DESIGN, 2) AUTOMATIC INSTRUMENTATION OF THE PROTOTYPE TO MEASURE HUMAN PERFORMANCE, 3) IMPROVED GRAPHICAL USER INTERFACE FOR DIALOGUE SPECIFICATION AND EDITING, 4) RECONFIGURABLE TO HANDLE A BROAD RANGE OF INTERACTION DEVICES AND MMI APPLICATIONS. THE EXPERT SYSTEM COMPONENT OF RIPL IS ITS MOST SIGNIFICANT AND UNIQUE FEATURE. THIS RESULTS IN RAPID GENERATION OF MMI PROTOTYPES WITH INHERENT ERGONOMIC DESIGN FEATURES WHICH MAXIMIZE USER PERFORMANCE. THE EXPERT SYSTEM WILL RELY ON A KNOWLEDGE BASE OF RULES MODIFIED FROM MMI GUIDELINES TO ANSWER USER QUERIES AND PERFORM DIALOG SYNTAX EVALUATIONS.

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SUBMITTED BY

DEPT

COMPUTER TECHNOLOGY ASSOCIATES, INC.
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ENGLEWOOD, CA 22217
REGINALD N. MEESON JR.

NAVY

TITLE:

INVESTIGATION OF FUNCTIONAL PROGRAMMING IN DEFENSE APPLICATIONS

TOPIC: 119 OFFICE: ONR

THE GOAL OF THE PROPOSED PHASE II RESEARCH IS TO TAKE THE THEORETICAL-
SOUNDING IDEAS OF FUNCTIONAL PROGRAMMING AND REDUCE THEM TO PRACTICE.
THE BASIC FEASIBILITY OF FUNCTIONAL PROGRAMMING WAS DEMONSTRATED IN
PHASE I. THE THREE MOST IMPORTANT OPEN RESEARCH QUESTIONS, NOW ARE:
HOW WELL DOES FUNCTIONAL PROGRAMMING SCALE UP FOR DEVELOPING LARGE
SOFTWARE SYSTEMS? HOW EASY ARE LARGE FUNCTIONAL PROGRAMS TO MAINTAIN?
WHAT KINDS OF SUPPORT TOOLS ARE NECESSARY FOR DEVELOPING AND MAINTAIN-
ING FUNCTIONAL SOFTWARE? THESE QUESTIONS CAN ONLY BE ANSWERED BY
BUILDING REAL EXAMPLES OF LARGER FUNCTIONAL PROGRAMS. HENCE, WE
PROPOSE TO BUILD A COLLECTION OF PROGRAMS AND SOFTWARE TOOLS TO
SUPPORT FUNCTIONAL PROGRAM DEVELOPMENT, STARTING WITH AN INTERPRETER
FOR THE FUNCTIONAL LANGUAGE WE DEVELOPED IN PHASE I. IN OUR PHASE I
WORK, WE FOUND THAT DATA FLOW DIAGRAMS WERE INDESPENSABLE IN HELPING
TO VISUALIZE AND UNDERSTAND FUNCTIONAL PROGRAM DEFINITIONS. OUR
ULTIMATE OBJECTIVE IS TO BUILD A DATA FLOW DIAGRAM EDITOR/COMPILER
THAT WILL ENABLE FUNCTIONAL SOFTWARE DEVELOPERS TO COMPOSE PROGRAMS
GRAPHICALLY AND HAVE THE CORRESPONDING FUNCTIONAL "CODE" GENERATED
AUTOMATICALLY. THE END RERSULT WILL BE A COLLECTION OF SOFTWARE TOOLS
THAT WILL SUPPORT THE TRANSLATION AND EXECUTION OF PROGRAMS IN WHAT,
TODAY, IS CONSIDERED A HIGH-LEVEL SOFTWARE SPECIFICATION LANGUAGE.

CREW SYSTEMS CONSULTANTS

AF

P.O. BOX 481

YELLOW SPRINGS, OH 45387

RICHARD L. NEWMAN

TITLE:

IMPROVEMENT OF HEAD-UP DISPLAY STANDARDS

TOPIC: 19a OFFICE: ASD/ENO

RECENT RESULTS INDICATE THE PRESENT HEAD-UP DISPLAY (HUD) STANDARDS
AND SPECIFICATIONS DO NOT ADDRESS CERTAIN KEY ASPECTS OF HUD

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DESIGN. THESE KEY ISSUES ARE (1) THE ACCURACY OF THE SENSORS DRIVING THE HUD; (2) THE CONTROL LAWS GOVERNING THE DISPLAYED SYMBOLS; (3) THE DISPLAY FORMAT; (4) THE OPTICAL PROPERTIES; AND (5) THE IMPACT OF THE HUD ON FLIGHT SAFETY. THESE ISSUES SHOULD BE ADDRESSED IN A COMBINED FLIGHT TEST AND GROUND BASED STUDY. THE QUESTION OF THE SENSOR ACCURACY (INERTIAL PLATFORM OR CONVENTIONAL GYROS) AND THE CONTROL LAWS DRIVING THE SYMBOLS WILL BE ADDRESSED IN A FLIGHT TEST EXPERIMENT. THIS EXPERIMENT WILL ALSO ADDRESS THE ISSUE OF AIR MASS DATA OR INERTIAL VELOCITY VECTOR. THE QUESTION OF DIGITAL VERSUS ANALOG SCALES WILL BE STUDIED IN A GROUND BASED SIMULATOR. A "STRAWMAN" HUD DESIGN GUIDE AND ALTERNATE MODES TO ADDRESS PROBLEMS ENCOUNTERED DURING SPATIAL DISORIENTATION AND WINDSHEAR ENCOUNTERS WILL ALSO BE ADDRESSED.

CRYSTAL SYSTEMS, INC.
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SALEM, MA 01970
CHANDRA P. KHATTAK

ARMY

TITLE:

DIRECTIONAL SOLIDIFICATION OF ALUMINUM OXYNITRIDE (ALON) FROM THE MELT BY THE HEAT EXCHANGER METHOD (HEM)

TOPIC: 7g OFFICE: LABCOM/MTL

THE OBJECTIVE IS TO DEVELOP PARAMETERS TO DIRECTIONALLY SOLIDIFY ALON FROM THE MELT IN LARGE SIZES SUITABLE FOR MISSILE DOME APPLICATIONS. THE MATERIAL WILL BE EVALUATED FOR THERMAL AND OPTICAL PROPERTIES AND COMPARED IN PERFORMANCE WITH A SINTERED PRODUCT. SOLIDIFICATION EXPERIMENTS WILL BE CONDUCTED AND THE MATERIAL WILL BE CHARACTERIZED AT THE ARMY MATERIALS AND MECHANICS RESEARCH CENTER. LIGHT SCATTERING MEASUREMENTS WILL BE CONDUCTED AT THE NAVAL WEAPONS CENTER. AFTER DEVELOPMENT WORK IS COMPLETED, EXPERIMENTS WILL BE CARRIED OUT TO PRODUCE 4-INCH DIAMETER ALON INGOTS USING OPTIMIZED PARAMETERS. THE MATERIAL WILL BE USED FOR FABRICATING WINDOWS AND DOMES FOR ACTIVE TESTING.

DATASONICS, INC.
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CATAUMET, MA 02534
WILLIAM L. DALTON

NAVY

TITLE:

DIVER HAND HELD UNDERWATER POSITIONING SYSTEM

TOPIC: 72 OFFICE: NAVSEA

A REQUIREMENT EXISTS FOR A PORTABLE, ECONOMICAL SYSTEM OF AREA NAVI-

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GATION FOR USE BY DIVERS IN A VARIETY OF MILITARY AND COMMERCIAL APPLICATIONS. WE PROPOSE TO DEVELOP AN ACOUSTIC TRANSPONDER BASED RANGE/RANGE TYPE OF NAVIGATION SYSTEM WITH INCREASED CAPABILITY IN TERMS OF POSITION ACCURACY, DIVER POSITION DISPLAY CONTENT, AND EASE OF DEPLOYMENT, RECOVERY, AND SYSTEM CALIBRATION. MAJOR SYSTEM DESIGN OBJECTIVES INCLUDE PROVISION FOR VISUAL COURSE GUIDANCE TO SELECTED WAY POINTS, NAVIGATION ALONG PREPROGRAMMED SURVEY LINES, AND IMPLEMENTATION OF A SYSTEM CONFIGURATION WHICH WILL NOT REQUIRE USE OF THE DIVERS HANDS DURING OPERATION. OUR COMPLETED PHASE I RESEARCH PROGRAM HAS RESULTED IN VERIFICATION OF FEASIBILITY FOR CONSTRUCTION OF THE DIVER DATA INPUT AND DISPLAY COMPONENTS, AND THE ABILITY TO PRODUCE A MICROPROCESSOR BASED ACOUSTIC DATA PROCESSOR WHICH CAN BE INCORPORATED IN A SMALL BACK MOUNTED PACKAGE. OUR PHASE II GOAL IS TO PROCEED WITH THE NECESSARY RESEARCH, DESIGN, AND DEVELOPMENT REQUIRED TO PRODUCE PREPRODUCTION SYSTEMS FOR FIELD EVALUATION AND OPERATIONAL TESTING BY THE NAVY. THE PROCESSING AND DATA I/O TECHNIQUES DEVELOPED DURING PHASE II MAY ALSO BE APPLIED TO OTHER DIVER NAVIGATION SYSTEMS SUCH AS THE SANS SYSTEM TO ALLOW GREATER DIVER FLEXIBILITY AND SUB SEA WORK CAPABILITY.

DECISION SCIENCE CONSORTIUM, INC.
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FALLS CHURCH, VA 22043
JAMES O. CHINNIS, JR.

ARMY

TITLE:

EXPERIMENTAL RESEARCH ON COGNITIVE TASKS AND THE DESIGN OF
SOLDIER-MACHINE INTERFACE

TOPIC: 5j OFFICE: ARI/PERI-PO

HUMAN-COMPUTER SYSTEMS HAVE TYPICALLY FAILED TO MAKE MAXIMUM SIMULTANEOUS USE OF BOTH THE HUMAN AND THE COMPUTER. TRADITIONAL HUMAN FACTORS GUIDELINES FOR PERSON-MACHINE TASK ALLOCATION HAVE PROVEN INADEQUATE FOR SYSTEMS WHICH SUPPORT HIGHER-LEVEL COGNITIVE FUNCTIONS. THE OBJECTIVES OF PHASE II RESEARCH ARE TO DEVELOP A DESIGN TECHNOLOGY WHICH IS BASED ON FINDINGS AND THEORIES IN COGNITIVE PSYCHOLOGY, EXPERIMENTALLY TESTED, AND QUANTITATIVE; AND TO RECOMMEND SPECIFIC DESIGN IMPROVEMENTS IN ARMY AIR DEFENSE SYSTEMS. PHASE I RESEARCH UTILIZED AN EXPERIMENTAL TESTBED MODELED ON A HIGH ALTITUDE MISSILE AIR DEFENSE ENVIRONMENT. IT WAS FOUND THAT UNDER CONDITIONS OF HIGH WORKLOAD, IF USERS HAD INFORMATION NOT AVAILABLE TO THE COMPUTER, PERFORMANCE WAS BEST WHEN THE COMPUTER DIRECTED THE USER'S ATTENTION

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WHERE HIS CONTRIBUTION WAS LIKELY TO BE MOST EFFECTIVE. IN PHASE II, EXPERIMENTS WILL BE CONDUCTED IN THE PHASE I TESTBED AND IN A NEW AIR DEFENSE TESTBED TO EXAMINE ISSUES SUCH AS HUMAN LEARNING ABILITY, SUBOPTIMAL HUMAN REASONING PROCESSES, TASK COHERENCE, COGNITIVE WORKLOAD, MAN-COMPUTER COMMUNICATION, AND METHODS OF HUMAN-COMPUTER COLLABORATION. HUMAN COGNITIVE PERFORMANCE WILL BE MODELED IN TERMS OF ELEMENTARY INFORMATION PROCESSES. THE RESULT SHOULD BE QUALITATIVE DESIGN GUIDELINES, QUANTITATIVE TOOLS AND PROCEDURES TO ASSIST THE DESIGN PROCESS, AND SPECIFIC RECOMMENDATIONS FOR ARMY AIR DEFENSE SYSTEM DESIGNS.

DEFENSE SYSTEMS, INC.
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MCLEAN, VA 22101
DONALD L. STARKEY
TITLE:
ON-THE-BOTTOM SURVEILLANCE BUOY
TOPIC: 112 OFFICE: NAVAIR

NAVY

A SONOBUOY ON THE BOTTOM OF THE OCEAN CAN ACHIEVE LONG DETECTION RANGES BY USE OF THE RELIABLE ACOUSTIC PATH (RAP). BY PUTTING AN ACOUSTIC SIGNAL PROCESSOR IN THE BUOY TO DO SPECTRU ANALYSIS AND CONTACT REPORT GENERATION, THE DATA TRANSMITTED TO THE SURVEILLANCE AIRCRAFT CAN BE REDUCED TO SHORT BURSTS ON A SCHEDULE THAT MEETS PATROL AIRCRAFT REVISIT REQUIREMENTS FOR INCREASED AIRCRAFT UTILIZATION AT LOWER COST. EMPLOYING ACOUSTIC COMMUNICATIONS FROM THE BOTTOM SENSOR TO A STANDARD PASSIVE BUOY DEPLOYED BY THE READOUT AIRCRAFT (AND SERVING AS A COMMUNICATIONS RELAY) CAN ELEIMINATE THE HIGH COST AND OFTEN UNRELIABLE ELECTROMECHANICAL LINK OF MOORED BUOYS. A BUOY COST SAVING IN EXCESS OF 80 PERCENT AND AN AIRCRAFT OPERATING COST REDUCTION BY A FACTOR OF 4 CAN BE ACHIEVED. DEFENSE SYSTEM INC (DSI) ON PHASE OF THIS SBIR PROGRAM DESIGNED AND BUILT THE CRITICAL ELEMENTS OF SUCH AN ON-THE-BOTTOM BUOY, COMPLETED WITH IN-BUOY SIGNAL PROCESSOR, ACOUSTIC COMMUNICATIONS LINK AND 200,000 FT. DEPTH-CAPABLE MECHANICAL STRUCTURE. DURING PHASE II, DSI WILL COMPLETE THE DEVELOPEMENT OF THE OTB BUOY, CONSTRUCT TWO UNITS AND DEPLOY THEM TO SEA TO DEMONSTRATE ITS DETECTION AND SURVEILLANCE CAPABILITIES. DSI SHALL SUPPLY THE NECESSARY TARGET SERVICES.

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DEFENSE SYSTEMS, INC.
6804 POPLAR PLACE
MCLEAN, VA 22101
GEORGE S. SEBESTYEN

DARPA

TITLE:

ADVANCED UNDERSEA TACTICAL COMMUNICATIONS TECHNIQUES

TOPIC: 5a OFFICE: DARPA

THE DEVELOPMENT AND DEMONSTRATION OF A LONG RANGE (150 NAUTICAL MILE OR MORE) ACOUSTIC COMMAND LINK FOR THE COMMAND AND CONTROL OF AUTONOMOUS UNDERWATER VEHICLES, MINES AND UNDERWATER SURVEILLANCE SENSORS. A PROTOTYPE LINK WILL BE BUILT AND DEMONSTRATED AT SEA UNDER REALISTIC CONDITIONS.

DURING PHASE I OF THIS SBIR PROGRAM A METHODOLOGY WAS DEVELOPED FOR THE DESIGN OF ACOUSTIC COMMUNICATION SYSTEMS, AFTER WHICH THE METHODOLOGY WAS APPLIED TO THE DESIGN OF TWO MUCH NEEDED SYSTEMS. THE FIRST WAS A LONG RANGE ACOUSTIC COMMAND LINK FOR REMOTE CONTROL OF VARIOUS DEVICES. THE SECOND WAS AN ACOUSTIC COMMUNICATION SYSTEM TO OBTAIN DATA FROM BOTTOM EMPLACED REMOTE SENSORS TO SHORE VIA INTERMEDIARY BUOYS.

DESIGNERS & PLANNERS, INC.

NAVY

1725 JEFFERSON DAVIS HIGHWAY, SUITE 700
ARLINGTON, VA 22202
DR. P.Y. CHANG

TITLE:

DESIGN METHODS FOR SHIPS STRUCTURAL RESPONSE TO EXTREME SEAWAY LOADINGS

TOPIC: 47 OFFICE: NAVSEA

AN ACCURATE PREDICTION OF THE STRUCTURAL RESPONSES OF SHIPS TO EXTREME SEAWAY LOADINGS IS IMPORTANT IN ALL THE PHASES OF SHIP DESIGN. THE CURRENTLY USED METHODS, IN GENERAL, ARE NOT ACCURATE ENOUGH. THE ROSAS3 COMPUTER PROGRAMS CAN BE THE BEST AVAILABLE DESIGN TOOL ONCE IT IS COMPLETED. THIS PROPOSAL PRESENTS A SYSTEMATIC APPROACH AND WORK PLAN TO COMPLETE THE ROSAS3 PROGRAM. THE PHASE II EFFORT WILL COMPLETE THE DETERMINATION OF NON-LINEAR HYDRODYNAMIC FORCES, EXAMINE THE EFFECTS OF VARIOUS WAVE FORMS, ADDING THE CAPABILITY TO CALCULATE STRUCTURAL RESPONSES DUE TO SLAMMING LOADS, IDEALIZE THE HULL MODELING SCHEME, IMPROVE AND EXPAND DOCUMENTATION OF ROSAS3 INITIATED IN

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PHASE I, DEVELOP AN INPUT DATA PREPROCESSOR UTILIZING THE COMPUTER PROGRAM HULSTRX, NEW SNAPPY, SMP, AND SMPOFF TO CONSIDERABLY REDUCE TIME SPENT ON TEDIOUS MANUAL CALCULATIONS, AND DEVELOP A COMPUTER GRAPHICS PRE-PROCESSOR TO READILY DISPLAY PROGRAM RESULTS.

DOTY ASSOCIATES, INC.
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AREVE B. ALEXANDER

NAVY

TITLE:

ANALYTICAL DECISION MAKING SOFTWARE - PHASE I

TOPIC: 114 OFFICE: NAVAIR

AN AUTOMATED DECISION AID, USEABLE ON A MICROCOMPUTER, WILL BE DEVELOPED TO ANALYZE PROJECT COST, TAKING INTO ACCOUNT QUANTITIES, DELIVERY SCHEDULES, AND OTHER PROGRAMMATIC AND ECONOMIC VARIABLES. THE PRODUCT WILL INCLUDE DATA BASES WHICH THE MODEL CAN MANIPULATE TO OBTAIN COST INPUTS. THE MAJOR OBJECTIVES IN PHASE II ARE TO COMPLETE THE PROGRAM ESTIMATION SOFTWARE; DEVELOP SOFTWARE FOR PERFORMING AGGREGATIONS AND ANALYSES OF PROGRAM COST ESTIMATES AND COST OR SCHEDULE PROFILES; DEVELOP AND DOCUMENT A DATA BASE OF HISTORICAL COSTS; AND EVALUATE THE FEASIBILITY OF ADDITIONAL CAPABILITIES.

DR. PRADEEP K. GUPTA
117 SOUTHURY ROAD
CLIFTON PARK, NY 12065
DR. PRADEEP K. GUPTA

AF

TITLE:

OPTIMIZING MANUFACTURING TOLERANCES IN ROLLING BEARINGS FOR CRITICAL DOD APPLICATIONS

TOPIC: 11i OFFICE: AFWAL/XRF-PO

AFTER DEMONSTRATING THE FEASIBILITY OF THE COMPUTER MODELLING APPROACH TO OPTIMIZING MANUFACTURING TOLERANCES IN ROLLING BEARINGS, PHASE I A DEVELOPMENT PROGRAM TO PARAMETRICALLY EVALUATE THE INFLUENCE OF VARIOUS GEOMETRICAL TOLERANCES ON BEARING PERFORMANCE IS PROPOSED. USING THE COMPUTER MODEL, ADORE, THE DYNAMIC PERFORMANCE OF BOTH BALL AND CYLINDRICAL ROLLER BEARINGS SHALL BE FIRST MODELED AS A FUNCTION OF PRESCRIBED GEOMETRICAL IMPERFECTION ON A SINGLE BEARING

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ELEMENT; THIS WILL RESULT IN A FUNDAMENTAL UNDERSTANDING OF THE INFLUENCE OF A PRESCRIBED IMPERFECTION ON THE OVERALL BEARING PERFORMANCE. IN THE SECOND STEP A STATISTICAL VARIATION IN THE IMPERFECTION SHALL BE CONSIDERED AND THE BEARING PERFORMANCE SHALL BE INVESTIGATED AS A FUNCTION OF VARIANCE IN THE PRESCRIBED IMPERFECTION AND GUIDANCE FOR DETERMINING LIMITS ON THE VARIANCE OF THE IMPERFECTION SHALL BE DEVELOPED; THIS MAY RESULT IN EFFECTIVE COST AND PERFORMANCE OPTIMIZATION FOR A NUMBER OF ROLLING BEARING APPLICATIONS. FINALLY, SEVERAL GEOMETRICAL IMPERFECTIONS SHALL BE CONSIDERED SIMULTANEOUSLY AND THE CUMULATIVE EFFECT ON BEARING PERFORMANCE SHALL BE SIMULATED. ASIDE FROM DEVELOPING A THOROUGH UNDERSTANDING OF THE ROLE OF MANUFACTURING TOLERANCES IN ROLLING BEARING BEHAVIOR, THE PROPOSED EFFORT SHALL RESULT IN SPECIFIC DESIGN GUIDELINES FOR CRITICAL APPLICATIONS AND IT WILL PROVIDE A PROVEN COMPUTER TOOL FOR IMMEDIATE TECHNOLOGY TRANSFER.

DYNAMICS TECHNOLOGY, INC.
21311 HAWTHORNE BLVD - STE 300
TORRANCE, CA 90503
DR C. MICHAEL DUBE

NAVY

TITLE:
FIBER OPTIC MAGNETIC GRADIOMETER FOR DETECTING DEEPLY BURIED
ORDNANCE
TOPIC: 73 OFFICE: NAVSEA

DYNAMICS TECHNOLOGY, INC. (DYNATECH) WILL DESIGN, CONSTRUCT, AND TEST, A FIBER-OPTIC VECTOR MAGNETIC GRADIOMETER FOR THE DETECTION OF BURIED ORDNANCE. DURING PHASE I, DYNATECH DEMONSTRATED A SUBSCALE LABORATORY FIBER GRADIOMETER WHICH UTILIZED A UNIQUE SIGNAL PROCESSING TECHNIQUE TO ACHIEVE CALIBRATED MAGNETIC GRADIENT MEASUREMENTS IN A FIELD ENVIRONMENT. IN ADDITION, SEVERAL ENGINEERING ISSUES WERE IDENTIFIED AND A PRELIMINARY PROTOTYPE DESIGN, BASED ON LABORATORY MEASUREMENTS, WAS PREPARED. IN PHASE II DYNATECH WILL FIRST PERFORM SUBSYSTEM DESIGN AND TESTING, INCLUDING (1) FIELD-ANNEALING OF THE MAGNETOSTRICTIVE METALLIC GLASS SUBSTRATE; (2) FABRICATION OF COMPACT EXTENDED LENGTH FIBER-OPTIC SENSING ELEMENTS; (3) SUPPRESSION OF MECHANICAL RESONANCES; AND (4) REFINEMENT OF THE GRADIENT SIGNAL PROCESSING ALGORITHM. THE PROTOTYPE SENSOR WILL BE INTEGRATED INTO A SELF-CONTAINED PACKAGE CAPABLE OF REAL TIME MEASUREMENTS. FOLLOWING INITIAL CHARACTERIZATION AND PRELIMINARY CALIBRATION IN THE DYNATECH LABORATORY, THE FIBER GRADIOMETER WILL BE FIELD TESTED AND REFERENCE

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CALIBRATED AT THE NAVAL EXPLOSIVE ORDNANCE DISPOSAL TECHNOLOGY CENTER AND THE NAVAL COASTAL SYSTEMS CENTER TEST RANGES.

E-OIR MEASUREMENTS, INC.

ARMY

P.O. BOX 3348

FREDERICKSBURG, VA 22402

JOSEPH R. MOULTON

TITLE:

THERMAL TARGET PROJECTOR FOR COMBAT VEHICLE RECOGNITION TRAINING OF THERMAL NIGHT SIGHT OPERATORS

TOPIC: 5e OFFICE: DRCPM TRADE

THIS PHASE II CALLS FOR DEVELOPMENT OF FIVE PROOF-OF-CONCEPT THERMAL TARGET PROJECTOR (TTP) DEMONSTRATORS FOR USE BY ARMY TRAINING CENTERS TO DETERMINE THE TRAINING WORTH OF THE TTP DEVELOPED DURING PHASE I FOR THERMAL COMBAT VEHICLE IDENTIFICATION TRAINING. INFRARED SLIDE LIBRARIES WILL BE PRODUCED THAT SIMULATE THE THERMAL APPEARANCE FOR A CROSS SECTION OF NATO AND WARSAW PACT COMBT VHEICLES UNDER SUMMER AND WINTER EUROPEAN BATTLEFIELD CONDITIONS. R&D WILL BE CARRIED OUT THAT WILL LEAD TO THE DEVELOPMENT OF SEVERAL ENHANCED TTP CONFIGURATIONS, NAMELY, ONE THAT PROJECTS WIDE FIELD-OF-REGARDS FOR TARGET SEARCH TRAINING, A TTP THAT PROVIDES FOR TARGET MOTION CUEING, AND A TTP THAT POSSESSES REFLECTIVE FORE OPTICS THAT WILL BE USED AS A LOW COST DEMONSTRATOR. BASE THERMAL IMAGERY USED IN PRODUCING THE IR SLIDE MASTERS WILL BE COLLECTED AND ARCHIVED. IR SLIDE LIBRARIES WILL BE DEVELOPED FOR USE WITH TRAINEES ON THE M1 AND M2 THERMAL NIGHT SIGHTS. SPECIFIC TARGET RANGE SIMULATION WILL BE COORDINATED WITH THE TRADOC COMMUNITY PRIOR TO IR SLIDE FABRICATION TO INSURE THE FUNCTIONAL SIMULATION SATISFIES USER REQUIREMENTS. FIELD IMAGERY COLLECTED THROUGH TACTICAL NIGHT SIGHTS WILL BE COMPARED TO THE SAME TARGETS AND RANGES AS TRAINING SCENES FOR THE PURPOSE OF VALIDATING THE TTP SIMULATIONS.

EDDINS-EARLES

AF

89 LEE DRIVE

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MARY EDDINS EARLES

TITLE:

DEVELOPMENT OF A SOFTWARE COST ESTIMATION MODEL FOR THE CONCEPTUALIZATION/FORMULATION STAGES

TOPIC: 9b OFFICE: RADC

THIS PROPOSAL IS FOR THE PROGRAMMING ON A MINI OR PERSONAL COMPUTER

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OF A SOFTWARE DESIGN/COST ESTIMATING SYSTEM THAT WAS DESIGNED DURING PHASE I, AND THE ESTABLISHMENT OF A DATABASE FOR COMMAND, CONTROL, AND COMMUNICATIONS AND INTELLIGENCE (C3I) SYSTEM IMPLEMENTATION. THE PROPOSED SYSTEM USES THE COST ESTIMATING RELATIONSHIPS OF THE COCOMO MODEL AND BASELINE FILES OF EXISTING C3I SOFTWARE DESIGNS AS GENERIC DEFAULTS. IT HAS TWO INPUT/OUTPUT MEDIUMS: A DISPLAY PROMPT FOR REQUIRED INPUTS AND A LINE PRINTER FOR HARDCOPY OUTPUTS. IT IS SIMPLE TO RUN BECAUSE IT IS "MENU-DRIVEN." IT IS DESIGNED TO MAKE IT EASY TO STORE, DISPLAY, AND ALTER VALUES OF INPUT VARIABLES. IT PERMITS A COMPUTER PROGRAM CONFIGURATION ITEM (CPCI) TO BE DESIGNED BY CHOOSING COMPUTER PROGRAM COMPONENTS (CPCs) FROM A STORED LIBRARY OF PAST PROGRAM DATA. IT PERMITS CPCs TO BE DESIGNED BY CHOOSING GENERIC MODULES OF CODE FROM A SIMILAR STORED LIBRARY. IT PERMITS LIFE CYCLE COST ESTIMATES TO BE MADE AT EACH LEVEL OF THE SOFTWARE BREAKDOWN STRUCTURE.

EIC LABORATORIES, INC
111 CHAPEL STREET
NEWTON, MA 02158
R DAVID RAUH

NAVY

TITLE:

SCHOTTKY BARRIER PHOTOELECTRODES WITH A VARIABLE BARRIER HEIGHT
TOPIC: 122 OFFICE: ONR

THE OBJECTIVE OF THIS RESEARCH IS TO DETERMINE THE PROPERTIES OF RECTIFYING JUNCTIONS FORMED BETWEEN SEMICONDUCTORS AND ION INSERTION COMPOUNDS OF VARIABLE WORK FUNCTION. IT WAS DETERMINED IN PHASE I THAT THE HEIGHT OF THE p-Si/LixWO3 SCHOTTKY BARRIER COULD BE MODULATED BY VARYING THE Li STOICHIOMETRY, ALTHOUGH FERMI LEVEL PINNING REDUCED THE EFFECT. PHASE II WILL ADDRESS A BROADER RANGE OF SEMICONDUCTOR-INSERTION COMPOUND JUNCTIONS. THESE WILL INCLUDE "COVALENT" SEMICONDUCTORS LIKE Si AND "IONIC" SEMICONDUCTORS LIKE CdS. INSERTION COMPOUNDS WILL SPAN A RANGE OF WORK FUNCTIONS FROM 2 TO 7 eV, AND WILL INCLUDE Pt GROUP OXIDES, POLYMERIC ORGANIC SEMICONDUCTORS, AND TRANSITION METAL DICHALCOGENIDES. THE PURPOSE WILL BE TO DISCOVER SYSTEMS WHERE ELECTRICAL PROPERTIES ARE MOST SENSITIVE TO WORK FUNCTION CHANGES. THE PHOTOELECTROCHEMISTRY OF SEMICONDUCTORS COATED WITH A SELECTIVE ION INSERTION LAYER WILL BE INVESTIGATED FOR SYSTEMS PROMISING A SYNERGISTIC EFFECT OF BARRIER HEIGHT ENHANCEMENT AND ELECTROCATALYSIS. THE VARIABLE IMPEDANCE PROPERTIES OF MOS STRUCTURES

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WHERE M IS AN INSERTION COMPOUND, WILL ALSO BE EXAMINED AS ELEMENTS SENSITIVE TO THE INSERTING SPECIES. THE END PRODUCT OF PHASE II WILL BE THE DEMONSTRATION OF SEVERAL DEVICE APPLICATIONS OF THE VARIABLE BARRIER HEIGHT CONCEPT AS A PRELUDE TO PHASE III DEVELOPMENT.

ELANCO INC
10 ALBE DR
NEWARK, DE 19702
L E HUFFMAN

ARMY

TITLE:
HEAT EXCHANGE MATRIX
TOPIC: 5f OFFICE: CDR/TACOM

THE FUNCTION OF A HEAT EXCHANGER IS DEPENDENT UPON THE AREA OF EXPOSURE TO THE FLUIDS IN PROCESS. FINS ARE COMMONLY USED TO INCREASE EXTERNAL SURFACE AREAS. TO EXTEND THE INNER SURFACE OF A TUBE OR VESSEL IS MORE DIFFICULT AND THERE IS CURRENTLY NO COST EFFECTIVE METHOD TO DO SO. THIS RESEARCH IS TO DEVELOP THE USE OF A MATRIX COMPOSED OF SMALL, HOLLOW, METAL CYLINDERS, BRAZED TOGETHER AT THEIR CONTACT POINTS AS A HEAT TRANSFER MATRIX. ENCAPSULATING THIS MATRIX IN TUBES EXTENDS THE TUBE INNER AREA. THE MATRIX HAS A HIGH AREA/WEIGHT RATIO AND IS RIGID AND LIGHT WEIGHT, AND IS VIBRATION AND SHOCK RESISTANT. A PRIORITY APPLICATION IS ONE FOR USE WITHIN U.S. ARMY COMBAT TANKS.

ELECTROMAGNETIC SCIENCES, INC.
125 TECHNOLOGY PARK/ATLANTA
NORCROSS, GA 30092
GORDON R. HARRISON

ARMY

TITLE:
NEAR-MILLIMETER WAVE FERRITE MATERIALS AND COMPONENTS RESEARCH
TOPIC: 9p OFFICE: LABCOM/ETDL

THE OBJECTIVE OF THIS PROGRAM IS TO DEVELOP NEW AND IMPROVED FERRITE MATERIALS FOR MILLIMETER WAVE APPLICATIONS IN ORDER TO PRODUCE HIGH PERFORMANCE, LOW COST MILLIMETER WAVE FERRITE COMPONENTS. THE MATERIALS R&D WILL FOCUS ON HEXAGONAL AND SPINEL FERRITE COMPOUNDS WITH PROPERTIES OPTIMIZED FOR MILLIMETER WAVE COMPONENT APPLICATIONS.

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THE DEVELOPMENT OF IMPROVED MILLIMETER WAVE COMPONENTS AND ASSOCIATED TECHNOLOGY WILL FOCUS ON SIGNAL PROCESSING AND CONTROL COMPONENTS SUCH AS RESONANCE ISOLATORS, JUNCTION CIRCULATORS, PHASE SHIFTERS, DUPLEXERS AND SWITCHES. THE MATERIAL AND APPLICATIVE TECHNOLOGY DEVELOPED WILL BE DEMONSTRATED VIA THE GENERATION OF BREADBOARD COMPONENTS OPERATING IN THE 90 TO 100 GHZ FREQUENCY REGION. RECTANGULAR WAVEGUIDE WILL PRIMARILY BE USED TO DEMONSTRATE IMPROVED COMPONENT PERFORMANCE; HOWEVER OTHER INNOVATIVE RF STRUCTURES AND MATERIAL/STRUCTURE CONFIGURATIONS WILL BE INVESTIGATED TOWARD PROVIDING THE TECHNOLOGY BASE FOR NEW AND IMPROVED ENGINEERING DESIGN APPROACHES FOR MILLIMETER WAVE SIGNAL PROCESSING AND CONTROL FUNCTIONS TO SUPPORT FUTURE INTEGRATED SYSTEM CONCEPTS. THESE INVESTIGATIONS WILL INCLUDE DESIGN AND PERFORMANCE STUDIES OF FERRITE COMPONENTS IN OPEN STRUCTURED TRANSMISSION LINES COMPARABLE TO AND CONSISTENT WITH LOW COST FABRICATION TECHNIQUES PRESENTLY UTILIZED FOR DERIVING MICROWAVE INTEGRATED CIRCUITS AND MODULES.

ENERGY COMPRESSION RESEARCH CORP

ARMY

2043 DE MAYO RD
DEL MAR, CA 92014
OVED S.F. ZUCKER

TITLE:

DEVELOPMENT OF REVERSIBLE INDUCTIVE STORAGE AND TRANSFER SYSTEM FOR EM GUNS

TOPIC: 14 OFFICE: ARDC

THE PROPOSED PHASE II EFFORT FOR DEVELOPMENT OF A REVERSIBLE INDUCTIVE STORAGE AND TRANSFER SYSTEM FOR EM GUNS IS TO CONDUCT EXPERIMENTS TO DEMONSTRATE ENERGY TRANSFER FROM INDUCTIVE SOURCE TO INDUCTIVE LOAD IN THE MS REGIME UTILIZING THE MEATGRINDER CIRCUIT. THE PHYSICAL DESIGN OF THE COIL AND SWITCHES IS DESCRIBED AND THE ANALYTICALLY PREDICTED PERFORMANCE WILL BE EXPERIMENTALLY TESTED. IN ADDITION, THE DESIGN OF THE COIL SWITCHES IS DESCRIBED AND THE ANALYTICALLY PREDICTED PERFORMANCE WILL BE EXPERIMENTALLY TESTED. IN ADDITION, THE DESIGN SHOWS THE SCALABILITY OF THE HARDWARE TO THE LIMITS APPLICABLE TO FULL SCALE EM GUNS.

ENERGY SCIENCE LABORATORIES, INC.
11404 SORRENTO VALLEY ROAD, SUITE 113
SAN DIEGO, CA 92121
G.W. WEBB, T.R. KNOWLES

AF

TITLE:

METAL/PHASE CHANGE MATERIAL COMPOSITE HEAT SINKS

TOPIC: 10b OFFICE: AFWAL/XRPF

SPACECRAFT ARE SUBJECTED TO THERMAL HEAT LOADS WHICH VARY IN TIME.

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RADIATORS WHICH ARE SIZED FOR PEAK LOADS ARE LARGER THAN NECESSARY FOR THE AVERAGE LOAD. HEATSINKS WOULD ALLOW THE RADIATORS TO BE SIZED FOR THE AVERAGE LOAD, SAVING WEIGHT AND REDUCING THE CROSS-SECTIONAL AREA OF THE SPACECRAFT. OUR PHASE I RESEARCH HAS SHOWN THE POTENTIAL BENEFITS OF METAL/PHASE CHANGE MATERIAL COMPOSITE MATERIALS FOR HIGH PERFORMANCE HEATSINKS IN APPLICATIONS OF THIS TYPE. WE PROPOSE A COMPREHENSIVE PROGRAM IN MATERIALS RESEARCH AND TESTING, HEATSINK DESIGN, AND THE CONSTRUCTION AND TESTING OF A PROTOTYPE HEATSINK. THE MATERIALS RESEARCH PROGRAM INVOLVES ANALYTICAL MODELING OF THE COMPOSITES, NUMERICAL SIMULATION OF PERFORMANCE UNDER DIFFERENT LOADS AND TESTING OF OPTIMIZED MATERIALS. HEATSINK DESIGN WILL INCLUDE A PARAMETRIC STUDY OF SIZING FOR DIFFERENT LOAD CHARACTERISTICS. VARIOUS CONFIGURATIONS OF HEATSINKS AND APPLICATIONS WILL BE EVALUATED ALSO. THE PROTOTYPE HEATSINKS WILL BE TESTED FOR POWER UPTAKE AND RELEASE RATES, STORAGE CAPACITY AND STABILITY UNDER MULTIPLE MELT-FREEZE CYCLES.

ENGINEERING ANALYSIS, INCORPORATED

ARMY

2109 CLINTON AVENUE W., SUITE 432

HUNTSVILLE, AL 35805

FRANK B. TATOM

TITLE:

AUDIO-VISUAL INITIAL DEBUG (AVID) METHOD FOR COMPUTER SOFTWARE

TOPIC: 8a OFFICE: BMD

THE AVID CONCEPT IS DESIGNED TO PROVIDE A SYSTEMATIC MEANS FOR THE EARLY DETECTION OF OPERATOR ENCODING ERRORS IN SOFTWARE UNDER DEVELOPMENT OR UNDERGOING SIGNIFICANT REVISION. THE TYPE OF ERRORS OF PRIMARY CONCERN ARE THOSE WHICH CANNOT BE DETECTED BY A COMPILATION PROCESS, ESPECIALLY IN CODES WHICH CONTAIN SO MANY BRANCHES THAT COMPLETE TESTING OF ALL COMBINATIONS OF OPTIONS IS NOT FEASIBLE. THE CONCEPT IS APPLICABLE TO ANY PROGRAMMING LANGUAGE INCLUDING FORTRAN, PASCAL, BASIC, COBOL, AND REQUIREMENTS STATEMENT LANGUAGE (RSL), AS WELL AS TO ASSEMBLY LANGUAGES. IT IS ESPECIALLY USEFUL FOR VERIFYING LARGE DATA STATEMENT ARRAYS, AND COULD ALSO BE USED TO VERIFY LARGE QUANTITIES OF DATA WHICH ARE MANUALLY INPUT INTO A COMPUTER. UNDER PHASE I, THE INITIAL VERSION OF AVID WAS DEVELOPED FOR FORTRAN DEBUGGING. THIS VERSION WAS DEMONSTRATED ON AN APPLIE III MICROCOMPUTER AND IS CURRENTLY FULLY OPERATIONAL. IN ADDITION, A PRELIMINARY VERSION OF AVID SUITABLE FOR DEBUGGING PASCAL HAS BEEN DEMONSTRATED

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ON THE SAME MICROCOMPUTER. FOR THE PHASE II DEVELOPMENT THE VERSIONS OF AVID SUITABLE FOR FORTRAN, PASCAL AND RSL PROCESSING WILL BE HOSTED ON A VAX COMPUTER. THE PROGRAMS WILL BE EXECUTED REMOTELY FROM THE APPLE III MICROCOMPUTER AND A DEC VT/102 TERMINAL.

ENGINEERING GUILD
12105 W. JEFFERSON BLVD, SUITE 200
CULVER CITY, CA 90230
PAUL GRIFFITH

ARMY

TITLE:
AN ELECTRONIC SYSTEM TROUBLESHOOTING PROGRAM USING ARTIFICIAL INTELLIGENCE TECHNIQUES.

TOPIC: 5b OFFICE: AVSCOM

PHASE II OF MICROEXPERT WILL CREATE A FULL CONSULTING TYPE HELICOPTER TROUBLESHOOTING PROGRAM. PHASE I MICROEXPERT IS A PROTOTYPE. IT CAN ACT AS INFORMATIONAL BACKUP FOR A PRACTICE TECHNICIAN. OR IT CAN CREATE THE PROBLEM SOLVING STRATEGIES, REASONING TRACES, AND EVEN HUNCHES THAT IMPROVE THE PERFORMANCE OF MORE NOVICE USERS. MICROEXPERT TRAINS ITS USERS AND LEARNS FROM ITS HISTORY. THROUGH USE, IT BECOMES MORE TIME AND COST EFFECTIVE. PHASE I MICROEXPERT PROVED THE CONCEPT FOR A SUBSYSTEM. IT HAD LIMITED REASONING, RULE CHECKING, AND FAULT FINDING ABILITIES. PHASE II WILL AUTOMATE THE REASONING PROCESS, ADD MULTIPLE SYMPTON RECOGNITION/MULTIPLE CAUSING HANDLING CAPABILITIES, IMPROVE RULE FORMATION AND MANIPULATION, AND GENERALLY PROGRESS IN SOPHISTICATION AND BREADTH OF APPLICATION. IT WILL CREATE A MAINTENANCE EXPERT SHELL INTO WHICH SPECIFIC SYSTEM DATA CAN BE INSERTED. THE ORIENTATION OF PHASE II WILL REMAIN HIGHLY PRACTICAL. MICROEXPERT WILL STAY PORTABLE, FAST, AND FRIENDLY. MICROEXPERT WILL TRAIN TECHNICIANS WHILE THEY ARE BEING PRODUCTIVE, GROW MORE EFFICIENT WITH AGE, RETAIN TROUBLESHOOTING EXPERTISE AFTER THE EXPERT HAS GONE, REDUCE FAULT ISOLATION AND REPORTING TIME, AND GENERALLY IMPROVE THE QUALITY OF FIELD MAINTENANCE.

EPI-TECH CORPORATION
52234 EAST HATCHER ROAD
PARADISE VALLEY, AZ 85253
DR. ROBERT L. ADAMS

AF

TITLE:
GROWTH OF GaAs USING ION CLUSTER BEAM TECHNOLOGY

TOPIC: 12a OFFICE: AFWAL/XRPA

THE OBJECTIVE OF THIS PROPOSAL IS THE GROWTH OF HIGH QUALITY

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EPITAXIAL GaAs ON GaAs SUBSTRATES. THE WORK WILL STUDY THE RELATIONSHIP BETWEEN THERMALLY NEUTRAL CLUSTERS AND EPITAXIAL FILM PROPERTIES AS WELL AS THE INFLUENCE OF IONIZED AND ACCELERATED CLUSTERS ON FILM PARAMETERS. PARTICULAR EMPHASIS WILL BE DIRECTED TO EFFORTS TO GROW FILMS AT TEMPERATURES BELOW 400 DEGREE C. THE NATIVE DEFECTS GROWN INTO THE SAMPLES IN THE PHASE I PROGRAM WERE THE RESULT OF HIGH ENERGY IONS HITTING THE SURFACE FROM SMALL CLUSTERS. THIS WORK WILL ADDRESS THE PROBLEM OF CLUSTER FORMATION CONDITIONS AND CLUSTER SIZE. THESE CRITICAL PARAMETERS WILL, IN TURN, BE RELATED TO MULTITUDE OF MACHINE MODIFICATIONS SUCH AS CRUCIBLE MODIFICATION, HEATER REDESIGN, TEMPERATURE CONTROL, AND FLUX DENSITY STUDIES. THE FILMS GROWN WILL BE CHARACTERIZED BY OPTICAL MICROSCOPY, HALL, C/V, PHOTOLUMINESCENCE AND SIMS TECHNIQUES. THE SIMS WILL BE USED TO STUDY IMPURITIES AT THE INTERFACE AND IN THE BULK. ONE OF THE FINAL OBJECTIVES WILL BE THE STUDY OF SELECTIVE DOPING OF THE FILMS WITH BOTH N-TYPE OR P-TYPE DOPANTS. THE TYPE OF DOPANT WILL BE VARIED AS WELL AS CHOICE OF USING A GASEOUS OR SOLID SOURCE.

FIBERCOM, INC.
5375 PETERS CREEK ROAD
ROANOKE, VA 24019
PHIL COUCH

NAVY

TITLE:

FIBER OPTIC DATA BUS ANALYSIS AND DEFINITION
FOR NAVY APPLICATIONS

TOPIC: 93 OFFICE: SPAWAR

VERY HIGH SPEED DATA TRANSFER NETWORKS WILL BE REQUIRED IN THE LATE 1990'S TO COMPLEMENT THE DEVELOPMENT OF DISTRIBUTED PROCESSORS INCORPORATING VHSIC AND GaAs TECHNOLOGIES. FIBER OPTIC DATA BUS TECHNOLOGY CAN PROVIDE THE WIDE BAND WIDTH COMMUNICATION MEDIA REQUIRED WITH THE ADDITIONAL BENEFITS OF INVULNERABILITY TO EMI/EMP WHILE BEING PHYSICALLY SMALL, LIGHT, AND STRONG. THE PROPOSED PHASE II SBIR IS TO DESIGN, BREADBOARD, AND DEMONSTRATE A VERY HIGH SPEED, 500 MB/S, FIBER OPTIC DATA BUS INTERFACE MODULE, BIM, WITH GaAs ENCODING AND DECODING. IN ADDITION, A BUS ARCHITECTURE WILL BE DEVELOPED FOR INSERTING THE TECHNOLOGY ONTO A PLATFORM TO SERVE AS A "MASTER" BUS FOR INTER-SYSTEMS OR INTRA-PLATFORM DATA TRANSFER. THIS BUS WOULD ACCESS SYSTEMS THROUGH GATEWAYS TO OTHER BUSES, THROUGH STANDARD NTDS (10 MB/S) INTERFACES, OR DIRECTLY TO TERMINALS SUCH AS

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SENSORS WITH 10-100 MB/S DATA RATES.

FLOW INDUSTRIES, INC.
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H.T. LIU

AF

TITLE:
THE DEVELOPMENT OF A PRESSURE TRANSDUCER FOR USAGE IN HIGH
TEMPERATURE AND VIBRATION ENVIRONMENTS
TOPIC: 16 OFFICE: AED/DPT

THE OBJECTIVE OF THIS PROPOSAL IS TO DEVELOP A HIGH-ACCURACY, HIGH-RANGE PRESSURE TRANSDUCER THAT IS SUITABLE FOR DYNAMIC MEASUREMENTS IN ENVIRONMENTS WHERE HIGH VIBRATIONS, HIGH TEMPERATURES AND VARYING LINE PRESSURES CREATE PROBLEMS FOR PRESENTLY AVAILABLE TRANSDUCERS. THE PRIMARY SENSOR IS AN ELASTIC METAL DIAPHRAGM THAT FORMS ONE PLATE OF A CAPACITOR. AN ELECTRONIC CIRCUIT CONVERTS DEFLECTIONS OF THE DIAPHRAGM INTO VOLTAGE VARIATIONS, WHICH ARE SAMPLED BY A MICROPROCESSOR. DUE TO THE SMALL OSCILLATING MASS OF THE DIAPHRAGM, THE TRANSDUCER HAS A HIGH NATURAL FREQUENCY AND IS LARGELY INSENSITIVE TO EXTERNALLY INDUCED VIBRATIONS. THE CAPACITIVE TRANSDUCER CONCEPT OFFERS AN UNUSUAL AMOUNT OF DESIGN FLEXIBILITY AND CAN WITHSTAND LARGE OVERLOADS. THE TRANSDUCER, AS SHOWN IN THE PHASE I RESEARCH, MEETS OR EXCEEDS ALL DOD REQUIREMENTS PROVIDED BY AEDC. FOR PHASE II, FURTHER RESEARCH AND DEVELOPMENT IS PROPOSED, LEADING TO A SELF-CONTAINED MICROPROCESSOR-CONTROLLED SENSING UNIT THAT HAS THE POTENTIAL FOR A WIDE RANGE OF APPLICATIONS IN ADVERSE ENVIRONMENTS AND IS NOT JUST LIMITED TO THE INTENDED MEASUREMENTS.

FLOW INDUSTRIES, INC.
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KENT, WA 98032
DR. J. THOMAS MCMURRAY

NAVY

TITLE:
DEVELOPMENT OF OCEAN INSTRUMENTATION FOR BOUNDARY LAYER MEASUREMENTS UNDER ICE
TOPIC: 115 OFFICE: ONR

MEASUREMENTS OF THE TURBULENT FLUXES OF MOMENTUM, HEAT, AND SALINITY

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-----DEPT

IN THE OCEANIC BOUNDARY LAYER ARE VERY DIFFICULT TO OBTAIN, AS BOTH A STABLE PLATFORM AND HIGH RESOLUTION INSTRUMENTATION ARE REQUIRED. THE ARCTIC OCEAN IS ONE REGION IN WHICH HIGH-QUALITY BOUNDARY LAYER STRESS MEASUREMENTS HAVE BEEN OBTAINED BY USING DRIFTING ICE FLOES AS STABLE PLATFORMS FOR INSTRUMENT DEPLOYMENT. A DOD SBIR PHASE I PROGRAM HAS BEEN CONDUCTED TO DEVELOP A BOUNDARY LAYER INSTRUMENTATION SYSTEM CAPABLE OF MEASURING TURBULENT FLUXES IN THE MARGINAL ICE ZONE ENVIRONMENT. THIS HAS INVOLVED THE FABRICATION OF SMALL, PROPELLER CURRENT METER CLUSTERS WITH FAST-RESPONSE TEMPERATURE AND CONDUCTIVITY SENSORS, THE DEVELOPMENT OF A MICROPROCESSOR-CONTROLLED DATA ACQUISITION INTERFACE, AND A FEASIBILITY STUDY TO EXAMINE THE USE OF DIODE LASERS FOR A HIGH RESOLUTION DIODE LASER DOPPLER VELOCIMETER (DLDV). THE PROPOSED PHASE II EFFORT FOCUSES ON THE FURTHER DEVELOPMENT OF THE DIODE LASER DOPPLER VELOCIMETER TO PRODUCE A HIGH RESOLUTION INSTRUMENTATION CLUSTER FOR THE MEASUREMENT OF TURBULENT FLUXES IN THE OCEANIC BOUNDARY LAYER. THE DEVELOPMENTAL WORK WILL INCLUDE FIELD TESTING OF PHASE I PROTOTYPE SENSORS, THE DEVELOPMENT OF DOPPLER SIGNAL ANALYSIS ELECTRONICS, THE INCORPORATION OF FLOW DIRECTION SENSING, AND THE CONSTRUCTION OF THREE-COMPONENT DLDV-TEMPERATURE/ CONDUCTIVITY CLUSTERS.

FOSTER-MILLER, INC.

AF

350 SECOND AVENUE

WALTHAM, MA 02254

RICHARD LUSIGNEA

TITLE:

ADVANCED POLYMER UTILIZATION (P-83181)

TOPIC: 11c OFFICE: AFWAL/XRPM

THE PURPOSE OF THE PROPOSED PHASE II PROGRAM IS TO ACHIEVE IMPROVED PERFORMANCE IN ENGINEERING STRUCTURES, BASED ON THE EXCEPTIONAL MECHANICAL, CHEMICAL AND THERMAL PROPERTIES OF ORDERED POLYMER MATERIALS. PHASE I IDENTIFIED APPLICATIONS WHERE ORDERED POLYMERS WILL MEET THE SERVICE REQUIREMENTS MORE EFFECTIVELY THAN OTHER MATERIALS. THE PHASE II EFFORT WILL ADDRESS: INNOVATIVE DESIGNS FOR COMPOSITE MATERIALS FROM FIBER, TAPE AND FILM FOR APPLICATION IN SPACE STRUCTURES AND TOUGH COMPOSITE STRUCTURES; AND TESTING TO DETERMINE THE PERFORMANCE OF PROTOTYPE PARTS. THE PROGRAM WILL PRODUCE DATA ON ACTUAL APPLICATIONS WITH THE MATERIALS AND THUS ENCOURAGE THEIR INCORPORATION IN FUTURE DESIGNS.

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-----FOSTER-MILLER, INC.
350 SECOND AVENUE
WALTHAM, MA 02254
ANDREW C. HARVEY

NAVY

TITLE:
VENTILATED BAND SEALS FOR NON-MAGNETIC DIESELS
TOPIC: 54 OFFICE: NAVSEA

A WIDE, ELASTIC, PRESSURE-BALANCED PISTON RING WITH A BACKUP RING WAS ANALYZED AND BRIEFLY TESTED IN PHASE I. IT WAS SHOWN THAT A VERY LOW FACE PRESSURE AND SUBSTANTIAL PRESSURE BALANCING COULD BE STABLY MAINTAINED. A TECHNICAL ADVANCE IN THIS AREA IS NEEDED FOR HIGHER SPECIFIC OUTPUT OR HOTTER (ADIABATIC) ENGINES AS OIL LUBRICATION DETERIORATES WITH INCREASED PRESSURE AND TEMPERATURE. PHASE II WILL REFINE THE DESIGN TOOLS THROUGH ADDITIONAL DEVELOPMENT IN A RING BLOWBY AND FRICTION MEASUREMENT RIG. FULL-SCALE ENGINE TESTS WILL BE CONDUCTED TO COMPARE THE BAND SEAL WITH CONVENTIONAL PISTON RINGS. A PRIMARY PERFORMANCE MEASURE WILL BE THE CYLINDER WALL TEMPERATURE THAT INITIATES RING SCUFFING FOR EACH TYPE OF RING. AN AIR-COOLED DIESEL WITH ADJUSTABLE COOLING BAFFLES AROUND THE TOP OF THE CYLINDER WILL PROVIDE THE VARIABLE WALL TEMPERATURES.

FRANKLIN ENGINEERING, CO., INC.
1902 LONGSHORE DRIVE
ANN ARBOR, MI 48105
CHARLES H. FRANKLIN

ARMY

TITLE:
PNEUMATICALLY DE-ICED STRUCTURAL ICE DETECTOR
TOPIC: 9x OFFICE: COE/CRREL

PHASE II TECHNICAL OBJECTIVES: DEVELOP A NEW PNEUMATIC DE-ICING BOOT CAPABLE OF SHEDDING HARD GLAZE ICE. REFURBISH PHASE I PROBE SYSTEM BASED ON, NEW DE-ICING BOOT DESIGN, AND SOFTWARE MODIFICATIONS SUGGESTED FROM THE PHASE I EXPERIENCE. CONDUCT 1985-86 MT. WASHINGTON ICING TESTS WITH MODIFIED PHASE I PROBE. VERIFY PRELIMINARY SPECIFICATION AND MODIFY AS NECESSARY BASED ON EARLY 1985-86 ICING TESTS. DESIGN, DEVELOP, AND FABRICATE ICE-DETECTION SYSTEM CONTROL

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ELECTRONICS BASED ON PHASE II STATE-OF-THE-ART. DESIGN, DEVELOP.
AND FABRICATE ICE-DETECTION ATMOSPHERIC PROBE BASED ON PHASE II
STATE-OF-THE-ART. FULLY CALIBRATE THE COMPLETE ICE DETECTION SYSTEM.
TEST FINAL PHASE II ICE DETECTION SYSTEM, WINTER 1986-87 ON MT.
WASHINGTON.

FUZETRON METHODS RESEARCH
10303 CENTINELL DR
LA MESA, CA 92041
THOMAS W. OAKES

NAVY

TITLE:
COATINGS TO REDUCE RADAR CROSS SECTION AND REFLECTANCE
IN THE INFRARED AND LASER SPECTRUM
TOPIC: 12 OFFICE: NAVSEA

THERE IS A CONTINUING NEED BY THE NAVY FOR IMPROVED CAMOUFLAGE TO
RENDER OBJECTS LESS VISIBLE FROM CERTAIN BANDS OF ELECTROMAGNETIC
RADIATION, ESPECIALLY RADAR CROSS SECTION REFLECTANCE. VARIOUS
MATERIALS HAVE BEEN APPLIED TO ACCOMPLISH THIS BUT IMPROVEMENTS ARE
NEEDED. THE OVERALL PHASE II OBJECTIVE IS TO CONTINUE RESEARCH AND
DEVELOPMENT OF INNOVATIVE COATINGS TO REDUCE THE REFLECTANCE OF SHIPS
FROM RADAR. DURING THE PHASE I EFFORT, SEVERAL INNOVATIVE COATINGS
WERE DEVELOPED WITH FAVORABLE RESULTS. PHASE II EFFORTS WILL FOCUS
ON UNDERSTANDING THE MECHANICS OF THE SHIFTS AND PEAKS IN ATTENUATION.
EFFORTS WILL BE MADE TO DEVELOP PRODUCTION AND TEST METHODS THAT GIVE
REASONABLE COST AND CONSISTENT PRODUCT QUALITY. WORK WILL BE DONE TO
COMBINE THE MATERIAL DEVELOPMENT WITH THE PRODUCTION AND TEST METHODS
TO DEVELOP COATINGS AND PROCESSES THAT WILL BE USEFUL FOR CONDITIONS
ON NAVY COMBATANT CRAFT.

GENERAL OPTRONICS CORPORATION
2 OLSEN AVENUE
EDISON, NJ 08820
DR. C.S. WANG

ARMY

TITLE:
ASSESSMENT OF SINGLE-MODE FIBER OPTIC TECHNOLOGY ON MISSILE
GUIDANCE
TOPIC: 3g OFFICE: DRSMICOM

A PHASE I STUDY HAS BEEN CONDUCTED TO ASCERTAIN THE ADVANTAGES AND

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POTENTIAL DIFFICULTIES INVOLVED IN THE APPLICATION OF SINGLE-MODE OPTICAL FIBER TO MISSILE GUIDANCE. IT DETERMINED THAT THE STRENGTH CHARACTERISTICS OF SINGLE-MODE FIBER ARE ESSENTIALLY THE SAME AS THOSE OF MULTI-MODE FIBER. IT ALSO DETERMINED THE OPTIMUM OPERATING WAVELENGTH FOR UTILIZATION OF SINGLE-MODE OPTICAL FIBER IN MISSILE GUIDANCE IS 1.3 MICRONS. AT THAT WAVELENGTH, A 10MHZ VIDEO SIGNAL HAVING A SIGNAL-TO-NOISE RATIO OF BETTER THAN 50DB CAN BE TRANSMITTED OVER A SINGLE-MODE FIBER WITH A RANGE OF 71.4 KILOMETERS. INFRARED IMAGE SEEKER SIGNALS GENERATING 100MBITS DATA CAN BE TRANSMITTED OVER A RANGE OF 64.7 KILOMETERS AT A BIT-ERROR RATE OF 10 TO THE 9TH POWER. THE MISSILE RANGES ARE THE RESULT OF CONSIDERING THE CURRENT STATE-OF-THE-ART PEAK POWER OF 4 MILLIWATTS WHICH MAY BE COUPLED INTO A SINGLE-MODE FIBER AT 1.3 MICROMETERS FROM A LASER. A RESEARCH AND DEVELOPMENT PROGRAM IS PROPOSED FOR EXTENDING THIS PEAK COUPLED POWER TO 20 MILLIWATTS THEREBY EXTENDING THE MISSILE RANGE BEYOND 100 KIOMETERS FOR TRANSMITTING BOTH ANALOG VIDEO AND DIGITAL INFRARED SEEKER IMAGERS.

GENERAL RESOURCES CORPORATION AF
207 POWELL STREET, #800
SAN FRANCISCO, CA 94102
THOMAS T. RILEY
TITLE:
REAL TIME IONOSPHERIC REFRACTION CORRECTION
TOPIC: 6 OFFICE: AFGL/XOP

SIMPLE MEASUREMENTS OF ORDINARY AND EXTRAORDINARY CRITICAL FRE- QUENCIES TOGETHER WITH INFORMATION ON TOTAL ELECTRON CONTENT MAY BE COUPLED WITH A PHYSICAL (FIRST-PRINCIPLE) MODEL TO PRODUCE A DESCRIPTION OF THE ELECTRON CONCENTRATION IN THE IONOSPHERE. TOTAL ELECTRON CONTENT IS ROUTINELY MEASURED USING SATELLITE-TO-GROUND RADIO LINKS. WE ARE DEVELOPING SIMPLE, COMPLEMENTARY SYSTEMS, CALLED "IONOSPHERIC MEASUREMNT SYSTEMS" (IMS), THAT ACCURATELY MEASURE THE ORDINARY-AND EXTRAORDINARY-MODE CRITICAL FREQUENCIES.

GENERAL TECHNOLOGY APPLICATIONS, INC. NAVY
12343(D) SUNRISE VALLEY DRIVE
RESTON, VA 22091
DR. ALBERT F. HADERMANN
TITLE:
SAFE/ECONOMICAL PROCESSES FOR ROCKET AND GUN
PROPELLANT MANUFACTURE
TOPIC: 34 OFFICE: NAVSEA

GENERAL TECHNOLOGY APPLICATIONS, INC (GTA) HAS MADE DISCOVERIES WHICH

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RESULT IN LOW SHEAR, LOW FRICTION, TIME-INSENSITIVE BLENDING AND MIXING OF CHEMICALLY REACTIVE AND PHYSICALLY INTERACTIVE MATERIALS. PHASE I OF THIS PROGRAM HAS DEMONSTRATED THE TECHNICAL FEASIBILITY OF APPLYING THE GTA PROCESS TO THE MANUFACTURE OF HIGHLY ENERGETIC PROPELLANTS AND HAS IDENTIFIED VARIOUS SAFETY AND COST IMPROVEMENTS POSSIBLE. GTA PROPOSES IN FOLLOW-ON WORK TO DESIGN, ENGINEER, PROCURE, INSTALL AND TEST EQUIPMENT WHICH PROVIDES A PRE-PRODUCTION OF PROCESSING CAPABILITY TO PRODUCE BOTH INERT AND LIVE SAMPLES FOR FUTURE TESTING. THIS PROPOSAL CONSISTS OF TWO PARTS: A FOUR MONTH MODIFICATION OF PHASE I AND A PHASE II. THE TASKS TO BE PERFORMED IN THE PHASE I MODIFICATION RE: 1) OBTAIN AND ANALYZE PERFORMANCE DATA AND DESIGN SPECIFICATIONS FOR CANDIDATE EQUIPMENT TO BE PROCURED, 2) CONDUCT A LITERATURE SEARCH FOR THE MOST PROMISING BINDER SYSTEMS COMMERCIALLY AVAILABLE, AND 3) IN CONJUNCTION WITH THE POLYMER SEARCH, MAKE EXTRUDED STRANDS OF SIMULANT PROPELLANT WITH VARIOUS BINDER MATERIALS AND SUBMIT THEM FOR TESTING AT GOVERNMENT LABORATORIES. PHASE II CONSISTS OF THE DESIGN, PROCUREMENT, FABRICATION, INSTALLATION AND TEST OF A PROTOTYPE PROCESSING SYSTEM. THIS EQUIPMENT WILL BE USED TO PRODUCE STRANDS OF INERT PROPELLANT FOR FURTHER GOVERNMENT TESTING. UPON COMPLETION OF INERT TESTING, THE UNIT WILL BE USED TO PRODUCE ENERGETIC PROPELLANT, TO BE TESTED FOR MECHANICAL AND BALLISTICS PROPERTIES AT DESIGNATED GOVERNMENT FACILITIES.

GEO-CENTERS, INC.
320 NEEDHAM STREET
NEWTON UPPER FALL, MA 021
EDWARD D. PETROW

DARPA

TITLE:
INFRARED OPTICAL WAVEGUIDES FOR REMOTE POWERING OF SMALL UNDERSEA DEVICES
TOPIC: 1c OFFICE: DARPA

THESE EFFORTS REPRESENT THE LOGICAL CONTINUATION OF THE FY 1983 PHASE I SBIR EFFORTS IN TOPIC 1c, WHICH AIMED PRIMARILY AT DEVELOPING NEW CONCEPTS FOR LOW WATTAGE UNDERSEA POWER SOURCES SUITABLE FOR POWERING SENSOR OR REPEATER NODES IN SYSTEMS SUCH AS ARIADNE. SPECIFIC OBJECTIVES: a. DETERMINE THE PRACTICAL PROBLEMS INVOLVED IN TRANSMITTING HIGH OPTICAL POWERS OVER LARGE DISTANCES BY DEMONSTRATING A HIGH POWER TRANSMISSION SYSTEM USING FUSED SILICA FIBER, A Nd:YAG LASER OPERATING AT A WAVELENGTH OF 1.319 MICRONS, 10 WATTS OF OPTICAL POWER INPUT TO THE FIBER LENGTH 10 KM AND ELECTRO-OPTIC POWER CONVER-

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SION. b. CONDUCT EXPERIMENTS TO COUPLE 1 LARGE AMOUNTS OF OPTICAL POWER INTO SAMPLE OF FLOURIDE GLASS OPTICAL FIBERS TO BE PROVIDED BY NRL. IN THE PHASE I EFFORT, GEO-CENTERS SUCCESSFULLY DEVELOPED AND CODED A MODEL DETERMINE THE TRANSMISSION THROUGH AN OPTICAL FIBER AND USED THIS TO PERFORM INITIAL CALCULATIONS OF THE FEASIBILITY OF OPTICAL POWERING OF REMOTE COMPONENTS. IT WAS SHOWN THAT THE BEST CURRENT FIBERS YIELD RANGES OF ONLY TENS OF KILOMETERS, BUT THAT DEVELOPMENT OF ULTRA-LOW LOSS FIBERS WOULD PERMIT POWER LEVELS ON THE ORDER OF A WATT TO BE TRANSMITTED FOR SOME THOUSANDS OF KILOMETERS, DEPENDING ON RAMAN SCATTERING.

GEO-CENTERS, INC. ARMY
320 NEEDHAM STREET
NEWTON UPPER FALL, MA 02164
DR. PETER P. OSTROWSKI
TITLE:
SOFT IGNITION SYSTEM FOR SELF CONTAINED MUNITIONS
TOPIC: 3a OFFICE: DRDAR-ARDC

THE PROPOSED PHASE II "SOFT IGNITION SYSTEM FOR SELF CONTAINED MUNITIONS" WILL RELY ON A LASER/FIBER OPTIC (LFO) SYSTEM TO ACHIEVE SIMULTANEOUS MULTIPLE POINT IGNITION AT SEVERAL AXIAL AND RADIAL POSITIONS WITHIN THE PROPELLING CHARGE. PROTOTYPE DEMONSTRATION TESTING WILL BE CONDUCTED WITH CENTER-CORE IGNITER TUBE DESIGNS, OUTSIDE-IN DESIGNS, AND OTHER IGNITION CONFIGURATIONS. THESE FULL-SCALE EXPERIMENTS AND ASSOCIATED LABORATORY RESEARCH WILL DEMONSTRATE AN IGNITION SYSTEM WITH UNIFORM FLAME-SPREAD CHARACTERISTICS. REDUCTION OR ELIMINATION OF THE UNPREDICTABLE ACCELERATION DEVIATIONS AND/OR LONGITUDINAL PRESSURE WAVES IS POSSIBLE WITH THE EMPLOYMENT OF A SOFT IGNITION SYSTEM.

GREENBRIAR SYSTEMS, INC. ARMY
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VIENNA, VA 22180
DIXON CLEVELAND
TITLE:
ADAPTIVE RESOURCE ALLOCATION FOR ADVANCED ELINT/ESM SYSTEMS
TOPIC: 1n OFFICE: CECOM/EWRSTA

GREENBRIAR SYSTEMS' SBIR PROJECT ADDRESSES ELINT/ESM INFORMATION

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-----DEPT

PROCESSING RESEARCH FOR REAL-TIME DETECTION, CHARACTERIZATION, IDENTIFICATION, AND LOCATION OF RADAR EMITTERS ON A BATTLEFIELD. GIVEN THE PREDICTED GROWTH OF PULSE DENSITIES IN THE ELECTRONIC ENVIRONMENT, AND THE PROLIFERATION OF AGILE RADARS FURTHER COMPLICATING THE SPECTRAL COMPOSITION, IT BECOMES NECESSARY TO APPLY STATE-OF-THE-ART PROCESSING TECHNOLOGY WITHOUT INCURRING SIZE OR WEIGHT PENALTIES IN THE ELINT/ESM EQUIPMENT. FROM THE VIEWPOINT OF INFORMATION PROCESSING, IT IS DESIRABLE TO OBTAIN MORE USEFUL ELECTRONIC ORDER OF BATTLE INFORMATION FOR LESS COMPUTATIONAL WORK OR WITH LESS EQUIPMENT; THAT IS, TO OBTAIN MORE ACCURATE, COMPLETE, AND RELEVANT INFORMATION ABOUT A COMPLEX EMITTER ENVIRONMENT WHILE MAINTAINING OR REDUCING THE COMPLEXITY OF THE PROCESSING EQUIPMENT. THE OBJECTIVE OF AN ADVANCED ESM SYSTEM, THEREFORE, IS TO SYNTHESIZE, FROM MEASUREMENTS MADE ON ENEMY RADAR TRANSMISSIONS, A COMPLETE, ACCURATE, AND UP-TO-DATE REPRESENTATION OF A SPECIFIC SEGMENT OF THE ENEMY'S EOB. IN PHASE I, IT WAS DEMONSTRATED THAT THE USE OF INFORMATION FEEDBACK CONTROL CAN SIGNIFICANTLY IMPROVE THE QUALITY OF EOB INFORMATION WITHOUT INCREASING THE COMPLEXITY OF THE HARDWARE. THE PURPOSE OF PHASE II IS TO COMPLETE THE DEVELOPMENT OF INFORMATION-BASED PROCESSING ALGORITHMS.

GUILD ASSOCIATES, INC.
7030 D HUNTLEY ROAD
COLUMBUS, OH 43229
MR. JOHN SCHLAECHTER

ARMY

TITLE:
DEVELOPMENT OF LIGHTWEIGHT HIGH CAPACITY PORTABLE OXYGEN SYSTEMS
FOR BATTLEFIELD MEDICAL SUPPORT
TOPIC: 6u OFFICE: SGRD-MRDC

THIS PROJECT SEEKS TO DEVELOP AN ADVANCED, PORTABLE OXYGEN GENERATOR FOR USE BY MEDICAL SUPPORT STAFF TO TREAT CASUALTIES IN FORWARD POSITIONS. THE DEVELOPMENT MAKES USE OF AN ADVANCED PRESSURE-SWING ADSORPTION (PSA) CONCEPT SPECIFICALLY DESIGNED FOR HIGH CAPACITY-TO-WEIGHT, LOW MAINTENANCE AND HIGH RELIABILITY CHARACTERISTICS. UTILIZING EXISTING EXPERIMENTAL DEVELOPMENT FACILITIES AND SOPHISTICATED ANALYTICAL TECHNIQUES, THE EFFECTS OF CONTAMINANTS SUCH AS CHEMICAL AGENTS AND OTHER NOXIOUS SPECIES AS WELL AS CLIMATIC EXTREMES ON THE UNIT'S PRODUCTION CAPABILITY ARE TO BE ESTIMATED. PHASE II HAS BEEN FORMULATED TO EXPAND UPON THE WORK ACCOMPLISHED IN PHASE I. THE OBJECTIVE OF THE PHASE II PROGRAM WILL BE TO PRODUCE FOUR PROTOTYPES

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THAT WILL SUCCESSFULLY ENDURE US ARMY TESTING WITH MINIMAL MODIFICATION. THE SPECIFIC TASKS COMPRISING PHASE II PROVIDE A SOLID BASIS FOR THE PHASE III PRODUCTION. THE FIRST SEVEN PROPOSED TASKS PROVIDE THE TRANSITION FROM THE PHASE I EFFORT TO THE WORK DIRECTLY RELATED TO PROTOTYPE PRODUCTION. THE BALANCE OF THE EFFORT IS DEVOTED TO PROTOTYPE FABRICATION, CHECKOUT AND DELIVERY.

H.S.S. INC.
2 ALFRED CIRCLE
BEDFORD, MA 01730
DONALD F. HANSEN

ARMY

TITLE:
REMOTE TACTICAL AREA WEATHER SENSOR
TOPIC: 1g OFFICE: LABCOM/ASL

A PORTABLE METEOROLOGICAL SENSOR CAPABLE OF MEASURING BOTH VISIBILITY AND PRESENT WEATHER PARAMETERS IS PROPOSED. THE INSTRUMENT WILL BE SMALL, LIGHTWEIGHT, OF RUGGED CONSTRUCTION, BE BATTERY POWERED WITH A VERY SMALL POWER REQUIREMENT, AND REQUIRED A MINIMUM OF SERVICING. VISUAL RANGE COVERAGE WILL BE FOUR ORDERS OF MAGNITUDE WITH OPTIONAL COVERAGE SETTINGS. A TYPICAL COVERAGE IS FROM 50 FEET TO 100 MILES. PRESENT WEATHER CAPABILITIES ENCOMPASS THE DETECTION, IDENTIFICATION AND INTENSITY MEASUREMENT OF ALL FORMS OF PRECIPITATION. THE SENSOR WILL BE CAPABLE OF RECOGNIZING FOG IN THE PRESENCE OR ABSENCE OF ANY FORM OF PRECIPITATION. WHEN THE RELATIVE HUMIDITY IS LESS THAN 80 PERCENT THE INSTRUMENT CAN RECOGNIZE SMOKE OR DUST AS THE OBSTRUCTION TO VISION. THE THRESHOLD OF RAIN DETECTION WILL BE APPROXIMATELY 0.001 INCHES PER HOUR. THE THRESHOLD FOR SNOW DETECTION WILL BE APPROXIMATELY 0.0001 INCHES PER HOUR OF EQUIVALENT WATER CONTENT.

HAUSER LABORATORIES
P.O. BOX G, 5680 CENTRAL AVENUE
BOULDER, CO 80306
DEAN P. STULL

ARMY

TITLE:
NOVEL METHOD OF DENTAL ANESTHESIA
TOPIC: 6p OFFICE: SGRD-MRDC

APPLICATION OF ELECTRONIC NERVE STIMULATION FOR PAIN CONTROL

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(ELECTROANESTHESIA) IS A PROMISING TECHNIQUE. STUDY OF THIS TECHNIQUE FOR DENTAL ANESTHESIA IS NOW POSSIBLE DUE TO HARDWARE DEVELOPED DURING PHASE I SBIR CONTRACT DAMD17-84-C-4030. APPLICATION OF THE ELECTRODE ATTACHMENT HARDWARE AND ELECTRIC CURRENT GENERATION HARDWARE TO CLINICAL STUDIES WILL PROVE THE EFFECTIVENESS OF ELECTROANESTHESIA IN DENTAL APPLICATIONS. THE HARDWARE DESIGN WILL BE IMPROVED AND FINALIZED DURING THIS PHASE II RESEARCH. COMMON DENTAL PROCEDURES REQUIRING ANESTHESIA WILL BE STUDIED AND THE EFFECTIVENESS OF THE ELECTROANESTHESIA DETERMINED. THE MOST EFFECTIVE LOCATION AND MODE OF ELECTRODE ATTACHMENT WILL BE ESTABLISHED AS WILL THE MOST EFFECTIVE ELECTRICAL PARAMETERS. IMPROVEMENTS IN THE HARDWARE WILL BE MADE AS NECESSARY, BASED UPON THE OUTCOME OF THE CLINICAL STUDIES.

HUMAN PERFORMANCE RESEARCH INC.
616 CARLO DRIVE
GOLETA, CA 93117
GAIL J. BORDEN

NAVY

TITLE:

ANALYSIS OF PECUIAR DEMANDS OF INTERIOR COMMUNICATIONS
IN USN SURFACE COMBATANTS

TOPIC: 42 OFFICE: NAVSEA

THE GOAL OF THIS STUDY IS TO ENHANCE THE OPERATIONAL READINESS OF SURFACE COMBATANT SHIPS BY IMPROVING THE DESIGN OF INTERIOR COMMUNICATION SYSTEMS USED BY SHIPBOARD PERSONNEL TO COMMAND, CONTROL, COORDINATE, AND SUPPORT SURFACE COMBATANT OPERATIONS. DRAMATIC CHANGES HAVE OCCURRED OVER THE PAST TWENTY YEARS IN THE COMPLEXITY AND TEMPO OF SURFACE COMBATANT OPERATIONS. THE DESIGN OF INTERIOR COMMUNICATION SYSTEM HAS NOT KEPT PACE WITH THESE CHANGES. FOR THE MOST PART, COMMUNICATION SYSTEMS HAVE REMAINED UNCHANGED IN DESIGN SINCE WORLD WAR II. AS A RESULT, INADEQUACIES EXIST IN PRESENT SYSTEMS THAT ARE SERIOUSLY COMPROMISING THE CAPABILITY OF SHIPBOARD PERSONNEL TO PERFORM THEIR JOBS. YET, DURING THIS SAME TIME PERIOD, THE COMMUNICATION INDUSTRY HAS MADE SIGNIFICANT ADVANCEMENTS IN COMMUNICATION TECHNOLOGY IN BOTH THE COMMERCIAL AND MILITARY SECTORS. THE PURPOSE OF THIS STUDY IS TO ENABLE THE NAVY TO APPLY THIS TECHNOLOGY BY IDENTIFYING REQUIREMENTS FOR IMPROVING THE DESIGN OF INTERIOR COMMUNICATION SYSTEMS THAT ARE CONSISTENT WITH THE TASK REQUIREMENTS OF PRESENT AND FUTURE SURFACE COMBATANT PERSONNEL.

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IAP RESEARCH, INC.
7546 MCEWEN ROAD
DAYTON, OH 45459
JOHN P. BARBER

AF

TITLE:
MEGAMPERE PULSED POWER SOURCE
TOPIC: 13a OFFICE: AFWAL/XRP-PO

SUPERCONDUCTING, INDUCTIVE ENERGY STORES HAVE VERY ATTRACTIVE CHARACTERISTICS FOR MANY AIR FORCE PULSED POWER APPLICATIONS. THEY HAVE VERY HIGH ENERGY DENSITIES, LOW LOSSES AND CONSTANT CURRENT OUTPUT CHARACTERISTICS. UNFORTUNATELY, THEY ARE LIMITED TO RELATIVELY LOW CURRENT LEVELS, UNSUITABLE FOR SOME OF THE MOST IMPORTANT APPLICATIONS. IN PHASE 2, WE PROPOSE TO DEMONSTRATE A PULSE TRANSFORMER/ENERGY STORAGE CONCEPT WHICH COMBINES THE GOOD FEATURES OF CRYOGENIC INDUCTIVE STORES WITH THE HIGH CURRENT OUTPUT OF NORMAL INDUCTORS.

INCOSYM, INC.
780 LAKEFIELD ROAD, SUITE E
WESTLAKE VILLAGE, CA 91361
ROBERT J. CRAIG

ARMY

TITLE:
GYROCOMPASS WITH REDUCED SUSCEPTIBILITY TO SHOCK,
VIBRATION AND MOTION
TOPIC: 7kk OFFICE: COE/ETL

ANALYSIS WAS PERFORMED UNDER PHASE I TO DETERMINE A MECHANIZATION FOR A NORTHFINDING SYSTEM USING A SINGLE TWO-AXIS, DYNAMICALLY TUNED GYRO TO DETERMINE EARTH RATE AND A SINGLE TWO-AXIS ACCELEROMETER, USED AS AN INCLINOMETER, TO DETERMINE LEVEL. A BREADBOARD SYSTEM WAS BUILT, SOFTWARE WAS WRITTEN, AND TESTS WERE PERFORMED TO ESTABLISH THE FEASIBILITY AND PRACTICALITY OF THE APPROACH. WORK IN PHASE II WILL BE TO DESIGN AND FABRICATE HARDWARE THAT CAN DEMONSTRATE THE CAPABILITY OF MEETING ARMY FIELD REQUIREMENTS FOR FINDING TRUE NORTH AND MEASURING INCLINATION. THE HARDWARE WILL THEN BE TESTED IN THE LAB AND ALSO A VEHICLE. THE HARDWARE WILL BE THE PROPERTY OF THE U.S. GOVERNMENT WHEN PHASE II IS COMPLETED.

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INTEGRATED SYSTEMS, INC.
151 UNIVERSITY AVE., SUITE 400
PALO ALTO, CA 94301
NAREN K. GUPTA

AF

TITLE:

COMPUTER-AIDED-DESIGN SOFTWARE FOR SOLVING TWO-POINT BOUNDARY VALUE PROBLEMS

TOPIC: 17d OFFICE: AD/CZO

OPTIMIZATION METHODS CAN SIGNIFICANTLY IMPROVE SYSTEM DESIGN AND OPERATION, THROUGH OPTIMAL SELECTION OF SYSTEM CHARACTERISTICS WITHIN COST, VOLUME, WEIGHT AND OTHER CONSTRAINTS. EVEN THOUGH OPTIMIZATION THEORY IS WELL DEVELOPED, IT HAS HAD LITTLE IMPACT ON SYSTEM DESIGN BECAUSE OPTIMIZATION ALGORITHMS ARE NOT AVAILABLE AS CONVENIENT DESIGN TOOLS. THE PROPOSED PHASE II WORK WILL DEVELOP AN INTERACTIVE, USER-FRIENDLY SOFTWARE PACKAGE TO ENABLE APPLICATION OF OPTIMIZATION TECHNOLOGY TO GENERAL DYNAMIC SYSTEMS. THE RESULTS WILL BE PRESENTED GRAPHICALLY. THE PACKAGE WILL BE USABLE BY ENGINEERS.

JP LABORATORIES
P.O. BOX 636, 212 DURHAM AVE
METUCHEN, NJ 08840
DR GORDHAN N. PATEL

ARMY

TITLE:

DOSIMETER FOR CHEMICAL AGENTS

TOPIC: 6j OFFICE: SGRD-MRDC

TWO DOSIMETER DEVICES ARE PROPOSED FOR DETECTION OF HIGHLY TOXIC AGENTS SUCH AS NERVE AGENTS AND VESICANTS. THE COMPOSITIONS USED FOR THE FIRST DEVICE WOULD UNDERGO SOLID STATE CATALYTIC CHAIN REACTION TO PRODUCE HIGHLY COLORED COMPOSITIONS, WHEN EXPOSED TO THE TOXIC AGENTS. AS THE AGENTS WOULD ACT AS CATALYSTS, THE YIELD OF THE COLORED COMPOSITIONS WILL BE VERY HIGH AND HENCE THE DEVICE IS EXPECTED TO BE VERY SENSITIVE. THE SECOND DEVICE IS BASED ON CHANGE IN ELECTRICAL CONDUCTIVITY OF COMPOSITIONS WHICH WHEN REACT WITH THE TOXIC AGENTS, WOULD UNDERGO SUBSTANTIAL CHANGE IN CONDUCTIVITY. AS EXPECTED TO BE EXTREMELY SENSITIVE. THIS DEVICE ALSO CAN BE AUTOMATED AND MINIATURIZED. THE PROPOSED DEVICES WOULD DETECT THE AGENTS, AS WELL AS DETERMINE THE TOTAL EXPOSURE (DOSIMETER) AND HENCE, CAN BE USED AT THE WAR FRONTS, PRODUCTION AND STORAGE FACILITIES, AND IN THE

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HOSPITAL LABORATORIES AS AN EARLY WARNING SYSTEM TO PREVENT INJURIES
AND DEATHS.

KUNZ ASSOCIATES, INC.

ARMY

P.O. BOX 25085

ALBUQUERQUE, NM 87191

DR. KAISER S. KUNZ

TITLE:

BROADBAND HIGH-POWER EW ANTENNA

TOPIC: 2 OFFICE: CECOM/EWRSTA

THE BROADBAND HIGH-POWER EW ANTENNA (BHEWA) DESIGNED IN PHASE I AS A JAMMER USEFUL IN ELECTRONIC WARFARE REQUIRES THE USE OF ELECTROOPTIC AND LOW-LOSS DIELECTRIC MATERIALS THAT ARE NOT YET AVAILABLE. THE STATE-OF-THE-ART KNOWLEDGE OF CERAMIC MATERIALS INSURES THAT THESE MATERIALS CAN BE PRODUCED BY A SOLID SOLUTION OF TWO OR MORE COMPOUNDS OF KNOWN ELECTROOPTIC AND DIELECTRIC PROPERTIES. SINCE THESE ARE ESSENTIALLY NEW MATERIALS, WE CAN NOT HOPE AT THIS STAGE TO OBTAIN THEM IN THE SIZES AND SHAPES REQUIRED BY THE BHEWA. KUNZ ASSOCIATES, INC. (KAI) HAS ARRANGED WITH THE MATERIALS RESEARCH LABORATORY OF PENNSYLVANIA STATE UNIVERSITY TO PROVIDE THESE MATERIALS IN SMALL PIECES 1" X 12" OR 1" X 1" USING THE MOST ADVANCED TECHNIQUES KNOWN. KAI IN COOPERATION WITH PHYSICAL SCIENCE LABORATORY, NMSU WILL CHECK ON THE PROPERTIES OF THE MATERIALS AND ASSEMBLE THEM IN A TEST ANTENNA TO VERIFY THE PRINCIPLE OF ELECTROOPTIC DEFLECTION OF A MICROWAVE BEAM. KAI WILL ALSO CHECK THE OVERALL BEHAVIOR OF THE MICROWAVE BEAM IN THE BHEWA USING STATE-OF-THE-ART NUMERICAL TECHNIQUES.

L'GARDE, INC.

AF

1555 PLACENTIA AVENUE

NEWPORT BEACH, CA 92663

GILBERT J. FRIESE

TITLE:

HIGH-ACCURACY INFLATABLE REFLECTORS -- PHASE I (LTP-182)

TOPIC: 3 OFFICE: AFRPL/TSPR

ON PHASE I OF THIS PROGRAM, THE FEASIBILITY TO OBTAIN SURFACE
ACCURACIES ON THE ORDER OF 0.1MM RMS USING INFLATABLE REFLECTORS WAS

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DEMONSTRATED. PHASE II WILL DETERMINE WHAT SYSTEM CONSTRAINTS SUCH AS THERMAL EXPANSION, DYNAMICS, AND HARD-STRUCTURE INTERFACES, MIGHT HAVE ON SUCH ACCURACY. ALSO, THE TECHNIQUES FOR OBTAINING HIGH-ACCURACY DISCOVERED ON THE FIRST PHASE I WILL BE APPLIED TO GENERATE 1 AND 3 METER DIAMETER PARABOLOIDS. KAPTON AND TEDLAR WILL BE CONSIDERED IN ADDITION TO MYLAR USED ON PHASE I. THE TECHNIQUE TO HOLD THE MAXIMUM DIAMETER USING A RIGIDIZED TORUS WILL BE DEVELOPED THROUGH ANALYSIS AND TESTING. A REFLECTOR MOUNTED ON SUCH A TORUS WILL BE CONSTRUCTED AND ITS SURFACE ACCURACY MEASURED.

L.N.K. CORPORATION
302 NOTLEY COURT
SILVER SPRING, MD 20904
BARBARA A. LAMBIRD

NAVY

TITLE:

AN A.I. APPROACH FOR TARGET RECOGNITION IN
REAL BATTLE ENVIRONMENTS

TOPIC: 113 OFFICE: NAVAIR

AUTOMATED ANALYSIS OF INVERSE SYNTHETIC APERTURE RADAR (ISAR) IMAGERY IS OF CONSIDERABLE IMPORTANCE TO THE NAVY BECAUSE OF APPLICATIONS TO SHIP DETECTION UNDER ADVERSE OPTICAL VISIBILITY CONDITIONS SUCH AS CLOUD COVER AND NIGHT. L.N.K. IS PROPOSING A FLEXIBLE ARTIFICIAL INTELLIGENCE APPROACH AS A STEP TOWARD THE SOLUTION OF THIS PROBLEM. WE PROPOSE THE DEVELOPMENT OF A PROTOTYPE SOFTWARE ISAR SHIP IMAGE CLASSIFICATION SYSTEM WHICH CAN OPERATE IN EITHER AN INTERACTIVE OR FULLY AUTOMATIC MODE. THE PARADIGM ON WHICH THE SYSTEM IS BASED USES AN ITERATIVE FEATURE EXTRACTION AND CLASSIFICATION SCHEME WHICH WOULD BE USED TO IDENTIFY A SHIP AS A MEMBER OF A PARTICULAR NAVAL CLASS OR AS A NONCOMBATANT. A KEY FEATURE OF THE PROPOSED SYSTEM IS THE INCORPORATION OF L.N.K.'s FLEXIBLE SEARCH APPROACH, THE NON-DIRECTIONAL SEARCH AND ANALYSIS SYSTEM (NOSAS) WHICH WOULD BE USED TO DRIVE THE SHIP IDENTIFICATION PROCESS. IN PHASE I OF THIS PROJECT, PRELIMINARY STUDIES WITH PARALLEL VERSIONS OF THIS ALGORITHM INDICATED THAT A SUBSTANTIAL IMPROVEMENT IN SEARCH PERFORMANCE CAN BE EXPECTED IF THE SEARCH ALGORITHM IS IMPLEMENTED ON PARALLEL HARDWARE. WE PROPOSE THE DEVELOPMENT OF A PARALLEL HARDWARE IMPLEMENTATION OF THE SEARCH ALGORITHM TO SUBSTANTIATE OUR PREVIOUS SIMULATION RESULTS ON SEARCH SPEEDUP.

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LAUREN MANUFACTURING COMPANY
2228 REISER AVE. SE
NEW PHILADELPHIA, OH 44663
FRANCIS M. DAUGHERTY

ARMY

TITLE:

FLOURELASTOMER COATINGS FOR MATERIALS PROTECTION IN CHEMICAL
WARFARE ENVIRONMENT

TOPIC: 4c OFFICE: DRXMR-TACOM

LAUREN MANUFACTURING COMPANY WILL SCREEN, DEVELOP, AND EVALUATE POLYMERIC MATERIALS, POLYMER BLENDS, AND RELATED POLYMERIC MATERIAL COATINGS FOR PROTECTION OF NON-METALLIC COMPONENTS AGAINST SIMULTANEOUS CW AGENT AND DECONTAMINANT EXPOSURES. THE EMPHASIS OF THE EFFORT WILL BE ON THE MODIFICATION AND EXTENSION OF LAUREN'S FLUORO-ELASTOMER COATING TECHNOLOGY, WHICH HAS BEEN SHOWN TO HAVE MAJOR POTENTIAL APPLICATION IN THE PROTECTION OF NON-METALLIC COMPONENTS AGAINST CW-RELATED THREATS.

LEHRER-PEARSON, INC.
1175 KOTTINGER DRIVE
PLEASANTON, CA 94566
J. W. PEARSON

AF

TITLE:

RESEARCH ON THE CORRELATION BETWEEN ELECTROSTATIC FIELD INTEGRITY
AND THE PERFORMANCE OF ELECTRON GUNS

TOPIC: 11i OFFICE: AFWAL/XRPM

THE COMBINATION OF THE PRECISION ELECTRON GUN DEVELOPED DURING PHASE I WITH THE PRECISION CATHODE PROMISES TO IMPROVE BEAM QUALITY BY SOME UNKNOWN EXTENT. PHASE II WILL USE PHASE I DATA TO REFINE THE FUN ELECTRODE POSITION WITH RESPECT TO THE CATHODE PLUS A COMPUTER ANALYSIS OF FOCUSING RING/CATHODE AXIAL POSITION FOR OPTIMUM BEAM TESTER TESTS WHICH SIMULATES A TWT, PLUS BUILDING A TWT USING THE SELECTED FUN DESIGN, AND COMPARING THE RESULTS WITH THE SAME MODE TWT USING A CONVENTIONAL GUN AND CATHODE.

MATERIELS CONCEPTS, INC.
666 NORTH HAGUE AVENUE
COLUMBUS, OH 43204
WENDELL J. MEYERER

ARMY

TITLE:

THE FEASIBILITY OF USING ULTRASONICS TO ENHANCE LIQUID METAL
INFILTRATION OF REINFORCING YARNS AND FIBERS

TOPIC: 7f.1 OFFICE: BRDC

SINCE PHASE I RESULTS INDICATE THAT THERE IS A DEFINITE ENHANCEMENT

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OF LIQUID METAL INFILTRATION THROUGH THE USE OF ULTRASONIC ENERGY, IT IS PROPOSED TO PREPARE SUFFICIENT PRECURSER WIRE BY THIS TECHNIQUE TO MAKE LABORATORY SIZE TEST PANELS OF GRAPHITE ALUMINUM COMPOSITE. THE PANEL WILL BE USED TO DETERMINE IF THE MECHANICAL PROPERTIES TRANSVERSE TO THE FIBER DIRECTION ARE IMPROVED OVER TEST PANELS MADE BY CONVENTIONAL INFILTRATION METHODS. DURING PHASE II OF THE SUBJECT SBIR EFFORT, THE PHYSICAL LIMITS OF SONIC DISPERSION OF SiCp INTO PURE MOLTEN ALUMINUM WILL BE DEFINED, I.E., PARTICULATE WILL BE ADDED TO THE MELT VIA SONIC DISPERSION UNTIL DISPERSION OF ADDITIONAL SOLID CAN NO LONGER BE ACHIEVED. SOLIDIFICATION AND MACHINING METHODS WILL BE OPTIMIZED. ONCE THE DISPERSION LIMITS HAVE BEEN DEFINED, AT LEAST FOUR SEPARATE INGOTS HAVING DIFFERENT LEVELS OF DISPERSED SiCp WILL BE CAST, MACHINED INTO TEST PANELS AND CHARACTERIZED FOR MECHANICAL PROPERTIES. FUNDING OF THE FINAL INCREMENT WILL DEPEND ON THE OUTCOME OF THE FIRST INCREMENT AND THE AVAILABILITY OF FUNDS.

MAXDEM INC
267 S. FAIR OAKS AVENUE
PASADENA, CA 91105
ROBERT R GAGNE
TITLE:

ARMY

A PORTABLE OXYGEN CONCENTRATOR FOR EMERGENCY MEDICAL USE
TOPIC: 6u OFFICE: SGRD-RMA

THE MAXDEM OXYGEN PUMP IS A NOVEL ELECTROCHEMICAL PROCESS FOR CONCENTRATING OXYGEN FROM AIR. IT IS RADICALLY DIFFERENT FROM ANY OTHER MEANS OF OBTAINING PURE OXYGEN. THE OXYGEN PUMP IS EXTREMELY SIMPLE IN CONCEPT. EXCEPT FOR A SMALL FAN TO CIRCULATE AIR, THERE ARE NO MOVING PARTS, PROVIDING FOR QUIET OPERATION. THIS NEW TECHNOLOGY FOR CONCENTRATING OXYGEN IS PROJECTED TO BE 4 - 5 TIMES MORE EFFICIENT THAN THE BEST PRESSURE SWING ABSORPTION DEVICES AND TO HAVE ADDITIONAL SIZE AND WEIGHT ADVANTAGES. MAXDEM WILL EXTEND THE SUCCESSFUL PHASE I WORK ON THE OXYGEN PUMP TO FULL SCALE LABORATORY TEST CELLS. THE PERFORMANCE WILL BE IMPROVED BY MATCHING THE PROPERTIES OF THE COMPONENT MATERIALS TO THE OBSERVED CHEMISTRY. BOTH SURFACE AND SOLUTION CHEMISTRY PLAY A ROLE IN OVERALL EFFICIENCY AND WILL BE INVESTIGATED. ENGINEERING AND CHEMICAL STUDIES WILL BE CLOSELY INTEGRATED. BASED ON THE TEST CELL RESULTS A PROTOTYPE SINGLE CELL WILL BE CONSTRUCTED AND A COMPLETE CELL STACK DESIGNED. THE ARMED FORCES UTILIZE OXYGEN GAS FOR A VARIETY OF CRITICAL NEEDS. AT PRESENT, MOST

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OF THE OXYGEN IS PURCHASED AS COMPRESSED GAS OR IN LIQUID FORM FROM COMMERCIAL SUPPLIERS. THE ASSOCIATED TRANSPORTATION AND STORAGE REQUIREMENTS POSE SEVERE LOGISTICS PROBLEMS, E.G., FOR REMOTE LOCATIONS AND FIELD HOSPITALS. THE MAXDEM OXYGEN PUMP IS DESIGNED TO BE A PORTABLE, CONVENIENT SOURCE OF HIGH PURITY OXYGEN, FOR MEDICAL AND OTHER MILITARY APPLICATIONS (WELDING, AIRCRAFT, ETC.).

MERIX CORPORATION
192 WORCESTER STREET
WELLESLEY, MA 02181
THOMAS W. MIX

ARMY

TITLE:

FORMULATION FOR PROTECTION/TREATMENT OF PERSONNEL EXPOSED
TO CW AGENTS

TOPIC: 6e OFFICE: SGRD-MRDC

CHEMICAL WARFARE AGENTS POSE A THREAT TO OUR FORCES WHICH REQUIRES A COUNTERMEASURE WHICH DOES NOT RESTRICT THE MOBILITY OR OPERATING EFFECTIVENESS OF THE FORCES. SPECIAL FORMULATIONS ARE REQUIRED FOR EXTERNAL USE WHICH WILL PROTECT AND/OR TREAT PERSONNEL EXPOSED TO CW AGENTS SUCH AS THE NERVE GASES, HYDROGEN CYANIDE, MUSTARD AND LEWISITE. THESE FORMULATIONS MUST BE EFFECTIVE WITHOUT IRRITANT OR TOXIC EFFECT, READILY STORED, APPLIED AND REMOVED. PROTECTIVE BARRIER COATINGS MUST BE WEATHER AND SWEAT RESISTANT, EFFECTIVE FOR AT LEAST 8 HOURS, AND ABLE TO PROVIDE A PROTECTIVE WORKING SURFACE FOR THE HANDS. DECONTAMINANT LOTIONS MUST NOT ONLY BE ABLE TO RAPIDLY NEUTRALIZE CW AGENT EXTERIOR TO THE SKIN BUT MUST ALSO BE ABLE TO REMOVE RAPIDLY AND EFFECTIVELY AN AGENT WHICH HAS PENETRATED THE SKIN AND MUST DO SO WITHOUT CAUSING THE CW AGENTS TO PENETRATE MORE DEEPLY. IN THE PROPOSED PHASE II FOLLOWING-ON, EFFECTIVE BARRIER COATINGS AND DECONTAMINANT LOTIONS EMPLOYING DISPERSED REAGENTS WILL BE DEVELOPED. BOTH FLUOROCARBON-BASED AND LIQUID MEMBRANE BARRIER COATINGS WILL BE DEVELOPED AS THEY APPEAR TO HAVE COMPLEMENTARY USES: THE FLUOROCARBON-BASED COATINGS AFFORD EFFICIENT PROTECTION EVEN IN THIN LAYERS AND CAN BE APPLIED TO HANDS AND FACE WITHOUT INTERFERING WITH SOLDIER MOBILITY OR EFFICIENCY; THE LIQUID-MEMBRANE BASED COATINGS CAN BE APPLIED IN THICKER LAYERS TO CLOTHING TO PROVIDE LOWER COST PROTECTION WITH THE ABILITY TO TRANSMIT MOISTURE AND ABSORB SWEAT. A NEW, POTENTIALLY EFFECTIVE DECONTAMINANT AND CW AGENT NEUTRALIZER CHEMICAL CLASS, THAT OF IODOXYBENZOATES, WILL BE STUDIED IF US ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE ANALYSIS INDICATES

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IT DESIRABLE TO DO SO. THE USE OF ROHM AND HAAS RESINS AS THE NEUTRALIZING REAGENTS IN MERIX FORMULATIONS SHOULD ENHANCE THEIR PERFORMANCE OVER THEIR CURRENT USE AND IS ALSO PROPOSED FOR STUDY.

MICROWAVE LABORATORIES, INC.
3805 BERYL ROAD
RALEIGH, NC 27607
CARL A. EVERLEIGH

NAVY

TITLE:
INCREASE THE BANDWIDTH OF THE BAND-9 ALQ-99
TOPIC: 94 OFFICE: SPAWAR

THIS IS A PHASE II SBIR PROPOSAL. IT DESCRIBES A PPM HELIX TWT DEVELOPMENT FOR THE BAND 9 AN/ALQ-99 SYSTEM, THAT WILL EXTEND THE TRANSMITTER FREQUENCY COVERAGE WELL ABOVE THE EXISTING LIMIT TO COVER THE FULL FREQUENCY RANGE REQUIREMENT. THE PROPOSED TWT WILL EMPLOY A BRAZED COPPER HELIX DESIGN TO OVERCOME THE HEAT DISSIPATION LIMITATION IN PAST HELIX DERIVED CIRCUIT TUBES. IT WILL ALSO EMPLOY A CLOVERLEAF PPM FOCUSING STRUCTURE EMPLOYING "PILL SHAPED" RARE EARTH MAGNETS. THIS DESIGN WILL PROVIDE ADEQUATE MAGNETIC FIELD WHILE PERMITTING PLACEMENT OF COOLING CHANNELS CLOSE ENOUGH TO THE HELIX STRUCTURE TO INSURE ADQUATE COOLING. UNDER THE PHASE I EFFORT, MLI HAS PERFORMED DETAILED MECHANICAL, ELECTRICAL AND THERMAL DESIGNS USING BOTH CONVENTIONAL AND CAD TOOLS, INCLUDING BOTH TWO DIMENSIONAL AND THREE DIMENSIONAL GUN DESIGN PROGRAMS. THE PHASE I STUDY AND ANOTHER RELATED ONGOING DEVELOPMENT PROGRAM AT MLI PROVIDE AN EXTREMELY HIGH LEVEL OF CONFIDENCE THAT THE PROPOSED DEVELOPMENT CAN BE SUCCESSFULLY DONE.

MICROWAVE MONOLITHICS INC.
465 E. EASY STREET, UNIT F
SIMI VALLEY, CA 93065
DANIEL R. CH'EN

ARMY

TITLE:
FLASH ANNEALING OF ION IMPLANTED DOPING PROFILES FOR HIGH PERFORMANCE X-BAND GaAs POWER FETS
TOPIC: 8k OFFICE: BMDSC

SUCCESSFUL IMPLEMENTATION OF MONOLITHIC MICROWAVE INTEGRATED CIRCUITS

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(MMIC'S) IS VITAL TO MANY EMERGING DOD SYSTEMS AS WELL AS COMMERCIAL APPLICATIONS. THE TECHNICAL APPROACH TO A HIGH PERFORMANCE MMIC COMPATIBLE POWER FET TECHNOLOGY WITH TAILORED DOPING PROFILES WAS STUDIED IN DETAIL DURING PROGRAM PHASE I. THE VIRTUAL ABSENCE OF IMPURITY DIFFUSION DURING FLASH ANNEALING MAKES POSSIBLE THE SYNTHESIS OF PRECISE DOPING PROFILES FOR OPTIMAL POWER FET PERFORMANCE. FABRICATION AND OPTIMIZATION OF TEST POWER FET'S FOLLOWED BY DESIGN OF AN MMIC POWER AMPLIFIER IS PROPOSED FOR PROGRAM PHASE II. DETAILED IN THIS PROPOSAL ARE (a) UNIQUE FEATURES OF THE FLASH ANNEALING TECHNIQUE FOR TAILORING DOPING PROFILES, (b) RESULTS OF PROGRAM PHASE I, (c) POWER FET AND MMIC DESIGN, AND (d) DEVICE FABRICATION AND CHARACTERIZATION PLANS.

MICROWAVE MONOLITHICS INCORPORATED

AF

P.O. BOX 5044-224

THOUSAND OAKS, CA 91359

DANIEL R. CH'EN

TITLE:

INNOVATIVE HIGH VOLUME PRODUCTION TESTING OF MMIC'S

TOPIC: 9a OFFICE: RADC/DORP

EFFICIENT HIGH VOLUME TEST CAPABILITY FOR MONOLITHIC MICROWAVE INTEGRATED CIRCUITS (MMIC'S) IS A VITAL STEP TOWARD HIGH VOLUME DOD SYSTEMS IMPLEMENTATION AND THE REALIZATION OF THE POTENTIAL OF THIS RAPIDLY EMERGING TECHNOLOGY. A DETAILED APPROACH TO COST EFFECTIVE AUTOMATIC TEST PROCEDURES FOR MMIC'S WAS DEVELOPED IN PHASE I, AND EXPERIMENTAL VERIFICATION OF THE TECHNIQUES DEVELOPED I PROPOSED TO RADC FOR PHASE II. DESCRIBED IN THE PROPOSAL ARE (a) DESIGN RULES TO INSURE MMIC TESTABILITY, (b) COST EFFECTIVE LOW FREQUENCY EVALUATION CRITERIA UNIQUE TO MMIC'S, (c) THE TESTS AND TEST SEQUENCE FOR IN-PROCESS MMIC EVALUATION, AND (d) FINALIZING DESIGN OF A LOW FREQUENCY AUTOMATIC TEST SYSTEM TO IMPLEMENT THE TEST STRATEGY DEVELOPED. KEY TO THE PROPOSED PROGRAM ARE AN INTEGRATED APPROACH WHICH PLACES THE BULK OF THE TESTING RESPONSIBILITY ON LOW FREQUENCY MEASUREMENTS AND THE CORRESPONDING REQUIREMENT THAT EXCELLENT CORRELATION BETWEEN LOW AND HIGH FREQUENCY (RF) MEASUREMENTS BE ESTABLISHED FOR MMIC CHIPS.

MODUS, INC.

AF

515 NORTH MELTON DRIVE

JONESBORO, AR 72401

DR. KEITH JONES

TITLE:

A MULTI-AXIS GYROSTATIC PICKOFF SENSOR AND INTELLIGENT SERVOMECHANISM FOR REAL-TIME MAN-MACHINE INTERFACE CONTROL

TOPIC: 5 OFFICE: AMD/RDO

OVER THE LAST TWENTY YEARS THERE HAVE BEEN MANY INNOVATIONS IN GYRO-

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SCOPIC CONTROL MECHANISM TECHNOLOGY, INCLUDING BOTH RATE AND ATTITUDE GYROS. THIS RESEARCH INVESTIGATES THE FEASIBILITY OF COMBINING THIS TECHNOLOGY WITH RESEARCH FROM BIOMECHANICS, PSYCHOPHYSIOLOGY, AND PSYCHOMOTOR DEVELOPMENT TO PROVIDE FOR IMPROVED MEANS OF MAN-MACHINE INTERFACE. THE RESEARCH HAS RESULTED IN SEVERAL INVENTIONS AND ADDITIONAL INNOVATIONS ARE BEING REFINED AND REDUCED TO PRACTICE; THESE INVENTIONS WILL BE PATENTED BY MODUS AND THE AIR FORCE SCHOOL OF MEDICINE. AMONG THE APPLICATIONS CURRENTLY BEING DEVELOPED ARE MEANS OF TRAINING AND TESTING FINE MOTOR SKILLS; REDUCING FATIGUE IN PROLONGED CONFINED OR UNCOMFORTABLE POSITIONS; FLIGHT CONTROLS AND AUTOMATED RECOVERY SYSTEMS; LEARNING MACHINES AND EMBEDDED TRAINING SIMULATORS; PHYSICAL THERAPY; ISOMETRIC EXERCISERS; ORTHOPEDIC AND SURGICAL EQUIPMENT; BIONICS AND ROBOTICS.

MSNW, INC.
P.O. BOX 865
SAN MARCOS, CA 92069
GEORGE H. REYNOLDS

ARMY

TITLE:

JOINING TECHNOLOGY: PREPARATION AND EVALUATION OF REDUCED HEAT INPUT ELECTROSLAG WELDS OF HEAVY-SECTION ALUMINUM ARMOR

TOPIC: 70 OFFICE: LABCOM/MTL

RESEARCH ON ECONOMICAL, SINGLE PASS WELDING PROCESSES FOR HEAVY SECTION (0.5 IN. OR GREATER THICKNESS) ALUMINUM ARMOR PLATE IS PROPOSED. THE PROCESSES ARE METAL POWDER ADDITION VARIANTS OF THE ELECTROGAS AND ELECTROSLAG WELDING PROCESSES WHEREIN SUPPLEMENTAL METAL POWDER FILLER IS ADDED CONTINUOUSLY TO THE WELDING PROCESSES TO INCREASE DEPOSITION RATE, IMPROVE WELDMENT MECHANICAL PROPERTIES, IMPROVE WELD METAL COMPOSITION CONTROL, AND DECREASE FABRICATION COSTS. A SERIES OF EXPERIMENTAL WELDMENTS WILL BE PREPARED WITH METAL POWDER FILLER ADDITIONS AND THEIR PHYSICAL AND MECHANICAL PROPERTIES EVALUATED IN DETAIL. EXPERIMENTAL WELDMENTS WILL ALSO BE SUPPLIED TO AMMRC FOR INDEPENDENT EVALUATION OF PROPERTIES. PRELIMINARY ESTIMATES OF PROCESS COSTS AND COST SAVINGS WILL BE FORMULATED.

N.J. DAMASKOS, INC.
POST OFFICE BOX 469
CONCORDVILLE, PA 19331
JOHN L. WALLACE

NAVY

TITLE:

A NOVEL LOW-COST INFRARED ABSORBING MATERIAL

TOPIC: 100 OFFICE: NAVAIR

DAMASKOS, INC. HAS, THROUGH PREVIOUS INVESTIGATION, DEMONSTRATED THE

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FEASIBILITY OF FABRICATING A MATERIAL WHICH IS COMPATIBLE WITH BOTH IR AND RADAR COUNTERMEASURES. THE MATERIAL IS A THIN FILM DEPOSITION WHICH IS BOTH ABSORBING IN THE NEAR IR AND TRANSMITTING AT RADAR FREQUENCIES. THIS MATERIAL COULD BE FABRICATED IN THE FORM OF LARGE SHEETS WHICH CAN BE INCORPORATED INTO CURRENT RAM DESIGNS, THUS CREATING A RADAR LOW OBSERVABLE WHICH IS IMPERVIOUS TO A PARTICULAR IR THREAT. PHASE II WILL FOCUS EFFORTS IN RESPONSE TO SPECIFIC THREATS BY A PRELIMINARY REVIEW OF AVAILABLE CLASSIFIED INFORMATION ON THE SUBJECT. THEORETICAL OPTIMIZATION OF MATERIALS DESIGN, PROTOTYPE PRODUCTION OF CANDIDATE MATERIALS AND SMALL SCALE TESTING WILL FOLLOW. THE BEST CANDIDATES IDENTIFIED IN THE EARLY WORK WILL BE PRODUCED IN GREATER VOLUME AND UTILIZED IN COMBINATION WITH GENERIC RAM FOR FURTHER EVALUATION. THE PERFORMANCE AT IR WAVELENGTHS AND AT MICROWAVE FREQUENCIES AND APPLICABLE MATERIALS SAMPLES TOGETHER WITH FOLLOW-ON EFFORT RECOMMENLATIONS REPRESENT THE DELIVERABLES.

ODYSSEY RESEARCH ASSOCIATES, INC.

ARMY

609 W. CLINTON STREET

ITHACA, NY 14850

DR. RICHARD KITTREDGE

TITLE:

SUBLANGUAGE TECHNOLOGY APPLIED TO COMMAND AND CONTROL "JARGONS"

TOPIC: 2f OFFICE: CDR/CECOM/AD

ODYSSEY RESEARCH PROPOSES TO CONDUCT APPLICATIONS-ORIENTED RESEARCH ON ARTIFICIAL INTELLIGENCE TECHNIQUES FOR UNDERSTANDING NATURAL LANGUAGE UNDER CONDITIONS OF NOISE AND INPUT ERROR. FIRST, A GENERAL FRAMEWORK WILL BE DEVELOPED FOR REPRESENTING THE IMPORTANT TYPES OF LINGUISTIC AND NONLINGUISTIC BEHAVIOR OBSERVED IN COOPERATIVE COMMAND AND CONTROL DOMAINS. THE FRAMEWORK WILL THEN BE USED TO SET UP A TESTBED FOR SYSTEMS WHICH USE LANGUAGE REDUNDANCY AND BOTH DOMAIN AND COMMON-SENSE KNOWLEDGE TO HEURISTICALLY GUIDE THE INTERPRETATION OF NOISY, ERRORFUL INPUT. THE TESTBED WILL BE INSTANTIATED WITH THE DESCRIPTION OF ARTILLERY FIRE CONTROL (AFC) SUBLANGUAGE MADE DURING PHASE I. AN AFC-INSTANTIATED TESTBED WILL BE DEVELOPED INCREMENTALLY THROUGH THE FOLLOWING STATES: (1) PARSING OF INDIVIDUAL SENTENCES AND DIALOGS WITH PERFECT TYPED INPUT; (2) USE OF LINGUISTIC AND DOMAIN KNOWLEDGE TO PROPERLY INTERPRET ILL-FORMED TYPED AND SPOKEN INPUT; (3) ADDITION OF NATURAL LANGUAGE OUTPUT CAPABILITY TO DEMONSTRATE ADEQUATE UNDERSTANLING OF PROBLEMATIC INPUT; (4) ADDITION

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OF COMMON SENSE REASONING CAPABILITY TO PROPERLY INTERPRET SPOKEN DIALOGS WITH A VARIETY OF INPUT NOISE AND ERROR PROBLEMS. AT EACH STAGE OF TESTBED DEVELOPMENT, GRAPHIC DISPLAY PATTERNS WILL BE GENERATED TO ILLUSTRATE PROPER UNDERSTANDING OF BOTH PERFECT AND ERRORFUL INPUT. IT IS EXPECTED THAT THE SUCCESSFUL DEVELOPMENT OF INTELLIGENT ERROR-RECOVERY TECHNIQUES FOR LIMITED DOMAINS WILL HAVE APPLICATIONS TO AIR TRAFFIC CONTROL, MILITARY MESSAGE MONITORING, NATURAL LANGUAGE DATABASE QUERYING, ETC. IN SHORT, THIS WORK WILL ADVANCE THE FEASIBILITY OF SYSTEMS ALLOWING VOICE INPUT WITHIN A NATURAL (E.G., PROFESSIONAL) SUBLANGUAGE OF ENGLISH.

OPHIR CORPORATION
7333 WEST JEFFERSON, SUITE 210
LAKEWOOD, CO 80235
DR. LOREN D. NELSON

AF

TITLE:

A PASSIVE DEVICE FOR REMOTELY SENSING ATMOSPHERIC PROFILES OF TEMPERATURE, HUMIDITY AND REFRACTIVE INDEX

TOPIC: 6 OFFICE: AFGL/XOP

WE HAVE RECENTLY DEVELOPED AN INFRARED ABSORPTION IN-SITU PASSIVE INFRARED THERMOMETER FOR USE IN THE EARTH'S ATMOSPHERE AND FROM MOVING AIRCRAFT. IN OUR PHASE I EFFORT WE HAVE SHOWN, BOTH THEORETICALLY AND EXPERIMENTALLY, THAT IT IS POSSIBLE TO ADAPT OUR NEW TECHNOLOGY TO QUANTITATIVELY MEASURE REAL-TIME ATMOSPHERIC TEMPERATURE SOUNDINGS FROM A PASSIVE, COVERT, GROUND-BASED, ANGLE-SCANNING RADIOMETER. IN PHASE II, WE PLAN TO DESIGN, FABRICATE, LABORATORY CALIBRATE, FIELD TEST, AND DELIVER SUCH AN INFRARED RADIOMETRIC TEMPERATURE PROFILER TO THE AIR FORCE GEOPHYSICS LABORATORY. IN PHASE III WE WILL CONSTRUCT ADDITIONAL INSTRUMENTS FOR BOTH MILITARY AND COMMERCIAL USE.

OPHIR CORPORATION
733 WEST JEFFERSON AVENUE
LAKEWOOD, CO 80235
DR. LOREN D. NELSON

NAVY

TITLE:

A DURABLE INFRARED HUMIDITY SENSOR FOR SHIPBOARD

TOPIC: 107 OFFICE: NAVAIR

THE OBJECTIVE OF THE PHASE I EFFORT WAS TO STUDY THE FEASIBILITY OF

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USING INFRARED HUMIDITY SENSOR TECHNOLOGY IN THE HARSH SHIPBOARD MARINE ENVIRONMENT. DURING THE PHASE I RESEARCH WE THEORETICALLY AND EXPERIMENTALLY TESTED THE FOLLOWING: (1) WE CONDUCTED EXTENSIVE INFRARED SPECTROPHOTOMETER SALT OBSCURATION TESTS ON SAPPHIRE WINDOWS, (2) WE RAN ADDITIONAL COMPUTER FASCOD THEORETICAL INFRARED PREDICTIONS, AND (3) WE COMPLETED A PRELIMINARY HARDWARE DESIGN FOR A MARINE SENSOR. ALL PORTIONS OF THE RESEARCH WERE SUCCESSFUL. RESULTS INDICATE THAT IT IS FEASIBLE TO CONSTRUCT AN INFRARED SHIPBOARD HYGROMETER THAT CAN BE USED RELIABLY WITHOUT SENSOR DEGRADATION IN THE HARSH NAVAL ENVIRONMENT. IN PHASE II WE PROPOSE TO FINALIZE THE DESIGN, CONSTRUCT, CALIBRATE, TEST, AND DELIVER TO THE NAVY SUCH A SHIPBOARD INFRARED HYGROMETER.

OPTIMIZATION TECHNOLOGY, INC.
20380 TOWN CENTER LANE, SUITE 160
CUPERTINO, CA 95014
DR ROBERT E. LARSON

ARMY

TITLE:
DECENTRALIZED DYNAMIC PROGRAMMING FOR BALLISTIC MISSILE DEFENSE
AND OTHER APPLICATIONS
TOPIC: 8c OFFICE: BMD

OPTIMIZATION TECHNOLOGY, INC. (OTI), IN ITS SBIR PHASE I EFFORT, DEVELOPED A POTENTIAL POWERFUL SOLUTION TO THE PROBLEM OF DYNAMICALLY ALLOCATING COMPUTER NETWORK RESOURCES. THE METHOD COMBINES A SYSTEM OF INTERACTING CONTROLLERS, EACH OF WHICH IS LOCATED AT A NETWORK NODE, WITH DISTRIBUTED ALGORITHMS FOR MAKING REAL-TIME CONTROL DECISIONS. THE NEWLY DEVELOPED METHODS ARE OF IMPORTANCE TO BMD BATTLE MANAGEMENT PROBLEMS FOR SPACE-BASED DEFENSE AS WELL AS TO COMMERCIAL APPLICATIONS SUCH AS OFFICE AUTOMATION.

PCP, INC.
2155 INDIAN ROAD
WEST PALM BEACH, FL 33409
MARTIN J. COHEN/WERNLUND

ARMY

TITLE:
TANDEM ION MOBILITY SPECTROMETER FOR CHEMICAL AGENT DETECTION
MONITORING AND ALARM
TOPIC: 4a OFFICE: CRDC

PHASE I PROVED THE TMS TO BE OF SIGNIFICANT BENEFIT IN ELIMIN-

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NATING INTERFERENCES TO ION MOBILITY SPECTROMETRY (IMS) DETECTIONS OF ORGANOPHOSPHOROUS COMPOUNDS (SPECIFICALLY, NERVE AGENT SIMULANTS). THE TMS IS AN EXCELLENT TOOL FOR STUDYING ION-MOLECULE REACTION CHEMISTRY, WHICH IS OF PRIMARY IMPORTANCE IN THE DEVELOPMENT OF IMS SYSTEMS, SUCH AS THE XM22 CHEMICAL AGENT ALARM AND THE BRITISH CHEMICAL AGENT MONITOR (CAM). IT IS QUITE POSSIBLE THAT THE RESULTING INSTRUMENTATION CAN BE INCORPORATED INTO MUCH IMPROVED FIELD SYSTEMS FOR DETECTION OF CHEMICAL WARFARE AGENTS. IN ADDITION, THE TMS MAY HAVE APPLICATION TO THE DETECTION OF TOXIC VAPORS FROM AGRICULTURAL OR INDUSTRIAL ACTIVITIES.

PDA ENGINEERING
1560 BROOKHOLLOW DRIVE
SANTA ANA, CA 92705
ROBERT G. OEDING

AF

TITLE:
TRACK G EROSION DATA APPLICATION ANALYSIS
TOPIC: 18 OFFICE: BMO/PMX

NOSETIP EROSION PERFORMANCE IS A CRITICAL FACTOR IN ALL WEATHER REENTRY SYSTEM SURVIVABILITY AND ACCURACY. LIMIT FLIGHT TESTING REQUIRES RELIANCE ON GROUND TEST FACILITIES TO PROVIDE NECESSARY EROSION DATA. AEDC TRACK G PROVIDES THE BEST SIMULATION OF KEY FLIGHT PARAMETERS AND HAS BEEN USED EXTENSIVELY TO EVALUATE CANDIDATE MATERIALS. THE UTILIZATION OF THE EXTENSIVE TRACK G DATA HAS BEEN LIMITED, HOWEVER, DUE TO TRACK PHENOMENA WHICH HAS THE DATA. IN ORDER TO CORRECTLY INTERPRET AND APPLY TRACK G DATA TO THE PREDICTION OF MATERIALS PERFORMANCE IN FULL-SCALE REENTRY WEATHER ENVIRONMENTS, A COMBINED ANALYTICAL AND EXPERIMENTAL PROGRAM IS PROPOSED. THE PROGRAM INVOLVES 1) QUANTIFYING KEY TRACK G AND FLIGHT PHENOMENA THROUGH ANALYSIS AND EXPERIMENTS, 2) VERIFYING AND APPLYING PHENOMENOLOGY MODELS TO CORRECT TRACK G EROSION DATA, 3) INTEGRATING MODELS AND DATA INTO COMPREHENSIVE ANALYSIS CODE, 4) PERFORMING ANALYSIS TO RECONCILE DIFFERENCES BETWEEN TRACK G AND FLIGHT EROSION, AND 5) DEVELOPING A METHODOLOGY FOR UTILIZING TRACK G DATA IN FLIGHT PERFORMANCE PREDICTIONS.

PDA ENGINEERING
1560 BROOKHOLLOW DRIVE
SANTA ANA, CA 92705
LIAM GROENER

AF

TITLE:
THERMAL ANALYSIS OF TRACK G DATA
TOPIC: 18 OFFICE: BMO/PMX

IMPROVED DESIGN TOOLS ARE REQUIRED TO DEVELOP NOSETIPS FOR EVOLVING

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AIR FORCE HYPERVELOCITY VEHICLE PROJECTS. THESE NEW VEHICLES WILL EXPERIENCE PRESSURES AND HEATING RATES WHICH MAKE CARBON MELTING A DESIGN CONSIDERATION FOR THE FIRST TIME AND WILL STRESS THE CAPABILITIES OF EXISTING NOSETIP MATERIALS. EXTREME ACCURACY IS ALSO AN INHERENT REQUIREMENT OF HYPERVELOCITY VEHICLES. IN THIS PROGRAM, AN INTEGRATED SET OF COMPUTER CODE WILL BE DEVELOPED WITH CAPABILITIES TO PREDICT: 1) NOSETIP RECESSIONS IN THE MELTING REGIME, 2) THE PROBABILITY DISTRIBUTION OF NOSETIP BENDING LEADS, AND 3) THE VEHICLE IMPACT ERRORS DUE TO NOSETIP ASYMMETRIES. THE PROGRAM WILL EXTEND AND IMPLEMENT A NEW MELTING ABLATION THEORY DEVELOPED IN THE PHASE I STUDY. INNOVATIVE NEW TESTS WILL BE CONDUCTED TO RESOLVE CURRENT UNCERTAINTIES IN CARBON THERMOPHYSICAL PROPERTIES. THE NEW TOOLS DEVELOPED WILL BE DEMONSTRATED BY PREDICING THE PERFORMANCE OF NOSETIP DESIGNS CURRENTLY BEING EVALUATED BY THE AIR FORCE.

PDA ENGINEERING
1560 BROOKHOLLOW DRIVE
SANTA ANA, CA 92705
HENRY MOODY

AF

TITLE:
ADVANCED ANTENNA WINDOW PERFORMANCE AND REQUIREMENT DEFINITION
TOPIC: 18a OFFICE: BMO/PMX

ANTENNA WINDOWS CRITICALLY AFFECT THE PERFORMANCE OF ADVANCED REENTRY SYSTEMS. IN MANY CASES COMPROMISES IN VEHICLE EFFECTIVENESS MUST BE MADE BECAUSE OF WINDOW MATERIAL LIMITATIONS. TO AID IN THE IMPROVEMENT OF WINDOW MATERIALS AND DESIGN TECHNIQUES, A MATERIAL/DESIGN REQUIREMENT DEFINITION PROGRAM IS PROPOSED. THIS PROGRAM SUPPORT THE BMO MaRV/TSF EFFORT; AND IN ADDITION, TWO GENERIC ANTENNA WINDOW DESIGNS WILL BE ASSESSED. THE PROGRAM WILL INVOLVE 1) THE IMPROVEMENT OF 2-D AND 3-D ABLATION ANALYSES TO MODEL HEATSHIELD/ANTENNA WINDOW SHAPE CHANGE, 2) AN INVESTIGATION TO DETERMINE THE IMPLICATIONS OF WINDOW SHAPE ON SYSTEM PERFORMANCE, 3) TRADE-OFF STUDIES TO IDENTIFY ANTENNA WINDOW DESIGN AND THEIR RESPECTIVE PERFORMANCE, AND 4) PARAMETRIC ANALYSES OF VARIATIONS IN MATERIAL PROPERTIES AND DESIGN FEATURES. AN EXPERIMENTAL EFFORT WILL BE PERFORMED ON ANTENNA WINDOW DESIGNS FOR THE PURPOSE OF EVALUATING 1) DESIGNS AND DESIGN FEATURES, 2) A SPECIFIC ABLATION OR DESIGN PHENOMENON AND 3) ANALYTICAL MODEL CAPABILITIES.

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PHOTOFABRICATION TECHNOLOGY, INC.

AF

PO BOX 3209
DERRY, NH 03038
R.E. HOWE

TITLE:

LOW COST ATMOSPHERIC CORROSION SENSORS

TOPIC: 11e OFFICE: AFWAL/XRPM

DURING PHASE I RESEARCH UNDER U.S. AIR FORCE CONTRACT NO. F33615-83-C-5104, THE FEASIBILITY OF USING PHOTOFABRICATION TECHNIQUES TO PRODUCE LOW COST ATMOSPHERIC CORROSION SENSORS WAS DEMONSTRATED. THESE SENSORS ARE UNIQUE IN THAT THE SAME SENSOR WILL MEASURE BOTH INSTANTANEOUS AND TIME AVERAGED CORROSION RATES USING PRINCIPLES THAT ARE WIDELY ACCEPTED IN THE CORROSION MONITORING FIELD. TESTING WAS DONE IN AN ACCELERATED ATMOSPHERIC CORROSION TEST CHAMBER; GOOD AGREEMENT WAS OBSERVED BETWEEN CORROSION RATES MEASURED BY THE SENSORS AND THOSE EXHIBITED BY WEIGHT LOSS PANELS WHICH WERE CONCURRENTLY EXPOSED. THIS PROPOSAL REPRESENTS A CONTINUATION OF THAT EFFORT WITH THE OBJECTIVES BEING TO OPTIMIZE THE DESIGN AND OPERATION OF THESE SENSORS AND TO PRODCUE SEVERAL PROTOTYPE SENSORS FOR TESTING BY THE PROJECT SPONSOR IN TYPICAL OPERATING ENVIRONMENTS.

PHYSICAL DYNAMICS, INC.

NAVY

4350 EXECUTIVE DR - STE 135
SAN DIEGO, CA 92121
WALTER PODNEY

TITLE:

ELECTROMAGNETIC DETECTION OF BURIED MINES USING A
SUPERCONDUCTIVE MAGNETIC GRADIOMETER

TOPIC: 2 OFFICE: NAVSEA

MINES BURIED IN THE SEA BOTTOM ARE OFTEN IMPOSSIBLE TO DETECT ACOUSTICALLY. ELECTROMAGNETIC ENERGY PROVIDES AN ALTERNATIVE MEANS OF DETECTION. PHASE I WORK DEMONSTRATES THE FEASIBILITY OF USING AN ACTIVE SYSTEM FORMED BY ELECTRIC COILS ENCIRCLING A SUPERCONDUCTIVE MAGNETIC GRADIOMETER TO DETECT BURIED MINES ELECTROMAGNETICALLY. IT DETECTS MAGNETIC FLUCTUATIONS COMING FROM EDDY CURRENTS IN METAL OBJECTS (FERROUS AS WELL AS NONFERROUS) THAT ARE EXCITED BY ELECTRIC CURRENT OSCILLATING IN THE COILS. THE TESTS OF PHASE I SHOW THAT THE DETECTION RANGE FOR A PROTOTYPE INSTRUMENT CAN BE 15 m IN SEAWATER

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TO A SPHERICAL SHELL 30 cm IN DIAMETER MADE OF 1/8 INCH THICK STAIN-
LESS STEEL, WHICH IS A USEFUL RANGE FOR AN UNDERWATER-TOWED SYSTEM.
SWEEPING THE FREQUENCY OF THE ELECTRIC CURRENT OSCILLATIONS CAN
CLASSIFY SIZE, SHAPE, AND MATERIAL OF A TARGET. WE PROPOSE TO DE-
VELOP THE PROTOTYPE OF AN INSTRUMENT THAT CAN ACHIEVE A RANGE EXCEED-
ING 15 m IN SEAWATER, CAN CLASSIFY SIZE, SHAPE, AND MATERIAL OF A
TARGET, AND CAN DETERMINE ITS BEARING TO PLUS OR MINUS 5 DEGREES
IN AZIMUTH.

PHYSICAL SCIENCES, INC.
RESEARCH PARK P.O. BOX 3100
ANDOVER, MA 01810
DR. ALAN GELB

AF

TITLE:
THE USE OF LIQUID FILMS FOR SPACECRAFT SURVIVABILITY TO LASER
RADIATION

TOPIC: 1c OFFICE: AFOSR/XOT

THE CONCEPT OF LIQUID FILM MEDIATED LASER PROTECTION WILL BE FURTHER
INVESTIGATED AND DEVELOPED. A COMBINED THEORETICAL-EXPERIMENTAL
PROGRAM IS PROPOSED. THE EXPERIMENTAL EFFORT WILL MEASURE THE
PROPERTIES OF COATED GRAPHITIC MATERIALS. HEATS OF VAPORIZATION,
EMISSIVITIES AND FILM STABILITY WILL BE DETERMINED FOR SEVERAL
POTENTIAL COATINGS INCLUDING TUNGSTEN CARBIDE. SEVERAL TYPES OF
GRAPHITIC SUBSTRATES WILL BE COATED AND TESTED. FOR THE MOST PROMIS-
ING COATINGS, HIGH POWERED C.W. LASER TESTS WILL BE PERFORMED. THE
THEORETICAL EFFORT WILL EXAMINE (1) THE FLUID DYNAMICS OF MASS TRANS-
PORT THROUGH THIN LIQUID COATINGS ON VAPORIZING SUBSTRATES AND THE
PARAMETERS FOR FILM STABILITY, AND (2) THE THERMODYNAMICS OF
COATING MATERIAL/SUBSTRATE VAPORIZATION.

PINSON ASSOCIATES, INC.
P.O. BOX 9648
AUSTIN, TX 78766
A. WAYNE SEFCIK

ARMY

TITLE:
IMPROVED RADAR TRACKING AGAINST CHAFF COUNTERMEASURES
TOPIC: 3i OFFICE: LABCOM/OMEW

THIS PROPOSED PROGRAM IS TO CONDUCT THE PRINCIPAL RESEARCH AND DE-

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DEVELOPMENT EFFORT TO PROVIDE THE CAPABILITY TO DO RADAR TRACKING OF AIR TARGETS WITHOUT A CHAFF COUNTERMEASURE ENVIRONMENT. IT WILL CONSIST OF TRADE OFF STUDIES TO DEFINE THE DETAILED REQUIREMENTS AND SPECIFICATIONS OF AN OPERATIONAL SYSTEM, FOLLOWED BY THE DESIGN AND FABRICATION OF A LIMITED CAPABILITY BRASS BOARD SYSTEM AND ENDING WITH A LIMITED FIELD TEST TO VALIDATE THE APPROACH AND TECHNIQUE. DATA WILL BE PROCESSED AND ANALYZED TO ESTABLISH ANY OPERATIONAL LIMITATIONS THAT MAY POSSIBLY EXIST. THE POSSIBILITY OF USING THE APPROACH AND TECHNIQUES PROVEN FEASIBLE IN PHASE I, TO FIND AND IDENTIFY AIR TARGETS IN A SATURATION CHAFF ENVIRONMENT WILL ALSO BE INVESTIGATED.

PLANNING SYSTEMS INC.
7900 WESTPARK DRIVE, SUITE 600
MCLEAN, VA 22102
BURLIE BRUNSON

NAVY

TITLE:
DETECTION/NEUTRALIZATION OF BURIED MINES: PHYSICAL
PROPERTIES FROM ACOUSTIC REFLECTIVITY
TOPIC: 2 OFFICE: NAVSEA

THE OBJECTIVE OF THE PROPOSED RESEARCH IS TO DESIGN AN AUTOMATED BURIED-MINE PREDICTION SYSTEM FOR ALLOCATING BURIED-MINE DETECTION RESOURCES BASED ON ENVIRONMENTAL INFORMATION. THE OBJECTIVE WILL BE ACHIEVED THROUGH A SERIES OF INTERRELATED STEPS WHICH INCLUDE: (1) ASSESSING THE CURRENT STATE OF MINE-BURIAL PREDICTION, (2) ASSESSING THE ACOUSTIC DETERMINATION OF MINE BURIAL POTENTIAL, (3) RELATING MINE BURIAL PROPERTIES TO MINE HUNTING PROPERTIES, (4) IDENTIFYING DECISIONS TO BE MADE IN AN AUTOMATED BURIED MINE PREDICTION SYSTEM, (5) IDENTIFYING THE ENVIRONMENTAL INPUTS NEEDED TO MAKE THOSE DECISIONS, AND (6) SPECIFYING THE FUNCTION AND COMPONENTS OF A SYSTEM TO PROVIDE THOSE INPUTS.

PLANNING SYSTEMS INC.
7900 WESTPARK DRIVE, SUITE 600
MCLEAN, VA 22102
STEPHEN S SCHIFF

NAVY

TITLE:
ACOUSTIC COMMUNICATIONS
TOPIC: 84 OFFICE: SPAWAR

THE PHASE I OBJECTIVES WERE TO ESTABLISH THE TECHNICAL MERIT AND

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TESTING FEASIBILITY OF SIX TRANSFORMED SPEECH TECHNIQUES DESIGNED TO COMBAT THE DISTORTING EFFECTS ATTENDANT TO ACOUSTIC UNDERWATER COMMUNICATIONS (UWC). WE FOUND THAT THE THREE TECHNIQUES WHICH INVOLVE TIME STRETCHING OF THE VOICE WAVEFORM PROMISE AN ORDER OF MAGNITUDE IMPROVEMENT IN RELIABLE COMMUNICATION RANGE COMPARED TO A CONVENTIONAL UNSTRETCHED SYSTEM. WE DETERMINED THAT THE TRI-WORD TEST OF INTELLIGIBILITY (TTI) CAN BE USED TO TEST THESE TECHNIQUES' PERFORMANCE, AND DESIGNED A LABORATORY SIMULATOR OF COMMERCIALY AVAILABLE MODULAR COMPONENTS TO ACCURATELY SIMULATE THE EFFECTS OF THE TRANSMISSION CHANNEL. WE ALSO INVENTED A METHODOLOGY FOR DETERMINING THE DEGREE OF TIME STRETCHING REQUIRED. IT IS PROPOSED TO PERFORM THE FEASIBILITY TESTING IN PHASE II. FIRST, THE SIMULATOR WILL BE ASSEMBLED AND TESTS PERFORMED TO REFINE THE PHASE I RESULTS AND ANSWER QUESTIONS WHICH COULD NOT BE ADDRESSED ANALYTICALLY. FOR EXAMPLE, THE RELATIVE PERFORMANCE OF THE THREE CANDIDATE TECHNIQUES WILL BE DETERMINED. SECOND, AN AT-SEA TEST WILL BE CONDUCTED USING AN/WQC-2 HARDWARE. THE TEST RESULTS WILL BE ANALYZED USING HUMAN SUBJECTS AND THE TTI TO EVALUATE INTELLIGIBILITY AND FEASIBILITY. THE APPROACH WILL ALLOW VALIDATION OF THE SIMULATION METHODOLOGY AND RESULTS, QUANTITATIVE MEASUREMENTS OF VOICE UWC AT SEA, AND ESTABLISHMENT OF PHASE III DESIGN ALTERNATIVES.

POTOMAC SYNERGETICS, INC.

ARMY

P.O. BOX 953

MCLEAN, VA 22101

VINCENT J CORCORAN

TITLE:

SLAB OPTICAL FREQUENCY DOUBLER

TOPIC: 1n OFFICE: CECOM/NVEO

THE ARMY HAS A NEED FOR HIGH PEAK POWER/HIGH AVERAGE POWER FREQUENCY DOUBLED, FLASHLAMP PUMPED, Q-SWITCHED Nd:YAG LASERS. THE PRINCIPAL LIMITATION TO THESE DEVICES ARE THE FREQUENCY DOUBLERS. THE SLAB OPTICAL FREQUENCY DOUBLER (SOFD) PROGRAM IS THE RESULT OF A CONCEPT WHICH OVERCOMES THE LIMITATIONS OF CONVENTIONAL FREQUENCY DOUBLERS. THE WORK PERFORMED IN PHASE I OF THE SOFD PROGRAM SHOWS THAT THE DESIGNS ARE FEASIBLE, BUT TESTING MUST BE COMPLETED AT LOW POWER LEVELS. THE OBJECTIVES OF PHASE II ARE TO EXTEND THE FEASIBILITY INVESTIGATION OF PHASE I TO LEVELS THAT ARE SIGNIFICANT FOR ARMY APPLICATION. THE SEVEN (7) TASKS IN PHASE II ARE DESIGNED TO INSURE THAT THE CON-

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CEPT IS THOROUGHLY TESTED. INCLUDED ARE TASKS NOT ONLY TO TEST FOR HIGH PEAK POWER INPUTS AND HIGH PEAK POWER/HIGH AVERAGE POWER INPUTS TO SLAB GEOMETRIES, BUT TO INVESTIGATE THE VALUE OF CONDUCTIVELY COOLING WITH GASES AND TO DETERMINE THE ADVANTAGES OF USING A SINGLE-AXIAL-MODE (SAM) PUMP AND A PHASE CONJUGATED PUMP VERSUS A STANDARD MULTIMODE, NONCONJUGATED PUMP. IT IS ESSENTIAL THAT THESE FACTORS BE CONSIDERED SINCE THEY MAY MAKE THE DIFFERENCE BETWEEN IMPRACTICALITY AND FEASIBILITY OF THE OVERALL SYSTEM WHICH MAY ALSO INCLUDE RAMAN INSERTS.

POWERTRONIC SYSTEMS, INC.

NAVY

POST OFFICE BOX 29109

NEW ORLEANS, LA 70189

CHARLES E. THOMAS

TITLE:

LOW-HARMONIC 400 HZ LINE VOLTAGE REGULATOR FOR SHIPBOARD
POWER-SYSTEMS

TOPIC: 52 OFFICE: NAVSEA

DEVELOPMENT IS PROPOSED OF AN IMPROVED TYPE OF 400 HZ LINE VOLTAGE REGULATOR (LVR) THAT INHERENTLY PROVIDES LOW-DISTORTION OUTPUT VOLTAGE WITH NON-LINEAR LOADS AND WITH DISTORTED INPUT VOLTAGE. REGULATION IS ACCOMPLISHED BY SWITCHING AT HIGH FREQUENCY TRANSFORMER WINDINGS TO GENERATE A BOOST/BUCK VOLTAGE IN SECONDARY WINDING IN SERIES BETWEEN THE LVR INPUT AND OUTPUT. THE LVR FUNCTIONS AS A VARIABLE-RATIO TRANSFORMER WITH OUTPUT-TO-INPUT RATIO AUTOMATICALLY CONTROLLED BY FEEDBACK TO MAINTAIN THE DESIRED INSTANTANEOUS OUTPUT VOLTAGE WAVEFORM. OPEN LOOP GAIN OF THE VOLTAGE REGULATOR IS SUBSTANTIAL FOR FREQUENCIES UP TO 5,200 HZ. CONSEQUENTLY, FEEDBACK ACTION REDUCES OUTPUT DISTORTION DUE TO EITHER NON-LINEAR LOADS OR TO DISTORTED INPUT VOLTAGE. THE OUTPUT FILTER IMPEDANCE IS LOW BECAUSE IT IS DESIGNED TO ATTENUATE THE SWITCHING FREQUENCY. PHASE II OBJECTIVES ARE DESIGN, FABRICATION AND TESTING OF A PROTOTYPE LVR THAT DEMONSTRATES THE CAPABILITY TO SUPPLY LOW-DISTORTION OUTPUT WITH NON-LINEAR LOADS AND WITH DISTORTED INPUT VOLTAGE. THE PROTOTYPE LVR CIRCUIT DESIGN WILL BE THE SAME AS THE BREAD-BOARD DESIGN EXCEPT FOR MODIFICATIONS REQUIRED FOR COMPLIANCE WITH THE SPECIFICATIONS DEFINED DURING PHASE II.

PULSE SCIENCES, INC.

AF

14796 WICKS BLVD.

SANLEANDRO, CA 94577

LELAND SCHLITT

TITLE:

THE SCANTRON--A HIGH POWER MICROWAVE GENERATOR CONCEPT

TOPIC: 8a OFFICE: AFWL/PRP

THE SCANTRON AMPLIFIER IS A NEW AND NOVEL APPROACH FOR GENERATING CO-

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HERENT MICROWAVE RADIATION AT FREQUENCIES IN THE RANGE OF 0.3-3.0 GHz, AT GIGAWATT POWER LEVELS AND FOR PULSE LENGTHS EXCEEDING 1 MICROSEC HIGH REPETITION RATE APPLICATIONS. THE DEVICE USES AN ARRAY OF TRANSVERSELY MODULATED, LOW PERVEANCE, RELATIVISTIC ELECTRON BEAMS, WHICH INTERACT WITH A SERIES OF TURNED OUTPUT CAVITIES, TO AMPLIFY INPUT SIGNALS BY TYPICALLY 40 DB. THE SIMPLICITY OF THE SCRANTON AND ITS ABILITY TO OPERATE EFFICIENTLY (> 50%) IN A LINEAR REGIME AT HIGH POWER LEVELS ARE ATTRACTIVE FEATURES OFFERED BY NO OTHER MICROWAVE SOURCE IN THIS FREQUENCY RANGE. THE PHASE I PROGRAM THEORETICALLY RESOLVED ALL KEY PHYSICS ISSUES AND RESULTED IN A SET OF PRODUCTION DRAWINGS FOR A 0.88 GHz, 0.3 GW SINGLE-SHOT DEMONSTRATION SYSTEM CONSISTING OF A SCRANTON TUBE, PULSED POWER DRIVER, OUTPUT WAVEGUIDE, VACUUM SYSTEM, AND DIAGNOSTICS. THE OBJECTIVES OF THE PHASE II EFFORT ARE TO CONSTRUCT THE DEMONSTRATION HARDWARE, TO PERFORM DETAILED EXPERIMENTAL EVALUATIONS, AND TO DEVELOP A SET OF EXPERIMENTALLY VERIFIED SCALING LAWS. TWO PHASE II PROGRAMS ARE PROPOSED, A PRIMARY PROGRAM (OPTION 1) AND A LOWER-COST OPTIONAL PROGRAM, WHICH WOULD DEMONSTRATE OPERATION WITH ONE OUTPUT CAVITY. THE RESULTS OF THE PRIMARY EFFORT WILL FORM A FIRM FOUNDATION FOR COMMERCIALIZATION OF THE SCANTRON.

QUANTIC INDUSTRIES, INC.
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WILLIAM F. MARSHALL

AF

TITLE:
PROPOSAL FOR A SEMICONDUCTOR-TRIGGERED HIGH VOLTAGE SWITCH
TOPIC: 7b OFFICE: AD/DXB

THIS INNOVATIVE RESEARCH PROGRAM IS DESIGNED TO DEVELOP: 1) TWO HIGH-ENERGY FIRING UNIT DESIGNS UTILIZING THE SEMICONDUCTOR TRIGGERED HIGH VOLTAGE SWITCH'S PRECISELY PREDICTABLE FIRING TIME; 2) DEVELOP THE SWITCH'S APPLICATION IN A FIRING UNIT CONFIGURATION HAVING A PHYSICALLY ISOLATED HIGH-ENERGY SYSTEM; AND 3) PACKAGING THE SWITCH IN AN INNOVATIVE MANNER TO REDUCE ITS INDUCTANCE AND IMPROVE SWITCHED CURRENT RISE TIME.

ONE HIGH-ENERGY FIRING UNIT DESIGN WILL ACTUALLY CONSIST OF A DUAL FIRING UNIT HAVING VARIABLE TRIGGERING RELAYS TO ENABLE THE DELAY BETWEEN FIRING TIMES OF THE TWO CHANNELS TO BE PRESET. THIS UNIT WILL DEMONSTRATE THE SEMICONDUCTOR SWITCH'S ABILITY TO FUNCTION IN AN

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EXPLOSIVE COINCIDENCE GATE APPLICATION, THUS MAKING ADVANTAGE OF THE SWITCH'S FIRING-TIME PREDICTABILITY. THE SECOND FIRING UNIT WILL UTILIZE A UNIQUE TRANSFER CIRCUIT CONCEPT WHERE A COMPONENT FAILURE WILL NOT INADVERTANTLY FIRE THE UNIT.

QUANTUM DESIGN, INC.
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DR. RONALD E. SAGER

NAVY

TITLE:
AN IMPROVED OPTICALLY PUMPED MAGNETIC DETECTOR FOR LOCATING DEEPLY BURIED FERROUS ORDNANCE
TOPIC: 73 OFFICE: NAVSEA

ALTHOUGH OPTICALLY PUMPED MAGNETIC DETECTORS ARE NOW USED IN A VARIETY OF BOTH MILITARY AND COMMERCIAL APPLICATIONS, THERE HAS BEEN LITTLE INTEREST IN RECENT YEARS IN DEVELOPING MORE SENSITIVE INSTRUMENTS BASED ON THE OPTICAL PUMPING TECHNIQUE. HOWEVER, DR. WILLIAM HAPPER OF PRINCETON UNIVERSITY HAS RECENTLY DESCRIBED THE TECHNIQUES FOR OBTAINING A DRAMATIC INCREASE IN SENSITIVITY FROM THESE DEVICES, AND DURING PHASE I, WE PERFORMED EXPERIMENTS WHICH HAVE DEMONSTRATED THE FUNDAMENTAL CONCEPT. IN THIS PROPOSAL WE PRESENT A PROGRAM FOR DEVELOPING AN OPTICALLY PUMPED MAGNETIC SENSOR BASED ON HAPPER'S ANALYSES. THE FIRST PART OF THE PROGRAM ADDRESSES THE CRITICAL ISSUES OF SPIN RELAXATION OF THE ALKALI METAL VAPOR IN THE ABSORPTION CELL, AND THE GENERATION OF A RELIABLE HIGH INTENSITY PUMPING BEAM TO ESTABLISH THE INITIAL POLARIZATION. THE LAST HALF OF THE PROGRAM IS DEVOTED TO CONSTRUCTING AND TESTING AN INITIAL EVALUATION UNIT, THEN REFINING THE DESIGN TO PRODUCE A SECOND GENERATION INSTRUMENT WHICH CAN BE USED TO PERFORM SOME INITIAL EVALUATION TESTS IN A FIELD ENVIRONMENT. THE PROPOSAL PRESENTS A DETAILED DESCRIPTION OF THE PROBLEMS TO BE SOLVED IN THE DEVELOPMENT PROGRAM, AND DISCUSSES OUR APPROACH TO EACH.

RASOR ASSOCIATES, INC.
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NED S. RASOR

NAVY

TITLE:
NOVEL HIGH-CURRENT CIRCUIT BREAKER AND CURRENT LIMITER FOR NAVAL SHIPBOARD ELECTRONIC POWER (RAP-088)
TOPIC: 51 OFFICE: NAVSEA

THE EMISSION FAULT CURRENT LIMITER (EFCL) IS A NEW TYPE OF DEVICE

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THAT INHERENTLY LIMITS THE INSTANTANEOUS LINE CURRENT TO A PRE-DETERMINE MAXIMUM VALUE WITHOUT INTERRUPTING THE CIRCUIT. IN PHASE I AN EFCL REFERENCE DESIGN WAS DEFINED, BASED ON EXISTING TECHNOLOGY, WITH ESTIMATED SPECIFICATIONS INDICATING THAT THE USE OF THE EFCL IN SHIPBOARD ELECTRIC POWER SYSTEMS IS BASICALLY FEASIBLE. THE OBJECTIVES OF THE PROPOSED PHASE II PROJECT ARE TO ESTABLISH A GENERAL EXPERIMENTAL AND ANALYTICAL TECHNOLOGY BASE FOR THE EFCL TO SURVEY AND ANALYTICALLY EVALUATE APPLICATION OF THE EFCL IN SHIPBOARD AND RELATED ELECTRICAL POWER SYSTEMS, AND ON THESE BASES TO PREPARE A PLAN FOR THE PHASE III SERIES PRODUCTION OF MISSION AND COST-EFFECTIVE EFCL'S FOR SHIPBOARD TRIALS AND COMMERCIALIZATION. THIS IS ACCOMPLISHED THROUGH ITERATIVE DESIGN AND EXPERIMENTAL TESTING OF TWO PREPROTOTYPE EFCL DISCHARGE TUBES AND A PREPROTOTYPE INTEGRATED EFCL SYSTEM. CONCURRENT DEVELOPMENT OF AN ANALYTICAL DESIGN MODEL OF THE EFCL, AND SYSTEM STUDIES OF THE REQUIREMENTS AND CHARACTERISTICS OF EFCL SHIPBOARD ELECTRIC POWER SYSTEMS, ARE ITERATIVELY IMPROVED BY THE TEST DATA, AND ARE USED TO GUIDE THE DEVICE DESIGN AND TESTING. EMPHASIS IS ON SHIPBOARD APPLICATION, BUT SHORE AND COMMERCIAL APPLICATIONS OF THE DEFINED EFCL WILL BE CONSIDERED.

REN CORPORATION

ARMY

5900 S. US 177 ROUTE 6, BOX 450
STILLWATER, OK 74074

BRENT COPPOCK

TITLE:

AUTOMATED AMMUNITION LOADING OF COMBAT VEHICLE

TOPIC: 5d OFFICE: HEL/LABCOM

THE OBJECTIVE OF THIS PROJECT IS TO PROVIDE DESIGN GUIDANCE FOR THE DEVELOPMENT OF ADVANCED HYDRAULIC CONTROL SYSTEMS FOR HEAVY LIFT ROBOTS. MATHEMATICAL MODELS WILL BE DEVELOPED WHICH WILL ALLOW ANALYSIS OF COMPLEX LOAD SENSING, TORQUE LIMITING HYDRAULIC SYSTEMS AND PERMIT OPTIMIZATION OF THE CONTROLS FOR VARIOUS ROBOT GEOMETRIC CONFIGURATIONS. AN ENGINEERING TEST BED WILL BE CONSTRUCTED TO VALIDATE THE MODELS AND PROVIDE A USEFUL FACILITY FOR TESTING ADVANCED CONCEPTS IN FIELD MATERIAL HANDLING ROBOTS. SPECIFIC SUBTASKS INCLUDE THE EVALUATION OF PURE HYDRAULIC AND ELECTRO-HYDRAULIC PUMP CONTROLS; THE EFFECTS OF PRESSURE COMPENSATION ON VALVE METERING CHARACTERISTICS, THE POTENTIAL FOR CONTROL ENHANCEMENT BY MODIFIED PHASING OF VALVE METERING FUNCTIONS AND THE EVALUATION OF VARIOUS CONTROL ALGO-

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RITHMS FOR MICROPROCESSOR CONTROL OF ADVANCED HYDRAULIC SYSTEMS.

SABBAGH ASSOCS. INC./ANALYTICS INC
2634 ROUND HILL LANE
BLOOMINGTON, IN 47401
HAROLD A. SABBAGH

NAVY

TITLE:

AN EDDY-CURRENT MODEL AND INVERSION ALGORITHM FOR NONDESTRUCTIVE
EVALUATION OF ADVANCED COMPOSITES

TOPIC: 99 OFFICE: NAVAIR

SABBAGH ASSOCIATES, INC. IS DEVELOPING AN EDDY-CURRENT SYSTEM FOR
THREE-DIMENSIONAL QUANTITATIVE EVALUATION (NDE). IT CONSISTS OF A
SENSOR AND ITS ASSOCIATED ELECTRONICS AND CONTROL HARDWARE, A SPECIAL
PURPOSE COMPUTER, THE SOFTWARE, INCLUDING THE MATHEMATICAL ALGORITHM
FOR FLAW RECONSTRUCTION AND THE COMPUTER OPERATING SYSTEM, AND A
GRAPHICAL DISPLAY UNIT, WHICH INCLUDES GRAPHICS AND IMAGING SOFTWARE.
THE PHASE II OBJECTIVES ARE TO DEVELOP A PROTOTYPE OF THE SPECIAL
PURPOSE COMPUTER, TOGETHER WITH THE SOFTWARE, AND TO TRANSFORM THE
RECONSTRUCTION ALGORITHM INTO A VERSION THAT FULLY EXPLOITS THE
ARCHITECTURE OF THE COMPUTER.

SCIENTIFIC RESEARCH ASSOCIATES
POST OFFICE BOX 498
GLASTONBURY, CT 06033
DR. STEPHEN J. SHAMROTH

NAVY

TITLE:

PROPOSAL TO DEVELOP A SHIP PROPELLER TIP
VORTEX ANALYSIS

TOPIC: 123 OFFICE: ONR

UNDER PHASE I OF THE TIP PROPELLER EFFORT, A THREE-DIMENSIONAL,
VISCIOUS FLOW FORWARD MARCHING ANALYSIS WAS SUCCESSFULLY APPLIED TO
THE SHIP PROPELLER TIP VORTEX PROBLEM. DEMONSTRATION CALCULATIONS
CLEARLY SHOWED THE RELEVANT PHYSICAL PROCESSES. UNDER THE PROPOSED
PHASE II EFFORT, THE ANALYSIS WOULD BE EXTENDED THROUGH INCORPORATION
OF A TURBULENCE MODEL, THE REQUIRED POTENTIAL FLOW ESTIMATE WOULD BE
COUPLED TO THE PROCEDURE AND AN ASSESSMENT OF THE PROCEDURE'S
QUANTITATIVE ACCURACY WOULD BE MADE VIA COMPARISON WITH EXISTING DATA.
FINALLY, THE TECHNOLOGY DEVELOPED WOULD BE TRANSFERRED TO NAVY LABORA-

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TORIES SUCH AS DTNSRDC AS A USER FRIENDLY PROGRAM.

SCIENTIFIC RESEARCH ASSOCIATES, INC.

AF

PO BOX 498

GLASTONBURY, CT 06033

HAROLD L. GRUBIN

TITLE:

TWO-DIMENSIONAL NUMERICAL SIMULATION OF THE GALLIUM ARSENIDE PERMEABLE BASE TRANSISTOR USING MOVEMENTS OF BOLTZMAN EQUATION

TOPIC: 1 OFFICE: AFOSR/XOT

THIS PROPOSAL DESCRIBES A NUMERICAL PROGRAM FOR EXAMINING THE HIGH FREQUENCY PROPERTIES OF THE GALLIUM ARSENIDE PERMEABLE BASE TRANSISTOR (PBT). THE PROGRAM HAS AS ITS BASIS ALGORITHMS FOR SOLVING THE MOMENTS OF THE BOLTZMANN TRANSPORT EQUATION (MBTE) AND THE DRIFT AND DIFFUSION EQUATIONS (DDE). THE DDE IS INTRODUCED AS AN EFFECTIVE MEANS FOR OBTAINING PRELIMINARY DEVICE PARAMETERS, FOLLOWING WHICH THE MBTE ALGORITHM IS INVOKED. THE MBTE ALGORITHM IS USED BECAUSE THE RELEVANT PBT DEVICE PHYSICS IS TIED INTO ITS SUBMICRON FEATURE SIZE, WHERE THE INFLUENCE OF VELOCITY OVERSHOOT MUST BE INCLUDED. THE PROPOSED STUDY INVOLVES SEVERAL BROAD TASKS INCLUDING ALGORITHM DEVELOPMENT TO IMPROVE CONVERGENCE RATES FOR THE MBTE SIMULATIONS. ADDITIONAL TASKS ARE DIRECTED TOWARD CHOOSING A SET OF PARAMETERS APPROPRIATE TO 60 AND 94GHZ SMALL SIGNAL AMPLIFICANT. THE ANALYSIS INCLUDES APPLICATION OF A ROUTINE FOR CALCULATING THE SMALL SIGNAL FREQUENCY AND BIAS DEPENDENT COMPLEX 'Y' PARAMETERS, AND USING THESE PARAMETERS TO COMPUTE THE UNITY CURRENT GAIN FREQUENCY, POWER GAIN AND MAXIMUM AVAILABLE GAIN. ADDITIONALLY, TRANSIENT SWITCHING TIMES ARE CALCULATED AND BREAKDOWN, THROUGH INCLUSION OF HOLE TRANSPORT AND AVALANCHING, IS ASSESSED.

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GLASTONBURY, CT 06033

STEPHEN J. SHAMROTH

TITLE:

DEVELOPMENT OF A DESIGN-ORIENTED NAVIER-STOKES CASCADE ANALYSIS

TOPIC: 13 OFFICE: AFWAL/XPR-PO

EFFICIENT HIGH PERFORMANCE COMPRESSORS AND TURBINES ARE HIGHLY

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DESIRABLE FOR MODERN ADVANCED PROPULSION SYSTEMS. THE DESIGN OF SUCH MACHINES COULD BE GREATLY AIDED BY THE DEVELOPMENT OF ACCURATE EFFICIENT FLOW PREDICTION PROCEDURES. A KEY AREA IN THIS DEVELOPMENT IS THE FLOW THROUGH THE COMPRESSOR OR TURBINE CASCADE. UNDER PHASE I OF THE SBIR A FLOW PREDICTION PROCEDURE BASED ON A NUMERICAL SOLUTION OF THE NAVIER-STOKES EQUATIONS FOR A CASCADE WAS RESTRICTED TO PERMIT SHORTER COMPUTER RUN TIMES AND TO ALLOW EFFICIENT UTILIZATION BY A RELATIVELY INEXPERIENCED USER. STEADY COMPRESSOR AND TURBINE CASCADE FLOW FIELDS CAN NOW BE CONVERGED IN LESS THAN 300 CPU SECS OF UNVECTORIZED CRAY-1 COMPUTER RUN TIME. UNDER PHASE II THE CODE WOULD BE VECTORIZED THUS POTENTIALLY ALLOWING CONVERGED CALCULATIONS IN AS LITTLE AS 30 CPU SECS. IN ADDITION, A MULTIPLE PASSAGE ANALYSIS WOULD BE INCORPORATED INTO THE CODE TO ALLOW THE EFFECTS OF NON-PERIODIC DISTURBANCES UPON THE FLOW SUCH AS INLET DISTORTION OR ROTATING STALL. THE CODE WOULD BE EXERCISED UNDER THESE CONDITIONS.

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DR. JOHN BAILLIEUL

AF

TITLE:
KINEMATICALLY REDUNDANT ROBOT MANIPULATORS
TOPIC: 11i OFFICE: AFWAL/XRPM

BECAUSE NONMINIMALLY ARTICULATED (OR KINEMATICALLY REDUNDANT) ROBOT MANIPULATORS HAVE EXTRA DEGREES OF FREEDOM WITH WHICH TO MOVE AND ORIENT END EFFECTORS IN THE WORKSPACE, THEY OFFER A NUMBER OF ADVANTAGES OVER CURRENTLY AVAILABLE DESIGNS. FROM THE VIEWPOINT OF PROGRAMMING AND CONTROL, HOWEVER, THERE ARE POTENTIAL PROBLEMS DUE TO THE INCREASED COMPLEXITY OF THE KINEMATICS AND DYNAMICS. THIS PROPOSAL DESCRIBES THE SECOND PHASE OF A THREE PHASE RESEARCH AND DEVELOPMENT PROGRAM AIMED AT DEVELOPING DESIGN, PROGRAMMING, AND CONTROL TECHNOLOGIES FOR KINEMATICALLY REDUNDANT ROBOT MANIPULATORS.

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CLARK M. NEILY, JR.

AF

TITLE:
INVESTIGATION OF AIR-TO-SPACE INTERCEPT GUIDANCE LAWS
TOPIC: 17c OFFICE: AD/CZO

IN PHASE I OF THIS RESEARCH, A SET OF CANDIDATE REFERENCE MISSIONS

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FOR INTERCEPT OF EARTH ORBITING TARGETS BY AN AIR-LAUNCHED INTERCEPTOR WERE DESCRIBED, AND APPROPRIATE GUIDANCE LAWS DEVISED.. THE PRESENT INVESTIGATION WILL DEVELOP APPROPRIATE COMPUTER-BASED ANALYSIS TOOLS TO IMPLEMENT THESE LAWS, AND REDUCE THEM TO PRACTICE IN A SIMULATED ENVIRONMENT. SPECIFICALLY, THE OBJECTIVES OF THIS EFFORT ARE TO EVOLVE EXISTING ARMAMENT DIVISION AIR-LAUNCHED MISSILE SIMULATION ANALYSIS TOOLS TO DEAL WITH THIS CLASS OF PROBLEMS; DEMONSTRATE THE PERFORMANCE OF VARIOUS GUIDANCE POLICIES FOR EACH TYPE MISSION; AND PRODUCE A PARAMETRIC DATA BASE OF SUBSYSTEM PERFORMANCE REQUIREMENTS TO CARRY OUT THESE TYPES OF MISSION.

SHENANDOAH SYSTEMS COMPANY
800 FOLLIN LANE SUITE 230
VIENNA, VA 22180
RICHARD C ROBINSON

NAVY

TITLE:

AUTOMATIC DATA PROCESSING FOR SIDE SCAN SONAR AND MAGNETOMETER
DATA

TOPIC: 74 OFFICE: NAVSEA

THE PRIMARY OBJECTIVE OF THIS SECOND PHASE OF THE PROGRAM IS TO DEVELOP AND VALIDATE, BY LABORATORY TEST, A SET OF SIDE SCAN SONAR MINE DETECTION ALGORITHMS. WHILE THESE ALGORITHMS ARE CRITICAL TO THE SUCCESS OF AN AUTOMATED MINE HUNTING SENSOR SYSTEM, THEIR DEVELOPMENT DOES NOT COMPLETE NOR FULLY VALIDATE THE PROGRAM. THE DETECTION ALGORITHM TEST FACILITY (DATF), PROPOSED HEREIN, IS A SINGLE CHANNEL SOFTWARE DEVELOPMENT TOOL WITH THE MINIMUM SET OF EQUIPMENT NECESSARY TO DEVELOP AND TEST A SIDE SCAN SONAR PROCESSOR. THE DATF EQUIPMENT SUITE WILL BECOME THE CENTRAL PROCESSOR AND DISPLAYS NECESSARY FOR AT-SEA TRIALS OF THE AUTOMATED SONAR SYSTEM. IT HAS ALSO BEEN SIZED (WITH SOME ADDITIONAL MEMORY) TO ALSO FUNCTION IN AN INTEGRATED MULTI-SENSOR SEARCH SYSTEM AND WITH THE INSHORE PILOT DATA BASE SYSTEM. SECONDARY OBJECTIVES OF THIS PHASE OF THE PROGRAM WILL BE TO LAY A SOLID FOUNDATION TO ENTER THE NEXT PHASE OF THE PROGRAM, AT-SEA DEMONSTRATION OF A AUTOMATED MINE HUNTING SYSTEM. WHILE MOST OF THE SUPPORTING EFFORT IS OF A PLANNING NATURE, IT IS NECESSARY TO KEEP THE DETECTION ALGORITHM DEVELOPMENT FOCUSED ON THE REAL OPERATIONAL PROBLEMS. IT IS ALSO NECESSARY IF THE PROGRAM IS TO MOVE SMOOTHLY INTO AT-SEA TESTS AND BE READY FOR TECH EVAL AND OP EVAL IN AN EFFICIENT AND TIMELY MANNER.

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SILICON DESIGNS
7417 92ND PLACE SE
MERCER ISLAND, WA 98040
JOHN C COLE

NAVY

TITLE:
DIGITAL SAFE AND ARM DEVICE FOR GUIDED MISSILES
TOPIC: 95 OFFICE: NAVAIR

SAFE AND ARM DEVICES CURRENTLY IN USE IN GUIDED MISSILES ARE DERIVATIVES OF A PROVEN MECHANICAL DESIGN. ALTHOUGH SIMPLE IN CONCEPT, THE CURRENT MECHANICAL DESIGN IS NOT EASY TO PRODUCE WITH THE NEEDED TOLERANCES. MAJOR ADVANCES IN MICROELECTRONIC COMPONENTS HAVE BEEN MADE IN RECENT YEARS, MAKING FEASIBLE THE REPLACEMENT OF MANY MECHANICAL SUBSYSTEMS WITH LOWER COST, MORE RELIABLE ELECTRONIC ONES. PHASE I WORK DEVELOPED AND ANALYZED THE PRELIMINARY DESIGN FOR AN ELECTRONIC SAFE AND ARM DEVICE THAT MEETS THE COST AND PERFORMANCE GOALS FOR SUCH A DEVICE. THE OFFEROR PROPOSES IN PHASE II TO CONTINUE THE ADVANCED DEVELOPMENT, RESULTING IN THE FABRICATION AND QUALIFICATION TESTING OF ENGINEERING MODELS NECESSARY TO DEMONSTRATE THE SAFETY OF THE DESIGN. THE PROGRAM HAS BEEN PLANNED TO TAKE MAXIMUM ADVANTAGE OF RELATED WORK PLANNED AND FUNDED AT THE NAVAL WEAPONS CENTER.

SIPPICAN OCEAN SYSTEMS, INC.
SEVEN BARNABAS ROAD
MARION, MA 02738
RICHARD W LANCASTER

NAVY

TITLE:
INVESTIGATION ON A FIBER OPTIC COMMUNICATIONS LINK FOR USE WITH AN EXPENDABLE TWO-WAY COMMUNICATION BUOY
TOPIC: 76 OFFICE: SPAWAR

THE CAPABILITY FOR A SUBMERGED UNDERWAY SUBMARINE TO CONDUCT TWO-WAY COMMUNICATIONS WITH A SURFACE SHIP, ANOTHER SUBMARINE, AIRCRAFT OR SATELLITE, WITHOUT ASCENDING TO PERISCOPE DEPTH DOES NOT EXIST IN THE FLEET. THIS CAPABILITY IS ESSENTIAL TO DIRECT SUPPORT, SECURE SUBMARINE COMMUNICATIONS AND MAY HAVE SUBSTANTIAL APPLICATION IN SUCH AREAS AS OVER-THE-HORIZON TARGETING. THEREFORE, THE GOAL OF THIS PHASE II EFFORT SHALL BE TO PURSUE AND DOCUMENT BY MEANS OF A HARDWARE DEMONSTRATION A VOICE OR DATA, ONE HOUR DURATIONS, UHF

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LINE-OF-SIGHT FIBER OPTIC EXPENDABLE COMMUNICATION SYSTEM. THE SPECIFIC OBJECTIVES OF THIS 18-MONTH SBIR PHASE II DEVELOPMENT PROPOSAL ARE: A. DEFINE THE PERFORMANCE PARAMETERS OF AN OPTICAL FIBER WOUND ON A SPOOL CONFIGURED AND CONSTRAINED TO THE BUOY MECHANICAL DESIGN AND OPERATING PARAMETERS; B. DESIGN, FABRICATE, AND TEST FOUR OPTICAL FIBER LINKED TWO-WAY SUBMARINE COMMUNICATIONS SYSTEMS; C. OPERATIONALLY DEMONSTRATE THE COMMUNICATIONS SYSTEM UNDER CONDITIONS SIMULATING SUBMARINE LAUNCH AND DEPLOYMENT; D. PROVIDE FOR THE TECHNOLOGY TRANSITION FROM A FIBER OPTIC EXPENDABLE TWO-WAY UHF VOICE OR DATA COMMUNICATIONS SYSTEM TO A SATELLITE COMPATIBLE FIBER OPTIC LINKED TWO-WAY SUBMARINE COMMUNICATIONS DEVICE.

SPARTA INC
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LAGUNA HILLS, CA, CA 92653
DR PHILIP D. HENSHAW

ARMY

TITLE:
OPTICAL DETECTION OF REENTRY VEHICLES IN SCENES WITH HIGH BACKGROUND CLUTTER
TOPIC: 8c OFFICE: BMDSC-CPP

A PROGRAM TO INVESTIGATE THE USE OF PHASE-ONLY IMAGING FOR THE PURPOSE OF SUPPRESSION OF CLEAR AND ATMOSPHERICALLY INDUCED BACKGROUND CLUTTER IS PROPOSED. PHASE I ANALYTICAL RESULTS HAVE SHOWN CLUTTER SUPPRESSION FACTORS OF UP TO 100,000, AND SIMULATIONS OF CLUTTER SUPPRESSION APPLIED TO CLOUD SCENES HAVE BEEN PERFORMED. RESULTS FROM THIS WORK ARE PRESENTED HERE. PROPOSED PHASE II WORK WILL INCLUDE: (i) AN APPLICATION OF THE PHASE-ONLY AND SIGN-ONLY ALTERS TO THE AOA MISSION, (ii) CONTINUE ANALYSIS AND SIMULATION OF BACKGROUND EFFECTS ON CLUTTER SUPPRESSION; AND (iii) AN EXAMINATION OF HARDWARE IMPLEMENTATION. THE TECHNOLOGY WILL BE INTEGRATED WITH THE AOA MISSION GOALS TO INCREASE THE RANGE AT WHICH TARGETS MAY BE ACQUIRED AND TRACKED. SUPPRESSION OF NUCLEAR INDUCED RED-OUT BACKGROUNDS WILL BE

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AF

TITLE:
RESEARCH ON LARGE, HIGHLY ACCURATE INFLATABLE REFLECTORS
TOPIC: 3 OFFICE: AFRPL/TSPR

IN-SPACE DEPLOYABLE, LARGE APERTURE, HIGHLY ACCURATE REFLECTORS OFFER

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UNIQUE CAPABILITIES FOR SOLAR ROCKET, SYNCHRONOUS ORBIT MICROWAVE, AND OTHER APPLICATIONS. THEY OFFER HIGH PERFORMANCE WITH MODERATE WEIGHT, COMPLEXITY AND COST REQUIREMENTS. THE PHASE I RESEARCH DEMONSTRATED THE FEASIBILITY OF FILM MEMBRANE INFLATABLE REFLECTORS (CONCENTRATION RATIOS OF 9000:1) WHICH EMPLOY ELECTROSTATIC ACTIVE CONTROL TECHNIQUES FOR MAINTAINING VERY ACCURATE REFLECTING SURFACE GEOMETRIES. IT ESTABLISHED THE BASIS FOR INFLATION DEPLOYABLE REFLECTOR SUPPORT STRUCTURE AND FIGURE SENSING AND CONTROL SYSTEM DEVELOPMENT AND PROVIDED AN EXTENSIVE DATA COMPENDIUM AND DESIGN AND TEST EXPERIENCE IN FILM SEAMING AND SHAPING TECHNIQUES AND FILM MATERIALS PROPERTIES. BASED ON THESE RESULTS, THE PHASE II EFFORT WILL DEVELOP AND EVALUATE ALTERNATE CLOSED-LOOP SURFACE GEOMETRY CONTROL TECHNIQUES; DETERMINE SPACE ENVIRONMENT EFFECTS ON REFLECTOR MATERIALS; DEVELOP FILM CURVATURE FORMING TECHNIQUES; PERFORM DEPLOYABLE STRUCTURE ASSEMBLY DETAILED DESIGN TRADES; AND DESIGN, CONSTRUCT, AND TEST IN VACCUUM AN INTEGRATED 2-3 METER DIAMETER MODEL WHICH DEMONSTRATES PACKAGING/ DEPLOYMENT MECHANISMS, FIGURE SENSING AND CONTROL DEVICES, AND CHARGE-DRIVE SYSTEM.

SPECTRA RESEARCH SYSTEMS
555 SPARKMAN DRIVE, SUITE 1406
HUNTSVILLE, AL 35805
RODNEY BRADFORD

DARPA

TITLE:

PORTABLE SOLAR POWERED WATER PURIFICATION AND DESALINATION SYSTEM
DEVELOPMENT

TOPIC: 8 OFFICE: DARPA

THE PROPOSED EFFORT IS TO BRING THE PROTOTYPE SOLAR POWERED WATER PURIFICATION AND DESALINATION SYSTEM STUDIED IN PHASE I TO THE POINT OF BEING FIELD-TESTED BY POTENTIAL OPERATIONAL USERS AND CONDUCT A COMPREHENSIVE EVALUATION AND TEST PROGRAM. THIS WILL INCLUDE MATERIALS EVALUATION AND TESTING, FABRICATION AND TESTING OF SELECTED ALTERNATE DESIGN ABSORBER/VAPORIZER AND SUPPORT STRUCTURES, PERFORMANCE ANALYSES CONSIDERING OPERATING CONDITIONS, PORTABILITY, DEPLOYMENT, MAINTENANCE AND COST, AND A MANUFACTURING AND PRODUCE-ABILITY ANALYSIS.

THE PRIMARY OBJECTIVE OF THE PHASE I EFFORT WAS TO DETERMINE THE FEASIBILITY OF A LIGHTWEIGHT, COMPACT, DURABLE AD PORTABLE SOLAR POWERED WATER PURIFICATION AND DESALINATION SYSTEM. THE CONCEPT THAT WAS ANALYZED AND TESTED ENTAILS AN INFLATABLE SPHERICAL

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VESSEL CONSTRUCTED OF THIN TRANSPARENT POLYMER FILM WHICH HAS A REFLECTIVE COATING ON THE LOWER HALF THAT SERVES AS A SOLAR RADIATION CONCENTRATOR AND ALSO AN AIR-COOLED CONDENSER. SEVERAL DESIGN CONCEPTS AND MATERIALS APPLICATIONS WERE INVESTIGATED FOR AN APPROPRIATE ABSORBER/VAPORIZER DESIGN. THE CONCEPTS AND SYSTEM ELEMENT DESIGN OPTIONS ANALYZED AND TESTED IN PHASE I DIRECTLY SUPPORT SYSTEM DEVELOPMENT AND SCALED-UP TESTING IN PHASE II.

SPECTRAN CORPORATION
P.O. BOX 650, HALL ROAD
STURBRIDGE, MA 01566
DR. RAYMOND E. JAEGER

AF

TITLE:
STUDY OF PREPARATION TECHNIQUES FOR LARGE BULK FLUORIDE COMPONENTS
TOPIC: 9c OFFICE: RADC/ES

BULK GLASS COMPONENTS PREPARED FROM FLUORIDE GLASSES SUCH AS WINDOWS, LENSES AND DOMES EXHIBIT BROAD BAND LOW LOSS TRANSMISSION FROM NEAR UV TO MID IR WAVELENGTHS. THE GOALS OF THE PROGRAM ARE TO DEVELOP A REPRODUCEABLE PROCESS FOR THE PREPARATION OF HIGH PURITY FLUORIDE GLASS IN BULK FORM. AN ADDITIONAL GOAL IS THE PREPARATION OF HIGH QUALITY DEVITRIFICATION-FREE LARGE COMPONENTS SUCH AS WINDOWS, DOMES RODS, TUBES AND PRISMS, THAT EXHIBIT HIGH BROAD BAND SPECTRAL TRANSMISSION. THE GOALS WILL BE ACCOMPLISHED THROUGH THE PREPARATION OF DOPED FLUORIDE GLASSES IN A CONTROLLED ENVIRONMENT USING A FLUOROZIRCONATE AS THE BASE COMPOSITION. AN AVERAGE OF TWO (2) EXPERIMENTAL MELTS PER WEEK WILL BE PREPARED AND THEIR OPTICAL AND PHYSICAL PROPERTIES EVALUATED. APPROXIMATELY ONE AND ONE-HALF MAN YEARS PER YEAR LEVEL OF EFFORT WILL BE REQUIRED FOR SUCCESSFUL COMPLETION OF THE PROGRAM.

SPECTRAN CORPORATION
P.O. BOX 650, HALL ROAD
STURBRIDGE, MA 01566
JOHN M. STEVENS

AF

TITLE:
DEVELOPMENT OF PROCEDURES FOR HERMETIC COATING OF OPTICAL FIBER USING ION DEPOSITION
TOPIC: 9i OFFICE: RADC/DORP

THE PRODUCTION OF LONG LENGTHS OF HIGH STRENGTH, HERMETICALLY COATED

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FIBER IS VITAL FOR FUTURE MILITARY AND COMMERCIAL NEEDS. ALTHOUGH, THE EXPERIMENTAL HERMETIC COATING APPARATUS HAS PRODUCED CARBON/INDIUM HERMETICALLY COATED FIBERS WITH STRESS CORROSION COEFFICIENTS GREATER THAN 140, LONG LENGTHS WERE NOT POSSIBLE. A PILOT PRODUCTION DRAW TOWER WAS CONSTRUCTED DURING PHASE I. THE OBJECTIVE OF PHASE II WILL BE TO DEPOSIT, VIA ION PLASMA DEPOSITION, VARIOUS DIELECTRIC MATERIALS ON TO OPTICAL FIBER, AND TO PRODUCE ONE KILOMETER LENGTHS (yr. 2) OF HERMETICALLY COATED OPTICAL FIBER.

SRL ELECTRONICS & INFOTEC DEVEL, INC. AF
26712 WESTVALE ROAD
PALOS VERDES PENN, CA 90274
SCOTT ANDERSON

TITLE:
SPACEBORNE MASS STORAGE DEVICES: DEVELOPMENT OF A SOLID STATE
(BUBBLE MEMORY) RECORDER
TOPIC: 14g OFFICE: SD/YLXT

TAPE RECORDERS PRESENTLY BEING USED AS SPACEBORNE MASS STORAGE DEVICES HAVE A HISTORY OF BEING UNRELIABLE AND REQUIRE EXTENSIVE AND COSTLY GROUND TESTING TO PROVIDE THE CONFIDENCE NECESSARY TO PASS LAUNCH READINESS. EVEN THEN THEY DO NOT ALWAYS ADEQUATELY PERFORM THEIR FUNCTION ON ORBIT.

THE OBJECTIVE OF THIS PHASE II PROGRAM IS TO CONTINUE THE DEVELOPMENT OF A BUBBLE MEMORY MODULE WHICH CAN BE USED AS A BUILDING BLOCK FOR THE ASSEMBLY OF SPACEBORNE RECORDERS THAT CAN REPLACE TAPE RECORDERS. A STUDY WILL BE CONDUCTED TO DETERMINE THE OPTIMUM LOCATION FOR THE MAGNETIC BUBBLE SUPPORT DEVICES. AT THE COMPLETION OF THIS STUDY BRASSBOARD CIRCUIT BOARDS WILL BE DESIGNED, MANUFACTURED AND TESTED USING THE INTEL 1 MEGABIT MAGNETIC BUBBLE DEVICE.

AFTER DEMONSTRATING THE DESIGN CONCEPT USING THE 1 MEGABIT BUBBLE DEVICE, THE DESIGN WILL BE MODIFIED TO USE THE BEST AVAILABLE 4 MEGABIT BUBBLE DEVICE. FLIGHT QUALITY INTERFACE BOARDS, CONTROL BOARDS AND MEMORY BOARDS WILL THEN BE MANUFACTURED AND FUNCTIONALLY TESTED.

SSG, INC. ARMY
150 BEAR HILL ROAD
WALTHAM, MA 02154
DEXTER WANG
TITLE:
OPTICAL SIGNATURE SIMULATOR
TOPIC: 8j OFFICE: BMDSC-CPP

THE PROPOSED DEVICE USES A PROGRAMMED MOSAIC OF HEATER ELEMENTS TO

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DEVELOP INFRARED SIGNATURES. DYNAMIC SCENES AND MOVING TARGETS CAN BE SIMULATED. THE SIMULATOR CAN DEPICT A LARGE SELECTION OF SCENES DERIVED FROM FLIGHT TEST DATA WITH CAPABILITY TO UPDATE AND CHANGE SCENE IN REAL TIME. THE DEVICES USES TECHNOLOGIES WHICH ARE DERIVATIVES OF ADVANCED FOCAL PLANE ARRAY TECHNOLOGIES. RESISTIVE MATERIAL IS DEPOSITED ON THIN BOARDS, DELINEATED, CIRCUIT CONNECTION MADE USING PRINTED CIRCUIT BOARD TECHNIQUES, AND THE BOARDS ARE ASSEMBLED INTO A MOSAIC. CONTROL IS OBTAINED WITH MULTIPLEXED READOUT AND DRIVER.

STAM INC.
885 WATERMAN AVENUE
E. PROVIDENCE, RI 02914
DR.A MANDAYAM C. NARASIMH

DARPA

TITLE:
SEA WATER BATTERIES
TOPIC: 1a OFFICE: DARPA

THESE EFFORT REPRESENT THE LOGICAL CONTINUATION OF THE FY 1983 PHASE I SBIR EFFORTS IN TOPIC 1a, WHICH AIMED PRIMARILY AT DEVELOPING NEW CONCEPTS FOR LOW WATTAGE UNDERSEA POWER SOURCES SUITABLE FOR POWERING SENSOR OR REPEATER NODES IN SYSTEMS SUCH AS ARIADNE. SPECIFIC OBJECTIVES: STAM, INC. - SELECT AND CAST RAPIDLY SOLIDIFIED MATERIALS TO BE USED AS SEA WATER BATTERY ANODES AND CATHODES. FOR CATHODES, ALLOYS OF PALLADIUM WILL BE CHILL CAST, AND FOR ANODES BOTH MAGNESIUM AND ALUMINUM ALLOYS WILL BE CAST. THE CAST MATERIALS WILL BE INSPECTED FOR THEIR MICROSTRUCTURE, PHASE AND GRAIN CHARACTERISTICS. THE CAST MATERIALS WILL THEN BE SUPPLIED TO NOSC FOR USE IN THE SEA WATER BATTERY PROGRAM. THE PERFORMANCE OF THESE SPECIALLY PREPARED ALLOYS WILL BE COMPARED TO NORMAL ALLOYS OF COPPER, ALUMINUM AND MAGNESIUM.

SUMX CORPORATION
P.O. BOX 14864, 221 DENTON DRIVE
AUSTIN, TX 78761
DAVID W DEBERRY

NAVY

TITLE:
ELECTROCHEMICALLY ACTIVE COATINGS FOR CORROSION PROTECTION
TOPIC: 100 OFFICE: NAVAIR

IN PHASE I, SUMX DEMONSTRATED NEW COATINGS FOR CORROSION PROTECTION

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WHICH MAINTAIN METALS IN A PASSIVE CONDITION DUE TO ELECTRON TRANSFER BETWEEN METALS AND IMMOBILIZED REDOX CENTERS IN COATINGS. PROTECTION AGAINST BOTH LOCALIZED AND UNIFORM CORROSION APPEARS TO BE FEASIBLE. SINCE THESE COATINGS PROTECT ELECTROCHEMICALLY, THEY ARE MORE EFFECTIVE THAN CONVENTIONAL COATINGS FOR PREVENTING CORROSION AT PINHOLES, HOLIDAYS, AND COATING RUPTURES. IN PHASE II, SUMX WILL TEST NEW REDOX COUPLES AND FORMULATIONS IN ACIDIC AND CHLORIDE-CONTAINING SYSTEMS. PHASE II WILL EMPHASIZE PROTECTION OF IRON AND LOW ALLOY METALS. COATED MATERIALS WILL BE STUDIED IN A RANGE OF ENVIRONMENTS. COATED METALS SHOULD BE MORE RESISTANT TO CERTAIN FORMS OF LOCALIZED CORROSION THAN CONVENTIONAL STEELS. THE COATINGS SHOULD ALLOW THE USE OF LESS EXPENSIVE METALS THAN NORMALLY FOUND IN CORROSIVE SERVICE. COATED METALS SHOULD SIGNIFICANTLY INCREASE PROTECTION AGAINST CREVICE CORROSION, CATASTROPHIC FAILURES, CORROSION AT GAS/LIQUID INTERFACES, AND CORROSION IN VARYING ENVIRONMENTS.

SUNPOWER, INC.
6 BYARD STREET
ATHENS, OH 45701
DAVID BERCHOWITZ

ARMY

TITLE:
DESIGN OF A 1.5 KW PORTABLE, ELECTRIC GENERATOR
TOPIC: 7b OFFICE: DRDME-ZKBRDC

SYNTRO CORPORATION
10655 SORRENTO VALLEY RD
SAN DIEGO, CA 92121
RONALD D BROWN

NAVY

TITLE:
BIOLOGICALLY PRODUCED MACRO-MOLECULES FOR AVIATION MATERIALS
TOPIC: 98 OFFICE: NAVAIR

SYNTRO CORPORATION HAS DEVELOPED THE MEANS TO SYNTHESIZE ARTIFICIAL GENES AND TO EXPRESS THESE GENES IN BACTERIA. SYNTRO PROPOSES TO COMBINE RECOMBINANT DNA TECHNOLOGY AND FERMENTATION TO PRODUCE SPECIAL POLYMERS TO BE USED AS FIBERS, FILMS AND ADHESIVES. THE MAJOR DEVELOPMENT OBJECTIVE IS TO PRODUCE SUFFICIENT MATERIAL BY THESE NEW METHODS TO ALLOW TESTING OF THE PROPERTIES OF THE POLYMERS.

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 SYSTEM ENHANCEMENT SVC CO (SESCO)
 1235 S. JEFFERSON DAVIS HWY - STE 100
 ARLINGTON, VA 22202
 MARSH E WRIGHT

NAVY

TITLE:

SHIP SYSTEMS INITIATIVES, JUSTIFICATION AND PRIORITIZATION

TOPIC: 29 OFFICE: NAVSEA

NAVSEA SHIP/SYSTEMS INITIATIVES DEVELOPMENT (SID) PROGRAM IDENTIFIES SHORTFALLS AND INEFFICIENCIES IN EXISTING OR PROJECTED SHIP SYSTEMS THROUGH A RIGOROUS ASSESSMENT OF THE CAPABILITIES OF FUTURE U.S. NAVY BATTLE GROUPS/BATTLE FORCES. FOR RATIONAL ALLOCATION OF LIMITED RESOURCES TO RESOLUTION OF THESE SHORTFALLS AND INEFFICIENCIES, CANDIDATE R&D INITIATIVES MUST BE IDENTIFIED AMONG NUMEROUS SCIENTIFIC AND TECHNOLOGICAL INNOVATIONS. THEY MUST BE EXAMINED FOR APPLICABILITY AND THEN METHODICALLY JUSTIFIED AND PRIORITIZED ON THE BASIS OF MILITARY WORTH. PHASE I OF THIS EFFORT DESCRIBED AND PROVIDED AN INITIAL DEMONSTRATION OF A METHOD FOR ACHIEVING THIS PRIORITIZATION, DEFINING MILITARY WORK IN TERMS OF PERFORMANCE, ACHIEVABILITY, AND AFFORDABILITY. PHASE II WILL (1) ESTABLISH THE FEASIBILITY AND BROAD APPLICABILITY OF THE METHOD THROUGH SUCCESSFUL APPLICATION TO GENERATE PRIORITIZED CANDIDATE R&D INITIATIVES FOR RESOLUTION OF BATTLE GROUP/BATTLE FORCE SHORTFALL IDENTIFIED IN THE SID PROCESS, (2) REFINED THE METHOD ON THE BASIS OF EXPERIENCE WITH THESE PRIORITIZATIONS, AND (3) FORMULATE REQUIREMENTS AND SPECIFICATIONS FOR AUTOMATING SELECTED ASPECTS OF THE METHOD. THE IDENTIFICATION OF PRIORITIZED R&T INITIATIVES IN THE SBIR PHASE I AND SID ANALYSIS EFFORTS HAVE RESULTED IN A FIRM COMMITMENT BY THE NAVY TO CONTINUE TO EXPAND THE SID AND SID DERIVATIVE METHODOLOGIES UNDER P.E. 62543N IN FY 85 AND BEYOND. THE METHOD IS EXPECTED TO BE DIRECTLY APPLICABLE TO NAVY R&T PLANNING AND RDT&E PROGRAMMING.

SYSTEMS ENGINEERING FOR POWER, INC.
 4300 EVERGREEN LANE #302
 ANNANDALE, VA 22003
 BOZIDAR AVRAMOVIC

AF

TITLE:

MODELING AND CONTROL OF LARGE SPACE STRUCTURES

TOPIC: 1a OFFICE: AFOSR/XOT

AN INTEGRATED SOFTWARE SYSTEM WILL BE DEVELOPED TO MAKE THE POWERFUL

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ANALYTICAL DESIGN TECHNIQUES FOR CONTROL AND MODELING DEVELOPED IN PHASE I USEFUL TO DESIGN ENGINEERS. THIS WILL BE DONE BY USING A COMMERCIALY AVAILABLE SYMBOLIC MANIPULATION LANGUAGE IN CONJUNCTION WITH A RELATIONAL DATA BASE MANAGER, A FLEXIBLE "COMMUNICATIONS FILE" STRUCTURE, AND SPECIAL PURPOSE (FORTRAN) PROGRAMS FOR NUMERICAL EVALUATIONS. THE SYSTEM WILL BE CAPABLE OF EVALUATING DISTRIBUTED PARAMETER MODELS FROM STANDARD STRUCTURAL MECHANICAL SPECIFICATION, OF COMBINING ELEMENTARY RIGID AND FLEXIBLE COMPONENTS TOGETHER TO MAKE A "HYBRID" SYSTEM, AND OF COMPUTING (SYMBOLICALLY AND NUMERICALLY) AND EVALUATING STABILIZING CONTROL LAWS FOR THE HYBRID SYSTEM, INCLUDING NONLINEAR LAWS. THE SYSTEM WILL BE PORTED ON A COMMERCIAL (SUN) GRAPHICS WORK STATION OF MODEST COST AND A SUPERVISOR INTERFACE WILL BE PROVIDED TO FACILITATE USER INTERACTION (AT THE SYMBOLIC, GRAPHICAL, OR NUMERICAL LEVEL) WITH THE SYSTEM. A DEMONSTRATION OF THE SYSTEM ON THE "NASA CHALLENGE SYSTEM (SCOLE)" WILL BE CARRIED OUT TO ASSESS THE EFFECTIVENESS OF THE SYSTEM.

SYSTEMS TECHNOLOGY, INC.
13766 S. HAWTHORNE BLVD.
HAWTHORNE, CA 90250
R. WADE ALLEN

AF

TITLE:
MISSION-ORIENTED DECISION AND CONTROL PILOT MODEL
TOPIC: 10c OFFICE: AFWAL/XRPF

DURING PHASE I OF THIS SBIR PROJECT WE HAVE DEVELOPED MODELS AND COMPUTER AIDS FOR ANALYZING PILOT/VEHICLE/SYSTEM INTERACTIONS. THE MODELS AND ANALYSIS PROCEDURES ENCOMPASS A RANGE OF PILOT BEHAVIOR (E.G., CONTINUOUS CONTROL, DISCRETE TASK QUEUE RESPONSE, TASK INTERFERENCE, ERROR PROBABILITY) AND SYSTEM PERFORMANCE (COST FUNCTIONAL, HANDLING QUALITIES RATINGS), AND ALLOW THE ANALYST TO SELECTIVELY SET SOME MODEL PARAMETERS AND OPTIMIZE OTHERS. THE PHASE II PROJECT DESCRIBED HEREIN PROPOSES TO DEVELOP MICROCOMPUTER COMPUTATIONAL AIDS AND PROCEDURES FOR DELIVERY TO THE AIR FORCE THAT WILL PERMIT APPLICATION OF THE ABOVE PILOT/VEHICLE/SYSTEM ANALYSIS TO A WIDE VARIETY OF SYSTEMS AND MISSION PHASES. THIS MISSION ORIENTED PILOT MODEL AND SYSTEMS ANALYSIS METHODOLOGY WILL BE CHECKED AND VALIDATED AGAINST A BOARD RANGE OF WELL DOCUMENTED DATA BASES. FINALLY, A DETAILED EXAMPLE ANALYSIS WILL BE CARRIED OUT INVOLVING APPROACH AND LANDING.

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SYSTOLIC SYSTEMS, INC.
1408 PETAL WAY
SAN JOSE, CA 95129
R. H. TRAVASSOS/C. LEE

AF

TITLE:
DEVELOPMENT OF AN AIRCRAFT FLIGHT TECHNOLOGY RESEARCH SYSTEM
TOPIC: 10c OFFICE: AFWAL/XRPF

TO MEET THE EXCEPTIONALLY HIGH THROUGHPUT REQUIREMENTS OF DOD STRATEGIC/TACTICAL AIRCRAFT IN THE 1990'S IT IS NECESSARY TO DEVELOP HIGHLY PARALLEL (OR DISTRIBUTED) FLIGHT CONTROL SYSTEMS. BECAUSE THE COMPUTER ARCHITECTURES OF SUCH SYSTEMS TEND TO BE PROBLEM DRIVEN TO ACHIEVE THE NECESSARY THROUGHPUT, A DISTRIBUTED FLIGHT CONTROL SYSTEM IS PROPOSED THAT MAY BE RECONFIGURED TO EVALUATE THE PERFORMANCE OF ALTERNATIVE MULTIPROCESSOR FLIGHT CONTROL ALGORITHMS AND ARCHITECTURES. SUCH A TESTBED FACILITY IS LARGELY UNAVAILABLE IN AEROSPACE RESEARCH LABORATORIES WHERE SIGNIFICANT RESOURCES ARE STILL EXPENDED TO DEVELOP SPECIALIZED HARDWARE AND SOFTWARE. THE PROPOSED RESEARCH DEVELOPS A REAL-TIME AIRCRAFT FLIGHT CONTROL FACILITY BY INTEGRATING 1.) STATE-OF-THE-ART VLSI HARDWARE 2.) THE DOD ADA PROGRAMMING LANGUAGE AND 3.) ARTIFICIAL INTELLEGENCE CONCEPTS. THE TESTBED FACILITY MAY BE USED AS A "SMART" PILOTS ASSOCIATE AND PROVE REAL-TIME AIRCRAFT FLIGHT CONTROL CONCEPTS IN THE LABORATORY.

SYSTRAN CORPORATION
4126 LINDEN AVENUE
DAYTON, OH 45432
JOHN JURGENSEN

AF

TITLE:
PROPOSAL TO INVESTIGATE COMBAT AID TO PILOTS BY EXPERT SYSTEMS
TOPIC: 12e OFFICE: AFWAL/AAA

THE PRIMARY GOAL OF THIS PROJECT IS TO EVALUATE THE USEFULNESS OF EXPERT SYSTEMS FOR AIRBORNE PILOT AIDING. THERE ARE THREE TECHNICAL OBJECTIVES WHICH SUPPORT THIS GOAL. THE FIRST IS TO DESIGN A TEST SCENARIO AND DEVELOPMENT SYSTEM REQUIREMENTS FOR A DEFINITIVE EXPERT SYSTEM PILOT AID (ESPA) TEST. THE SECOND IS TO BUILD A TEST BENCH

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USING THE OPS-5 EXPERT SYSTEM AND AIR FORCE AVIONICS LABORATORY SIMULATION HARDWARE AND SOFTWARE. THE THIRD IS TO EVALUATE THIS SYSTEM, TESTING PILOT PERFORMANCE IN SEVERAL SCENARIOS, WITH AND WITHOUT EXPERT SYSTEM ASSISTANCE. THE EVALUATION WILL INCLUDE AN ANALYSIS OF TEST RESULTS, PILOT QUESTIONNAIRE ANSWERS AND PROBLEMS OF TECHNOLOGY TRANSFER TO AN AIRBORNE APPLICATION. THE TEST BENCH MAKES EXTENSIVE USE OF THE AIR FORCE AVIONICS LABORATORY'S DIGITAL AVIONICS INFORMATION SYSTEM (DAIS) AND GENERALIZED AVIONIC SIMULATION/INTEGRATION SYSTEM (GENASIS). IT ALSO ADDS A VOICE SYNTHESIS/RESPONSE SUBSYSTEM INTO THE MAN-MACHINE INTERFACE. MODIFICATIONS TO THE OPS-5 EXPERT SYSTEM INCLUDE MINOR CHANGES TO ALLOW SOFTWARE ROUTINE HOSTING ON THE SYMBOLICS 3600 MICROPROCESSOR AND DEVELOPMENT OF A HIGH SPEED INTERFACE WITH DAIS/GENASIS HARDWARE. OPS-5 EVENT/PROCESSING PRIORITIZATION WILL ALSO REQUIRE MODIFICATION. TEST SCENARIOS INCLUDE EXAMPLES OF PILOT SENSORY SATURATION AS WELL AS EMERGENCY SITUATIONS REQUIRING FAST, ACCURATE RESPONSES.

TECHNICAL RESOURCES, INC
3202 MONROE ST - STE 300
ROCKVILLE, MD 20852
ANDY C CHEN

NAVY

TITLE:

DEVELOPMENT OF A NEW TYPE OF RADAR ABSORBING MATERIAL

TOPIC: 12 OFFICE: NAVSEA

A NOVEL NEW CONCEPT TO DEVELOP AN INEXPENSIVE AND EFFECTIVE RADAR ABSORBING MATERIAL (RAM) HAD BEEN EXPLORED IN RESPONSE TO THE NAVY'S SBIR PROGRAM SOLICITATION. THE CONCEPT IS TO UTILIZE POLYMERIC BEADS AS A NEW TYPE OF RAM. CROSS-LINKED POROUS POLYMERIC BEADS ARE HOLLOW MICROSPHERES WITH THREE-DIMENSIONAL NETWORK WHICH CAN ABSORB ELECTROMAGNETIC WAVE ENERGY AND DISSIPATE THE ENERGY WITHIN THE THREE-DIMENSION NETWORK CAGE. IMPORTANT PROPERTIES SUCH AS DIELECTRIC STRENGTH, DIELECTRIC CONSTANT, DISSIPATION FACTOR, COEFFICIENT OF THERMAL EXPANSION, THERMAL CONDUCTIVITY, DEFLECTION TEMPERATURE UNDER LOAD, HARDNESS, AND TENSILE YIELD STRENGTH HAVE BEEN EXAMINED IN PHASE I TO OPTIMIZE MATERIAL SELECTION PROCESS. A RANKING SYSTEM FOR MATERIAL SELECTED HAS BEEN DEVISED AND THE TOP FIVE PROMISING CANDIDATES HAVE BEEN IDENTIFIED AND SELECTED IN PHASE I. IN PHASE II WE WILL PERFORM THE FOLLOWING TASKS TO IMPLEMENT THE FINDINGS FROM PHASE I WORK: (1) PROCUREMENT AND SYNTHESIS OF CANDIDATE RAMS; (2) COATING AND LAMINA-

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TION OF CANDIDATE RAMS; (3) DEVELOPMENT OF TESTING METHODS AND PROCEDURES FOR RAM EVALUATION; (4) MEASUREMENT AND DATA COLLECTION OF CANDIDATE RAMS; (5) DATA REDUCTION AND ANALYSIS, (6) DEMONSTRATION OF MASS PRODUCTION POTENTIALS.

TECHNOLOGY FOR ENERGY CORP
ONE ENERGY CENTER, PELLISSIPPI PKWY
KNOXVILLE, TN 37922
ROBERT W HENDRICKS

NAVY

TITLE:
STUDY OF XRAY RESIDUAL STRESS MEASUREMENTS IN NAVAL AVIATION
MAINTENANCE ENVIRONMENTS
TOPIC: 99 OFFICE: NAVAIR

THE RESEARCH AND DEVELOPMENT DESCRIBED IN THIS PROPOSAL WILL LEAD TO AN ENVIRONMENTALLY PROTECTED NONDESTRUCTIVE EVALUATION INSTRUMENT FOR MEASURING RESIDUAL STRESSES IN A WIDE RANGE OF NAVAL AIRCRAFT COMPONENTS. THIS TECHNIQUE WILL BE VALUABLE FOR MONITORING THE PROCESSING CONTROL VARIABLES OF CRITICAL REWORKED COMPONENTS AND FOR POTENTIAL PREDICTIVE MAINTENANCE OF THOSE COMPONENTS AT THE INTER-MEDIATE (I)-LEVEL OF MAINTENANCE. THIS SHOULD LEAD TO IMPROVED RELIABILITY, MAINTAINABILITY, AND AVAILABILITY OF NAVAL AIRCRAFT TO THE FLEET.

TECHNOLOGY SERVICE CORP
2950 31ST STREET
SANTA MONICA, CA 90405
NICHOLAS WILLIS

NAVY

TITLE:
AIR VEHICLE WARNING USING BISTATIC RADAR SONOBUOYS
TOPIC: 109 OFFICE: NAVAIR

THE OBJECTIVE OF THIS WORK IS TO VALIDATE TWO CONCEPTS FOR DETECTING, VIA A FENCE OF SONOBUOYS, LOW ALTITUDE AIR VEHICLES BEYOND THE TASK FORCE HORIZON: (1) A LABORATORY TEST VALIDATION OF AN RF BISTATIC RADAR CONCEPT, USING THE SONOBUOY VHF DATA LINK AS THE BISTATIC TRANSMITTER, AND (2) AN AT-SEA TEST VALIDATION OF A HYDRO ACOUSTIC CONCEPT, USING THE ACOUSTIC SIGNATURE FROM THE AIR VEHICLE COUPLED INTO THE WATER AND DETECTED BY THE HYDROPHONE. THE RF BISTATIC RADAR

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WORK CONSISTS OF DEVELOPING A TRANSMITTER/MODULATOR, A RECIEVER/
SIGNAL PROCESSOR, AND A SIGNAL SIMULATOR (TARGET RETURN, DIRECT PATH,
NOISE AND CLUTTER); ASSEMBLING THE SYSTEM IN THE TSC, SANTA MONICA,
LABORATORIES; AND EXERCISING THE SYSTEM OVER A WIDE RANGE OF PARA-
METERS TO VALIDATE THE CONCEPT AND ESTABLISH OPERATING DOMAINS. THE
HYDRO ACOUSTIC WORK CONSISTS OF DEVELOPING A SIGNAL PROCESSING
ALGORITHM TO OPTIMIZE DETECTION AND DISCRIMINATION OF THE ACOUSTIC
SIGNATURE; AND DEMONSTRATING SYSTEM PERFORMANCE BY MEANS OF AN AT-
SEA EXPERIMENT, PROBABLY AT PMTC, PT. MUGU, USING STANDARD,
UNMODIFIED SONOBUOYS AND CRUISE MISSILES/JET AIRCRAFT AS TARGETS.

TECHNOLOGY SERVICE CORP
2950 31ST STREET
SANTA MONICA, CA 90405
DR. D WHITE

NAVY

TITLE:

TRACKING ALGORITHM-EXPLOITATION OF TOTAL INFERENCE BASE IN
SURFACE SHIPS

TOPIC: 41 OFFICE: NAVSEA

WHEN ATTEMPTING TO SEARCH FOR AND TRACK SMALL TARGETS IN ADVERSE
ENVIRONMENTS, THE HIGH FALSE ALARM RATES OF CONVENTIONAL AIR SURVEIL-
LANCE RADARS CAN CAUSE HIGH RATES OF FALSE TRACK INITIATION AND POOR
TRACK CONTINUITY. THE PROPOSED INVESTIGATION WILL ADDRESS THE IM-
PROVEMENT OF RADAR TRACK QUALITY BY EXTRACTION OF UNUSED MEASUREMENTS
FROM RADAR SIGNALS AND UTILIZING THEM IN AUGMENTED TARGET TRACK
FILTERS. PRELIMINARY INVESTIGATION SUGGEST THAT REDUCTIONS IN FALSE
TRACK RATES OF UP TO A FACTOR OF 100 MAY BE ACHIEVED WITH NECESSITAT-
ING INCREASES IN TARGET-TO-BACKGROUND POWER RATIOS. THE PROPOSED
INVESTIGATION WILL COMPARE PERFORMANCES OF ALTERNATIVE RADAR SIGNAL
MEASUREMENT EXTRACTION TECHNIQUES IN TERMS OF SINGLE AND MULTIPLE
SENSOR TRACK QUALITY MEASURES, AND TRADE OFF THE ALTERNATIVES AGAINST
COMPLEXITY. A DOCUMENTED SIMULATION TEST BED WILL BE DEVELOPED TO
DEMONSTRATE THE PERFORMNCE ACHIEVABLE.

TETRA CORPORATION
1325 SAN MATEO SE P.O. BOX 4369
ALBUQUERQUE, NM 87196
WILLIAM M MOENY

NAVY

TITLE:

SELF-SUSTAINED, RADIAL-DISCHARGE PULSED CO2 LASER DEVELOPMENT
PROGRAM

TOPIC: 22 OFFICE: NAVSEA

TETRA CORPORATION HAS EXPERIMENTALLY DEMONSTRATED EXTRACTION OF LASER

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POWER FROM THE RADIAL CO2 LASER AND DEMONSTRATED FEASIBILITY OF THE CONCEPT IN PHASE I. THE ACHIEVED LASER EFFICIENCY WAS VERY CLOSE TO THE PREDICTED LASER EFFICIENCY. IN PHASE II OF THIS PROGRAM, TETRA PROPOSES TO COMPLETE DEVELOPMENT OF THE RADIAL CO2 LASER TECHNOLOGY TO THE POINT OF COMMERCIALIZATION OR DEFENSE APPLICATION ON SHIPBOARD. THE PRIMARY PROGRAM OBJECTIVE IS TO DEMONSTRATE LASER OUTPUT OF 100 J AT 50 Hz WITH A CLOSED CYCLE SYSTEM FOR A RUN DURATION OF AT LEAST 10 SECONDS, YIELDING A 5 kW AVERAGE OUTPUT LASER. THIS PROPOSAL REPRESENTS A UNIQUE TECHNOLOGY ADVANCEMENT OPPORTUNITY FOR THE NAVAL SEA SYSTEMS COMMAND, WITH PERFORMANCE CAPABILITIES AVAILABLE IN THE RADIAL CO2 LASER THAT ARE UNAVAILABLE IN ANY OTHER PULSED CO2 LASER.

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AF

TITLE:

UV-SUSTAINED RADIAL GLOW DISCHARGE OPENING SWITCH

TOPIC: 8b OFFICE: AFWL/PRP

IN THIS PHASE II PROPOSAL, WE PROPOSE TO CONTINUE TO DEVELOP THE UV-SUSTAINED, MAGNETICALLY STABILIZED, RADIAL GLOW DISCHARGE OPENING SWITCH BASED ON OUR SUCCESSFUL DEMONSTRATION OF THE FEASIBILITY OF THE SWITCH IN PHASE I. THE GLOW DISCHARGE IS SUSTAINED BY A UV SOURCE AND OPERATES IN A RADIAL GEOMETRY IN ORDER TO PROVIDE CERTAIN UNIQUE FEATURES TO THE OPENING SWITCH CHARACTERISTICS. THE UV PHOTONS FROM THE UV SUSTAINER PRODUCE FREE ELECTRONS THAT ARE ACCELERATED BY THE ELECTRIC FIELD. AS THE UV SOURCE IS TURNED OFF, THE DISCHARGE DECAYS WITH THE LOSS OF ELECTRONS IN THE DISCHARGE, OPENING THE SWITCH. WE USE A RADIAL GLOW DISCHARGE AS A MEANS OF SUBSTANTIALLY ENHANCING THE CURRENT GAIN IN THE DEVICE AND ALSO AS A MEANS OF SUBSTANTIALLY IMPROVING THE SWITCH RATIO. WE USE A MAGNETIC FIELD TO STABILIZE THE DISCHARGE AND IMPROVE THE CONDUCTION TIME. THIS SWITCH HAS THE POTENTIAL FOR FULFILLING THE REQUIREMENT FOR A HIGH-REPETITION RATE OPENING SWITCH FOR PULSE POWER APPLICATIONS. WE BELIEVE THIS SWITCH HAS THE CAPABILITY OF OPERATING IN A BURST MODE AT GREATER THAN 10 KHZ AND IN A CONTINUOUS REPETITION MODE AT REPETITION RATES OF NEAR 1 KHZ.

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THERMACORE, INC.
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TITLE:
HIGH PERFORMANCE ALUMINUM HEAT PIPE DEVELOPMENT
TOPIC: 10b OFFICE: AFWAL/XRPF

THIS PROGRAM WILL TAKE THE TECHNIQUES DEVELOPED IN PHASE I FOR SINTERING ALUMINUM WICK STRUCTURE AND DEVELOP EQUIPMENT CAPABLE OF PRODUCING HEAT PIPE SEGMENTS TEN FEET LONG THAT ARE CAPABLE OF BEING JOINED TOGETHER TO MAKE HEAT PIPES UP TO 60 FEET LONG WHICH IS THE MAXIMUM LENGTH AVAILABLE ON THE SST. IN ADDITION, THE BASIC SINTERED ALUMINUM WICK STRUCTURE WILL BE CHARACTERIZED ANALYTICALLY AND EXPERIMENTALLY IN A SPECIALIZED TEST VEHICLE, DEMOUNTABLE HEAT PIPES AND OPERATIONAL HEAT PIPES UP TO 20 FEET LONG. THIS CHARACTERIZATION WILL PRODUCE A WELL CORRELATED HEAT PIPE MODEL, INCLUDING HEAT FLUX LIMITATIONS, WHICH CAN BE USED BY DESIGNERS FOR SYSTEM STUDIES AND EVALUATIONS.

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AUGUST HUGO KRUESI

ARMY

TITLE:
RESIN APPLICATOR RING FOR MANUFACTURE OF LIGHTWEIGHT HIGH PERFORMANCE BRAIDED COMPOSITE PARTS
TOPIC: 7q OFFICE: LABCOM/MTL

PHASE I RESEARCH HAS DEMONSTRATED THE BASIC ABILITY OF THE RESIN APPLICATOR CONCEPT TO IMPREGNATE MOVING FIBERS IN A CONTROLLED FASHION. PHASE II RESEARCH IS PROPOSED TO DEVELOP A FULL SCALE COMPOSITE BRAIDING SYSTEM USING THIS CONCEPT. MAJOR OBJECTIVES OF PHASE II WORK ARE TO TEST THE EFFECTS OF SCALE-UP, 360 DEG FIBER ORIENTATION, PERFORMANCE IN BIAxIAL AND TRIAXIAL BRAIDING, AND PRODUCTION PROCEDURES. PROBLEMS WITH FLOW CONTROL OF VISCOUS EPOXIES EXPERIENCE IN PHASE I WILL BE ADDRESSED. TESTING OF BASIC MECHANICAL PROPERTIES, RESIN CONTENT AND VOID CONTENT WILL BE CONDUCTED ON PARTS BRAIDED WITH THE PROTOTYPE RESIN APPLICATOR SYSTEM. A TWO STEP APPROACH IS PROPOSED: FIRST, A SUB-SCALE PROTOTYPE WILL BE BUILT

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AND TESTED AT U.S. COMPOSITES. A FULL-SCALE PRODUCTION RESIN APPLICATOR RING WILL THEN BE BUILT AND INSTALLED ON A 144 CARRIER BRAIDER AT WATERVLIET ARSENAL'S COMPOSITE LABORATORY. OPERATIONAL TESTING WILL BE PERFORMED OVER A FIVE MONTH PERIOD.

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RICHARD KAPLAN

AF

TITLE:
HIGH TEMPERATURE OXIDATION RESISTANT COATINGS
TOPIC: 3 OFFICE: AFRPL/TSPR

CHEMICAL VAPOR DEPOSITED COATINGS OF PLATINUM, IRIIDIUM, RHODIUM, HAFNIUM OXIDE AND ZIRCONIUM OXIDE EACH AFFORD HIGH TEMPERATURE OXIDATION RESISTANCE FOR REFRACTORY METALS, AS HAS BEEN DEMONSTRATED FOR LABORATORY SPECIMENS BY RESEARCH PERFORMED IN PHASE I. PHASE II INVOLVES OPTIMIZING THE DEPOSITION PROCESS FOR THE LARGER SIZES AND COMPLEX SHAPES REQUIRED IN PRACTICAL APPLICATIONS LIKE TURBINE BLADES, ROCKET THRUST CHAMBERS AND NOZZLES. RHENIUM, MOLYBDENUM, NICKEL, NIOBIUM, COPPER AND CARBON COMPOSITES ARE THE SUBSTRATE MATERIALS OF INTEREST. THE PRINCIPAL OBJECTIVE OF THE PHASE II EFFORT IS TO PREPARE A DESIGN TABLE INDICATING THE MOST EFFECTIVE OXIDATION RESISTANT COATING FOR EACH SUBSTRATE METAL, THE OPTIMAL DEPOSITION PARAMETERS (STARTING COATING METAL COMPOUND, TEMPERATURES, PRESSURE, CARRIER GAS ETC.) THE EFFECT OF COATING THICKNESS ON THE DEGREE OF OXIDATION PROTECTION (COATING LIFE VERSUS TEMPERATURES AND THERMAL CYCLING). THIS INFORMATION WILL BE VERIFIED BY TEST UNDER ACTUAL OPERATION CONDITIONS AS PERFORMED BY ROCKET ENGINE MANUFACTURERS WHICH HAVE INDICATED AS WILLINGNESS TO PARTICIPATE.

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TITLE:
WEAR, OXIDATION, AND CORROSION INHIBITORS FOR CTFE FLUIDS
TOPIC: 11g OFFICE: AFWAL/XRPM

THE OBJECTIVE OF THE PROPOSED PROGRAM IS TO DEVELOP IMPROVED PER-

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FORMANCE, THERMAL OXIDATIVE STABILITY UP TO 400 DEGREES F, CORROSION, OXIDATION, AND WEAR-INHIBITING ADDITIVES FOR CTFE FLUIDS BASED ON THE CONCEPTS ESTABLISHED UNDER PHASE I EFFORTS. THE CANDIDATE ADDITIVES ARE PHOSPHA-S-TRIAZINES, PERFLUOROALKYL GROUPS CONTAINING PHOSPHAZENES, PERFLUOROALKYL-SUBSTITUED AROMATIC SULFONIC ACID SALTS, PERFLUOROALKYL SULFONATE SALTS, PERFLUOROALKYL-SUBSTITUED AROMATIC CARBOXYLIC ACID SALTS, AND PERFLUORINATED ACID SALTS. THE ADDITIVES WILL BE EVALUATED IN DIFFERENT CTFE FLUIDS ALONE AND IN COMBINATION TO DETERMINE THE PRESENCE OF SYNERGISTIC AND COMPLIMENTARY ACTION. THE SCREENING TEST PROCEDURES TO BE USED ARE MODIFIED CREP, HUMIDITY CHAMBER, MICRO-OXIDATION CORROSION, AND 4-BALL WEAR TEST. OF ALL CANDIDATES, 20-40 G SAMPLES WILL BE SYNTHESIZED; OF THE FIVE MOST PROMISING, UP TO 200 G; OF THE TWO BEST, UP TO 3 LBS. AN-OTHER OBJECTIVE OF THE PROGRAM IS TO OPTIMIZE AND SCALE-UP THE SYNTHESIS PROCESSES SO AS TO BE AMENABLE TO PILOT PLANT OPERATIONS BY INDUSTRIAL CONCERNS UNDER PHASE III.

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ROBERT BOCKSTAHLER

NAVY

TITLE:
ADVANCED WORKSTATION FOR OCEAN SURVEILLANCE
TOPIC: 87 OFFICE: SPAWAR

WORKSTATIONS ARE NEEDED FOR LAND- AND SEA-BASED OCEAN SURVEILLANCE SYSTEMS FOR REDUCTION OF INTELLIGENCE AND OPERATIONAL DATA. THIS PROJECT IS DIRECTED AT THE CONTINUATION OF DEVELOPMENT OF VERY POWERFUL WORKSTATIONS. THESE WILL SUPPORT MAN-MACHINE SYSTEMS WITH CAPABILITIES OF EXPLOITATION OF DATA BECOMING AVAILABLE FROM EMERGING SENSOR SYSTEMS TO PROVIDE SUBSTANTIALLY IMPROVED OCEAN SURVEILLANCE PRODUCTS. PHASE I DEMONSTRATED THE FEASIBILITY AND POTENTIAL BENEFIT OF MARRYING A POWERFUL SYMBOLIC PROCESSOR WITH A CO-PROCESSOR TO ENHANCE THE WORKSTATION CAPABILITY. PHASE II IS DIRECTED AT DEMONSTRATING A DESIGN FOR A SIGNIFICANTLY MORE POWERFUL CO-PROCESSOR DESIGNED WITH MULTIPLE PROCESSORS. THIS SYSTEM WILL BE CAPABLE OF RAPIDLY HANDLING SIGNFICANTLY LARGER QUANTITIES OF DATA WITH RESPONSE TIME APPROPRIATE TO THE OCEAN SURVEILLANCE ANALYST. THE ANTICIPATED IMPROVEMENT IN PROCESSING POWER WILL SIGNIFICANTLY ENHANCE THE ACCURACY AND TIMELINES OF THE SCENE

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GENERATION PROCESS.

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GEORGE COWAN

AF

TITLE:
NETWORK SECURITY DEVICE DEVELOPMENT
TOPIC: 15b OFFICE: ESD/ALEE

THIS PROPOSAL ADDRESSES THE PROTOTYPE DEVELOPMENT OF A SECURE LOCAL AREA NETWORK (LAN) THAT INCORPORATES NETWORK SECURITY DEVICES AND A NETWORK SECURITY CENTER. THE SECURE LAN WILL PROVIDE A PROCESSING ENVIRONMENT WHERE TRANSMISSION OF DATA AT MULTIPLE SECURITY LEVELS MAY BE ACCOMPLISHED WITH CONFIDENCE IN THE PRESERVATION OF THE SECURITY AND INTEGRITY OF THE DATA. THE PHASE II WORK WILL DEVELOP A PROTOTYPE SECURE LAN THAT IS NOT ONLY FULLY FUNCTIONAL, BUT THAT IS BASED ON THE REQUIREMENTS FOR A CLASS AL SYSTEM AS DEFINED BY THE DEPARTMENT OF DEFENSE TRUSTED COMPUTER SYSTEM EVALUATION CRITERIA. THE AL CRITERIA STIPULATE VERIFIED DESIGN, AND THUS A KEY ASPECT OF THE PHASE II EFFORT WILL BE THE VERIFICATION OF A FORMAL TOP-LEVEL SPECIFICATION OF THE SYSTEM AGAINST A MATHEMATICAL MODEL OF NETWORK SECURITY.

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THEODORE F. ZEHNPFENNIQ

DNA

TITLE:
REAL-TIME ADAPTIVE NUCLEAR CLUTTER MITIGATION
TOPIC: 2 OFFICE: DDST

ADVANCED SURVEILLANCE SYSTEMS WILL BE REQUIRED TO OPERATE IN A TRANS-ATTACK AND POST-ATTACK ENVIRONMENT. THE HIGH ALTITUDE INFRARED CLUTTER FOR SUCH AN ENVIRONMENT IS NOT KNOWN FROM NUCLEAR FIELD TESTS. THE PROPOSED OPTICAL TECHNIQUE PROVIDES A REAL TIME ADAPTIVE CAPABILITY TO REJECT NUCLEAR CLUTTER AND OPTIMIZE SYSTEM PERFORMANCE. THIS TECHNIQUE UTILIZES A DUAL-STATE OPTICAL SYSTEM

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WHOSE IMAGING PROPERTIES ALTERNATE BETWEEN TWO MODES WITH TIME AND A DETECTOR WHOSE OUTPUT IS PROPORTIONAL TO THE DIFFERENCE BETWEEN THESE MODES. THE TWO STATES OF THE DUAL STATE OPTIC ARE GENERATED BY APPLYING CONTROLLED PATTERNS OF SMALL AMPLITUDE, HIGH FREQUENCY OSCILLATIONS TO ONE OF THE COMPONENTS IN THE OPTICAL SYSTEM, SUCH AS THE SECONDARY MIRROR. THE OSCILLATIONS, WHICH ARE SOFTWARE PROGRAMMABLE, CAN BE VARIED IN REAL TIME TO OPTIMIZE PERFORMANCE IN AN UNKNOWN NUCLEAR ENVIRONMENT. UNDER THE PHASE II WORK PROPOSED HERE, A LABORATORY VERSION OF A DUAL-STATE OPTICAL SYSTEM WITH A TWO DIMENSIONAL IMAGING AND DISPLAY CAPABILITY WILL BE DESIGN AND FABRICATED. IT WILL THEN BE USED IN A PROGRAM OF LABORATORY MEASUREMENTS (BOTH ADAPTIVE AND NON-ADAPTIVE) TO DEMONSTRATE EXPERIMENTALLY THE IMPROVEMENTS IN PERFORMANCE PREDICTED BY THE CALCULATIONS PERFORMED UNDER PHASE I.

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DR. JAMES P. REILLY

DNA

TITLE:
PULSED SHORT WAVELENGTH LASER EFFECTS SIMULATOR
TOPIC: 5 OFFICE: DDST

IN PHASE I, WE DETERMINED THAT OUR NOVEL APPROACH TO SIMULATING SHORT WAVE-LENGTH LASER EFFECTS IS TECHNICALLY FEASIBLE. THIS PROPOSAL IS TO DEVELOP THE TECHNOLOGY NECESSARY TO DESIGN AND BUILD A HIGH IRRADIANCE LASER EFFECTS SIMULATOR CONCEPTS. THE PROGRAM WILL BE ACCOMPLISHED FIRST BY UPGRADING OUR EXISTING SINGLE PULSE DEVICE TO HAVE REP PULSE CAPABILITY. THEN, REP PULSE OPERATION WILL BE INVESTIGATED AND CHARACTERIZED IN A SERIES OF EXPERIMENTS AND MODELING EFFORTS. FIRST, THE INTERPULSE ELECTRICAL RECOVERY OF THE DISCHARGE AND THEN ALTERNATE SWITCHING APPROACHES, TO CIRCUMVENT POTENTIAL HIGH CURRENT AND HIGH ENERGY TRANSFER LIMITATION, WILL BE INVESTIGATED. ALSO, SYSTEM COOLING REQUIREMENTS DUE TO THE HIGH AVERAGE POWER DELIVERED TO THE ELECTRODES AND DIELECTRIC SUBSTRATE WILL BE DETERMINED, AND INITIAL DESIGN SOLUTIONS FABRICATED AND TESTED. BOTH MODELING AND TESTS WILL BE CARRIED OUT TO ADDRESS SYSTEM "LIFETIME" ISSUES. FINALLY, THE RESULTS OF THIS WORK WILL BE USED TO DESIGN TWO SYSTEMS, ONE WITH AN ORDER OF MAGNITUDE INCREASE IN REP RATE (SAME ENERGY/PULSO) AND THE OTHER WITH MORE

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THAN AN ORDER OF MAGNITUDE INCREASE IN ENERGY PER PULSE (SAME REP RATE).

W. W. GAERTNER RESEARCH, INC.

ARMY

205 SADDLE HILL ROAD

STAMFORD, CT 06903

DR W. W. GAERTNER

TITLE:

ARTIFICIAL INTELLIGENCE (ROBOT JAMMER)

TOPIC: 1e OFFICE: CECOM/SWL

USING THE (AI)2, ARTIFICIAL INTELLIGENCE AND ARTIFICIAL INSTINCT, ARCHITECTURE FROM PHASE I COUPLED WITH AN INTERACTIVE GRAPHICS CAPABILITY, AN EXPERT SYSTEM WILL BE DEVELOPED FOR PRE-ENGAGEMENT PLANNING AND FOR MONITORING AND RE-PLANNING DURING ACTUAL OPERATIONS. THE OUTPUT OF THE SYSTEM WILL BE AN EW ESTIMATE INCLUDING THE GENERATION OF TIME-PHASED GRAPHICS OVERLAYS OF THE EEOB WITH EMPHASIS ON EW ACTIVITIES, A VERBAL SUMMARY OF THE VARIOUS POSSIBLE COURSES OF ACTION, RECOMMENDATIONS AS TO WHICH COURSE OF ACTION IS EASIEST TO SUPPORT FROM AN EW STANDPOINT, AND POSSIBLY LOAD PARAMETERS FOR THE (SEMI) AUTONOMOUS ROBOT JAMMERS. THE AI COMPUTATIONS WILL USE KNOWLEDGE BASES LIKE TERRAIN MAPS (DMA DLMS), FRIENDLY EW CAPABILITIES, ENEMY TACTICAL, COMMUNICATION AND EW DOCTRINE, ENEMY COMMUNICATION EQUIPMENT AND COMMUNICATION NET STRUCTURES. OTHER AD HOC INPUTS WILL INCLUDE SIGINT REPORTS AND WEATHER FORECASTS. THE SOFTWARE STRUCTURE WILL INCLUDE RULES FOR PLACING RADIOS AND ECM EQUIPMENT IN THE TERRAIN BASED ON THE EXPECTED MOVEMENT OF FORCES AND PROPAGATION CHARACTERISTICS, TAKING INTO ACCOUNT TERRAIN ELEVATION, GROUND COVER AND WEATHER. VALUES WILL BE ASSIGNED TO BOTH ENEMY AND FRIENDLY ASSETS TO ESTABLISH NUMERICAL PAYOFFS AND NUMERICAL RISK FACTORS FOR ALL ACTIONS. THE PROPOSED HARDWARE WILL CONSIST OF A COMPUTER CAPABLE OF EXECUTING (AI)2, ARITHMETIC AND GRAPHICS ROUTINES; A HIGH RESOLUTION COLOR GRAPHICS DISPLAY; AND POSSIBLY A DIGITAL PLOTTER AS WELL AS A COMMUNICATION INTERFACE TO TRANSMIT EW ESTIMATES, MAPS AND PLOT OVERLAYS AND FOR DOWNLOADING PROGRAMMING PARAMETERS TO ROBOT JAMMERS.

WYATT TECHNOLOGY COMPANY

ARMY

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PHILIP J. WYATT

TITLE:

SUBMICRON PARTICLE ANALYSER

TOPIC: 4a OFFICE: CRDC

THE COMPLETION OF PHASE II WILL RESULT IN THE DEVELOPMENT OF A

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DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM
(SBIR) ABSTRACTS OF PHASE II AWARDS(U) DEPARTMENT OF
DEFENSE WASHINGTON DC 1983

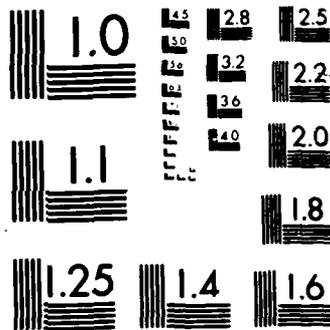
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PORTABLE SUBMICRON PARTICLE ANALYZER CAPABLE OF REAL-TIME ANALYSIS WHICH WILL OUTPERFORM EVERY PARTICLE ANALYZER ON THE MARKET WITH RESPECT TO ACCURACY, RELIABILITY, AND COMPLETENESS OF CHARACTERIZATION. A SUBMICRON PARTICLE ANALYZER CAN BE USED FOR THE OPTICAL CHARACTERIZATION OF EXPERIMENTAL OBSCURANTS AND AS THE BASIS FOR STANDARDIZED MEASUREMENTS COMPARING RESULTS BETWEEN RESEARCH TEST CHAMBERS AND FIELD TRAILS. IT MAY ALSO HAVE APPLICATION IN CHEMICAL/BIOLOGICAL AGENT DETECTION. COMMERCIAL APPLICATIONS INCLUDE CLEAN ROOM MONITORING FOR ELECTRONIC AND COMPUTER PARTS FABRICATION AND MONITORING OF HAZARDOUS AEROSOLS IN HOSPITALS (I.E., BACTERIA AND VIRUSES) AND PUBLIC FACILITIES (I.E., ASBESTOS FIBERS).

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DR. SHELDON B. HUTCHISON

NAVY

TITLE:
DIATOMIC SULFUR BLUE-GREEN LASER EXCITATION EXPERIMENTS
TOPIC: 88 OFFICE: SPAWAR

DIATOMIC SULFUR (S₂ B-->X) LASER CONVERSION MAY PROVIDE AN ALTERNATIVE SOURCE OF BLUE-GREEN RADIATION FOR COMMUNICATIONS PURPOSES. UNDER A PHASE I SBIR PROGRAM, WE DEMONSTRATED THE TECHNICAL FEASIBILITY OF A NOVEL DISCHARGE DISSOCIATION/LASER PUMPING TECHNIQUE. HOWEVER, MANY QUESTIONS REGARDING OVERALL CONVERSION EFFICIENCY AND TUNABILITY REMAIN TO BE ANSWERED. THE WORK OF THE PROPOSED PHASE II PROGRAM IS DIVIDED IN TWO PARTS. THE FIRST PART (PHASE IIa) WILL PROVIDE RESEARCH NECESSARY TO ANSWER QUESTIONS ABOUT SULFUR KINETICS AND SPECTROSCOPY TO ALLOW FURTHER DEVICE DEVELOPMENT IN THE PROGRAM OF THE SECOND PART (PHASE IIb). THERMAL AND ELECTRIC DISCHARGE DISSOCIATION SCHEMES WILL BE EXPLORED IN PHASE IIa, WITH EXCITATION PROVIDED BY LASERS AND NON-COHERENT SOURCES.

TOTAL NUMBER OF AWARDS: 152

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