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VOLUME I

ARMY PROJECTS

ABSTRACTS OF PHASE I AWARDS

FROM

FY 1987 SBIR SOLICITATION

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April 1988

PREFACE

On July 31, 1987 Secretary of Defense Casper W. Weinberger announced the selection of small business firms proposals under Phase I of the Fiscal Year (FY) 1987 Department of Defense (DoD) Small Business Innovation Research (SBIR) Program to be funded upon successful completion of contract negotiations.

The selection of proposals for funding was made from proposals received by the Military Departments, the Defense Advanced Research Projects Agency (DARPA), the Defense Nuclear Agency (DNA), and the Strategic Defense Initiative Organization (SDIO) in response to the FY 1987 solicitation distributed on October 1, 1986 with a closing date of January 9, 1987.

FY 1987 Program

	<u>Number of Topics</u>	<u>Proposals Received</u>	<u>Phase I Awards</u>
Army	330	2402	331
Navy	263	2004	286
Air Force	241	1863	350
DARPA	33	395	59
DNA	8	200	25
SDIO	<u>14</u>	<u>672</u>	<u>212</u>
	889	7536	1263

In order to make information available on the technical content of the Phase I projects supported by the Department of Defense SBIR Program, this report presents, in four volumes, the abstracts of those proposals which have resulted in contract awards.

This is Volume I which contains abstracts and contacts for the 331 Phase I projects funded by the Army from the FY 1987 SBIR Program. Projects funded by other Department of Defense components are published in separate volumes, as follows:

- Volume II - Navy Projects (Pages 202 - 375) *Keywords: Contract proposals, Military research, Commerce, Military procurement.*
- Volume III - Air Force Projects (Pages 376 - 587)
- Volume IV - DARPA, DNA and SDIO Projects (Pages 588 - 788)

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 is shown.

INTRODUCTION

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

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 pre-requisite for further DoD support in Phase II.

Phase II awards will be made only to firms on the basis of results from the Phase I effort, and the scientific and technical merit of the Phase II proposal. 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.

Selection Criteria

Phase I proposals received in each topic area in the DoD solicitation brochure are evaluated on a competitive basis in the organization which generated the topic, by scientists and engineers knowledgeable in that area and in accordance with the following criteria:

1. The scientific/technical quality of the research proposal and its relevance to the topic description, with special emphasis on its innovation and originality.
2. Qualifications of the principal investigator, other key staff, and consultants, if any, and the adequacy of available or obtainable instrumentation and facilities.

3. Anticipated benefits of the research to the total DoD research and development effort.

4. Adequacy of the Phase I proposed effort to show progress toward demonstrating the feasibility of the concept.

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. 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	150M	202M	221M
Actual Awarded Dollars	20.6M	44.6M	78.2M	150.7M	202M	

FY 1983 Program

	<u>Number of Topics</u>	<u>Proposals Received</u>	<u>Phase I Awards</u>	<u>Phase II Awards</u>
Army	182	1121	98	45
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	149

1984 Program

	<u>Number of Topics</u>	<u>Proposals Received</u>	<u>Phase I Awards</u>	<u>Phase II Awards</u>
Army	111	758	81	35
Navy	146	859	99	52
Air Force	283	1208	162	73
DARPA	17	107	15	7
DNA	<u>8</u>	<u>80</u>	<u>12</u>	<u>1</u>
	565	3012	369	168

FY 1985 Program

	<u>Number of Topics</u>	<u>Proposals Received</u>	<u>Phase I Awards</u>	<u>Phase II Awards</u>
Army	111	808	124	69
Navy	138	851	110	58
Air Force	218	1306	249	119
DARPA	17	130	14	6
DNA	7	95	18	6
SDIO	<u>18</u>	<u>415</u>	<u>36</u>	<u>16</u>
	509	3605	551	274

FY 1986 Program

	<u>Number of Topics</u>	<u>Proposals Received</u>	<u>Phase I Awards</u>	<u>Phase II Awards</u>
Army	225	1643	245	77
Navy	190	1222	225	81
Air Force	304	1795	306	132
DARPA	22	177	44	11
DNA	7	171	46	8
SDIO	<u>12</u>	<u>552</u>	<u>154</u>	<u>38</u>
	760	5560	1020	347

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

SUBMITTED BY

A.I. TECHNOLOGY INC
PO BOX 3081
PRINCETON, NJ 08543
CONTRACT NUMBER: DAAK70-87-C-0028
DR KEVIN K T CHUNG
TITLE:
MATERIALS WITH DUAL RADAR AND THERMAL SUPPRESSION CHAR
TOPIC# 138 OFFICE: BRDC-PVD

ALTHOUGH THERE ARE NO INTRINSIC CONFLICTS FOR THE SAME MATERIAL SYSTEMS TO ACHIEVE BOTH THE RADAR ABSORPTION AND THERMAL SUPPRESSION CHARACTERISTICS THERE EXISTS NO COMMERCIAL PRODUCT THAT HAS THE DESIRED DUAL PROPERTIES. A THEORETICAL CALCULATION ON THE FEASIBILITY OF SEVERAL PROPOSED MATERIAL SYSTEMS WILL BE PERFORMED. THE CALCULATIONS ARE BASED ON A MEAN FIELD THEORY FOR DIELECTRIC PROPERTIES. MATERIAL SYSTEMS WITH DEMONSTRATED FEASIBILITY WILL BE CONSTRUCTED. BOTH THE RADAR ABSORBING AND THERMAL SUPPRESSION PROPERTIES OF THE STUDIED MATERIALS WILL BE PRESENTED.

ADELSYS INC
11855 EDGEWATER DR - #304
LAKEWOOD, OH 44107
CONTRACT NUMBER: DAMD17-87-C-7212
DOUGLAS E BAHNIUK
TITLE:
PORTABLE LIGHT-WEIGHT FIELD DENTAL CHAIR UTILIZING COM
MATERIALS
TOPIC# 271 OFFICE: MEDICAL

DENTAL ILLNESSES AND INJURIES OCCURRING IN THE FIELD ARE DIFFICULT TO TREAT WITHOUT A DENTAL CHAIR. WE HAVE DESIGNED A FIELD EXPEDIENT DENTAL CHAIR MADE OF COMPOSITE (PRIMARILY HONEYCOMB AND CARBON-GRAPHITE FIBER) MATERIALS. THE CHAIR ALLOWS BOTH STAND-UP AND SIT DOWN DENTISTRY. THE CHAIR WEIGHS LESS THAN TEN LB., FOLDS TO A SMALL VOLUME, IS EASILY CLEANED AND IS RUGGED. ADDITIONALLY, THE DEVICE ALLOWS FOR EASY SET-UP AND TAKE-DOWN, AND IS FULLY ADJUSTABLE. PATIENT COMFORT, POSITIONING, AND SAFETY WERE CONSIDERED IN THE DESIGN.

ADIABATICS INC
630 S MAPLETON ST
COLUMBUS, IN 47201
CONTRACT NUMBER: DAAE07-87-C-8057
ROY KAMO
TITLE:
STOICHIOMETRIC DIESEL ENGINE
TOPIC# 161 OFFICE: TACOM

SUBMITTED BY

A FEASIBILITY STUDY ON THE DEVELOPMENT OF A STOICHIOMETRIC DIESEL ENGINE IS PROPOSED USING THE THERMAL IGNITION COMBUSTION CHAMBER. THE ADIABATIC DIESEL ENGINE WITHOUT WATER OR AIR COOLING ALLOWS THE THERMAL IGNITION CHAMBER TO STORE HEAT DURING COMBUSTION AND RELEASE THE ENERGY FOR IGNITION IN THE FOLLOWING CYCLE. INJECTION OF FUEL ON TO 1800-2000 DEG. F WALL TEMPERATURE WILL PREPARE THE FUEL FOR COMBUSTION AND IGNITE IT VIA SURFACE IGNITION. THE PARTIAL PRODUCTS OF COMBUSTION PRODUCTS ISSUING FROM THE THERMAL IGNITION CHAMBER TO THE HOT ADIABATIC MAIN CHAMBER SHOULD ALLOW HIGH HEAT RELEASE RATES TO OCCUR. IN A CONVENTIONALLY COOLED PRECHAMBER DIESEL, THE SLOW HEAT RELEASE RATE OF THE PARTIAL COMBUSTION PRODUCTS INTO THE MAIN CHAMBER IS RECOGNIZED AS THE PROBLEM AREA. AIR UTILIZATION AND MULTIFUEL CAPABILITY ARE EXPECTED TO IMPROVE AND LEAD TOWARDS A STOICHIOMETRIC DIESEL ENGINE. THE CONSEQUENT ADIABATIC ENGINE SHOULD APPROACH THE HOMOGENEOUS COMBUSTION GASOLINE ENGINE RESULTING IN A MORE COMPACT, LIGHT WEIGHT, HIGH POWER DENSITY POWER PLANT WITHOUT THE NEED FOR A COMPLEX TURBOCHARGER SYSTEM. A COMPLETE ANALYSIS OF THE COMBUSTION PHENOMENA IN A STOICHIOMETRIC DIESEL ENGINE WILL BE MADE USING EXISTING ADIABATIC ENGINE DATA. ENGINE PERFORMANCE, SPECIFICATIONS AND TURBOCHARGER REQUIREMENTS WILL BE OBTAINED.

ADVANCED COMPOSITE PRODUCTS INC
21 COMMERCE DR
NORTH BRANFORD, CT 06471
CONTRACT NUMBER: DAAJ02-87-C-0007
DAVID MAASS
TITLE:
CONFORMAL THERMOPLASTIC COMPOSITE MATERIALS FOR COMPOU
HELICOPTER PRIMARY STRUCTURES
TOPIC# 31 OFFICE: AVSCOM

HIGHLY CONFORMAL GRAPHITE/PEEK THERMOPLASTIC COMPOSITE FABRICS UTILIZING CO-MINGLED YARNS ARE CURRENTLY BEING INVESTIGATED FOR USE IN SIMPLE CURVATURE PRIMARY HELICOPTER STRUCTURE. THIS PROGRAM SEEKS TO ADVANCE THEIR USE TO COMPOUND CURVATURE HELICOPTER PRIMARY STRUCTURE AND CONCURRENTLY DEMONSTRATE A MANUFACTURING PROCESS APPLICABLE TO LARGE, COMPLEX STRUCTURES. THE DEVELOPMENT PROGRAM INCLUDES SELECTION OF A REPRESENTATIVE HELICOPTER STRUCTURAL COMPONENT, SELECTION OF A SPECIFIC MATERIAL AND PROCESS, PROCESS

SUBMITTED BY

OPTIMIZATION, LIMITED MECHANICAL TESTING, AND FABRICATION OF TWO PARTS. A FINAL REPORT SHALL BE PREPARED.

ADVANCED DECISION SYSTEMS
201 SAN ANTONIO CIR - STE 286
MOUNTAIN VIEW, CA 94040
CONTRACT NUMBER: DAAB10-87-C-0045
LAURA B BALCOM
TITLE:
KNOWLEDGE SHARING
TOPIC# 318 OFFICE: CECOM/SWLAB

ADS PROPOSES TO PERFORM REQUIREMENTS ANALYSIS, CONCEPT DEVELOPMENT, AND FEASIBILITY ANALYSIS FOR A PHASE II IMPLEMENTATION OF A SORTER/PARSER FOR INTERCEPTED MESSAGES IN THE TACTICAL BATTLEFIELD DOMAIN. THE CONCEPT PROPOSED FOR A MESSAGE SORTER PARSER UTILIZES A KEYWORD-BASED INFORMATION RETRIEVAL PROGRAM, CALLED RUBRIC, TO SORT THE MESSAGES INTO SENDER AND INTENDED RECEIVER CATEGORIES, TOGETHER WITH A SET OF LIMITED DOMAIN PARSERS TO EXTRACT THE MEANING OF THE TESTS. THE OUTPUT OF THE PARSERS WILL BE IN A FORMAT USEFUL TO AN INFORMATION FUSION/SITUATION ASSESSMENT EXPERT SYSTEM UNDER DEVELOPMENT ON A SEPARATE CONTRACT. ADS DEMONSTRATES THAT IT HAS THE PERSONNEL, FACILITIES, AND BACKGROUND IN THE DOMAIN AND IN TEXT PROCESSING WHICH ARE NECESSARY TO PERFORM THE REQUIREMENTS OF THIS PROJECT.

ADVANCED DECISION SYSTEMS
201 SAN ANTONIO CIR - STE 286
MOUNTAIN VIEW, CA 94940
CONTRACT NUMBER: DAAE07-87-C-8054
RANDAL WALSER
TITLE:
TEAMWORKS - A LABORATORY FOR THE STUDY OF TEAMWORK AMO ROBOTS
TOPIC# 158 OFFICE: TACOM

TEAMWORKS IS AN APPROACH TO THE MULTIPLICATION OF COMBAT POWER THROUGH THE EVOLUTIONARY DEVELOPMENT OF TELEROBOTIC SYSTEMS. WE PROPOSE TO BUILD A SIMULATION GAMING LABORATORY, DISTRIBUTED OVER A

SUBMITTED BY

NETWORK OF PERSONAL COMPUTERS, FOR THE STUDY OF TEAMWORK AMONG HUMANS AND ROBOTS. OUR LONG-TERM OBJECTIVE IS TO DEVISE AN ADVANCED AUDIO/VISUAL INTERFACE THROUGH WHICH A TANK COMMANDER CAN MANEUVER A SIMULATED TEAM OF ROBOTIC VEHICLES. THE UNDERLYING PREMISE IS THAT NATURAL INTELLIGENCE AND ARTIFICIAL INTELLIGENCE CAN BE COMBINED TO FORM A POWERFUL, HYBRID INTELLIGENCE SYSTEM THAT CAN PERFORM MORE EFFECTIVELY THAN HUMANS OR ROBOTS ACTING INDEPENDENTLY. WE ALSO SEEK TO PROMOTE ADVANCES IN AI BY GIVING SCIENTISTS (1) GAME WORLDS IN WHICH TO EXPERIMENT AND (2) TOOLS WITH WHICH THEY THEMSELVES CAN CREATE GAME WORLDS.

ADVANCED DECISION SYSTEMS
201 SAN ANTONIO CIR - #286
MOUNTAIN VIEW, CA 94040
CONTRACT NUMBER: DAAB07-87-C-A044
DANIEL G SHAPIRO
TITLE:
AI FOR COMMAND AND CONTROL: RESEARCH TOWARD A TERRAIN
SYSTEM
TOPIC# 300 OFFICE: C/A

THIS PROPOSAL IS FOR RESEARCH TOWARDS THE DEVELOPMENT OF A TERRAIN ANALYST'S WORKSTATION, WHICH WILL PERFORM TERRAIN REASONING TASKS IN SUPPORT OF DIVERSE USERS DURING ARMY TACTICAL MISSION PLANNING AND OPERATIONS. IN SPECIFIC, THE GOAL IS TO BUILD ARTIFICIAL INTELLIGENCE BASED SYSTEM WITH A MIXED INITIATIVE INTERFACE FORMAT THAT IS ABLE TO IDENTIFY FEATURES OF MILITARY INTEREST FROM DIGITIZED MAP DATA, SELECT TERRAIN SITES FOR PARTICULAR TACTICAL ACTIONS GIVEN SPECIFIC EQUIPMENT AND ORDER OF BATTLE DATA, EVALUATE THE IMPACT OF TERRAIN ON ACTIONS PROPOSED BY THE USER, AND DISPLAY THE RESULTS OF THESE INVESTIGATIONS IN A NATURAL FORM. THIS WORK CAPITALIZES ON A TERRAIN ANALYSIS AND PLANNING SYSTEM ALREADY IMPLEMENTED AT ADVANCED DECISION SYSTEMS.

ADVANCED DIGITAL SYSTEMS INC
10052 MESA RIDGE CT - STE 200
SAN DIEGO, CA 92121
CONTRACT NUMBER: DAED18-87-C-0036
WILLIAM HOFFMAN
TITLE:
ARTIFICIAL INTELLIGENCE FOR VOICE JAMMING
TOPIC# 237 OFFICE: TECOM

SUBMITTED BY

EVALUATION OF JAMMING EFFECTIVENESS IN DATA SIGNALS IS RATHER STRAIGHTFORWARD AND IS GENERALLY REPEATABLE. THAT IS, A PARTICULAR JAMMING SYSTEM WILL PRODUCE THE SAME BIT ERROR RATE EACH TIME A TEST IS RUN WITH THE SAME TEST PARAMETERS. EVALUATION OF EFFECTIVENESS OF JAMMING OF VOICE SIGNALS HOWEVER, IS VERY SUBJECTIVE AND EVEN WITH THE SAME TEST SUBJECTS, RESULTS WILL FREQUENTLY DIFFER FROM TEST TO TEST WITH THE SAME TEST PARAMETERS. A NEWLY DEVELOPED METHOD OF CHARACTERIZING VOICE SIGNALS COUPLED WITH A NEW DEVELOPMENT IN ARTIFICIAL INTELLIGENCE (AI) TITLED "FINITE INDUCTIVE SEQUENCE PROCESSING" (FISP) HAS THE CAPABILITY OF PRODUCING REPEATABLE TESTING OF JAMMER EFFECTIVENESS AGAINST VOICE SIGNALS. FISP IS A PROPRIETARY SYSTEM JOINTLY OWNED BY THE ADS/CIS TEAM.

ADVANCED DIGITAL SYSTEMS INC
10052 MESA RIDGE CT - STE 200
SAN DIEGO, CA 92121
CONTRACT NUMBER: DAAB07-87-C-P056
GARY FITZHUGH
TITLE:
ARTIFICIAL INTELLIGENCE FOR THREAT WARNING SYSTEMS
TOPIC# 291 OFFICE: EW

THE OBJECTIVE OF THIS EFFORT IS TO EXPLORE THE POTENTIAL OF FINITE INDUCTIVE SEQUENCE PROCESSING (FISP) TO PROVIDE FOR SMART THREAT SENSOR SYSTEMS. THE PROPOSAL WILL SINGLE OUT THE RADAR WARNING RECEIVER (RWR) AS A CANDIDATE SYSTEM. FISP, HOWEVER, HAS APPLICATION AND CAPABILITY WELL BEYOND THAT WHICH WILL BE PROPOSED AND COULD BE USED AS AN ONBOARD, CHIP-LEVEL, KNOWLEDGE-BASED SENSOR FUSION SYSTEM. FISP IS AN ALGORITHMIC APPROACH TO AN AI SYSTEM WHICH DOES NOT REQUIRE THE COMPUTER STORAGE AND EXECUTION SPACE NORMALLY ASSOCIATED WITH A SYSTEM OF THIS TYPE. WE BELIEVE FISP TO BE IDEAL AS A MEANS TO UPGRADE CURRENT SENSORS TO SMART, KNOWLEDGE-BASED SYSTEMS AND BELIEVE IT IS FULLY CAPABLE OF REPLACING THE HUMAN OPERATOR. THIS EFFORT WILL BE REFERRED TO AS AIRWR THROUGHOUT THE REMAINDER OF THE PROPOSAL.

ADVANCED SYSTEMS CONCEPTS INC
2333 N LAKE AVE
ALTADENA, CA 91001
CONTRACT NUMBER: DAAA15-87-C-0060
DR JOHNETTA MacCALLA
TITLE:
TRACKING LASER DATA LINK
TOPIC# 90 OFFICE: BRL

SUBMITTED BY

THE PURPOSE OF THIS PROJECT IS TO EXAMINE THE FEASIBLE OF DEVELOPING A TRACKING LASER DATA LINK. THE PROPOSED SYSTEM WILL USE A DUAL TRACKING SYSTEM, ONE ON THE RETROREFLECTIVE MOBILE UNIT, THE OTHER ON THE LASER. TRIANGULATION WILL BE USED TO PROVIDE LASER TRACKING WHEREAS PROJECTED PATH WILL BE USED IN THE MOBILE TRACKING UNIT. ACOUSTO-OPTICAL MODULATION OF THE LASER WILL BE USED FOR THE DATA LINK.

ADVANCED TECHNOLOGY & RESEARCH INC
3933 SANDY SPRING RD
BURTONSVILLE, MD 20866
CONTRACT NUMBER: DAAD05-87-C-0137
VALMORE F DeVOST

TITLE:
ASSESSMENT OF MECHANICAL SHOCK SENSOR CAPABILITIES
TOPIC# 184 OFFICE: TECOM

THERE HAS BEEN LITTLE, IF ANY, DEVELOPMENT IN RECENT YEARS IN THE AREA OF MECHANICAL SHOCK (MS) SENSORS, ESPECIALLY SENSORS WITH HIGH FREQUENCY AND HIGH-G RESPONSE. IT IS PROPOSED THAT THROUGH THE USE OF LITERATURE SOURCES AN ASSESSMENT BE MADE OF THE STATE-OF-THE-ART IN MS SENSORS AND OF THE IMPROVABILITY OF THE MOST ADVANCED DEVICES TO EXTEND THEIR FREQUENCY AND DYNAMIC RANGE. IT IS ALSO PROPOSED THAT THEORETICAL STUDIES BE CONDUCTED ON THE RESPONSE OF MAGNETIC, HEAT SENSING, PYROTECHNIC AND ABLATIVE MATERIALS TO SHOCK AND THAT EXPLORATORY TESTS BE CONDUCTED ON PROMISING SYSTEMS.

AERO-CHEM RESEARCH LABS INC
PO BOX 12
PRINCETON, NJ 08542
CONTRACT NUMBER: DAA15-87-C-0041
WILLIAM FELDER

TITLE:
UNIQUE HIGH TEMPERATURE HIGH PRESSURE GASEOUS PHOTOCHE
TOPIC# 82 OFFICE: BRL

A UNIQUE HIGH TEMPERATURE, HIGH PRESSURE GASEOUS PHOTOCHEMICAL REACTOR WITH OPTICAL AND MASS SPECTROMETRIC SPECIES DETECTION CAP-

SUBMITTED BY

ABILITIES WILL BE DESIGNED. THE PROPOSED DESIGN, UTILIZING AERO-CHEM'S EXPERIENCE IN CONSTRUCTING AND USING SIMILAR APPARATUS, WILL EXCEED THE UPPER TEMPERATURE AND PRESSURE SPECIFICATIONS GIVEN IN THE SOLICITATION IN ORDER TO GIVE THE INSTRUMENT GREATER UTILITY. ALTERNATE DESIGN CONCEPTS WILL BE EVALUATED WITH FEASIBILITY CALCULATIONS, AND A FINAL OPTIMUM CONFIGURATION WILL BE SELECTED AND DESIGN DRAWINGS PREPARED. THE REACTOR WILL BE CAPABLE OF TEMPERATURE GREATER THAN 1000 DEG C AND PRESSURES ABOVE 20 ATM. IN PHASE II OF THIS WORK THE HIGH PRESSURE PHOTOCHEMICAL REACTOR WILL BE CONSTRUCTED, TESTED, AND DELIVERED.

AERO-VIRONMENT INC
825 MYRTLE AVE
MONROVIA, CA 91016
CONTRACT NUMBER: DACA88-87-C-0009
W RAY MORGAN
TITLE:
SIMPLIFIED COMPOSITE STRUCTURE JOINING TECHNIQUES FOR
APPLICATIONS
TOPIC# 248 OFFICE: CERL

THE POTENTIAL FOR USING COMPOSITE MATERIALS IN CONSTRUCTING SPACE STATION ENVIRONMENTS APPEARS TO BE DESIRABLE DUE TO THE SUBSTANTIAL PAYLOAD WEIGHT SAVINGS OF POLYMER COMPOSITES, AS COMPARED TO MOVING MORE CONVENTIONAL MATERIALS FROM EARTH. IN THE HOSTILE ENVIRONMENT OF SPACE, JOINTS MUST BE HIGHLY STABLE AND RELIABLE, AS WELL AS BEING SIMPLE TO MANUFACTURE. CURRENT TECHNIQUES FOR JOINING, AS USED HERE ON EARTH, MAY NOT BE APPROPRIATE OR MAY BE OVER-DESIGNED FOR USE IN SPACE. THE REQUIREMENTS FOR THESE SPACE STRUCTURES ARE LIGHT WEIGHT, HIGH RIGIDITY, ENVIRONMENTAL DURABILITY, AND EASE OF ASSEMBLY. THE PROPOSED EFFORT IS TO DEVELOP THE SIMPLEST POSSIBLE JOINING TECHNIQUE WHICH MEETS THESE GOALS.

AERODYNE RESEARCH INC
45 MANNING RD
BILLERICA, MA 01821
CONTRACT NUMBER: DAAB07-87-C-P034
JONATHAN B LURIE
TITLE:
ADVANCED IRCM SOURCE
TOPIC# 294 OFFICE: EW

SUBMITTED BY

FUTURE THREAT INFRARED MISSILE SEEKERS WILL POSSESS THE CAPABILITY TO EFFECTIVELY DISCRIMINATE AGAINST IR DECOY FLARES. NEW DECOY FUELS MUST BE IDENTIFIED WHICH PROVIDE A GOOD SPECTRAL MATCH BETWEEN DECOYS AND HELICOPTERS, AND WHICH HAVE IMPROVED TOTAL RADIANT INTENSITY AND BURNING CHARACTERISTICS. IN ADDITION, ALTERNATIVE DECOY CONCEPTS TO THE FREE-GRAIN FLARE MUST BE EVALUATED. IN THIS PROPOSAL, A COMPUTER SCREENING PROCEDURE IS OUTLINED FOR THE IDENTIFICATION OF THE MOST PROMISING DECOY FUELS FOR INCORPORATION INTO AN ADVANCED DECOY SYSTEMS CONCEPT. THE PROCEDURE INVOLVED IDENTIFYING A LARGE NUMBER OF POTENTIAL FUELS AND PERFORMING INITIAL SCREENING CALCULATIONS WITH AN EQUILIBRIUM COMBUSTION CODE AND SIMPLE RADIATION TRANSPORT COMPUTATIONS. THE BEST COMPOUNDS WILL BE INVESTIGATED MORE THOROUGHLY WITH A FULLY-FINITE RATE CONTROLLED COMBUSTION CODE, PLUME FLOW FIELD CODES AND A RADIATION TRANSPORT CODE. THIS PROCEDURE PERMITS THE EVALUATION OF A LARGE NUMBER OF POTENTIAL DECOY FUELS, WHICH CANNOT BE ACCOMPLISHED IN A COST-EFFECTIVE MANNER BY THE TRADITIONAL "CUT-AND-TRY" APPROACH TO THE DESIGN OF NEW IR DECOYS.

AEROMET INC
PO BOX 701767
TULSA, OK 74170
CONTRACT NUMBER: DAAD07-87-C-0082
MARK BRADFORD
TITLE:
MESOSCALE ENVIRONMENTAL NOWCASTING FOR TACTICAL ARMY O
TOPIC# 71 OFFICE: LABCOM/ASL

A PLAN FOR THE DEVELOPMENT OF A MESOSCALE WEATHER NOWCASTING SYSTEM IS PROPOSED. THAT SYSTEM WOULD BE USED AS A TACTICAL DECISION AID FOR SUPPORT OF TACTICAL ARMY OPERATIONS. THE SYSTEM WOULD BE COMPOSED OF MODULAR SENSOR PACKAGES, A TELEMETRY SYSTEM, A FLEXIBLE SYSTEM OF SENSOR DEPLOYMENT, AND A MICROPROCESSOR BASED TACTICAL COMPUTER SYSTEM FOR THE ANALYSIS AND DISPLAY OF DATA COLLECTED. THE PROPOSED SYSTEM WOULD ALLOW FOR MAXIMUM FLEXIBILITY IN GATHERING ENVIRONMENTAL INTELLIGENCE AND WOULD BE EASY TO USE WITH A MINIMUM AMOUNT OF TRAINING. NEITHER METEOROLOGICAL EXPERTISE, NOR COMPUTER EXPERTISE, WOULD BE NECESSARY TO CONFIGURE, OPERATE AND USE THE SYSTEM.

AEROMETRICS INC
PO BOX 308
MOUNTAIN VIEW, CA 94042
CONTRACT NUMBER: DACA33-87-C-0047
WILLIAM D BACHALO
TITLE:
DEVELOPMENT OF ADVANCED INSTRUMENTATION FOR DROP SIZE
WATER CONTENT MEASUREMENTS IN CLOUDS
TOPIC# 260 OFFICE: CRREL

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1
BY SERVICE
FISCAL YEAR 1987
ARMY

PAGE 9

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DEVELOPMENT OF ADVANCED DIAGNOSTICS FOR THE DETERMINATION OF THE LIQUID WATER (LWC) FOR FOG AND CLOUDS IS PROPOSED. SUCH DATA ARE FUNDAMENTAL TO THE RESEARCH IN CLOUD PHYSICS, ACID PRECIPITATION, ELECTROMAGNETIC WAVE PROPAGATION, AND AIRCRAFT ICING. CURRENTLY, THE METHODOLOGIES FOR MEASURING LWC ARE TIME-CONSUMING, LACK VERSATILITY, AND LACK ACCURACY. UNDER THIS PROGRAM, THE RECENTLY DEVELOPED PHASE DOPPLER PARTICLE ANALYZER (PDPA) WILL BE EVALUATED AS A MEANS OF PROVIDING ACCURATE DROP SIZE SPECTRA, AIRFLOW SPEED, AND NUMBER OF DROPS COUNTED IN A MEASURED PERIOD OF TIME. THESE RESULTS ARE NEEDED ALONG WITH THE SAMPLING CROSS SECTION TO ESTABLISH THE LWC. CRITICAL QUESTIONS ON THE SYSTEM PERFORMANCE IN LOW TEMPERATURE ENVIRONMENTS AND ON AIRCRAFT WILL BE ADDRESSED. DEMONSTRATIONS ON THE CONSISTENT LEVELS OF ACCURACY IN THE MEASUREMENT OF THE LWC WILL BE PERFORMED. EVALUATIONS WILL BE MADE BY GENERATING SPRAYS OF SIZE DISTRIBUTIONS SIMILAR TO FOG AND CLOUDS WITH KNOWN LWC. MEASUREMENTS OF THESE SPRAYS WILL BE PERFORMED WITH THE PDPA AND COMPARED TO THE KNOWN NOZZLE FLOW RATES. THESE MEASUREMENTS WILL BE MADE IN THE AEROMETRICS' TWO-PHASE FLOW WIND TUNNEL AT A RANGE OF CONVECTION VELOCITIES.

AKM ASSOCS
30 WEST POINT PL
SAN MATEO, CA 94402
CONTRACT NUMBER: DAAE07-87-C-8056
R WALSER
TITLE:
VEHICLE INSTRUMENT PANELS
TOPIC# 160 OFFICE: TACOM

THE REQUIREMENT FOR A TRACKED VEHICLE AND A WHEELED VEHICLE INSTRUMENT PANEL (ALLOWING VARIATIONS FOR EACH) WILL BE MET, OPTIMALLY, WITH A SINGLE FLAT-PANEL DISPLAY DEVICE, MICROCONTROLLER AND SPECIFIC FIRMWARE FOR EACH CLASS OF APPLICATION OR INSTRUMENT. UTILIZING THE MOST APPROPRIATE DISPLAY TECHNOLOGY, SENSOR INPUTS WILL BE PROCESSED BY THE MICROCONTROLLER TO PROVIDE THE DESIRED DISPLAY OUTPUT. REPEAT OUT-OF-RANGE READINGS (BASED ON PROGRAMMED VALUES) WILL FLASH THE AFFECT ELEMENT OF THE DISPLAY AND ELIMINATE THE NEED FOR EXTRA WARNING INDICATORS. THE ACTUAL NUMBER, SIZE, SHAPE, AND SCALE OF THE GAUGE IMAGE WILL BE PROGRAMMED IN FIRMWARE ON A ROM. AN

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 10
BY SERVICE
FISCAL YEAR 1987
ARMY

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INTEGRAL PART OF THE PROJECT WILL BE THE REQUIRED FORMAT BUILDER PROGRAM, HOSTED ON AN IBM PC-AT, WHICH WILL PROVIDE A SIMPLE GAUGE FORMATTING PROCEDURE FOR CREATING THE REQUIRED ROM FIRMWARE. PHASE I OF THIS EFFORT WILL CONSIST OF A DETAILED DESIGN AND SCHEMATICS OF INSTRUMENT PANELS, ONE FOR A TRACKED VEHICLE AND ONE FOR A WHEELED VEHICLE. PHASE II OF THIS EFFORT WILL BE COMPRISED OF THE FABRICATION AND INSTALLATION OF THE VERSATILE INSTRUMENT PANEL ON THESE TWO TYPES OF VEHICLES. BASED ON THE CONSTRUCTED PROTOTYPE, PRODUCTION COSTS WOULD BE CALCULATED IN DETAIL AND THE INSTRUMENT WILL BE LABORATORY AND FIELD-TESTED.

AMERASIA TECHNOLOGY INC
620-1 HAMPSHIRE RD
WESTLAKE VILLAGE, CA 91361
CONTRACT NUMBER: DAAL02-87-C-0065
DR EDWARD J STAPLES
TITLE:
LOW-COST MINIATURE VELOCIMETER
TOPIC# 48 OFFICE: HDL

A COMPACT, SIMPLE AND TOTALLY PASSIVE VELOCIMETER OR INTEGRATING ACCELEROMETER UTILIZING WELL ESTABLISHED MECHANICAL PRINCIPLE IS PROPOSED. THE ADVANTAGES OF THE PROPOSED APPROACH ARE THAT: (1) THE SENSOR IS TRULY INTEGRATING AND CONSUMES NO POWER, (2) THE OUTPUT CAN BE ANALOG OR DIGITAL AND THE MEMORY FOR THE OUTPUT LASTS INDEFINITELY, (3) IT IS IMMUNE TO ANGULAR ACCELERATION, VIBRATION AND SHOCK BY ITS DESIGN, (4) IT IS INSENSITIVE TO TEMPERATURE AND ITS VOLUME IS LESS THAN 1 CC AND (5) IT IS LOW COST. THE PROPOSAL DEMONSTRATES THE PRINCIPLE OF OPERATION AND PROVIDES RESULTS OF A PRELIMINARY TEST THAT LEADS TO PERFORMANCE AND VOLUME ESTIMATES STATED ABOVE. PHASE I PROGRAM WILL PROVIDE A DETAILED ANALYSIS OF THE SENSOR DYNAMICS AND A COMPLETE DESIGN FOR THE VELOCIMETER. IT WILL ALSO DEMONSTRATE THE FEASIBILITY OF THE CONCEPT THROUGH A LABORATORY MODEL AND DETERMINE THE OPTIMAL MATERIAL TO BE USED FOR THE SENSOR. THE FABRICATION AND TESTING OF THE VELOCIMETER WILL BE IMPLEMENTED IN PHASE II.

AMERCOM INC
8928 FULLBRIGHT AVE
CHATSWORTH, CA 91311
CONTRACT NUMBER:
CURTIS BURKLAND
TITLE:
ELECTROMAGNETIC (EM) LAUNCH COMPONENT TECHNOLOGIES
TOPIC# 4 OFFICE: ARDC

SUBMITTED BY

A SIX-MONTH FEASIBILITY STUDY TO INVESTIGATE THE USE OF CERAMIC AND METAL MATRIX COMPOSITE MATERIALS FOR THE CONDUCTING RAILS OF ELECTROMAGNETIC RAIL GUNS IS PROPOSED. CERTAIN ELECTRICAL, MECHANICAL AND THERMAL PROPERTIES OF THE MATERIAL WILL BE DETERMINED AND MICRO-STRUCTURAL FEATURES OF THE COMPOSITE EVALUATED. SAMPLE RAIL MATERIALS WILL BE EXPOSED TO THE PLASMA ARC ENVIRONMENTS FOUND IN RAIL GUNS TO EVALUATE ARC EROSION RESISTANCE.

AMERICAN RESEARCH CORP OF VA
PO BOX 3406 - 642 FIRST ST
RADFORD, VA 24143
CONTRACT NUMBER: DAAD05-87-C-0029
DR M G NIIMURA

TITLE:
TUNABLE-WAVELENGTH COMPACT MILLIMETERWAVE RADAR FOR CL
TOPIC# 196 OFFICE: TECOM

THERE IS A NEED OF A MM-WAVE RADAR TO RECORD THE INTERNAL STRUCTURE OF SMOKE OBSCURANT CLOUDS GENERATED DURING THE TESTS. MILLIMETER WAVE RADAR WITH 7.5M RANGE RESOLUTION AND 0.5 DEGREE ANGULAR RESOLUTION ARE REQUIRED. THE MILLIMETER WAVE RADAR TO BE DEVELOPED UNDER THIS PROPOSAL IS FREQUENCY TUNABLE IN A WIDE RANGE (10¹¹1000GHz) AND THUS THE SPATIAL RESOLUTIONS CAN BE TUNED ALSO IN A WIDE RANGE. TYPICAL 2M (AT 1KM POSITION) RESOLUTION AND 0.11 DEGREE ANGULAR RESOLUTION ARE, HOWEVER, EXPECTED TO BE ACHIEVED WITHOUT DIFFICULTY. THE WIDE-BAND FREQUENCY TUNABILITY IS BASED ON THE ADVANCED CONCEPT OSCILLATOR CALLED ORBITRON MASER AND PARTICULARLY IDEAL FOR THE CLOUD MAPPING. RICH SIGNATURE OF EACH SMOKE OBSCURANTS WOULD BE IDENTIFIED FROM THE FREQUENCY SPECTRUM OF BACKSCATTERED INTENSITY, PHASE AND POLARIZATION INFORMATION. THE FREQUENCY TUNABILITY ALSO CAN MAKE POSSIBLE TO IDENTIFY THE TARGET OBSCURANT AT DIFFERENT DEPTHS OF THE CLOUD, FROM WHICH THE MAPPING OR IMAGING OF EACH TARGET SPECIES CAN BE MADE. THIS PROPOSAL DEVELOPS A FIELD USABLE, COMPACT BATTERY-POWERED MM-WAVE RADAR FOR THE PURPOSE OF CLOUD MAPPING. SINCE IT CAN BE HANDHELD, ONE CAN POINT IT TO THE SHORTLIFE CLOUD RATHER QUICKLY AND CAN MEASURE ANGULAR DISTRIBUTION OF THE BACKSCATTER QUITE EASILY. THE CURRENTLY AVAILABLE OTHER MM-WAVE SOURCES ARE EITHER NARROW-BAND OR HEAVY-WEIGHT AS SYMBOLIZED BY THE MAGNETRON OR THE GYROTRON AND FEL (FREE ELECTRON LASER), RESPECTIVELY. THE GYROTRON AND

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FEL, NOW ENTHUSIASTICALLY DEVELOPING, CAN BE POWERFUL, FREQUENCY-TUNABLE MM-WAVE SOURCES. HOWEVER, HEAVY EQUIPMENTS SUCH AS QUASI-RELATIVISTIC ELECTRON GUN AND HIGH-INTENSITY MAGNETS ARE ESSENTIAL IN THEIR OPERATION, WHICH CURTAILES THE FIELD APPLICATION. THE RESEARCH WILL INCLUDE THROUGH EVALUATION OF THE NEW CONCEPT OSCILLATOR, ORBITRON IN WHICH NO ELECTRON GUN NOR MAGNETS ARE NEEDED, TOGETHER WITH INNOVATIVE INSTRUMENTATIONS AND STUDY OF MM-WAVE INTERACTIONS WITH SMOKE OBSCURANTS AND WITH BACKGROUND WATER VAPOR. SUCH A STUDY WILL DETERMINE THE OPTIMUM FREQUENCY, OPTIMUM SOURCE POWER, AND THE EFFECT OF POLARIZATION ON BACKSCATTER.

AMERICAN RESEARCH CORP OF VA
PO BOX 3406 - 642 FIRST ST
RADFORD, VA 24143
CONTRACT NUMBER: DAAB07-87-C-F092
DR RUSSELL J CHURCHILL
TITLE:
MICROWAVE EDDY CURRENT NONDESTRUCTIVE EVALUATION OF ME
CADMIUM TELLURIDE (Hg Cd Te) MATERIALS AND DEVICES
TOPIC# 306 OFFICE: NV

ELECTRONIC COMPONENTS AND SYSTEMS FOR USE IN DEFENSE APPLICATIONS HAVE REQUIREMENTS OF MATERIAL UNIFORMITY, QUALITY ELECTRICAL CONNECTIONS, MICROSTRUCTURAL INTEGRITY AND FREEDOM FROM STRESS AND DEFECTS. ALTHOUGH THE ELECTRONICS INDUSTRY HAS BEEN SUCCESSFUL IN MEETING MANY OF THESE CONDITIONS, THE INCREASING DEMANDS FOR HIGHER SPEED DEVICES AND CIRCUITS ARE STEADILY REDUCING THE MARGINS OF SAFETY. TO RESPOND TO THIS SITUATION, THIS PROPOSAL SUGGESTS THE USE OF MICROWAVE-GENERATED EDDY CURRENTS IN CONJUNCTION WITH MINIATURE SENSORS TO DETECT PERTURBATIONS IN GENERATED FIELDS AS SIGNATURES OF DEFECT CONDITIONS AND MATERIAL CHARACTERIZATION IN SEMICONDUCTOR MATERIALS AND DEVICES. THE TARGET OF OPPORTUNITY IS THE COMBINATION OF TWO NON-DESTRUCTIVE EVALUATION (NDE) TECHNOLOGIES TO ACHIEVE THE OBJECTIVES OF EVALUATING SEMICONDUCTOR COMPONENTS AND INTEGRATE CIRCUITS, DEVELOPMENT OF A MICROWAVE SYSTEM FOR CONTROLLED GENERATION OF EDDY CURRENTS, DESIGN AND CONSTRUCTION OF MINIATURE SENSORS, SYSTEM CALIBRATION, ACQUISITION OF FAMILIES OF TEST DATA AND OPTIMIZATION OF A PROOF-OF-CONCEPT SYSTEM. SUCCESSFUL COMPLETION OF THE PROGRAM OBJECTIVES SHOULD LEAD TO A PROTOTYPE NDE SYSTEM DURING THE PHASE II

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PROGRAM AND TO COMMERCIALIZATION IN THE PHASE III PROGRAM.

AMERICAN RESEARCH CORP OF VA
PO BOX 3406 - 642 FIRST ST
RADFORD, VA 24143
CONTRACT NUMBER: DAAH01-87-C-0923
DR M G NIIMURA
TITLE:
BATTERY-POWERED HANDHELD AND RUGGED MILLIMETERWAVE SOU
APPLICATION
TOPIC# 153 OFFICE: MICOM

THERE IS A NEED FOR SMALL, COMPACT, AND RUGGED SOURCES THAT OPERATE IN THE 0.7-2MM WAVELENGTH REGION. SUCH A SOURCE WOULD BE SOLID STATE BUT THE OVERALL SYSTEM WILL MOSTLIKELY NOT BE SO COMPACT IF THE WIDE-BAND FREQUENCY TUNABILITY IS DESIRED. THE CONCEPTUAL SOLID-STATE (In-As) GYROTRON IS WIDE-BAND BUT OPERATED WITH A CRYOGENIC SYSTEM WHICH IS MOSTLIKELY BULKY. THIS PROPOSAL ADDRESSES CURRENT AVAILABILITY OF A NOVEL MM-WAVE SOURCE WHICH SATISFIES ALL THOSE FEATURES REQUIRED. THE NEW CONCEPT SOURCE IS CALLED ORBITRON MASER. UNLIKE TO CLASSICAL MASERS, IT OPERATES WITHOUT A CRYOGENIC SYSTEM AND, IF THE PROPOSAL IS SUCCESSFUL, WITH ONLY A SMALL POWER SUPPLY OR BATTERY. OUTPUT POWER AND WAVELENGTH REQUIREMENTS 0.1"10 MW AND 0.7"2MM ARE NO PROBLEM; THE ORBITRON HAS READILY PRODUCED UP TO 50W OVER THE REGION 0.3"30MM. THE OSCILLATOR IS AS SMALL AS A BEER CAN AND RUGGED CONSTRUCTION. DESPITE THE COMPLICATED PHYSICS TAKING PLACE FOR THE RADIATION EMISSION, THE CONSTRUCTION AND OPERATION ARE EXTREMELY SIMPLE; THERE NEED NO LASER BEAMS (NEEDED FOR LASER BACKWARD WAVE OSCILLATOR), NO EXTERNAL ELECTRON BEAM AND/OR MAGNETS (NEEDED FOR GYROTRONS AND FREE-ELECTRON LASERS AS WELL AS MOST OF CLASSICAL SOURCES). THIS PROPOSAL EVALUATES THE ORBITRON MASER SOURCE IN COMPARISON WITH OTHER POTENTIAL CANDIDATES: FROM MAGNETRON TO ADVANCED CONCEPT SOURCES. THIS PROPOSAL THEN CONCENTRATE THE PHASE I EFFORT ONTO THE CHARACTERIZATION AND PERFORMANCE TEST OF THE ORBITRON SOURCE THROUGH INSTRUMENTATION OF A RADAR SYSTEM. THE PROPOSAL STUDIES THE FEASIBILITY OF DEVELOPING A COMPACT MILLIMETERWAVE RADAR (HERE CALLED MIDAR) EMPLOYING THE NOVEL OSCILLATION SOURCE. THE WORK INCLUDES THE CHARACTERIZATION OF THE SYSTEM IN ORDER TO EVALUATE THE SOURCE PERFORMANCE IN AN APPLICATION SYSTEM, THE INNOVATIVE INSTRUMENTATION AND

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ELECTRONICS COMPATIBLE TO THE COMPACT SOURCE, AND THE FABRICATION OF
PROTOTYPE SOURCE AND MIDAR.

AMTEC ENGINEERING INC
10001 NE 4TH ST
BELLEVUE, WA 98004
CONTRACT NUMBER: DAAL03-87-C-0012
KELTON M PEERY
TITLE:
THREE-DIMENSIONAL VISCOUS FLOW ANALYSIS FOR MOVING BOD
FIXED STRUCTURES
TOPIC# 115 OFFICE: ARO

THE USE OF COMPUTER CODES THAT SIMULATE FLUID FLOWS IS BECOMING
INCREASINGLY IMPORTANT IN THE DESIGN OF AIRCRAFT COMPONENTS. THE
CURRENT STATE OF THE TECHNOLOGY OF NUMERICAL SIMULATION OF VISCOUS
FLUID FLOWS IS SUFFICIENT FOR DEVELOPING ENGINEERING TOOLS FOR FLOW
ANALYSIS OF VARIOUS TYPES OF COMPLEX THREE-DIMENSIONAL FLUID FLOWS.
OF PARTICULAR INTEREST ARE FLOWS WITH AERODYNAMIC BODIES PERIODICALLY
MOVING PAST FIXED STRUCTURES SUCH AS FOUND IN TURBOMACHINE COMPRESSOR
AND TURBINE PASSAGES, AND HELICOPTER BLADE/FUSELAGE INTERACTION. A
COMPUTER CODE WILL BE DEVELOPED THAT HAS THE CAPABILITY OF ANALYZING
FLOWS OVER COMPLEX 3D CONFIGURATIONS USING MULTIPLE ZONE OF MESH AND
SOLVER TYPE (NAVIER-STOKES, EULER, POTENTIAL, ETC.). EACH ZONE IS
CHOSEN TO MINIMIZE MESH GENERATION DIFFICULTY AND TO UTILIZE THE
LEAST EXPENSIVE SOLVER TYPE THAT IS APPROPRIATE IN THAT PART OF THE
FLOW FIELD. THE OBJECTIVE OF THE PHASE I EFFORT IS TO DEVELOP AND
VALIDATE THE ANALYSIS PROCEDURE FOR FLOW THROUGH A ROTATING TURBINE
BLADE MOVING PAST STATIONARY BLADES.

ANACAPA SCIENCES INC
901 OLIVE ST
SANTA BARBARA, CA 93101
CONTRACT NUMBER: DAAB07-87-C-A045
DR JAMES GEIWITZ
TITLE:
METHODS PURPOSES AND REPRESENTATIONS IN KNOWLEDGE ACQU
EXPERT SYSTEMS
TOPIC# 300 OFFICE: C/A

SUBMITTED BY

THIS PROPOSAL SEEKS TO EXAMINE THE FEASIBILITY OF RESEARCH ON THE KNOWLEDGE-ACQUISITION PHASE OF THE DEVELOPMENT OF EXPERT SYSTEMS. THE GENERAL OBJECTIVE WILL BE PURSUED IN TERMS OF THREE SPECIFIC OBJECTIVES: (i) TO DEVELOP A CONCEPTUAL MODEL OF THE KNOWLEDGE-ACQUISITION PROCESS, RELATING KNOWLEDGE STRUCTURES TO USER'S REQUIREMENTS AND METHODS OF KNOWLEDGE ELICITATION. (ii) TO COMPARE EXPERIMENTALLY DIFFERENT METHODS OF KNOWLEDGE ELICITATION FOR DIFFERENT PROBLEMS AND DIFFERENT PURPOSES. (iii) TO DEVELOP GUIDELINES FOR KNOWLEDGE-ACQUISITION STRATEGIES, SO THAT WITH A GIVEN PROBLEM AND A GIVEN PURPOSE, THE MOST EFFECTIVE METHOD WOULD BE PRESCRIBED.

ANALYSIS & SIMULATION INC
1 AMERICAN DR
BUFFALO, NY 14225
CONTRACT NUMBER: DAAJ02-87-C-0014
PAUL PATTI
TITLE:
MULTI-ROTORCRAFT MULTI-THREAT AIR-TO-GROUND ENGAGEMENT
TOPIC# 35 OFFICE: AVSCOM

THE NEED EXISTS FOR A SIMULATION CAPABLE OF EVALUATING THE BENEFITS OF EMERGING ROTORCRAFT TECHNOLOGIES IN THE CONTEXT OF MULTI-ROTORCRAFT, MULTI-THREAT AIR-TO-GROUND COMBAT ENGAGEMENT. THE OBJECTIVE OF THE PHASE I EFFORT IS TO DEMONSTRATE THE FEASIBILITY OF INNOVATIVE ANALYTICAL/PROGRAMMING TECHNIQUES TO MEET THIS NEED AND TO PROVIDE A FIRM BASIS AND DIRECTION FOR FORMULATION OF A PHASE II DEVELOPMENT PLAN. THE APPROACH INVOLVES: (1) ESTABLISHMENT OF BASIC SIMULATION REQUIREMENTS AND DEFINITION OF A GENERIC FUNCTIONAL DESCRIPTION; (2) IDENTIFICATION OF EXISTING USEFUL ALGORITHMS, MODULES OR EXPLOITABLE IDEAS APPLICABLE TO MEETING THE REQUIREMENTS; (3) IDENTIFICATION OF ONE OR MORE SPECIFIC ANALYTICAL/PROGRAMMING TECHNIQUES THAT HOLD PROMISE FOR PRACTICAL IMPLEMENTATION OF SUCH A SIMULATION; (4) CONCEPTUALIZATION OF A SIMULATION APPROACH; AND (5) IMPLEMENTATION OF A PROTOTYPE APPLICATION WITHIN A SELECTED EXISTING AIR-TO-GROUND SIMULATION.

ANALYTIC APPLICATIONS INC
1705 - 14TH ST - STE 126
BOULDER, CO 80302
CONTRACT NUMBER: DAAD09-87-C-0021
STEVEN CONNOLLY
TITLE:
WIND AND ENERGY BUDGET MEASUREMENT SYSTEM FOR DESERT T
TOPIC# 199 OFFICE: TECOM

SUBMITTED BY

A MICROCLIMATOLOGICAL WEATHER STATION DESIGN IS PROPOSED WHICH INCORPORATES RESEARCH QUALITY INSTRUMENTS CAPABLE OF MEASURING HEAT FLUXES DIRECTLY. RECENT TECHNOLOGICAL ADVANCES HAVE ENABLED THESE INSTRUMENTS TO OPERATE IN REMOTE, LOW POWER, UNATTENDED APPLICATIONS. ULTRASONIC TECHNOLOGY IS USED TO MEASURE SENSIBLE AND LATENT HEAT FLUXES USING THE EDDY CORRELATION METHOD. THE WEATHER STATION IS DESIGNED FOR EASY MOBILIZATION AND DEMOBILIZATION IN MOUNTAINOUS TERRAIN.

ANALYTICAL METHODS INC
2133 152ND AVE NE
REDMOND, WA 98052
CONTRACT NUMBER: DAAL03-87-C-0011
DAVID R CLARK
TITLE:
DEVELOPMENT OF A PANEL METHOD FOR MODELING CONFIGURATI
UNSTEADY COMPONENT MOTIONS
TOPIC# 115 OFFICE: ARO

A PROGRAM OF STUDY IS PROPOSED WHICH WILL LEAD TO A PRACTICAL ANALYSIS CAPABLE OF CALCULATING THE FLOW AROUND AND THE LOADS ON CONFIGURATIONS WHERE ELEMENTS OF THE VEHICLE ARE IN MOTION RELATIVE TO EACH OTHER AND WHERE THE VEHICLE ITSELF MAY BE IN UNSTEADY MOTION IN THE INERTIAL FRAME. A WIDE RANGE OF PROBLEMS FALL INTO THIS CATEGORY RANGING FROM COUPLED MOTION OF ORDNANCE OR STORES RELEASED FROM AN AIRCRAFT OR UNSTEADY CONTROL SURFACE MOVEMENTS TO BLADE PASSAGE EVENTS SUCH AS PROPELLER BLADE INLET INTERFERENCE, BLADE/STATOR INTERFERENCE IN TURBOFANS AND DYNAMIC ROTOR BLADE/FUSELAGE INTERFERENCE IN HELICOPTERS. THE ANALYSIS USED WILL BE AN EXTENSION OF AN EXISTING PANEL METHOD ALREADY SUCCESSFULLY APPLIED TO UNSTEADY ATTACHED FLOW PROBLEMS WHERE THE WHOLE VEHICLE IS IN MOTION. THE MAJOR OUTPUT FROM THE STUDY WILL BE A PRACTICAL TOOL FOR THE ANALYSIS OF DYNAMIC INTERFERENCE WITH POTENTIAL APPLICATIONS IN A NUMBER OF FIELDS FROM IMPROVING PROPELLER/INLET PERFORMANCE TO REDUCING ROTOR-INDUCED FUSELAGE VIBRATORY AND IMPULSIVE LOADS AND VIBRATION WITH ASSOCIATED BENEFITS IN AREAS SUCH AS EXTENDED SYSTEM LIFE AND REDUCED PILOT FATIGUE.

ANALYTICS INC
2500 MARYLAND RD
WILLOW GROVE, PA 19090
CONTRACT NUMBER: DAAB07-87-C-A034
FLOYD A GLENN III
TITLE:
ARTIFICIAL INTELLIGENCE FOR COMMAND AND CONTROL
TOPIC# 300 OFFICE: C/A

SUBMITTED BY

THIS PROPOSAL PRESENTS AN APPROACH TO THE DEVELOPMENT AND EXPERIMENTAL REFINEMENT OF TECHNIQUES AND INTERFACE COMPONENTS TO FACILITATE USER ACCESS TO PROBABILITY DISTRIBUTION DATA IN THE CONTEXT OF MILITARY DECISION PROBLEMS. WE PROPOSE TO DEVELOP A DESIGN METHODOLOGY FOR DECISION AIDING INTERFACES FOR TIME-STRESSED, MILITARY DECISIONS THAT BEGIN WITH A CHARACTERIZATION OF AVAILABLE INFORMATION AND ASSOCIATED TYPES OF UNCERTAINTY, THEN SURVEYS PERTINENT INFORMATION PROCESSING AND DISPLAY TECHNOLOGIES, AND THEN USES THE RESULTS OF THE FIRST TWO STEPS TO GUIDE AN ANALYSIS OF THE DECISION MAKER'S INFORMATION NEEDS. THUS, WE WILL CONSTRUCT A DESIGN PROCESS THAT FORCE ANALYTIC DISCRIMINATION ONLY TO THE EXTEND REQUIRED TO SUPPORT SPECIFIC DESIGN DECISIONS. TIME CONSTRAINTS AND TEMPORAL PROCESSING CHARACTERISTICS OF COMPUTERS AND HUMAN DECISION MAKERS WILL BE ADDRESSED S INTEGRAL ELEMENTS OF THE SITUATION. AIDING TECHNIQUES WILL BE RATED ACCORDING TO THE PROCESSING TIMES AND USAGE TIMES IMPOSED ON THE DECISION MAKER SO THAT ALTERNATIVES FOR THE SAME APPLICATION CAN BE EXAMINED WITH RESPECT TO THE TIMING CONSTRAINTS OF THE SITUATION.

ANALYTICS INC
2500 MARYLAND RD
WILLOW GROVE, PA 19090
CONTRACT NUMBER: DAAB07-87-C-P033
FLOYD A GLENN III
TITLE:
ARTIFICIAL INTELLIGENCE FOR COMMAND AND CONTROL MAN MA
INTERFACE
TOPIC# 300 OFFICE: CECOM

THE TACTICS AND DOCTRINE OF THE MODERN BATTLEFIELD DICTATE THE NEED FOR INTELLIGENT MACHINES TO ASSIST HUMAN OPERATORS. THE TECHNOLOGY ASSOCIATED WITH ENCAPSULATING THE KNOWLEDGE AND TECHNIQUES USED IN ARTIFICIAL INTELLIGENCE (AI) TO CAPTURE THE REASONING PROCESS THAT HUMAN EXPERTS PERFORM WILL HAVE A SIGNIFICANT IMPACT ON FUTURE COMPUTER SYSTEMS FOR THE MILITARY. EQUALLY AS IMPORTANT AS THE DEVELOPMENT OF THESE INTELLIGENT MACHINES IS THE REQUIREMENT THAT A BATTLEFIELD ANALYST, UNTRAINED IN THE USE OF HIGH TECHNOLOGY COMPUTER SYSTEMS, BE ABLE TO USE THE DEVICE. THE PURPOSE OF THIS EFFORT IS TO DEVELOP A MAN-MACHINE INTERFACE, THROUGH HUMAN FACTORS ENGINEERING, TO ENABLE AN INTELLIGENCE ANALYST UNTRAINED IN COMPUTER SCIENCE TO

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 18
BY SERVICE
FISCAL YEAR 1987
ARMY

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MAKE USE OF RECENT TECHNOLOGY ADVANCES APPLICABLE TO BATTLEFIELD
MANAGEMENT.

ANAMET LABS INC
3400 INVESTMENT BLVD
HAYWARD, CA 94545
CONTRACT NUMBER: DAAK70-87-C-0021
ROCKY RICHARD ARNOLD
TITLE:
DAMAGE TOLERANT COMPOSITE STRUCTURES FOR THE U.S. ARMY
COUNTEROBSTACLE VEHICLE
TOPIC# 135 OFFICE: BRDC-PVD

THE OBJECTIVE OF THE PHASE I RESEARCH AND DEVELOPMENT PROPOSED
HEREIN IS TO DETERMINE WHICH MAJOR COMPONENTS OF THE U.S. ARMY
COUNTEROBSTACLE VEHICLE (COV) CAN BE MANUFACTURED FROM COMPOSITE
MATERIALS. THE APPROACH TAKEN IN THE PHASE I FEASIBILITY RESEARCH IS
TO DEVELOP ONE OR MORE ACCEPTABLE DESIGNS FOR SELECTED MAJOR COM-
PONENTS, PERFORM PRELIMINARY DESIGN AND ANALYSIS, AND PREPARE TECH-
NICAL DRAWINGS FOR EVALUATION BY THE U.S. ARMY. THE INITIAL DESIGN
CONSTRAINTS/REQUIREMENTS PLACED ON ANY POTENTIAL COMPOSITE REPLACE-
MENT COMPONENT, IN THEIR APPROXIMATE ORDER OF IMPORTANCE, ARE AS
FOLLOWS: DAMAGE TOLERANCE, REPAIRABILTY, WEIGHT REDUCTION, STIFF-
NESS, STRENGTH, AND COST. A SATISFACTORY DESIGN MUST BE ABLE TO
MEET OR EXCEED CERTAIN SPECIFICATIONS IN EACH OF THESE AREAS TO BE
CONSIDERED A VIABLE CANDIDATE FOR FURTHER PHASE II PROTOTYPE MANU-
FACTURE, TEST, AND EVALUATION. THE FINAL RESULT OF PHASE I WORK WILL
BE THE CREATION OF TECHNICAL DRAWINGS FOR SEVERAL COMPONENTS OF THE
COV THAT ARE TO BE MADE FROM COMPOSITE MATERIALS.

ANCO ENGINEERS INC
9937 JEFFERSON BLVD
CULVER CITY, CA 90232
CONTRACT NUMBER: DAAK70-87-C-0040
RUSSELL B SPENCER
TITLE:
AUTOMATED INTELLIGENT POWER DISTRIBUTION MODULES
TOPIC# 144 OFFICE: BRDC-PVD

SUBMITTED BY

MODERN TACTICAL MILITARY INSTALLATIONS REQUIRE RELIABLE ELECTRIC POWER TO PERFORM THEIR INTENDED FUNCTIONS. THE ELECTRIC POWER DISTRIBUTION SYSTEMS CAN BENEFIT FROM THE APPLICATION OF LOAD MANAGEMENT MONITORING AND CONTROL UNDER THE AUTOMATIC SUPERVISION OF A COMPUTERIZED EXPERT SYSTEM. THE "INTELLIGENT" POWER DISTRIBUTION SYSTEM WOULD OPTIMALLY RECONFIGURE ITSELF BASED ON PREVAILING CONDITIONS (NORMAL, EMERGENCY OR ADVERSE) AND ON THE AVAILABILITY OF GENERATORS AND CONNECTED LOADS OF EQUIPMENT. A SPECIAL CENTRAL DISPLAY CONSOLE WILL INDICATE THE STATUS OF THE POWER DISTRIBUTION SYSTEM AND ALERT AN OPERATOR OF PENDING OR ABNORMAL CONDITIONS. THE TECHNICAL FEASIBILITY OF DEVELOPING SPECIAL HARDWARE TO IDENTIFY TYPES OF LOADS AND OF DEVELOPING THE SPECIAL EXPERT SYSTEM HARDWARE WILL BE STUDIED AND PRESENTED IN A FINAL REPORT.

ANCO ENGINEERS INC
9937 JEFFERSON BLVD
CULVER CITY, CA 90232
CONTRACT NUMBER: DAA15-87-C-0038
THOMAS SOLIMEO
TITLE:
RADIATION CONTOUR SYNTHESIZER
TOPIC# 76 OFFICE: BRL

THE FIELD SIMULATION OF RADIATION CONTOURS FOR MILITARY TRAINING WITHOUT THE USE OF ACTUAL RADIOACTIVE MATERIAL IS PROPOSED. RADIO LOCATION DETECTION AND TRANSMISSION OF CONTOUR CHARACTERISTICS WILL BE USED WITH A CENTRAL BASE STATION AND CPU, QUADRATURE RECEIVERS, AND SMALL TRANSPONDERS INCORPORATED INTO EXISTING RADIATION DETECTORS WILL ALLOW REALISTIC, SAFE, AND FLEXIBLE SIMULATION.

ANCO ENGINEERS INC
9937 JEFFERSON BLVD
CULVER CITY, CA 90232
CONTRACT NUMBER: DACA88-87-C-0011
DR KARL BERNSTEIN
TITLE:
MONITOR FOR AIRBORNE LEAD
TOPIC# 254 OFFICE: CERL

SUBMITTED BY

THE OBJECTIVE OF THE PHASE I PROGRAM IS TO ESTABLISH THE FEASIBILITY OF A LOW RESOLUTION X-RAY FLUORESCENCE INSTRUMENT FOR MEASUREMENT OF THE CONCENTRATION OF LEAD IN THE AIR. THE INSTRUMENT MUST BE SMALL ENOUGH TO SERVE AS A PERSONAL MONITOR FOR INDOOR FIRING RANGE USERS. PRELIMINARY STUDIES INDICATE THAT A LOW COST, SMALL MONITOR CAN BE BUILT. THE PHASE I PROGRAM WILL COVER DESIGN, FABRICATION, AND TESTING OF ALL COMPONENTS OF THE MONITOR, AND MEASUREMENT OF THE LEAD CONTENT OF SYNTHETIC SAMPLES PREPARED TO SIMULATE SAMPLES DRAWN BY THE INSTRUMENT FROM CLEAN AND CONTAMINATED AIR. A PROTOTYPE LEAD MONITOR WILL BE DESIGNED BASED ON THE PHASE I RESULTS.

ANRO ENGINEERING CONSULTANTS INC
5 MILITIA DR - STE 104
LEXINGTON, MA 02173
CONTRACT NUMBER: DAAD05-87-C-0115
DAVID K BARTON
TITLE:
RADAR EVALUATION HANDBOOK
TOPIC# 232 OFFICE: TECOM

MOST OF THE TECHNICAL LITERATURE IN RADAR IS WRITTEN FOR PROFESSIONALS IN THAT FIELD. THE PROPOSED RADAR EVALUATION HANDBOOK WILL CONTAIN TECHNICAL DATA AND PROCEDURES FOR RADAR EVALUATION, BUT WILL BE ADDRESSED TO THE NEEDS OF GENERALISTS FOR WHOM RADAR IS ONLY ONE OF MANY TECHNICAL DISCIPLINES NEEDED IN THEIR WORK. THE MATERIAL WILL TAKE ADVANTAGE OF THE NEW 2ND EDITION OF RADAR SYSTEM ANALYSIS, ALREADY PREPARED FOR PUBLICATION IN 1987. THIS TEXT HAS, SINCE 1964, BEEN ONE OF THE BASIC REFERENCE WORKS IN RADAR, AND THE ONLY ONE DIRECTED TOWARD ANALYSIS OF SYSTEM PERFORMANCE. TWO SIGNIFICANT CHANGES ARE NEEDED TO ADAPT THIS MANUSCRIPT FOR USE IN THE HANDBOOK: SELECTION AND REWRITING OF EXISTING MATERIAL FOR THE GENERALISTS, AND ADDITION OF MATERIAL SPECIFICALLY DIRECTED TOWARD THE 10-140 GHz BANDS AND THEIR ARMY APPLICATIONS. THIS WILL INVOLVE NEW MATERIAL ON MM-WAVE CLUTTER AND TARGET CROSS SECTIONS, AIR-TO-GROUND RADARS ABOVE X-BAND, AND MULTIPATH EFFECTS IN THE MM-WAVE BANDS. IN ADDITION, ASPECTS OF WAVEFORM DESIGN AND MODERN DIGITAL SIGNAL PROCESSING FOR ARMY WEAPONS AND INSTRUMENTATION APPLICATIONS WILL BE COVERED.

ANTECH INC
788 MYRTLE ST
ROSWELL, GA 30075
CONTRACT NUMBER:
ASHOK K NAGRANI
TITLE:
CREATION OF AS-BUILT DRAWINGS IN CAD SYSTEMS
TOPIC# 255 OFFICE: CERL

SUBMITTED BY

A STUDY WILL BE MADE OF THE FEASIBILITY OF MAKING FIELD MEASUREMENTS OF EXISTING BUILDINGS AND AUTOMATICALLY CREATING AS-BUILT DRAWINGS IN A CAD SYSTEM. VARIOUS TYPES OF SCANNING DEVICES SUCH AS LASERS, SONARS, MECHANICAL, PHOTOGRAMMETRY, ETC. WILL BE STUDIED AND EVALUATIONS MADE REGARDING ACCURACY AND CONVENIENCE VERSUS COST. DATA PROTOCOL COMPATIBILITY BETWEEN THE MEASURING DEVICE AND THE DATA RECORDING DEVICES WILL BE ESTABLISHED. SOFTWARE WILL BE WRITTEN FOR THE DATA COLLECTOR SUCH THAT DATA CAN BE COLLECTED WITH ADEQUATE PROMPTS. A METHOD OF EASILY TRANSFERRING THE DATA COLLECTED TO A HOST PERSONAL COMPUTER WILL BE DEVELOPED. SOFTWARE WILL BE WRITTEN TO CONVERT THE DESCRIPTION DATA COLLECTED INTO A CAD DRAWING FILE. CONVERSION TO A MINI-BASED SYSTEM THROUGH TRANSLATORS WILL BE EVALUATED. CONCEPTUAL DRAWINGS AND SPECIFICATIONS WILL BE DEVELOPED FOR A FAMILY OF AFFORDABLE INTEGRATED SCANNING AND RECORDING DEVICES.

APA OPTICS INC
2950 NE - 84TH LN
BLAINE, MN 55432
CONTRACT NUMBER: DAAD05-87-C-0025
DR W T BOORD
TITLE:
INTEGRATED OPTICS MACH ZEHNDER BASED INFRARED SENSOR
TOPIC# 192 OFFICE: TECOM

A SPECTRALLY AGILE BASED UPON A TUNABLE FILTER CAN EFFECTIVELY MEASURE INFRARED BACKGROUND, TARGETS, AND OBSCURANT CLOUDS. AN INTEGRATED OPTICS INTEGRATED FILTER (IOTF) PLACED IN FRONT OF THE SENSOR FOCAL PLANE OR INTEGRATED WITH THE FOCAL PLANE DETECTORS CAN BE USED TO SELECT WAVEBAND LOCATION AND BANDWIDTH IN THE INFRARED. A SPECIFIC CONCEPT FOR THE FILTER IS PROPOSED BASED UPON A MACH-ZEHNDER IMPLEMENTATION OF FILTER. THE IMPLEMENTATION OF THE CONCEPT COULD PROVIDE SPECTRAL SELECTION TO EACH DETECTOR IN THE FOCAL PLANE. THE SENSOR CAN THEREFORE BE ADJUSTABLE IN SEGMENTS OF THE FIELD OF VIEW, ENABLING MULTIPLE FUNCTIONS TO BE CARRIED OUT SIMULTANEOUSLY. AN INSTRUMENT BASED UPON SUCH A DEVICE PROVIDES THE FLEXIBILITY DESIRED IN "SMART" SENSORS, AND IS EFFECT A PRE-FOCAL PLANE DATA PROCESSOR. THE EXPECTED PERFORMANCE AND TECHNOLOGY ISSUES WILL BE IDENTIFIED AND THE FEASIBILITY OF THE CONCEPT SHOWN IN THIS PHASE I PROGRAM. PHASE II WILL CONSTRUCT A COMPLETE SINGLE CHANNEL OF THE

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 22
BY SERVICE
FISCAL YEAR 1987
ARMY

SUBMITTED BY

FILTER AND DETECTOR IN A SIMPLE OPTICAL DEMONSTRATOR.

APA OPTICS INC
2950 NE - 84TH LN
BLAINE, MN 55432
CONTRACT NUMBER: DAAA15-87-C-0059
DR W T BOORD

TITLE:
INTEGRATED OPTICS LASER CRT DISPLAY GENERATION
TOPIC# 89 OFFICE: BRL

THE RESEARCH FOR AN ALTERNATE MEANS TO CRT TECHNOLOGY OF GENERATING VISUAL DISPLAY HAS BEEN UNDERWAY FOR YEARS. THE PROGRAM PROPOSED WILL DEFINE A METHOD OF PRODUCING A "CRT" TYPE OF VISUAL DISPLAY USING A LASER SCANNING CONCEPT PREVIOUSLY BASED ON WORK AT APA OPTICS, INC. THE PREVIOUS WORK DEFINED A METHOD OF GENERATING A NON-MOVING PART SINGLE AXIS LASER SCAN GENERATOR. THIS PROGRAM WILL INVESTIGATE A DEFINED CONCEPT FOR INTRODUCING THE SECOND AXIS CONTROL AND THE IMPLEMENTATION OF SUFFICIENT RESOLUTION IN THE BEAM TO PRODUCE A HIGH FIDELITY IMAGING SYSTEM. TECHNOLOGY ISSUES AND A KEY TECHNOLOGY FABRICATION AND TEST PROGRAM HAVE BEEN IDENTIFIED. THIS PROGRAM IS A UNIQUE ELEMENT IN A PROGRAM OF INTEGRATED OPTICS DEVELOPMENT UNDERWAY AT APA OPTICS WHICH SEEKS TO APPLY A LASER SCANNING CONCEPT BASED UPON A BRAGG DIFFRACTION APPLICATION.

APPLICATIONS RESEARCH CORP
4031 COLONEL GLENN HWY
DAYTON, OH 45431
CONTRACT NUMBER: DAAD07-87-C-0100
DR JOHN H BLAKELOCK

TITLE:
LFAD VS GUIDED MUNITIONS
TOPIC# 68 OFFICE: VAL

THIS PROPOSAL DESCRIBES A NEW DECEPTION COUNTERMEASURE TECHNIQUE TO COUNTER ADVANCED GUIDED WEAPON SYSTEMS. PRIOR EXPERIMENTATION PERFORMED AT ARC DEMONSTRATED THE INTERACTIONS OF THE LFAD ANGULAR DECEPTION TECHNIQUE, SUPERIMPOSED ON TARGET LINE-OF-SIGHT RATE, AND

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THE IMPACT UPON MICROWAVE WEAPON SYSTEM PERFORMANCE. THESE PROJECTS EXPLORED SEVERAL OPERATIONAL SITUATIONS AND IDENTIFIED POTENTIAL WEAPON SYSTEM WEAKNESS. THE LFAD TECHNIQUE IS UNIQUE IN THAT IT SHOULD BE EFFECTIVE AGAINST ALL GUIDANCE SYSTEMS EMPLOYED ON SMART MUNITIONS AND THUS IS A PRIME CANDIDATE AS A STRESSOR OF USA ADVANCED MUNITIONS FOR ESTABLISHING EW VULNERABILITY. PHASE I PROPOSES TO EVALUATE AND SYNTHESIZE A UNIQUE SYSTEM DESIGN FOR PROVIDING A MULTI-SPECTRAL LFAD SMART MUNITION CM SYSTEM.

APPLICATIONS RESEARCH CORP
4031 COLONEL GLENN HWY
DAYTON, OH 45431
CONTRACT NUMBER: DAAB07-87-C-P050
RALPH J McLEAN
TITLE:
LOW COST MULTI-SPECTRAL EXPENDABLE COUNTERMEASURES
TOPIC# 293 OFFICE: EW

THE PROPOSED CONCEPT IS A REFLECTOR-EXPENDABLE DESIGNED TO COUNTER WEAPONS SYSTEMS THAT UTILIZE INTEGRATED RF/EO/IR TARGET ACQUISITION AND TRACKING SYSTEMS THREAT FIRE CONTROL SENSORS OVER THE ENTIRE FREQUENCY. THIS PHASE I EFFORT IS CONCERNED WITH PROVING PRELIMINARY FEASIBILITY OF THE BASIC CONCEPT ANALYTICALLY FOR APPLICATIONS ON SEMA AIRCRAFT, AND TO PERFORM SUFFICIENT PACKAGING ANALYSIS TO ESTABLISH DESIGN REQUIREMENTS FOR PHASE II MODEL DEVELOPMENT AND EXPERIMENTAL DEMONSTRATION. LOW COST WILL BE ACHIEVED VIA SELECTION OF APPROPRIATE INEXPENSIVE MATERIALS.

APPLIED FUSION TECHNOLOGIES INC
PO BOX 9652
FORT COLLINS, CO 80525
CONTRACT NUMBER: DAAK70-87-C-0035
CHARLES CONNELLY
TITLE:
VIBRATORY AGING AND STRESS RELIEF (VASR) FOR A7005 ALU
TOPIC# 145 OFFICE: BRDC

THE PRIMARY OBJECTIVE OF THIS RESEARCH IS TO DEVELOP A METHOD THAT

SUBMITTED BY

WILL IMPROVE BOTH THE RELIABILITY AND PREDICTABILITY OF WELDING AGE HARDENING ALUMINUM ALLOYS. THIS MAY BE ACCOMPLISHED BY USING AN IMPROVED VASR (VIBRATORY AGING AND STRESS RELIEF) SYSTEM, SQUARE WAVE PULSED ARC WELDING, AND POSSIBLY A COMBINATION OF BOTH TECHNIQUES. VASR TECHNIQUES INCLUDE TESTING IN BOTH THE SUBRESONANT AND RESONANT FREQUENCY LEVELS WITH ATTENTION ALSO GIVEN TO BEAT VIBRATIONS. PULSE ARC WELDING INCLUDES TESTING BOTH MICRO-PULSE MILLI-PULSE FREQUENCIES AND THE COMBINED POLY-PULSE METHOD. RESEARCH METHODS INCLUDE EMPLOYING THESE DYNAMIC TECHNIQUES IN MAKING A LARGE SERIES OF WELDS. THE RESULTS WILL THEN BE COMPARED OVER AN AGING PERIOD OF UP TO 21 DAYS, USING MICRO HARDNESS TRAVERSES AND TENSILE TESTS. MICROSTRUCTURES WILL BE EXAMINED USING TRANSMISSION ELECTRON MICROSCOPY (TEM).

APPLIED LOGIC SYSTEMS INC
PO BOX 90 - UNIVERSITY STATION
SYRACUSE, NY 13210
CONTRACT NUMBER: DAAB10-87-C-0039
KENNETH A BOWEN
TITLE:
PC-BASED COOPERATING SYSTEMS
TOPIC# 319 OFFICE: CECOM/SWLAB

ARTIFICIAL INTELLIGENCE RESEARCH HAS SHOWN THE IMPORTANCE OF COOPERATING EXPERT SYSTEMS ARCHITECTURES IN THE CONSTRUCTION OF INTELLIGENT PROGRAMS TO ASSIST WITH TASKS RANGING FROM DISTRIBUTED SITUATION ASSESSMENT TO INFERENCE OF PROTEIN STRUCTURE. THE MOST WIDELY ADOPTED IS THE BLACKBOARD ARCHITECTURE, WHICH HAS PROVEN HIGHLY EFFECTIVE IN A NUMBER OF SETTINGS. ONE SIGNIFICANT PROBLEM IS THE DEVELOPMENT OF SUITABLE TOOLS FOR THE EFFICIENT IMPLEMENTATION OF SYSTEMS UTILIZING SUCH ARCHITECTURES. A FEW TOOLS HAVE BEEN DEVELOPED FOR MAINFRAME COMPUTERS. NONE AT ALL HAVE BEEN DEVELOPED FOR SMALL MACHINES SUCH AS THE IBM PC. HOWEVER, MANY REAL-WORLD INFORMATION ACQUISITION AND MANAGEMENT SYSTEMS (E.G., MILITARY SITUATION ASSESSMENT) ARE COMPOSED OF GROUPS OF SMALL MACHINES SUCH AS PCs NETWORKED WITH 32-BIT WORKSTATIONS AND MINICOMPUTER. THE SITUATION CREATES BOTH A DEMAND AND AN OPPORTUNITY TO DEVELOP TOOLS FOR IMPLEMENTING BLACKBOARD-BASED COOPERATING EXPERT SYSTEMS IN THE ENVIRONMENT OF NETWORK PCs AND WORKSTATION. THIS PROPOSAL ADDRESSES A FEASIBILITY

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STUDY FOR CONSTRUCTING SUCH TOOLS. THE TECHNICAL APPROACH IS BASED ON THE USE OF META-INTERPRETERS AND PARTIAL EVALUATION COMBINED WITH HIGH-SPEED INCREMENTAL PROLOG COMPILERS.

APPLIED PHYSICS INC
5353 WYOMING BLVD NE - STE 3
ALBUQUERQUE, NM 87109
CONTRACT NUMBER: DAAL02-87-C-0103
RICHARD HOLLAND
TITLE:
VARIATIONAL EVALUATION OF EM COUPLING TO A WIRE INSIDE
TOPIC# 45 OFFICE: HDL

CONTRACTOR WILL DEVELOP A LAGRANGIAN FORMULATION FOR THE ELECTRO-MAGNETIC RESPONSE OF A METALLIC ENCLOSURE WITH THIN, SLIGHTLY DIFFUSIVE WALLS AND A WIRE SPANNING THE ENCLOSURE. CONTRACTOR WILL FIRST DERIVE A LAGRANGIAN OPERATOR ON THE FIELDS WHICH IS STATIONARY WHEN MAXWELL'S EQUATIONS ARE SATISFIED. THE LAGRANGIAN WILL THEN BE USED TO DETERMINE THE ENCLOSURE EIGENMODES (WIRE INCLUDED) AND THE AMPLITUDE OF EACH EIGENMODE RESULTING FROM AN ARBITRARY EXCITATION SOAKING INTO THE ENCLOSURE. CONTRACTOR WILL NEXT TRANSFORM THE FREQUENCY-DOMAIN EIGENMODE SOLUTION INTO THE TIME DOMAIN. LASTLY, CONTRACTOR WILL COMPARE RESULTS WITH THOSE OBTAINED FROM A CONVENTIONAL TIME-DOMAIN FINITE DIFFERENCE CODE.

APPLIED PHYSICS INC
5353 WYOMING BLVD NW - STE 3
ALBUQUERQUE, NM 87109
CONTRACT NUMBER: DAAL02-87-C-0096
DR RICHARD L KNIGHT
TITLE:
EMP ENVIRONMENT PREDICTION FOR COLLIMATED SOURCES
TOPIC# 53 OFFICE: HDL

CODES CURRENTLY EXIST THAT WILL CALCULATE THE ELECTROMAGNETIC ENVIRONMENT (EMP) PRODUCED BY A BEAM OF COLLIMATED GAMMA RAYS. THE COLLIMATION MAY BE EITHER CYLINDRICAL OR CONICAL. THE CURRENT EFFORT WILL BE TO INSTALL THE CODES ON AN ARMY CRAY COMPUTER AND TO SET THEM

SUBMITTED BY

UP AND RUN THEM FOR PROBLEMS OF INTEREST TO THE ARMY.

APPLIED RESEARCH ASSOCS INC
4300 SAN MATEO NE - STE B380
ALBUQUERQUE, NM 87110
CONTRACT NUMBER: DACA39-87-C-0033
HARRY J BEWLEY

TITLE:
DEVELOPMENT OF A HIGH RANGE PARTICLE VELOCITY GAGE
TOPIC# 268 OFFICE: WES

THERE IS AN ESTABLISHED NEED FOR A SIMPLE ROBUST TRANSDUCER TO MEASURE PARTICLE VELOCITY IN SEVERE BLAST AND SHOCK ENVIRONMENTS SUCH AS NUCLEAR AND HIGH EXPLOSIVE TESTS. A GAGE CONCEPT IS PROPOSED FOR DEVELOPMENT, BASED ON THE PROVEN MEASUREMENT PRINCIPLES USED IN THE HIGHLY SUCCESSFUL DX GAGE, BUT RECONFIGURED MECHANICALLY AND ELECTRICALLY TO WITHSTAND THE HARSH SHOCK ENVIRONMENTS. THE CONCEPT RELIES ON SENSING THE RELATIVE DISPLACEMENT BETWEEN THE INERTIAL MSS AND ITS RIGID CASE. MUTUAL INDUCTANCE ELECTRICAL SENSING METHOD IS PROPOSED WITH THE AC CIRCUITRY ASSOCIATED WITH THE GAGE SO THAT THE GAGE OUTPUT WILL BE A DC SIGNAL.

APTEC INC
7442 E SWEETWATER
SCOTTSDALE, AZ 85260
CONTRACT NUMBER: DAAA21-87-C-0184
JOHN POE
TITLE:
VOICE ACTIVATED GUN TURRENT CONTROL
TOPIC# 11 OFFICE: ARDC

TO DEFINE, DESIGN, AND BUILD PROTOTYPE HARDWARE AND SOFTWARE TO ENABLE A PILOT OR GUNNER TO USE HUMAN VOICE TO RECEIVE AUTOMATIC STATUS REPORTS, GIVE COMMANDS TO, AND QUERY ARMAMENT, AIRCRAFT, AND FLIGHT INSTRUMENT FUNCTIONS. HARDWARE WILL BE CONSTRUCTED ON A MODULAR BASIS CONSISTING OF A SPEECH OUTPUT ADVISOR AND A LOW MEMORY REQUIREMENT (LMR) VOICE/UTTERANCE RECOGNIZER. THE LMR VOICE/UTTERANCE RECOGNITION MODULE USES ARTIFICIAL INTELLIGENCE TO INCREASE ITS CAP-

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ABILITIES COMPARED TO CONVENTIONAL RECOGNITION DEVICES WHILE REDUCING MEMORY AND HARDWARE REQUIREMENTS. THE UNIT SHOULD RECOGNIZE INSTANTLY, A NORMAL ARMAMENT CONTROL VOCABULARY AS SPOKEN BY DIFFERENT PILOTS OR GUNNERS UNDER VARYING DEGREES OF STRESS. THE MODULE WILL HAVE THE ABILITY TO CLOSE RELAYS AND PERFORM OTHER REMOTE CONTROL FUNCTIONS. THE SPEECH ADVISOR WILL CONTAIN A NORMAL HELICOPTER ARMAMENT VOCABULARY. INPUTS CAN BE QUERIED TO DETERMINE STATUS. THE MODULE WILL HAVE OUTPUT CAPABILITY TO USE A CONVENTIONAL SPEAKER OR KEY UP A TRANSMITTER. HARDWARE CONSISTS OF OFF-THE-SHELF COMPONENTRY, IS SELF CONTAINED, COMPACT, LOW WEIGHT, AND WILL BE COMPATIBLE WITH COMMON COMMUNICATIONS PROTOCOLS, AND AIRCRAFT CONTROLS.

APTEK INC
2862 S CIRCLE DR - STE 346
COLORADO SPRINGS, CO 80906
CONTRACT NUMBER: DACA39-87-C-0047
MARK DEE LANDON

TITLE:
GRAPHICAL ANIMATION OF DYNAMIC FINITE ELEMENT/DIFFEREN
OUTPUT DATA ONTO FILM AND VIDEOTAPE
TOPIC# 262 OFFICE: AWES

THIS WORK WILL DEVELOP A PROCEDURE FOR THE ACOE TO ANIMATE THE OUTPUT DATA FROM VARIOUS FINITE ELEMENT/DIFFERENCE CODES WITH STATE-OF-THE-ART COLOR COMPUTER GRAPHIC ANIMATION TECHNIQUES. PART OF THIS EFFORT WILL BE THE CREATION OF A MOTION PICTURE (MOVIE) OF AN ACTUAL DYNAMIC FINITE ELEMENT CALCULATION. THE SOFTWARE AND HARDWARE REQUIREMENTS WILL BE ADDRESSED ALONG WITH THE INVESTIGATION OF THE USE OF THE MULTI-LEVEL DISTRIBUTED COMPUTING FACILITY.

ARCTEC ENGINEERING INC
9104 RED BRANCH RD
COLUMBIA, MD 21045
CONTRACT NUMBER: DACA39-87-C-0027
THOMAS V KOTRAS

TITLE:
CONSTRUCTION OF MODEL ARMOR UNITS
TOPIC# 265 OFFICE: WES

SUBMITTED BY

TO DEVELOP A MODELLING MATERIAL AND PRODUCTION TECHNIQUES THAT WILL PROVIDE MODEL BREAKWATER ARMOR UNITS WITH THE FOLLOWING ATTRIBUTES AT REASONABLE MODEL SCALES: GEOMETRICAL MODELLING OF DOLOS, TETRAPODS, TRIBARS, AND SO ON; MASS AND INERTIAL MODELLING OF PROPERTIES OF ARMOR UNITS; STRENGTH MODELLING OF REINFORCED CONCRETE; MASS PRODUCTION AT RELATIVELY LOW ACQUISITION COST; EASY HANDLING AND STORAGE; STABLE STRENGTH PROPERTIES AND REASONABLE "SHELF LIFE". IT IS OUR BELIEF THAT A MATERIAL CURRENTLY REFERRED TO A MOD-CRETE MAY POSSESS THE POTENTIAL PROPERTIES TO ACHIEVE THESE OBJECTIVES. MOD-CRETE IS A SPECIALLY PREPARED MODELLING MATERIAL CURRENTLY USED SUCCESSFULLY IN THE CONDUCT OF PHYSICAL MODEL TESTS OF ICE INTERACTING WITH SHIPS AND OFFSHORE STRUCTURES. THIS MODELLING MATERIAL FOR ICE (MOD-ICE) WAS ORIGINALLY DEVELOPED BY DR. B. MICHEL IN THE EARLY 70s AND SINCE BEEN REFINED & IMPROVED BY THE ARCTEC GROUP IN LAST 10 YRS FOR USE IN MODELLING SEA ICE WITH THE PROPER GEOMETRICAL, MASS DENSITY AND INERTIAL PROPERTIES AS WELL AS MECHANICAL PROPERTIES OF FLEXURAL (BENDING) STRENGTH, CRUSHING STRENGTH AND ELASTIC MODULUS AND FRICTIONAL PROPERTIES.

ARES INC
BLDG 818 FRONT ST - ERIE INDUSTRIAL PK
PORT CLINTON, OH 43452
CONTRACT NUMBER: DAAA21-87-C-0174
MIKE BRENNAN
TITLE:
30MM COMVAT FEED SYSTEM STUDY
TOPIC# 8 OFFICE: ARDC

IN SUPPORT OF THE IDENTIFIED NEED FOR A FULL SCALE FEED SYSTEM FOR COMVAT WHICH WILL BE COMPATIBLE WITH FUTURE AND PRESENT RESUPPLY VEHICLES AND REQUIRE LITTLE EFFORT FROM THE CREW, THIS SIX MONTH TRADE STUDY WILL CREATE, AND ANALYZE A MINIMUM OF THREE FEED SYSTEM CONCEPTS VIA A SYSTEMS APPROACH. SYSTEM REQUIREMENTS WILL BE ESTABLISHED, WEIGHTED AND APPROVED BY THE SPONSORING AGENCY PRIOR TO THE CONCEPTUAL DESIGN. AFTER CONCEPTING, THEY WILL BE EVALUATED BY RANKING EACH DESIGN FEATURE AGAINST THE WEIGHTED REQUIREMENTS. THE WINNING CONCEPT WILL BE INCORPORATED INTO A PHASE II PROPOSAL FOR FURTHER DESIGN AND DEVELOPMENT. TWO PRELIMINARY FEED SYSTEM CONCEPT HAVE BEEN PRESENTED AS EXAMPLES OF UNIQUE POTENTIAL CONCEPTS. THEIR

SUBMITTED BY

COMPATIBILITY WITH PRESENT AND FUTURE RESUPPLY VEHICLES ARE CLEARLY SHOWN WITH A NUMBER OF RESUPPLY CONCEPTS. ONE WEAPON STATION FEED SYSTEM CONSISTS OF A PAIR OF SWINGING BOX MAGAZINES THAT ARE AUTOMATICALLY REPLENISHABLE FROM ON-BOARD STORAGE OR FROM OFF-VEHICLE. A SECOND CONCEPT OFFERS A UNIQUE LINEAR LINKLESS TRI-PLEX CHUTE TO TRANSFER THE AMMUNITION FROM FIXED BOXES TO THE WEAPON. THESE CONCEPTS, ALONG WITH CONCEPTUALIZED RESUPPLY SYSTEM CONSTITUTE THE HEART OF THE TRADE STUDY TO BE PERFORMED.

ARMAMENT SYSTEMS INC
PO BOX 158 - 211 W BEL AIR AVE
ABERDEEN, MD 21001
CONTRACT NUMBER: DAAA15-87-C-0063
B M (MIKE) DAVALL
TITLE:
ANALYTIC SUPPORT FOR COMBAT SERVICE SUPPORT ROBOTICS
TOPIC# 325 OFFICE: TPM

ASI, LB&M ASSOCIATES AND ODETTICS ARE UNIQUELY QUALIFIED WITH THE NECESSARY EXPERIENCE, RESOURCES, AND FACILITIES TO EFFECTIVELY SUPPORT AMC AND TRADOC IN THE ANALYSIS AND IDENTIFICATION OF THE POTENTIAL FOR ROBOTICS AND AI SYSTEMS IN FUTURE COMBAT SERVICE SUPPORT SYSTEM REQUIREMENTS. THIS TEAM WILL USE A "TOTAL SYSTEM APPROACH" METHODOLOGY THAT FOCUSES NOT ONLY ON THE OBVIOUS AREAS OF NEED, BUT ALSO ADDRESSES ALL OTHER FACTORS THAT WILL BE IMPACTED (DOCTRINE, MATERIEL, FORCE STRUCTURE, AND TRAINING). THE PHASE I EFFORT WILL PROVIDE A DETAILED CONCEPT FORMULATION FOR THE APPLICATION OF ROBOTICS TO MEETING THE NEEDS OF THE COMBAT SERVICE SUPPORT FORCES THROUGH THE YEAR 2010. IT WILL ALSO IMPLEMENT THE PROCESS OF INTERACTING WITH THE AMC AND TRADOC ROBOTIC TECHNICAL AND USER COMMUNITIES TO PROVIDE FOR A TRULY INTEGRATED DEVELOPER/USER LIST OF HIGH PRIORITY/HIGH PAYOFF ROBOTIC PROJECTS THAT WILL LEAD TO THE TIMELY FIELDING OF ROBOTIC COMBAT SERVICE SUPPORT SYSTEMS. THE PLAN AND METHODOLOGY FOR PERFORMANCE OF THE FOLLOW-ON PHASE II DETAILED ANALYSES REQUIRED TO PROVIDE A SOLID, SUPPORTABLE BASIS FOR AMC AND TRADOC ROBOTIC PROGRAMS AND THEIR JUSTIFICATION AND SUPPORT IN THE BUDGET PROCESS WILL ALSO BE PROVIDED AS PART OF THE PHASE I EFFORT.

ARMAMENT SYSTEMS INC
PO BOX 158 - 211 W BEL AIR AVE
ABERDEEN, MD 21001
CONTRACT NUMBER:
B M (MIKE) DAVALL
TITLE:
ANALYTIC SUPPORT FOR INFANTRY ROBOTICS
TOPIC# 329 OFFICE: TPM

SUBMITTED BY

ASI, LB&M ASSOCIATES AND ODETICS ARE UNIQUELY QUALIFIED WITH THE NECESSARY EXPERIENCE, RESOURCES, AND FACILITIES TO EFFECTIVELY SUPPORT AMC AND TRADOC IN THE ANALYSIS AND IDENTIFICATION OF THE POTENTIAL FOR ROBOTICS AND AI SYSTEMS IN FUTURE COMBAT INFANTRY SYSTEMS REQUIREMENTS. THIS TEAM WILL USE A "TOTAL SYSTEM APPROACH" METHODOLOGY THAT FOCUSES NOT ONLY ON THE OBVIOUS AREAS OF NEED, BUT ALSO ADDRESSES ALL OTHER FACTORS THAT WILL BE IMPACTED (DOCTRINE, MATERIEL, FORCE STRUCTURE, AND TRAINING). THE PHASE I EFFORT WILL PROVIDE A DETAILED CONCEPT FORMULATION FOR THE APPLICATION OF ROBOTICS OF MEETING THE NEEDS OF THE INFANTRY COMBAT FORCES THROUGH THE YEAR 2010. IT WILL ALSO IMPLEMENT THE PROCESS OF INTERACTING WITH THE AMC AND TRADOC ROBOTIC TECHNICAL AND USER COMMUNITIES TO PROVIDE FOR A TRULY INTEGRATED DEVELOPER/USER LIST OF HIGH PRIORITY/HIGH PAYOFF ROBOTIC PROJECTS THAT WILL LEAD TO THE TIMELY FIELDING OF INFANTRY ROBOTIC SYSTEMS. THE PLAN AND METHODOLOGY FOR PERFORMANCE OF THE FOLLOW-ON PHASE II DETAILED ANALYSES REQUIRED TO PROVIDE A SOLID, SUPPORTABLE BASIS FOR AMC AND TRADOC ROBOTIC PROGRAMS AND THEIR JUSTIFICATION AND SUPPORT IN THE BUDGET PROCESS WILL ALSO BE PROVIDED AS PART OF THE PHASE I EFFORT.

ARTIFICIAL INTELLIGENCE ATLANTA INC
119 E COURT SQ
DECATUR, GA 30030
CONTRACT NUMBER: DAAA21-87-C-100
W E UNDERWOOD

TITLE:
INTELLIGENT TASK PLANNING AND EXECUTION FOR ROBOTIC CO
TOPIC# 6 OFFICE: ARDC

THE OBJECTIVE OF THIS RESEARCH IS THE CONCEPTUAL DESIGN OF CAPABILITIES FOR TASK PLANNING AND PLAN EXECUTION IN A HIERARCHIAL ROBOTIC CONTROL SYSTEM. THE ROBOTIC CONTROL SYSTEM HAS MULTISENSORY CAPABILITIES INCLUDING FORCE/TORQUE, TACTILE AND VISION. LEVERAGE IS GAINED IN PLANNING EFFICIENCY BY STRUCTURING KNOWLEDGE OF 1 PREVIOUSLY USEFUL NAMED PLANS, PLANBOXES AND SCRIPTS TO REDUCE THE EFFORT NEEDED FOR REPLANNING. THE PLANS GENERATED MAY ALSO BE RECALLED OR LATER USE AS SCRIPTS. ADVANTAGES ARE ALSO TO BE GAINED IN ADAPTABILITY BY PUTTING OFF DECISIONS UNTIL EXECUTION TIME. THIS IS BECAUSE FEEDBACK FROM THE ENVIRONMENT CAN CONSTRAIN THE PLAN AND

SUBMITTED BY

OFTEN OBTAIN THE NEED FOR REPLANNING WHEN SITUATIONS IN THE ENVIRONMENT ARE DIFFERENT THAN EXPECTED.

ASPEN SYSTEMS INC
184 CEDAR HILL ST
MARLBOROUGH, MA 01752
CONTRACT NUMBER: DAAK60-87-C-0035
H HAMED BORHNIAN
TITLE:
EXHAUST HEAT DRIVEN THERMOELECTRIC FAN
TOPIC# 177 OFFICE: NATICK

DURING COLD AMBIENT CONDITIONS, THE THERMAL GRADIENTS CREATED BY STANDARD NON-ELECTRIC MILITARY HEATERS IN ARMY TENTS AND BARRACKS PRODUCE UNCOMFORTABLE LIVING CONDITIONS. CIRCULATION OF THE INTERIOR AIR BY A FAN REDUCES SIGNIFICANTLY THE THERMAL GRADIENTS. HOWEVER, WITH THE ABSENCE OF ELECTRICITY, THERE IS A NEED FOR POWER NOT ONLY FOR THE FAN BUT ALSO FOR OTHER ELECTRICAL EQUIPMENT. ASPEN SYSTEMS PROPOSES THE DEVELOPMENT OF AN EXHAUST HEAT DRIVEN THERMOELECTRIC FAN. THE PROPOSED CONCEPT HAS THE FOLLOWING SALIENT FEATURES: UTILIZATION OF EXHAUST HEAT FROM STANDARD LIQUID FUEL SPACE HEATERS, OFF-THE-SHEFT COMPONENTS, LOW COST, AND HIGH RELIABILITY. THE PHASE I PRINCIPAL OBJECTIVES ARE TO IDENTIFY AND LABORATORY TEST THE KEY COMPONENTS INDIVIDUALLY AND THE DESIGN AND LABORATORY TESTING OF THE THERMOELECTRIC FAN ASSEMBLY. DIVIDED INTO FOUR TASKS, PHASE I INCLUDES ANALYSIS AND LABORATORY TESTING OF THE FAN, THERMOELECTRIC MODULE, AND MOTOR, DESIGN AND LABORATORY TESTING OF THE THERMOELECTRIC FAN ASSEMBLY, AND PREPARATION OF A PHASE II TEST PLAN. THE ANTICIPATED RESULTS ARE COMPONENTS SELECTION, LABORATORY PROTOTYPE SYSTEM DESIGN, AND PERFORMANCE DATA FOR THE COMPONENTS AND THERMOELECTRIC FAN ASSEMBLY.

ATAC
1200 VILLA ST
MOUNTAIN VIEW, CA 94041
CONTRACT NUMBER: DAAA21-87-C-0166
BRADLEY C ASHMORE
TITLE:
COMPUTER AIDED SOFTWARE TESTABILITY MODEL
TOPIC# 19 OFFICE: ARDC

SUBMITTED BY

THIS PROPOSAL DESCRIBES A MODELING AND ANALYSIS METHODOLOGY CALLED COMPUTER AIDED SOFTWARE TESTABILITY MODEL (CASTM) WHICH IS DESIGNED TO IDENTIFY LOCATIONS OF SOFTWARE TEST HOOKS. THE STRUCTURED, HIGHLY AUTOMATED UTILITY WILL IMPROVE ON CURRENT METHODS BASED ONLY ON PROGRAM FLOW OR DATA FLOW. CASTM WILL INCLUDE A PARSER FOR EXTRACTING BOTH PROGRAM DATA FLOW FROM SOURCE CODE. A MODEL BUILDER INTEGRATES THE TWO KINDS OF INFORMATION FLOW TO PRODUCE A DIGRAPH DEPENDENCY MODEL WHICH IS USED BY THE TEST HOOK PLACEMENT ANALYSIS. THE ANALYSIS BORROWS IMPORTANT TEST ECONOMY PRINCIPLES FROM ELECTRONIC CIRCUIT TESTABILITY EXPERIENCE, SUCH AS CONTROLLABILITY/OBSERVABILITY CONCEPTS AND THE COST/BENEFIT CONSIDERATIONS WHICH DRIVE THE OPTIMIZATION ALGORITHM. CASTM WILL BE GENERIC IN NATURE AND CAN BE APPLIED TO THE DESIGN OF TESTABLE HARDWARE/SOFTWARE SYSTEMS SUCH AS THOSE USED IN BUILT-IN TEST.

ATLANTIC AEROSPACE ELECTRONICS CORP
470 TOTTEN POND RD
WALTHAM, MA 02154
CONTRACT NUMBER: DAAL02-87-C-0071
PAUL F MCKENZIE
TITLE:
IN-ARRAY DIGITAL BEAM FORMING ARCHITECTURE
TOPIC# 41 OFFICE: HDL

IT IS PROPOSED TO DEVELOP AND EVALUATE AN ARCHITECTURE FOR A MULTI-ELEMENT RADAR RECEIVING ARRAY WHICH PERFORMS DIGITAL BEAM FORMING (DBF) WITHIN THE RECEIVING ARRAY ITSELF, USING EACH ELEMENT AS A NODE OF A SYSTOLIC-LIKE ARRAY PROCESSOR. THE PROCESSOR ASSOCIATED WITH EACH ELEMENT OF THE ARRAY WILL PRODUCE A DIFFERENT SPATIAL BEAM. THIS DISTRIBUTED ARRAY PROCESSING CAPABILITY CAN BE REALIZED BY ADDING A SMALL AMOUNT OF DIGITAL CIRCUITRY TO EACH ELEMENT AND BY PROVIDING ELEMENT-TO-ELEMENT INTERCONNECTION IN A NOVEL AND EFFICIENT MANNER WHICH MINIMIZED INTERCONNECTION WIRING. THIS APPROACH CONTRASTS WITH CONVENTIONAL DBF ARCHITECTURES WHICH PERFORM ONLY QUANTIZATION AT EACH ELEMENT. THE QUANTIZED DATA FROM EACH ELEMENT IS PASSED TO A CENTRAL PROCESSOR FOR WEIGHTING AND SUMMING. THE HIGH AGGREGATE DATA RATE OFTEN REQUIRES A LARGE NUMBER OF PARALLEL DATA LINES. THE PROPOSED APPROACH PERMITS THE TRANSMITTED DATA TO BE REDUCED TO ONLY THOSE SPATIAL BEAMS OF CURRENT INTEREST, THEREBY RE-

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DUCING THE REQUIRED DATA RATE. THE PROPOSED DEVELOPMENT AND EVALUATION EFFORT WILL INCLUDE ANALYSIS AND ASSESSMENT OF THIS DBF APPROACH FOR SURVEILLANCE AND MULTI-TARGET TRACKING APPLICATIONS, AS WELL AS REFINEMENT OF THE BASIC ARCHITECTURAL CONCEPT TO ACCOMMODATE THE BROADEST POSSIBLE RANGE OF APPLICATION SCENARIOS. SUCCESSFUL DEMONSTRATION OF BASIC SYSTEM FEASIBILITY WILL LEAD TO THE DESIGN AND EVENTUAL FABRICATION OF APPROPRIATE CUSTOM VLSI PROCESSOR ELEMENTS.

AUTOMETRIC INC
5205 LEESBURG PIKE - STE 1308/SKYLINE 1
FALLS CHURCH, VA 22041
CONTRACT NUMBER: DACA76-87-C-0007
BRIAN NICKOLS
TITLE:
MULTISENSOR RECORD REGISTRATION
TOPIC# 241 OFFICE: ETL/PR-P

THE OVERALL PROGRAM IS ENVISIONED TO REQUIRE THREE PHASES TOWARDS THE PRODUCTION OF A SET OF CAPABILITIES THAT WILL ALLOW REGISTRATION BETWEEN DIGITAL MULTI-SENSOR RECORDS. THE FIRST PHASE OF THE PROGRAM IS PROPOSED AS A STUDY IN WHICH THE ANALYSIS WILL PRODUCE REGISTRATION SCENARIOS THAT WILL ACCOMMODATE MULTI-SENSOR REGISTRATIONS. THE SCENARIOS WILL DIFFER SINCE MAP DATA IS EXPECTED TO RANGE FROM COMPLETE FEATURE AND ELEVATION DATA COVERAGE TO NON-EXISTANT COVERAGE. IN ADDITION, THE SCENARIOS WILL DIFFER SINCE REGISTRATION REQUIREMENTS WILL CHANGE TO ACCOMMODATE THE PAIRING OF SIMILAR (SAME SENSOR) AND DISSIMILAR (MULTI-SENSOR) IMAGES. TO CREATE SCENARIOS, PHASE I WILL CONCENTRATE ON INVESTIGATING AND ANALYZING 1) MAP DATA CONTENT DEFINITIONS, 2) ERROR BUDGE GUIDELINES FOR MAP DATA AND GEOMETRIC MODELS, 3) GEOMETRIC REGISTRATION MODEL DEFINITION, 4) INHERENT RESOLUTIONS FOR MAP PRODUCTS AND IMAGES, AND 5) THE UTILIZATION OF VISION UNDERSTANDING FOR REGISTRATION. THESE ABOVE TECHNICAL INVESTIGATIONS AND ANALYSES WILL BE FOLLOWED BY THE PROCESS OF DESCRIBING MULTI-SENSOR REGISTRATION SCENARIOS AND A TEST THAT EXERCISE A REGISTRATION SCENARIO. THE TECHNICAL INVESTIGATIONS, ANALYSES, SCENARIOS AND SCENARIO TEST WILL BE PRESENTED IN A FINAL REPORT ORIENTED TOWARDS RECOMMENDATIONS FOR PHASE II DEVELOPMENTS.

BARR ASSOC. INC
2 LYBERTY WY
WESTFORD, MA 01886
CONTRACT NUMBER: DAAL04-87-C-0053
DR GHANIM AL-JUMAILY
TITLE:
ION ASSISTED DEPOSITION OF HARD OPTICAL COATINGS
TOPIC# 112 OFFICE: MTL

SUBMITTED BY

THE ION ASSISTED DEPOSITION (IAD) PROCESS WILL BE EMPLOYED DURING DEPOSITION OF DIELECTRIC COATINGS WITH IMPROVED EROSION RESISTANCE. THE OBJECTIVE OF THIS EFFORT IS TO DEMONSTRATE THE COMMERCIAL FEASIBILITY OF THE IAD PROCESS TO PRODUCE HARD OPTICAL COATINGS. THE EFFORT WILL CONSIST OF A MATRIX OF FIVE COATING MATERIALS AND THREE DEPOSITION CONDITIONS. THE MATERIALS CHOSEN HAVE A WIDE TRANSMITTANCE RANGE FROM THE UV TO THE IR. FILMS WILL BE DEPOSITED ON DIFFERENT TYPES AND SHAPES OF SUBSTRATES TO EXAMINE SUBSTRATE/FILM CAPABILITY. A NUMBER OF DIAGNOSTIC TECHNIQUES WILL BE EMPLOYED TO DETERMINE THE OPTIMUM DEPOSITION CONDITIONS THAT YIELD FILMS WITH THE BEST OPTICAL AND MECHANICAL PROPERTIES.

BARRON ASSOCS INC
RTE 1 - BOX 159
STANARDSVILLE, VA 22973
CONTRACT NUMBER: DAAA21-87-C-0140
ROGER L BARRON

TITLE:
USE OF POLYNOMIAL NETWORKS TO IMPROVE ON CONTROL EFFIC
MANEUVERABLE PROJECTILE
TOPIC# 9 OFFICE: ARDC

EXECUTION OF OPTIMAL GUIDANCE AND CONTROL ALGORITHMS IN REAL TIME WITH A MICROPROCESSOR IS POSSIBLE USING POLYNOMIAL NETWORKS TO STORE, IN COMPACT AND ALMOST INSTANTLY RETRIEVABLE FORM, INFORMATION ABOUT A LARGE NUMBER OF PRE-COMPUTED OPTIMUM TWO-POINT BOUNDARY-VALUE (TPBV) SOLUTIONS. THESE SOLUTIONS MAY BE OBTAINED OFF-LINE USING THE CALCULUS OF VARIATIONS, ITERATIVE SEARCH, DYNAMIC PROGRAMMING, AND EQUIVALENT METHODS, ALL LEADING TO POWERFUL BUT (IN THEIR USUAL FORMS OF IMPLEMENTATION) COMPLEX GUIDANCE AND CONTROL ALGORITHMS. SOLUTION OF A TPBV PROBLEM REQUIRES INITIALIZATION OF A FAMILY OF NONLINEAR DIFFERENTIAL EQUATIONS. HISTORICALLY, THESE INITIALIZATIONS HAVE NECES-SITATED ITERATIVE COMPUTATIONS BECAUSE THE DIFFERENTIAL EQUATIONS ARE NOT, IN GENERAL, ANALYTICALLY INTEGRABLE. IT HAS RECENTLY BEEN DEMONSTRATED THAT THE APPROPRIATE INITIALIZATIONS CAN BE PERFORMED BY POLYNOMIAL NETWORKS THAT ARE FITTED, OFF-LINE, TO OPTIMUM TRAJECTORY SIMULATION DATA. IT IS PROPOSED THAT POLYNOMIAL NETWORKS BE APPLIED TO GUIDANCE AND CONTROL OF A MANEUVERABLE PROJECTILE THAT CAN ACHIEVE SIGNIFICANT PERFORMANCE BENEFITS USING A COMPLEX GUIDANCE AND CONTROL

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ALGORITHM IMPLEMENTED IN A SIMPLE AND ECONOMICAL FORM.

BATTERY ENGINEERING INC
1636 HYDE PARK AVE
HYDE PARK, MA 02189
CONTRACT NUMBER: DAAL01-87-C-0751
DR CARL SCHLAIKJER

TITLE:

IMPROVEMENT IN THE CAPACITY AND SAFETY OF LITHIUM/INOR
ELECTROLYTE SULFUR DIOXIDE RECHARGEABLE CELLS
TOPIC# 143 OFFICE: ETDL

THE OBJECTIVE IS TO INCREASE THE CAPACITY AND SAFETY OF THE LITHIUM/
LiAlCl₄.6SO₂/CARBON RECHARGEABLE CELL BY ALTERING THE ELECTROLYTE AND
THE POSITIVE ELECTRODE, AND BY IMPROVING THE METHODS CURRENTLY EM-
PLOYED FOR MAKING THE ELECTROLYTE. ALUMINUM IS REMOVED AS DISCHARGE
PROCEEDS, SINCE ONE OF THE PRODUCTS IS AN INSOLUBLE COMPLEX BETWEEN
THE ALUMINUM, REDUCED SO₂, AND THE CARBON SURFACE. THE DILEMMA IS
THAT ADDING MORE ALUMINUM AS LiAlCl₄, WHILE IT MIGHT IMPROVE THE
CAPACITY, WOULD ALSO RAISE THE ELECTROLYTE FREEZING POINT TO AN UN-
ACCEPTABLE HIGH LEVEL. WE PROPOSE TO CHANGE THE COMPOSITION OF THE
ELECTROLYTE SUCH THAT THE LOW FREEZING POINT IS MAINTAINED, YET ADD-
ING SOLUTES WHICH ARE LIKELY TO INCREASE THE CAPACITY. IN ADDITION,
INSOLUBLE MATERIALS WHICH COULD BE INSTRUMENTAL IN INCREASING THE
CAPACITY BY ENCOURAGING THE FORMATION OF COMPLEXES SIMILAR TO THE ONE
WHICH FORMS ON THE KETJENBLACK NOW USED IN THESE CELLS WILL BE ADDED
TO THE CARBON POSITIVE ELECTRODE. WE EXPECT IMPROVEMENTS IN SAFETY
THROUGH THE ADDITION TO THE ELECTROLYTE OF MATERIALS WHICH WOULD
IMPROVE THE MORPHOLOGY OF THE PLATED LITHIUM.

BERGEY WINDPOWER CO INC
2001 PRIESTLEY AVE
NORMAN, OK 73069
CONTRACT NUMBER: DAAL04-87-C-0048
KARL H BERGEY

TITLE:

DETERMINING FIBER VOLUME FRACTION AND POROSITY IN ORTH
COMPOSITE LAMINATES
TOPIC# 102 OFFICE: MTL

SUBMITTED BY

ULTRASONIC NONDESTRUCTIVE TESTING HAS BECOME THE METHOD OF CHOICE FOR THE QUALITY ASSURANCE OF ADVANCED COMPOSITE MATERIALS. THE PROPOSED RESEARCH PROGRAM COVERS THE DEVELOPMENT OF A COMPUTER-BASED NDT METHOD FOR DETERMINING LOCAL FIBER VOLUME FRACTION AND RESIN POROSITY IN PRACTICAL LAMINATED COMPOSITES. THE COMPUTER ALGORITHMS WILL BE BASED ON EARLIER STUDIES THAT HAVE BEEN SUCCESSFUL FOR UNIDIRECTIONALLY REINFORCED COMPOSITES. THEY DEPEND ON SIMULTANEOUS MEASUREMENTS OF TWO ULTRASONIC WAVE VELOCITIES USING IMMERSION TRANSDUCERS. THE SPECIFIC OBJECTIVES OF THE PHASE I STUDY ARE TO DEVELOP A DETAILED MODEL FOR WAVE PROPAGATION AT OBLIQUE INCIDENCE ANGLES, CHECK THE ANALYTIC MODEL EXPERIMENTALLY, AND MODIFY EXISTING ALGORITHMS FOR FIBER FRACTION AND POROSITY DETERMINATION IN COMPLEX LAMINATES. ADDITIONAL GOALS INCLUDE THE DESIGN AND TESTING OF FIXTURES TO HOLD THE REQUIRED TRANSDUCER ASSEMBLIES AND THE TESTING OF PRACTICAL LAY-UPS (WITH SHAPE AND LAMINATION VARIATIONS) TO VERIFY THE PROCEDURE.

BIO-IMAGING RESEARCH INC
425 BARCLAY BLVD
LINCOLNSHIRE, IL 60069
CONTRACT NUMBER: DAAL04-87-C-0049
R T BERNARDI
TITLE:
HIGH RESOLUTION DIGITAL RADIOGRAPHIC NDE OF LAMINAR BO
COMPOSITE MATERIALS USING DISCRETE DETECTORS
TOPIC# 102 OFFICE: MTL

THIS PHASE I SBIR PROGRAM PROPOSES TO DETERMINE THE FEASIBILITY OF USING HIGH-RESOLUTION DIGITAL RADIOGRAPHY (DR), LAMINOGRAPHY, AND COMPUTED TOMOGRAPHY (CT) TO EXAMINE LAMINAR BONDS IN COMPOSITE SAMPLES SUPPLIED BY THE ARMY. THE PROJECT WILL UTILIZE DISCRETE, SOLID-STATE X-RAY DETECTORS DESIGNED AND BUILT BY BIO-IMAGING RESEARCH, INC. THE PHASE I PROGRAM WILL ALSO RECOMMEND A PRELIMINARY DESIGN FOR SUCH A SYSTEM. SIMPLE TANGENTIAL DR SHOULD ALLOW EXAMINATION OF CIRCULARLY SYMMETRIC OBJECTS WITH RESULTS SUPERIOR TO ANY OTHER FILM OR FILMLESS INSPECTION TECHNIQUE. LAMINOGRAPHY, ALSO KNOWN AS CONVENTIONAL TOMOGRAPHY, AND CT UTILIZING THIS DETECTION TECHNOLOGY, SHOULD ALLOW LAMINAR PLY IMAGING OF FLAT PLANES. IMAGING IS ACHIEVED BY MOTION OF THE SAMPLE THROUGH A COLLIMATED X-RAY FAN BEAM OR VICE VERSA. DISCRETE DETECTORS PROVIDE DR WITH HIGH CONTRAST

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1
BY SERVICE
FISCAL YEAR 1987
ARMY

PAGE 37

SUBMITTED BY

RESOLUTION AND A DYNAMIC RANGE OF 16 BITS (65,536 GRAY LEVELS). THESE DETECTORS CAPTURE NEARLY 100% OF THE X-RAYS TRANSMITTED FOR EXCEPTIONAL QUANTUM EFFICIENCY. LINEAR ARRAYS OF THESE DETECTORS CONSIST OF DISCRETE CHANNELS OF OPTICALLY ISOLATED SCINTILLATION CRYSTALS INDIVIDUALLY COUPLED TO INDEPENDENT PHOTODIODES. INDIVIDUAL CRYSTALS WITH SPECIFIC ACTIVE WINDOW WIDTHS AND PACKING DENSITIES MAKE IT POSSIBLE TO SPATIALLY RESOLVE INDIVIDUAL PLIES IN TYPICAL COMPOSITE STRUCTURES THAT ARE BETWEEN 125 AND 300 MICRONS THICK. THIS SPATIAL RESOLUTION IS OFFERED WITHOUT THE BLOOMING ASSOCIATED WITH OTHER FILMLESS IMAGING TECHNIQUES.

BRIMROSE CORP OF AMERICA
7720 BELAIR RD
BALTIMORE, MD 21236
CONTRACT NUMBER: DAAB07-87-C-F089
DR S B TRIVEDI

TITLE:

NOVEL TECHNIQUE FOR NON-DESTRUCTIVE CHARACTERIZATION O
MATERIALS

TOPIC# 306

OFFICE: NV

II-VI SEMICONDUCTORS BASED INFRARED DEVICE TECHNOLOGY IS BECOMING INCREASINGLY IMPORTANT FOR MILITARY APPLICATIONS, ESPECIALLY IN RANGES OF 3-5 MICROMETERS AND 8-14 MICROMETERS WHICH CORRESPOND TO ATMOSPHERIC WINDOWS. IT HAS BEEN CONCLUSIVELY ESTABLISHED THAT PERFORMANCE OF THESE DEVICES DEPENDS CRITICALLY ON THE MICRO-STRUCTURAL INTEGRITY OF STARTING MATERIAL. HOWEVER, QUANTITATIVE STRUCTURE - PROPERTY RELATIONSHIP FOR THESE MATERIALS IS NOT ESTABLISHED. THIS SEVERELY LIMITS THE YIELD OF DEVICES. THE PROPOSED PROGRAM FOCUSES ON ESTABLISHING A QUANTITATIVE RELATIONSHIP BETWEEN MICRO-STRUCTURAL AND ELECTRICAL CHARACTERISTICS OF THIS MATERIAL. THIS WILL PROVIDE A UNIQUE QUALITY CONTROL TOOL TO IMPROVE THE DEVICE YIELD AND RELIABILITY. WE WANT TO USE NON-DESTRUCTIVE AND NON-INTRUSIVE ADVANCED X-RAY DIFFRACTION TECHNIQUE DARC (DIGITAL AUTOMATED ROCKING CURVE) X-RAY TOPOGRAPHY DEVELOPED AT BRIMROSE. THE EXPERIMENTAL APPROACH IS FIRST TO CHARACTERIZE II-VI SEMICONDUCTORS USING DARC AND THEN USING HALL MEASUREMENTS AND PHOTOLUMINESCENCE SPECTROSCOPY. USING THESE RESULTS WE WILL RELATE ELECTRICAL PROPERTIES TO MICROSTRUCTURE. UNLIKE CONVENTIONAL TOPOGRAPHIC TECHNIQUES DARC PROVIDES QUANTITA-

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TIVE INFORMATION ABOUT LATTICE STRAINS ASSOCIATED WITH CHANGE IN
LATTICE PARAMETER (BRAGG PEAK SHIFT) AS WELL AS DEFECTS (BRAGG
PEAK BROADENING).

BRIMROSE CORP OF AMERICA
7720 BELAIR RD
BALTIMORE, MD 21236
CONTRACT NUMBER: DAAB07-87-C-F060
DR S B TRIVEDI
TITLE:
GROWTH AND CHARACTERIZATION OF $Cd(1-x)Zn(x)Te$ SINGLE C
TOPIC# 310 OFFICE: NV

MERCURY CADMIUM TELLURIDE (MCT) HAS EMERGED AS THE SUPERIOR MATERIAL FOR INFRARED APPLICATIONS IN IMPORTANT 3-5 MICROMETER AND 8-13 MICROMETER RANGES CORRESPONDING TO ATMOSPHERIC WINDOWS. BULK GROWTH METHODS CANNOT PROVIDE DEVICE GRADE LARGE AREA CRYSTALS OF THIS MATERIAL. HENCE, IN ORDER TO REALIZE THE STATE-OF-THE-ART LARGE AREA DEVICES, EPITAXIAL GROWTH IS THE ONLY PLAUSIBLE TECHNIQUE AT THE PRESENT. FOR PRODUCING DEVICE GRADE EPITAXIAL ALYERS, GOOD QUALITY SUBSTRATES IS THE ESSENTIAL REQUIREMENT. $CdTe$ IS THE COMMONLY USED SUBSTRATE MATERIAL FOR MCT EPITAXY. IT IS EXTREMELY DIFFICULT TO GROW LARGE, TWIN FREE $CdTe$ CRYSTALS WITH LOW DISLOCATION DENSITY. THE ALTERNATIVE SUBSTRATE MATERIAL IS $Cd(1-x)Zn(x)Te$ WHICH CAN BE GROWN WITH BETTER CRYSTALLOGRAPHIC PERFECTION. HOWEVER, GROWTH OF COMPOSITIONALLY UNIFORM CRYSTAL IS VERY DIFFICULT DUE TO METALLURGICAL NATURE OF $Cd(1-x)Zn(x)Te$. IN THIS PROPOSAL A TECHNIQUE TO GROW LARGE, SUBSTRATE QUALITY CRYSTAL OF $Cd(1-x)Zn(x)Te$ USING ZONE LEVELING/MELTING IS SUGGETED. THE GROWTH SYSTEM HAS A VERTICAL CONFIGURATION. GROWTH AMPOULE HAS PRACTICALLY NO FREE VOLUME OVER THE STOICHIOMETRIC CHARGE WHICH IS IN FORM OF SOLID INGOT. THIS WILL PREVENT FORMATION OF VOIDS AND LOSS OF MATERIAL BY SUBLIMATION/EVAPORATION DURING THE GROWTH PROCESS. MULTIPLE ZONE LEVELING PASSES WILL HOMOGENIZE THE COMPOSITION OVER THE ENTIRE INGOT AND A FINAL ZONE MELTING PASS WITH PREDETERMINED SPEED WILL GROW THE SINGLE CRYSTAL. THESE CRYSTALS WILL BE COMPLETELY CHARACTERIZED WITH RESPECT TO MICRO-STRUCTURE USING MICROSCOPIC AND ADVANCED X-RAY DIFFRACTION TECHNIQUES AND ELECTRICAL CHARACTERIZATION WILL BE CARRIED OUT USING HALL MEASUREMENTS AND PHOTOLUMINESCENCE SPECTROSCOPY. FROM THE CORRELATION BETWEEN GROWTH

SUBMITTED BY

CONDITIONS AND CRYSTAL QUALITY, TECHNIQUE TO GROW DEVICE GRADE CRYSTALS WILL BE DEVELOPED.

CARLOW ASSOCS INC
8315 LEES HWY - STE 410
FAIRFAX, VA 22031
CONTRACT NUMBER: DAAA15-87-C-0058
DR MARK KIRKPATRICK
TITLE:
HUMAN FACTORS ENGINEERING IMPLICATIONS OF SUPERVISORY
MANIPULATIVE ROBOTIC SYSTEMS
TOPIC# 101 OFFICE: HEL

THE OBJECTIVE OF THE PROPOSED EFFORT IS THE DEVELOPMENT OF IMPLEMENTATION CONCEPTS FOR APPLICATION OF SUPERVISORY CONTROL TECHNIQUES TO ROBOTIC/TELEOPERATOR SYSTEMS. THE STATE-OF-THE-ART IN MANIPULATOR AND MOBILITY SYSTEM OPERATOR INTERFACE AND CONTROL TECHNIQUES WILL BE EVALUATED AGAINST FUNCTIONAL REQUIREMENTS OF ANTICIPATED ARMY ROBOTIC/TELEOPERATOR APPLICATIONS TO HAZARDOUS MATERIALS HANDLING AND OPERATION IN HOSTILE ENVIRONMENTS. SELECTED APPLICATIONS WILL BE ANALYZED IN DETAIL TO IDENTIFY "ELEMENTAL MOVEMENTS" FOR MOBILITY AND MANIPULATOR SYSTEMS WHICH CAN BE PERFORMED UNDER MACHINE AUTONOMY. INFORMATION REQUIREMENTS WILL BE IDENTIFIED FOR PROMISING CONTROL SCHEMES BASED ON A WORLD MODEL APPROACH. THE FEASIBILITY WILL BE EVALUATED OF DEVELOPING AN OPERATOR INTERFACE TECHNIQUE IN WHICH THE OPERATOR INTERACTS WITH A WORLD MODEL WHICH CONTAINS DATA ABOUT OBJECTS AND CONDITIONS IN THE VICINITY OF THE ROBOTIC/TELEOPERATOR SYSTEM. THE OPERATOR WOULD USE THE WORLD MODEL TO COMMUNICATE WITH THE REMOTE SYSTEM AND WOULD CORRECT DATA IN THE WORLDMODEL AS REQUIRED. SEQUENCES OF ELEMENTAL MOVEMENTS AND ASSOCIATED PARAMETERS WOULD BE COMMANDED BY THE OPERATOR AND EXECUTED UNDER MACHINE CONTROL. IT IS CONSIDERED THAT THE PROPOSED STUDY WILL PROVIDE USEFUL CONCEPTS AND EVALUATIVE DATA FOR DESIGNERS OF SUCH SYSTEMS IN THE FUTURE.

CARNEGIE FEDERAL SYSTEMS CORP
650 COMMERCE CT - STATION SQ
PITTSBURGH, PA 15219
CONTRACT NUMBER: DAAA15-87-C-0055
DR MARK FOX
TITLE:
GOAL DIRECTED SIMULATION FOR LOGISTICS PLANNING SYSTEM
TOPIC# 100 OFFICE: HEL

SUBMITTED BY

TWO QUESTIONS ARE OFTEN ASKED IN LOGISTICS MANAGEMENT: HOW CAN I (E.G. SUPPLY THE UNIT WITH AMMUNITION); WHAT IF (E.G. ENEMY DISTURPTS SUPPLY LINES). THE COUPLING OF HUMAN EXPERTISE WITH ANALYTIC MODELS ALLOW SOME OF THESE QUESTIONS TO BE ANSWERED. BUT MANY OF THESE PROBLEMS ARE SO COMPLEX THAT THE MATHEMATICS ARE INTRACTABLE, REQUIRING THE USE OF SIMULATION, WHICH CAN BE BOTH EXPENSIVE AND TIME CONSUMING. MORE IMPORTANTLY, THE EXPERTISE REQUIRED TO USE SIMULATION EFFECTIVELY MAY NOT BE AVAILABLE. IT APPEARS THAT AI PLANNING AND KNOWLEDGE BASED SIMULATION TECHNIQUES, WHEN COUPLED TOGETHER, CAN ENHANCE THE PRODUCTIVITY AND EFFECTIVENESS OF HUMAN LOGISTICS PLANNERS. THIS PROPOSAL FOCUSES ON TWO ISSUES: PLANNING TECHNIQUES FOR ANSWERING "HOW CAN I" QUESTIONS, AND ITS LINKAGE TO; KNOWLEDGE BASED SIMULATION TECHNIQUES FOR ANSWERING "WHAT IF" QUESTIONS. OUR APPROACH TO PLANNING WILL BE TO CONSTRUCT AN INTERACTIVE PLANNER WHICH USES KNOWLEDGE TO CRITICIZE AND GUIDE THE PLANNING PROCESS. THE PLANNER WILL BE CONSTRUCTED USING A BLACKBOARD ARCHITECTURE, ENABLING IT TO BE PERUSED BY THE LOGISTICIAN AND EFFECTIVELY COUPLED WITH THE SIMULATION SYSTEM. THE MAJORITY OF OUR EFFORT WILL FOCUS ON SIMULATION TOOLS. FOR THE CLASS OF COMPLEX PROBLEMS FOR WHICH SIMULATION IS THE MOST APPROPRIATE TECHNOLOGY, KNOWLEDGE BASED SIMULATION (KBS) (REDDY ETAL., 1986) CAN BE USED MOST EFFECTIVELY TO ANSWER THESE QUESTIONS. HOWEVER, THE CONSTRUCTION AND ANALYSIS OF KBS MODELS STILL REMAINS EXPENSIVE. ALTHOUGH AI REPRESENTATION TECHNIQUES ARE USE, THE DESIGN, IMPLEMENTATION, AND ANALYSIS OF KBS MODELS REQUIRES A VARIETY OF KNOWLEDGE (E.G., DOMAIN INFORMATION, STATISTICAL ANALYSIS TECHNIQUES) AND SKILLS (E.G., EXPERIMENT DESIGN) POSSESSED BY FEW. CONSEQUENTLY, WE WILL FOCUS ON THE DEVELOPMENT OF KNOWLEDGE BASES WHICH EXTEND KBS IN THE AREAS OF EXPERIMENT DESIGN AND ANALYSIS.

CARTWRIGHT ENGINEERING INC
251 E PALAIS RD
ANAHEIM, CA 92805
CONTRACT NUMBER: DAAD05-87-C-0086
C D MILLER
TITLE:
MOBILE TARGET NEAR-MISS SCORING SYS M
TOPIC# 227 OFFICE: TECOM

A VARIETY OF SCORING SYSTEMS HAVE BEEN IN EXISTENCE SINCE THE LATE

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1950'S AND USED PRIMARILY BY THE MILITARY TO EVALUATE WEAPONS SYSTEMS. THE MORE SUCCESSFUL SCORING SYSTEMS HAVE BEEN BASED UPON EITHER ACOUSTIC OR RF RADAR TECHNOLOGIES. RADAR SCORING SYSTEMS HAVE BEEN USED MORE SUCCESSFULLY PRIMARILY DUE TO THE FACT THAT THEIR PERFORMANCE IS NOT AFFECTED BY ALTITUDE OR AIRSPEED. AS THE MAJOR SUPPLIER OF RADAR SCORING SYSTEMS, CARTWRIGHT ENGINEERING, INC. (CEI) HAS PROVIDED A WIDE VARIETY OF INSTRUMENTATION FOR DRONES AND TOW TARGETS TO MEET THE REQUIREMENTS OF THE AIR FORCE, ARMY AND NAVY AS WELL AS A NUMBER OF FOREIGN COUNTRIES. THE SPECIFIC PROBLEM TO BE ADDRESSED BY THE PHASE I EFFORT DESCRIBED IN THIS PROPOSAL WILL BE TO ADAPT THE RADAR TECHNOLOGY PERFECTED BY CEI FOR AIRBORNE SCORING APPLICATIONS FOR USE WITH A REMOTE CONTROL TARGET VEHICLE. SUCH A TARGET WILL PRESENT A MUCH MORE HOSTILE ENVIRONMENT TO THE SCORING SYSTEM THAN IN AN AIRBORNE APPLICATION BECAUSE OF TARGET NOISE AND GROUND INTERFERENCE. IN ADDITION, THIS TYPE OF TARGET VEHICLE WILL PRESENT A MORE DIFFICULT PROBLEM IN PROVIDING FOR THE RELIABLE TELEMETRY TRANSMISSION OF SCORING DATA.

CASCADE MICROTECH INC
14155 SW BRIGADOON CT - STE B
BEAVERTON, OR 97005
CONTRACT NUMBER: DAAL01-87-C-0739
KEITH JONES
TITLE:
LOW LOSS MILLIMETER-WAVE SEMICONDUCTOR WAFER PROBES
TOPIC# 119 OFFICE: ETDL

MAKING ACCURATE AUTOMATED ON-WAFER MEASUREMENTS OF MILLIMETER-WAVE SEMICONDUCTOR DEVICES AND CIRCUIT ELEMENTS IS A FUNDAMENTAL REQUIREMENT FOR THE ADVANCEMENT OF A MILLIMETER-WAVE TECHNOLOGY. MILLIMETER-WAVE WAFER PROBE DEVELOPMENT IS REQUIRED. PRESENTLY ON-WAFER PROBING IS AVAILABLE ONLY TO 26.5 GHz. HOWEVER, SIGNIFICANT INNOVATIONS ARE REQUIRED TO EXTEND THIS CAPABILITY OF HIGHER FREQUENCIES. THIS WORK INVESTIGATES THE FEASIBILITY OF OVERCOMING WAFER PROBE INSERTION LOSS PROBLEMS IN THE MILLIMETER-WAVE BANDS. PHASE I RESULTS IN PROTOTYPES OF DC TO 50 GHz WAFER PROBES WITH LESS THAN 2 dB INSERTION LOSS FOR THE MEASUREMENT OF ACTIVE MILLIMETER-WAVE DEVICES ON-WAFER. THESE RESULTS WILL PROVIDE A BASIS FOR MILLIMETER-WAVE NOISE FIGURE AND DYNAMIC RANGE MEASUREMENTS IN LATER WORK.

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CERAMATEC INC
2425 S 900RD W
SALT LAKE CITY, UT 84119
CONTRACT NUMBER: DAAL04-87-C-0058
ROGER MATSUMOTO

TITLE:
HIGH TEMPERATURE EVALUATION OF NEW FERROELASTIC TOUGH
MATERIALS
TOPIC# 111 OFFICE: MTL

IT IS PROPOSED THAT NEW CERAMIC MATERIALS WITH POTENTIAL FOR STRENGTH AND TOUGHNESS RETENTION TO ELEVATED TEMPERATURES WILL BE FABRICATED AND CHARACTERIZED. THESE NEW CERAMIC MATERIALS EXHIBIT A PHENOMENON KNOWN AS FERROELASTICITY. THE PHENOMENON OF FERROELASTICITY IS VERY SIMILAR TO THAT OF FERROELECTRICITY AND FERROMAGNETISM. THE FERROELASTIC STATE IS CHARACTERIZED BY THE EXISTENCE OF AT LEAST TWO ENERGETICALLY EQUIVALENT STATES CORRESPONDING TO TWO VALUES OF STRAIN. IT HAS BEEN RECENTLY PROPOSED THAT FERROELASTIC DOMAIN REORIENTATION PROVIDES A MECHANISM OF TOUGHENING FERROELASTIC CERAMICS. IN OUR WORK, TOUGHNESS VALUES IN EXCESS OF 16 MPa.m(1/2) AS MEASURED BY THE DOUBLE CANTILEVER BEAM (DCB) TECHNIQUE WERE RECORDED. SUCH HIGH VALUES OF TOUGHNESS MAKE THESE MATERIALS IDEALLY SUITED FOR ADVANCED APPLICATIONS SUCH AS THE ADIABATIC DIESEL ENGINE. THE PRINCIPAL OBJECTIVES OF THE PHASE I EFFORT INCLUDE FABRICATION OF THESE CERAMIC MATERIALS OF CERAMATEC PROPRIETARY COMPOSITIONS AND EVALUATION OF STRENGTH AND TOUGHNESS AS A FUNCTION OF TEMPERATURE UP TO 1100 DEG C. HIGH TEMPERATURE TESTING WILL BE CONDUCTED IN COLLABORATION WITH THE ARMY MATERIALS TECHNOLOGY LABORATORY. THE RESULTS OF THE HIGH TEMPERATURE TESTING WILL BE USED IN AN ITERATIVE FASHION TO MAKE APPROPRIATE COMPOSITION AND PROCESS MODIFICATIONS TO YIELD MATERIALS WITH EXCELLENT STRENGTH AND TOUGHNESS RETENTION TO ELEVATED TEMPERATURES.

CGS SYSTEMS INC
65 CASTLE HOWARD CT
PRINCETON, NJ 08540
CONTRACT NUMBER: DAAL02-87-C-0061
ALBERT H MEDWIN
TITLE:
DEVELOPMENT OF A NON-CONTACT (CAPACITIVE) FUZE SETTER
TOPIC# 64 OFFICE: HDL

SUBMITTED BY

THIS PROPOSAL DESCRIBES THE DEVELOPMENT OF A CONTACTLESS, CAPACITIVE ENCODER SYSTEM TO PROVIDE A RUGGED, LOW COST DIGITAL CODE READER THAT IS SMALL IN SIZE, AND ABLE TO MEET ENVIRONMENTAL AND GUN LAUNCH STRESSES. THE EFFORT WOULD DRAW UPON VENDOR'S EXPERIENCE IN DEVELOPING ITS OWN COMMERCIAL ELECTRONIC VERNIER CAPACITIVE ABSOLUTE ENCODER. PHASE I INVOLVES THE DESIGN OF THE THREE-RING SENSING ELEMENTS AND THE DIGITAL CIRCUITRY THAT "READS" THE SETTING OF EACH RING. A DEMONSTRATION MODEL WOULD BE FABRICATED.

CHARLES RIVER ANALYTICS INC
55 WHEELER ST
CAMBRIDGE, MA 02138
CONTRACT NUMBER: DAAL01-87-C-0758
GREG L ZACHARIAS
TITLE:
MODEL-BASED PROTOCOL FOR OPTIMIZED LEARNING
TOPIC# 287 OFFICE: ARI

THE PRIMARY OBJECTIVE OF THIS STUDY IS TO EVALUATE THE FEASIBILITY OF DEVELOPING A MODEL-BASED PROTOCOL FOR OPTIMIZED INSTRUCTION. THE BASIC TECHNIQUE CENTERS ON THE USES OF THE OPTIMAL CONTROL MODEL (OCM) OF THE HUMAN OPERATOR, AN INFORMATION-PROCESSING MODEL OF SKILLED HUMAN BEHAVIOR WHOSE STRUCTURE AND PARAMETER SET REFLECT THE BASIC HUMAN LIMITATIONS AND COMPONENT SKILLS WHICH DETERMINE TASK PERFORMANCE. WE PROPOSE USING A PARAMETRIC LEARNING MODEL TO SPECIFY THE TIME HISTORY OF MODEL PARAMETERS DURING TRAINING, FOR BOTH INDIVIDUAL SUBJECTS AND NORMAL POPULATIONS. LEARNING DEFICIENCIES ARE DETECTED AND DIAGNOSED BY COMPARING INDIVIDUAL VS. POPULATION PARAMETER TIME HISTORIES. SKILL-DEFICIENT INDIVIDUALS UNDERGO REMEDIAL TRAINING ON TASKS SELECTIVELY TUNED TO AMELIORATE THE SPECIFIC DEFICIT; SUCCESSFUL REMEDIAL TRAINING RETURNS THE INDIVIDUAL TO THE MAIN INSTRUCTIONAL SEQUENCE. WE PROPOSE TO EVALUATE OVERALL PROTOCOL FEASIBILITY VIA FOUR TASKS. WE WILL: 1) EXTEND THE PARAMETRIC LEARNING MODEL TO SUPPORT STATISTICAL DECISION-MAKING; 2) SPECIFY A METHOD FOR DEFICIT DIAGNOSIS AND DESIGN SELECTIVELY-SENSITIVE REMEDIAL TASKS; 3) EVALUATE THE PROTOCOL WITH A BASELINE TASK AND EXPERIMENTAL PROGRAM; AND 4) IDENTIFY PROTOCOL DEFICIENCIES AND SPECIFY REQUIREMENTS FOR FOLLOW-ON DEVELOPMENT. A FINAL REPORT WILL SUMMARIZE THE STUDY'S OBJECTIVES, ACHIEVEMENTS, AND RECOMMENDATIONS

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 44
BY SERVICE
FISCAL YEAR 1987
ARMY

SUBMITTED BY

FOR FURTHER WORK.

CHENG TECHNOLOGY & SERVICES INC
101 FIRST ST - STE 413
LOS ALTOS, CA 94022
CONTRACT NUMBER: DAAE07-87-C-8052
DR DAH YU CHENG
TITLE:
WATER CANTEEN TEMPERATURE MAINTAINING SYSTEM FOR COMBA
CREWS
TOPIC# 156 OFFICE: TACOM

THE COMPLEXITY OF THE PROBLEM OF MAINTAINING POTABLE WATER TEMPERATURE IN AN ALL BUTTONED-UP COMBAT VEHICLE, WHERE THE TEMPERATURE CAN BE 20 TO 30 DEGREES ABOVE THE AMBIENT DEPENDS ON COMBAT ZONE WEATHER CONDITIONS. THE TWO EXTREMES CAN BE A DESERT WARFARE WHERE THE AIR IS VERY HOT, BUT DRY, OR A TROPICAL WARM ZONE WHERE THE TEMPERATURE HOVERS UNDER 100 DEGREES WITH A HUMIDITY NEARLY 10. TO ENCOURAGE CREW MEMBERS TO DRINK, A DESIRABLE WATER TEMPERATURE IS AROUND 70-75 DEGREE. GOOD INSULATION ALONE MAY NOT BE ABLE TO MAINTAIN THIS WATER TEMPERATURE. THE PHASE I RESEARCH PROPOSES TO ESTABLISH QUANTITATIVELY, THROUGH ANALYSIS AND EXPERIMENT THE FEASIBILITY OF APPLICATION OF A CONCEPT TAKES ADVANTAGE SOLID STATE COOLING OR HEATING DEVICES, AND THE EVAPORATIVE COOLING METHOD IS PACKAGED IN THE FORM OF A COOLED FINGER SUBMERGED IN THE LIQUID OF A THERMAL. THE SYSTEM USES VERY LITTLE ENERGY AND CAN BE MADE COMPATIBLE WITH THE VEHICLE POWER SYSTEM. PHASE II WILL INVOLVE THE PRACTICAL ASPECTS OF PACKAGING THE CONCEPT IN A MANNER TO PROVIDE A PRACTICAL DEVICE FOR THE DEMANDING SERVICES OF THE INTERIAL OF A CROWDED COMBAT VEHICLE ENVIRONMENT.

CHI SYSTEMS INC
1164 MCKELVEY LN
BLUE BELL, PA 19422
CONTRACT NUMBER: DAAL01-87-C-0755
DR WAYNE W ZACHARY
TITLE:
DEVELOPMENT OF A HUMAN OPERATOR MODEL FOR SYSTEM EVALU
TOPIC# 288 OFFICE: ARI

SUBMITTED BY

A SYSTEMS APPROACH IS PRESENTED FOR DEVELOPMENT AND EMPIRICAL VALIDATION OF A HUMAN OPERATOR MODEL FOR SYSTEM EVALUATION (HOMSE). A PLAN IS PROPOSED TO DEVELOP HOMSE PRIMARILY FROM EXISTING TECHNIQUES AND COMPONENTS IN THE DOMAIN OF HUMAN PERFORMANCE MODELS. THE MODEL WILL BE DESIGNED TO PREDICT THE EFFECTS OF INDIVIDUAL DIFFERENCES IN THE PERCEPTUAL-MOTOR-COGNITIVE PERFORMANCE OF HUMAN OPERATORS USING ARMY SYSTEMS. THE PURPOSE OF THE MODEL IS TO PROVIDE AID IN EVALUATING SYSTEM DESIGN CONCEPTS EARLY IN SYSTEM DEVELOPMENT. THE MODEL WILL BE CALIBRATED TO THE EMPIRICAL PERFORMANCE DATA AVAILABLE IN ARI'S PROJECT A. A VALIDATION PLAN FOR HOMSE IS PROPOSED, CONSISTING PRINCIPALLY OF COMPARING MODEL PREDICTIONS GENERATED BY HOMSE USERS WITH SIMILAR PREDICTIONS OBTAINED FROM OBJECTIVE PERFORMANCE DATA AND FROM THE SUBJECTIVE ESTIMATES OF EXPERTS.

CHI SYSTEMS INC
1164 McKELVEY LN
BLUE BELL, PA 19422
CONTRACT NUMBER: DAAB07-87-C-A022
DR WAYNE W ZACHARY
TITLE:
AN INTELLIGENT INTERFACE FOR COMMAND AND CONTROL DECIS
TOPIC# 300 OFFICE: C/A

THIS PROJECT DEVELOPS AN INTELLIGENT INTERFACE FOR A COMMAND AND CONTROL DECISION-MAKER TRYING TO USE MULTIPLE ARTIFICIAL-INTELLIGENCE BASED DECISION AIDS IN A COORDINATED MANNER. IT ADDRESSES THE CRITICAL NEED FOR COMMAND AND CONTROL DECISION-MAKERS TO BE ABLE TO USE ARTIFICIAL INTELLIGENCE AIDS WITHOUT COMPROMISING THEIR INTUITIVE COGNITIVE APPROACH TO THE REAL TIME AND MULTI-TASKING DEMANDS OF COMMAND AND CONTROL. SPECIFICALLY, THE INTELLIGENT INTERACE EMPLOYS A MODEL OF ITS USER TO ANTICIPATE THE USER'S SHIFTS IN ATTENTION AMONG COMMAND AND CONTROL TASKS, ADAPTING ITS COMPUTATIONS AS THESE ATTENTION SHIFTS OCCUR. THIS ADAPTIVE PERFORMANCE BY THE INTERFACE ALLOWS THE DECISION MAKER TO PURSUE THE COMMAND AND CONTROL PROBLEM AS THE BATTLEFIELD ENVIRONMENT DEMANDS, WITHOUT HAVING TO STOP TO ACTIVATE AND/OR DEACTIVATE EACH INDIVIDUAL DECISION AID REQUIRED ALONG THE WAY. THE USER MODEL IS BUILT THROUGH AN INNOVATIVE INTEGRATION OF THREE TECHNOLOGIES, THE ARTIFICIAL INTELLIGENCE TECHNIQUES OF PLAN RECOGNITION AND BLACKBOARD BASED CONTROL, AND THE COGNITIVE

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SCIENCE MODELING TOOL GOMS.

CHO INC
4004 HARRISON RD
BELTSVILLE, MD 20705
CONTRACT NUMBER:
DR YONG M CHO
TITLE:
MICROCOMPUTER-NETWORK ARCHITECTURE FOR RANGE INSTRUMEN
APPLICATIONS
TOPIC# 209 OFFICE: TECOM

VLSI (VERY LARGE SCALE INTEGRATION) TECHNOLOGY HAS BEEN DEVELOPED TO THE POINT WHERE SPECIAL PURPOSE PROCESSORS MAY BE CONCATENATED TO FORM SUPERCOMPUTERS WITH FASTER THROUGHPUT RATES THAN UNI-PROCESSOR MACHINES. CHO, INC. PROPOSES TO DESIGN AND DEVELOP A MULTI-PROCESSOR COMPUTER ARCHITECTURE FOR REAL-TIME DIGITAL FILTERING OF MULTI-SENSOR TRACKING DATA. THE ARCHITECTURE WILL BE OPTIMIZED FOR IMPLEMENTATION OF THE DECENTRALIZED SQUARE ROOT INFORMATION FILTER (SRIF). PHASE I RESEARCH WILL DEMONSTRATE FEASIBILITY OF THE DECENTRALIZED SRIF AS A MEANS FOR SOLVING THE LINEAR LEAST SQUARES ESTIMATION PROBLEM IN DECENTRALIZED FORM. PHASE II RESEARCH WILL FOCUS UPON DEVELOPMENT AND TESTING OF A PROTOTYPE DEVICE.

CICCONE V J & ASSOCS INC
14045 JEFFERSON DAVID HWY
WOODBIDGE, VA 22191
CONTRACT NUMBER: DAAK70-87-C-0041
DR GEORGE A GARRIGAN
TITLE:
UNIVERSAL CLEANING OF REVERSE OSMOSIS MEMBRANES THROUG
DESIGNS IN MEMBRANES SPACERS SUPPLEMENTED BY ULTRASONI
TOPIC# 140 OFFICE: BRDC-PVD

THIS TECHNICAL PROPOSAL PRESENTS NEW CONCEPTS IN DESIGN AND OPERATIONS WHICH MAY BE APPLIED TO THE RESTORATION OF REVERSE OSMOSIS (RO) MEMBRANES AFTER USE. THE PROPOSED SBIR PHASE I RESEARCH WILL BE CARRIED ON IN TWO PARTS. PART I WILL INCLUDE THE INVESTIGATION OF

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INNOVATIVE CHANGES IN SPACER DESIGN TO DETERMINE MODIFICATIONS TO THIS FEATURE OF SPIRAL WOUND MEMBRANES TO REDUCE FOULING TENDENCIES. PART II WILL BE TO APPLY PROVEN TECHNOLOGICAL ADVANCES IN THE USE OF ULTRASONIC VIBRATIONS IN CONJUNCTION WITH THE INNOVATIVE SPACER MODIFICATIONS TO CONFIGURATIONS OF THE REVERSE OSMOSIS MULTI-ELEMENT MODULE (ROMEM) DESIGN. THE PURPOSE WILL BE TO FIND THE MOST EFFECTIVE CONFIGURATION FOR CLEANING AND TO QUANTITATIVELY EVALUATE THE EFFICIENCY OF VARIOUS CLEANING PROTOCOLS.

CIM SYSTEMS
274 W CAMPBELL RD - STE 411
RICHARDSON, TX 75080
CONTRACT NUMBER: DAAE07-87-C-8059
DR POM PIUMSOMBOOM
TITLE:
INTELLIGENT KNOWLEDGE-BASED CAD FOR PRODUCIBILITY
TOPIC# 163 OFFICE: TACOM

INNOVATIVE RESEARCH IS NEEDED TO ADDRESS THE PROBLEM OF DESIGNING FOR PRODUCIBILITY. KNOWLEDGE BASED SYSTEMS NOW OFFER CONSIDERABLE PROMISE IN THIS FIELD. IF THE GROUND DATA FOR THE INFERENCES OF SUCH A SYSTEM CAN BE CAPTURED DIRECTLY FROM A DESIGN DRAWING THEN ANALYSIS CAN BE CONDUCTED WITH THE AID OF AN EXPERT SYSTEM AND RESULTS MADE AVAILABLE AT A CAD WORKSTATION TO PROMPT IMMEDIATE REVISION IF NECESSARY. WITH THIS TECHNOLOGY, MANY INDUSTRIAL MANUFACTURING PROBLEMS AND INEFFICIENCIES THAT ARE TRACEABLE BACK TO THE DESIGN PROCESS CAN BE SOLVED. CIM SYSTEMS, INC. WILL ESTABLISH A CONCEPTUAL FRAMEWORK FOR THE DESIGN AND DEVELOPMENT OF AN INTELLIGENT KNOWLEDGE BASED DECISION SUPPORT SYSTEM THAT WILL ENABLE DESIGN ENGINEERS TO OPTIMIZE A PART DESIGN FROM A MANUFACTURABILITY PERSPECTIVE DURING OR FOLLOWING THE DESIGN OF THE PART. THE CONCEPTUAL DESIGN WILL UTILIZE ARTIFICIAL INTELLIGENCE (AI) TECHNOLOGY TO FACILITATE THE DEVELOPMENT OF A WORKING PROTOTYPE FOR AN IBM-PC EXPERT/DATABASE INTERFACE MECHANISM FOR ASSISTING ENGINEERING PERSONNEL IN MANIPULATION, ANALYSIS AND EVALUATION OF A LARGE DATABASE CONSISTING OF COMPUTER AIDED DESIGN (CAD) DATA FILES, A KNOWLEDGE BASE CONTAINING MANUFACTURING RULES OF PRODUCIBILITY, AND A LEXICON FOR A NATURAL LANGUAGE INTERFACE. THIS CAD DESIGN SUPPORT SYSTEM WILL INCLUDE AN EXPERT SYSTEM TO HELP THE USER BY PERFORMING THE TIME CONSUMING AND

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DIFFICULT TASK OF DATABASE MANIPULATION, UPDATE AND INTERFACE. A MULTIWINDOWING GRAPHICS PACKAGE WILL PROVIDE EASY USE AND DISPLAY OF THE DATABASE INFORMATION, BY PRESENTING INFORMATION ABOUT PART OR PRODUCT PRODUCIBILITY, COST AND OTHER PERTINENT DESIGN INFORMATION TO THE CAD ENGINEER IN AN INTERACTIVE MODE. THE PROTOTYPE WILL DEMONSTRATE THE INTEGRATION OF AI/EXPERT FUNCTIONS INTO EXISTING CAD DATABASE SYSTEMS MAINTAINED ON THE IBM-PC FAMILY OF MICROCOMPUTERS IS FEASIBLE AND BENEFICIAL.

COLEMAN RESEARCH CORP
5950 LAKEHURST DR
ORLANDO, FL 32819
CONTRACT NUMBER: DACA39-87-C-0038
DR WILLIAM STEINWAY

TITLE:
ADVANCED SENSORS FOR CLOSE PROXIMITY ROBOTIC MINE DETE
TOPIC# 267 OFFICE: WES

THE OBJECTIVE OF THE STUDY EFFORT IS TO PRODUCE SPECIFICATIONS, A DETAILED DESIGN, AND PERFORMANCE CALCULATIONS FOR THREE SENSORS WHICH ARE INTEGRATED TO FORM A MINE DETECTION SYSTEM. THE SENSORS INCLUDE A FREQUENCY STEPPED GROUND PENETRATION RADAR, A DUAL BAND INFRARED SCANNER, AND A VIDEO SCANNER. THE INTEGRATION OF THE SENSOR OUTPUT INFORMATION AND ULTIMATE DECISION FOR MINE/NON-MINE OBJECT IS PERFORMED BY AN AI MICROPROCESSOR WITH A SOFTWARE 'EXPERT SYSTEM' IMPLEMENTED. WITH AN IMPROVED GROUND PENETRATION RADAR AND INFRARED SENSOR, COUPLED WITH THE 'EXPERT SYSTEM' PROCESSING, THE MINE DETECTION SYSTEM WILL BE ABLE TO PROVIDE IMPROVED PERFORMANCE OVER CURRENTLY AVAILABLE SYSTEMS.

CONSULTANT'S CHOICE INC
8601 DUNWOODY PL - STE 122
ATLANTA, GA 30338
CONTRACT NUMBER: DAAD07-87-C-107
ROGER W ANDERSON

TITLE:
AUTOMATED WEATHER FACTOR ANALYSIS AND DISPLAY
TOPIC# 71 OFFICE: LABCOM/ASL

SUBMITTED BY

EFFECTIVE INTELLIGENCE PREPARATION OF THE BATTLEFIELD (IPB) MUST INCLUDE WEATHER PREDICTION, ANALYSIS, AND EFFECTS. IT IS WELL WITHIN THE STATE-OF-THE-ART OF AUTOMATION THAT WEATHER ANALYSIS FOR EFFECTS ON TACTICAL OPERATIONS CAN BE IMPLEMENTED ON MICROCOMPUTERS AND INTEGRATED WITH ONGOING EFFORTS TO APPLY EXPERT SYSTEM TECHNOLOGY TO WEATHER PREDICTION AND USE. CCI WILL COMBINE KNOWLEDGE-ENGINEERING TOOLS WITH GEOPROCESSING SOFTWARE TO IMPLEMENT A WEATHER FACTOR ANALYSIS AND DISPLAY SYSTEM, THEREBY PROVING FEASIBILITY AND UTILITY AND SETTING THE STAGE FOR REFINEMENT AND EXTENSION OF WEATHER/TERRAIN ANALYSIS.

CONTINUUM DYNAMICS INC
PO BOX 3073
PRINCETON, NJ 08543
CONTRACT NUMBER: DAAL03-87-C-0013
DR TODD R QUACKENBUSH
TITLE:
VORTEX DYNAMICS FOR ROTORCRAFT INTERACTIONAL AERODYNAM
TOPIC# 115 OFFICE: ARO

OVER THE PAST SEVERAL YEARS, UNDER GOVERNMENT AND COMMERCIAL SUPPORT, CONTINUUM DYNAMICS, INC. HAS MADE CONSIDERABLE PROGRESS IN COMPUTING THE UNSTEADY WAKES OF ROTARY WING AIRCRAFT. THIS PROGRESS HAS RESULTED LARGELY FROM THE SUCCESSFUL DEVELOPMENT OF THE BASIC CURVED VORTEX ELEMENT (BCVE), AS A FUNDAMENTAL WAKE ELEMENT BUILDING BLOCK, AND THE DEVELOPMENT OF A NOVEL METHOD TO REPRESENT THE FULL-SPAN VORTEX WAKE SHED FROM EACH ROTOR BLADE. THESE NEW METHODS TO COMPUTE THE CONVECTIVE EVOLUTION OF THE ROTOR WAKE IN FORWARD FLIGHT AFFORD A UNIQUE OPPORTUNITY TO CALCULATE COMPLEX FREE-WAKE FLOWS TO ANALYZE ROTORCRAFT INTERACTIONAL AERODYNAMICS. THE PHASE I RESEARCH EFFORT WOULD ASSESS THE PROMISE OF USING THESE NEW METHODS IN VORTEX DYNAMICS TO PREDICT AERODYNAMIC INTERACTIONS OF THE ROTOR WAKE WITH THE TAIL ROTOR AND VEHICLE LIFTING SURFACES. NEW WAYS TO TREAT VORTEX FILAMENTS IN CLOSED PROXIMITY TO BOUNDARIES, AND FILAMENTS BEING CUT BY SURFACES WILL BE DEVELOPED AS PART OF THIS EFFORT. THIS WORK IS INTENDED TO DEMONSTRATE THE FEASIBILITY OF DEVELOPING A GENERAL, STATE-OF-THE-ART INTERACTIONAL AERODYNAMICS ANALYSIS CODE.

COPROCESSOR CORP
PO BOX 4593
FT WALTON BEACH, FL 32549
CONTRACT NUMBER: DAAB07-87-C-P041
DONALD J IMSAND
TITLE:
INTEGRATED AIRCRAFT SURVIVABILITY EQUIPMENT EFFECTIVIT
TOPIC# 292 OFFICE: EW

SUBMITTED BY

THIS EFFORT WILL DEVELOP A COMPUTER SIMULATION MODEL TO EVALUATE THE EFFECTIVENESS OF BOTH ON-BOARD AND OFF-BOARD AIRCRAFT SURVIVABILITY EQUIPMENT (ASE). THE MODEL FAMILY WILL INCLUDE GROUND BASED TARGET TRACKING RADAR AND AIRBORNE INTERCEPTOR RADAR MODELS, RF AND IR TARGET MODELS, RADAR AND IR SEEKER MODELS, FIVE DEGREE OF FREEDOM MISSILE MODEL WITH PROPORTIONAL NAVIGATION, CLUTTER AND NOISE ENVIRONMENT MODELS, AND ON-BOARD AND EXPENDABLE COUNTERMEASURES MODELS. EXPENDABLE COUNTERMEASURES WILL INCLUDE CHAFF, FLARES, AND ACTIVE RF DEVICES. ON BOARD COUNTERMEASURES WILL INCLUDE NOISE AND DECEPTION TECHNIQUES. ALL MODELS WILL BE GENERIC IN NATURE, WITH SPECIFIC PARAMETERS SELECTED BY A MENU DRIVEN INPUT FILE SYSTEM. THE COMPUTER SOFTWARE WILL BE FORTRAN CODED AND DESIGNED FOR EXECUTION ON VAX 11 COMPUTERS.

CORION TECHNOLOGIES INC
32 FRESH POND PL
CAMBRIDGE, MA 02138
CONTRACT NUMBER: DAAJ02-87-C-0019
DR JOHN J PIRET
TITLE:
IDENTIFICATION/FEASIBILITY ANALYSIS OF A NEW SYSTEM FO
CONTROLLING STATIC ELECTRICITY ACCUMULATIONS ON HOVERI
TOPIC# 33 OFFICE: AVSCOM

THE OBJECTIVES OF THIS PROJECT ARE TO IDENTIFY AN INNOVATIVE SYSTEM TO SENSE AND CONTROL THE ELECTROSTATIC CHARGE BUILDUP ON HOVERING HELICOPTERS AND PERFORM A FEASIBILITY ANALYSIS OF THE SELECTED SYSTEM. THIS WILL BE ACCOMPLISHED THROUGH A COMPREHENSIVE SURVEY OF THE PHYSICAL AND TECHNICAL PHENOMENA WHICH CONTROL AND AFFECT THE PROBLEM AND OF THE PAST AND CURRENT EFFORTS TO SOLVE IT, INCLUDING A RECENTLY PROPOSED INNOVATIVE SENSING AND ACTIVE DISCHARGER SYSTEM. A CRITICAL ANALYSIS OF THE VARIOUS SENSING AND DISCHARGING SYSTEMS WHICH HAVE BEEN PROPOSED OR ARE AVAILABLE WILL THEN BE PERFORMED. THESE SYSTEMS WILL BE TECHNICALLY EVALUATED AND CLASSIFIED IN ORDER TO SELECT THE MOST EFFECTIVE OVERALL SOLUTION. THE SELECTED SYSTEM WILL BE ANALYZED FOR TECHNICAL FEASIBILITY AND COST EFFECTIVENESS, AND A DEVELOPMENT AND TESTING PROGRAM WILL BE PROPOSED FOR PHASE II.

CRAIG DEVELOPMENT CORP
7767 E QUAKER RD
ORCHARD PARK, NY 14127
CONTRACT NUMBER: DAAL01-87-C-0730
DWIGHT R CRAIG
TITLE:
AN ULTRA-HIGH-DENSITY CAPACITOR TO MAKE POSSIBLE A POW
ON A CHIP
TOPIC# 320 OFFICE: ETDL

SUBMITTED BY

THIS PROPOSAL DESCRIBES AN INNOVATIVE CONCEPT FOR ELECTRONIC CAPACITORS THAT ALLOWS ENERGY STORAGE DENSITIES 1,000 TO 100,000 TIMES THOSE OF STATE-OF-THE-ART CAPACITORS. SUCH DENSITIES, USED IN CONJUNCTION WITH MICROELECTRONIC TECHNOLOGIES, WOULD ALLOW COMPLETE POWER SUPPLIES TO BE CONTAINED ON INTEGRATED-CIRCUIT CHIPS. THIS, IN TURN, WOULD ALLOW UNPRECEDENTED FLEXIBILITY AND SAVINGS IN CIRCUIT DESIGN AND LAYOUT BY PERMITTING THE USE OF DISTRIBUTED POWER SUPPLIES AND SELECTIVE REGULATION. WITH THIS INNOVATION, CIRCUIT BOARDS AND LARGE-SCALE INTEGRATED CIRCUITS COULD CARRY THEIR OWN POWER SUPPLIES, THUS FREEING THEM FROM THE PRESENTLY-REQUIRED PROXIMITY TO CENTRAL POWER SUPPLIES AND ALLOWING COMPLETE FREEDOM OF LOCATION. IN FACT, THE CENTRAL POWER SUPPLY WOULD COMPLETELY CEASE TO EXIST FOR MANY APPLICATIONS. PROTOTYPE CAPACITORS THIS EXCITING CONCEPT HAVE ALREADY BEEN PRODUCED IN AQUEOUS TECHNOLOGY, WHICH, OF COURSE, IS NOT CURRENTLY APPLICABLE TO INTEGRATED-CIRCUIT USES. HOWEVER, THE CONCEPT YIELDS TO SOLID-STATE TECHNOLOGY, WHICH CAN BE USED FOR SUCH APPLICATIONS. THE RESEARCH PROGRAM DESCRIBED HERE HAS AS ITS GOAL THE DEMONSTRATION OF THE FEASIBILITY OF USING SOLID-STATE TECHNOLOGY IN THE NEW CONCEPT. SEVERAL CANDIDATE SYSTEMS ARE PROPOSED WHICH HAVE THE POTENTIAL FOR SATISFYING THE REQUIREMENTS, AND THESE ARE TO BE TESTED TO DETERMINE THEIR CHARACTERISTICS. THE RESULT OF THIS PHASE I EFFORT WILL DETERMINE THE DETAILS OF THE PROGRAM TO BE FOLLOWED IN PHASE II FOR THE PRODUCTION OF PROTOTYPES OF TRUE SOLID-STATE CAPACITORS AND CHIP- AND IC-SCALE POWER SUPPLIES.

CREATIVE OPTICS INC
32 WILDWOOD DR
BEDFORD, MA 01730
CONTRACT NUMBER: DAAK60-87-C-0036
DR JOHN F EBERSOLE

TITLE:

NOVEL TECHNIQUE FOR TARGET ACQUISITION REDUCTION EVALU
CAMOUFLAGE FOR PERSONNEL
TOPIC# 178 OFFICE: NATICK

OBJECTIVE MEASURES ARE NEEDED OF THE TARGET ACQUISITION REDUCTION (TAR) AFFORDED PERSONNEL BY CAMOUFLAGE; SUBJECTIVE MEASURES ARE EXPENSIVE, UNREPEATABLE AND DIFFICULT TO COMPARE BETWEEN FIELD AND LABORATORY TRIALS. THE OBJECTIVE MEASURES MUST BE BASED ON FACTORS

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AFFECTING HUMAN PERFORMANCE. WE PROPOSE, IN PHASE I, TO DEVELOP A RELATIVE OBJECTIVE MEASURE OF EFFECTIVENESS (ROME) WHICH WILL PRODUCE OBJECTIVE SIGNATURES OF CAMOUFLAGE. TO ACHIEVE THIS, WE PROPOSE TO EXPLOIT RECENT ADVANCES IN MICROPROCESSOR TECHNOLOGY FOR PERSONAL COMPUTERS AND REAL-TIME IMAGE PROCESSING. IN PHASE II, WE WILL EXTEND THE METHODOLOGY WHICH WILL ALLOW COMPUTATION OF A UNIQUE "CAMOUFLAGE FINGERPRINT" FOR A TARGET IN A GIVEN BACKGROUND. THIS MULTI-DISCRIMINATOR ROME CAN BE RELATED TO A PROBABILITY OF DETECTION WITH THE ASSISTANCE OF THE COUNTERMEASURE WORKSTATION (CMWS) RECENTLY DEVELOPED BY US FOR THE US ARMY. FINALLY, WE PROPOSE TO MERGE THIS MODULAR ALGORITHM APPROACH WITH A VARIETY OF HARDWARE AND SOFTWARE ELEMENTS IN ORDER TO CONSTRUCT AND DELIVER TO THE US ARMY NATICK RESEARCH, DEVELOPMENT & ENGINEERING CENTER A MACE--MOBILE ARMY CAMOUFLAGE EVALUATION--SYSTEM WHICH IS COMPACT, PORTABLE AND CAPABLE OF REAL-TIME OBJECTIVE DETERMINATION OF TAR EFFECTIVENESS FOR PERSONNEL CAMOUFLAGE IN BOTH LABORATORY AND FIELD TRIALS.

CREATIVE OPTICS INC
32 WILDWOOD DR
BEDFORD, MA 01730
CONTRACT NUMBER: DAAD05-87-C-0084
DR JOHN F EBERSOLE
TITLE:
INNOVATIVE METHODOLOGY FOR DEFINING DIRECTIONS IN TARG
PERFORMANCE REQUIREMENTS
TOPIC# 226 OFFICE: TECOM

WE PROPOSE AN INNOVATIVE METHODOLOGY WHICH WILL PROVIDE TECOM WITH A NEW CAPABILITY TO EVALUATE THREAT TARGETS AND WEAPON SYSTEMS AS THE STATE-OF-THE-ART IN ALLIED TECHNOLOGIES, REQUIREMENTS, AND TACTICS EVOLVES. WE DESCRIBE HOW WE WILL IMPLEMENT OUR WORK, AND HOW IT WILL PROVIDE TECOM WITH THE NECESSARY FLEXIBILITY AND ROBUSTNESS TO DEFINE THE 'TARGET OF THE FUTURE' BY ESTABLISHING CRITERIA FOR REPRESENTING THE THREAT IN TEST AND EVALUATION OF NEW WEAPON SYSTEMS. WE PROVIDE EXAMPLES OF HOW OUR PROPOSED METHODOLOGY IS APPLICABLE TO BOTH AERIAL AND GROUND TARGETS.

CRYSTAL RESEARCH
1441 SUNNYSIDE TER
SAN PEDRO, CA 90732
CONTRACT NUMBER: DAAL04-87-C-0055
PAUL J SHLICHTA
TITLE:
LOW-COST PRODUCTION OF BORON CARBIDE POWDER AND CERAMI
TOPIC# 110 OFFICE: MTL

SUBMITTED BY

AS STATED IN THE TOPIC DESCRIPTION, THE ARMY IS IN NEED OF LOW-COST HIGH-PERFORMANCE CERAMIC ARMOR. THE BEST ARMOR CERAMIC, BORON CARBIDE, IS CURRENTLY EXPENSIVE BECAUSE OF BOTH THE HIGH PRICE OF THE POWDERED STARTING MATERIAL AND THE HIGH FABRICATION COST BECAUSE OF THE CURRENT HIGH TEMPERATURE AND PRESSURE REQUIRED FOR HOT PRESSING. WE PROPOSE TO DEVELOP A NOVEL SYNTHESIS APPROACH FOR THE PRODUCTION OF REACTIVE SUBMICRON BORON CARBIDE POWDER, AT SUBSTANTIALLY LOWER COST THAN IS PRESENTLY POSSIBLE, WHICH CAN BE ECONOMICALLY FABRICATED AT LOWER TEMPERATURES AND PRESSURES THAN ARE CURRENTLY NECESSARY.

CRYSTAL SYSTEMS INC
27 CONGRESS ST
SALEM, MA 01970
CONTRACT NUMBER: DAAB07-87-C-F103
CHANDRA P KHATTAK
TITLE:
GROWTH OF CdZnTe SUBSTRATES FOR HIGH PERFORMANCE IR DE
TOPIC# 310 OFFICE: NV

CdZnTe SUBSTRATES ARE REQUIRED FOR THE PRODUCTION OF CdHgTe IR DETECTORS. FOR THE SECOND GENERATION SYSTEMS REQUESTED BY THE ARMY, THE CdHgTe EPITAXIAL LAYER NEEDS TO BE GROWN ON LATTICE-MATCHED SUBSTRATES. HOWEVER, THE DEFECT DENSITY IN THE CURRENTLY AVAILABLE SUBSTRATES IS HIGH, AND THE EXISTENCE OF LARGE SIZES IS LIMITED. THE PROBLEM IN GROWTH OF CdZnTe CRYSTALS IS THE INABILITY TO PRODUCE AND MAINTAIN A CONVEX SOLID-LIQUID INTERFACE BY THE VERTICAL BRIDGMAN PROCESS. THE PROPOSED PROGRAM IS TO ADAPT THE HEAT EXCHANGER METHOD (HEM[TM]) FOR THE GROWTH OF CdZnTe SUBSTRATES. IT HAS BEEN SHOWN N CdTe CRYSTALS THAT GROWTH BY THE HEM RESULTS IN A CONVEX SOLID-LIQUID INTERFACE THAT CAN BE MAINTAINED DURING THE CRYSTAL GROWTH CYCLE. IT HAS ALSO BEEN DEMONSTRATED THAT CENTIMETER-SIZE GRAINS ARE PRODUCED EVEN IN UNSEEDDED GROWTH. THE DEFECT DENSITY IN CdTe CRYSTAL GROWN BY THE HEM IS $\sim 10(3)/\text{cm}(2)$, MUCH LOWER THAN THE $10(5)/\text{cm}(2)$ IN COMMERCIALLY AVAILABLE SUBSTRATES. IT IS INTENDED TO USE SIMILAR PROCEDURES FOR CdZnTe SUBSTRATE GROWTH. BECAUSE OF THE SOLIDUS-LIQUIDUS SEPARATION IN THE CdZnTe SYSTEM, THE VARIATION IN Zn CONCENTRATION IS EXPECTED TO BE MINIMIZED BY EMPHASIZING HIGHER TEMPERATURE GRADIENTS DURING GROWTH. THE DEFECTS DUE TO TEMPERATURE-GRADIENT-INDUCED STRESSES CAN BE MINIMIZED BY IN SITU ANNEALING AFTER THE

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HEM GROWTH AND PRIOR TO COOLDOWN. AT THE END OF THE PROPOSED PROGRAM, IT IS INTENDED TO ESTABLISH FEASIBILITY OF PRODUCING CdZnTe SUBSTRATES FOR IR DETECTOR SYSTEMS REQUIRED BY THE ARMY.

CRYSTAL SYSTEMS INC
27 CONGRESS ST
SALEM, MA 01970
CONTRACT NUMBER: DAAB07-87-C-F065
CHANDRA P KHATTAK
TITLE:
GROWTH OF Ti:YALO(3) FOR TUNABLE SOLID-STATE LASER APP
TOPIC# 312 OFFICE: NV

THE DISCOVERY OF THE Ti:Al(2)O(3) TUNABLE SOLID-STATE LASER IN 1982 HAS SPARKED A LOT OF INTEREST IN SOLID-STATE LASER HOSTS FOR TITANIUM. AMONG THE VARIOUS LASER HOSTS, YALO(3) HOLDS THE MOST PROMISE BECAUSE IT IS A HIGH CRYSTAL FIELD MATERIAL. Ti:YALO(3) CRYSTALS HAVE BEEN GROWN BY THE CZOCHRALSKI AND GRADIENT FREEZE TECHNIQUES. SPECTROSCOPIC MEASUREMENTS ON SAMPLES HAVE SHOWN AN EMISSION RANGE FROM 500 TO 800 nm AND A LIFETIME OF APPROXIMATELY 10 MICROSEC. THIS DATA SUGGESTS THAT TiYALO(3) WILL BE AN ATTRACTIVE LASER. THE Ti:YALO(3) CRYSTALS HAVE NOT BEEN LASED SO FAR AND THIS PERFORMANCE IS ATTRIBUTED TO THE POOR OPTICAL QUALITY OF THE CRYSTALS. THE PRESENT PROPOSAL IS TO SHOW FEASIBILITY OF Ti:YALO(3) CRYSTAL GROWTH USING THE HEAT EXCHANGER METHOD (HEM[TM]). THE MAIN PROBLEMS ANTICIPATED IN THE GROWTH OF Ti:YALO(3) BY HEM ARE (a) PROBLEMS WITH PHASE TRANSITION; (b) MINIMIZATION OF SCATTERING CENTERS IN THE CRYSTAL; AND (c) MAINTAINING TITANIUM IN THE TRIVALENT STATE. THE LATTER TWO PROBLEMS WERE ALSO ENCOUNTERED IN THE ADAPTATION OF HEM FOR Ti:Al(2)O(3) CRYSTALS. SINGLE CRYSTAL SAMPLES GROWN DURING THE PROPOSED PROGRAM WILL BE CHARACTERIZED FOR SPECTROSCOPIC DATA AND LASER PROPERTIES. AT THE END OF THE PROPOSED PROGRAM, IT IS EXPECTED THAT FEASIBILITY OF GROWTH OF Ti:YALO(3) FOR LASER APPLICATIONS WILL BE ESTABLISHED.

CRYSTALLUME
3180 PORTER DR - STE 2
PALO ALTO, CA 94304
CONTRACT NUMBER: DAAB07-7-C-F078
DR J MICHAEL PINNEO
TITLE:
PE-CVD DIAMOND THIN FILM FOR TUNABLE SOLID STATE LASER
TOPIC# 312 OFFICE: NV

SUBMITTED BY

THE OBJECTIVE OF THIS PROPOSED RESEARCH EFFORT IS TO EXPERIMENTALLY EVALUATE THE OPTICAL PROPERTIES OF CHEMICAL VAPOR DEPOSITED DIAMOND THIN FILMS WITH RESPECT TO ELECTROLUMINESCENCE IN THE UV AND BLUE-GREEN SPECTRAL REGIONS. AS A RESULT OF SUCH EFFORTS WE WILL DETERMINE THE EXTENT TO WHICH DIAMOND THIN FILMS MAY BE USED AS LASING MEDIA AND ASCERTAIN THE FEASIBILITY OF DIAMOND BASED MICROLASERS.

DCS CORP
1055 N FAIRFAX ST
ALEXANDRIA, VA 22314
CONTRACT NUMBER: DAAB07-87-C-F069
RICHARD J RIORDAN
TITLE:
PARAMETRIC ANALYSIS OF MAP DATA
TOPIC# 305 OFFICE: NV

FORWARD LOOKING INFRARED (FLIR) SYSTEMS INTEGRATED WITH OTHER SENSOR INPUTS CAN EXPAND FLIR MISSION EFFECTIVENESS SIGNIFICANTLY. DEFENSE MAPPING AGENCY (DMA) MAP DATA OFFERS AN ADDITIONAL PASSIVE INPUT TO ENHANCE FLIR SYSTEM PERFORMANCE. INCORPORATION OF DIGITAL TERRAIN ELEVATION DATA (DTED) MAY AUGMENT FLIR IMAGERY BY PROVIDING RIDGE LINES, TERRAIN CONTOURS, AND LINE OF HORIZON. TERRAIN PROFILES MAY ALSO PRESENT AN ADDITIONAL AUTOMATIC TARGET RECOGNITION (ATR) DECISION CRITERION TO IMPROVE SYSTEM ACCURACY BY REDUCING FALSE ALARMS. DIGITAL FEATURE ANALYSIS DATA (DFAD) COULD IMPROVE FLIR SYSTEM CAPABILITIES BY PROVIDING CULTURAL FEATURE LOCATION AND IDENTIFICATION. IN ORDER TO ASSESS THE UTILITY OF DMA MAP INTEGRATION INTO FLIR SYSTEMS FOR THESE FUNCTIONS THE DEGREE OF CORRELATION ACHIEVABLE BETWEEN MAP DATA AND SENSED IMAGE MUST BE DETERMINED. DCS PROPOSES TO PERFORM AN ASSESSMENT OF AIRCRAFT NAVIGATION INSTRUMENTS, SENSOR PLATFORM ANGLES/RATES, SENSOR RESOLUTION, AND MAP DATA BASE PARAMETERS AS THEY APPLY TO REAL-TIME MAP DATA ENHANCEMENT OF FLIR SYSTEM DISPLAYS. OTHER ISSUES SUCH AS MASS DATA STORAGE AND RETRIEVAL, THREE DIMENSIONAL IMAGE SOFTWARE CONTROL, AND VIDEO DISPLAY TECHNOLOGY WILL BE ANALYZED TO DETERMINE THE CORRELATION ACHIEVABLE BETWEEN THE MAP DATA AND THE SENSED IMAGE TO PREDICT THE SUCCESS OF THIS APPROACH.

DCS CORP
1055 N FAIRFAX ST
ALEXANDRIA, VA 22314
CONTRACT NUMBER: DAAB07-87-C-F09
RICHARD T FLAHERTY
TITLE:
AUTOMATED MINIMUM RESOLVABLE DELTA TEMPERATURE (MRT) T
DEVELOPMENT
TOPIC# 307 OFFICE: NV

SUBMITTED BY

SEVERAL TESTS CAN BE PERFORMED ON THERMAL IMAGING SYSTEMS TO DETERMINE PERFORMANCE. MINIMUM RESOLVABLE TEMPERATURE DIFFERENCE, MRT, IS THE MOST WIDELY USED SPECIFICATION PARAMETER AND A BASIC INGREDIENT IN THE PREDICTION OF TARGET ACQUISITION CAPABILITIES OF THE SYSTEM. CURRENT METHODS TO MEASURE MRT FOR A THERMAL IMAGING SYSTEM RELY HEAVILY ON THE SUBJECTIVE NATURE OF A HUMAN OBSERVER. AS THE USE OF THERMAL IMAGING SYSTEMS INCREASES, SO DOES THE NEED TO PROVIDE A COST EFFECTIVE, SIMPLE, AND ACCURATE METHOD TO RELATE SYSTEM SPECIFICATIONS TO FIELD PERFORMANCE. DCS CORPORATION PROPOSES TO PROVIDE AN OBJECTIVE TEST METHOD TO MEASURE MRT.

DECISION SUPPORT TECHNOLOGY INC
125 CAMBRIDGE PARK DR.
CAMBRIDGE, MA 02140
CONTRACT NUMBER:
C LAWRENCE MEADOR
TITLE:
SOFTWARE PRODUCT ASSURANCE COST ESTIMATING MODEL
TOPIC# 303 OFFICE: AMSEL-PA

TO MEET THE ARMY'S NEED FOR IMPROVED COST CONTROL AND PREDICTION OF RESOURCE USAGE IN THE INDEPENDENT PRODUCT ASSURANCE ACTIVITIES IN AS TIMELY A MANNER AS POSSIBLE, WE PROPOSE USING THE SOFTWARE QUALITY ASSURANCE DATABASE (SQUAD/20) MODEL, DEVELOPED BY CAPERS JONES AS A PROTOTYPE FOR ITERATIVE DEVELOPMENT OF AN IV&V COST ESTIMATING SYSTEM. THE MODEL CURRENTLY PREDICTS COST, EFFORT, AND DEFECT REMOVAL EFFICIENCIES FOR INDEPENDENT VERIFICATION AND VALIDATION AND A NUMBER OF OTHER DEFECT REMOVAL ACTIVITIES. THE OBJECTIVES IN PHASE I ARE TO VALIDATE THE MODEL WITHIN THE DOD AND ENLARGE THE DATABASE OF SQUAD/20, RECOMMEND AND INITIATE AN ONGOING PROJECT MEASUREMENT SYSTEM FOR IV&V PREDICTION PURPOSES, AND SPECIFY THE SUBSEQUENT VERSION OF THE MODEL. FUTURE VERSIONS WOULD HANDLE ONE OR MORE OF THE FOLLOWING: MORE THOROUGH EXAMINATION OF FACTORS EFFECTING QA PRODUCTIVITY, A LARGER DATABASE OF HISTORICAL PROJECTS, FINER DETAIL ON ACTIVITY ESTIMATION AND MORE SOPHISTICATED PREDICTIVE ALGORITHMS.

DECISION-SCIENCE APPLICATIONS INC
1901 N MOORE ST - STE 1000
ARLINGTON, VA 22209
CONTRACT NUMBER: DAAJ02-87-C-0017
ROBERT M KERCHNER
TITLE:
AIR-TO-AIR COMBAT ENGAGEMENT ANALYSIS UTILIZING TERRAI
TOPIC# 36 OFFICE: AVSCOM

SUBMITTED BY

A PROGRAM TO DEVELOP A SIMULATION OF ONE-VERSUS-ONE HELICOPTER AIR-TO-AIR COMBAT IS PROPOSED. IT WILL PROVIDE A POWERFUL ANALYTIC TOOL FOR EXPLORING THE EFFECTIVENESS OF HELICOPTER DESIGNS, WEAPONS, AND SENSORS AS WELL AS TACTICS AND ENVIRONMENTS. THE EFFORT BUILDS UPON THE EXISTING TAC BRAWLER COMPUTER SIMULATION OF AIR-TO-AIR COMBAT INVOLVING FIXED WING AIRCRAFT. IT EMPLOYS EXPLICIT REPRESENTATION OF PILOT DECISION PROCESSES SUCH THAT SURPRISE, CONFUSION, AND THE UTILITY OF SENSOR INFORMATION ARE MODELED. THE SIMULATION WILL PROVIDE REALISTIC MODELING OF TERRAIN, ENEMY THREATS, COUNTER-MEASURES AND TACTICS. THE MODEL WOULD BE CAPABLE OF BEING INTEGRATED INTO SIMULATORS AND TRAINING AIDS.

DECISION-SCIENCE APPLICATIONS INC
1901 N MOORE ST - STE 1000
ARLINGTON, VA 22209
CONTRACT NUMBER: DAAL02-87-C-0072
WESLEY M KUROWSKI
TITLE:
MULTISTATIC RADAR TECHNOLOGY
TOPIC# 46 OFFICE: HDL

FOR THE PROPOSED RESEARCH, DSA PLANS TO FOLLOW A LOGICAL AND METHODOLOGICAL APPROACH TO SATISFY THE TECHNICAL OBJECTIVES. THE OBJECTIVES OF THE PHASE I PROGRAM ARE TO EXAMINE MULTISTATIC RADAR ISSUES. IN PARTICULAR, APPROACHES, CONCEPTS, AND TECHNOLOGY NEEDS SHALL BE EXAMINED IN A SEARCH FOR INNOVATIVE MULTISTATIC RADAR TECHNIQUES AND APPLICATIONS. ISSUES TO BE EXAMINED SHALL INCLUDE COHERENCY; BEAM, PULSE, AND BURST CHASING PROCESSING TECHNIQUES; ANTENNA BEAMFORMING TECHNIQUES; TARGET AND CLUTTER MODELING AND PROCESSING TECHNIQUES. ALSO, AS PART OF THE PHASE I EFFORT, A PARTICULAR SCENARIO WITH BISTATIC AND/OR MULTISTATIC SENSORS SHALL BE EXAMINED FOR THE PURPOSE OF EVALUATING THE ADVANTAGES AND DISADVANTAGES VIA A VIS A COMPARABLE MONOSTATIC SYSTEM.

DEFENSE RESEARCH TECHNOLOGIES INC
4608 NORBECK RD
ROCKVILLE, MD 20853
CONTRACT NUMBER: DAAL02-87-C-0044
DR TADEUSZ DRZEWIECKI
TITLE:
DEVELOPMENT OF A SINGLE-INPUT LAMINAR FLOW AMPLIFIER
TOPIC# 51 OFFICE: HDL

SUBMITTED BY

CONVENTIONAL LAMINAR PROPORTIONAL AMPLIFIERS (LPAS) ARE GEOMETRICALLY SYMMETRICAL AND ACCEPT INPUTS ON ONE SIDE OR ANOTHER BUT THE GAIN IS DEGRADED BY CROSS-TALK FROM THE IMPEDANCE OF THE OPPOSITE CONTROL, PARTICULARLY AT HIGH FREQUENCIES. OFTEN, AS IN PHOTO-ACOUSTIC TRANSDUCTION OR SEECH AMPLIFICATION, IT IS DESIROUS TO OPTIMIZE THE GAIN AT FREQUENCIES RANGING FROM 100 TO BEYOND 10,000 Hz. DR DRZEWIECKI IS THE INVENTOR OF TWO, SINGLE-INPUT LAMINAR DEVICES. THE FIRST, A SET-POINT SENSOR, PRODUCES A DIFFERENTIAL OUTPUT SIGNAL PROPORTIONAL TO CHANGES IN PRESSURE ABOUT SOME ABSOLUTE LEVEL. THE SECOND DEPENDS ON THE DEFLECTION OF A LAMINAR STREAM FROM A CONTROL PORT ON ONE SIDE WHEN THE OPPOSITE SIDE IS IN A FREE FIELD. BOTH AMPLIFIERS ARE GEOMETRICALLY ASYMMETRICAL AND SIGNIFICANTLY DEVIATE FROM CONVENTIONAL AMPLIFIER DESIGN. WHILE CONCEPTUALLY, AND ON A LIMITED EXPERIMENTAL BASIS, THESE AMPLIFIERS HAVE DEMONSTRATED PERFORMANCE INCREASES, IT STILL REMAINS TO ADEQUATELY ANALYZE, CHARACTERIZE, AND DEMONSTRATE ENGINEERING FEASIBILITY OF THESE DEVICES. IT IS THE PURPOSE OF THIS RESEARCH TO PROVIDE THE GOVERNMENT WITH THE BASIS FOR THE DEVELOPMENT OF SUCH DEVICES.

DELFIN SYSTEMS
2001 GATEWAY PL - STE 420
SAN JOSE, CA 95110
CONTRACT NUMBER: DAAA15-87-C-0054
MARK WILLIAMS
TITLE:
LOTS DECISION AID
TOPIC# 100 OFFICE: HEL

THE DEFENSE TRANSPORTATION SYSTEM NETWORK HAS MANY NODES EXTENDING FROM THE SHIPPER TO THE OVERSEAS FIELD COMBAT COMMANDER. IN A MAJOR DEPLOYMENT OF U.S. FORCES TO A THEATER OF OPERATIONS APPROXIMATELY 95% OF UNIT COMBAT EQUIPMENT SUSTAINING SUPPLIED AND RESUPPLY ARE TRANSPORTED BY CARGO SHIPS. THE MOST DEMANDING WAR SCENARIOS ASSUME THAT FIXED SEAPORT DISCHARGE FACILITIES ARE DENIED. CARGO DISCHARGE, THEREFORE, REQUIRES A LOGISTIC OVER THE SHORE (LOTS) OPERATION. THE GOAL OF THIS PROJECT IS TO PROVIDE THE OCEAN TERMINAL COMMANDER IN THE THEATER OF OPERATIONS A DECISION-MAKING TOOL FOR THE FEASIBLE UTILIZATION OF WATERCRAFT LIGHTERAGE TO MEET THE CARGO REQUIRED DELIVERY DATES OF THE THEATER COMMANDER. THIS GOAL WILL BE ACHIEVED

SUBMITTED BY

THROUGH ARCHITECTURE DESIGN AND SYSTEM PROTOTYPING OF A BLACKBOARD-BASED EXPERT SYSTEM DECISION AID RUNNING ON AN IBM PC/AT.

DIALOG SYSTEMS INC
2842 E GRAND RIVER
EAST LANSING, MI 48823
CONTRACT NUMBER: DAAA21-87-C-0120
DR OMAR K HELFERICH
TITLE:
AN EXPERT SYSTEM FOR USE WITH COMPUTER AIDED AMMUNITION
DESIGN
TOPIC# 26 OFFICE: ARDC

FEASIBILITY STUDY FOR USING ARTIFICIAL INTELLIGENCE SYSTEMS IN AMMUNITION PACKAGING DESIGN. EXPERT SYSTEMS WOULD BE USED BY A DESIGNER INDEPENDENTLY OR IN CONJUNCTION WITH A COMPUTER AIDED DESIGN SYSTEM. THE EXPERT SYSTEM WOULD BE PC BASED, MENU-DRIVEN, AND USER INTERACTIVE. THROUGH A SERIES OF QUESTIONS, THE SYSTEM WOULD SOLICIT INFORMATION ABOUT THE ENVIRONMENT A PRODUCT WILL BE SHIPPED, STORED, AND HANDLED IN. BASED ON THIS INFORMATION AND THE PRODUCT'S CHARACTERISTICS, THE EXPERT SYSTEM AIDS IN DETERMINING PACKAGING REQUIREMENTS. PACKAGING REQUIREMENTS COULD RELATE TO MARKINGS, COSTS, CLIMATE, VIBRATION, COMPRESSION, SHOCK, NUCLEAR/BIOLOGIC CHEMICAL (NBC) ENVIRONMENT, ELECTRO-STATIC DISCHARGE, ETC. BASED ON PACKAGING REQUIREMENTS THE SYSTEM WOULD SEEK ADDITIONAL INFORMATION RELATING TO A SPECIFIC REQUIREMENT TOPIC, UTILIZE INTERNAL DATA BASES, AND RECOMMEND DESIGN APPROACHES. MODULES COULD DEAL WITH JACKET REQUIREMENTS, CUSHION REQUIREMENTS, MARKETING/LABELING REQUIREMENTS, OR OTHER TOPICS AS REQUIRED. THE LEVEL OF PROTECTION, MATERIAL/DESIGN OPTIONS, COSTS, AND THE REASONS FOR THE RECOMMENDATION WOULD BE PRESENTED. DURING PHASE I AN OVERALL EXPERT SYSTEM DESIGN, PHASE II IMPLEMENTATION COST/BENEFITS AND A PROTOTYPE TYPE EXPERT SYSTEM WILL BE DEVELOPED. THE PROTOTYPE WILL DEAL WITH ONE SPECIFIC REQUIREMENT TOPIC (SHOCK, VIBRATION, CLIMATE, ETC.).

DISPLAYTECH INC
2200 CENTRAL AVE - STE C
BOULDER, CO 80301
CONTRACT NUMBER: DAAA15-87-C-0044
DR MARK HANDSCHY
TITLE:
HIGH SPEED ELECTRO-OPTIC IMAGE SHUTTER USING FERROELECTRIC
LIQUID CRYSTALS
TOPIC# 92 OFFICE: BRL

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1
BY SERVICE
FISCAL YEAR 1987
ARMY

PAGE 60

SUBMITTED BY

THE PROPOSED WORK AIMS TO DEVELOP ELECTRO-OPTIC SHUTTERS THAT HAVE A UNIQUE COMBINATION OF OPERATING PROPERTIES RESULTING FROM THEIR USE OF FERROELECTRIC LIQUID CRYSTALS (FLCs). THE ELECTRO-OPTIC CHARACTERISTICS OF FLCs WOULD ALLOW THE SHUTTER FAST SWITCHING (20 MICROSECONDS) AT LOW DRIVE VOLTAGE (15 V) WITH VERY LITTLE ENERGY CONSUMPTION (5 MICROJOULES/SWITCHING). THE EMPHASIS OF THE EFFORT IS ON DEVELOPING TECHNIQUES FOR FABRICATING SHUTTERS OF HIGH OPTICAL QUALITY. SPECIFIC OBJECTIVES INCLUDE 2.5 CM APERTURE DIAMETER, 1000:1 EXTINCTION, AND 25% TRANSMITTANCE WITH LESS THAN 0.25% VARIATION ACROSS THE APERTURE AND LESS THAN + OR - 5% VARIATION WITH WAVELENGTH WITHIN THE VISIBLE SPECTRUM.

E.W.S. LTD INC
JOURNEY'S END RD
CROTON, NY 10520
CONTRACT NUMBER: DACA39-87-C-0032
ROBERT J RICHTER
TITLE:
NEW METHODS OF CONSTRUCTING SCALE MODEL ARMOR UNITS
TOPIC# 265 OFFICE: WES

SCALE MODEL ARMOR UNITS OF SPECIFIED SIZE, SHAPE, AND DENSITY ARE NEEDED FOR USE IN COASTAL MODEL INVESTIGATION OF BREAKWATER STABILITY. THE TECHNICAL REPORTS INDICATE THAT THE MODELS USED IN PREVIOUS TESTS MADE USING A SULFUR COMPOUND HAD A LOW-BREAK STRENGTH. THE AIM OF THIS RESEARCH IS TO DEVELOP MODELS IN EITHER PLASTIC, AND/OR "SUPER" CONCRETE IN A COST-EFFECTIVE, SAFE MANNER, THAT MEET THE SPECIFIED SIZE, SHAPE, AND DENSITY, AND HAVE A HIGH-BREAK STRENGTH.

EARTH TECHNOLOGY CORP (WESTERN)
3777 LONG BEACH BLVD
LONG BEACH, CA 90807
CONTRACT NUMBER: DACA39-87-C-0035
LARRY TAYLOR
TITLE:
LARGE-SCALE SOILS LABORATORY STRESS CELL
TOPIC# 264 OFFICE: WES

SUBMITTED BY

THE OBJECTIVE OF THE PROPOSED PROJECT IS THE CONCEPTUAL DEVELOPMENT, DESIGN AND FABRICATION OF A LARGE-SCALE STRESS CELL SYSTEM FOR LABORATORY SIMULATION OF IN SITU SOIL STRESS CONDITIONS. THE PURPOSE OF THE STRESS CELL IS TO PROVIDE A COST-EFFECTIVE MEANS TO DEVELOPING INTERPRETATIVE GUIDELINES FOR AND VALIDATING IN SITU DEVICES AND STUDYING IN SITU TESTING AND SAMPLING TECHNIQUES. THE PHASE I PROPOSAL PRESENTS A TECHNICAL APPROACH TO EVALUATING THE OVERALL FEASIBILITY OF THE PROPOSED SYSTEM. CONSIDERATION IS GIVEN TO EVALUATION OF A CUBICAL CELL UTILIZING A MODULAR DESIGN CONCEPT. CAPABILITIES WILL INCLUDE APPLICATION OF THREE PRINCIPAL STRESSES, CONTROL OF SATURATION AND PORE WATER PRESSURE AND VARIATION OF LATERAL STRESS WITH DEPTH OR AT SPECIFIC LOCATIONS TO SIMULATE DIFFERENT $K(\sigma)$ CONDITIONS. INSTRUMENTATION AND DATA ACQUISITION CONCEPTS WILL BE ADDRESSED WITH RESPECT TO MONITORING OF SOIL RESPONSE AND CONTROL/ VERIFICATION OF SOIL CONDITIONS BEFORE, DURING AND AFTER TESTING. THE PROPOSED PHASE I EFFORT WILL INCLUDE A LITERATURE SEARCH AND REVIEW, AN EVALUATION OF PRELIMINARY DESIGN CRITERIA AND INSTRUMENTATION REQUIREMENTS, AND ASSESSMENT OF AVAILABLE TECHNOLOGY, PREPARATION OF CONCEPTUAL DESIGN ALTERNATIVES, DEVELOPMENT OF AN ANALYTICAL MODEL TO ASSESS DESIGN ALTERNATIVES, AND A SUMMARY EVALUATION OF THE OVERALL FEASIBILITY OF THE PROPOSED PROJECTS.

EDWARDS COMMUNICATION ELECTRO-OPTICS
335 PARK ST NE
VIENNA, VA 22180
CONTRACT NUMBER: DAEA18-87-C-0035
RAJ B EDWARDS
TITLE:
EARLY WARNING LIGHTNING SENSING AND PROTECTION SYSTEM
TOPIC# 236 OFFICE: TECOM

EDWARDS COMMUNICATIONS ELECTRO-OPTICS (ECE) WILL DEFINITELY DETERMINE THE SCIENTIFIC AND TECHNOLOGICAL FEASIBILITY OF USING ECE'S REMOTELY OPERABLE SENSORS OF ELECTROMAGNETIC FIELDS FOR EARLY WARNING OF IMMINENT LIGHTNING STRIKES AND WILL PERFORM A 'PROOF OF PRINCIPLE' EXPERIMENT TO DEMONSTRATE THE PROPRIETARY PROTECTION CONCEPT. THE ALL-PASSIVE, FIELD SENSORS EMBODY ECE'S PROPRIETARY TECHNOLOGY. THE DESIGN ENVISAGES USE OF LIGHTNING SURVIVABLE INSULATING MATERIALS, AND PERMITS REMOTE OPERATION WITHOUT THE USE OF OUTDOOR ELECTRICAL

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LEADS, CIRCUITRY OR CONDUCTORS IN THE SURROUNDING AREAS OR VICINITY OF THE NON-METALLIC, MINIATURE SENSING ELEMENT, THEREFORE WILL NOT PERTURB ANTENNA RADIATION PATTERNS. THE PROTECTION OF DISTRIBUTED VULNERABILITIES IS OBTAINED BY THE USE OF A PROPRIETARY CONCEPT WHICH DIVERTS LIGHTNING AWAY FROM THE HIGH VALUE TARGETS. THE SCHEME YIELDS EMP INVULNERABILITY AND SURVIVABILITY. THE DESIGN FEASIBILITY STUDY AND THE FIRST ORDER EXPERIMENT EMPLOYING VOLTAGE AND DISTANCE SCALING, WILL CONCLUSIVELY DEMONSTRATE FEASIBILITY AND LAY THE STRONG FOUNDATION FOR PHASE II EXPLORATORY DEVELOPMENT AND ARE TO BE PERFORMED BY ECE IN VIENNA, VA. DR. BERNARD KEISER, THE NOTED CONSULTING ENGINEER ON LIGHTNING PROTECTION, WILL PERFORM INTERNAL ECE EVALUATION OF THE EARLY WARNING PROTECTION SYSTEM.

EIC LABS INC
111 DOWNEY ST
NORWOOD, MA 02062
CONTRACT NUMBER: DAAL01-87-C0738
DR K M ABRAHAM
TITLE:
HIGH ENERGY DENSITY CATHODES FOR RECHARGEABLE LITHIUM
TOPIC# 118 OFFICE: ETDL

A FEASIBILITY STUDY OF AN AMBIENT TEMPERATURE RECHARGEABLE LITHIUM BATTERY BASED ON THE $\text{Li}/\alpha\text{-MoO}(x)\text{S}(3)-x$ CHEMICAL COUPLE IS PROPOSED. IT IS ENVISIONED THAT, FULLY DEVELOPED, THIS BATTERY WILL PROVIDE A SPECIFIC ENERGY APPROACHING 300 Wh/kg. IN THE PHASE I PROGRAM IT IS PROPOSED TO SYNTHESIZE AND CHARACTERIZE A NOVEL SET OF Li INSERTION MATERIALS, AMORPHOUS MOLYBDENUM OXYSULFIDES OF THE GENERAL FORMULA $\alpha\text{-MoO}(x)\text{S}(3)-x$, DETERMINE THE ELECTRONIC CONDUCTIVITY OF THESE MATERIALS, AND ASSESS THEIR CATHODE CAPACITY USING WELL SPECIFIED, LABORATORY TEST CELLS. THE ELECTROLYTE WILL BE THF:2,Me-THF/LiAsF(6), THE HIGHEST EFFICIENCY Li CYCLING SOLUTION PRESENTLY AVAILABLE TO USE OVER MOST OF THE MIL-SPEC TEMPERATURE RANGE. THE CELL TESTS WILL CONSIST OF CAPACITY DETERMINATION OVER A WIDE RANGE OF CURRENT DENSITIES FROM 0.5 THROUGH 8 mA/cm², AND GALVANOSTATIC AND POTENTIOSTATIC CYCLING. IT IS INTENDED THAT THIS PHASE I PROGRAM WILL ESTABLISH A STRONG FOUNDATION FOR A PHASE II PROGRAM, INVOLVING AN EXTENSIVE BATTERY DEVELOPMENT, BY ANSWERING BASIC QUESTIONS CONCERNING THE SUITABILITY OF THE MOLYBDENUM OXYSULFIDES FOR USE

SUBMITTED BY

AS REVERSIBLE CATHODE MATERIALS IN Li CELLS.

ELECTRO MAGNETIC APPLICATIONS INC
PO BOX 8482
ALBUQUERQUE, NM 87198
CONTRACT NUMBER: DAAL02-87-C-0091
T H LEHMAN

TITLE:

DEVELOPMENT OF APPROXIMATIONS FOR A FAST-METHOD OF MOM
TECHNIQUE BASED ON NORMAL MODES
TOPIC# 60 OFFICE: HDL

A FAST NEW APPROXIMATION FOR THE METHOD OF MOMENTS SOLUTION OF
ELECTROMAGNETIC RESPONSE PROBLEMS IS PROPOSED. THE NEW APPROACH IS
BASED ON SEPARATION OF THE PROBLEM INTO A GLOBAL RESPONSE SET DEPEND-
ENT ON NORMAL MODES, AND A LOCAL RESPONSE DEPENDENT ON GEOMETRICAL
OPTICS. THE EFFORTS OF NEGLECTING THE LOCAL RESPONSE TERM ALONG WITH
OTHER APPROXIMATIONS WILL BE INVESTIGATED TO QUALIFY THE RESULTING
ERROR AND PERFORMANCE. THIS NEW TECHNIQUE IS EXPECTED TO BE AS MUCH
AS 1000 TIMES FASTER THAN CONVENTIONAL METHOD-OF-MOMENTS FORMULATIONS
FOR TYPICAL PROBLEMS. THE FEASIBILITY OF EXTENDING THIS APPROACH TO
MORE COMPLEX GEOMETRIES AND TO HYBRID SOLUTION TECHNIQUES, WHERE THE
FAST RESPONSE SOLUTION IS OVERLAID INTO ANOTHER SOLUTION TECHNIQUE
SUCH AS A NON-LINEAR FINITE DIFFERENCE COMPUTATION, WILL BE EVALUATED.

ELECTRO-OPTEK CORP
3152 KASHIWA ST
TORRANCE, CA 90505
CONTRACT NUMBER: DAAB07-87-C-F080
WILLIAM S CHAN

TITLE:

HgCdTe EPITAXY ON Si SUBSTRATE
TOPIC# 310 OFFICE: NV

A PROPOSAL IS MADE ON AN INNOVATIVE APPROACH TO PERFORM EPITAXIAL
GROWTH OF HIGH-QUALITY HgCdTe (HCT) MATERIAL ON SILICON (Si) SUB-
STRATES BY MOLECULAR BEAM EPITAXY (MBE). BY USING Si SUBSTRATE, A
LARGE SURFACE AREA OF HCT EPITAXIAL LAYER CAN BE MADE RESULTING IN

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 64
BY SERVICE
FISCAL YEAR 1987
ARMY

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A POTENTIALLY COST-EFFECTIVE METHOD OF FABRICATING LARGE DETECTOR ARRAYS. THE PROPOSED INNOVATION FIRST EMPLOYS THE MBE TECHNIQUE TO FORM A PERFECTLY-BUFFERED SILICON SUBSTRATE ON WHICH TO PERFORM THE EPITAXY OF HCT. IT IS THEN FOLLOWED BY THE EPITAXY OF LOW DEFECT, HIGHLY UNIFORM HCT EPILAYER. THE OBJECTIVE OF PHASE I OF THE PROPOSED PROGRAM ARE: TO DEFINE AND DELINEATE THE COMPLETE MBE PROCESS FOR PERFORMING HgCdTe EPITAXY AND BUFFERED SUBSTRATES. TO ESTABLISH THE MBE COMPONENTS AND SUBSTRATE PREPARATION REQUIREMENTS.

ELECTRO-RADIATION INC
225 RTE 46 - STE 7
TOTOWA, NJ 07512
CONTRACT NUMBER: DAAB07-87-C-P035
MURRAY W ROSEN
TITLE:
RESEARCH IN ARTIFICIAL INTELLIGENCE FOR NON-COMMUNICAT
ELECTRONIC WARFARE SYSTEMS
TOPIC# 291 OFFICE: EW

THE PROGRAM DEFINES THE REQUIREMENTS FOR A SYSTEM SUPERVISORY CONTROL FUNCTION FOR ESM AND EW PLATFORMS, APPLICABLE TO THE US ARMY QUICK FIX SYSTEM. THE PROJECT INCORPORATES ARTIFICIAL INTELLIGENCE/EXPERT SYSTEM TECHNIQUES TO STRUCTURE THE DESIGN ARCHITECTURE AND CONDUCT THE KNOWLEDGE ENGINEERING NECESSARY TO DEFINE THE CONTROL STRUCTURE (INTERFERENCE ENGINE) AND THE KNOWLEDGE DATA BASE. THE EFFORT ATTEMPTS TO CAPTURE USER MISSION OBJECTIVES AND EXPERT EXPERIENCE, KNOWLEDGE, AND JUDGEMENT; CORRELATE AND INTEGRATE INFORMATION FROM MULTIPLE SENSORS, SUCH AS ESM, COMMUNICATIONS, AND REL-NAV SYSTEMS; PROCESS AND PRIORITIZE THE BATTLEFIELD ENVIRONMENT/SCENARIO; ASSIGN JAMMING RESOURCES, OPTIMIZE AND MANAGE ECM TECHNIQUES, AND CONDUCT POWER MANAGEMENT; RESOLVE RESOURCE CONFLICTS; INTERFACE WITH HUMAN OPERATORS AT SELECTABLE ATTRIBUTE LEVELS TO ALLOW DEGRESS OF AUTONOMOUS OPERATOR INTERACTIVE OPERATION. THE PROJECT CONDUCTS THE NECESSARY RESEARCH TO PLAN, MECHANIZE AND DEMONSTRATE A PROTOTYPE DESIGN.

ENERGY OPTICS INC
224 N CAMPO
LAS CRUCES, NM 88001
CONTRACT NUMBER: DAMD17-87-C-7221
JEAN J ROBILLARD
TITLE:
SELF-DEVELOPMENT X-RAY FILM
TOPIC# 277 OFFICE: MEDICAL

SUBMITTED BY

THIS PROGRAM IS ORGANIZED TO DEMONSTRATE THE FEASIBILITY OF A NON-SILVER X-RAY PROCESS TO ELIMINATE THE NEED FOR SPECIAL CHEMICALS AND A DAYLIGHT DEVELOPING MACHINE FOR ARMY FIELD DENTAL APPLICATION. THIS PROCESS WILL BE COMPATIBLE WITH CURRENT X-RAY EQUIPMENT. THE IMPORTANT OBJECTIVES OF PHASE I ARE TO INVESTIGATE AND DEMONSTRATE THAT AN X-RAY PICTURE USING EXISTING X-RAY EQUIPMENT, NO CHEMICALS PROCESSING IS NECESSARY, INSENSITIVITY TO LIGHT.

ENGINEERING & ECONOMICS RESEARCH INC
1801 ALEXANDER BELL DR - STE 400
RESTON, VA 22091
CONTRACT NUMBER: DAAL01-87-C-0757
DR RASHMI LAL

TITLE:
MEASUREMENT AND MODELS OF EMPLOYMENT DECISION MAKING:
CONTRIBUTION OF FAMILY SATISFACTION ON RE-ENLISTMENT DE
TOPIC# 290 OFFICE: ARI

THE DECISION TO RE-ENLIST OR NOT TO RE-ENLIST IS A FUNCTION OF SEVERAL CONFLICTING ECONOMIC, PSYCHOLOGICAL AND SOCIOLOGICAL FACTORS. THE APPROACH OUTLINED IN THIS PROPOSAL SUGGESTS A MULTIVARIATE - MULTIDISCIPLINARY REGRESSION MODEL TO ANALYZE THE DECISION MAKING PROCESS. IN THIS MODEL, FAMILY SATISFACTION IS CONSIDERED AS ONE OF THE IMPORTANT EXPLANATORY VARIABLES. IT IS FURTHER PROPOSED TO ANALYZE REASONS OF FAMILY DISSATISFACTION. IT IS POSTULATED THAT FAMILY DISSATISFACTION MAY BE THE RESULT OF LOW FAMILY INCOME. AN EXPLORATORY ANALYSIS IS SUGGESTED TO FIND OUT IF FAMILY INCOME IS LOW BECAUSE THE ARMY SPOUSE IS AT A DISADVANTAGE IN THE LABOR MARKET.

ENGINEERS INTERNATIONAL INC
98 E NAPERVILLE RD
WESTMONT, IL 60559
CONTRACT NUMBER: DACA39-87-C-0040
PETER JAY HUCK

TITLE:
LARGE-SCALE SOILS LABORTORY STRESS CELL
TOPIC# 264 OFFICE: WES

SUBMITTED BY

THE DESIGN AND CONSTRUCTION OF A LARGE SCALE SOIL LABORATORY FACILITY CAPABLE OF IMPOSING AXISYMMETRIC STRESSES UP TO 1,000 PSI ON CYLINDRICAL SOIL SPECIMENS AS LARGE AS THREE METERS IN DIAMETER IS PROPOSED. THE OPTION OF PHASED CONSTRUCTION OF A 1-1/2 METER DIAMETER, FOLLOWED BY CONSTRUCTION OF A THREE METER DIAMETER FACILITY IS OFFERED. THE DESIGN WILL INCLUDE ALL ANCILLARY SPECIAL EQUIPMENT TO REDUCE THE PER TEST COST, MINIMIZING LIFE CYCLE COSTS. BOUNDARY CONDITIONS ARE IMPOSED TO PREVENT UNDESIRABLE SHEAR LOADING THAT CAN CAUSE NECKING OR BULGING. PROVISION IS MADE FOR VARIATION OF RADIAL STRESS ALONG THE SPECIMEN LENGTH. CONTROL SYSTEMS WILL PROVIDE FOR STRESS CONTROL, STRAIN CONTROL OR PROGRAMMED CONTROL.

ENVIRONMENTAL DIAGNOSTICS INC
2990 ANTHONY RD
BURLINGTON, NC 27215
CONTRACT NUMBER: DAMD17-87-C-7220
DR R KEVIN PEGG

TITLE:

TECHNICAL FEASIBILITY DEVELOPING A RECEPTOR TEST FOR A
BIOLOGICAL TOXIN
TOPIC# 331 OFFICE: MEDICAL

ENVIRONMENTAL DIAGNOSTICS, INC. PROPOSED TO DETERMINE THE FEASIBILITY OF APPLYING ITS NEW INNOVATIVE HAPTEN TECHNOLOGY TO THE DEVELOPMENT OF IMMUNORECEPTORS FOR DETECTION AND ASSAY OF BIOLOGICAL TOXINS. THE NEW HAPTEN RECEPTOR TECHNOLOGY OVERCOMES PREVIOUS SCIENTIFIC LIMITATIONS AND TECHNICAL DIFFICULTIES IN DEVELOPING IMMUNOASSAYS FOR HIGHLY TOXIC, LOW MOLECULAR WEIGHT PROTEIN TOXINS. TO DATE, THE TECHNOLOGY HAS BEEN USED TO DEVELOP TESTS FOR THE TOXIC CHEMICALS DIOXIN, POLY CHLORINATED BIPHENYLS AND ETHYLENE DIBROMIDE WITH SENSITIVITIES OF 10 PARTS PER TRILLION. IMMUNOASSAYS MAY BE ENGINEERED TO DEVELOP TESTS WHICH ARE HIGHLY SPECIFIC FOR A PARTICULAR TOXIN, OR FOR A FAMILY OF CHEMICALLY RELATED TOXINS, OR FOR A PARTICULAR TOXIN AND ITS METABOLITES AND ANALOGS. TETRODOTOXIN WILL BE USED AS A MODEL BIOLOGICAL TOXIN IN PHASE I. THE IMMUNORECEPTORS FOR TETRODOTOXIN WILL BE ADAPTED TO THE COMPANY'S EZ-SCREEN WHICH IS A LOW COST, COMMERCIALY SUCCESSFUL FIELD TEST THAT CAN DETECT TOXIC CHEMICALS IN THE PARTS PER TRILLION RANGE WITHOUT INSTRUMENTATION. A COLOR CHANGE RESULTS IN 3 TO 5 MINUTES THAT CAN BE EASILY INTERPRETED BY A RELATIVELY

SUBMITTED BY

UNSKILLED WORKER. SUCCESS IN PHASE I WILL INDICATE THAT TESTS CAN BE QUICKLY DEVELOPED IN PHASE II FOR 15 OR MORE BIOLOGICAL TOXINS.

ERDAS INC
430 TENTH ST NW - STE N-206
ATLANTA, GA 30318
CONTRACT NUMBER: DACA72-87-C-0007
LAWRIE E JORDAN III

TITLE:

DFAD-PLUS: A DATA FUSION METHODOLOGY FOR UPDATING AND
DFAD USING IMAGE PROCESSING ARTIFICIAL INTELLIGENCE TER
TOPIC# 239 OFFICE: ETL/PR-P

PHASE I OF THIS PROPOSAL WILL DESIGN THE METHOD FOR INTENSIFYING AND UPDATING DFAD DATA TO MEET TERRAIN ANALYSIS SPECIFICATIONS THROUGH A UNIQUE DATA FUSION APPROACH. THE APPROACH INVOLVES IMAGE PROCESSING (IP), ARTIFICIAL INTELLIGENCE, TERRAIN ANALYSIS (TA), AND GEOGRAPHIC INFORMATION SYSTEM (GIS) TECHNIQUES. THE DATA FUSION ND ANALYSIS WILL USE A "BLACKBOARD INTERFACE" MENU FOR THE FRONT END, WHICH WILL IN TRUN INVOKE PARALLEL PROCESSING OF DFAD, DTED, MSI (SPOT, TM, OTHER PLATFORMS), AUXILIARY DATA, AND PREBRIEF/HISTORY DATA. THE ARTIFICIAL INTELLIGENCE COMPONENT OF THE FRONT END MAKES HIGHLY EFFICIENT USE OF RULE-BASED AND PROCEDURAL KNOWLEDGE SOURCES, AS WELL AS MULTIPLE CONTROL STRATEGIES AND MULTIPLE KNOWLEDGE REPRESENTATION SCHEMES. THE IMAGE PROCESSING, TERRAIN ANALYSIS, AND G.I.S., COMPONENTS FORM THE CORE OF THE PACKAGE AND INCLUDE FULL CAPABILITIES FOR ENHANCEMENT, CLASSIFICATION, COORDINATE TRANSFORMATION/MAP PROJECTION, OVERLAY, MASKING, SEGMENTATION AND REGION IDENTIFICATION AND RASTER-TO-VECTOR CONVERSION FOR DFAD-COMPATIBLE OUTPUT. THE DESIGN OF THIS INTEGRATED SYSTEM WILL ALLOW OPERATIONAL PRODUCTION OF UPDATED AND INTENSIFIED DFAD DATA. PHASE II WILL RE-FINE THE SYSTEM TO PRODUCE NEW DFAD DATA FROM MSI WHERE CURRENT DFAD IS NOT AVAILABLE. THE PROTOTYPE ENVIRONMENT WILL BE IN ADA USING A MICROVAX II WITH INTELLIGENT PC/AT OR 386-BASED WORKSTATIONS.

ESSEX CORP
741 LAKEFIELD RD - STE B
WESTLAKE VILLAGE, CA 91361
CONTRACT NUMBER: DAAL01-87-C-0756
DR F A MUCKLER
TITLE:
RESEARCH IN SIMULATOR/DEVICE MIX METHODOLOGIES
TOPIC# 286 OFFICE: ARI

SUBMITTED BY

A TWELVE-TASK, SIX-MONTH, TECHNICAL EFFORT IS DESCRIBED TO PRODUCE DESIGN GUIDELINES AND RESOURCE ALLOCATION ALGORITHMS TO HELP SOLVE THE PROBLEM OF SELECTING AN APPROPRIATE DEVICE OR MIX OF DEVICES IN TRAINING APPLICATIONS. BASICALLY, THE APPROACH REQUIRES A COMPARISON OF STUDENT CHARACTERISTICS AND DEVICE ATTRIBUTES WITHIN THE FRAMEWORK OF THE IDENTIFICATION OF CRITICAL TASKS FOR TRAINING AS CONSTRAINED BY ORGANIZATIONAL UTILIZATION AND CONSTRAINTS. A COMPUTER SYSTEM - THE ESSEX TRAINING ANALYSIS SYSTEM (ETAS) - WILL BE USED TO PROVIDE THE FRAMEWORK FOR THIS COMPARISON. IN GENERAL, SIX STEPS ARE HIGHLIGHTED AMONG OTHERS: (1) IDENTIFICATION OF RELEVANT LEARNER CHARACTERISTICS, (2) IDENTIFICATION OF CRITICAL TASK CHARACTERISTICS, (3) REQUIREMENTS AND CONSTRAINTS IN THE TRAINING ENVIRONMENT, (4) IDENTIFICATION OF DESIRABLE PERFORMANCE OUTCOMES, (5) DEFINITION OF TRAINING DEVICE FUNCTIONAL ATTRIBUTES AND CANDIDATE SUITES OF DEVICE MIXES, AND (6) INTEGRATION OF THE STUDENT-CRITICAL TASK-TRAINING DEVICE-INSTRUCTIONAL STRATEGIES PARAMETERS INTO GUIDELINES AND ALGORITHMS FOR THE OPTIMAL SELECTION OF COST-EFFECTIVE SIMULATOR/DEVICE MIXES.

EVB SOFTWARE ENGINEERING INC
5320 SPECTRUM DR
FREDERICK, MD 21701
CONTRACT NUMBER: DAAB07-87-C-A041
EDWARD V BERNARD
TITLE:
REUSABLE SOFTWARE
TOPIC# 299 OFFICE: C/A

REUSABLE SOFTWARE IS A HOT TOPIC IN THE SOFTWARE ENGINEERING COMMUNITY. STUDIES SHOW THAT AS MUCH AS 75% OF THE SOFTWARE IN EXISTING SYSTEMS STUDIES HAVE COMMON FUNCTIONS. THIS WORK WILL CREATE A METRIC SCALE WHICH SHOWS IF SOFTWARE HAS THE POTENTIAL TO BE REUSED. IN ADDITION A SOFTWARE PARADIGM WILL BE CREATED THAT SHOWS A COMMONALITY IN REUSABLE SOFTWARE. FINALLY, A SOFTWARE DEVELOPMENT METHODOLOGY WILL BE IDENTIFIED WHICH PRODUCES REUSABLE MODULES.

EXAC CORP
1370 DELL AVE
CAMPBELL, CA 95008
CONTRACT NUMBER: DAAD05-87-C-0081
ALAN YOUNG
TITLE:
DIESEL ENGINE FUEL CONSUMPTION MEASUREMENT SYSTEM
TOPIC# 183 OFFICE: TECOM

SUBMITTED BY

THE OBJECTIVE OF THE PROPOSED PHASE I EFFORT IS TO DETERMINE THE FEASIBILITY OF USING COMMERCIALY AVAILABLE MASS FLOW MEASUREMENT TECHNOLOGY BASED ON THE CORIOLIS PRINCIPLE FOR DIESEL ENGINE FUEL CONSUMPTION MEASUREMENT. MASS FLOW RATE MEASUREMENT OF FUELS BASED UPON THE CORIOLIS PRINCIPLE ARE SUPERIOR TO TRADITIONAL VOLUMETRIC TECHNOLOGIES BECAUSE A DIRECT NON-INVASIVE MEASUREMENT OF MASS FLOW IS OBTAINED INDEPENDENT OF THE FUEL'S PHYSICAL OR CHEMICAL PROPERTIES. THE PROPOSED PHASE I EFFORT WILL EVALUATE THE SUITABILITY OF A COMMERCIALY AVAILABLE CORIOLIS MASS FLOWMETER FOR ARMY VEHICLE FUEL CONSUMPTION MEASUREMENTS FROM THE STANDPOINT OF OPERATIONAL PERFORMANCE, ENVIRONMENTAL RUGGEDNESS AND EXPLOSION PROTECTION.

F&H APPLIED SCIENCE ASSOCS INC
7105 GREENE ST
PHILADELPHIA, PA 19119
CONTRACT NUMBER: DAAL01-87-C-0750
PETER R HERCZFELD

TITLE:
OPTICAL CONTROL OF MICROWAVE/MILLIMETER WAVE DEVICES
TOPIC# 116 OFFICE: ETDL

THE PRINCIPAL AIM OF THE PROJECT IS TO INVESTIGATE OPTICALLY CONTROLLED MICROWAVE AND MILLIMETER WAVE DEVICES, PARTICULARLY PIN DIODES. THE WORK WILL INCLUDE BOTH EXPERIMENTAL INVESTIGATION, DESIGN FABRICATION, AND TESTING OF THESE DEVICES. THE THEORETICAL WORK WILL INCLUDE THE MODELING AND EVALUATION OF THE DEVICES.

FAILURE ANALYSIS ASSOCS
2225 E BAYSHORE RD
PALO ALTO, CA 94303
CONTRACT NUMBER: DAAE07-87-C-8058
ERNEST D EASON

TITLE:
DIESEL ENGINE RELIABILITY/DURABILITY ALGORITHM/METHOD
TOPIC# 162 OFFICE: TACOM

THE OBJECTIVE OF PHASE I IS TO DEVELOP A SPECIAL RELIABILITY ANALYSIS ALGORITHM FOR DIESEL ENGINES THAT ACCOUNTS FOR THE COMPLEX FACTORS

SUBMITTED BY

AND SEVERE ENVIRONMENTAL CONDITIONS EXPERIENCED IN MILITARY APPLICATIONS. A RELIABILITY, AVAILABILITY, MAINTAINABILITY (RAM) MONTE CARLO SIMULATION APPROACH IS PROPOSED TO BE INTEGRATED WITH EXISTING FAULT TREE ANALYSIS SOFTWARE FOR EFFICIENT PREDICTION OF DIESEL ENGINE SYSTEM-SPECIFIC RAM CHARACTERISTICS. BY DELEGATING THE DETAILED RELIABILITY MODELING TO FAULT TREE PROGRAMS, THE RAM SIMULATION CODE CAN BE STREAMLINED, MAKING IT ECONOMICAL FOR STUDYING RAM POLICY DECISIONS WHILE MAINTAINING MODEL SENSITIVITY TO ALL SIGNIFICANT RELIABILITY FACTORS. THE PECULIAR COMPLEX INTERRELATIONSHIPS BETWEEN COMPONENTS OF A DIESEL ENGINE WILL BE REPRESENTED IN THE PROPOSED APPROACH.

FERMIONICS CORP
9555 OWENSMOUTH AVE - STE 15
CHATSWORTH, CA 91311
CONTRACT NUMBER: DAAB07-87-C-F072
MUREN CHU

TITLE:
EPITAXIAL IR MATERIALS TECHNOLOGY FOR HIGH PERFORMANCE
GENERATION SYSTEMS
TOPIC# 310 OFFICE: NV

IN THE LAST SEVERAL YEARS, UNDER EXTENSIVE GOVERNMENT AND INDUSTRY R&D EFFORTS, GREAT ACHIEVEMENTS HAVE BEEN ACCOMPLISHED IN THE DEVELOPMENT OF HgCdTe INFRARED TECHNOLOGY. LWIR INFRARED FOCAL PLANE ARRAYS HAVE BEEN MADE AND HgCdTe EPILAYERS CAN BE PRODUCED BY NOT ONLY LPE BUT ALSO VARIOUS VAPOR PHASE METHODS. HOWEVER, AMONG ALL OF THESE SUCCESSES, THERE IS A BIG PROBLEM TO BE SOLVED, I.E. THE LOW DETECTOR ARRAY YIELD. BASED ON OUR ANALYSIS, THERE ARE THREE TYPES OF POOR PV DEVICES, AND CRYSTALLINE DEFECTS ARE MOST LIKELY RESPONSIBLE FOR THE POOR DEVICE PERFORMANCE. THE GOAL OF THIS PROGRAM IS THEREFORE TO DISCOVER THESE DEFECTS AND TO DEVELOP METHODS TO AVOID OR TO ELIMINATE THEM. IN THE PHASE I PROGRAM, WE WILL STUDY THE CAUSE OF Te PRECIPITATES AND THEIR EFFECTS TO THE MATERIALS AND DETECTORS BOTH THEORETICALLY AND EXPERIMENTALLY. IN ADDITION, CRYSTALLINE DEFECTS IN ZnCdTe SUBSTRATES WILL BE IDENTIFIED AND THEIR EFFECTS ON THE LPE LAYERS WILL BE CHARACTERIZED.

FIBERTEK INC
510-A HERNDON PKWY
HERNDON, VA 22070
CONTRACT NUMBER: DAAB07-87-C-F096
DR HORACIO VERDUN

TITLE:
APPLICATION OF THE SCANNING TUNNELING MICROSCOPE FOR N
TESTING OF HgCdTe DIODES
TOPIC# 306 OFFICE: NV

SUBMITTED BY

A NOVEL METHOD FOR NON-CONTACT, NON-INVASIVE IN-SITU PHOTODIODE EVALUATION ON THE WAFER IS PROPOSED. THE PROPOSED METHOD IS BASED ON A MODIFIED FORM OF THE SCANNING TUNNELING MICROSCOPE (STM). ALTHOUGH PRIMARILY A TOOL FOR MATERIALS SURFACE RESEARCH, WE BELIEVE THE TECHNIQUE CAN BE ADAPTED TO MEASURE CURRENT THROUGH THE DIODE VIA TUNNELING FROM THE PROBE TIP TO THE CONTACTIVE PADS OF THE DIODES. IN CONJUNCTION WITH AN OPTICAL PROBE BEAM, THE RESPONSIVITY AT DIFFERENT WAVELENGTH AS WELL AS THE I-V CHARACTERISTIC CAN BE MEASURED.

FIBERTEK INC
510-A HERNDON PKWY
HERNDON, VA 22070
CONTRACT NUMBER: DAAB07-87-C-F074
DR W KOECHNER
TITLE:
SOLID STATE MID INFRARED LASER
TOPIC# 314 OFFICE: NV

THE POTENTIAL OF A SOLID STATE SOURCE FOR THE GENERATION OF TUNABLE MIR WILL BE REEXAMINED IN LIGHT OF RECENT DEVELOPMENTS IN THE AREA OF NEW NONLINEAR OPTICAL MATERIALS AND THE EMERGENCE OF VERY EFFICIENT SOLID STATE LASERS.

FLIGHT DYNAMICS INC
PO BOX 5070
RALEIGH, NC 27650
CONTRACT NUMBER: DAAK60-87-C-0031
THOMAS H PURCELL JR
TITLE:
DEMONSTRATION OF HIGH LIFT TO DRAG RATIO ROGALLO WING
TOPIC# 327 OFFICE: TPM

THE PROJECT WILL BE DEVOTED TO SELECTING AN OPTIMUM CONFIGURATION AND RUNNING 1/4 SCALE MODEL TESTS OF A ROGALLO TYPE WING. THE WING WILL HAVE HIGHER THAN USUAL ASPECT RATIOS FOR ROGALLO WINGS, AND WILL BE AIR DEPLOYABLE. A CONTROL SYSTEM TO AUTOMATICALLY LAND THE VEHICLE WILL BE DEVELOPED. FINAL DESIGN OF A FULL SCALE VEHICLE WILL BE DELIVERED.

SUBMITTED BY

FLOW RESEARCH CO
21414 - 68TH AVE S
KENT, WA 98032
CONTRACT NUMBER: DAAA21-87-C-0099
CHARLES SKORUPA
TITLE:
LIGHT-WEIGHT FIELD PORTABLE REMOTE EXPLOSIVES DEPLOYME
TOPIC# 12 OFFICE: ARDC

THE PROPOSED PROJECT ADDRESSES THE NEED FOR A SYSTEM TO DEPLOY EXPLOSIVES UNDERGROUND. THE SYSTEM WOULD BE BASED ON A GUIDED HORIZONTAL BORING TOOL CAPABLE OF MAKING EXCAVATIONS UP TO 400 FEET IN LENGTH AT DEPTHS UP TO 7 FEET. THE TOOL USES PRESSURIZED FLUID JETS TO CUT THROUGH A WIDE VARIETY OF SOIL TYPES. THE BORING TOOL COULD BE USED TO EITHER DROP AN EXPLOSIVE DEVICE AT A DESIRED LOCATION OR TO INSTALL A CONDUIT THAT COULD BE FILLED WITH PUMPABLE EXPLOSIVES. SUCH A SYSTEM WOULD HAVE SEVERAL BENEFITS OVER CONVENTIONAL EXPLOSIVES EMPLACEMENT TECHNIQUES. IT WOULD BE FASTER AND COULD EVENTUALLY BE FULLY AUTOMATED. IT ALSO WOULD OFFER SUBSTANTIALLY INCREASED CONCEALMENT SINCE THE TUNNEL WOULD NOT BE VISIBLE IN THE SURFACE. THE GOAL OF THE WORK PROPOSED FOR PHASE I IS TO PROVIDE AN ASSESSMENT OF CURRENT TECHNOLOGY AS RELATED TO DEFENSE NEEDS AND TO IDENTIFY THE REQUIRED DEVELOPMENT AREAS FOR PHASE II.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: DACA39-87-C-0042
ARNIS MANGOLDS
TITLE:
TECHNIQUE FOR REDUCING THE VARIABILITY BETWEEN SPT APP
TOPIC# 263 OFFICE: WES

A METHOD OF ESTABLISHING A STANDARD SPT TEST IS PROPOSED. IT INVOLVES ELIMINATING RANDOM ERROR BY MEANS OF EITHER AN AUTOMATIC TRIP MONKEY OR A SWING-OUT DROP WINCH. BOTH OF THE PROPOSED DESIGNS CAN BE RETROFIT TO EXISTING HAMMER SYSTEMS AT MINIMAL COST AND EXPENSE. IN

SUBMITTED BY

ORDER TO ELIMINATE SYSTEM ERROR BETWEEN HAMMER MODELS, A METHOD OF TUNING THE DELIVERED IMPACT ENERGY IS SUGGESTED. CONFORMANCE WITH ASTM DIMENSIONAL STANDARDS IS PRESERVED BY ALTERING THE HAMMER/ANVIL SPECT RATIO, OR BY USE OF CUSTOM CUSHION BLOCKS. THIS WILL AVOID TROUBLESOME CORRECTION FACTORS AND PRESERVE THE BUSINESS BASE OF EXISTING HAMMER PRODUCTS. A 60 PERCENT ER(i) IS SUGGESTED AS A GOAL IN ORDER TO REMAIN COMPATIBLE WITH THE ESTABLISHED INTERNATIONAL DATA BASE.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: DAAL04-87-C-0050
JOHN F McCOY
TITLE:
IN-SITU FIBER OPTIC SENSOR FOR FTIR MONITORING OF COMP
CYCLES
TOPIC# 106 OFFICE: MTL

FOURIER TRANSFORM INFRARED SPECTROSCOPY (FTIR) DEMONSTRATED IN THE LABORATORY IS A VALUABLE TECHNIQUE FOR MONITORING THE CURE CYCLE IN ADVANCED THERMOSETTING COMPOSITE MATERIALS. NEW INFRARED TRANSMITTING OPTICAL FIBERS OFFER THE PROMISE THAT THIS LABORATORY TECHNOLOGY CAN BE MOVED INTO A PRODUCTION ENVIRONMENT TO PROVIDE AN IN-SITU, NON-DESTRUCTIVE EVALUATION TECHNIQUE TO DETERMINE THE STATE OF CURE IN THERMOSET COMPOSITES IN REAL TIME. THIS PROGRAM INTENDS TO THOSE OBTAINED IN THE LABORATORY IN THE CURING CYCLE OF A TYPICAL THERMOSETTING RESIN USING AN OPTICAL FIBER SENSOR TRANSMITTING LINK AND A FTIR ANALYZER. THE FIBERS USED WILL BE OF A FLUORIDE GLASS CAPABLE OF TRANSMITTING IN THE NEAR-IR WAVELENGTHS THAT WILL PRODUCE SPECTRAL INFORMATION IN THE 2,200 TO 6,600 WAVENUMER BAND. BECAUSE OF THE RELATIVELY HIGHER ATTENUATION OF LIGHT IN THE CHALCOGENIDE GLASSES, WHICH TRANSMIT IN THE 800 TO 2,200 WAVENUMBER BAND, WE PROPOSE TO USE NEAR-IR SPECTRAL INFORMATION IN THE 1 TO 5 MICRO REGION USING VERY LOW ATTENUATION HEAVY METAL FLUORIDE GLASS FIBERS AND FTIR-CORRELATION TECHNIQUES. THE PHASE I PROGRAM WILL DEMONSTRATE WHETHER IR TRANSMITTING OPTICAL FIBERS ARE TECHNICALLY AND ECONOMICALLY FEASIBLE TO PROVIDE IN-SITU MEASUREMENTS OF STATE OF CURE IN A THERMOSET COMPOSITE MATERIAL.

SUBMITTED BY

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: DAAD05-87-C-0087
JOHN F McCOY
TITLE:
FIBER OPTIC NON-CONTACT TEMPERATURE MEASUREMENT SYSTEM
VEHICLE TRACKS
TOPIC# 182 OFFICE: TECOM

THE TRACKS AND TRACK PADS OF COMBAT VEHICLES UNDERGO BUILUPS IN TEMPERATURE IN EXCESS OF 300 DEG F LEADING TO PREMATURE FAILURE OF THE MATERIALS. IN ORDER TO BETTER UNDERSTAND THE EFFECT OF REPEATED TEMPERATURE EXCURSIONS IN DEVELOPING IMPROVED TRACKS AND TRACK PADS, A NEW METHOD OF MEASURING TEMPERATURE OF THESE PARTS WHILE THE VEHICLE IS IN OPERATION IS NEEDED. PRESENT METHODS ARE RESTRICTED TO MEASURING TEMPERATURES IN A STATIC CONDITION WHILE THE VEHICLE IS AT REST. NEW INFRARED TRANSMITTING OPTICAL FIBERS COUPLED TO A LOW COST, SIMPLE THERMOPILE DETECTOR OFFERS THE PROMISE OF A NOVEL NON-CONTACT METHOD FOR MONITORING TRACK TEMPERATURES IN REAL TIME WHILE THE VEHICLE IS MOVING. FOSTER-MILLER, IN CONJUNCTION WITH VANZETTI SYSTEMS, INC., INTENDS TO DEMONSTRATE THE FEASIBILITY OF SUCH A SYSTEM IN THIS PHASE I PROGRAM THAT WILL PROVIDE CONTINUOUS TEMPERATURE READINGS OVER A RANGE OF 150-500 DEG F + OR - 10 DEG F AND AN OUTPUT SIGNAL OF 0-5 VOLTS SUITABLE FOR DATA REDUCTION. THIS SIMPLE SYSTEM CAN MONITOR MULTIPLE POINTS AND BE RUGGEDIZED TO WITHSTAND THE ENVIRONMENT.

FROST ENGINEERING DEVELOPMENT CORP
PO BOX 1294 - 3900 S KALAMATH
ENGLEWOOD, CO 80150
CONTRACT NUMBER: DAAK60-87-C-0033
HORACE M VARNER
TITLE:
HIGH SPEED PERSONNEL PARACHUTE ENERGY ABSORBER
TOPIC# 176 OFFICE: NATICK

SUBMITTED BY

A SHORT-STROKE ENERGY ABSORBER CAN BE USED TO REDUCE PARACHUTE SNATCH FORCE AND THE ONSET RATE OF THE OPENING SHOCK. SUCH A DEVICE MUST OPERATE WITH THE DESIRED OPENING SHOCK FORCES AND BE NONELASTIC, LIGHT, SMALL, IN PARALLEL WITH THE RISERS, AND NOT RESULT IN ASYMMETRIC SUSPENSION AFTER PARACHUTE OPENING. ASSESSMENT OF THE DYNAMIC CHARACTERISTICS OF THE ENERGY ABSORBER WILL BE ACCOMPLISHED BY MEANS OF A DYNAMIC MODEL OF PARACHUTE OPENING TO BE DEVELOPED DURING THE PROJECT. A SMALL FRICTION DEVICE BASED ON THE CAPSTAN PRINCIPLE WILL BE USED IN CONJUNCTION WITH A SLIP-CLUTCH, FOR REPEATED USE, OR A STITCH-RIPPING MECHANISM, FOR ONE-SHOT USE, TO PROVIDE THE NEEDED RETARDING FORCE. METHODS FOR PREVENTING ASYMMETRIC SUSPENSION WILL BE STUDIED. THE RELATIVE COST ADVANTAGES AND DISADVANTAGES OF ONE-SHOT AND MULTI-USE DEVICES WILL BE COMPARED, AND THE BEST DESIGN SELECTED BASED ON TECHNICAL AS WELL AS THE COST AND OPERATIONAL FACTORS.

GAIN ELECTRONICS CORP
22 CHUBB WY
SOMERVILLE, NJ 08876
CONTRACT NUMBER: DAAL01-87-C-0736
THOMAS HIERL
TITLE:
HIGH EFFICIENCY MONOLITHIC GUNN OSCILLATORS
TOPIC# 123 OFFICE: ETDL

MOST GUNN DIODE OSCILLATOR APPLICATIONS CURRENTLY EMPLOY A DISCRETE GUNN DIODE EMBEDDED INTO EITHER A HYBRID OR A WAVEGUIDE MATCHING CIRCUIT. NEXT GENERATION MILITARY SYSTEMS WOULD BENEFIT FROM A MONOLITHIC DESIGN WHICH INCORPORATES THE GUNN DIODE AND ITS ASSOCIATED MATCHING CIRCUITRY ONTO ONE GaAs SUBSTRATE. THIS APPROACH OFFERS SEVERAL ADVANTAGES WHICH INCLUDE LOWER UNIT COST, BETTER REPRODUCIBILITY, SMALLER SIZE, LESS WEIGHT, AND BETTER PERFORMANCE. THIS PROGRAM WILL OPTIMIZE THE DESIGN OF A MONOLITHIC GUNN OSCILLATOR FOR OPERATION AT 35 GHz PHASE I EFFORTS INCLUDE THE OPTIMIZATION OF THE DOPING PROFILE FOR MAXIMUM POWER AND EFFICIENCY AND THE DEVELOPMENT OF THE PROCESS TECHNOLOGY FOR PLANAR DEVICES. PLANAR DISCRETE GUNN DIODES WILL BE FABRICATED AND EVALUATED. IN PHASE II, MATCHING CIRCUITS WILL BE DESIGNED AND FULLY MONOLITHICS OSCILLATORS FABRICATED AND EVALUATED DURING PHASE II.

GENERAL AERO PRODUCTS CORP
11 LINCOLN ST
COPIAGUE, NY 11726
CONTRACT NUMBER: DAAA15-87-C-0071
CHARLES MULLER
TITLE:
HELMET-MOUNTED STEREO DISPLAY SYSTEM
TOPIC# 88 OFFICE: BRL

SUBMITTED BY

A HELMET-MOUNTED DISPLAY (HMD) SYSTEM IS PROPOSED OPERATING WITH HOLOGRAPHIC OPTICS. THE HOLOGRAPHIC OPTICAL ELEMENT (HOE) REFLECTORS ARE MOUNTED ON OR DIRECTLY COATED ON A HEMISPHERICAL VISOR. THESE REFLECTORS WILL, IN COMBINATION WITH THE EYEPIECE SYSTEM, FOCUS THE IMAGES PROPERLY INTO THE EYES. BOTH IMAGES WILL PRODUCE A STEREO-SCOPIC VISION WHICH COINCIDES WITH THE SEE-THROUGH IMAGE. THE IMAGES THEMSELVES WILL BE REALIZED WITH AN IMAGING SYSTEM SUCH AS A CRT. THE CONNECTION WITH THE EYEPIECES ON THE HELMET WILL BE MADE BY MEANS OF OPTICAL FIBERS. THE HELMET POSITION AND ORIENTATION HAVE TO BE DETECTED AS REQUIRED FEEDBACK TO THE IMAGE GENERATING SYSTEM. THIS PROJECT SUGGESTS A HOLOGRAPHIC DETECTION SENSOR SYSTEM TO ACHIEVE THE DESIRED RESULTS. IN PHASE I, A DESIGN AND FEASIBILITY STUDY WILL BE ACCOMPLISHED.

GENERAL NETWORK CORP
25 SCIENCE PK
NEW HAVEN, CT 06511
CONTRACT NUMBER: DAAB07-87-C-A038
DR JASON LIU
TITLE:
ADVANCED FACILITIES TO EXPEDITE DESIGN AND EVALUATION
COMMUNICATIONS SYSTEMS
TOPIC# 302 OFFICE: C/A

THE ULTIMATE LONG-TERM OBJECTIVE OF THIS PROJECT IS TO ADAPT AND MODIFY GENERAL NETWORK'S TURNKEY PACKAGE, TOTAL SOLUTION, FOR MILITARY USE AS AN ADVANCED FACILITY TO EXPEDITE THE DESIGN AND EVALUATION OF COMMUNICATION SYSTEMS. TOTAL SOLUTION IS COMPRISED OF COMPUTER HARDWARE AND GENERAL NETWORK'S PROPRIETARY SOFTWARE. THIS SOFTWARE IS AN INNOVATIVE, MODULARIZED, INTERACTIVE GRAPHICS SYSTEM DEVELOPED FOR COMMERCIAL USE IN DESIGNING, TESTING, EVALUATING AND OPTIMIZING THE PERFORMANCE AND ECONOMICS OF COMMUNICATION SYSTEMS, INCLUDING VOICE, DATA, PACKET AND INTEGRATED NETWORKS. TOTAL SOLUTION IS AN EXISTING ADVANCED FACILITY WITH DEMONSTRATED SUCCESSFUL COMMERCIAL APPLICATIONS SOLVING COMPLEX COMMUNICATION SYSTEM PROBLEMS INCLUDING NETWORK SURVIVABILITY, RELIABILITY, SECURITY AND OPTIMAL COMPONENT INTERCONNECTIONS. PHASE I OBJECTIVES ARE TO 1) RESEARCH, INVENTORY AND PRIORITIZE THE REQUISITE VARIABLES AND ATTRIBUTES OF BATTLEFIELD COMMUNICATION SYSTEMS, 2) EVALUATE PERTINENT ALGORITHMS

SUBMITTED BY

AVAILABLE AND DEFINE NEEDED MATHEMATICAL TECHNIQUES FOR MODELING THE NECESSARY EQUIPMENT AND ENVIRONMENTAL CONDITIONS AND 3) DETERMINE FEASIBILITY AND DEFINE PRIORITIES FOR ADAPING TOTAL SOLUTION TO THESE MILITARY APPLICATIONS. THE OVERALL GOAL IS TO USE THE VERSATILITY AND POWER OF TOTAL SOLUTION TO SOLVE A RANGE OF PROBLEMS FROM CONVENTIONAL NETWORK OPTIMIZATION TO THE EXPONENTIALLY MORE COMPLEX BATTLEFIELD COMMUNICATION SYSTEMS ENVIRONMENT.

GEO-CENTERS INC
7 WELLS AVE
NEWTON CENTRE, MA 02159
CONTRACT NUMBER: DAAL01-87-C-0742
E D PETROW/B NELSON
TITLE:
OPTICALLY ISOLATED SENSORS FOR MEGAWATT COMPONENTS
TOPIC# 131 OFFICE: ETDL

THE DEVELOPMENT OF A NEW FAMILY OF FIBER OPTIC SENSORS WHICH ARE BASED ON THE ELECTRO-OPTIC EFFECT IS PROPOSED. INTRINSICALLY, THESE SENSORS OFFER IMMUNITY TO THE EFFECTS OF ELECTROMAGNETIC INTERFERENCE (EMI), MAKING THEM IDEAL SENSORS FOR OPERATION IN, NEAR, OR ON MEGAWATT COMPONENTS. THE RELEVANT TECHNOLOGY DEMONSTRATION PROPOSED UNDER PHASE I WILL BE THE DEVELOPMENT OF A VOLTAGE SENSOR WHICH WILL HAVE A DYNAMIC RANGE GREATER THAN 40 dB AND AN AC MEASUREMENT BANDWIDTH CAPABILITY GREATER THAN A GHz. A NOVEL POLARIMETRIC OUTPUT DETECTION SCHEME IS ALSO PROPOSED WHICH PRODUCES A SENSOR OUTPUT THAT IS INSENSITIVE TO SOURCE LIGHT INTENSITY VARIATIONS, MICROBENDING LOSSES, RADIATION DARKENING OF THE OPTICAL FIBERS, AND SCINTILLATION OR OTHER LIGHT-PRODUCING EVENTS. THE PROPOSED PHASE I EFFORT WILL FOCUS ON: RELEVANT TECHNOLOGY DEVELOPMENT AND FABRICATION OF PROTOTYPE VOLTAGE SENSORS; PERFORMANCE EVALUATION AT THE SPONSOR'S LABORATORY (ETDL); AND CLOSE COORDINATION WITH RELATED TECHNOLOGY DEVELOPMENT EFFORTS AT THE NATIONAL BUREAU OF STANDARDS.

GEOHAZARDS INC
PO BOX 14956
GAINESVILLE, FL 32604
CONTRACT NUMBER: DAAD01-87-C-0070
DR ANTHONY F RANDAZZO
TITLE:
DEVELOPMENT OF A CORRELATION MODEL ADDRESSING CONTINGENT COURSES AMONG DESERTS
TOPIC# 224 OFFICE: TECOM

SUBMITTED BY

EXISTING CORRELATIONS OF MOBILITY ROUTES AMONG WORLD-WIDE DESERTS ARE BASED ON INCOMPLETE DATA AND ON A LIMITED ARRAY OF FACTORS. THE PROPOSED RESEARCH WILL YIELD A COMPUTER-BASED, DESERT MOBILITY COURSE CORRELATION MODEL WHICH WILL INVOKE A WEIGHTED APPLICATION OF EVERY SIGNIFICANT IMPACTING CRITERIA (E.G. TOPOGRAPHY, CLIMATE, ROAD NETWORKS, VISIBILITY, DRAINAGE, ETC.) TO A SERIES OF CORRELATION "FRAMES." THE MODEL, THEN, CAN ADAPT EACH FRAME TO ANY OF A SERIES OF SCENARIOS DICTATED BY SPECIFIC DESERT SITES, SEASONS, TACTICAL SITUATIONS, VEHICLE TYPES, MISSION DEMANDS, ETC. TO DEPICT GRAPHICALLY COURSE CORRELATIONS AND IDENTIFY ADVANTAGEOUS MOBILITY ROUTES. EXTENSIVE USE OF FACTOR ANALYSIS AND STATISTICAL EVALUATIONS OF DATA WILL CONTRIBUTE TO A COMPLETE COMPUTERIZATION OF THE MODEL TO FACILITATE INSTANTANEOUS GRAPHICAL PORTRAYAL OF CORRELATION RESULTS AND COMPILATION OF TRAVEL TIMES. SPECIFIC DATA FOR THE SONORAN-AMARGOSA DESERT WILL BE COLLECTED AND ANALYZED TO EVALUATE THE MODEL AND TO DEVELOP TEST PROGRAMS FOR VEHICLES AT THE YUMA PROVING GROUND.

GINER INC
14 SPRING ST
WALTHAM, MA 02254
CONTRACT NUMBER: DAAK70-87-C-0056
LARRY L SWETTE
TITLE:
IMPROVED CHLORINE FEEDER FOR REVERSE OSMOSIS WATER PUR
UNITS
TOPIC# 142 OFFICE: BRDC

THE PROGRAM'S GOAL IS TO DEVELOP A SAFE, RELIABLE SYSTEM FOR THE ON-SITE PRODUCTION OF SODIUM HYPOCHLORITE FOR DIRECT USE WITH THE REVERSE OSMOSIS WATER PURIFICATION UNIT. HYPOCHLORITES ARE WELL KNOWN FOR THEIR DISINFECTING POWER. THE PROPOSED METHOD, HOWEVER, REQUIRES THE DEVELOPMENT OF A SUITABLE FLOW-THROUGH ELECTROCHEMICAL REACTOR WITH THE FOLLOWING CHARACTERISTICS: 1) LIGHT WEIGHT AND SMALL VOLUME, 2) LOW COST, 3) ELIMINATES OR SAFELY MANAGES ANY BY-PRODUCT HYDROGEN, 4) CAPABLE OF BEING ACTIVATED INSTANTANEOUSLY ON DEMAND, 5) INHERENTLY SAFE, LOW MAINTENANCE OPERATION, 6) SAFELY DISPOSES (REACTS) RESIDUAL HYPOCHLORITE AND 7) LOW POWER/VOLTAGE OPERATION. THE METHODOLOGY FOR PHASE I WOULD BE TO CONDUCT SINGLE CELL STUDIES OF THE EFFECT ON EFFICIENCY OF SODIUM HYPOCHLORITE PRODUCTION

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AND CELL VOLTAGE BY CERTAIN REACTOR OPERATING PARAMETERS AND CELL CHARACTERISTICS INCLUDING ELECTRODE STRUCTURES AND CELL SEPARATORS. MATHEMATICAL MODELS WOULD BE DEVELOPED INTERACTIVELY WITH THE SINGLE-CELL TESTING. THE RESEARCH COULD RESULT IN THE DEVELOPMENT OF SEVERAL NOVEL CONCEPTS INCLUDING 1) THE USE OF AN OXYGEN (AIR) DEPOLARIZED ELECTRODE TO LOWER CELL VOLTAGE AND AVOID THE HYDROGEN EVOLUTION REACTION AND 2) THE ELECTROCHEMICAL REDUCTION OF SODIUM HYPOCHLORITE TO SODIUM CHLORIDE FOR SAFE DISPOSAL.

GINER INC
14 SPRING ST
WALTHAM, MA 02254
CONTRACT NUMBER: DAAD09-87-C-0048
DR JOHN A KOSEK
TITLE:
REAL-TIME MEASUREMENT OF HCl GAS
TOPIC# 205 OFFICE: TECOM

THE DEVELOPMENT OF A CONTINUOUS SAMPLING GASEOUS HCl DETECTOR IS PROPOSED. THE SYSTEM WILL BE BASED ON A SOLID POLYMER ELECTROLYTE SENSOR CELL. PROGRAM GOALS INCLUDE A RESPONSE TIME OF 90% OF FINAL RESPONSE IN LESS THAN 1 SECOND AND THE ABILITY TO DETECT GASEOUS HCl LEVELS AS LOW AS 0.1 PPM. WHEN DEVELOPED, THE METHOD WILL LEAD TO A RELIABLE, SENSITIVE HCl DETECTION SYSTEM.

GRADIENT LENS CORP
207 TREMONT ST
ROCHESTER, NY 14608
CONTRACT NUMBER: DAAA21-87-C-0123
PAUL O McLAUGHLIN
TITLE:
APPLICATION AND COMPARISON OF ASPHERE AND GRADIENT IND
TECHNOLOGIES
TOPIC# 2 OFFICE: ARDC

THE PURPOSE OF THE PROPOSED RESEARCH IS TO UNDERSTAND THE TRADE-OFFS BETWEEN GRADIENT-INDEX OPTICAL SYSTEMS AND ASPHERIC SYSTEMS. IN THE CASE OF GRADIENT-INDEX SYSTEMS, IT IS KNOWN THAT CERTAIN ADDITIONAL

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 80
BY SERVICE
FISCAL YEAR 1987
ARMY

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DEGREES OF FREEDOM EXIST WHICH MAKE RADIAL GRADIENTS MORE USEFUL THAN AXIAL GRADIENTS AND THAT AXIAL GRADIENTS HAVE THE ADDITIONAL CAPACITY TO CORRECT ABERRATIONS WITH RESPECT TO ASPHERIC SURFACES. HOWEVER, IT HAS NEVER BEEN SHOWN, IN REAL OPTICAL SYSTEMS, WHERE THESE ADVANTAGES LEAD. FOR EXAMPLE, DOES THIS MEAN THE DIFFERENCE OF FEWER NUMBER OF ELEMENTS IN AN AXIAL GRADIENT-INDEX SYSTEM VERSUS ITS ASPHERIC COUNTERPART? IS THE ASPHERIC SYSTEM EASIER OR MORE DIFFICULT TO MAKE THAN AN AXIAL GRADIENT AND, FINALLY, WHAT IS THE EXPECTED COST ADVANTAGE IN LOW VOLUME PRODUCTION (LESS THAN 1,000 PARTS/MONTH) IN THE SHORT TERM (0-3 YEARS) AND THE LONG TERM (4-10 YEARS).

GRANT J D INC
2675-J S SANTA FE
DENVER, CO 80223
CONTRACT NUMBER: DAAK70-87-C-0037
JAMES F DICKSON
TITLE:
FOAM AIR DECOYS
TOPIC# 137 OFFICE: BRDC

THIS PROJECT WILL RESEARCH MATERIALS AND DEVELOP A CONCEPT FOR MAKING TWO AND THREE DIMENSIONAL DECOY DEVICES REPRESENTING TACTICAL MILITARY MAJOR END EQUIPMENT. ADDITIONALLY, A PROTOTYPE DECOY DEVICE WILL BE MANUFACTURED. THE DECOYS WILL BE DUPLICATES OF AN ORIGINAL TACTICAL VEHICLE AND WILL HAVE HIGH FIDELITY VISUAL CHARACTERISTICS THROUGH THE USE OF BEAM MOLDING TECHNIQUES. VARIOUS TYPES OF MATERIALS WILL BE RESEARCHED TO INCLUDE FOAM AIR AND HARD FORM PRODUCTS. EMPHASIS WILL BE PLACED ON THE DECOYS HAVING THE CAPABILITY OF BEING LEFT IN THE FIELD AND SUBJECTED TO THE ELEMENTS AS WELL AS BEING SUFFICIENTLY STURDY TO ACCOMODATE FIELD HANDLING DEPLOYMENT. THE DECOYS WILL BE IN MODULAR/COMPRESSED FORM AS NECESSARY TO FACILITATE HANDLING AND STORAGE BUT STILL ALLOW RAPID DEPLOYMENT. EACH PIECE WILL BE LIGHT ENOUGH TO BE MAN PORTABLE. THE UNASSEMBLED/COMPRESSED DECOY WILL OCCUPY A SMALL FRACTION OF THE SPACE OF AN ORIGINAL PIECE OF MILITARY HARDWARE AND BE TRANSPORTABLE BY ORGANIC TACTICAL CARGO VEHICLE. WHILE BEING EMPLACED IN THE FIELD, THE PIECES COULD BE ASSEMBLED/ERECTED BY UNTRAINED INDIVIDUALS IN LESS THAN 1 MAN HOUR. THE ASEMBLED DECOY WILL BE LIGHT ENOUGH SO THAT IT CAN BE MANEUVERED INTO PLACE AND REPOSITIONED BY HAND. FIELD MAINTENANCE WOULD BE

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ACCOMPLISHED BY THE SERVICE MEMBERS WITH READILY AVAILABLE MATERIALS
SUCH AS TAPE AND VEHICLE PAINT.

GT-DEVICES INC
5705 GENERAL WASHINGTON DR
ALEXANDRIA, VA 22312
CONTRACT NUMBER: DAAA21-87-C-113
RODNEY L BURTON
TITLE:
REPETITIVE FAST HIGH CURRENT MECHANICAL OPENING SWITCH
TOPIC# 4 OFFICE: ARDC

TO DATE, HIGH CURRENT MECHANICAL OPENING SWITCHES FOR INDUCTIVE STORE APPLICATIONS HAVE BEEN LIMITED TO LONG (100-1000 MICROSEC) OPENING TIMES BECAUSE OF SPEED OR PRESSURE LIMITATIONS. BY USING AN INSULATING FLUID IN THE OPENING GAP, OPENING CURRENT AND VOLTAGE HOLDOFF PERFORMANCE CAN BE INCREASED TO THE MEGAMPERE/TENS OF KILOVOLTS LEVEL. OPENING TIMES IN THE 10 MICROSEC RANGE REQUIRE PRESSURE RISE RATES IN THE 10 TO THE 9TH POWER ATM/SEC RANGE, WHICH IS ACCOMPLISHED IN THE PROPOSED EFFORT BY A GIGAWATT-LEVEL ELECTROTHERMAL DISCHARGE IN A SMALL VOLUME. THE DISCHARGE PROVIDES FOR THE 10 TO THE 4TH POWER ATM PRESSURE REQUIREMENT TO MOVE THE SWITCH CONTACTS, AND ALSO PROVIDES FOR FLOW OF INSULATING FLUID INTO THE GAP TO QUENCH THE ARC. SINCE THE ELECTROTHERMAL DISCHARGE HAS DEMONSTRATED REPETITIVE OPERATION, SWITCH OPERATION AT 10 PPS OR SO IS POSSIBLE. THE PROPOSED PHASE I WORK CALLS FOR MODELING OF THE SWITCH AND CALCULATIONS OF ITS PERFORMANCE, PRIOR TO A PHASE II EXPERIMENTAL DEVELOPMENT EFFORT.

H&N INSTRUMENTS INC
412 DANIEL AVE
NEWARK, OH 43055
CONTRACT NUMBER: DAAH01-87-C-0924
DR GARY M NISHIOKA
TITLE:
A NOVEL TECHNIQUE FOR STUDYING WATER ASSOCIATED WITH O
TOPIC# 155 OFFICE: MICOM

THE DEGRADATION IN OPTICAL AND MECHANICAL PROPERTIES OF FIBERS CAUSED

SUBMITTED BY

BY ATMOSPHERIC WATER IS A SERIOUS PROBLEM. LITTLE IS KNOWN, HOWEVER, OF THE TYPES AND QUANTITIES OF WATER ACTUALLY ASSOCIATED WITH OPTICAL FIBERS, AND THE MECHANISM FOR THE DELETERIOUS EFFECT OF THESE STATES OF WATER. THIS PROJECT WILL UTILIZE A NEW METHOD TO STUDY THE WATER ASSOCIATED WITH OPTICAL FIBERS. THE METHOD CONTINUOUSLY MEASURES THE QUANTITY OF WATER DESORBED FROM FIBERS AS THEY ARE HEATED AT A CONSTANT RATE. THE METHOD CAN DISTINGUISH BETWEEN PHYSICALLY ADSORBED, CHEMICAL ADSORBED, NEAR SURFACE, AND BULK WATER. SINCE AS LITTLE AS 0.01 MICROGRAMS OF WATER CAN BE DETECTED FROM A 10 GRAM SAMPLE, THE METHOD IS SUFFICIENTLY SENSITIVE TO MEASURE SUBMONOLAYER QUANTITIES OF WATER. THE OBJECTIVE OF THIS PHASE I STUDY IS TO DEMONSTRATE THE USEFULNESS OF THE THERMODESORPTION METHOD THROUGH MEASUREMENT OF THE WATER ASSOCIATED WITH THE BARE AND COATED OPTICAL FILAMENTS. WATER ADSORPTION ISOTHERMS WILL ALSO BE GENERATED FOR EACH SAMPLE. THIS PHASE I STUDY WILL GENERATE UNIQUE CHEMICAL INFORMATION CONCERNING OPTICAL FIBERS. THIS STUDY WILL SERVE AS THE BASIS FOR A COMPREHENSIVE EXAMINATION OF THE EFFECT OF ENVIRONMENTAL WATER ON OPTICAL FIBERS.

HARTMANN RESEARCH INC
5419 RIDGEDALE DR
DALLAS, TX 75206
CONTRACT NUMBER: DAAL01-87-C-0749
CLINTON S HARTMANN
TITLE:
MODELS FOR MULTI-REGION SAW WAVEGUIDES ON ANISOTROPIC
TOPIC# 124 OFFICE: ETDL

THE PROPOSED RESEARCH WILL DEVELOP A MORE ACCURATE METHOD FOR ANALYZING SAW DEVICES BASED ON MODELING A SAW TRANSDUCER AS AN ACOUSTIC WAVEGUIDE. APPROXIMATE ANALYSIS HAS SHOWN THAT IN MOST CASES, THE LOWEST ORDER TRANSDUCER WAVEGUIDE MODES HAVE UNDESIRABLE MODE SHAPES THAT TEND TO CONCENTRATE ENERGY UNDER THE BUS BARS ON EITHER SIDE OF THE STRUCTURE. A MORE COMPLEX TRANSDUCER STRUCTURE IS PROPOSED WHICH SHOULD GREATLY IMPROVE THE LOWEST ORDER MODE SHAPES AND HENCE IMPROVE THE PERFORMANCE OF VIRTUALLY ALL TYPES OF SAW DEVICES. THE GOALS OF THE PROPOSED PROGRAM ARE (1) DEVELOP THE MODELING TECHNIQUES NEEDED TO ANALYZE COMPLEX TRANSDUCER STRUCTURES, (2) DEVELOP METHODS FOR ANALYZING THE EFFECTS OF SUBSTRATE ANISOTROPY,

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AND (3) DEVELOP METHODS FOR ACCURATELY MEASURING THE CHARACTERISTICS OF TRANSDUCER WAVEGUIDE MODES.

HOKENSON CO
840 S TREMAINE AVE
LOS ANGELES, CA 90005
CONTRACT NUMBER: DAAD03-87-C-0035
DR GUSTAVE J HOKENSON
TITLE:
EVALUATION OF AN ADD-ON MUZZLE EXHAUST FLOW MANIPULATOR
SUPPRESSION ON LARGE CALIBER GUNS
TOPIC# 214 OFFICE: TECOM

UTILIZING NUMERICAL SIMULATION TOOLS DEVELOPED BY THE PRINCIPAL INVESTIGATOR AND THE HOKENSON COMPANY FOR ARDEC, THE EVALUATION OF A SIMPLE AND LIGHTWEIGHT ADD-ON DEVICE TO MANIPULATE THE MUZZLE EXHAUST FLOW OF LARGE CALIBER GUNS IS PROPOSED. THE OBJECTIVE OF THESE SIMULATION IS TO DETERMINE THE SPECIFIC OPTIMUM GEOMETRIC CONFIGURATIONS OF THE GENERIC CONCEPT, ITS EFFECTIVENESS IN REDUCING THE RADIATED SOUND PRESSURE LEVEL AND THE REQUIREMENTS FOR PHASE II EXPERIMENTAL VALIDATION. BASED ON PREVIOUS AND ON-GOING STUDIES OF GUN FLOW FOR ARDEC, IT WAS NOTICED THAT THE INITIAL RADIAL IMPULSE APPLIED TO THE AMBIENT FLOW BY THE GAS IMMEDIATELY BEHIND THE PROJECTILE CONTRIBUTES SIGNIFICANTLY TO THE TRANSIENT PRESSURE FIELD IN THE ENVIRONMENT. THEREFORE, THE CONCEPT TO CAPTURE THIS TRANSIENT RADIAL 'JET' AT THE MUZZLE, RE-DIRECT AND DIFFUSE IT WAS DEVELOPED. BY VARYING EACH OF THE LENGTHS WHICH CHARACTERIZE THE DEVICE, ITS PERFORMANCE RELATIVE TO NOISE SUPPRESSION MAY BE QUANTIFIED. SUBSEQUENTLY, MODIFICATIONS TO THE CONCEPT MAY BE INDICATED AND GUIDANCE FOR THE PHASE II EXPERIMENTAL VALIDATION STUDIES SHALL RESULT. ALL COMPUTATIONS SHALL BE PRESENTED ON COLOR VIDEOTAPE FOR EFFECTIVE COMMUNICATION OF THE TRANSIENT MULTI-DIMENSIONAL FLOW SOLUTIONS.

HORINE ENGINEERS INC
PO BOX 2027
LOS GATOS, CA 95031
CONTRACT NUMBER: DAAA21-87-C-0190
CARLTON L HORINE
TITLE:
IMPROVED GASKET MATERIALS
TOPIC# 26 OFFICE: ARDC

SUBMITTED BY

IT IS PROPOSED TO ESTABLISH THE FEASIBILITY, AND PREPARE A PROTOCOL FOR SYNTHESIZING AND FORMULATING A NEW IMPROVED SILICONE ELASTOMER MATERIAL FOR USE IN ARMY WEAPONRY PACKAGING. THIS MATERIAL WILL HAVE EXTENDED SERVICE COMPARED TO ELASTOMERS CURRENTLY IN USE FOR THIS PURPOSE, AND PRODUCTION COSTS SHOULD BE REASONABLE. THE BEST MEASURE OF MERIT FOR LONG SERVICE LIFE IS LOW STRESS RELAXATION (AND INDIRECTLY LOW COMPRESSION SET). IT IS PROPOSED TO TEST A BASELINE GASKET MATERIAL FOR STRESS RELAXATION AND COMPARE THIS DATA WITH THREE SPECIALTY SILICONE RUBBERS (WITH CHEMICAL SIMILARITIES TO THE NEW MATERIAL) THAT ARE AVAILABLE IN EXPERIMENTAL QUANTITIES. PHYSICAL PROPERTY CHANGES OF THESE ELASTOMERS WILL BE MEASURED UNDER DIFFERENT DEGREES OF COMPRESSION (DEFLECTION) AT 73 DEGREES F, AS WELL AS HIGH (302 DEGREES F) AND LOW (-40 DEGREES F) TEMPERATURES. USING THE TIME-TEMPERATURE SHIFT METHOD (SUPERPOSITIONING), THE ACCELERATED AGING DATA WILL BE CORRELATED INTO A 73 DEGREE F MASTER CURVE, PROJECTING STRESS RELAXATION FOR SEVERAL YEARS (UP TO 20). THE 73 DEGREES F DATA (ONLY A FEW MONTHS TIME PERIOD IN PHASE I) WILL BE USED TO MAKE A PRELIMINARY ESTIMATE OF THE ADJUSTMENT FACTORS NEEDED FOR USE IN PREDICTING SERVICE LIFE OF ELASTOMERS.

HOUTZ INSTRUMENT & MACHINE
RD 1 - 103 HARVARD RD
PORT MATILDA, PA 16870
CONTRACT NUMBER: DAAA15-87-C-0043
RAYMOND E HOUTZ
TITLE:
STRAND BURNER FOR SPECTROSCOPIC AND PHOTOCHEMICAL PROB
BURNING PROPELLANTS
TOPIC# 81 OFFICE: BRL

THIS PROPOSAL WAS PREPARED IN RESPONSE TO SBIR 87.1 SOLICITATION A87-81 FOR THE DESIGN AND CONSTRUCTION OF A STRAND BURNER FOR SPECTROSCOPIC AND PHOTOCHEMICAL PROBING OF SOLID-PROPELLANT FLAMES. THE TEST RIG WILL BE A WINDOWED HIGH-PRESSURE VESSEL FOR FEEDING A PROPELLANT STRAND BURNING AT A FIXED POSITION. THE MAXIMUM CHAMBER PRESSURE IS 2000 PSI. THE TEST SECTION IS EQUIPPED WITH FOUR QUARTZ WINDOWS FOR FLOW VISUALIZATION AND NONINTRUSIVE COMBUSTION DIAGNOSTIC MEASUREMENTS. THE END-CAP PIECE WILL HAVE A WINDOW PORT FOR RADIATIVE IGNITION OF PROPELLANTS BY INFRARED- OR ULTRAVIOLET-ENERGY

SUBMITTED BY

SOURCE. THE END PRODUCT OF THIS PROJECT IS THE DELIVERY OF THE STRAND-BURNER TEST RIG DESCRIBED IN THIS PROPOSAL.

IAP RESEARCH INC
2763 CULVER AVE
DAYTON, OH 45429
CONTRACT NUMBER: DAAA15-87-C-0050
JOHN P BARBAR
TITLE:
TRANSITIONAL ARMATURE CONTACT DEVELOPMENT
TOPIC# 78 OFFICE: BRL

RAILGUN ARMATURES ARE LOSSY AND CAN PRODUCE SEVERE BARREL DAMAGE. THE OBJECTIVE OF THIS PROGRAM IS TO DEVELOP THE DESIGN TOOLS AND DATA REQUIRED TO PERMIT THE USE OF TRANSITIONING CONTACTS IN ARMATURES. THIS WILL SIGNIFICANTLY INCREASE THE EFFICIENCY AND BARREL LIFE OF RAILGUNS BY COMBINING THE LOW LOSS, LOW SPEED CHARACTERISTICS OF METAL ARMATURES WITH THE LOW DAMAGE, HIGH SPEED CHARACTERISTICS OF PLASMA ARMATURES. THE PROGRAM WILL BUILD ON EXISTING CONTACT THEORY AND WILL BE DIRECTED TO VALIDATION OF CONTACT TRANSITION CRITERIA.

IAP RESEARCH INC
2763 CULVER AVE
DAYTON, OH 45429
CONTRACT NUMBER: DAAD05-87-C-0089
DAVID P BAUER
TITLE:
ELECTROMAGNETIC BALLISTIC SHOCK SIMULATOR
TOPIC# 185 OFFICE: TECOM

THIS PROPOSAL DESCRIBES AN APPROACH FOR PROVIDING HIGH ACCELERATION, HIGH FREQUENCY CONTENT, BALLISTIC SHOCK LEVEL MECHANICAL LOADING TO TEST ARTICLES. AN ELECTROMAGNETIC ACCELERATOR CONCEPT IS PROPOSED TO MEET THE REQUIREMENTS. THE ACCELERATOR WILL BE POWERED FROM AN ENERGY DISCHARGE CAPACITIVE STORE. ACCELERATIONS AS HIGH AS ONE MILLION GEE WILL BE GENERATED.

ICE CORP
240 LEVEE DR
MANHATTAN, KS 66502
CONTRACT NUMBER: DAAK70-87-C-0032
WILLIAM H DAWES
TITLE:
THE DESIGN AND FABRICATION OF HYBRID CIRCUIT POWER SWI
INCLUDING DRIVE AND PROTECTION NETWORKS
TOPIC# 141 OFFICE: BRDC

SUBMITTED BY

THIS PROPOSAL WOULD ENCOMPASS THE DESIGN AND FABRICATION OF SOLID STATE POWER SWITCHES AS HYBRID CIRCUITS. THE CIRCUITS WOULD CONTAIN PARALLEL OUTPUT TRANSISTORS, ALL REQUIRED CURRENT DRIVE STAGES, HIGH-TEMPERATURE AND HIGH-CURRENT PROTECTION. TEMPERATURES ARE MEASURED WITH SCREEN PRINTED OR CHIP THERMISTORS AND CURRENT WILL BE MONITORED AS A VOLTAGE ACROSS A SENSE RESISTOR OR OTHER METHOD YET TO BE DESIGNED, SUCH AS HALL-EFFECT SENSORS. ALL COMPONENTS WILL BE SCREEN PRINTED OR SURFACE MOUNT DEVICES, INCLUDING THE OUTPUT TRANSISTORS. SUCCESSFUL COMPLETION OF THIS ACTIVITY WILL RESULT IN THE FABRICATION OF A NUMBER OF WORKING CIRCUITS.

II-VI INC
SAXONBURG BLVD
SAXONBURG, PA 16056
CONTRACT NUMBER: DAAB07-87-C-F088
KAI-YUNG LAY

TITLE:
DEVELOPMENT OF $Cd(1-x)Mn(x)Te$ AS A LATTICE MATCHED SUB
EPITAXY OF $Hg(1-x)Cd(x)Te$
TOPIC# 310 OFFICE: NV

THE GROWTH OF $Hg(1-x)Cd(x)Te$ LAYERS BY MOLECULAR BEAM EPITAXY (MBE) AND INNOVATIVE IN-SITU WAFER PREPARATION PRIOR TO GROWTH ARE KEY ISSUES IN DEVELOPING SECOND GENERATION HIGH PERFORMANCE IR DETECTORS. THE OBJECTIVE OF THIS WORK IS TO ESTABLISH THE GROWTH OF $Cd(1-x)Mn(x)Te$ CRYSTALS THAT CAN SERVE AS SUBSTRATES FOR THE GROWTH OF LATTICE-MATCHED $Hg(1-x)Cd(x)Te$ LAYERS. PHASE I WILL INCLUDE: (1) SCALEUP OF CRYSTAL GROWTH TECHNOLOGY TO PRODUCE LARGE HIGH QUALITY SUBSTRATES, (2) ASSESSMENT OF WAFER AND SURFACE PROCESSING, (3) DEVELOPMENT OF INGOT CHARACTERIZATION AND (4) DEVELOPMENT OF SPUTTER-CLEANING AND ANNEALING KINETICS UTILIZING X-RAY PHOTOEMISSION SPECTROSCOPY (XPS) AND PHOTOREFLECTANCE (PR) SPECTROSCOPY. PHASE II IS ENVISIONED TO INCLUDE: (1) PURIFICATION OF SOURCE MATERIALS, (2) DEVELOPMENT OF ADVANCED GROWTH TECHNOLOGY TO IMPROVE THE CRYSTAL QUALITY, (3) DEVELOPMENT OF ADVANCED CHARACTERIZATION TECHNOLOGY, (4) DEVELOPMENT OF IN-SITU FINAL WAFER PREPARATION AND GROWTH IN AN MBE SYSTEM.

IMATRON INC
389 OYSTER POINT BLVD
SO SAN FRANCISCO, CA 94080
CONTRACT NUMBER: DAAL04-87-C-0047
DR FREDRICK RODER

TITLE:
NONDESTRUCTIVE EVALUATION OF FIBER VOLUME DENSITY BY U
COMPUTERIZED TOMOGRAPHY
TOPIC# 102 OFFICE: MTL

SUBMITTED BY

COMPUTERIZED TOMOGRAPHY (CT) AFFORDS A UNIQUE CAPABILITY OF MEASURING THE FIBER VOLUME DENSITY OF COMPOSITE MATERIALS AT ANY POINT WITHIN THE VOLUME. IMATRON, INC. HAS DEVELOPED A CAPABILITY OF SCANNING COMPOSITE STRUCTURES RAPIDLY AND CONTINUOUSLY USING ELECTRON BEAM TECHNOLOGY TO REPLACE THE CONVENTIONAL ROTATING X-RAY TUBE AND THUS MAKE CT A PRACTICAL TOOL FOR NDE. IMATRON PROPOSES TO QUANTITATIVELY MEASURE THE FIBER VOLUME DENSITY OF A VARIETY OF COMPOSITE MATERIALS AND CONFIGURATIONS, DEMONSTRATE THE EFFICACY OF THIS APPROACH, AND PROJECT INSPECTION TIMES AND COSTS FOR PRODUCTION ITEMS.

IMSCO
2416 OUR COUNTRY RD
ESCONDIDO, CA 92025
CONTRACT NUMBER: DAAD09-87-C-0085
MICHAEL W YOUNG
TITLE:
STUDY PROGRAM FOR SIGNAL SECURITY FOR VIDEO (TELEVISIO
TOPIC# 204 OFFICE: TECOM

THE PROJECT AIMS WILL BE TO IDENTIFY SUITABLE NATIONAL SECURITY AGENCY ENCRYPTION DEVICES AND TRANSMISSION STANDARDS TO ENABLE TRANSMISSION AND RECEPTION OF SECURE VIDEO AND ANALOGUE DATA WITHIN THE CONSTRAINTS IDENTIFIED BY A87-204 REQUIREMENTS. THIS INFORMATION WILL ENABLE THE FULL DEFINITION OF A VIDEO CODER-DECODER (CODEC) EQUIPMENT FEATURING FULL COMPATIBILITY WITH SECURE TRANSMISSION STANDARDS.

INCUBATOR TECHNOLOGIES INC
RTE 4 - BOX 519
ROLLA, MO 65401
CONTRACT NUMBER: DAAL02-87-C-0075
VISHWA BHUSHAN
TITLE:
SHAPE CHARGE INITIATION OF HIGH EXPLOSIVE AND CARGO PR
TOPIC# 67 OFFICE: HDL

CURRENT FUZES FOR CARGO DISPENSING PROJECTILES CAN ALSO BE FITTED WITH A HIGH EXPLOSIVE (HE) BOOSTER PELLET AND USED TO INITIATE HE

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BURSTER TYPE PROJECTILES. ITI PROPOSES TO DEVELOP A SHAPE CHARGE FUZE THAT WILL DETONATE BOTH PROJECTILES. THE PHASE I EFFORT WILL INCLUDE ANALYSIS OF THE EXISTING PROJECTILE CONFIGURATIONS AND EXPLOSIVE/PROPELLANT CONTENT, SELECTION OF A SUITABLE SHAPE CHARGE CONFIGURATION AND LINER MATERIAL THROUGH TESTING AT DESIGN CHARGE SIZES, AND FABRICATION AND TESTING OF TWO PROTOTYPE FUZES. THE DEVELOPMENT OF A SHAPE CHARGE FUZE FOR THIS APPLICATION WOULD BE COMPATIBLE WITH THE IMMINENT FUTURE UPGRADE OF PROJECTILE HE'S WITHIN THE INSENSITIVE MUNITIONS PROGRAM TO PLASTIC BONDED EXPLOSIVES.

INDUSTRIAL QUALITY INC
PO BOX 2397
GAITHERSBURG, MD 20879
CONTRACT NUMBER: DAAK70-87-C0027
DANIEL POLANSKY
TITLE:
DEVELOPMENT OF REFERENCE RADIOGRAPHS FOR ALUMINUM WELD
TOPIC# 146 OFFICE: BRDC

A STANDARDS DOCUMENT OF REFERENCE RADIOGRAPHS OF ALUMINUM WELDS IS NEEDED TO MINIMIZE INTERPRETATION PROBLEMS RELATED TO THE ACCEPTANCE OF ALUMINUM WELDS IN MILITARY AND CIVILIAN STRUCTURES. THE REFERENCE RADIOGRAPHS WILL ALLOW THE PRODUCER AND THE BUYER TO AGREE ON A GIVEN GRADED REFERENCE RADIOGRAPH AS AN ACCEPTANCE QUALITY LEVEL AND WILL ALSO AID THIRD PARTY OBSERVERS TO AUDIT AND EVALUATE THE WELD QUALITY LEVEL PRODUCED. THE PROGRAM OBJECTIVE IS TO DEVELOP A SET OF REFERENCE RADIOGRAPHS FOR ALUMINUM WELDS. TO ACCOMPLISH THIS, A DATA BANK OF ALUMINUM WELD RADIOGRAPHS WILL BE COLLECTED FROM INDUSTRIAL AND GOVERNMENT INSPECTION FACILITIES. THE DATA BANK MAY CONSIST OF TRANSPARENCIES, PRINTS OR DIAGRAMS, OR COMBINATIONS OF THESE. THE DATA BANK WILL BE ORGANIZED IN TERMS OF ALUMINUM ALLOY, WELD THICKNESS, RADIOGRAPHIC TECHNIQUE, DEFECT TYPE AND DEFECT SEVERITY LEVEL. ONCE THE DATA BANK IS ORGANIZED IN THIS WAY, A DETERMINATION CAN BE MADE AS TO THE BEST WAY TO PROCEED. THE DATA BANK MAY BE SUFFICIENTLY COMPLETE SO THAT WE MAY BEGIN DISCUSSIONS WITH STANDARDS ORGANIZATIONS. IF THE DATA BANK IS INCOMPLETE, WE WILL PUT FORWARD A PLAN TO COMPLETE IT AND PREPARE THE WAY FOR A CONSENSUS STANDARD.

INFORMATION DYNAMICS INC
7903 SPRINGER RD
BETHESDA, MD 20817
CONTRACT NUMBER: DACA88-87-C-0012
STEVEN J KOLODRUBETZ
TITLE:
IDENTIFYING PHYSICAL BUILDING COMPONENTS FROM GRAPHICAL REPRESENTATION
TOPIC# 259 OFFICE: CERL

SUBMITTED BY

THE OBJECTIVE OF THIS PHASE I PROPOSAL IS TO DEVELOP A DESIGN AND IMPLEMENTATION CONCEPT OF AN EXPERT INTEGRATED SYSTEM THAT CAN SCAN A CONSTRUCTION DRAWING AND AUTOMATICALLY GENERATE AN ACCURATE BILL OF MATERIALS FROM THE ELEMENTS IN THE DRAWING. A PROTOTYPE WILL BE DEVELOPED ON A MICROCOMPUTER USING AUTOCAD, DBASE III, AND OTHER TOOLS AND CUSTOM PROGRAMS AS NECESSARY. THE WORK PLAN CAN BE BROKEN INTO FIVE CATEGORIES: PRODUCT EVALUATION AND SELECTION (SELECT APPROPRIATE TOOLS TO BE USED FOR FURTHER SYSTEM IMPLEMENTATION), GRAPHIC REPRESENTATION OF COMPONENTS (USING GRAPHIC REPRESENTATION STRUCTURES AND INFERENCE PROCESSES TO DETERMINE WHAT KIND OF BUILDING COMPONENT A GIVEN DRAWING ELEMENT IS), DRAWING ANALYSIS (ESTABLISHING THE APPROPRIATE DIMENSIONS OF THE GIVEN DRAWING ELEMENT FOR TAKEOFF PURPOSES), SUMMARY FILE GENERATION (DEVELOPMENT OF TOOLS TO REDUCE THE DATA GENERATED BY THE DRAWING ANALYSIS AND GRAPHIC REPRESENTATION TO A SPECIFIC FILE OR SET OF FILES), AND LINK TO DATABASES (LINKING THE SUMMARY FILE TO A DATABASE PROGRAM FOR REPORT GENERATION, ETC.).

INFORMATION RESEARCH ASSOCS

911 W 29TH ST

AUSTIN, TX 78705

CONTRACT NUMBER: DAAB07-87-C-A035

DOUG NEUSE

TITLE:

ADVANCED FACILITIES TO EXPEDITE DESIGN AND EVALUATION
COMMUNICATIONS SYSTEMS

TOPIC# 302

OFFICE: C/A

THE TECHNICAL OBJECTIVE OF THIS PROJECT IS TO ESTABLISH THE FEASIBILITY OF SATISFYING THE REQUIREMENTS OF THE U.S. ARMY COMMUNICATIONS ELECTRONICS COMMAND (CECOM) FOR RAPID AND EFFECTIVE MODELING OF U.S. ARMY COMMUNICATION SYSTEMS. THE METHOD WE PROPOSE FOR SATISFYING THESE REQUIREMENTS IS TO ADAPT A TOP-DOWN DESIGN SYSTEM FOR ELECTRONIC SYSTEMS BEING DEVELOPED FOR THE U.S. NAVY TO MODELING OF COMMUNICATION SYSTEMS. THE GOALS OF PERFORMANCE MODELING FOR THE ARMY'S COMMUNICATION SYSTEMS ARE DIFFERENT FROM THE GOALS OF MODELING FOR COMMERCIAL COMMUNICATION SYSTEMS. PERFORMANCE MODELING OF COMMERCIAL SYSTEMS IS PRIMARILY CONCERNED WITH OPTIMALITY UNDER RATHER STABLE OPERATING CONDITIONS. MODELING OF MILITARY SYSTEMS IS PRIMARILY CONCERNED WITH ADEQUACY UNDER DYNAMIC CONDITIONS. PERFOR-

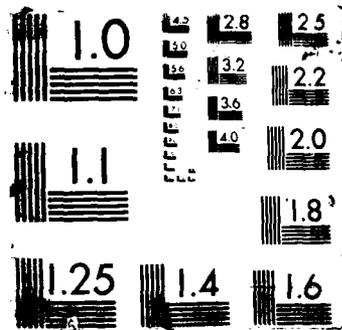
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MANCE IN THE PRESENCE OF FAULTS AND PERFORMANCE WITH DEGRADED RE-SOURCES ARE OF PRIME IMPORTANCE. THE OPPORTUNITY TO CREATE A DESIGN AND DESIGN EVALUATION SYSTEM WHICH MEETS THESE NEEDS IS AFFORDED BY THE CONFLUENCE OF SEVERAL TECHNOLOGIES. COMMUNICATION SYSTEMS ARE INCREASINGLY BEING BUILT FROM STANDARD COMPONENTS WHOSE INDIVIDUAL PROPERTIES ARE KNOWN. A REPERTOIRE OF TOOLS FOR EVALUTION OF MODELS OF COMMUNICATION SYSTEMS IS APPEARING. GRAPHICAL PROGRAMMING PROVIDES A MEANS OF DIRECT SYNTHESIS OF EXECUTABLE REPRESENTATIONS OF COMMUNICATION SYSTEMS AS SIMULATION MODELS.

INSTRUMENT RESEARCH CO
PO BOX 40207
SANTA BARBARA, CA 93103
CONTRACT NUMBER: DAAL02-87-C-0076
EDWARD L WITHEY
TITLE:
RECYCLABLE LOW-COST MINIATURE HIGH VOLTAGE SWITCH
TOPIC# 63 OFFICE: HDL

THE INSTRUMENT RESEARCH COMPANY IS PROPOSING A DEVELOPMENT EFFORT LEADING TO AN INEXPENSIVE, RUGGED, RELIABLE MINIATURE HIGH VOLTAGE SWITCH. TWO PRACTICAL APPROACHES ARE DISCUSSED; THE FIRST, A SWITCH EMPLOYING A MINIATURE SPHERICAL SPARK GAP WITH A MID-PLANE TRIGGER ELECTRODE, FABRICATED WITH AVAILABLE PRINTED CIRCUIT BOARD TECHNOLOGY. TRIGGERING CIRCUITRY EMPLOYING A PRINTED CIRCUIT STEP-UP COIL AND SURFACE-MOUNTED TRIGGERING COMPONENTS ARE ENVISIONED. A SECOND APPROACH EXAMINES MINIATURE SEALED GAS SPARK GAPS, SOLD AS TRANSIENT SUPPRESSORS, IN A HIGH VOLTAGE SWITCHING CONFIGURATION. TRIGGER ELECTRODE FIRING VIA THE CIRCUIT DISCUSSED ABOVE WILL BE EMPLOYED. THE PROPOSAL INDICATES A PRACTICAL DIRECTION FOR THE CONSTRUCTION METHODS AND MATERIALS, OUTLINES THE TYPE OF TEST INSTRUMENTATION REQUIRED, AND DISCUSSES THE WAYS WE INTEND TO OVERCOME THE PROBLEMS. OPTIONAL TECHNOLOGIES TO MEET THE SWITCH REQUIREMENTS ARE DISCUSSED, TOGETHER WITH THE DIFFICULTIES ASSOCIATED WITH THEM.

INTEGRATED CHEMICAL SENSORS CORP
44 MECHANIC ST
NEWTON, MA 02164
CONTRACT NUMBER: DAAA15-87-C-0047
DR GLENN J BASTIAANS
TITLE:
ELECTROPHORETIC DESORPTION FOR THE REGENERATION OF IMM
ACTIVE SENSOR SURFACES
TOPIC# 28 OFFICE: CRDC



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THE PURPOSE OF THIS PROGRAM IS TO DETERMINE IF THE PROVEN TECHNIQUE OF ELECTROPHORETIC DESORPTION (ED) CAN BE USED TO EFFECTIVELY REGENERATE IMMUNOLOGICALLY ACTIVE SURFACES SUITABLE FOR USE WITH MICRO-ELECTRONIC BIOSENSORS. PREVIOUS WORK ON ED WAS DONE WITH CHROMATOGRAPHIC GELS, NOT PLANAR SURFACES. A SYSTEM FOR ED OF PLANAR SENSOR SURFACES WILL BE DEVELOPED; THE SYSTEM WILL BE OPTIMIZED AND EVALUATED FOR THE EFFICIENCY OF REGENERATION AND THE REUSABILITY OF THE REGENERATED SURFACE. FACTORS TO BE CONSIDERED INCLUDE: ELECTRIC FIELD GEOMETRIES, POWER REQUIREMENTS, pH, IONIC STRENGTH, TIME REQUIREMENTS, EFFICIENCY OF ELUTION AND REUSABILITY OF THE REGENERATED SURFACE. THE COMBINATION OF THIS TECHNIQUE WILL CHAOTROPIC AGENTS AND SURFACTANTS WILL ALSO BE STUDIED. THE REMOVAL OF BOTH LARGE AND SMALL MOLECULES WILL BE STUDIED. THE MODEL SYSTEMS WILL BE BASED ON ICSC SAW SENSORS. IT IS EXPECTED THAT THE INFORMATION GAINED FROM THIS STUDY SHOULD BE APPLICABLE TO OTHER ELECTRONIC AND OPTICAL MICRO-SENSOR SYSTEMS AND RECEPTOR-BASED BIOSENSORS WHICH WILL BE STUDIED IN PHASE II OF THIS PROGRAM.

INTEGRATED SYSTEMS INC
101 UNIVERSITY AVE
PALO ALTO, CA
CONTRACT NUMBER: DAAA21-87-C-0101
DR ROBERT A WALKER
TITLE:
ADVANCED TRACKING AND ADAPTIVE POINTING CONTROL MODULE
TOPIC# 1 OFFICE: ARDC

ADVANCED GUN POINTING AND STABILIZATION SYSTEMS FOR BOTH ROTORCRAFT AND FIGHTING VEHICLE BASED WEAPONS REQUIRE THE INTEGRATION OF COMPLEX TARGET LEAD PREDICTION ALGORITHMS, NONLINEAR ADAPTIVE STRATEGIES, AND FAULT-TOLERANT USE OF MULTI-SENSOR SUITES INCLUDING IMV'S, DISTRIBUTED ACCELEROMETERS, OPTICAL SENSORS, R TO D CONVERTERS, AND ETC. CURRENT CONTROL HARDWARE ARCHITECTURES DO NOT PROVIDE A SUFFICIENTLY FLEXIBLE DESIGN AND TEST ENVIRONMENT TO READILY EVALUATE THE BENEFITS OF SUCH ADVANCED CONTROL STRATEGIES. THE PROPOSED RESEARCH WILL DEVELOP AND TEST A RUGGEDIZED HARDWARE PROTOTYPE SUITABLE FOR FLIGHT/GROUND VEHICLE TEST AND DEMONSTRATION. PHASE I WILL ADDRESS DETAILED ARCHITECTURE SPECIFICATIONS AGAINST ARMY COMPUTATIONAL REQUIREMENTS AND WILL GENERATE A DETAILED BROAD LEVEL HARDWARE SPECIFICATION FOR

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THE PROTOTYPE TO BE FULLY DEMONSTRATED IN PHASE II. SELECTED ELEMENTS OF THE ARCHITECTURE WILL BE DEMONSTRATED AT THE END OF PHASE I. AN OPEN, FLEXIBLE ARCHITECTURE IS PROPOSED WHICH WILL ALLOW RIDIG RECONFIGURATION AND UPGRADES TO THE STATE-OF-THE-ART HARDWARE INCLUDING ASIC'S FOR DEDICATED PRODUCTION WEAPONS SYSTEMS. PROCESSOR PROGRAMMING WILL BE ACCOMPLISHED VIA A BLOCK DIAGRAM DATA BASE AND AUTOMATED CODE GENERATION IN EITHER FORTRAN OR ADA DEPENDING ON USER REQUIREMENTS AND AVAILABLE PROCESSOR DEVELOPMENT TOOLS.

INTELLI-TEK INC
9653 REACH RD
POTOMAC, MD 20854
CONTRACT NUMBER: DAAD07-87-C-0101
BARRY G SILVERMAN
TITLE:
JAMS-II: A COMPUTER AIDED ELECTRONIC WARFARE VULNERAB
ASSESSMENT (EWVA) TECHNIQUE
TOPIC# 68 OFFICE: VAL

IT IS PROPOSED TO DEVELOP A COMPUTER-AIDED EWVA TECHNIQUE CALLED JAMS TO INCREASE THE PRODUCTIVITY OF EWVA PROFESSIONALS IN THEIR THEORETICAL/ASSESSMENT. JAMS WILL PROVIDE THIS SUPPORT SINCE IT IS BASED ON THE CASE ORIENTED PROCESSING ENVIRONMENT (COPE) CONCEPT WHICH INTEGRATES A NUMBER OF AI TECHNIQUES (E.G., LEARNING, BELIEF MAINTENANCE, REASONING, AND KNOWLEDGE REPRESENTATION/PROPAGATION) WITH MORE TRADITIONAL REPORT PREPARATION AND EWVA DECISION ANALYSIS METHODS IN A FASHION THAT SUPPORTS THE MANAGEMENT AND EVOLUTION OF KNOWLEDGE AS A CASE PROCEEDS. JAMS WILL PROVIDE THE PROFESSIONAL WITH AN INTELLIGENT CASE OBJECT (ICO) BASED ON THE STRUCTURE OF AN EWVA CASE; THAT CAN GROW AND ADAPT WITH EACH NEW CASE ITS APPLIED TO; AND THAT WILL SERVE AS THE ELECTRONIC EXTENSION OF THE CREATIVE PROFESSIONAL'S PENCIL AND PAPER WORKSPACE. THIS IS A PROPOSAL TO PREPARE A 6 MONTH PROOF-OF-CONCEPT PROTOTYPE AND PHASE II PLAN.

INTELLIGENT AUTOMATION INC
1715 GLASTONBERRY RD
ROCKVILLE, MD 20854
CONTRACT NUMBER: DAAA21-87-C-0106
DR LEONARD S HAYNES
TITLE:
A ROBOT VISION SYSTEM BASED ON PIPE AUGMENTED BY A MIN
STRUCTURED LIGHT SYSTEM
TOPIC# 7 OFFICE: ARDC

SUBMITTED BY

THIS PROPOSAL PROPOSES AN APPROACH TO 3-D VISION WHICH WILL BE PRACTICAL FOR USE IN INDUSTRIAL AND MILITARY APPLICATIONS OF ROBOTS SUCH AS THE PUMA 560. THE KEY COMPONENTS OF THE PROPOSAL ARE PIPE, WHICH STANDS FOR PIPELINED IMAGE PROCESSING ENGINE, AUGMENTED WITH A COMPACT STRUCTURED LIGHT PROJECTOR. PIPE CAN PERFORM REAL-TIME IMAGE ENHANCEMENT ON IMAGES, INCLUDING SUCH FUNCTIONS AS SMOOTHING, EDGE PRESERVING SMOOTHING, SPATIAL, HIGH AND LOW PASS FILTERING, TEMPORAL HIGH AND LOW PASS FILTERING, THRESHOLDING, REGION SHRINKING AND GROWING, AVERAGING AND NOISE REDUCTION, ARBITRARY NEAREST NEIGHBOR OPERATIONS, OR COMBINATIONS OF THESE TYPES OF OPERATIONS, ALL IN REAL-TIME. PIPE CAN PERFORM DIFFERENT OPERATIONS ON DIFFERENT PORTIONS OF AN IMAGE, AND THE DECISION AS TO WHICH OPERATIONS TO PERFORM ON WHAT PORTION OF THE IMAGE CAN BE CONTROLLED IN REAL-TIME BY THE IMAGE DATA. PIPE IS A COMMERCIAL PRODUCT. THIS PROPOSAL OUTLINES HOW PIPE, AUGMENTED BY A COMPACT STRUCTURED LIGHT SOURCE TO AID THE DISPARITY PROBLEM, CAN PROVIDE THE REQUIRED 3-D ROBOT VISION MODULE.

INTELLIGENT SYSTEMS INTEGRATION INC
2120 FATHER SKY NE
ALBUQUERQUE, NM 87112
CONTRACT NUMBER: DACA39-87-C-0025
DR TIMOTHY J ROSS

TITLE:

FRAME-TO-FRAME COHERENCE APPROACH TO EFFICIENT 3-D ANI
TOPIC# 262 OFFICE: WES

CURRENT 3-D ANIMATION TECHNIQUES INVOLVES SIMPLE SHOWING SEPARATELY PREPARED IMAGES IN A SEQUENCE. THESE TECHNIQUES ARE SOMETIMES CALLED REPEAT-STATIC TECHNIQUES BECAUSE THEY MAKE NO USE OF THE SIMILARITY BETWEEN THE SUCCESSIVE IMAGES IN THE PREPARATION OF THE IMAGES. FOR REALISTIC ANIMATION REQUIRING THOUSANDS OF FRAMES, THE COMPUTATIONAL COST CAN BE PROHIBITIVE, AND THE TURN-AROUND TIME UNACCEPTABLE. IN THIS PROPOSAL, WE DESCRIBE HOW FRAME-TO-FRAME COHERENCE CAN BE USED TO DRASTICALLY REDUCE THE IMAGE PREPARATION TIME AND COST. THE APPROACH MAKES USE OF THE FACT THAT IN ANIMATION, ANY IMAGE IN THE SEQUENCE IS USUALLY ALMOST IDENTICAL TO ITS PREDECESSOR. HENCE, MOST INFORMATION REQUIRED FOR VISIBLE STATUS DETERMINATION NEEDS NOT BE RECOMPUTED IF FRAME-TO-FRAME COHERENCE PROPERTY IS INCORPORATED INTO THE IMAGE GENERATION PROCESS.

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INTERNATIONAL INFORMATION SYSTEMS INC
802 WOODWARD RD
MARSHALL, VA 22115
CONTRACT NUMBER: DAAA15-87-C-0064
DR STEPHEN J ANDRIOLE
TITLE:
EMBEDDED PROCESS MODELING ANALOGY-BASED EXPLANATION FA
GRAPHIC NAVIGATIONAL AIDS FOR ENHANCED USER-COMPUTER I
TOPIC# 98 OFFICE: HEL

USER-COMPUTER INTERACTION AND THE INTERFACE (UCI) TECHNOLOGY THAT SUPPORTS IT IS FAR FROM PERFECT. IN SPITE OF CALLS FOR "USER FRIENDLINESS," USERS STILL GET LOST DURING PROBLEM-SOLVING SESSIONS, FORGET COMMAND STRUCTURES, AND FIND MANY INPUT ROUTINES DIFFICULT IF NOT IMPOSSIBLE TO USE. THIS PROPOSAL CALLS FOR THE DESIGN, DEVELOPMENT, AND EVALUATION OF SEVERAL ADVANCED TECHNIQUES FOR ENHANCED USER-COMPUTER INTERACTION. THE TECHNIQUES INCLUDE THE USE OF EMBEDDED PROCESS MODELS FOR SYSTEM STATUS MONITORING, THE USE OF ANALOGY-BASED EXPLANATIONS FOR ON-LINE INSTRUCTION AND TRAINING, AND THE USE OF GRAPHIC NAVIGATIONAL AIDS AND CUES FOR EFFECTIVE INPUT/PROCESS/OUTPUT ROUTINES. THE PROPOSAL CALLS FOR THE INCARNATION OF THE TECHNIQUES IN THE DOMAIN OF ARMY TACTICAL PLANNING VIA AN INTERACTIVE COMPUTER-BASED STORYBOARD THAT WILL DEMONSTRATE PRECISELY HOW THE TECHNIQUES CAN BE EXPECTED TO ENHANCE USER-COMPUTER INTERACTION.

INTERSPEC INC
1100 HECTOR ST
CONSHOHOCKEN, PA 19428
CONTRACT NUMBER: DAAL02-87-C-0068
MARK S PROKOP
TITLE:
DIGITAL BEAM FORMING RADAR
TOPIC# 41 OFFICE: HDL

TECHNIQUES ARE PROPOSED FOR REDUCING THE COMPUTATIONAL LOADING IN DIGITAL BEAM FORMING RADAR (DBFR). THESE TECHNIQUES INVOLVE REDUCING THE DYNAMIC RANGE OF THE INPUT SIGNAL BY PRE-PROCESSING BE-

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1
BY SERVICE
FISCAL YEAR 1987
ARMY

PAGE 95

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FORE DIGITIZING, THEN CONVERTING THE SIGNAL TO A POLAR COORDINATE REPRESENTATION TO REDUCE PROCESSOR LOADING FOR BEAM-STEERING AND SIGNAL PROCESSING. DYNAMIC RANGE REDUCTION TECHNIQUES ARE EXAMINED WITH REGARD TO RADAR DATA REPRESENTATION AND EFFECT ON RADAR SYSTEMS DESIGN AND PERFORMANCE. RADAR PERFORMANCE IS ANALYZED IN THE PRESENCE OF NOISE, CLUTTER AND EMI. SIGNAL PROCESSING STRUCTURES FOR RADAR ARE EXAMINED IN THE CONTEXT OF THE REDUCED DATA FORMAT AND A PROCESSING ARCHITECTURE IS ILLUSTRATED.

IRT CORP
1953 GALLOWS RD - STE 200
VIENNA, VA 22180
CONTRACT NUMBER: DAAL02-87-C-0078
VINCENT A DePRENGER
TITLE:
TOTAL DOSE PROM TEST
TOPIC# 44 OFFICE: HDL

THE MAIN OBJECTIVE OF THIS PROJECT IS TO CHARACTERIZE UP TO 5 EPROM IC PART TYPES TO TOTAL IONIZING DOSE. UNHARDENED EPROMS AND UVEPROMS WITH HIGH MEMORY DENSITIES, MOS TECHNOLOGIES, AND SCALED DOWN GEOMETRICS WILL BE CONSIDERED. ONLY THOSE EPROMS PRODUCED BY U.S. MANUFACTURERS AND FOR WHICH THERE IS NO EXISTING TOTAL DOSE DATA WILL BE TESTED. EACH DEVICE WILL BE POWERED UP AND FUNCTIONALLY TESTED CONTINUOUSLY WHILE BEING IRRADIATED IN ONE OF IRT'S COBALT-60 SOURCES. (A SPECIAL TEST CIRCUIT WILL BE DEVELOPED FOR THIS APPLICATION.) AS A RESULT, ERRORS DUE TO ANNEALING WILL BE MINIMIZED AND MORE ACCURATE FAILURE LEVELS CAN BE ACHIEVED THAN WITH STEP TESTING. THE TOTAL DOSE FAILURE LEVELS, PRE- AND POST-IRRADIATION PARAMETERS, AS WELL AS OTHER PERTINENT DATA WILL BE RECORDED, ANALYZED, AND REPORTED.

IRT CORP
3030 CALLAN RD
SAN DIEGO, CA 92121
CONTRACT NUMBER: DAAB07-87-C-P045
JOSEPH AZAREWICZ
TITLE:
ENERGY-COMPENSATED DETECTOR AND FRONT END ELECTRONICS
RADIOMETER
TOPIC# 295 OFFICE: EW

SUBMITTED BY

THIS PROPOSAL ADDRESSES THE FIRST PHASE OF A PROGRAM TO PRODUCE A LOW POWER, COMPACT AND PORTABLE SOLID STATE SURVEY METER/PERSONNEL RADIAC. IN THIS PHASE, EXTENSIVE COMPUTER MODELING WILL BE USED TO DETERMINE WHICH OF THE PROPOSED METHODS AND MATERIALS PRODUCE A LINEAR RELATIONSHIP BETWEEN DOSE AND SIGNAL. THE STUDY WILL EXAMINE BOTH THE PULSE COUNTING AND CHARGE INTEGRATION METHODS OF CALCULATING DOES AND DOSE RATE.

IRT CORP
PO BOX 85317
SAN DIEGO, CA 92138
CONTRACT NUMBER: DAAB07-87-C-PO59
DR RICHARD LUKENS
TITLE:
RADIOCHROMIC LEUKO DYE DOSIMETRY SOLUTIONS RESEARCH ON
OF YELLOWING
TOPIC# 296 OFFICE: EW

SOME BATCHES OF RADIOCHROMIC LEUKO DYE SOLUTIONS UNDERGO YELLOWING IN THE BASENCE OF EXPOSURE TO RADIATION. WHILE IT IS POSSIBLE THAT AN IMPURITY IN THOSE BATCHES MAY BE RESPONSIBLE FOR THE PROBLEM, OTHER CAUSES OF THE REACTION ARE POSSIBLE. FOR EXAMPLE, AN IMPURITY COMMON TO ALL BATCHES MAY ORDINARILY BE CONTROLLED BY A STABILIZER THATIS ABSORBED BY SOME BATCHES OF CONTAINER MATERIAL. THEREFORE, WE PROPOSE AN EFFORT THAT, INSTEAD OF RELYING EXCLUSIVELY ON CHEMICAL ANALYSES, ALSO ADDRESSES IMPORTANT ENERGY-HANDLING MARKERS---FLUORESCENCE, PHOSPHORESCENCE, AND CHEMILUMINESCENCE--FROM THE SOLUTIONS, THEIR COMPONENTS, AND THEIR CONTAINERS. THIS APPROACH WILL PROVIDE GREAT SENSITIVITY FOR COMPOSITIONAL DIFFERENCES BETWEEN GOOD AND POOR LEUKO DYE SOLUTIONS, CHANGES IN COMPOSITION OF THE SOLUTIONS WHILE IN THEIR CONTAINERS, AND CHEMICAL REACTIONS ASSOCIATED WITH YELLOWING. ADDITIONA, CHEMICAL ANALYSIS, AS MAY BE NECESSARY, WILL BE GUIDED BY THE LUMINESCENCE WORK. THE WORK WILL PRODUCE A KNOWLEDGE OF THE CAUSE OF THE YELLOWING PROBLEM AND RECOMMENDATIONS FOR ITS SOLUTION.

ISCAN INC
PO BOX 2076 - 755A CONCORD AVE
CAMBRIDGE, MA 02238
CONTRACT NUMBER: DAAJ02-87-C-0006
RIKKI RAZDAN
TITLE:
HELMET MOUNTED OCCULOMETER
TOPIC# 34 OFFICE: AVSCOM

SUBMITTED BY

THE INHERENT ABILITY OF THE OCULOMOTOR SYSTEM TO RAPIDLY SHIFT THE EYE'S LINE OF GAZE IN A CHANGING VISUAL ENVIRONMENT, POTENTIALLY MAKES THE EYE AN IDEAL INPUT DEVICE FOR MAN/MACHINE INTERFACE APPLICATIONS. INSTRUMENTATION TO MONITOR EYE MOVEMENTS AND MEASURE PUPIL DIAMETER MUST BE ABLE TO EASILY ACCOMODATE A WIDE VARIETY OF SUBJECTS, RELIABLY AND ACCURATELY COMPUTE EYE LINE OF GAZE OVER THE FULL RANGE OF AMBIENT LIGHT LEVELS AND BE MINIMALLY INTRUSIVE TO A SUBJECT'S WORKING ENVIRONMENT. WE PROPOSE TO DESIGN AND DEVELOP A HELMET MOUNTED OCCULOMETER WHICH WILL MEET THE ABOVE REQUIREMENTS. THE OCCULOMETER WILL INCORPORATE AN INFRARED VIDEO IMAGING SYSTEM COUPLED TO ISCAN'S REAL TIME EYE MOVEMENT MONITORING IMAGE PROCESSOR. PHASE I WILL EVALUATE THE COMPARATIVE BENEFITS OF USING A MINIATURE HEAD MOUNTED VIDEO CAMERA OR A COHERENT FIBER OPTIC BUNDLE CONNECTED TO AN OFF-HELMET VIDEO CAMERA TO ACQUIRE A TRACKABLE IMAGE OF THE EYE. WE WILL ALSO EXPLORE CALIBRATION AND AMBIENT LIGHT COMPENSATION TECHNIQUES WHICH WILL LEAD TO THE DEVELOPMENT OF A PROTOTYPE, SELF-CALIBRATING, HELMET MOUNTED OCCULOMETER.

J-TEC ASSOCS INC
317 - 7TH AVE SE
CEDAR RAPIDS, IA 52401
CONTRACT NUMBER: DAAA15-87-C-0072
ROBERT D JOY
TITLE:
ULTRASONIC TANK METEOROLOGICAL SENSOR
TOPIC# 77 OFFICE: BRL

KNOWLEDGE OF THE AIR PRESSURE, TEMPERATURE AND HUMIDITY ARE REQUIRED FOR SOLUTION OF THE TANK FIRE CONTROL ALGORITHMS. THE SEVERE ENVIRONMENT OF THE TANK MAKES THE USE OF CONVENTIONAL SENSING TECHNIQUES VERY DIFFICULT. THE TRANSMISSION EFFICIENCY OF AN ULTRASONIC SIGNAL IS SHOWN TO BE DIRECTLY DEPENDENT UPON THE ABSOLUTE AIR PRESSURE AND INVERSELY PROPORTIONAL TO THE ABSOLUTE TEMPERATURE. THE SPEED OF SOUND IS ALSO PROPORTIONAL TO THE ABSOLUTE AIR TEMPERATURE AND BY MEASURING BOTH THE RECEIVED SIGNAL LEVEL AND TIME DELAY, BOTH THE TEMPERATURE AND PRESSURE CAN BE DERIVED. BY PROPER CHOICE OF THE ULTRASONIC FREQUENCY, THE ULTRASONIC LOSS IS ALSO AFFECTED BY MOISTURE CONTENT IN THE AIR. THE USE OF TWO ULTRASONIC FREQUENCIES CAN THEN ALSO DETERMINE HUMIDITY LEVELS.

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J. K. RESEARCH
PO BOX 6124
BOZEMAN, MT 59771
CONTRACT NUMBER: DAAA15-87-C-0062
DR JOAN COMBIE
TITLE:
THERMOPHILIC MICROORGANISMS AS SOURCE OF HEAT STABLE O
PEROXIDASE
TOPIC# 29 OFFICE: CRDC

ENZYMES OF INTEREST IN CHEMICAL/BIOLOGICAL DEFENSE, PARTICULARLY
OXIDASES AND PEROXIDASES, WOULD BE MORE USEFUL IF THEY COULD WITH-
STAND HIGH TEMPERATURES AND HAD A LONGER SHELF LIFE. THERMALLY
LABILE FORMS NOW AVAILABLE COULD BE SYNTHETICALLY STABILIZED BUT THIS
WOULD BE EXPENSIVE. MICROORGANISMS EXISTING IN HIGH TEMPERATURE
HABITATS SURVIVE SUCH CONDITIONS BECAUSE THEY PRODUCE HEAT STABLE
ENZYMES. THE VARIED ENVIRONMENTAL EXTREMES OF A NEARBY GEOTHERMAL
REGION PROVIDE AN UNPARALLELED OPPORTUNITY TO SCREEN BACTERIA, FUNGI
AND ALGAE FROM THERMALLY STABLE OXIDASES AND PEROXIDASES. ONCE
ISOLATED, AN ATTEMPT WILL BE MADE TO INCREASE ENZYME PRODUCTION IN
THE MOST PROMISING ORGANISMS BY MANIPULATION OF AERATION, TEMPERATURE
AND CHEMICAL INDUCERS.

KARTA TECHNOLOGY INC
9303 LOCKRIDGE
SAN ANTONIO, TX 78250
CONTRACT NUMBER: DAAJ02-87-C-0010
DR G P SINGH
TITLE:
CERAMIC COMPONENT NONDESTRUCTIVE TESTING TECHNOLOGY
TOPIC# 37 OFFICE: AVSCOM

CERAMICS ARE BEING WIDELY CONSIDERED FOR REPLACEMENT OF METALS AND
POLYMERS IN MANY ENGINEERING APPLICATIONS. THEIR CORROSION RESIST-
ANCE, SMALL COEFFICIENTS OF THERMAL EXPANSION, LIGHT WEIGHT, LOW
COST, EXCELLENT MECHANICAL PROPERTIES UNDER HEAVY STRESS, OUTSTANDING
ELECTRICAL AND OPTICAL PROPERTIES, AND EXCEPTIONAL RESISTANCE TO HIGH

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TEMPERATURE, MAKE THEM VERY ATTRACTIVE IN STRUCTURAL, MICROELECTRONIC, AND BIOTECHNOLOGY AREAS. DESPITE THEIR DESIRABLE PROPERTIES, USE OF CERAMICS IS GREATLY RESTRICTED IN STRUCTURAL APPLICATIONS BECAUSE CERAMICS ARE BRITTLE AND THEIR PHYSICAL PROPERTIES ARE NONUNIFORM. TO ASSURE CERAMIC PRODUCT RELIABILITY, IT IS EXTREMELY IMPORTANT THAT THEY BE EXAMINED NONDESTRUCTIVELY. HIGH-FREQUENCY ULTRASONIC TECHNIQUES ARE PROPOSED TO DETERMINE GRAIN SIZE AND POROSITY, DETECT AND CHARACTERIZE SURFACE AND NEAR-SURFACE FLAWS INCLUDING CRACKS AND INCLUSIONS AND BULK DEFECTS. ULTRASONIC TECHNIQUES WILL BE EVALUATED ON SILICON NITRIDE, SILICA CARBIDE, AND ALUMINA CERAMICS.

KEM TEK INC
PO BOX 1285
LINWOOD, PA 19061
CONTRACT NUMBER: DAAK70-87-C-0050
ROGER DESROSIER
TITLE:
FOAM AIR DECOYS
TOPIC# 137 OFFICE: BRDC

RESEARCH PROGRAM IS DESIGNED TO TAKE CLOSELY ALLIED TECHNOLOGIES IN THE AREA OF FOAM AND INFLATABLES AND FABRICATE TWO AND THREE DIMENSIONAL LIGHT WEIGHT, LOW VOLUME, RAPIDLY DEPLOYABLE DECOYS HAVING REDUCED LOGISTICS BURDEN AND GREATLY IMPROVED FIDELITY AND SURVIVABILITY.

KMS FUSION INC
PO BOX 1567 - 3853 RESEARCH PK
ANN ARBOR, MI 48106
CONTRACT NUMBER: DAAD05-87-C-0164
STEPHEN W SMITH
TITLE:
FLEXIBLE DYNAMIC IR TARGET SIMULATOR
TOPIC# 228 OFFICE: TECOM

THE UNAVAILABILITY AND HIGH COST OF VEHICLES FOR USE ON RANGES TO PRODUCE IR SIGNATURES FOR TESTING, DEVELOPMENT AND TRAINING RESULTS IN LESS THAN OPTIMUM USE OF THE RANGES. TO ALLEVIATE THIS PROBLEM,

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 100
BY SERVICE
FISCAL YEAR 1987
ARMY

SUBMITTED BY

A FLEXIBLE, DYNAMIC IR TARGET SIMULATOR COULD BE USED ON THE RANGE TO SIMULATE THE THREE-DIMENSIONAL IR SIGNATURE OF ACTUAL VEHICLES. THE SIMULATOR SHOULD BE DYNAMIC TO SIMULATE REALTIME VARIATIONS IN THE IR SIGNATURE AS THE VEHICLE UNDERGOES VARIOUS MODES OF OPERATION. IT SHOULD HAVE A THERMAL RESOLUTION OF ABOUT ONE DEGREE C AND SPATIAL RESOLUTION OF APPROXIMATELY ONE SQUARE INCH. IT SHOULD BE HIGHLY MODULAR AND RECONFIGURABLE; EASY TO PROGRAM; AND CONTAIN EXTENSIVE DIAGNOSTIC AND SELF-TEST CAPABILITY. THIS PROGRAM INVESTIGATES THE FEASIBILITY OF SATISFYING THESE REQUIREMENTS BY USING AN ARRAY OF LOCAL MICROPROCESSOR CONTROLLED MODULES MOUNTED TO A FRAME SIMULATING THE SHAPE OF THE TARGET VEHICLE. A MASTER CONTROL MICROCOMPUTER DOWNLOADS THE TEMPERATURE PROFILE FOR EACH MODULE TO THE MODULE'S LOCAL PROCESSOR. TO SIMULATE DYNAMIC OPERATION OF THE TARGET, THE TEMPERATURE PROFILES FOR THE VARIOUS MODULES WOULD BE UPDATED BY THE MASTER CONTROLLER AND DOWNLOADED TO THE AFFECTED MODULE.

KMS FUSION INC
PO BOX 1567 - 3853 RESEARCH PARK DR
ANN ARBOR, MI 48106
CONTRACT NUMBER: DAAD05-87-C-0160
DONALD L MUSINSKI
TITLE:
IMPROVED BLAST OVERPRESSURE TRANSDUCER
TOPIC# 186 OFFICE: TECOM

WE WILL ESTABLISH PROOF OF PRINCIPLE FOR AN OPTICAL BLAST OVERPRESSURE TRANSDUCER FOR USE IN THE 1-100 kpa RANGE THAT WILL OPERATE FROM DC TO kHz, OR 300 kHz IF UNDAMPED. LIGHT FROM A LASER WILL BE TRANSMITTED TO THE TRANSDUCER THROUGH AN OPTICAL FIBER. THE OPERATION OF THE TRANSDUCER WILL BE BASED ON THE FACT THAT THE LIGHT COUPLED BACK INTO THE FIBER FROM THE TRANSDUCER WILL BE A FUNCTION OF THE PRESSURE IN THE ENVIRONMENT. THIS VERY SMALL (SUB-MILLIMETER) PHOTONIC TRANSDUCER WILL BE INSENSITIVE TO ELECTROMAGNETIC INTERFERENCE (EMI), YET EASY TO CONSTRUCT AND OPERATE. OUR OBJECTIVES ARE TO DESIGN THE UNIT, FABRICATE SEVERAL PROTOTYPES, AND MEASURE THEIR STATIC AND DYNAMIC RESPONSE OVER THE RANGE OF INTEREST.

KOFORD ENGINEERING
415 BELDEN AVE
ADDISON, IL 60101
CONTRACT NUMBER: DAAJ02-87-C-0008
STUART KOFORD
TITLE:
IMPROVED REPAIR TECHNIQUES FOR FIBER OPTIC CONNECTORS
TOPIC# 32 OFFICE: AVSCOM

SUBMITTED BY

CURRENTLY A PRIMARY DRAWBACK OF FIBER OPTIC SYSTEMS FOR MILITARY USE IS THE DIFFICULTY OF REPAIRING AND SERVICING THESE SYSTEMS. THE OBJECTIVE OF THIS PROJECT WILL BE TO DEVELOP TECHNIQUES FOR RAPID, RELIABLE FIELD REPAIR OF FIBER OPTIC CONNECTORS AND CABLES, TO PUT MAINTENANCE OF THESE SYSTEMS ON PAR WITH COPPER WIRE INTERCONNECTIONS. TECHNIQUES FOR RELIABLE HIGH PERFORMANCE TERMINATION OF GLASS FIBERS WITHOUT THE NEED OF EPOXY OR POLISHING WILL BE INVESTIGATED. AMONG THESE TECHNIQUES IS THE USE OF HAND OPERATED PORTABLE TOOLS TO CLEAVE THE FIBER UNDER TENSION, AND THE USE OF CONNECTORS CONTAINING LENSES, OR INDEX MATCHING FLUIDS TO ACHIEVE REDUCED LOSSES IN CRITICAL CIRCUITS. AN EMPHASIS WILL BE PLACED ON ACHIEVING CONSISTANT TERMINATION LOSSES WITH A MINIMUM OF OPERATOR INFLUENCE ON THE RESULT, AND WITHOUT COMPLEX PROCEDURES. TO THE GREATEST POSSIBLE EXTENT TECHNIQUES WILL BE DEVELOPED WHICH USE PROCEDURES AND TOOLS AS CLOSE AS POSSIBLE IN OPERATION TO EXISTING COPPER WIRE ITEMS. METHODS FOR ATTACHING THE FIBER AND CABLE TO THE CONNECTOR WHICH AVOID THE TIME CONSUMING APPLICATION OF ADHESIVES WILL BE INVESTIGATED. ALSO THE USE OF PERMANENT SPLICES TO REPAIR DAMAGE CABLE IN APPLICATIONS WHERE REPLACEMENT OF THE CABLE IS PROHIBITIVE WILL BE INVESTIGATED.

KOHLI S ASSOCS
1195 LANDSBURN CIR
WESTLAKE VILLAGE, CA 91361
CONTRACT NUMBER: DAA01-87-C-0068
SANJAI KOHLI
TITLE:
VELOCITY REFERENCE FOR TESTING INERTIAL SYSTEMS
TOPIC# 221 OFFICE: TECOM

IN THIS PROPOSAL A PROGRAM IS DESCRIBED FOR DETERMINING THE FEASIBILITY OF USING CODED RADIO FREQUENCY WAVES FOR DETERMINING THE VELOCITY OF AN AIRCRAFT WITH AN ACCURACY OF 0.05 M/S. A SIMULATOR WILL BE DEVELOPED TO SUPPORT ANALYSIS, IMPLEMENTATION AND TEST EFFORTS. THIS SIMULATOR WILL PROVIDE A PRECISE REPRESENTATION OF THE TRANSMITTER AND RECEIVER ERRORS, AND THE CHANNEL EFFECTS.

KOR ELECTRONICS INC
5731 McFADDEN AVE
HUNTINGTON BEACH, CA 92649
CONTRACT NUMBER: DAAL02-87-C-0067
MARTIN C SPRINGFIELD
TITLE:
APPLICATION OF DIGITAL RF MEMORIES TO MULTISTATIC RADA
TOPIC# 46 OFFICE: HDL

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 102
BY SERVICE
FISCAL YEAR 1987
ARMY

SUBMITTED BY

SEVERAL ISSUES IMPACTING THE SUCCESSFUL IMPLEMENTATION OF MULTISTATIC RADAR SYSTEMS CONTINUE TO REQUIRE RESEARCH. ONE SUCH ISSUE IS ACHIEVING COHERENCY BETWEEN TRANSMITTER AND RECEIVER. THIS PROPOSAL ADDRESSES THE USE OF A DIGITAL RF MEMORY (DRFM) IN ORDER TO DO SO. THE DRFM OFFERS THE ADDITIONAL POTENTIAL OF PROVIDING A TARGET RECOGNITION AND CLUTTER REJECTION CAPABILITY IN ADDITION TO ACHIEVING COHERENCY. A 2 PHASE PROGRAM IS PROPOSED; IN PHASE I SIGNAL PROCESSING REQUIREMENTS COMMON TO DIFFERENT TYPES OF MULTI-OR BI-STATIC RADAR OPERATIVES WILL BE IDENTIFIED IN ORDER TO DERIVE CANDIDATE IMPLEMENTATIONS. SELECTED REQUIREMENTS WILL BE MODELED TO PREDICT OVERALL RECEIVER PERFORMANCE AND OPTIMUM IMPLEMENTATION. THIS WOULD PROVIDE THE GROUNDWORK FOR A PHASE II EFFORT TO DESIGN, FABRICATE, AND TEST A BRASSBOARD RECEIVER SYSTEM TO DEMONSTRATE THE CONCEPT. THE PROPOSED EFFORT WILL BE PERFORMED BY PERSONNEL DOMINANT IN THE DRFM FIELD.

KOR ELECTRONICS INC
5731 McFADDEN AVE
HUNTINGTON BEACH, CA 92649
CONTRACT NUMBER: DAAD05-87-C-0085
MARTIN C SPRINGFIELD
TITLE:
MM-WAVE SIGNATURE GENERATOR STUDY
TOPIC# 229 OFFICE: TECOM

A REQUIREMENT EXISTS FOR A LOW COST TARGET SIMULATOR THAT CAN GENERATE A MM-WAVE RADAR RETURN IN ORDER TO REPLICATE THE RETURNS OF VARIOUS GROUND VEHICLES. SUCH A DEVICE IS NEEDED IN ORDER TO EFFECTIVELY TEST "SMART MUNITION" WEAPON SYSTEMS EMPLOYING MM-WAVE TARGET SEEKERS. THIS PROPOSAL DESCRIBES AN APPROACH WHICH APPLIED DIGITAL RF MEMORIES (DRFMs) TECHNIQUES TO THE PROBLEM; A 2 PHASE PROGRAM IS PROPOSED. IN THE FIRST PHASE THE RANGE OF PARAMETERS WHICH CHARACTERIZE THE TYPE OF RETURNS OF INTEREST WILL BE IDENTIFIED AND THE VIABILITY OF THE PROPOSED APPROACH TO SATISFY THESE REQUIREMENTS WILL BE DEMONSTRATED IN THE LABORATORY. PHASE 1 WILL CULMINATE WITH THE SPECIFICATION AND GENERAL DESIGN OF A BRASSBOARD MM-WAVE TARGET SIMULATOR SYSTEM THAT COULD BE CONSTRUCTED AND TESTED IN A FOLLOW ON PHASE 2 EFFORT. THE PERSONNEL WHO WILL BE ENGAGED IN THE WORK ARE LEADERS IN DRFM TECHNOLOGY.

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KSE INC
PO BOX 368
AMHERST, MA 01004
CONTRACT NUMBER: DAAA15-87-C-0070
DR J R KITTRELL
TITLE:
INSENSITIVE HTPB EXPLOSIVE BINDER
TOPIC# 79 OFFICE: BRL

ARMY EXPLOSIVES NEED TO BE MADE LESS SENSITIVE AND LESS VULNERABLE TO SYMPATHETIC DETONATION AND FIRE. COST, PROCESSABILITY AND STABILITY ARE ALSO IMPORTANT. KSE HAS UNDER DEVELOPMENT A PROCESS FOR THE DIRECT NITRATION OF HYDROXYL TERMINATED POLYBUTADIENE (HTPB), A RUBBERY BINDER CURRENTLY IN USE FOR EXPLOSIVES AND PROPELLANT CHARGES. THE FUNCTIONAL GROUPS ADDED TO THE HTPB SHOULD INCREASE THE ENERGY DENSITY OF THE BINDER. MORE IMPORTANTLY, FOUR SENSITIVITY TEST PROCEDURES HAVE BEEN PERFORMED ON HIGHLY NITRATED HTPB, AND IT WAS SHOWN TO BE LESS SENSITIVE THAN CURRENT EXPLOSIVE INGREDIENTS, PROBABLY DUE TO OXYGEN ADDITION TO THE POLYMER BACKBONE THROUGH NITRATE ESTERS. THE COMBINATION OF INSENSITIVITY, OXYGEN CONTENT, AND ENERGETIC PROPERTIES OF THE BINDER SHOULD GREATLY EXPAND THE EXPLOSIVE REFORMULATION OPTIONS TO PROVIDE LOW VULNERABILITY EXPLOSIVES AS ENERGETIC AS COMPOSITION B. THE COST EFFECTIVENESS AND PROCESSABILITY ARE ACHIEVED BY UTILIZATION OF AN EXISTING BINDER MATERIAL (HTPB) AND BY THE UTILITY OF EXISTING CAST-CURE EQUIPMENT. IN THE PROPOSED PROGRAM, SYNTHESIS PROCEDURES ARE TO BE OPTIMIZED FOR LOVA CHARACTERISTICS AND BINDER PROPERTIES ARE TO BE CHARACTERIZED. ELEMENTS OF THE PROGRAM WILL UTILIZE RESOURCES OF THE POLYMER SCIENCE DEPARTMENT OF THE UNIVERSITY OF MASSACHUSETTS.

KSE INC
PO BOX 368
AMHERST, MA 01004
CONTRACT NUMBER: DAAA21-87-C-0130
DR J R KITTRELL
TITLE:
FEASIBILITY OF NITRATED THERMOPLASTIC ELASTOMER AS ENE
TOPIC# 24 OFFICE: ARDC

SUBMITTED BY

TO IMPROVE CURRENT DOUBLE BASE AND CAST CURED PROPELLANT FORMULATIONS, POLYMERIZATION OF ENERGETIC MONOMERS HAS BEEN STUDIED, BUT THESE ROUTES HAVE SHOWN COMPLEX SYNTHESIS REQUIREMENTS AND MARGINAL MECHANICAL PROPERTIES. THE CONVENIENCE AND REUSE CHARACTERISTICS OF THERMOPLASTIC ELASTOMERS (TPE) WOULD BE DESIRED FOR BINDER APPLICATIONS, AND ENERGETIC TPES WOULD BE PARTICULAR ADVANTAGEOUS. IN THE PROPOSED PROGRAM, MEMBERS OF THE KRATON CLASS OF TPES WILL BE ENERGIZED; THIS IS THE MOST WIDELY USED TPE COMMERCIALY, AND HAS SUPERIOR MECHANICAL AND CHEMICAL PROPERTIES. THE TPE WILL BE ENERGIZED USING DIRECT POLYMER NITRATION CHEMISTRY ALREADY DEVELOPED AT KSE. BECAUSE OF THE SUPERIOR INITIAL MECHANICAL PROPERTIES AND WELL-KNOWN FORMULATION ADDITIVIES FOR KRATON, WE EXPECT TO DEMONSTRATE THE FEASIBILITY OF A SIMPLE ONE-STEP PROCESS TO PRODUCE ENERGETIC TPES FROM AN EXISTING COMMERCIAL PRODUCT. DUE TO THE HIGH ENERGY BINDER, PLASTICIZER REFORMULATION WILL BE POSSIBLE TO ACHIEVE MORE EFFECTIVE KRATON PROPERTIES UNDER HIGH SOLIDS LOAD, THEREBY OPTIMIZING BINDER COMPOSITION TO ACHIEVE A COMBINATION OF MECHANICAL AND CHEMICAL PROPERTIES, ENERGY DENSITY, AND SAFETY. THE PROGRAM WILL UTILIZE RESOURCES OF THE POLYMER SCIENCE DEPARTMENT AT THE UNIVERSITY OF MASSACHUSETTS. CERTAIN ENERGETIC AND COMPATIBILITY TESTS MUST BE CONDUCTED AT OUTSIDE LABORATORIES.

LASER POWER OPTICS
12777 HIGH BLUFF DR
SAN DIEGO, CA 92130
CONTRACT NUMBER: DAAB07-87-C-F066
DR DOUGLAS TANIMOTO
TITLE:
MIDIR LASER
TOPIC# 314 OFFICE: NV

ADVANCES IN SENSOR TECHNOLOGY HAVE LED TO A PROLIFERATION OF ELECTRO-OPTICAL SYSTEMS OPERATING IN THE MID-INFRARED (3 TO 5 MICRONS). EXAMPLES ARE SEARCH AND TRACK SETS, MISSILE SEEKERS, LASER DESIGNATORS, AND HIGH ENERGY LASERS. TO COUNTER ENEMY USE OF SUCH SYSTEMS, JAMMING AND COLLECTION SYSTEMS WHICH EMPLOY LASERS OF MODEST POWER OPERATING WITHIN THE SPECTRAL PASS-BAND OF THE THREAT WOULD BE DESIRABLE. A MODULATABLE, WAVELENGTH AGILE, COMPACT, MID-INFRARED LASER OF MODEST AVERAGE OUTPUT POWERS COULD BE EXTREMELY ATTRACTIVE

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FOR INFRARED COUNTERMEASURES AND OPTINT COLLECTIONS APPLICATIONS. A PULSED DEUTERIUM FLUORIDE (DF) CHEMICAL LASER EMPLOYING A UNIQUE ELECTRIC DISCHARGE GAIN GENERATOR CONFIGURATION PROMISES SIGNIFICANT IMPROVEMENTS IN EFFICIENCY, COMPACTNESS, AND RELIABILITY. THE PROPOSED PROGRAM WILL EXAMINE OPTIMUM RESONATOR CONFIGURATIONS FOR THIS UNCONVENTIONAL GAIN GENERATOR INCLUDING THE VIABILITY OF DIAMOND TURNED ASPHERIC OPTICS. IN ADDITION, THE FEASIBILITY OF DESIGNING AND FABRICATING SHARP CUT-OFF THIN FILM COATINGS, NARROWBAND SPIKE FILTERS, AND MAXIMUM REFLECTORS TO PREFERENTIALLY SELECT DESIRED OUTPUT LINES OF THE DF LASER WILL BE EXPLORED.

LASER SCIENCE INC
80 PROSPECT ST
CAMBRIDGE, MA 02139
CONTRACT NUMBER: DAAA15-87-C-0074
BRUCE THOMSON
TITLE:
MINIATURE LIDAR SYSTEM FOR STANDOFF DETECTION
TOPIC# 27 OFFICE: CRDC

A PROGRAM IS PROPOSED TO EVALUATE THE FEASIBILITY OF DEVELOPING A FORTY-POUND COMPACT LIDAR SYSTEM BASED ON A UNIQUE LSI LASER DESIGN. THE GOAL IS A SYSTEM HAVING FOUR FREQUENCY AGILE COAXIALLY ALIGNED CO2 LASER BEAMS WITH AN ENERGY OUTPUT OF AT LEAST 100 mj, A PRF OF 100 Hz, AND TUNABILITY TO 66 LINES AT A TUNING RATE OF 100 Hz. THE SYSTEM SHOULD USE NINE INCH COLLECTING OPTICS, STATE-OF-THE-ART DETECTORS, HAVE A SEALED LASER LIFE OF 10 MILLION PULSES, OPERATE ON A 28 VOLT POWER SUPPLY AND PROVIDE BUFFERED 16 BIT DIGITAL DATA (TTL LOGIC), USING AN A/D RATE OF 20 MHz, STORING 4K WORDS OF DATA FOR EACH LASER SHOT. THE MOST IMPORTANT ASPECT OF THE PHASE I FEASIBILITY STUDY WILL BE TO DEMONSTRATE THAT A LIGHTWEIGHT LASER HEAD CAN BE BUILT WHICH MEETS THE PULSE ENERGY AND PULSE RATE REQUIREMENTS, THAT A LIGHTWEIGHT AGILE SYSTEM CAN BE DEVELOPED, AND THAT TECHNOLOGY IS AVAILABLE TO DEVELOP A LIGHTWEIGHT RECEIVER AND DATA HANDLING SYSTEM. EACH MAJOR COMPONENT OF THE SYSTEM WILL BE ADDRESSED THROUGH A COMBINATION OF FEASIBILITY DEMONSTRATION, ANALYSIS AND DESIGN STUDIED. VARIOUS PACKAGING CONCEPTS WILL BE CONSIDERED TO SELECT A CONCEPTUAL DESIGN AND ESTIMATES WILL BE MADE OF WEIGHT, SIZE AND PERFORMANCE. THIS DESIGN WILL FORM THE BASIS FOR A PHASE II PROGRAM

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1
BY SERVICE
FISCAL YEAR 1987
ARMY

PAGE 106

SUBMITTED BY

TO DEVELOP AND TEST A SYSTEM.

LASER-GENICS CORP
PO BOX 33010
LOS GATOS, CA 95031
CONTRACT NUMBER: DAAB07-87-C-P032
DR RICHARD SCHLECHT
TITLE:
EFFICIENT SOLID STATE LASER FOR IR COUNTERMEASURES
TOPIC# 294 OFFICE: EW

A SERIOUS THREAT EXISTS TO OUR ARMED FORCES FROM VARIOUS INFRARED SENSORS MOUNTED ON A VARIETY OF MILITARY PLATFORMS. THE SPECTRAL RANGES OF THE SENSORS ARE IN THE 3-5 AND 8-12 MICRON BANDS. THE PRIMARY THREAT HAS BEEN IN THE 3-5 MICRON BAND. THERE IS A CRITICAL NEED TO DEVELOP AN IR SOURCE TO COUNTER THIS THREAT. IF THE SOURCES WERE TUNABLE IT WOULD BE VIRTUALLY IMMUNE TO COUNTER-COUNTER MEASURES. THE OBJECTIVE OF OUR PROPOSED PROGRAM IS TO DEVELOP AN EXCEPTIONALLY EFFICIENT LASER SOURCE THAT IS TUNABLE ACROSS THE 3-5 MICRON BAND. WE WILL INVESTIGATE DIODE PUMPED Er:YAG AS A LASER SOURCE AT 1.66 MICROMETERS. DURING THE COURSE OF THE PHASE II EFFORT THIS LASER SOURCE WILL BE SCALED UP TO HIGH AVERAGE POWERS AND USED AS A PUMP FOR AN OPO USING AgGaSe(2).

LAUREN MANUFACTURING CO
2228 REISER AVE SE
NEW PHILADELPHIA, OH 44663
CONTRACT NUMBER: DAAL04-87-C-0051
JAMES R HAMILTON II
TITLE:
MATERIAL PROTECTION FROM CHEMICAL AGENTS AND DECONTAMI
TOPIC# 103 OFFICE: MTL

LAUREN MANUFACTURING COMPANY WOULD LIKE TO DEVELOP A MODIFIED FLUOROELASTOMER TECHNOLOGY TO PROTECT LAMINATED FIBERGLASS REINFORCES STRUCTURES FROM CHEMICAL AGENTS AND DECONTAMINANTS. FLAME RETARDENCY, ADHESION, ABRASION RESISTANCE, LOW WEIGHT/AREA CHARACTERISTICS WOULD BE IMPROVED. CHLORO-TRIFLUOROETHYLENE SHOWS

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MORE PROMISING RESULTS THAN CONVENTIONAL FLUOROELASTOMERS. LAUREN PROPOSES TO FORMULATE AND EVALUATE THE CANDIDATE SYSTEMS FOR ARMY. FRP SAMPLES WILL BE PREPARED AND WOULD BE TESTED AT BOTH ARMY AND LAUREN RESEARCH LABS.

LB&M ASSOCS
111 SW "C" AVE - STE 200
LAWTON, OK 83501
CONTRACT NUMBER: DAAA21-87-C-0105
DR JOSEPH E HALLORAN
TITLE:
INTELLIGENT HOWITZER DECISION AID FOR RECONNAISSANCE S
OCCUPATION OF POSITION (RSOP)
TOPIC# 5 OFFICE: ARDC

ARMY DOCTRINE STATES THAT QUICK, EFFECTIVE COMMAND AND CONTROL (C2) IS THE KEY TO SUCCESS ON THE BATTLEFIELD. THE INCREASING TEMPO AND LETHALITY OF THE MODERN BATTLEFIELD DICTATE THAT THE ARMY'S DISPERSED, SEMI-AUTONOMOUS UNITS AND SYSTEMS POSSESS THE CAPABILITY TO OPERATE EFFECTIVELY ON THE BATTLEFIELD BY HAVING ON-BOARD INTELLIGENT C2 SYSTEMS. THE US ARMY FIELD ARTILLERY ENVISIONS THE DISPERSED, SEMI-AUTONOMOUS OPERATION OF HOWITZER AND ROCKET SYSTEMS WHICH HAVE TO MOVE QUICKLY AND FREQUENTLY ON THE BATTLEFIELD. THESE SYSTEMS REQUIRE ON-BOARD, INTELLIGENT DECISION SUPPORT SYSTEMS WHICH ASSIST THE SYSTEM CREWS DURING THE RECONNAISSANCE, SELECTION, AND OCCUPATION OF POSITIONS (RSOP). THE PROPOSED SYSTEM PROVIDES AIDS TO THE WEAPON CREW AND CORRELATES CREW ACTIONS WITH PARENT UNIT REQUIREMENTS. THE MODULAR DESIGN OF SUCH A SYSTEM WOULD ALSO POSSESS EMBEDDED TRAINING CAPABILITIES. THIS PROJECT WILL ESTABLISH THE FUNCTIONAL AND OPERATIONAL FOUNDATION FOR THE DESIGN AND DEVELOPMENT OF SUCH A SYSTEM.

LB&M ASSOCS
111 SW "C" AVE - STE 200
LAWTON, OK 73501
CONTRACT NUMBER: DAAA21-87-C-0107
DR JOSEPH E HALLORAN
TITLE:
INTELLIGENT HOWITZER SELF-DEFENSE DECISION AID
TOPIC# 5 OFFICE: ARDC

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THE INCREASING TEMPO AND LETHALITY OF THE MODERN BATTLEFIELD DICTATE THAT THE ARMY'S DISPERSED, SEMI-AUTONOMOUS UNITS AND SYSTEMS POSSESS THE CAPABILITY TO DEFEND THEMSELVES INTELLIGENTLY ON THE BATTLEFIELD BY HAVING EFFECTIVE C2 SYSTEMS WHICH ASSISTS IN INTEGRATING THE DEFENSES FOR WEAPONS PLATFORMS. THE US ARMY FIELD ARTILLERY ENVISIONS THE DISPERSED, SEMI-AUTONOMOUS OPERATION OF WEAPONS SYSTEMS WHICH HAVE TO SURVIVE IN THE BATTLEFIELD, OFTEN WITHOUT THE ASSISTANCE OF SUPPORT FROM OTHER APPROPRIATE ELEMENTS SUCH AS AIR DEFENSE UNITS AND ANTI-TANK ELEMENTS OF MANEUVER UNITS. THESE FIELD ARTILLERY SYSTEMS REQUIRE INTELLIGENT DECISION AIDS WHICH ASSIST THEM DURING THE DEFENSE OF THEIR OWN POSITIONS. SUCH DECISION AIDS PROVIDE THE ONLINE FACILITIES AND TUTORIALS NEEDED FOR EMBEDDED TRAINING CAPABILITIES. A DECISION SUPPORT SYSTEM, WITH MODULAR APPLICATIONS THAT ARE HARDWARE INDEPENDENT, WHICH OPERATES WITH THE KNOWLEDGE OF OTHER EXPERT SYSTEMS (SUCH AS SENSORS) CAN PROVIDE THE CONTROL AND COORDINATION ASSISTANCE REQUIRED FOR BATTLEFIELD SURVIVAL. THIS PROJECT WILL ESTABLISH THE FUNCTIONAL AND OPERATIONAL FOUNDATION FOR THE DESIGN AND DEVELOPMENT OF SUCH A SYSTEM.

LICA SYSTEMS INC
10400 EATON PL - STE 100
FAIRFAX, VA 22030
CONTRACT NUMBER: DAAK70-87-C-0024
KENNETH M IRISH
TITLE:
ADAPTIVE TACTICAL POWER DISTRIBUTION SYSTEM
TOPIC# 144 OFFICE: BRDC

GENERATOR USED PRIMARY POWER SYSTEMS ARE THE ACHILLES HEEL OF TACTICAL COMMAND AND CONTROL SYSTEMS, FIELD HOSPITALS, AND OTHER TACTICAL SUPPORT FACILITIES. THEY ARE NOISY AND PRONE TO FAILURE AT THE MOST CRITICAL TIMES. TACTICAL POWER USING SYSTEMS HAVE DIFFERENT POWER DUTY CYCLES AND POWER FACTORS. SOME ARE PREDICTABLE; OTHER TOTALLY RANDOM; AND MANY MUST BE DEPENDED UPON IN THE "HEAT OF THE BATTLE". THE OBJECTIVE OF THE PHASE I WORK IS TO DEVELOP THE FUNCTIONAL DESCRIPTION AND SYSTEM SPECIFICATION FOR A DYNAMIC ADAPTIVE TACTICAL POWER DISTRIBUTION SYSTEM (ATPDS) THAT CAN BE USED WITH TACTICAL POWER GENERATION AND TACTICAL C3I EQUIPMENT AS MAINTENANCE FACILITIES, ETC. THE RESULTING SPECIFICATION WILL BE USED IN PHASE

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II FOR THE DEVELOPMENT OF A PROTOTYPE OF THE SYSTEM THAT CAN BE FIELD
EVALUATED BY THE ARMY.

LIGHTING SCIENCES INC
7830 N EVANS RD
SCOTTSDALE, AZ 85260
CONTRACT NUMBER: DAAK70-87-C-0031
DR IAN LEWIN
TITLE:
QUANTIFICATION AND MEASUREMENT OF VISUAL BIREFLECTANCE
DISTRIBUTION FOR DECOYS
TOPIC# 136 OFFICE: BRDC

THIS PROJECT WILL INVESTIGATE AND DEMONSTRATE THE CAPABILITY OF
BIDIRECTIONAL REFLECTANCE DISTRIBUTION FUNCTIONS TO CHARACTERIZE THE
REPLICATION ATTRIBUTES OF DECOYS, ALLOWING SPECIFICATION AND
TOLERANCES TO BE DEVELOPED. THIS WILL BE PERFORMED BY A LITERATURE
SEARCH, MATHEMATICAL ANALYSIS AND HUMAN SUBJECT TESTING. A GONIO-
REFLECTOMETER WILL BE DESIGNED AND BREADBOARDED TO INDICATE THE CAP-
ABILITY OF SUCH INSTRUMENTATION TO MEASURE THE BRDF OF SURFACES.
INSTRUMENT PARAMETERS AND COMPONENTS WILL BE STUDIED, AS WILL THE
METHOD OF DATA REDUCTION.

LIGHTWAVE ELECTRONICS CORP
897-5A INDEPENDENCE AVE
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER: DAAA15-87-C-0057
WILLIAM M GROSSMAN
TITLE:
INTERFEROMETRIC HIGH-PRESSURE SENSOR
TOPIC# 74 OFFICE: BRL

WE PROPOSE RESEARCH TO SHOW THE FEASIBILITY OF COHERENT OPTICAL
TECHNIQUES FOR MEASUREMENT OF VERY HIGH PRESSURE. IN ADDITION, THE
OPTICAL PROBE WILL BE IMMUNE TO ELECTRICAL AND MAGNETIC INTERFERENCE,
SO IT MAY BE USEFUL IN A WIDE RANGE OF ENVIRONMENTS AND HAVE COM-
MERCIAL APPLICATIONS. THE SENSOR HEAD WILL BE A COMPAST FABRY-PEROT
ETALON. PRESSURE CHANGES INDUCE REFRACTIVE INDEX CHANGES IN THE

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ETALON, CHANGING ITS OPTICAL REFLECTION OR TRANSMISSION WHICH IS MEASURED BY PHOTO-SENSORS. A FREQUENCY STABILIZED DIODE-LASER PUMPED MONOLITHIC RING LASER, RECENTLY DEVELOPED A LIGHTWAVE ELECTRONICS CORPORATION FOLLOWING RESEARCH AT STANFORD UNIVERSITY, IS UNIQUELY SUITED TO THIS APPLICATION.

LINKNET

710 SILVER SPUR RD - STE 285
ROLLING HILLS EST, CA 90274
CONTRACT NUMBER: DAAB07-87-C-A023
TSUN-YEE YAN

TITLE:

INTERACTIVE VISUAL SIMULATION OF COMMUNICATION SYSTEMS
TOPIC# 302 OFFICE: C/A

THE OBJECTIVE IS TO DEVELOP AN INTERACTIVE VISUAL SIMULATION SOFTWARE PACKAGE CAPABLE OF MODELLING BOTH COMMUNICATION TRANSMISSION LINKS AND DATA COMMUNICATION NETWORKS. SPECIFIC CHARACTERISTICS OF THE TACTICAL BATTLEFIELD ENVIRONMENT WILL BE INCLUDED IN THE SIMULATION MODEL. THE EMPHASIS IS ON AN EXTENSIVE GRAPHICS INTERFACE THAT GIVES THE USER AN ANIMATED VIEW OF THE SIMULATION RUN ALONG WITH FULL INTERACTIVE CONTROL OF THE SIMULATION. MOUSE DRIVEN GRAPHICAL INPUT CAPABILITY ALSO ALLOWS THE USER TO CONFIGURE THE SIMULATION MODEL VISUALLY. THE SOFTWARE IS TO BE DEVELOPED ON A LOW COST 68020 CO-PROCESSOR BOARD EQUIPPED ENHANCED IBM CP-XT/COMPATIBLE PERSONAL COMPUTER TO RESULT IN AN ECONOMICAL AND POWERFUL TOOL CAPABLE OF SIGNIFICIANTLY INCREASING THE PRODUCTIVITY OF COMMUNICATION SYSTEM DESIGNERS.

M.L. ENERGIA INC

PO BOX 1468
PRINCETON, NJ 08542
CONTRACT NUMBER: DAAA15-87-C-0040
DR MOSHE LAVID

TITLE:

VARIABLE PRESSURE AND HIGH TEMPERATURE CLOSED BOMB FOR
IGNITION STUDIES
TOPIC# 87 OFFICE: BRL

SUBMITTED BY

PHOTOLYSIS HAS BEEN IDENTIFIED AS A MEANS OF INITIATING AND ENHANCING GAS, LIQUID AND SOLID PHASE CHEMICAL REACTIVITY. A NUMBER OF RECENT OPPORTUNITIES FOR PHOTOCHEMICAL AUGMENTATION INVOLVE CHEMICAL SYSTEMS AT ELEVATED AND VARIABLE TEMPERATURE AND PRESSURE. CONSEQUENTLY, THERE EXISTS THE NEED TO GATHER FUNDAMENTAL PHOTOCHEMICAL DATA UNDER THE SEVERE CONDITIONS ATTENDANT TO GAS PHASE EXPLOSIVES, AND SOLID AND LIQUID PROPELLANT COMBUSTION. A PHASE I RESEARCH PROGRAM IS PROPOSED FOR THE DESIGN AND TESTING OF A VARIABLE HIGH PRESSURE AND TEMPERATURE CLOSED BOMB APPARATUS FOR LASER IGNITION AND PHOTOCHEMICAL STUDIES. THIS APPARATUS WILL HAVE THE FOLLOWING CAPABILITIES: A VERSATILE SAMPLE CHAMBER FOR CONTROLLED HEATING OF SOLID, LIQUID OR GASEOUS SAMPLES; THE CAPABILITY FOR ACCOMMODATING VARIOUS PHOTOLYSIS SOURCES FROM VUV TO MID-IR SPECTRAL RANGES; PRESSURE AND TEMPERATURE TRANSDUCERS FOR CONTINUOUS MONITORING; AND CAPABILITY FOR ACCOMMODATING VARIOUS SPECTROSCOPIC PROBES, SUCH AS FT-IR, LASER INDUCED FLUORESCENCE AND MASS SPECTROSCOPY. TO MEET THESE OBJECTIVES, A 6-TASK PHASE I PROGRAM IS PROPOSED. IT WILL INCLUDE 1) FACT-FINDING EFFORT, 2) DESIGN EFFORT, 3) PROTOTYPE CONSTRUCTION, 4) TESTING OF BOMB APPARATUS, 5) MODIFYING BOMB APPARATUS, AND 6) TIME PERMITTING, ANALYTICAL MODELING OF REACTOR PROCESSES.

MALIBU RESEARCH ASSOCS INC
1330 OLYMPIC BLVD
SANTA MONICA, CA 90404
CONTRACT NUMBER: DAAB07-87-C-P038
DR DANIEL G GONZALEZ
TITLE:
INVESTIGATION OF AN EAGLE SCANNER FOR A RADAR CUER
TOPIC# 297 OFFICE: EW

AN ALTERNATE MEANS OF ACHIEVING BEAM SCAN FOR THE RADAR CUER APPLICATION IS BY MEANS OF ELECTRO-MECHANICAL SCANNERS. VARIOUS TYPES OF SUCH SCANNERS HAVE BEEN DEVELOPED OVER THE PAST 40 YEARS BUT HAVE LARGELY BEEN IGNORED RECENTLY IN FAVOR OF ALL ELECTRONIC SCANNING - FOR REASONS OF BULK, WEIGHT, SCAN SECTOR AND MOST IMPORTANTLY, BEAM AGILITY. BUT, IN MOST BATTLEFIELD RADAR APPLICATIONS (WEAPON LOCATION EXCLUDED) AGILITY IS NOT REQUIRED. WITH THIS FACT IN MIND, WE HAVE RE-EXAMINED THE APPLICABILITY OF ELECTRO-MECHANICAL SCANNERS TO THE RADAR CUER PROBLEM. THERE IS ONE ELECTRO-MECHANICAL

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 112
BY SERVICE
FISCAL YEAR 1987
ARMY

SUBMITTED BY

SCANNER CONCEPT IN PARTICULAR, THE WORK WAR II EAGLE SCANNER, THAT IS A PRIME CANDIDATE FOR USE IN THIS APPLICATION. THE EAGLE SCANNER HAS SIGNIFICANT ADVANTAGES OVER THE ELECTRONIC PHASED ARRAY ANTENNA IN TERMS OF COST AND SIDELobe PERFORMANCE. CONSEQUENTLY, WE BELIEVE THAT THE EAGLE SCANNER SHOULD BE EVALUATED AS A COST AND PERFORMANCE EFFECTIVE SOLUTION TO THE RADAR CUER PROBLEM. THE SBIR PROGRAM PROVIDES THE GOVERNMENT WITH AN EXCELLENT OPPORTUNITY TO CONSIDER THIS ALTERNATIVE FROM A POINT OF MINIMUM TECHNICAL AND FINANCIAL RISK.

MARTINGALE RESEARCH CORP
100 ALLENTOWN PKWY - STE 211
ALLEN, TX 75002
CONTRACT NUMBER: DAAB07-87-C-P058
DR ROBERT L DAWES
TITLE:
NEURAL NETWORKS FOR NON-COMMUNICATION ELECTRONIC WARFA
TOPIC# 291 OFFICE: EW

NEURAL NETWORKS ARE A PROMISING SOLUTION TO SEVERAL PROBLEMS IN THE APPLICATION OF PARALLEL PROCESSING TECHNOLOGY FOR ADAPTIVE RECOGNITION AND RESPONSE TO COMPLEX PATTERNS. UNFORTUNATELY, IT IS NOT KNOWN HOW TO GET A NEURAL NETWORK TO RECOGNIZE PATTERNS INDEPENDENTLY OF THE VALUES OF THEIR FEATURE PARAMETERS WITHOUT INCORPORATING SPECIAL INVARIANT TRANSFORMS INTO THE SENSOR ARRAY FOR EACH SUCH FEATURE. THIS PROPOSAL INTRODUCES THE CONCEPT OF THE "PARAMETRIC AVALANCHE", WHICH DESCRIBES HOW A NEURAL NETWORK CAN ASSOCIATE PATTERNS THROUGH THE ACTIVATION OF FEATURE PATHWAYS OTHER THAN SIMPLE TIME PROXIMITY. THROUGH THIS MECHANISM, WE DESCRIBE NOT ONLY HOW TO MEASURE THE SPECTRAL PARAMETERS OF A SIGNAL, BUT ALSO HOW TO TRACK THE THREAT AND GUIDE A COUNTERMEASURE TO DEAL WITH IT.

MATERIAL CONCEPTS INC
666 N HAGUE AVE
COLUMBUS, OH 43204
CONTRACT NUMBER: DAAK70-87-C-0045
RALPH F ORBAN
TITLE:
MATERIALS WITH DUAL RADAR AND THERMAL SUPPRESSION CHAR
TOPIC# 138 OFFICE: BRDC-PVD

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THIS PROGRAM WILL CENTER ON DEVELOPING A FABRIC ARRAY SYSTEM WHICH WILL HAVE THE DUAL CAPABILITIES OF SUPPRESSING THERMAL (IR) AND RADAR SIGNATURES FOR COMBAT TROOPS, EQUIPMENT, AND SHELTERS. RESEARCH WILL CENTER ON IDENTIFYING AND QUANTIFYING DUAL THERMAL COATINGS (A HIGHLY REFLECTIVE COATING AND A LOW EMISSIVITY COATING). SANDWICHED BETWEEN TWO COATED FABRICS WOULD BE A DIPOLE FILLER WHICH WOULD EXHIBIT A LOW RADAR CROSS SECTION.

MATERIAL CONCEPTS INC
666 N HAGUE AVE
COLUMBUS, OH 43204
CONTRACT NUMBER: DAAK70-87-C-0046
RALPH F ORBAN
TITLE:
TACTICAL DECEPTION INFRARED SIGNATURE/GENERATOR ALTERN
TOPIC# 147 OFFICE: BRDC-PVD

MATERIAL CONCEPTS, INC. WILL ATTEMPT TO DEVELOP A TWO-DIMENSIONAL IR DECOY SYSTEM USING METAL-COATED FABRICS WHICH CAN BE RESISTIVELY HEATED TO GENERATE THE PROPER IR SIGNATURES. SUCH A SYSTEM WILL BE LIGHTWEIGHT, EASY TO TRANSPORT, COULD BE EASILY MASS PRODUCED AT AN ATTRACTIVE UNIT COST, AND WOULD WITHSTAND VARIOUS WEATHER AND BATTLE-FIELD CONDITIONS. FURTHER, THIS SYSTEM WOULD BE FLEXIBLE AND EASILY CONFIGURED TO SERVE AS DECOY FOR A VARIETY OF VEHICLE TYPES.

MATERIALS & ELECTROCHEMICAL RSCH (MER)
4233 S FREMONT AVE
TUCSON, AZ 85714
CONTRACT NUMBER: DAAL04-87-C-0054
DR J C WITHERS
TITLE:
A COMPOSITE CERAMIC MATERIAL FOR LOW HEAT REJECTION DI
TOPIC# 111 OFFICE: MTL

CERAMICS HAVE BEEN DEMONSTRATED TO BE VIABLE ALTERNATIVES IN CONVENTIONAL AND ADIABATIC DIESEL ENGINES WITH THE POTENTIAL OF 30% FUEL SAVINGS. THERE IS AN INTERNATIONAL COMPETITION TO DEVELOP CERAMICS IN GENERAL AND SPECIFICALLY FOR DIESEL ENGINES. IN AM-

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BITIOUS DOMESTIC AND FOREIGN PROGRAMS TO UTILIZE CERAMICS IN DIESELS, THE LIMITATION OF CURRENTLY AVAILABLE CERAMICS HAVE BEEN IDENTIFIED. IN METAL STRUCTURAL SYSTEMS, ELABORATE ALLOYS ARE DEVELOPED TO MEET THE MECHANICAL/PHYSICAL REQUIREMENTS OF THE APPLICATION. ON THE OTHER HAND, CERAMICS ARE GENERAL PURE (E.G. Al_2O_3 , SiC, Si_3N_4) OR THERMODYNAMICALLY STABLE COMPOUNTS (E.G. MULLITE, $3Al_2O_3 \cdot 2SiO_2$); AND NO EFFORTS HAVE PURSUED THE DEVELOPMENT OF CERAMIC ALLOYS TO ACHIEVE UNIQUE PROPERTY MATERIALS AS HAS OCCURRED WITH METALS. THIS PROGRAM PROPOSES UTILIZING A STATISTICAL EXPERIMENTAL DESIGN TO DEVELOP A COMPOSITE CERAMIC ALLOY COMPOSITION THAT WILL BE OPTIMIZED FOR USE IN THE HARSH DIESEL ENVIRONMENT. THE CERAMIC ALLOY WILL BE A ZIRCONIA BASE CONTAINING ONE OR MORE NITRIDE MATERIALS, ONE OR MORE TITANIA MATERIALS AND SiC WHISKERS. A PROVEN SOL-GEL PRECURSOR APPROACH WILL BE UTILIZED WHICH SOULD INSURE THE U.S. AS A WINNER IN CERAMIC MATERIALS DEVELOPMENT FOR DIESEL ENGINE APPLICATIONS.

MATERIALS ANALYSIS INC
10338 MILLER RD
DALLAS, TX 75238
CONTRACT NUMBER: DAAJ02-87-C-0016
EDWARD P COX
TITLE:
REDUCTION OF GEAR WEIGHT BY INERTIA WELDING TITANIUM W
GEAR RINGS
TOPIC# 39 OFFICE: AVSCOM

BECAUSE OF ITS WEIGHT REDUCTION POTENTIAL, IT WOULD BE ADVANTAGES TO USE BIMETALLIC STEEL RING/TITANIUM WEB GEARS IN POWER TRANSMISSION ASSEMBLIES. ALTHOUGH SEVERAL TECHNOLOGIES EXIST FOR JOINING TITANIUM TO STEEL, FACTORS SUCH AS COST, SIZE-FLEXIBILITY, RELIABILITY, POST-FABRICATION PROCESSING, JOINT EFFICIENCY, AND EXTREME TEMPERATURE OPERATION RAPIDLY REDUCE THE NUMBER OF REALISTIC JOINING PROCESSES. PRIOR RESEARCH AND ACTUAL MANUFACTURING EXPERIENCE SHOW INERTIAL WELDING (ONE KIND OF FRICTION WELDING) IS THE BEST PROCESS FOR PRODUCING BIMETALLIC GEARS TO MEET THE ABOVE CRITERIA. HOWEVER, THERE IS A TECHNOLOGICAL LIMIT IN THE SIZE OF TITANIUM-STEEL INERTIAL WELDED JOINTS BEYOND WHICH BRITTLE INTERMETALLIC PHASES DETERIORATE JOINT MECHANICAL PROPERTIES. PHASE I RESEARCH WOULD INCLUDE INERTIA

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WELDING GEAR BLANKS CONTAINING AN ALUMINUM ALLOY INTERFACE TO OVERCOME WELD JOINT BRITTLINESS SO THAT CONVENTIONALLY-SIZED GEARS CAN BE PRODUCED. TITANIUM-TO-STEEL WELD JOINTS WOULD BE MADE WITH AND WITHOUT ALUMINUM, TORSION TESTED, AND MICROSTRUCTURALLY EXAMINED TO DETERMINE THE QUALITY OF THE INERTIA WELDED GEAR BLANKS. IT IS ANTICIPATED THAT SMOOTH, HARDENED STEEL RINGS CAN BE SUCCESSFULLY BONDED BY INERTIAL WELDING TO A TITANIUM WEB AND USED WITH LITTLE SUBSEQUENT PROCESSING. PHASE II WOULD INVESTIGATE LARGE DIAMETERS AND WIDTHS, OTHER (POSSIBLY BETTER) INTERFACE MATERIALS, AND CONToured JOINT SUFACES.

MICROBAC INSULATING MATERIALS TESTING
PO BOX 368 - HARMONY DR
INGOMAR, PA 15127
CONTRACT NUMBER: DAAL02-87-C-0086
DAN A GENUTIS
TITLE:
LOW COST MINIATURE HIGH VOLTAGE SWITCH
TOPIC# 63 OFFICE: HDL

THE OBJECTIVE OF THIS RESEARCH EFFORT IS TO DEVELOP A LOW COST, MINIATURE HIGH VOLTAGE SWITCH. WE PROPOSE TO SOLVE THIS PROBLEM BY DESIGNING A SWITCH THAT UTILIZES THE SPARK GAP METHOD. LOW COST AND EASY REPRODUCTION WILL BE INCORPORATED IN THE DESIGN. CARE MUST BE TAKEN TO INSURE RELIABILITY OF THE SWITCH. THE SWITCH MUST FUNCTION PROPERLY AT EXTREME TEMPERATURES AND OVER YEARS OF MILITARY STORAGE CONDITIONS. RELIABILITY MUST ALSO BE CONSIDERED IN THE DESIGN OF THE TRIGGERING CONFIGURATION AND COMPONENTS. DEVELOPING A SWITCH THAT IS REUSABLE IS ALSO A DESIRABLE CHARACTERISTIC AND A DESIGN THAT CAN BE INCORPORATED IN A FLEX PRINT ASSEMBLY MAY ALSO BE ACHIEVED. BY UTILIZING OUR COMPLETE DIELECTRIC LABORATORY AND THE TECHNICAL EXPERIENCE OF OUR RESEARCH STAFF, WE WILL DESIGN THE BEST SWITCH POSSIBLE.

MICROFOAM INC
9372 ELM ST
CHADWICKS, NY 13319
CONTRACT NUMBER: DAMD17-87-C-7216
LAWRENCE C CERNY
TITLE:
AN ACELLULAR RESUSCITATIVE FLUID
TOPIC# 282 OFFICE: MEDICAL

SUBMITTED BY

DURING THE PAST SEVERAL YEARS, GREAT ADVANCES HAVE BEEN MADE TOWARD THE GOAL OF PRODUCING AN OXYGEN-CARRYING RESUSCITATIVE FLUID, COMMONLY CALLED ARTIFICIAL BLOOD SUBSTITUTE. FROM THE PRELIMINARY STUDIES IN THIS LABORATORY, IT APPEARS FEASIBLE TO SYNTHESIZE A SUITABLE SUBSTANCE IN FREEZE-DRIED FORM. THE ARTIFICIAL BLOOD PROPOSED IN THIS INVESTIGATION CAN BE PRODUCED FROM A STABILIZED TETRAMERIC HEMOGLOBIN AND A MODIFIED HYDROXYETHYL STARCH. THE COMPOUND IN THIS STUDY HAS THE FOLLOWING ADVANTAGES: 1) MADE FROM READILY AVAILABLE AND INEXPENSIVE MATERIALS; 2) THE COMPOSITION IS KNOWN AND CAN BE VARIED TO MEET SPECIFIC NEEDS; 3) BLOOD TYPING IS UNNECESSARY; 4) NO DANGER OF CONTRACTING HEPATITIS OR TRANSFUSION-TRANSMITTED DISEASES SUCH AS AIDS; 5) LARGE VOLUME USAGE IS PRACTICAL; 6) THE FREEZE-DRIED PRODUCT MAKES STORAGE EASY; 7) THE LONG SHELF-LIFE OF THE PRODUCT MAKES IT VIABLE FOR EXTENDED PERIODS OF TIME, UP TO FIVE YEARS.

MICROTRONICS ASSOCS
4516 HENRY ST
PITTSBURGH, PA 15213
CONTRACT NUMBER: DAAL01-87-C-0733
DR DARRYL D COON
TITLE:
THEORETICAL ANALYSIS OF HETEROJUNCTION DOUBLE BARRIER
LOGIC APPLICATIONS
TOPIC# 128 OFFICE: ETDL

THE USE OF LOGIC CIRCUITS EMPLOYING HETEROJUNCTION DOUBLE BARRIER DIODES WITH NEGATIVE DIFFERENTIAL RESISTANCE REGIONS WILL BE EXAMINED THEORETICALLY. SWITCHING TIME LIMITATIONS WILL BE ESTIMATED BASED ON CIRCUIT CONSIDERATIONS AND THE DEVICE ARCHITECTURE. FUNDAMENTAL LIMITATIONS ARISING FROM RIGOROUS UNITARITY BOUNDS AND DISPERSION EFFECTS INVOLVING QUANTUM MECHANICAL RESONANT TUNNELING TIME DELAY WILL BE INCLUDED. THE FUNDAMENTAL LIMIT CONSIDERATIONS ARE SUFFICIENTLY GENERAL TO APPLY TO BARRIERS WITH ARBITRARY SHAPE. PRELIMINARY THEORETICAL ESTIMATES INDICATE THAT PICOSECOND OR SUBPICOSECOND SWITCHING TIMES MIGHT BE ACHIEVABLE WITH APPROPRIATELY DESIGNED $Al(x)Ga(1-x)As/GaAs$ DEVICES. THESE SWITCHING TIMES ARE SO SHORT THAT IT BECOMES IMPORTANT TO EXAMINE ALL EFFECTS WHICH COULD LIMIT PERFORMANCE.

MICROTRONICS ASSOCS INC
4516 HENRY ST
PITTSBURGH, PA 15213
CONTRACT NUMBER: DAAB07-87-C-P029
DR DARRYL D COON
TITLE:
QUANTUM WELL INFRARED SOURCES
TOPIC# 294 OFFICE: EW

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RESEARCH WILL BE CARRIED OUT ON QUANTUM WELL INFRARED SOURCES EMPLOYING RESONANT TUNNELING AND INTRABAND TRANSITIONS IN THE 3-5 MICRON AND 8-12 MICRON WAVELENGTH REGIONS. THE DEVICE STRUCTURES WHICH WE PROPOSE ARE TRIPLE BARRIER DIODES (TBDS). IN CONTRAST WITH CONVENTIONAL SOLID STATE LASERS AND LIGHT EMITTING DIODES, TBDS PROVIDE LONGER WAVELENGTH CAPABILITY DUE TO THE USE OF INTRABAND RATHER THAN INTERBAND OPTICAL TRANSITIONS. INTRABAND TRANSITIONS DO NOT IMPOSE A LONG WAVELENGTH CUTOFF AND THEY PERMIT THE USE OF WIDE BANDGAP MATERIALS WITH FEW MATERIALS PROBLEMS. THE PHASE I WORK WILL BE DEVOTED ENTIRELY TO DEVICE DESIGN. THE DESIGN WORK WILL INVOLVE OPTIMIZATION OF RADIATIVE RESONANT TUNNELING AND SUPPRESSION OF NONRADIATIVE TUNNELING. THIS WORK WILL BENEFIT FROM THE CONSIDERABLE PROGRESS WHICH HAS BEEN MADE IN THE DEVELOPMENT OF DOUBLE BARRIER DIODES (DBDs). THE MAIN GOAL OF THIS WORK WILL BE TO DETERMINE THE FEASIBILITY OF USING TBDS AS INFRARED COUNTERMEASURES (IRCM) SOURCES. SPONTANEOUS AND STIMULATED EMISSION WILL BE CONSIDERED IN DETAIL FOR DEVICES WHICH OFFER THE POSSIBILITY OF STIMULATED EMISSION (LASER ACTION) AND HIGH POWER OUTPUT WITH EFFICIENT CONVERSION OF ELECTRICAL POWER INTO OPTICAL POWER.

MICROWAVE MEDICAL SYSTEMS INC (MMS)
52 SOUTH AVENUE - BLDG #7/MS-704
BURLINGTON, MA 01803
CONTRACT NUMBER: DAMD17-87-C7214
RICHARD S GRABOWY

TITLE:

IN-LINE MICROWAVE WARMER FOR BLOOD AND INTRAVENOUS FLU
TOPIC# 284 OFFICE: MEDICAL

HYPOVOLEMIC SHOCK, SECONDARY TO TRAUMATIC EXSANGUINATION, IS THE MOST COMMON CAUSE OF DEATH IN SEVERELY INJURED SOLDIERS. TREATMENT OF HYPOVOLEMIC SHOCK AND ATTENDANT HYPOTHERMIA IS THE SUBJECT OF THE STUDY PROPOSED HERE. TO ADDRESS THE PROBLEM OF HYPOTHERMIA AND ITS ASSOCIATED COAGULOPATHY AND CARDIAC DYSFUNCTION OCCURRING WITH TRAUMA, A DEVICE IS PROPOSED THAT IS CAPABLE OF IN-LINE HEATING OF BLOOD AND INTRAVENOUS (IV) FLUIDS. THE DESIGN IS BASED ON A MICROWAVE GENERATOR CAPABLE OF UNIFORM HEATING OF FLUIDS DURING THE INFUSION PROCESS. THIS DEVICE WOULD BE SMALL IN SIZE AND SUITABLE FOR FIELD USE. AN IN-LINE UNIT OVERCOMES THE DELAY INHERENT WITH REMOTE WARNING AND

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THE COOLING OCCURRING IN A COLD ENVIRONMENT DURING TRANSPORT OF FLUID OR BLOOD HEATED AT A REMOTE LOCATION. KEY INNOVATIONS IN THE PROPOSED DESIGN INCLUDE: UNIFORM IN-LINE HEATING WITHOUT THE "HOT SPOTS" NORMALLY ASSOCIATED WITH MICROWAVE OVEN CHAMBERS; NON-INVASIVE TEMPERATURE MEASUREMENT ALONG THE LENGTH OF THE FLUID PATH; AND USE OF ONLY A SHORT LENGTH OF NORMAL INTRAVENOUS TUBING WITHIN THE HEATING CAVITY ITSELF. STANDARD LABORATORY TESTS WILL BE PERFORMED TO COMPARE THE CONSTITUENCY OF BLOOD SAMPLES EXPOSED TO MICROWAVE HEATING WITH EQUIVALENT UNHEATED SAMPLES.

MID-ATLANTIC RESEARCH CORP
362 E WHITTIER AVE
FAIRBORN, OH 45324
CONTRACT NUMBER:
B L CAMPBELL/J L WEST

TITLE:
AN ANALYSIS PROGRAM TO STUDY THE LIGHTNING OF THE FORC
TOPIC# 328 OFFICE: TPM

THE DEVELOPMENT OF A COMPUTERIZED ANALYSIS PROGRAM WHICH WILL ANALYZE THE EFFECTS OF INTERCHANGING VARIOUS BATTALION EQUIPMENT/WEAPONS CONFIGURATIONS WOULD BE A USEFUL TOOL FOR THE BATTLE MANAGER, OR THE ENGINEER STUDYING WHERE TO PLACE EFFORT FOR LIGHTENING BATTALION WEIGHT. THE MIDATLANTIC RESEARCH CORPORATION WILL DESIGN A COMPUTERIZED SYSTEM WHEREBY THE USER MAY PERFORM "WHAT IF" ANALYSIS BY INTERCHANGING VARIOUS EQUIPMENT ITEMS AND PARTS. THE PROGRAM RESULTS SHOWING HIM THE EFFECT OF THE CHANGES ON OVERALL BATTALION WEIGHT AND BATTALION PERFORMANCE/LOGISTICS PARAMETERS. SUCH A PROGRAM CONSISTS OF DATA BASES WITH INFORMATION ON MAJOR BATTALION EQUIPMENT PART PARAMETERS AND OPERATIONAL SCENARIO PARAMETERS. IT ALSO INCLUDES A VARIETY OF ANALYSIS ALGORITHMS WHICH RUN DATA BASE SORTS AND INDEXING ROUTINES, EXTRACT ANY RELEVANT DATA, THEN INTERRELATE AND PERFORM ANALYSIS TO PRODUCE THE REQUIRED RESULTS. THE PROGRAM IS DEVELOPED USING LOTUS 1-2-3 SOFTWARE AND IS HOSTED ON A ZENITH 158 PERSONAL COMPUTER SYSTEM.

MILLIMETER WAVE TECHNOLOGY INC
1395 MARIETTA PKWY - BLDG 700
MARIETTA, GA 30067
CONTRACT NUMBER: DAAH01-87-C-0878
R E FORSYTHE
TITLE:
COMPACT NEAR MILLIMETER WAVE SOURCES
TOPIC# 153 OFFICE: MICOM

SUBMITTED BY

THE DEVELOPMENT OF SMALL, SOLID STATE SOURCES AT THE 0.7-2 MM WAVELENGTH (150 TO 430 GHz) REGION IS REQUIRED TO REPLACE TUBE-TYPE SOURCES WHICH HAVE LARGE, BULKY POWER SUPPLIES. WE PROPOSE TO DEVELOP A LOW COST, BROADBAND AND EFFICIENT TECHNIQUE USING SINGLE AND MULTIPLE DIODES CONFIGURED AS UP CONVERTERS AND MULTIPLIERS. THESE DEVICES WILL BE DRIVEN BY LOWER FREQUENCY OSCILLATORS.

MILLIMETER WAVE TECHNOLOGY INC (MWT)
1395 MARIETTA PKWY - BLDG 700
MARIETTA, GA 30067
CONTRACT NUMBER: DAAK60-87-C-0032
J M SCHUCHARDT
TITLE:
RADAR SIGNATURE REDUCING FABRIC
TOPIC# 179 OFFICE: NATICK

THE DEVELOPMENT OF FABRICS CAPABLE OF PROVIDING SIGNIFICANT RADAR SIGNATURE REDUCTION IS PROPOSED. BOTH THIN AND THICK TECHNIQUES ARE IDENTIFIED THAT CAN BE USED FOR UNIFORMS, PARACHUTE APPLICATIONS AND PERSONNEL ITEMS. THESE FABRICS WILL BE DESIGNED TO BE COMPATIBLE WITH COLLATERAL VISUAL AND IR CAMOUFLAGE, FLAME PROTECTION, AND DURABILITY REQUIREMENTS.

MILLITECH CORP
PO BOX 109 - S DEERFIELD RESEARCH PK
SOUTH DEERFIELD, MA 01373
CONTRACT NUMBER: DAAL01-87-C-0732
DANA E WHEELER
TITLE:
QUASIOPTICAL MONOLITHIC CONTROL COMPONENTS FOR MILLIME
TOPIC# 116 OFFICE: ETDL

IMPROVE CONTROL AND FASTER SWITCHING SPEEDS HAVE BECOME NECESSARY TO ACHIEVE ACCEPTABLE SYSTEM PERFORMANCE OF MILLIMETER WAVE PHASED ARRAY SYSTEMS. THE PROPOSED STUDY HAS THE OBJECTIVE OF APPLYING QUASI-OPTICAL TECHNIQUES TO SOLVE THE TECHNOLOGICAL PROBLEMS ASSOCIATED WITH DISCRETE CONTROL DEVICES. THE INTRODUCTION OF PIN DIODES INTO APPROPRIATELY DESIGNED METALLIC GRATINGS CAN BE EMPLOYED TO VARY AND

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CONTROL THE EFFECT OF THE GRATINGS ON THE ELECTROMAGNETIC WAVE IN SUCH A MANNER AS TO AFFECT BEAM STEERING. THE PROPOSED RESEARCH PROGRAM WILL EXAMINE THIS TECHNIQUE WITH A VIEW TO DEVELOP A MONOLITHIC APPROACH TO BEAM STEERING YIELDING THE DESIRED SYSTEM PERFORMANCE AND COST ADVANTAGES.

MILLITECH CORP
PO BOX 109 - S DEERFIELD RESEARCH PK
SOUTH DEERFIELD, MA 01373
CONTRACT NUMBER: DAAH01-87-C-0925
DR PAUL F GOLDSMITH
TITLE:
LOW-COST DUAL-POLARIZED MICROWAVE AND MILLIMETER WAVE
DESIGNS
TOPIC# 149 OFFICE: MICOM

MONOPULSE ANTENNAS ARE COMPLEX AND EXTREMELY SENSITIVE TO FREQUENCY, TEMPERATURE AND ENVIRONMENT AT MICROWAVE FREQUENCIES AND EVEN MORE SO AT MILLIMETER WAVES. ADDING A DUAL-POLARIZATION REQUIREMENT GREATLY INCREASES THE COMPLEXITY OF THE WHOLE MONOPULSE ASSEMBLY SINCE THE MONOPULSE COMBINING NETWORK MUST THEN HAVE SIX PORTS (SIGMA[V], DELTA E[V], DELTA H[V], SIGMA[H], DELTA E[H], DELTA H[H]) AS COMPARED TO THE SINGLE POLARIZED CIRCUIT WHICH HAS ONLY THREE PORTS. THE COMPLEXITY OF THE MONOPULSE CIRCUIT IS CONSIDERABLY REDUCED WHEN THE DUAL-POLARIZATION FORMING NETWORK IS REMOVED FROM THE COMPARATOR COMBINING NETWORK. MILLITECH PROPOSES TO SEPARATE THE POLARIZATION FORMING NETWORK USING GAUSSIAN OPTICS TECHNIQUES. MILLITECH ALSO PROPOSES TO INVESTIGATE PLANAR FEED DEVICES TO REDUCE THE OVERALL SIZE AND COMPLEXITY OF THE MONOPULSE CIRCUITRY AND THUS ALLOW DUAL POLARIZED MONOPULSE ANTENNAS TO BE EASILY PRODUCED AT LOW COST.

MISSION RESEARCH CORP
5503 CHEROKEE AVE - STE 201
ALEXANDRIA, VA 22312
CONTRACT NUMBER: DAAL01-87-C-0735
DR BRUCE GOPLIN
TITLE:
MODE EXCITATION ANALYSIS OF VACUUM ELECTRONICS DEVICES
TOPIC# 134 OFFICE: ETDL

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1
BY SERVICE
FISCAL YEAR 1987
ARMY

PAGE 121

SUBMITTED BY

WE PROPOSE TO INVESTIGATE A NEW METHOD FOR COMPUTING MODE EXCITATION RATES WITHIN VACUUM ELECTRONICS DEVICES. THIS METHOD UTILIZES THE MUTUAL ORTHOGONALITY OF EIGEN-FUNCTION AND COMBINES TIME-DOMAIN AND FREQUENCY-DOMAIN ANALYSIS. THE METHOD WILL PREDICT THE GROWTH OF ELECTROMAGNETIC MODES AS A FUNCTION OF TIME AND OF DEVICE OPERATING PARAMETERS. IT REQUIRES NUMERICAL SOLUTION OF THE COMPLETE SET OF MAXWELL'S EQUATIONS IN THREE-DIMENSIONS WITH BOUNDARY CONDITIONS DETERMINED FROM THE DEVICE GEOMETRY, AND IS EQUALLY APPLICABLE TO COLD-TEST AND PARTICLE BEAM OPERATION. BECAUSE THIS APPROACH RELIES ON BASIC PHYSICS PRINCIPLES, IT IS POTENTIALLY MORE GENERAL IN APPLICATION THAN THE NUMEROUS SPECIAL-PURPOSE (E.G., CIRCUIT MODEL) CODES PRESENTLY IN USE BY INDUSTRY. THIS RESEARCH WILL ALLOW US TO EXPLOIT THE BEST FEATURES OF TIME-DOMAIN AND FREQUENCY-DOMAIN ANALYSIS. WE PROPOSE TO: (1) ANALYZE THE ORTHOGONALITY ALGORITHM REQUIREMENTS FOR ACCURACY AND SPEED, (2) DEMONSTRATE ON A REALISTIC OR ACTUAL DEVICE SUCH AS A CCTWT, AND (3) EVALUATE THE POTENTIAL FOR TECHNOLOGY TRANSFER TO INDUSTRY AND COMMERCIAL APPLICATIONS.

MISSION RESEARCH CORP
PO DRAWER 719 - 735 STATE ST
SANTA BARBARA, CA 93102
CONTRACT NUMBER: DAAL02-87-C-0113
DR BARTON M GOLDSTEIN

TITLE:

ELECTROMAGNETIC FIELD COUPLING TO A WIRE INSIDE A META

ENCLOSURE

TOPIC# 45

OFFICE: HDL

ELECTROMAGNETIC RADIATION CAN DIFFUSE THROUGH THE WALLS OF A METALLIC ENCLOSURE AND CAUSE INTERFERENCE WITH INTERNAL ELETRONIC CIRCUITRY. THE PURPOSE OF THE PROPOSED RESEARCH IS TO UNDERSTAND AND DEVELOP A CAPABILITY TO PREDICT THE CURRENT AND VOLTAGE ON A WIRE WITHIN A RECTANGULAR METALLIC ENCLOSURE. THE PULSE IS VERY WIDEBAND.

MISSION RESEARCH CORP
PO DRAWER 719
SANTA BARBARA, CA 93102
CONTRACT NUMBER: DAAE07-87-C-8064
DR STEVE F STONE

TITLE:

FIELD REMANUFACTURE OF FAILED PARTS

TOPIC# 170

OFFICE: TACOM

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 122
BY SERVICE
FISCAL YEAR 1987
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MISSION RESEARCH (MRC) PROPOSES AN SBIR INVESTIGATION TO: 1. TABULATE THE VEHICLE PARTS AND STRUCTURES MOST SUSCEPTIBLE TO DAMAGE AND FAILURE DURING CRITICAL USAGE IN THE BATTLEFIELD OR AWAY FROM SUPPLY LINES AND ACCESSIBLE REPLACEMENT AND: 2. DEVELOP PLANS TO FIELD REMANUFACTURE OR REPAIR THESE DAMAGED PARTS. A LOCAL MANUFACTURING AND MACHINING CAPABILITY WOULD INCREASE THE RETURN RATE OF VEHICLES AND EQUIPMENT TO DUTY. THE FIRST TASK WOULD BE THE COMPUTERIZED TABULATION OF CRITICAL PARTS AND MATERIALS SUBJECT TO DAMAGE. THIS WOULD INCLUDE A REPLACEMENT AND REMANUFACTURING ANALYSIS RATING AND POSSIBLE CHANGES IN MATERIAL OR DESIGN. THE PART WOULD BE INVESTIGATED TO DETERMINE MATERIAL, USAGE, SUPPLIER REQUIREMENTS AND SUBSTITUTION POSSIBILITIES. ENGINEERING CRITERIA WOULD BE USED TO DETERMINE OUR OBJECTIVES AND MAINTAIN CONTINUITY OF MATERIAL REQUIREMENTS. THE NEXT TASK WOULD BE TO DESIGN AND REMANUFACTURING SYSTEM AND SELECT THE EQUIPMENT AND PROCESSES THAT WOULD PERMIT THE REPLACEMENT OF THESE PARTS UNDER LESS THAN IDEAL CIRCUMSTANCES. FINALLY A PHASE II EFFORT WOULD BE THE USE OF THE MACHINES NECESSARY TO MAKE PARTS OR ENGINEERED DESIGN REPLACEMENTS UTILIZING THE REBUILDING AND REMACHINING SYSTEM.

MOLECULON RESEARCH CO
230 ALBANY ST
CAMBRIDGE, MA 02139
CONTRACT NUMBER: DAMD17-87-C-7215
DR S JAMES DAVIDSON
TITLE:
A CONTROLLED RELEASE POROPLASTIC WOUND DRESSING WITH B
AND POLYMXIN B
TOPIC# 275 OFFICE: MEDICAL

A CONTROLLED RELEASE ANTIBIOTIC WOUND DRESSING IS TO BE DEVELOPED FOR ADMINISTRATION OF BACITRACIN AND POLYMXIN B. THE DRESSING IS TO BE EASILY APPLIED AND CONFORMABLE TO WOUND SURFACES. BOTH ANTIBIOTICS ARE TO BE MAINTAINED AT EFFECTIVE LEVELS WITHIN WOUNDS FOR THREE DAYS, PREVENTING INFECTION FOR THIS PERIOD OF TIME. THE DRESSING IS TO BE INCORPORATED INTO POROPLASTIC CELLULOSE TRIACETATE MEMBRANES IN A FORMULATION DEVELOPED TO PROVIDE THE REQUIRED FUNCTIONAL PROPERTIES. THE EXPERIMENTAL APPROACH TO BE FOLLOWED IN DEVELOPMENT WILL BE BASED UPON EXPERIENCE GAINED IN DEVELOPING THE

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POROPLASTIC MEMBRANE CONTROLLED RELEASE DRESSING FOR DELIVERY OF GENTAMICIN AND CLINDAMYCIN PHOSPHATE. DURING PHASE I, REQUIRED ANALYTICAL METHODS WILL BE VALIDATED. THE SOLUBILITY BEHAVIOR OF THE ANTIBIOTICS WILL BE INVESTIGATED TO ESTABLISH THE BASIS FOR DRESSING FORMULATION. INITIAL DRESSING FORMULATIONS WILL BE PREPARED, AND THEIR ANTIBIOTIC DELIVERY PROPERTIES WILL BE STUDIED IN DIFFUSION CELLS.

MPR ASSOCS
1050 CONNECTICUT AVE NW - STE 400
WASHINGTON, DC 20036
CONTRACT NUMBER: DAAE07087-C8061
LAURENCE DEMICK
TITLE:
TRACK STANDING WAVE ANALYSIS
TOPIC# 167 OFFICE: TACOM

THE PROPOSED FEASIBILITY STUDY IS AN ANALYSIS OF TRACKS OF TRACKED VEHICLES TO EVALUATE ALTERNATIVE MEANS TO DAMPEN STANDING WAVES IN THE TRACKS WHICH OCCUR WHEN THE TRACKED VEHICLES OPERATE AT HIGH SPEEDS. THE STANDING WAVES ABSORB POWER AND REDUCE DRIVETRAIN EFFICIENCY. A RUGGED, INEXPENSIVE MEANS OF DAMPING THE STANDING WAVES IS DESIRED.

MYK TECHNOLOGY INC
1140-P CENTRE DR
INDUSTRY, CA 91789
CONTRACT NUMBER: DAAL01-87-C-0745
DR YU-WEN CHANG
TITLE:
ADVANCED MILLIMETER HIGH EFFICIENCY GUNN OSCILLATOR SE
TOPIC# 123 OFFICE: ETDL

HIGH EFFICIENCY MILLIMETER WAVE GUNN OSCILLATORS ARE USED AS 94 GHz SENSORS FOR SMALL MISSILE AND SUBMUNITION APPLICATIONS. THE SENSOR IS BASED ON ULTRA-LINEAR FMCW WAVEFORM WITH AN INTEGRATED CIRCUIT FRONTEND CONSTRUCTION SUITABLE FOR BOTH HYBRID AND MONOLITHIC CIRCUIT INTEGRATION.

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 124
BY SERVICE
FISCAL YEAR 1987
ARMY

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MYK TECHNOLOGY INC
1140-P CENTRE DR
INDUSTRY, CA 91789
CONTRACT NUMBER: DAAL01-87-C-0746
DR YU-WEN CHANG
TITLE:
MILLIMETER WAVE InP DEVICE STRUCTURES
TOPIC# 125 OFFICE: ETDL

METAL-ORGANIC CHEMICAL VAPOR DEPOSITION (MOCVD) IS PROPOSED TO GROW MULTI-LAYER InP/GaInAsP HETEROJUNCTION CURRENT LIMITING CONTACT AND THIN HIGH-LOW-HIGH CONTACT FOR HIGH EFFICIENCY InP GUNN DEVICES AT MILLIMETER WAVE FREQUENCIES, SPECIALLY AT 94 GHz. DISCRETE AND MONOLITHIC GUNN OSCILLATORS WILL BE DEVELOPED WITH A SPECIALLY CONSTRUCTED MOCVD SYSTEM.

MYK TECHNOLOGY INC
1140-P CENTRE DR
INDUSTRY, CA 91789
CONTRACT NUMBER: DAAH01-87-C-0928
DR YU-WEN CHANG
TITLE:
LOW COST DUAL-POLARIZED MILLIMETER WAVE ANTENNA
TOPIC# 149 OFFICE: MICOM

POLARIZATION SWITCHABLE MONOPULSE ANTENNA CONFIGURATION IS PROPOSED. THE ANTENNA CAN BE DIRECTLY INTEGRATED WITH 94 GHz INTEGRATED CIRCUIT FRONTEND AND MONOPULSE COMPARATOR CIRCUIT AND USING CASAGRANIAN REFLECTOR TO PROVIDE THE ANTENNA APERTURE.

MCCABE & ASSOCS INC
5501 TWIN KNOLLS RD - STE 111
COLUMBIA, MD 21045
CONTRACT NUMBER: DAAA21-87-C-0153
THOMAS J MCCADE
TITLE:
DESIGN COMPLEXITY APPROACH TO SOFTWARE MAINTENANCE
TOPIC# 13 OFFICE: ARDC

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THE McCADE CYCLOMATIC COMPLEXITY METRIC IS AN INDUSTRY ACCEPTED TOOL WHICH QUANTIFIES THE ABILITY TO UNDERSTAND A SOFTWARE MODULE BASED ON THE DECISION STRUCTURE OF THE CODE. IN ADDITION, THIS METRIC PROVIDES INFORMATION REGARDING THE AMOUNT OF TESTING REQUIRED TO VERIFY A SOFTWARE MODULE. TOGETHER THESE MEASURES PROVIDE AN ANALYTIC APPROACH TO SOFTWARE MAINTENANCE ISSUES. McCABE & ASSOCIATES, INC. HAS RECENTLY IMPLEMENTED THE CYCLOMATIC COMPLEXITY METRIC AS AN AUTOMATED ANALYSIS TOOL (CAT), TO SUPPORT THE IMPLEMENTATION AND TESTING PHASE OF THE SOFTWARE LIFE CYCLE. BECAUSE OF OUR EXTENSIVE BACKGROUND IN THE AREA OF COMPLEXITY AND TESTING EFFORTS, McCADE & ASSOCIATES, INC. IS IN A UNIQUE POSITION TO EXTEND THE PRESENT COMPLEXITY THEORY TO THE SYSTEM LEVEL. BY TREATING THE STRUCTURE CHART AS A MATHEMATICAL OBJECT, QUANTIFIABLE MEASURES OF SYSTEM QUALITY WILL BE DETERMINED AS EARLY AS THE DESIGN PHASE. USING THE RESULTS OF THIS ANALYSIS TO DETERMINE 1) TEST SCENARIOS TO BE USED DURING INTEGRATION TESTING; 2) CRITICAL AREAS OF THE DESIGN IN TERMS OF MAINTAINABILITY; 3) INTERDEPENDENCE OF MODULES IN THE DESIGN, WILL SHIFT THE EMPHASIS FROM ERROR DETECTION AND CORRECTION TO A MORE DESIRABLE EFFORT OF ERROR PREVENTION.

McCABE & ASSOCS INC
5501 TWIN KNOLLS RD - STE 111
COLUMBIA, MD 21045
CONTRACT NUMBER: DAAA21-87-C-0145
THOMAS J McCABE
TITLE:
STRESS TEST ASSESSMENT TOOL
TOPIC# 16 OFFICE: ARDC

A RECOGNIZED NEED EXISTS FOR A STRESS TEST ASSESSMENT TOOL, WHICH WILL AUTOMATE THE TESTING PROCESS WITH AN EMPHASIS ON TESTING SOFTWARE PERFORMANCE UNDER STRESS CONDITIONS. McCADE & ASSOCIATES, INC. PROPOSES THE DEVELOPMENT OF A TOOL WHICH EXTENDS THE McCADE COMPLEXITY METHODOLOGY TO INCLUDE AUTOMATIC STRESS TESTING. THE McCADE CYCLOMATIC COMPLEXITY METRIC IS AN INDUSTRY ACCEPTED TOOL WHICH QUANTIFIES THE AMOUNT OF TESTING REQUIRED TO VALIDATE A SOFTWARE MODULE. RECENTLY THIS METRIC WAS IMPLEMENTED AS AN AUTOMATED ANALYSIS TOOL (CAT), TO SUPPORT THE IMPLEMENTATION AND TESTING PHASES OF THE SOFTWARE LIFE CYCLE. THE CAT INCLUDES A TEST PATH GENERATOR WHICH IS

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USED TO IDENTIFY A BASIS SET OF PATHS WHICH FULLY TESTS A MODULE. BECAUSE OF OUR EXTENSIVE BACKGROUND IN THE AREA OF COMPLEXITY AND TESTING EFFORTS, McCADE & ASSOCIATES, INC. IS IN A UNIQUE POSITION TO EXTEND THE PRESENT COMPLEXITY THEORY TO INCLUDE AUTOMATIC STRESS TESTING. AN EXTENSION OF THE CAT METHODOLOGY WOULD PROCEED ACCORDING TO THE FOLLOWING PLAN: 1) DETERMINE TEST CONDITIONS FOR EACH TEST PATH IDENTIFIED BY CAT; 2) DERIVE ACTUAL TEST DATA FROM EACH TEST CONDITION; 3) DETERMINE STRESS CONDITIONS AND CORRESPONDING TEST DATA; 4) INTERFACE THE METHODOLOGY WITH THE EXISTING CAT METHODS.

NATIONAL HYBRID INC
220 SMITHTOWN AVE
RONKONKOMA, NY 11779
CONTRACT NUMBER: DAAD09-87-C-0041
MARTIN SIEGEL
TITLE:
MOBILE RF INTERFEROMETER ANTENNA ARRAY (2.2-2.4 GHz)
TOPIC# 207 OFFICE: TECOM

A MULTIPLE BASELINE INTERFEROMETER ARRAY ANTENNA DESIGN FOR HIGH ANGULAR RESOLUTION IS PROPOSED. THE ACHIEVABLE DIRECTION FINDING RESOLUTION IS BETTER THAN FOUR TENTHS OF A DEGREE. THIS DESIGN APPROACH RESULTS IN AN AREA SIZE REDUCTION OF 95 PERCENT COMPARED TO TRADITIONAL ARRAYS. THIS INTERFEROMETER ARRAY ANTENNA IS SUITABLE FOR MOBILE APPLICATION.

NICHOLS RESEARCH CORP
4040 S MEMORIAL PKWY
HUNTSVILLE, AL 35802
CONTRACT NUMBER: DAAK70-87-C-0044
JOSEPH MUDAR
TITLE:
TACTICAL DECEPTION INFRARED SIGNATURE GENERATOR ALTERN
TOPIC# 147 OFFICE: BRDC

A TWO DIMENSIONAL PANEL WHOSE THERMAL IMAGE (WHEN HEATED BY AN EXTERNAL POWER SOURCE) IS SIMILAR TO AN OPERATING VEHICLE WHEN VIEWED AT DIFFERENT ASPECT AND ELEVATION ANGLES IS PROPOSED. THE

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PANEL WOULD ACT AS A DECOY FOR THE COMBAT VEHICLE AND SHOULD PROVIDE A CREDIBLE IMAGE TO AN IR SENSOR. IN ADDITION, THE PANEL WILL BE LIGHTWEIGHT, COMPACT AND EASILY DEPLOYABLE.

NICHOLS RESEARCH CORP
4040 S MEMORIAL PKWY
HUNTSVILLE, AL 35802
CONTRACT NUMBER: DAAJ02-87-C-0013
DEWEY FARMER
TITLE:
CERAMIC COMPONENT NON-DESTRUCTIVE TESTING TECHNOLOGY
TOPIC# 37 OFFICE: AVSCOM

OPTICAL SIGNATURE ANALYSIS WILL BE APPLIED TO MASS-PRODUCTION QUALITY CONTROL OF ENGINEERING CERAMICS. ADAPTATION OF PROVEN EFFECTIVE OPTICAL TECHNIQUES TO MASS PRODUCTION REQUIRES INNOVATION IN RAPID DATA ACQUISITION AND PROCESSING. THE PROPOSED INNOVATION APPLIES STRATEGIC DEFENSE INITIATIVE (SDI) DISCRIMINATION TECHNIQUES. LIFE-TIME OF CERAMIC WEAR PARTS, SUCH AS BEARING AND CAMS, CAN DEPEND ON SURFACE DEFECTS OF 5-10 MICROMETERS, SO THE FIRST APPLICATION WILL BE PRODUCTION QUALITY CONTROL OF CERAMIC WEAR PARTS. THE DATA BASE DEVELOPED FOR THIS APPLICATION WILL BE USED IN SUBSEQUENT WORK TO GO BEYOND DETECTION AND CHARACTERIZATION OF SURFACE DEFECTS. OUR GOAL IS TO ESTIMATE SPECIFIC STRUCTURAL STRENGTH PARAMETERS IN FINISHED PARTS BY PROCESSING OPTICAL SIGNATURE TIME-HISTORIES OF TRANSIENT MOTIONS. THE FEASIBILITY OF DETECTING SURFACE DEFECTS IN REGIMES FROM 5-10 MICROMETERS TO REGIMES GREATER THAN 100 MICROMETERS, ON A PRODUCTION LINE, WILL BE DETERMINED IN PHASE I. RESULTS WILL BE BASED ON PROCESSING DATA FROM LASER SCATTERING MEASUREMENTS, USING SPECIMENS WITH WELL-CHARACTERIZED SURFACE PROPERTIES AND DEFECTS. SDI TECHNOLOGY, DEVELOPED BY NICHOLS RESEARCH CORPORATION, WILL BE COORDINATED WITH RESOURCES OF THE UNIVERSITY OF ALABAMA IN HUNTSVILLE TO PROVE FEASIBILITY AND BEGIN THE REQUISITE DATA BASE.

NKF ENGINEERING INC
12200 SUNRISE VALLEY DR
RESTON, VA 22091
CONTRACT NUMBER: DAAE07-87-C-8062
JOHN OBRADOVICH
TITLE:
DEVELOPMENT OF STANDARD FOR VEHICLE INPUT LOADS
TOPIC# 168 OFFICE: TACOM

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THE PROPOSED WORK WILL REVIEW EXISTING STANDARDS FOR VEHICLE MANUFACTURERS AND EXISTING LITERATURE TO MAKE A DETERMINATION OF WHETHER AND HOW A SUITABLE DESIGN STANDARD FOR VEHICLE SUSPENSION SYSTEMS AND FRAMES CAN BE DEVELOPED, AND TO DEVELOP SUCH A STANDARD IN TERMS OF LOADS (AS MULTIPLES OF THE ACCELERATION OF GRAVITY-- "G'S"), AS A FUNCTION OF VEHICLE TYPE, TERRAIN, AND SPEED. THIS EFFORT WILL ALSO EVALUATE THE FEASIBILITY OF SPECIFYING THESE DESIGN ACCELERATION LEVELS AS FUNCTIONS OF FREQUENCY (THE NATURAL FREQUENCY OF THE VEHICLE COMPONENT UNDER CONSIDERATION). THIS STUDY WILL DETERMINE WHETHER THIS STANDARD CAN BE DEVELOPED SUCH THAT IT WILL ENCOMPASS EXISTING VEHICLE DESIGN STANDARDS, BASED ON THE APPLICATION OF POWER SPECTRAL DENSITY AND SHOCK SPECTRUM METHODS (THE FORMER PRINCIPALLY FOR VIBRATION AND THE LATTER FOR SHOCK EFFECTS).

NOVACOM INC
9401 MATHY DR
FAIRFAX, VA 22031
CONTRACT NUMBER: DAAD07-87-C-0081
JOHN A BALLAGH
TITLE:
SATELLITE ANALYSES FOR SPECIAL FORCES OPERATIONS
TOPIC# 69 OFFICE: LABCOM/ASL

THE ARMY IS CURRENTLY IN SEARCH OF APPLICATIONS AND TECHNIQUES FOR UTILIZING METEOROLOGICAL SATELLITE DATA TO PROVIDE WEATHER INTELLIGENCE INFORMATION TO BATTLEFIELD COMMANDERS INVOLVED IN SPECIAL FORCES OPERATIONS. NOVACOM, INC. IS PROPOSING TO IDENTIFY A COMPLETE SET OF PRACTICAL SPECIFICATIONS FOR A PORTABLE SATELLITE RECEIVER WHICH IS INTENDED TO PROVIDE THE BATTLEFIELD COMMANDER WITH THE DESIRED TACTICAL INFORMATION. DATA ACQUISITION AND TRANSLATION SPECIFICATIONS REPRESENT SIGNIFICANT RESEARCH CATEGORIES IN THE PROPOSED RECEIVER SYSTEM DESIGN. THE ULTIMATE OBJECTIVE IS TO PROVIDE THE BATTLEFIELD COMMANDER WITH INTELLIGENCE RELATION TO ENVIRONMENTAL EFFECTS ON OPERATIONS AND EQUIPMENT. USER-FRIENDLY DATA DISPLAYS ARE ANOTHER KEY OBJECTIVE. ANTENNA IDENTIFICATION, RECEIVER DEFINITION, DECODER OPERATION, AND INFORMATION TRANSLATION ALL REPRESENT SIGNIFICANT TECHNICAL OBJECTIVES IN PRODUCING A FEASIBLE RECEIVER DESIGN.

ODETICS INC
1515 S MANCHESTER
ANAHEIM, CA 92802
CONTRACT NUMBER: DAAE07-87-C-803
ALAN ROHRBACHER
TITLE:
ROBOTIC TACTICAL RECONNAISSANCE MISSION PACKAGE
TOPIC# 157 OFFICE: TACOM

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THE DETAILED CONCEPT DEFINITION, ANALYSIS AND CONCEPT DESIGN OF A ROBOTIC TACTICAL RECONNAISSANCE MISSION PACKAGE WILL BE COMPLETED AS A SPECIFIC BASIS FOR FOLLOW-ON R&D LEADING TO FIELD DEMONSTRATION OF HARDWARE. DAY/NIGHT VISUAL AND IR CAPABILITIES AS WELL AS BINAURAL HEARING AND RF DETECTION WILL BE INCLUDED. NEW CAPABILITIES TO LOCATE ACOUSTIC AND RF SOURCES THROUGH CORRELATION AMONG MULTIPLE, DISPERSED SENSORS WILL BE INVESTIGATED FOR BATTLEFIELD FEASIBILITY. DESIGN APPROACHES WILL ACCOUNT FOR TECHNICAL AND HUMAN FACTOR INTERFACES TO OTHER RELATED DOD PROGRAMS FOR FUTURE IMPLEMENTATIONS. DESIGN APPROACHES WILL ALSO BE SHAPED BY FEASIBILITY REQUIREMENTS RESULTING FROM PROJECTED TACTICS, DOCTRINE AND FORCE STRUCTURE AS WELL AS THREAT ANALYSES.

OM TECH INC
PO BOX 100 - 837 6TH AVE
BRACKENRIDGE, PA 15014
CONTRACT NUMBER: DAAK60-87-C-0044
VERNON G AMMONS

TITLE:
NOVAL POLYMERS FOR COMBATANT EYE PROTECTION APPLICATIO
TOPIC# 173 OFFICE: NATICK

THE OVERALL OBJECTIVE OF THIS PROPOSED PROJECT IS TO DEVISE THE BEST POSSIBLE URETHANE-CARBONATE COPOLYMER PLASTIC SUBSTANCE RELATIVE TO PRODUCING HIGH PERFORMING GOGGLES AND CORRECTIVE LENSES. IT IS KNOWN FROM PAST RESEARCH THAT TRANSPARENT HIGH PERFORMING PLASTIC SUBSTANCES CAN BE SYNTHESIZED USING A SELECTED MONOMERIC DIOL, CERTAIN ALIPHATIC POLYCARBONATE DIOLS, AND A PARTICULAR ALIPHATIC DISSOCYANATE. FROM PAST WORK, IT IS KNOWN THAT THE ABOVE DESCRIBED URETHANE-CARBONATE COPOLYMERS HAVE VERY HIGH IMPACT RESISTANCE WHICH IS IMPORTANT FOR THE PRODUCTION FOR GOGGLES FOR EYE PROTECTION. ALSO, THESE PLASTIC SUBSTANCES HAVE MUCH BETTER ABRASION RESISTANCE THAN THE "POLYCARBONATE" PRESENTLY USED IN LENSES. PAST TESTING HAS ALSO SHOWN THAT THE ABOVE URETHANE-CARBONATE COPOLYMER SYSTEMS HAVE OUTSTANDING DURABILITY. IN FACT THE SYSTEMS SHOW THE UNIQUE PROPERTY OF SIMULTANEOUSLY HAVING HIGH HYDROLITIC STABILITY AND HIGH OXIDATIVE RESISTANCE. BY THE PRESENT PROPOSED PROJECT, A SERIES OF THE ABOVE DESCRIBED URETHAN-CARBONATE COPOLYMERS WOULD BE SYNTHESIZED AND SCREEN TESTED.

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OPTELECOM INC
15930 LUANNE DR
GAITHERSBURG, MD 20877
CONTRACT NUMBER: DAAH01-87-C-0927
WILLIAM H CULVER
TITLE:
AUTOMATIC ON-LINE HIGH STRENGTH FIBER OPTIC SPLICING
TOPIC# 154 OFFICE: MICOM

DEVELOPMENT OF A SYSTEM FOR HIGH STRENGTH FIBER OPTIC SPLICING FOR APPLICATION IN PRECISION SPOOL WINDING FACILITIES IS PROPOSED. PHASE I EFFORT WOULD BE DEVOTED TO LITERATURE REVIEW, SELECTION OF SPLICING METHOD, DEFINITION OF SPLICING PROCEDURES, CONCEPTUAL DESIGN, AND PHASE II PLAN. PROCEDURES TO BE DEFINED INCLUDE BUFFER STRIPPING, CLEAVING, SPLICING PROPER, BUFFER RECOATING AND FIBER TRANSPORT BETWEEN VARIOUS STAGES OF THE OVERALL SPLICING PROCESS. PHASE II PLAN IS EXPECTED TO INCLUDE DESIGN OF FABRICATION AND TESTING OF AN EXPERIMENTAL SPLICING SYSTEM, ACCELERATED LIFE TESTING OF SPLICES MADE WITH THE SYSTEM, MEASUREMENTS TO CHARACTERIZE SPLICES, ANALYSIS OF RESULTS, DOCUMENTATION OF ALL PHASE II WORK AND RECOMMENDATIONS FOR CONTINUED WORK.

ORTEL CORP
2015 W CHESTNUT ST
ALHAMBRA, CA 91803
CONTRACT NUMBER: DAAB07-87-C-F066
JEFFREY E UNGAR
TITLE:
LASER DIODE ARRAY FABRICATION
TOPIC# 315 OFFICE: NV

APPROACH TO FABRICATION OF VERY LOW COST, HIGH POWER GaAlAs LASER DIODE SOURCES FOR PUMPING OF SOLID STATE LASERS IS DESCRIBED. APPROACH USES NOCVD TO FABRICATE BROAD AREA LASERS. THIN ACTIVE LAYERS AND NON-ABSORBING FACETS USED TO INCREASE POWER DENSITY.

OTISCA INDUSTRIES LTD
PO BOX 127 - SALINA STA (501 BUTTERNUT)
SYRACUSE, NY 13208
CONTRACT NUMBER: DACA88-87-C-0013
F J SIMMONS
TITLE:
DEVELOPING SLURRY FUEL FROM ANTHRACITE
TOPIC# 247 OFFICE: CERL

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OTISCA INDUSTRIES HAS BEEN ENGAGED IN THE PREPARATION, DELIVERY AND COMBUSTION OF OVER 70 TONS (DRY) OF BOILER AND ENGINE GRADE COAL/WATER SLURRY FUELS FOR OVER THE PAST FIVE YEARS. THE AVERAGE COMPOSITION OF THOSE FUELS AS PREPARED FROM BITUMINOUS COAL IS 0.8 WT.% ASH, 0.8 WT.% SULFUR, 50 WT% SOLID, 100 CENTIPOISE VISCOSITY (100 SEC-1) AND AN AVERAGE PARTICLE SIZE OF 4 MICROMETERS. OTISCA HAS ALSO PERFORMED RESEARCH ON OVER 100 SEAMS OF COAL AND ANTHRACITE. WITH THOSE TOOLS IN HAND OTISCA IS CONVINCED THAT AN ANTHRACITE/WATER SLURRY CAN BE DEVELOPED WHICH WILL HAVE EXCELLENT STORAGE AND RHEOLOGICAL PROPERTIES AND WILL BE CAPABLE OF MAINTAINING STABLE COMBUSTION IN A SMALL INDUSTRIAL BOILER SUCH AS THE EXISTING 75 HORSEPOWER FIRE-TUBE BOILER THAT WILL BE USED IN THIS RESEARCH PROGRAM. THE PROPOSED PROGRAM CONSISTS OF FIVE TASKS WHICH INCLUDE THE PREPARATION OF TWO SLURRIES: ONE WITH A PARTICLE DIAMETER IN THE RANGE OF 150umXO AND THE OTHER 20umXO; AND AN IN DEPTH DEVELOPMENT OF THE RHEOLOGY OF THOSE ANTHRACITE/WATER SLURRIES CONSISTENT WITH OUR KNOWLEDGE OF THE SPECIFICATIONS WHICH ARE NECESSARY FOR STORAGE AND ATOMIZATION. WITH THE SPECIFICATIONS IN HAND, AN IN-HOUSE PILOT PLANT WILL PRODUCE ABOUT 1000 LBS (DRY) OF EACH ANTHRACITE/WATER SLURRY FOR COMBUSTION TESTING IN THE EXISTING FIRE-TUBE BOILER TO ESTABLISH THE COMBUSTION EFFICIENCY OF THAT FUEL. ALL DATA WILL BE REVIEWED IN THE FINAL REPORT WHICH WILL ALSO INCLUDE AN ECONOMIC ANALYSIS AND CONVERSION COSTS.

PDA ENGINEERING
2975 RED HILL AVE
COSTA MESA, CA 92626
CONTRACT NUMBER: DAAA21-87-C-0115
DR RONALD E ALLRED
TITLE:
IMPROVED COMPOSITE FLYWHEEL STORAGE DEVICES FOR ELECTRIC
LAUNCHERS
TOPIC# 4 OFFICE: ARDC

ORGANIC FIBERS, SUCH AS POLYETHYLENE, ARE EXTREMELY ATTRACTIVE FOR ROTATING MACHINERY, ENERGY STORAGE DEVICES BECAUSE OF HIGH SPECIFIC LONGITUDINAL STRENGTH AND STIFFNESS PROPERTIES. THE MAJOR LIMITATION IN THESE TYPES OF APPLICATIONS (E.G., FLYWHEELS) IS THE LOW TRANSVERSE TENSILE STRENGTH OF THE COMPOSITE, A CONSEQUENCE OF THE

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EXTREMELY LOW INTERFACIAL ADHESIVE STRENGTH BETWEEN THE ORGANIC FIBER AND THE RESIN MATRIX. THIS RESULTS IN DELAMINATION AND FRAYING, NEGATING THE USEFUL CHARACTERISTICS OF THIS COMPOSITE. A SURFACE CHEMICAL MODIFICATION PROCESS HAS BEEN DEVELOPED FOR ORGANIC FIBERS WHICH RESULTS IN COVALENT BONDING BETWEEN THE FIBER AND EPOXY RESINS. SIGNIFICANT INCREASES IN INTERFACIAL ADHESION RESULT. TRANSVERSE TENSIL STRENGTHS APPROACHING 4000 PSI HAVE ALREADY BEEN ACHIEVED IN KEVLAR 49/EPOXY LAMINATES. THIS INCREASE IN TRANSVERSE STRENGTH PROPERTIES IS DIRECTLY TRANSLATABLE INTO INCREASED ENERGY STORAGE CAPABILITY. THE SURFACE CHEMICAL MODIFICATION PROCESS WILL BE APPLIED TO POLYETHYLENE FIBERS FOR FABRICATION INTO UNIDIRECTIONAL EPOXY COMPOSITES. TRANSVERSE TENSILE STRENGTHS WILL BE MEASURED AS A FUNCTION OF THE SURFACE CHEMICAL MODIFICATION TREATMENT CONDITIONS. FRACTURE SURFACEMORPHOLOGY STUDIES WILL BE CONDUCTED TO ADDRESS CHANGES IN FAILURE SURFACE BEHAVIOR. ANALYTICAL STUDIES WILL BE CONDUCTED, FOR VARIOUS ROTOR DESIGNS, TO DETERMINE THE EFFECT OF INCREASED TRANSVERSE TENSILE STRENGTH ON ENERGY STORAGE CAPABILITY.

PDA ENGINEERING
2975 RED HILL AVE
COSTA MESA, CA 92626
CONTRACT NUMBER: DAAL02-87-C-0097
ROBERT OEDING
TITLE:
OPTICAL PROTECTION FROM NUCLEAR THERMAL ENERGY
TOPIC# 52 OFFICE: HDL

OPTICAL DEVICES MAY BE EXPOSED TO DIRECT OR INDIRECT THERMAL RADIATION FROM FIREBALLS ON THE TACTICAL NUCLEAR BATTLEFIELD. THE FIREBALL THERMAL RADIATION PERSISTS FOR SEVERAL SECONDS, DEPENDING ON THE YIELD AND DETONATION ALTITUDE OF THE NUCLEAR WEAPON. THE TOTAL BLACKBODY FLUENCE RADIATED TO THE VICINITY OF AN OPTICAL DEVICE MAY BE WELL IN EXCESS OF THE LEVEL AT WHICH CRITICAL COMPONENTS OF THE DEVICE FAIL AS A RESULT OF EXCESSIVE TEMPERATURE RISE, MATERIAL DEGRADATION, OR OTHER MECHANISMS. THE FEASIBILITY OF USING VARIOUS TECHNIQUES, INCLUDING PHOTOCHROMICS AND ELECTROCHROMICS, TO PROTECT THE SENSITIVE OPTICAL DEVICES FROM FIREBALL THERMAL RADIATION WILL BE ASSESSED. THE RELATIVE PROTECTION AFFORDED BY THE TECHNIQUES AND THE PENALTIES ASSOCIATED WITH OPEN-STATE, OR BENIGN, PERFORMANCE WILL

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BE INVESTIGATED. PROTECTION FOR SEVERAL CLASSES OF OPTICAL DEVICES WILL BE INCLUDED IN THE STUDY. DISTINCTION WILL BE MADE AMONG NARROW AND BROAD-BAND SENSORS AND SPECIFIC POTENTIAL FAILURE MODES AND LEVELS. HUMAN EYE PROTECTION WILL BE CONSIDERED IN CONJUNCTION WITH SPECIFIC OPTICAL DEVICES. HARRY DIAMOND LABORATORIES WILL PROVIDE SUPPORT IN THE INITIAL PERIOD OF THE EFFORT TO DEFINE SPECIFIC DEVICES AND THEIR OPTICAL CHARACTERISTICS.

PDA ENGINEERING
2975 RED HILL AVE
COSTA MESA, CA 92626
CONTRACT NUMBER: DAAB07-87-C-PO44
DR L A HARRAH
TITLE:
IMPROVED RADIOCHROMIC DOSIMETERS
TOPIC# 296 OFFICE: EW

WE PROPOSE A COMBINED PROGRAM OF ANALYSIS AND ACCELERATED AGING TO DETERMINE THE ORIGIN OF INSTABILITIES IN FLUID SOLUTIONS OF THE RADIOCHROMIC DYES USED IN OPTICAL WAVEGUIDE DOSIMETERS. CHROMATOGRAPHIC AND SPECTROPHOTOMETRIC TECHNIQUES WILL BE USED TO SEPARATE AND IDENTIFY IMPURITIES IN DYES AND SOLVENTS USED IN THESE SOLUTIONS. THERMALLY ACCELERATED AGING WILL BE ATTEMPTED TO IDENTIFY THE PRECURSORS AND PRODUCTS OF THE UNDESIRABLE REACTIONS LEADING TO SOLUTIONS YELLOWING. METHODS WILL BE PROPOSED, BASED ON THE ANALYTICAL AND ACCELERATED AGING PROGRAMS, TO STABILIZE THESE SOLUTIONS. SOLID, POLYMERIC SOLUTIONS OF RADIOCHROMIC DYES WILL BE EXPLORED AS POTENTIALLY MORE STABLE, MORE EASILY USED REPLACEMENTS FOR THE LIQUID CORE OPTICAL WAVEGUIDES.

PERCEPTION - THE MACHINE VISION CO
23855 RESEARCH DR
FARMINGTON HILLS, MI 48024
CONTRACT NUMBER: DAAA21-87-C-0118
JEREMY SALINGER
TITLE:
ARM MOUNTED 3-D ROBOT VISION FOR TRACKING OBJECTS IN A
TOPIC# 7 OFFICE: ARDC

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3-D SENSING TECHNOLOGY HAS PROGRESSED TO THE POINT THAT HIGH SPEED, 3-D ROBOT VISION FOR TRACKING OBJECTS IN A WORK CELL MAY BE ACHIEVABLE. PERCEPTRON IS AGGRESSIVELY PURSUING 3-D SENSING AND RELATED TECHNOLOGIES AND CAN MAKE SIGNIFICANT TECHNOLOGICAL PROGRESS TOWARD THE SOLICITED PROGRAM GOALS. PERCEPTRON IS CURRENTLY DEVELOPING A SERIES OF 3-D SCANNERS TO SUIT THE NEEDS OF ROBOT RELATED OPERATIONS SUCH AS ROBOTIC BIN-PICKING AND ROBOTIC ASSEMBLY. THE SENSORS WILL PROVIDE THREE DIMENSIONS OF INFORMATION FOR EACH SCANNED POINT WITHOUT REQUIRING IMAGE PROCESSING AND ITS ASSOCIATED TIME DELAYS. IT IS ANTICIPATED THAT THE DEVELOPMENT OF A HIGH SPEED, ARM MOUNTED SENSOR IS QUITE POSSIBLE WITHIN THE TIME LIMITS OF THE PROGRAM. PERCEPTRON IS ALSO DEVELOPING THE 3-D SOFTWARE TO SUPPORT THE WORK CELL. THE SOFTWARE OPERATES UPON A STANDARD LIBRARY LANGUAGE CURRENTLY UNDER USE BY THE DOD KNOWN AS C4PL. THIS ADVANCED LANGUAGE WILL OPERATE UPON A SPECIALIZED HIGH SPEED IMAGE PROCESSING COMPUTER KNOWN AS THE CYTOCOMPUTER.

PERFECT VIEW INC
532 PYLON DR
RALEIGH, NC 27606
CONTRACT NUMBER: DAAA15-87-C-0052
DR A J ATTAR
TITLE:
CARBON SURFACE MODIFICATIONS TO ACHIEVE HYDROPHOBICITY
TOPIC# 30 OFFICE: CRDC

PERFECT VIEW INC. AND THE PRINCIPAL INVESTIGATOR, DR. A. J. ATTAR, HAVE RECENTLY OBTAINED A PATENT ON A METHOD TO REMOVE MINERAL WATER FROM COAL BY FIRST TURNING ITS SURFACE HYDROPHOBIC (U.S. PATENT 4,597,769, ISSUED JULY 1ST, 1986). THE TREATMENT INVOLVES A VERY LOW-COST CHEMICAL REACTION WHICH CONVERTS THE HYDROXLIC AND CARBOXYLIC SURFACE FUNCTIONALITIES TO ETHERS AND ESTERS. THIS TREATMENT REDUCES THE PROTICITY OF THE SURFACE BUT DOES NOT INFLUENCE MUCH THE POLARIZABLE SURFACE FUNTIONALITIES. THEREFORE, WE EXPECT THAT IT WILL REDUCE SIGNIFICANTLY THE ADHERENCE AND SORPTION OF WATER TO THE SURFACE BUT WILL HAVE LITTLE OR NO EFFECT ON THE SORPTION OF WARFARE GASES. IN THIS PROJECT DIFFERENT SURFACE TREATMENTS WILL BE EXAMINED IN THE SPIRIT OF THE PATENT AND THEIR EFFECT ON THE SORPTION OF WARFARE GAS (WG) SIMULANTS WILL BE EXAMINED IN THE ABSENCE AND IN THE

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PRESENCE OF CONTROLLED AMOUNTS OF HUMIDITY. SHOULD TREATMENTS AT SOME CONDITIONS APPEAR TO REDUCE THE SENSITIVITY OF THE SORPTION OF WG TO THE RELATIVE HUMIDITY, THE PROCESSING CONDITIONS WILL BE OPTIMIZED TO OBTAIN "WATER-RESISTANT" CARBON SUPPORT.

PERSIS TECHNOLOGY INC
PO BOX 402
THREE BRIDGES, NJ 08887
CONTRACT NUMBER: DAAL02-87-C-0085
S SINGH
TITLE:
PIN DIODE LIMITER DYNAMICS
TOPIC# 42 OFFICE: HDL

THE DESIGN OF PIN DIODE HAVE TRADITIONALLY BEEN CONDUCTED USING LINEAR CIRCUIT ANALYSIS AND INVOLVED INCORPORATING OF THE DIODE INTO A LOW PASS STRUCTURE. THIS STUDY WILL IMPLEMENT THE COMPLETE PIN DIODE MODEL INTO THE SPICE SOURCE CODE AND WILL MAKE POSSIBLE THE LINEAR AND NON LINEAR ANALYSIS IN THE TIME DOMAIN AND FREQUENCY DOMAIN. IN THE TRANSIENT ANALYSIS THE SPIKE LEAKAGE AND FLAT LEAKAGE WILL BE DISPLAYED FOR PULSE EXCITATION AND THE ENERGY ASSOCIATED IN EACH WILL BE DETERMINED BY INTEGRATION. ALSO RECOVERY TIME ANALYSIS WILL LEAD TO THEORETICAL ASSESSMENT OF THE BURN OUT LEVELS. IN ADDITION PRACTICAL EXPERIMENTS WILL BE CONDUCTED TO AUGMENT THE ELECTRICAL MODEL OF THE PIN DIODE. THEORETICAL RESULTS, FROM RECOVERY TIME ANALYSIS ON SPICE, UP TO THE BURN OUT LEVELS WILL BE COMPARED WITH PRACTICAL MEASUREMENTS. EMPHASIS WILL BE GIVEN TO NON-DESTRUCTIVE TESTING AND IT'S CORRELATION WITH THE ANALYSIS. SOFTWARE WILL BE PROVIDED.

PHOTON SCIENCES (OLD: FLOW RESEARCH CO)
11816 N CREEK PKWY S
BOTHELL, WA 98011
CONTRACT NUMBER: DAAA15-87-C-0061
DR BRIAN WALKER
TITLE:
HIGH SPEED NONPOLARIZING NEUTRAL DENSITY FILTER
TOPIC# 91 OFFICE: BRL

SUBMITTED BY

BY APPLYING ADVANCED CONCEPTS IN LIQUID CRYSTAL TECHNOLOGY A DYNAMIC, IMAGING QUALITY, NONPOLARIZING, NEUTRAL DENSITY FILTER CAN BE CONSTRUCTED WHICH WILL VARY TRANSMITTED LIGHT INTENSITY OVER A FULL RANGE OF NEARLY 0 TO 100%. THIS DEVICE WOULD POSSESS A SWITCHING SPEED ON THE ORDER OF ONE MILLISECOND AND COULD BE FABRICATED AT LOW COST OVER A VERY LARGE RANGE OF SIZES.

PHYSICAL DYNAMICS INC
PO BOX 1883
SAN DIEGO, CA 92038
CONTRACT NUMBER: DAAD05-87-C-0023
DR WILLIAM T KREISS
TITLE:
DESIGN AND DEVELOPMENT CONSIDERATIONS FOR AN IMPROVED
WIND TUNNEL AT DPG
TOPIC# 191 OFFICE: TECOM

THE PERFORMANCE OF ATMOSPHERIC SAMPLERS IS CRUCIAL TO THE ANALYSES AND INTERPRETATION OF DISPOSAL AND REACTION-RATE TRAIL DATA FOR CBW MATERIALS AND OBSCURANTS. ROUTINE CALIBRATION OF SENSOR/SAMPLER IS PERFORMED PRIOR TO DEPLOYMENT IN SUPPORT OF FIELD TRIALS. PRESENTLY SENSOR/SAMPLERS COLLECTION EFFICIENCY AND PERFORMANCE IS DETERMINED AT DPG USING A WIND TUNNEL WHICH IS NOT STATE-OF-THE-ART AND WHICH PRODUCES RESULTS THAT ARE SUBJECT TO NUMEROUS UNCERTAINTIES. CURRENT AND PROJECTED MILITARY OPERATIONAL REQUIREMENTS ARE SUCH THAT IMPROVED CALIBRATION RELIABILITY OVER A BROAD RANGE OF ENVIRONMENTAL CONDITIONS IS NECESSARY. TO ACCOMMODATE THIS REQUIREMENT, DPG IS SEEKING TO UPGRADE OR REPLACE THEIR CURRENT WIND TUNNEL. A WIND TUNNEL THAT WOULD MEET ALL OF THE CALIBRATION AND TESTING REQUIREMENTS OF DPG HAS ALREADY BEEN DESIGNED, CONSTRUCTED, AND PERFORMANCE-EVALUATED. IT IS HEREIN PROPOSED THAT ITS DESIGN, AND THE LESSONS LEARNED IN ITS EVALUATION, BE APPLIED TO THE UPGRADING OF THE DPG WIND TUNNEL TO PRODUCE A STATE-OF-THE-ART, MICROPROCESSOR-CONTROLLED CALIBRATION AND TESTING FACILITY.

PHYSICAL SCIENCES INC
603 KING ST
ALEXANDRIA, VA 22314
CONTRACT NUMBER: DAAL01-87-C-0751
DR MICHAEL E READ
TITLE:
FEASIBILITY STUDY OF NEW HIGH CURRENT DENSITY ELECTRON
USING PULSE LASER OF ELECTRON BEAM IRRADIATION
TOPIC# 133 OFFICE: ETDL

SUBMITTED BY

CATHODES CAPABLE OF GENERATING CURRENTS OF 100 A TO 10,000 A WITH CURRENT DENSITIES OF 100 TO 1000 A/cm² WITH HIGH BRIGHTNESS ARE REQUIRED FOR SUPERPOWER MICROWAVE, mm-WAVE AND OPTICAL COHERENT RADIATION SOURCES, SUCH AS FREE ELECTRON LASERS. OF PRESENTLY AVAILABLE CATHODES, ONLY FIELD EMISSION TYPE CATHODES CAN PRODUCE THE REQUIRED CURRENT DENSITIES. THESE ARE NOT SUITABLE FOR LONG PULSE OF HIGH DUTY CYCLE OPERATION, WHICH IS CRITICAL TO MANY APPLICATIONS. PULSE LASER DRIVEN PHOTOEMISSIVE AND PULSE HEATED THERMIONIC CATHODES HAVE RECENTLY BEEN SHOWN TO BE CAPABLE OF PRODUCING BEAMS WITH CURRENT DENSITIES EXCEEDING 100 A/cm² OVER 1 cm², AND WITH NORMALIZED BRIGHTNESSES AS HIGH AS 10⁽⁷⁾ A/cm² RAD⁽²⁾. CALCULATIONS INDICATE THAT WITH NEW METHODS OF COOLING, DUTY FACTORS AS HIGH AS 0.1 CAN BE ACHIEVED. IN ADDITION, WITH THESE CATHODES, EMISSION GATING IS POSSIBLE. THE PROPOSED WORK IS TO EXAMINE ANALYTICALLY IN DETAIL THE FEASIBILITY OF HIGH CURRENT DENSITY PHOTOEMISSIVE AND/OR PULSE HEATED THERMIONIC CATHODES SUITABLE FOR HIGH POWER MICROWAVE TUBES, INCLUDING OPTIMIZATION OF THE USE OF PRESENTLY KNOWN EMITTERS AS WELL AS A SEARCH FOR NEW MATERIALS.

PHYSICON INC
3225 BOB WALLACE AVE - STE I
HUNTSVILLE, AL 35805
CONTRACT NUMBER: DAAH01-87-C-0916
MELVIN L PRICE
TITLE:
PLUME MODELING AND TESTING
TOPIC# 151 OFFICE: MICOM

TACTICAL MANEUVERING INTERCEPTORS OPERATE IN THE ATMOSPHERE BUT MAY BE AT A HIGH ENOUGH ALTITUDE TO ENCOUNTER FREE MOLECULAR FLOW. PLUME MODELS USED TO SIMULATE VARIOUS CONDITIONS ENCOUNTERED DURING FLIGHT REQUIRE INCREASINGLY COMPLEX COMPUTATIONAL RESOURCES TO ADVANCE THE STATE-OF-THE-ART. AS THESE MODELS BECOME MORE AND MORE COMPLEX THE RESULTS PREDICTED BY THE MODEL ARE NOT EASILY RELATED TO THE AVAILABLE DATA FOR MODEL VERIFICATION AND/OR CALIBRATION. IN THIS PROPOSAL, PHYSICON WANTS TO DEVELOP A NEW, INNOVATIVE TEST FACILITY SPECIFICALLY TAILORED TO PROVIDE REALISTIC DATA FOR DETERMINING PLUME BEHAVIOR OF MANEUVERING INTERCEPTORS. INCLUDED IN THIS TEST FACILITY WILL BE HIGH MACH AIRFLOW, VARIABLE ATMOSPHERIC CONDITIONS, PLUME

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INTERACTIONS, AND INTERCEPTOR RESPONSE MEASUREMENTS. THE INSTRUMENTATION DEVELOPED WITH THE TEST FACILITY WILL BE DESIGNED TO LOOK AT PLUME/INTERCEPTOR INTERACTIONS, PLUME/SENSOR INTERACTIONS AND OTHER PHENOMENA.

PICKARD-LOWE & GARRICK INC
2260 UNIVERSITY DR
NEWPORT BEACH, CA 92660
CONTRACT NUMBER: DAAD05-87-C-0083
DR STAN KAPLAN

TITLE:
BAYESIAN METHODOLOGY FOR QUANTITATIVE RELIABILITY ASSE
APPLICATIONS TO COMPLEX WEAPONS SYSTEMS
TOPIC# 235 OFFICE: TECOM

A METHODOLOGY WILL BE DEVELOPED BASED ON BAYES' THEOREM FOR QUANTITATIVE RELIABILITY ASSESSMENT OF COMPLEX WEAPONS SYSTEMS. THIS METHODOLOGY WILL BE ABLE TO USE ALL RELEVANT, OR EVEN PARTIALLY RELEVANT, EVIDENCE AND INFORMATION, INCLUDING FIELD AND LABORATORY TESTS, EXPERT OPINIONS, THEORETICAL CALCULATIONS, ACTUAL EXPERIENCE OF SIMILAR RELATED EQUIPMENT, EARLIER GENERATIONS OF THE EQUIPMENT, ETC. ALL SUCH ITEMS OF INFORMATION WILL BE APPROPRIATELY WEIGHED RELATIVE TO EACH OTHER BY THE METHODOLOGY. THIS WILL ALLOW THE USER TO OPTIMIZE HIS DECISIONS WITH RESPECT TO THE NUMBERS AND TYPES OF RELIABILITY TESTS REQUIRED.

PIEZO TECHNOLOGY INC
2525 SHADER RD
ORLANDO, FL 32804
CONTRACT NUMBER: DAAL01-87-C-0747
JOHN R HUNT
TITLE:
IMPROVED CRYSTAL BLANK ANGLE CORRECTION
TOPIC# 121 OFFICE: ETDL

THE TEMPERATURE DEPENDENCE OF QUARTZ CRYSTAL RESONATOR FREQUENCIES IS DETERMINE PRINCIPALLY BY THE CRYSTALLOGRAPHIC ORIENTATION OF CRYSTAL BLANKS. AS FREQUENCY REQUIREMENTS BECOME MORE STRINGENT, THE

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1
BY SERVICE
FISCAL YEAR 1987
ARMY

PAGE 139

SUBMITTED BY

REQUIRED ANGLE TOLERANCES CAN BECOME TIGHTER THAN THE TYPICAL CAPABILITY OF MANY PRODUCTION PROCESSES. FOR THE EFFICIENT PRODUCTION OF PRECISION ATI- AND SC-CUT RESONATORS WITH HIGH RESULTANT YIELDS, AN EFFECTIVE TECHNIQUE MUST BE DEvised TO CORRECT PRODUCTION ANGLE SPREADS TO ACCEPTABLE DEVICE LIMITS. MANY METHODS HAVE BEEN UTILIZED TO ACCOMPLISH CRYSTAL BLANK ANGLE CORRECTION, WITH VARYING DEGREES OF PRACTICAL SUCCESS. AS FREQUENCY CONTROL ELEMENTS ARE REQUIRED TO MEET THEIR SPECIFICATIONS OVER WIDER AND WIDER ENVIRONMENTAL EXTREMES, MORE EMPHASIS IS PLACED ON THE SC-CUT CRYSTAL RESONATOR. THE DOUBLY-ROTATED CRYSTAL CUT NOW REQUIRES THE MANUFACTURER TO ACCURATELY CONTROL TWO ANGLES OF ROTATION. WHAT IS SUBMITTED IN THIS PROPOSAL IS AN IMPLEMENTATION OF AN ANGLE CORRECTION TECHNIQUE WHICH WOULD ALLOW FOR THE SIMULTANEOUS ADJUSTMENT OF BOTH THE PHI AND THETA ANGLES ON AN SC- CUT BLANK WITH A SINGLE LAPPING OPERATION ON A STANDARD PIECE OF LAP EQUIPMENT.

PINNACLE RESEARCH INSTITUTE INC
10432 N TANTAU AVE
CUPERTINO, CA 95014
CONTRACT NUMBER:

DR HECTOR SIERRAALCAZAR
TITLE:

A MICRO ELECTROCHEMICAL PROBE WITH SEGMENTED ELECTRODE
CORROSION/SCALING SENSING
TOPIC# 251 OFFICE: CERL

SEVERAL HUNDRED MILLION DOLLARS A YEAR COULD BE SAVED NATION WIDE BY APPLYING EXISTING CORROSION/SCALING CONTROL MEASURES TO POTABLE WATER DISTRIBUTION SYSTEMS. FOR EFFECTIVE CONTROL, IT IS ESSENTIAL TO USE THE FEEDBACK OF A DISTRIBUTED CORROSION/SCALING SENSOR NETWORK. PRI PROPOSES THE DEVELOPMENT OF A CORROSION/SCALING SENSOR BASED ON MULTIPLE ELECTROCHEMICAL AC AND DC TECHNIQUES. THE TECHNIQUES USED WILL BE BASED ON A MICROELECTROCHEMICAL PROBE WITH SEGMENTED ELECTRODE (MEPSE). WE WILL DETERMINE POLARIZATION RESISTANCE, TAFEL SLOPES, CAPACITANCE, CORROSION POTENTIAL, GALVANIC CURRENTS, AND TRUE STEADY STATE POLARIZATION CURVES FOR MICROAREAS IN THE INSIDE OF A TUBE. SCALING AND CORROSION ASSESSMENT DETERMINATION IS EXPECTED TO BE OBTAINED FROM STATISTICAL EVALUATION OF LOCAL CORROSION RATES, LOCAL CAPACITANCE AND OHMIC RESISTANCE. THE MEASUREMENT SYSTEM WILL

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HAVE A HIGH DEGREE OF FLEXIBILITY BOTH IN THE TECHNIQUES USED, IN THE DATA ANALYSIS, AND IN THE DISPLAY STORAGE AND COMMUNICATION OPTIONS. A DEVICE WITH CUSTOMIZED INSTRUMENTATION COULD BE DEVELOPED FOR COMMERCIAL APPLICATIONS SERVING INDUSTRY AT LARGE.

PLANNING & DECISION SCIENCES INC
1705 BELLE VIEW BLVD - STE A-1
ALEXANDRIA, VA 22307
CONTRACT NUMBER: DAAD07-87-C-0059
ERNEST A CARROLL
TITLE:
RADIOMETER BEAM LOCATION SYSTEM
TOPIC# 234 OFFICE: TECOM

THIS PROPOSAL DESCRIBES HOW TO DEVELOP A RADIOMETER BEAM LOCATION SYSTEM WHICH WILL LOCATE WHERE A SMALL MUNITION'S RADIOMETER IS POINTED AT ANY TIME DURING A LIVE FIRE TEST. A SADARM-TYPE MUNITION IS USED AS A BASELINE EXAMPLE. TWO CLASSES OF POTENTIAL DESIGNS ARE EXAMINED (REMOTE AND INTEGRAL). EACH DESIGN HAS TWO SUB-OPTIONS. A TRADES STUDY IS USED TO SELECT THE MOST COST EFFECTIVE DESIGN.

POLYFORM CORP
PO BOX 447 - 69 MILK ST
WESTBORO, MA 01581
CONTRACT NUMBER: DAAA21-87-C-0185
PAUL A DiPIERRO
TITLE:
DEVELOPMENT OF A REACTION INJECTION MOLDED (RIM) PALLE
FOR THE NEW 155 MM PLASTIC PROP CHARGE CASE
TOPIC# 12 OFFICE: ARDC

THE DEVELOPMENT OF NEW METHODS OF PACKAGING HAS BEEN A PRIMARY CONCERN TO THE DEPARTMENT OF DEFENSE. THIS IS EVIDENT IN THE INNOVATIVE METHODS AND MATERIAL CHOICES THAT HAVE BEEN SELECTED FOR CONSIDERATION BY THE AMMUNITION LOGISTICS PLANNERS. A MEANS OF ADAPTING PALLETS TO VARIOUS AMMUNITION CONTAINERS IS OF PRIME IMPORTANCE. RATHER THAN CONSIDERING THE HIGH COST OF A SPECIAL PALLET FOR EACH CONTAINER STYLE, AN ADAPTER, PRODUCED FROM HIGH STRENGTH POLYURETHANE

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1
BY SERVICE
FISCAL YEAR 1987
ARMY

PAGE 141

SUBMITTED BY

RIM MOLDED MATERIAL WOULD ENABLE A FEW PALLET SIZES TO BE INTER-CHANGABLE FOR A NUMBER OF DIFFERENT CONTAINER CONFIGURATIONS. A PALLET ADAPTER WOULD ALSO FACILITATE THE STACKING AND LOADING INTEGRITY. THE USE OF DURABLE, HIGH COMPRESSIVE STRENGTH, NON-SPARKING, MBC RESISTANT POLYURETHANE IS A VALID APPROACH TO THIS PROBLEM. THE PROPOSED PROGRAM IS DIRECTED TOWARD THE DEVELOPMENT AND PROOF OF PRINCIPLE OF JUST SUCH A PALLET ADAPTER.

POLYTRONIX INC
1820 GLENVILLE AVE
RICHARDSON, TX 75081
CONTRACT NUMBER: DAAL02-87-C-0060
JACOB W LIN
TITLE:
LIQUID CRYSTAL DISPLAY ILLUMINATION FOR NIGHT USE
TOPIC# 66 OFFICE: HDL

AN ALL PLASTIC LIQUID CRYSTAL DISPLAY SYSTEM ESPECIALLY APPROPRIATE FOR NIGHT OR LOW LIGHT LEVEL ILLUMINATION USE WILL BE DEVELOPED. A KEY ELEMENT IN THE RESEARCH WILL BE THE SUBSTITUTION OF DICHRONIC LIQUID CRYSTALS FOR THE COMMONLY USED TWISTED NEMATIC (TN) LIQUID CRYSTALS. THE USE OF A DICHOIC DISPLAY PERMITS THE ELIMINATION OF THE LINEAR POLARIZERS ON BOTH THE FRONT AND REAR SURFACES OF THE CONVENTIONAL TN LCDS. THE ELIMINATION OF THE POLARIZERS NOT ONLY SIGNIFICANTLY ENHANCES THE READABILITY OF THE DISPLAY BUT IT REPRESENTS SIGNIFICANT COST SAVING IN TERMS OF MANUFACTURING EASE AND ILLUMINATION COSTS. ALSO THIS IMPROVEMENT ALLOWS THE ILLUMINATION POWER TO REDUCE TO A MINIMUM. BASED ON POLYTRONIX'S PAST AND CURRENT RESEARCH WITH ALL PLASTIC LCDS, WE ARE CONFIDENT IN BEING ABLE TO PRODUCE A DICHOIC DISPLAY WITH A THICKNESS OF 0.015 INCHES AND A WIDTH OF 0.75 INCHES CAPABLE OF BEING FORMED INTO AN AREA OF 120 DEG WITH A ONE INCH RADIUS. THIS DISPLAY WILL BE ILLUMINATED FOR NIGHT USE AND WOULD BE RELATIVELY INEXPENSIVE WITH RESPECT TO LARGE VOLUME PRODUCTION.

POLYTRONIX INC
1820 GLENVILLE AVE
RICHARDSON, TX 75081
CONTRACT NUMBER: DAAK60-87-C-0040
JACOB W LIN
TITLE:
BALLISTIC FACE SHIELD WITH DEICING/DEFOGGING CAPABILIT
EXTREME CLIMATE
TOPIC# 175 OFFICE: NATICK

SUBMITTED BY

WE PROPOSE TO USE PLASMA POLYMERIZATION METHODS TO DEPOSIT HYDROPHOBIC FLUOROCARBON FILMS ON FACE SHIELDS TO PREVENT ICE AND FOG BUILD-UP. THESE WILL BE VERY LOW SURFACE ENERGY COATINGS, STRONGLY ADHERENT TO THE PLASTIC SHIELD. THE PROPOSED RESEARCH WILL EVALUATE A NUMBER OF FLUOROCARBON FILMS IN TERMS OF ADHERENCE, TRANSPARENCY, AND SURFACE ENERGY. OVERALL, THE USE OF SUCH FILMS REPRESENT AN IDEAL SOLUTION TO THE ICE AND FOG BUILD-UP PROBLEM IN THAT THE PROPOSED METHOD IS BOTH EFFECTIVELY AND RELATIVELY INEXPENSIVE TO APPLY.

PREDICTION SYSTEMS INC
200 ATLANTIC AVE
MANASQUAN, NJ 08736
CONTRACT NUMBER: DAAL01-87-C-0737

WILLIAM C CAVE

TITLE:

EXPERT SYSTEM SIMULATOR TO EVALUATE AI TECHNIQUES FOR
SYSTEM ECCM

TOPIC# 68

OFFICE: VAL

THE NDI METHOD OF PROCUREMENT FOR ARMY COMMUNICATIONS SYSTEMS HAS BROUGHT ABOUT A REDUCTION OF THE LONG LEAD TIMES FOR SYSTEM DEPLOYMENT. A RESULTING CONCERN IS THAT SOME REQUIRED ITEMS REMAIN UNSPECIFIED AT THE TIME OF PURCHASE, AND ARE LEFT TO BE ADDRESSED SEPARATELY. SPECIFICALLY, THE ARMY'S MOBILE SUBSCRIBER EQUIPMENT (MSE) PROCUREMENT DOES NOT ALLOW THE INCORPORATION OF ECCM INTO THE SYSTEM. THE NEED FOR ESM AND ECCM HAS BEEN RECOGNIZED IN A NUMBER OF DOCUMENTED SOURCES. THIS PROPOSAL PROVIDES FACILITIES TO SUPPORT THE SOLUTION OF THIS PROBLEM. USING AI TECHNIQUES, PSI HAS DEVELOPED AN EXPERT SYSTEM APPROACH TO BUILDING SIMULATIONS FOR RAPID DESIGN, TEST, AND EVALUATION OF COMMUNICATIONS SYSTEMS, AND THEIR VULNERABILITIES. THUS, A SIMULATION FACILITY COULD BE BUILT QUICKLY FOR TEST AND EVALUATION OF ESM. USING PSI'S SIMULATION TOOLS AND THE MODEL LIBRARIES, THIS FACILITY COULD GROW WITH THE ADDED KNOWLEDGE OF EXPERT USERS. THE FACILITY ITSELF CAN THEN BE GROWN TO BECOME AN EXPERT SYSTEM FOR DESIGN, TEST, AND EVALUATION OF ESM AND ECCM FEATURES TO SUPPORT MSE TYPE COMMUNICATIONS. SUCH A FACILITY COULD ALSO BE USED FOR RAPID PROTOTYPING OF SYSTEM MODELS TO BE USED IN VULNERABILITY ASSESSMENT.

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PREDICTION SYSTEMS INC
200 ATLANTIC AVE
MANASQUAN, NJ 08736
CONTRACT NUMBER: DAAB07-87-C-P055
WILLIAM C CAVE

TITLE:
APPLICATION OF AI TECHNIQUES TO THE DEVELOPMENT OF ADA
POWER MANAGEMENT
TOPIC# 291 OFFICE: EW

JAMMER POWER MANAGEMENT REQUIRES SIGNIFICANT EXPERTISE COVERING THE RECOGNITION OF OPPORTUNITIES, AND KNOWLEDGE OF EW SYSTEM CAPABILITIES SYSTEMS TO TAKE ADVANTAGE OF THOSE OPPORTUNITIES. THERE IS DOUBT THAT MANY OF THE FUNCTIONS OF JAMMER POWER MANAGEMENT CAN BE AUTOMATED. FOR EXAMPLE, ELECTROMAGNETIC PATTERN OPTIMIZATION IN THE SPACE, TIME, AND FREQUENCY DOMAINS, PARTICULARLY THE SELECTION OF FREQUENCY COVERAGE AND MODULATION, LEND THEMSELVES TO AUTOMATION SUPPORT SYSTEMS. HOWEVER, REPLICATING THE KNOWLEDGE OF AN EXPERT IN THE WAY THAT THEY WOULD DECIDE TO SELECT THESE FUNCTIONS GOES WELL BEYOND AUTOMATION AIDS. PSI HAS BEEN DEVELOPING AN EXPERT SYSTEM SIMULATION FACILITY TO PERFORM AI-BASED EXPERIMENTS. THIS FACILITY PROVIDES AN ELECTROMAGNETIC ENVIRONMENT AND EW EQUIPMENT MODELING CAPABILITY TO COLLECT THE TYPES AND AMOUNT OF DATA NEEDED TO PERFORM THE REQUIRED EW ANALYSES. THE USE OF AI TECHNIQUES TO DEVELOP ADAPTIVE JAMMER STRATEGIES APPEARS TO BE AN EXCELLENT OPPORTUNITY TO DEMONSTRATE PSI'S EXPERT SYSTEM SIMULATION ENVIRONMENT. IN ADDITION, THE FACILITIES PROPOSED CAN SUPPORT THE ANALYSIS, DESIGN AND EVALUATION OF THE APPLICATION OF AI TECHNIQUES TO THE DEVELOPMENT OF ADAPTIVE POWER MANAGEMENT STRATEGIES.

PREDICTION SYSTEMS INC
200 ATLANTIC AVE
MANASQUAN, NJ 08736
CONTRACT NUMBER: DAAB07-87-C-A031
WILLIAM C CAVE

TITLE:
ADVANCED FACILITIES TO EXPEDITE DESIGN AND EVALUATION
SWITCHED SYSTEMS
TOPIC# 302 OFFICE: C/A

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 144
BY SERVICE
FISCAL YEAR 1987
ARMY

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THE URGENT NEED FOR THE ARMY TO MODERNIZE ITS COMMUNICATIONS FACILITIES FOR THE TACTICAL ENVIRONMENT HAS BEEN EMPHASIZED BY THE PROCUREMENT OF NONDEVELOPMENTAL ITEMS (NDI), E.G., THE MOBILE SUBSCRIBER EQUIPMENT (MSE). ASSOCIATED WITH THE PROCUREMENT OF THE MSE SYSTEM ARE ADDITIONAL ISSUES TO BE ADDRESSED TO INSURE THAT THE SYSTEM WILL FULLY SUPPORT USER EXPECTATIONS. AMONG THE MOST IMPORTANT ONES IN THE INTEGRATION OF PACKET SWITCHED NETWORKS TO INCORPORATE LARGE NUMBERS OF DATA USERS IN A WAY THAT ALL USERS CAN BE PROVIDED WITH ADEQUATE SERVICE. THIS EFFORT PROVIDES AN EXPERT SYSTEM APPROACH TO BUILDING SIMULATIONS TO DESIGN, TEST, AND EVALUATE PACKET SWITCHING PROTOCOLS AS THEY WOULD BE INCORPORATED INTO MSE TYPE NETWORKS. THIS APPROACH PROVIDES FOR INTERCHANGEABILITY OF MODELS AND SUBMODELS FROM SIMULATION TO SIMULATION. PSI HAS ALREADY BUILT SIMULATIONS CONTAINING PACKET PROTOCOLS AND SEPARATE SIMULATIONS OF THE MSE SYSTEM. THUS, BASED ON THE MODELS ALREADY EXISTING, PSI CAN BUILD A FACILITY FOR RAPID ANALYSIS, TEST, AND EVALUATION OF THE INTEGRATION OF PACKET SWITCHING PROTOCOLS WITH MSE.

PREDICTION SYSTEMS INC
200 ATLANTIC AVE
MANASQUAN, NJ 08736
CONTRACT NUMBER: DAAB07-87-C-A024
ROBERT E WASSMER
TITLE:
SYMBOLIC MODEL DEVELOPMENT FACILITIES FOR EVALUATION O
NETWORKS
TOPIC# 302 OFFICE: C/A

IN APPLYING MODELING AND SIMULATION TECHNIQUES TO MODERN COMMUNICATIONS SYSTEMS PROBLEMS, THE APPLICATION ENGINEER IS FACED WITH EVER INCREASING COMPLEXITIES OF THE COMMUNICATION SYSTEM ITSELF, THE COMPLEXITY OF THE STUDY OF INTEREST, THE DATABASES FOR INPUT AND OUTPUT, AND THE DEBUGGING ACTIVITIES. GRAPHICS ARE PROVIDING THE NEW DIMENSIONS TO KEEP THESE COMPLEX OPERATIONS AT MANAGEABLE LEVELS. THIS PROJECT ALLOWS THE COMPLETE GRAPHIC DEVELOPMENT OF MODELS AND SIMULATIONS. THE GENERAL SIMULATION SYSTEM PROVIDES COMMUNICATIONS SYSTEMS ENGINEERS WITH THE ABILITY TO RAPIDLY BUILD COMPLEX MODELS, RUN SIMULATIONS, AND PRODUCE RESULTS VERY QUICKLY. PSI IS PROPOSING THAT INTERACTIVE SYMBOLIC MODEL DEVELOPMENT BE APPLIED TO THE MSE SYSTEM

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ACCESS NETWORKS TO DEMONSTRATE A SIGNIFICANT ENGINEERING DESIGN TOOL ENHANCEMENT FOR COMMUNICATIONS SYSTEMS. THE SIMULATION DEVELOPER CREATES THE HIGHEST LEVEL GRAPHIC DESCRIPTION OF THE MODEL TO BE BUILT, NAMING KEY INPUT, OUTPUT, AND INTERNAL FUNCTIONS AND USING STANDARD ICONS AS REQUIRED. AT ANY TIME, A HIERARCHICAL PUSHDOWN PROCESS IS INITIATED TO FURTHER DESCRIBE SUBMODELS, AND THEIR INPUT, OUTPUT, AND INTERNAL FUNCTIONS. THIS HIERARCHICAL PUSHDOWN OF MODELS CAN BE CONTINUED THROUGH SEVERAL LEVELS UNTIL THE PHYSICAL PROCESS IS BEST DESCRIBED BY THE GRAPHIC PRIMITIVES OF THE SIMULATION LANGUAGE WHICH ARE AUTOMATICALLY COMPILABLE.

PRINCETON COMBUSTION RSCH LABS INC
475 U S HIGHWAY ONE
MONMOUTH JUNCTION, NJ 08852
CONTRACT NUMBER: DAAA15-87-C-0056
DR NEAL A MESSINA

TITLE:

PROTECTIE COATINGS FOR ALUMINUM ALLOYS IN A BALLISTIC ENVIRONMENT

TOPIC# 85 OFFICE: BRL

ENHANCED GUN TUBES AND PROPELLANT TECHNOLOGY HAVE GREATLY INCREASED PROJECTILE VELOCITIES, DYNAMIC FORCES, AND AERODYNAMIC HEATING OF TANK-LAUNCHED PROJECTILES. IN MANY INSTANCES THE STRENGTH AND TEMPERATURE LIMITATIONS OF ALUMINUM ALLOY FINS HAVE BEEN EXCEEDED UNDER TANK GUN IN-BORE PROJECTION AND IN-FLIGHT CONDITIONS AND HAVE RESULTED IN DEGRADED OR COMPROMISED WEAPON SYSTEM PERFORMANCE. NEW EROSION RESISTANT COATING MATERIALS AND APPLICATION PROCESSES MUST BE DEVELOPED WHICH WILL PERMIT UNCOMPROMISED OPERATION OF HIGH PERFORMANCE LARGE CALIBER TANK-LAUNCHED PROJECTILES WITH ALUMINUM ALLOY FINS, WHETHER FIXED FIN OR FOLDING FIN OR T-TAIL. THESE COATINGS MUST SURVIVE AT THE IN-BORE COMBUSTION GAS TEMPERATURES AND AT THE FREE-FLIGHT RECOVERY TEMPERATURES WITHOUT EVAPORATING, CRACKING, OR SPALLING. PCRL WILL DIAGNOSTICALLY EVALUATE SEVERAL CANDIDATE FIN COATING MATERIALS AND ASSOCIATED APPLICATION TECHNIQUES TO ALUMINUM ALLOY TEST SPECIMENS IN ITS BALLISTIC COMPRESSOR DYNAMIC PRESSURE GENERATING SYSTEM, UP TO TEMPERATURES OF 3000 DEG C AND FLOW VELOCITIES OF 3750 FT/SEC. CANDIDATE COATINGS INCLUDE ZIRCONIUM OXIDE-YTTRIUM OXIDE; GROUP VIII NOBLE METALS (Pt, Ru, Rh); AND

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SYNTHETIC DIAMOND. WEIGHT LOSS MEASUREMENTS AND PHOTOMICROGRAPHS OF THE COATING SURFACE WILL PROVIDE QUANTITATIVE INFORMATION ON THE EROSION RESISTANCE OF THE CANDIDATE COATINGS.

Q-DOT INC
1069 ELKTON DR
COLORADO SPRINGS, CO 80907
CONTRACT NUMBER: DAAA15-87-C-0037
DR MARK WADSWORTH

TITLE:
A MULTIPLE-OUTPUT Si/GaAs HYBRID IMAGING DEVICE FOR VE
FRAME-RATE APPLICATIONS
TOPIC# 96 OFFICE: BRL

CONVENTIONAL HIGH-SPEED IMAGE-RECORDING SYSTEMS ARE TYPICALLY BASED ON STROBOSCOPIC AND/OR HIGH-SPEED FILM METHODOLOGIES. THESE APPROACHES SUFFER FROM THE USE OF FILM AS A RECORDING MEDIUM, REDUCING SYSTEM FLEXIBILITY AND ELIMINATING REAL-TIME EVALUATION OF IMAGE DATA. FURTHERMORE, CONVENTIONAL ELECTRONIC IMAGING SYSTEMS DO NOT POSSESS HIGH FRAME-RATE CAPABILITIES. Q-DOT PROPOSES A HYBRID Si/GaAs ELECTRONIC IMAGING DEVICE CAPABLE OF OBTAINING MORE THAN ONE THOUSAND IMAGES PER SECOND. THE DEVICE CONSISTS OF A SILICON PERISTALTIC CHARGE-COUPLED DEVICE IMAGING ARRAY WITH GaAs FIELD-EFFECT TRANSISTORS BUMP MOUNTED FOR USE AS OUTPUT STRUCTURES. THE PROPOSED IMAGER HAS INHERENT OPTICAL SHUTTERING AND UTILIZES A PARALLELDL OUTPUT DATA ARRANGEMENT. FOR AN ARRAY FORMAT OF 512 X 512 PIXELS WITH 8 PARALLEL OUTPUT CHANNELS, THE PROPOSED IMAGER CAN GATHER AND OUTPUT MORE THAN 1250 IMAGES PER SECOND AT A 50 MEGAPIXEL/SECOND/CHANNEL OUTPUT RATE, WITH A DYNAMIC RANGE OF GREATER THAN 500 TO 1. SUBSTANTIALLY HIGHER FRAME RATES ARE POSSIBLE THROUGH THE USE OF ADDITIONAL OUTPUT CHANNELS AND HIGHER OUTPUT DATA RATES.

QO INC
2240 GOLF LINKS RD
SIERRA VISTA, AZ 85635
CONTRACT NUMBER: DAAB07-87-C-A033
MILES A MERKEL
TITLE:
EM PROPAGATION IN UN-IONIZED MEDIA - STATE OF THE ART
TOPIC# 301 OFFICE: C/A

SUBMITTED BY

RESEARCH IS PROPOSED IN THE AREA OF CURRENT CAPABILITY OF INTERNATIONAL RADIO WAVE PROPAGATION ALGORITHMS TO PREDICT THE STATE OF THE UN-IONIZED MEDIA. MAJOR WEAKNESSES IN ALGORITHMS WILL BE IDENTIFIED. THE IMMEDIATE BENEFITS OF THE RESEARCH INCLUDE A DESIGN FOR A MODEL ENCOMPASSING THE ENTIRE ELECTROMAGNETIC SPECTRUM WHICH COULD BE CONSTRUCTED WITH PHASE II FUNDING.

QUANTEX CORP
2 RESEARCH CT
ROCKVILLE, MD 20850
CONTRACT NUMBER: DAAA15-87-C-0036
CHARLES Y WRIGLEY
TITLE:
DATA ACQUISITION ERASABLE OPTICAL MEMORY
TOPIC# 97 OFFICE: BRL

THIS PROPOSAL ADDRESSES THE FEASIBILITY DEMONSTRATION OF AN OPTICAL MEMORY APPROACH WHICH IS INHERENTLY AMENDABLE TO MULTI-LEVEL-DIGITAL OR ANALOG OPTICAL STORAGE. RECENT QUANTEX MATERIALS DEVELOPMENTS HAVE SHOWN THAT SOME OF ITS NEW ELECTRON-TRAPPING (ET) MATERIALS CAN PROVIDE ALL-OPTICAL WRITE, READ AND ERASE MEMORY FUNCTIONS WHICH ARE LINEAR OVER ORDERS OF MAGNITUDE OF THE WRITE LIGHT INTENSITY. EACH MICROSCOPIC STORAGE LOCATION COULD THEREFORE STORE MANY BITS OF INFORMATION. THE ET MATERIALS PERFORM THE OPTICAL MEMORY FUNCTION AT ROOM TEMPERATURE AND HAVE VERY FAST RESPONSE TIMES. RESEARCH AND DEVELOPMENT TO GENERATE SUCH GENERAL-PURPOSE VERY-HIGH-STORAGE-DENSITY OPTICAL MEMORIES COULD GREATLY AID IMAGE DATA ACQUISITION AND OTHER HIGH-BANDWIDTH SYSTEMS.

QUANTEX CORP
2 RESEARCH CT
ROCKVILLE, MD 20850
CONTRACT NUMBER: DAAB07-87-C-F099
CHARLES Y WRIGLEY
TITLE:
FLIR ARRAY ALTERNATIVE
TOPIC# 311 OFFICE: NV

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1
BY SERVICE
FISCAL YEAR 1987
ARMY

PAGE 148

SUBMITTED BY

NEW MATERIALS TO DIRECTLY UP CONVERT 1 TO 12 MICRON INFRARED IMAGES TO VISIBLE HAVE BEEN DEVELOPED BY QUANTEX IN THE PAST YEAR. THESE MATERIALS ARE A NEW GROUP OF DOPED SEMICONDUCTORS WHICH HAVE PURPOSELY TAILORED ELECTRON TRAP DEPTHS SELECTED FROM 85 meV TO 1.3 eV. ONCE THE TRAPS ARE FILLED BY A VISIBLE PUMP LIGHT, THEY CAN REMAIN SO FOR EXTREMELY LONG TIMES UNTIL TRIGGERED TO VISIBLE EMISSION BY INFRARED PHOTONS. THIS PROPOSED WORK WILL EVALUATE THESE MATERIALS FOR CONVERSION EFFICIENCY AND EQUIVALENT NOISE AS A FUNCTION OF TEMPERATURE FOR INFRARED INPUT, ESPECIALLY IN THE 3-5 MICRON AND 8-14 MICRON WAVELENGTH RANGES. IT IS EXPECTED, FROM VERY RECENT INITIAL OBSERVATIONS, THAT THESE NEW ELECTRON TRAPPING (ET) MATERIALS COULD BE DEVELOPED FOR EFFICIENT, VERY LOW NOISE INFRARED IMAGE CONVERTERS OUT TO 14 MICRONS. THEN COMMONLY AVAILABLE VISIBLE-WAVELENGTH HIGH-EFFICIENCY OPTO-ELECTRONICS COULD EASILY BE UTILIZED FOR DISPLAY SYSTEMS, ETC.

QUANTIC INDUSTRIES INC
990 COMMERCIAL ST
SAN CARLOS, CA 94070
CONTRACT NUMBER: DAAL02-87-C-0058
WILLIAM MARSHALL
TITLE:
LOW COST MINIATURE DC-DC CONVERTER
TOPIC# 61 OFFICE: HDL

THE OBJECTIVE OF THIS PROJECT IS TO DEVELOP AND BUILD PROTOTYPE MODELS OF A DC-DC VOLTAGE CONVERTER CAPABLE OF CHARGING A FIRING CAPACITOR FOR AN EXPLODING FOIL INITIATOR (EFI) FUZE. THE CONVERTER WILL OCCUPY LESS THAN 0.4 CUBIC INCH OF SPACE. PERFORMANCE PARAMETERS WILL EMPHASIZE RAPID CHARGE AND HIGH EFFICIENCY AS WELL AS LOW-COST PRODUCIBILITY. QUANTIC INDUSTRIES, INC. HAS ALREADY BUILT, ON INTERNAL RESEARCH AND DEVELOPMENT FUNDING, A MODEL THAT MEETS MOST OF THE REQUIREMENTS DESCRIBED IN A87-61. CONTINUED WORK IS REQUIRED IN ORDER TO ASSURE HIGH RELIABILITY AND LOW MANUFACTURING COSTS. THIS PROJECT WOULD MODIFY THE EXISTING DESIGN TO MEET THE PRECISE REQUIREMENTS, AND THEN BUILD AND DELIVER PROTOTYPE MODELS FOR HDL EVALUATION AND TEST. IN ADDITION, A PAPER DESIGN THAT USES THE MAXIMUM LEVEL OF CIRCUIT COMPONENT INTEGRATION AND SEMI-AUTOMATED PRODUCTION TECHNIQUES TO MINIMIZE PRODUCTION COSTS WILL BE SUBMITTED.

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1
BY SERVICE
FISCAL YEAR 1987
ARMY

PAGE 149

SUBMITTED BY

WHEN A COMPACT, LOW-COST DC-DC CONVERTER IS AVAILABLE, ALL-ELECTRONIC PROJECTILE FUZES ARE FEASIBLE. THESE EFI-BASED FUZES PROMISE TO IMPROVE SAFETY, INCREASE RELIABILITY, AND REDUCE COST AS COMPARED TO CURRENT MECHANICAL DEVICES.

QUANTIC INDUSTRIES INC
990 COMMERCIAL ST
SAN CARLOS, CA 94070
CONTRACT NUMBER: DAAL02-87-C-0059
THEODORE J NETOFF
TITLE:
LOW COST MINIATURE ENERGY STORAGE CAPACITOR
TOPIC# 62 OFFICE: HDL

THE OBJECTIVE OF THIS PROJECT IS TO BUILD, TEST, AND DELIVER MINIATURE, HIGH-ENERGY STORAGE CAPACITORS THAT ARE CAPABLE OF FIRING EXPLODING FOIL INITIATORS (EFIs). IN THE LAST THREE YEARS, QUANTIC HAS ACTIVELY EXPLORED AVAILABLE CAPACITORS FOR USE IN EFI APPLICATIONS, AND IS DEVELOPING DESIGNS BASED ON MYLAR, KAPTON AND ALUMINUM, THE GOAL BEING ESSENTIALLY THE SAME PERFORMANCE CRITERIA ESTABLISHED IN A87-62. A CAPACITOR WRAPPING MACHINE HAS BEEN DEVELOPED AND BUILT THAT ENABLES PRODUCTION OF THESE CAPACITORS. SINCE QUANTITIES BUILT TO DATE ARE SMALL, EXTENSIVE RELIABILITY TESTING HAS NOT BEEN COMPLETED. THEREFORE, THE PROPOSED EFFORT WOULD BUILD AND DELIVER TO HDL TEN CAPACITORS THAT WILL MEET THE PERFORMANCE CRITERIA, AND WILL ALSO PROVIDE MORE EXTENSIVE ANALYSIS AND TEST RESULTS TO INDICATE THE RELIABILITY OF THE CAPACITOR FOR THE INTENDED APPLICATION. A KEY ISSUE IN THIS ANALYSIS IS THE PRODUCIBILITY OF A RELIABLE CAPACITOR AT LOW COST, AND THIS IN TURN IMPLIES EXTREME QUALITY CONTROL ON THE FILMS AND FOIL USED. ONCE SUCH A CAPACITOR IS AVAILABLE AT LOW COST, AND COUPLED WITH THE LOW COST DC-DC CONVERTER PROPOSED IN A SEPARATE SBIR, THE ELEMENTS OF THE COMPACT AND INEXPENSIVE ARTILLERY FUZE BASED ON AN EFI SYSTEM BECOMES FEASIBLE. THESE ALL-ELECTRIC, EFI-BASED FUZES PROMISE TO IMPROVE SAFETY, INCREASE RELIABILITY, AND REDUCE COSTS AS COMPARED TO CURRENT MECHANICAL DEVICES.

QUANTUM TECHNOLOGY INC
2620 IROQUOIS AVE
SANFORD, FL 32771
CONTRACT NUMBER: DAAB07-87-C-F081
DR R S ADHAV
TITLE:
TUNABLE SOLID STATE LASER SOURCE
TOPIC# 312 OFFICE: NV

SUBMITTED BY

THE NEW NON-LINEAR CRYSTAL BETA-BARIUM BORATE (B-BaB(2)O(4), BBO) HAS BEEN RECENTLY IDENTIFIED AS A VERY PROMISING MATERIAL FOR NON-LINEAR FREQUENCY CONVERSION, AND OPTICAL PARAMETRIC OSCILLATION. IT IS INDEED AN EXCELLENT MATERIAL FOR PRODUCING TUNABLE LASER RADIATION FROM 400 TO 700nm WHEN IT IS USED AS AN OPO, PUMPED BY A THIRD HARMONIC 354.7nm FROM A Nd:YAG LASER. IT IS PROPOSED THAT A PRACTICAL OPO DEVICE BE BUILT USING ONE CRYSTAL AS OPO AND ONE AS OPA FOR TUNING THE RANGE 400nm TO 700nm WITH A CRYSTAL ORIENTATION OF 27 DEG AND TUNING OVER + OR - 5 DEG. THE OPO CRYSTAL (6x10x7mm[3]) IS TUNED IN THE 10mm DIRECTION TO GIVE ADEQUATE TUNING OF + OR - 5 DEG ANGLE. THE OPA CRYSTAL SIZE IS 6x10x9mm(3) FOR ADEQUATE AMPLIFICATION. THE CRYSTAL CD*A IS USED AS TYPE I DOUBLER AND KD*P IS USED AS A TYPE II TRIPLER. THE OVERALL TRIPLING EFFICIENCY OF 25% OF THE FUNDAMENTAL 1060nm Nd*YAG RADIATION. THIS 355nm TRIPLED RADIATION WILL BE USED TO PUMP THE B-BBO OPO AND SUBSEQUENT BBO OPA WITH AN EXPECTED EFFICIENCY OF 20 TO 30% OF THE PUMP AT 355nm. THIS DEVICE IS SOLID STATE, EFFICIENT, RELIABLE, COMPACT AND HIGHLY TEMPERATURE STABLE BECAUSE OF THE UNIQUE FEATURE OF A VERY LARGE TEMPERATURE ACCEPTANCE WIDTH OF 55 DEG C (FWHM). A MARKED IMPROVEMENT IN THE OPO PERFORMANCE IS EXPECTED TO CREATE SIGNIFICANT IMPACT IN THE SOLID STATE TUNABLE LASER TECHNOLOGY.

REINHART & ASSOCS INC
PO BOX 9802-173
AUSTIN, TX 78766
CONTRACT NUMBER: DAAK60-87-C-0039
RONALD E LARSEN
TITLE:
RADIOGRAPHIC LAYER COUNTER FOR COMPOSITES
TOPIC# 174 OFFICE: NATICK

THE ARMY BALLISTIC HELMET IS A COMPOSITE CONSISTING OF 19 RESIN-BONDED KELVAR. IT IS TYPICALLY LAID UP IN A PINWHEEL AND CROWN PLY CONFIGURATION. INADVERTANT OMISSION OF LAYERS OR UNDETECTED SHIFTING OF LAYERS DURING THE MOLDING PROCESSES CAN REDUCE THE EFFECTIVE NUMBER OF FIBERS IN SOME AREAS OF A HELMET UNDER FABRICATION AND THEREBY IMPAIR THE STRENGTH PROPERTIES OF THE HELMET. CURRENTLY, VERIFICATION OF THE INTEGRITY OF THE HELMET IS BY BALLISTIC TESTING ON A SAMPLING BASIS. THIS PROJECT SEEKS TO DEVELOP A HAND HELD IN-

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1
BY SERVICE
FISCAL YEAR 1987
ARMY

PAGE 151

SUBMITTED BY

STRUMENT CAPABLE OF NONDESTRUCTIVELY (NDE) COUNTING THE NUMBER OF LAYERS OF KEVLAR AT ANY LOCATION IN THE HELMET. THE OBJECTIVE OF THE PHASE I EFFORT IS TO DEMONSTRATE EXPERIMENTALLY THAT A THROUGH-TRANSMISSION GAMMA RADIOMETRY INSTRUMENT USING A LOW ENERGY EMITTER WOULD COUNT LAYERS WITH SUFFICIENT ACCURACY TO DETECT MISSION LAYERS. AVAILABILITY OF SUCH AN INSTRUMENT WOULD FACILITATE 100% NONDESTRUCTIVE EVALUATION OF HELMETS. THIS PHASE WOULD INCLUDE DESIGN, CONSTRUCTION, TESTING, AND FIELD EVALUATION OF LABORATORY INSTRUMENTS TO SERVE AS A BASIS IN DEVELOPMENT OF A FIELD GRADE INSTRUMENT FOR USE BY ACCEPTANCE AND MANUFACTURING PERSONNEL.

REMTECH INC
2603 ARTIE ST - STE 21
HUNTSVILLE, AL 35805
CONTRACT NUMBER: DAAD05-87-C-0082
C S JONES
TITLE:
FLEXIBLE DYNAMIC IR TARGET
TOPIC# 228 OFFICE: TECOM

AN INEXPENSIVE, PROGRAMMABLE, 3-D THERMAL TARGET WHICH SIMULATES THE IR SIGNATURE OF VARIOUS VEHICLES IS NEEDED TO ASSIST IN DESIGNING MISSILE SEEKERS, TAILORING IR SIGNATURES TO IMPROVE STEALTH CHARACTERISTICS OF VEHICLES, AND FOR DEVELOPING IR IMAGERY DEVICES. THE PURPOSE OF THIS PHASE I STUDY IS TO DEVELOP A FEASIBLE (P) PROGRAMMABLE (IR) (T) TARGET (OR "PIRT") DESIGN, AND TO PRODUCE A WORKABLE PROTOTYPE COMPONENT IR HEATER MODULE OF THIS DESIGN. THIS WOULD ALLOW A FULL SCALE PIRT TECHNOLOGY DEMONSTRATOR TO BE DEVELOPED IN PHASE II.

RESOURCE TECHNOLOGIES GP INC
400 MISSISSIPPI ST
MORGANTOWN, WV 26505
CONTRACT NUMBER: DAAA15-87-C-0042
DR PAUL J BEKOWIES
TITLE:
FLOWING-GAS THERMOCOUPLE CALIBRATOR
TOPIC# 75 OFFICE: BRL

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 152
BY SERVICE
FISCAL YEAR 1987
ARMY

SUBMITTED BY

A PROPOSED HIGH TEMPERATURE THERMOCOUPLE CALIBRATOR FOR USE IN FLOWING GAS STREAMS COMPRISES THREE SUBSYSTEMS: (a) A HOT GAS GENERATOR USING A PLASMA GENERATOR OR FLAT FLAME BURNER AS THE HEAT SOURCE; (b) A LASER DOPPLER VELOCIMETRY SYSTEM FOR MEASURING VELOCITY COMPONENTS IN THE NEIGHBORHOOD OF THE TEST PROBE; (c) A COMPUTER-CONTROLLED TEMPERATURE MEASUREMENT SYSTEM THAT COMBINES SPECTROSCOPIC (PLANCK'S RADIATION) MEASUREMENTS IN THE VISIBLE REGION WITH A MEANS OF REDUCING DIRECT TEMPERATURE MEASUREMENT OF THE FLOWING GAS TO THE SIMPLER TASK OF A PRESSURE DETERMINATION NEAR ROOM TEMPERATURE. MAJOR OBJECTIVES OF THE PHASE I WORK ARE TO DETERMINE WHETHER THE PLASMA SOURCE IS SUPERIOR TO A FLAT FLAME BURNER AS A CALIBRATION HEAT SOURCE; TO DEMONSTRATE THAT BETTER CALIBRATIONS ARE OBTAINED WHEN TWO PHYSICALLY DIFFERENT METHODS ARE USED TOGETHER; AND TO SHOW THAT THE LABORATORY PROTOTYPE CAN BE RELIABLY AND CONVENIENTLY OPERATED, THUS OFFERING PROMISE OF A CONVENIENT, COMPACT SYSTEM THAT CAN BE COMMERCIALY PRODUCED FOR ROUTINE USE.

RF MONOITHICS
4441 SIGMA RD
DALLAS, TX 75244
CONTRACT NUMBER: DAAL01-87-C-0731
DARRELL ASH
TITLE:
SURFACE ACOUSTIC WAVE (SAW) BAND ELIMINATION FILTER
TOPIC# 120 OFFICE: ETDL

RFM HAS DEMONSTRATED A SAW NOTCH FILTER BASED ON A PATENTED SAW NOTCH ELEMENT (SNE). NOTCH SHAPE FACTORS (40dB: 1dB) OF LESS THAN 10:1 ARE DEMONSTRATED WITH LESS THAN 2dB OF LOSS. THIS PROPOSAL ADDRESSES SOME OF THE RESEARCH NECESSARY TO MAKE THIS TECHNOLOGY PRACTICAL. IT INCLUDES IMPROVED MODELLING AND EXPERIMENTAL VERIFICATION.

RO-SEARCH INC
PO BOX 188
WAYNESVILLE, NC 28786
CONTRACT NUMBER: DAAK60-87-C-0042
SVEN OBERG
TITLE:
INTEGRATED LIGHTWEIGHT COMBAT BOOT
TOPIC# 180 OFFICE: NATICK

SUBMITTED BY

A LIGHTWEIGHT COMBAT BOOT, SIMILAR IN UPPER PATTERN TO THE PRESENT HOT WEATHER BOOT, SUITABLE FOR ALL SEASON WEAR IN TEMPERATE CLIMATES, WITH IMPROVED BALLISTICS AND FIRE RESISTANCE, AND AN APPRECIABLE DEGREE OF CHEMICAL AND ENVIRONMENTAL THREAT RESISTANCE.

ROBOTIC TECHNOLOGY INC
10001 CRESTLEIGH LN
POTOMAC, MD 20854
CONTRACT NUMBER: DAAA15-87-C-0051
ROBERT FINKELSTEIN
TITLE:
ANALYTIC SUPPORT FOR FIRE SUPPORT (ARTILLERY) ROBOTICS
TOPIC# 323 OFFICE: TPM

A METHOD IS PROPOSED TO DETERMINE THE POTENTIAL VALUE OF ROBOTIC ARTILLERY TO THE U.S. ARMY. THE IMPORTANCE OF COMBAT ROBOTICS IS DESCRIBED AND A METHODOLOGY IS DISCUSSED. SCENARIOS ARE TO BE DEFINES, CONCEPTUAL SYSTEMS DESIGNED, MOPs AND MOES DEFINES, AND THE SYSTEMS EVALUATED, IN THE CONTEXT OF SCENARIOS, USING THE ANALYTIC HIERARCHY PROCESS.

RUPPRECHT & PATASHNICK CO INC
PO BOX 330
VOORHEESVILLE, NY 12186
CONTRACT NUMBER: DAAD05-87-C-0024
HARVEY PATASCHNICK
TITLE:
A PORTABLE TEOM PARTICULATE MASS MONITOR FOR FIELD APP
TOPIC# 188 OFFICE: TECOM

AN INSTRUMENT CAPABLE OF REAL-TIME MONITORING OF SMOKE AND AEROSOL MASS CONCENTRATION UNDER FIELD CONDITIONS IS PRESENTED. IT IS BASED ON TEOM TECHNOLOGY WHICH ENABLES DIRECT MASS MEASUREMENTS OF PARTICULATES IN REAL TIME. THE SYSTEM MEASURES PARTICULATE MASS INDEPENDENTS OF OTHER PARTICULATES PROPERTIES AND HAS THE ADDITIONAL ADVANTAGE OF UTILIZING EXCHANGEABLE FILTER CARTRIDGES WHICH ALLOWS POST COLLECTION ANALYSES OF THE PARTICULATES IF REQUIRED. PHASE I OF THE PROGRAM WILL ADDRESS THE ENGINEERING DESIGN AND DEVELOPMENT NEEDS OF

SUBMITTED BY

THE SYSTEM FOR A SMALL, LIGHT WEIGHT, AND LOW POWER CONSUMING INSTRUMENT SUITABLE FOR FIELD APPLICATION. PHASE II WILL CONSIST OF THE FABRICATION AND TESTING OF THE INSTRUMENTATION.

SABBAGH ASSOCS INC
4639 MORNINGSIDE DR
BLOOMINGTON, IN 47401
CONTRACT NUMBER: DAAL02-87-C-0101
HAROLD A SABBAGH
TITLE:
TRANSIENT ELECTROMAGNETIC FIELD COUPLING TO A METALLIC
USING N-PORT THEORY
TOPIC# 45 OFFICE: HDL

THERE IS A NEED TO UNDERSTAND AND PREDICT THE COUPLING OF TRANSIENT ELECTROMAGNETIC FIELDS TO METALLIC ENCLOSURES. THIS ALLOWS US TO SAFEGUARD SENSITIVE ELECTRONIC EQUIPMENT FROM THE EFFECTS OF LARGE ELECTROMAGNETIC PULSES, WHOSE ORIGINS MAY BE NUCLEAR EXPLOSIONS PULSED MICROWAVES OR LIGHTNING. THE PROBLEM THAT WE PROPOSE TO INVESTIGATE INVOLVES THE COUPLING OF ELECTROMAGNETIC FIELDS TO A THIN WIRE THAT IS LOCATED INSIDE A METALLIC ENCLOSURE FORMED BY A THIN-WALLED BODY OF RECTANGULAR SHAPE. WE PROPOSE TO SOLVE THE PROBLEM BY RESORTING TO N-PORT THEORY, WHICH IS FAMILIAR TO ELECTRICAL ENGINEERS. IN THIS APPROACH THE STRUCTURE IS ISOLATED FROM ITS ENVIRONMENT AND IS REPLACED BY ITS EQUIVALENT IMMITTANCE MATRIX, WHICH WILL BE COMPUTED USING FINITE ELEMENTS. THE IMMITTANCE MATRIX FOR THE EXTERNAL WORLD WILL BE COMPUTED BY A BOUNDARY INTEGRAL EQUATION. TWO METHODS FOR OBTAINING THE TRANSIENT RESPONSE OF THE COUPLED SYSTEMS WILL BE STUDIED: (a) NUMERICAL INVERSION OF FOURIER OR LAPLACE TRANSFORMS, OR (b) DIRECT TIME-STEPPING.

SCHAFFER W J ASSOCS INC
321 BILLERICA RD
CHELMSFORD, MA 01824
CONTRACT NUMBER: DAAB07-87-C-F077
ROBERT GRASSO
TITLE:
TUNABLE SOLID STATE LASER SOURCE
TOPIC# 312 OFFICE: NV

SUBMITTED BY

THE PROGRAM PROPOSED HEREIN IS TO EXPERIMENTALLY INVESTIGATE AND CHARACTERIZE VISIBLE LASER EMISSION FROM THE SOLID-STATE LASER MATERIAL $Ti(3+):Al(2)O(3)$ USING A SURFACE DISCHARGE AS THE PRIMARY EXCITATION SOURCE. RECENTLY, A VISIBLE FLUORESCENCE REGION WAS FOUND TO EXIST EXTENDING FROM 480 TO 690 NANOMETERS AND LASER EMISSION HAS BEEN ACHIEVED IN THIS EMISSION BAND IN THE PROPOSER'S LABORATORY. WE PROPOSE TO EXPERIMENTALLY DETERMINE THE GREATEST ENHANCEMENT FROM A SURFACE DISCHARGE SUBSTRATE WITHIN THE 210 TO 315 NANOMETER ABSORPTION REGION AND USE THIS INFORMATION TO SELECT A SURFACE DISCHARGE SUBSTRATE THAT BEST ENHANCES THESE ABSORPTION BANDS. BASED UPON THESE RESULTS, A SURFACE DISCHARGE PUMPED VISIBLE $Ti(3+):Al(2)O(3)$ LASER WILL BE CONSTRUCTED AND EXPERIMENTALLY CHARACTERIZED WITH REGARD TO LASER OUTPUT AND TUNABILITY OVER THE VISIBLE EMISSION RANGE.

SCHWARTZ ELECTRO-OPTICS INC
45 WINTHROP ST
CONCORD, MA 01742
CONTRACT NUMBER: DAAB07-87-C-F086
DR PETER F MOULTON
TITLE:
EFFICIENT PARAMETRIC GENERATOR AT 4 MICRONS
TOPIC# 314 OFFICE: NV

THE PROPOSED EFFORT WILL ATTEMPT TO DEMONSTRATE RELIABLE AND EFFICIENT OPERATION OF A CdSe OPTICAL PARAMETRIC OSCILLATOR (OPO) PUMPED BY A SOLID-STATE 3 MICRON ERBIUM LASER. THE EXPECTED TUNING RANGE OF THE OPO IS 3.5-4.5 MICRONS. THIS PHASE I EFFORT REPRESENTS A FIRST STEP IN THE DEVELOPMENT OF A SYSTEM THAT HAS THE POTENTIAL TO GENERATE COHERENT RADIATION OF 4 MICRONS WITH AN ELECTRICAL TO OPTICAL CONVERSION EFFICIENCY GREATER THAN ONE PERCENT.

SCIENCE & ENGINEERING ASSOCS INC
3838 CAMINO DEL RIO N - STE 120
SAN DIEGO, CA 92108
CONTRACT NUMBER: DAMD17-87-C-7213
R GREENWELL/Wm COOLEY
TITLE:
EMP HARDENING OF MEDICAL ISO-SHELTERS
TOPIC# 273 OFFICE: MEDICAL

SUBMITTED BY

THIS SMALL BUSINESS INNOVATIVE RESEARCH EFFORT WILL PROVIDE A RETROFIT KIT DESIGN WHICH WILL INCREASE THE EMP PROTECTION TO A LEVEL FROM 20 TO 40 dB. BASED ON SEA'S PREVIOUS EXPERIENCE, OUR COMPANY WILL REVIEW THE DRAWINGS AND DIAGRAMS OF THE ISO-SHELTER, DETERMINE THE BEST EMP HARDENING OPTIONS, DEVELOP A PROTOTYPE OF THE RETROFIT KIT, AND VALIDATE THESE HARDENING TECHNIQUES WITH OUR CW EMP TEST EQUIPMENT. PHASE II WILL INCLUDE COMPLETE DESIGN SPECIFICATIONS AND A PRICING FOR A PRODUCTION VERSION OF THE RETROFIT KIT INCLUDING INSTALLATION AND CHECK OUT PROCEDURES. VALIDATION TESTS WILL ALSO BE PERFORMED TO ENSURE RELIABILITY, MAINTAINABILITY AND SURVIVABILITY OF THE ISO-SHELTER UNDER VARIOUS ADVERSE CONDITIONS.

SCIENTIFIC RESEARCH ASSOCS INC
PO BOX 1058 - 50 NYE RD
GLASTONBURY, CT 06033
CONTRACT NUMBER: DAAL03-87-C-0010
BERNARD C WEINBERG

TITLE:
AN EFFICIENT PATCHED GRID NAVIER-STOKES SOLUTION PROCE
MULTIPLE BODIES
TOPIC# 115 OFFICE: ARO

AN EFFICIENT PROCEDURE IS PROPOSED TO SOLVE THE TIME-DEPENDENT, MULTIDIMENSIONAL NAVIER-STOKES EQUATIONS ABOUT MULTIPLE BODY CONFIGURATIONS WHICH MAY BE IN MOTION RELATIVE TO ONE ANOTHER. FOR SUCH APPLICATIONS, THE GEOMETRIC CONSTRAINTS OF THE COMPONENT ELEMENTS OFTEN REQUIRE THAT PATCHED GRIDS BE EMPLOYED. EXISTING PATCHED GRID APPROACHES FIRST OBTAIN SOLUTIONS ON EACH OF THE COMPONENT GRIDS AND THEN ENSURE COMPATABILITY VIA AN ITERATION PROCEDURE. IN CONTRAST TO SUCH APPROACHES THE PROPOSED METHOD CALCULATES THE ENTIRE FLOW FIELD OVER BOTH GRIDS SIMULTANEOUSLY WITHOUT ITERATION. BY ELIMINATING ITERATION WITHIN A TIME STEP, AND ALLOWING TIME STEPS TO BE CHOSEN BY ACCURACY CONSIDERATIONS RATHER THAN BY STABILITY LIMITS, THIS INNOVATIVE PROCEDURE WOULD LEAD TO A SUBSTANTIAL SAVINGS IN COMPUTER RUN TIME. IN ADDITION, FOR STEADY STATE PROBLEMS, IMPROVED CONVERGENCE RATES COULD BE EXPECTED. THE PROPOSED METHOD IS QUITE GENERAL AND COULD BE APPLIED TO A WIDE CLASS OF PROBLEMS IN WHICH PATCHED GRIDS ARE REQUIRED. HOWEVER, TO DEMONSTRATE THE CAPABILITIES AND ADVANTAGES OF THE NEW PROCEDURE, A PROBLEM OF CURRENT INTEREST IN

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TURBOMACHINERY WOULD BE INVESTIGATED, THE FLOW FIELD IN A ROTOR
STATOR STAGE.

SCIENTIFIC RESEARCH ASSOCS INC
PO BOX 1058 - 50 NYE RD
GLASTONBURY, CT 06033
CONTRACT NUMBER: DAAL01-87-C-0740
M MEYYAPPAN

TITLE:

PROCESS MODELING OF MAGNETRON REACTIVE ION ETCHING (MI)
APPLICATIONS TO GaAs AND AlGaAs
TOPIC# 126 OFFICE: ETDL

THIS DOCUMENT DISCUSSES A PROPOSAL TO PERFORM PROCESS MODELING, VIA
NUMERICAL SIMULATION, OF MAGNETRON REACTIVE ION ETCHING (MIE) PRO-
CESS WITH APPLICATIONS TO ETCHING OF GaAs, AlGaAs AND OTHER III-IV
COMPOUNDS. THE KEY ISSUES ARE UNDERSTANDING OF FLOW DYNAMICS,
EFFECTS OF MAGNETIC FIELD ON FLOW DYNAMICS, AND PLASMA KINETICS. MIE
PROCESS HAS A LARGE NUMBER OF PARAMETERS. IT IS NOT WELL KNOWN
PRESENT HOW VARIOUS SYSTEM PARAMETERS SUCH AS PRESSURE, RF POWER,
MAGNETIC FIELD STRENGTH, FLOW RATE, SYSTEM GEOMETRY, TEMPERATURE AND
TYPE OF PLASMA AFFECT ETCH RATE, SELECTIVITY AND VOLTAGE REQUIRE-
MENTS. MIE PROCESS ALSO IS DIFFICULT TO SCALE UP DUE TO COMPLEXITY
OF PHYSICAL AND CHEMICAL PROCESSES INVOLVED. THIS PROPOSAL ADDRESSES
THE ABOVE ISSUES, THROUGH NUMERICAL SOLUTIONS TO THE GOVERNING NON-
ISOTHERMAL NAVIER-STOKES AND SPECIES CONTINUITY EQUATIONS. SURFACE
REACTION KINETICS FOR THE ETCHING OF GaAs IS INCLUDED.

SCIENTIFIC RESEARCH ASSOCS INC
PO BOX 1058 - 50 NYE RD
GLASTONBURY, CT 06033
CONTRACT NUMBER: DAAL01-87-C-0741
HAROLD L GRUBIN

TITLE:

NUMERICAL SIMULATION OF HETEROSTRUCTURE GUNN OSCILLATO
TOPIC# 127 OFFICE: ETDL

THE TRANSFERRED ELECTRON DEVICE IS AN ACTIVE DEVICE CAPABLE OF

SUBMITTED BY

OPERATION AS A DIPOLE DOMAIN DOMINATED GUNN OSCILLATOR AND AS A CIRCUIT CONTROLLED 94 GHz GUNN OSCILLATOR. THERE ARE SEVERAL KEY INGREDIENTS FOR DEVICE OPERATION. FIRST, THERE IS THE REQUIREMENT THAT THE SEMICONDUCTOR MATERIAL POSSES A REGION OF NEGATIVE DIFFERENTIAL CONDUCTIVITY. SECOND THERE IS THE ISSUE OF DESIGNING THAT PORTION OF THE DEVICE ASSOCIATED WITH LAUNCHING EITHER A GUNN DIPOLE LAYER OR A GUNN ACCUMULATION LAYER. THESE ARE CRITICAL ISSUES BECAUSE THEY IDENTIFY THE MODE OF OPERATION TO BE EXPECTED, AND THE RELEVANT OUTPUT POWER AND EFFICIENCY. THE DIFFICULTY IN DETERMINING WHERE TO PLACE THE LAUNCHING REGION IS COMPOUNDED WHEN IT IS REALIZED THAT THE DESIGN FEATURES ARE DEPENDENT IN A CRITICAL WAY ON WHETHER THE DEVICE IS CONFIGURED AS, E.G., A PLANAR OR MESA STRUCTURE. THE PURPOSED OF THIS PROPOSAL IS TO DESCRIBE A NUMERICAL PROGRAM FOR THE LAUNCHING OF DIPOLE AND ACCUMULATION LAYERS THROUGH THE PRESENCE OF A HETEROSTRUCTURE LAUNCHER. THE APPLICATIONS ARE TO AlGaAs/GaAs AND InGaAs/GaAs MESA STRUCTURE CONFIGURED DEVICES.

SCIENTIFIC SYSTEMS INC
ONE ALEWIFE PL
CAMBRIDGE, MA 02140
CONTRACT NUMBER: DAMD17-87-C-7219
DONALD E GUSTAFSON
TITLE:
PATTERN RECOGNITION OF DIGITAL RADIOGRAPHIC IMAGES
TOPIC# 278 OFFICE: MEDICAL

THE PROPOSED RESEARCH IS CONCERNED WITH THE USE OF ARTIFICIAL INTELLIGENCE TECHNIQUES FOR IDENTIFICATION AND DISCONTINUITIES WITHIN DIGITAL RADIOGRAPHIC IMAGES. THE INTENDED APPLICATION IS FOR MEDICAL IMAGES IN THE FIELD, I.E., TO AID THE PHYSICIAN IN LOCATING OBJECTS WITHIN THE IMAGE. WE REVIEW THE STATE-OF-THE-ART, INCLUDING RECENT DEVELOPMENTS USING MARKOV RANDOM FIELD MODELS WHICH SHOW GREAT PROMISE. THE RESULTS OF THE PHASE I STUDY WILL BE A THROUGH LITERATURE SEARCH AND RECOMMENDATIONS OF THE MOST PROMISING AND PRACTICAL TECHNIQUES.

SCIENTIFIC TECHNOLOGY INC
4 PROFESSIONAL DR - STE 125
GAITHERSBURG, MD 20878
CONTRACT NUMBER: DAAD05-87-C-0026
TING-I WANG
TITLE:
A LONG RANGE OPTICAL SCIENTILLOMETER FOR ATMOSPHERIC R
TURBULENCE
TOPIC# 190 OFFICE: TECOM

SUBMITTED BY

THIS PROPOSAL ADDRESSES A DIAGNOSTIC TECHNIQUE WHICH WILL MEASURE PATH-AVERAGED ATMOSPHERIC TURBULENCE INTENSITY OF A 3-KILOMETER OR LONGER HORIZONTAL PATH. THE PROPOSED TECHNIQUE IS BASED ON A MODIFICATION OF THE EXISTING OPTICAL SCINTILLOMETER FOR TURBULENCE MEASUREMENT DEVELOPED BY WAVE PROPAGATION LABORATORY OF NOAA. THE OLD SCINTILLOMETER WAS DESIGNED TO OPERATE UP TO 1 km ONLY. HOWEVER, WITH THE HELP OF LARGER TRANSMITTING AND RECEIVING APERTURES, A SECOND GENERATION OPTICAL SCINTILLOMETER IS ABLE TO MEASURE ATMOSPHERIC TURBULENCE INTENSITY OF 3 km OR LONGER. THE INSTRUMENT WILL PROVIDE REAL-TIME CONTINUOUS MEASUREMENTS OF TURBULENCE INTENSITY IN THE FIELD OPERATION; ALTHOUGH FOG AND SMOKE MAY OCCASIONALLY INTERRUPT THE MEASUREMENTS, THE INSTRUMENT IS INSENSITIVE TO ENVIRONMENTAL ACOUSTIC AND ELECTROMAGNETIC NOISES. IT IS COMPACT FOR EASY TRANSPORTING AND OPERATION.

SENSIS CORP
THE MARKET PL - RTE 92
MANLIUS, NY 13104
CONTRACT NUMBER: DAAL02-87-C-0070
RICHARD TAYLOR
TITLE:
MULTISTATIC RADAR TECHNOLOGY
TOPIC# 46 OFFICE: HDL

THE LOW RADAR CROSS SECTION AIR TARGET AND FUTURE ECM, ESM, AND ARMS ARE CREDIBLE, DIFFICULT THREATS THAT DEMAND AN AIR DEFENSE CAPABILITY NOT NOW AVAILABLE. ONE PROMISING SOLUTION INVOLVES A MULTISTATIC RADAR (MSR). TO COUNTER THE REDUCTION IN BACKSCATTERED ENERGY FROM LOW CROSS SECTION TARGETS, IT VIEWS THE TARGET FROM DIFFERENT ASPECT ANGLES AND THROUGH BISTATIC ANGLES WHERE THE REFLECTED ENERGY MAY, IN FACT, BE ENHANCED. ALSO, THE HIGH-VALUE RECEIVE PORTION OF THE SYSTEM IS PASSIVE, THUS SIGNIFICANTLY ENHANCING THE SYSTEM'S FUNCTIONAL AND PHYSICAL SURVIVABILITY. VIABILITY AND AFFORDABILITY OF MSR HAS BY NO MEANS BEEN PROVEN AT THE PRESENT TIME, AND CAN OCCUR ONLY BY USING THE STATE-OF-THE-ART AND ALSO PROJECTED FUTURE CAPABILITIES OF DIGITAL, ANALOG, MECHANICAL, AND SOFTWARE TECHNOLOGIES. THIS PROPOSAL EVALUATES THE ISSUES ASSOCIATED WITH MSR IMPLEMENTATION, DISCUSSES APPROACHES AND CONCEPTS FOR RESOLVING EACH ISSUE, IDENTIFIES THE PRESENT LIMITATIONS OF THE TECHNOLOGIES, AND IDENTIFIES FUTURE

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 160
BY SERVICE
FISCAL YEAR 1987
ARMY

SUBMITTED BY

TECHNOLOGY NEEDS FOR MAKING MSR MORE ATTRACTIVE WITH RESPECT TO SIZE, WEIGHT, POWER, RELIABILITY, AND COST. A PRELIMINARY DESIGN OF A MSR TESTBED, RECOMMENDED FOR PHASE II, IS ALSO PRESENTED.

SEPARATION SYSTEMS TECHNOLOGY

6242 MT AGUILAR DR

SAN DIEGO, CA 92111

CONTRACT NUMBER: DAAK70-87-C-0065

CLYDE E MILSTEAD

TITLE:

DEVELOPMENT OF AN IMPROVED CLEANING SOLUTION FOR ROWPU

TOPIC# 140 OFFICE: BRDC-PVD

THIS PHASE I PROGRAM IS DIRECTED TOWARD THE DEVELOPMENT OF AN IMPROVED CLEANING SOLUTION FORMULATION FOR CLEANING FOULED ROWPU MEMBRANE ELEMENTS, WITH THE ULTIMATE OBJECTIVE OF A LOW-COST GENERIC FORMULATION THAT CAN BE PRE-PACKAGED AS DRY CHEMICALS FOR USE ON BOTH ARMY AND MARINE CORPS ROWPU UNITS. DURING THIS DEVELOPMENT PROGRAM FOUR PRIMARY FACTORS ARE CONSIDERED: 1) THE CHEMISTRY, STRUCTURE, AND PROPERTIES OF THE THIN-FILM COMPOSITE MEMBRANE ELEMENTS QUALIFIED FOR USE IN ROWPU UNITS, 2) INTERACTIONS OF VARIOUS CHEMICALS WITH THE MEMBRANES, 3) THE EFFECT OF SOLUTION pH, IONIC STRENGTH, AND TEMPERATURE ON THE MEMBRANES, AND 4) THE NATURE OF FOULANTS TO BE REMOVED FROM THE MEMBRANE SURFACE.

SHENANDOAH SYSTEMS CO INC

800 FOLLIN LN

VIENNA, VA 22180

CONTRACT NUMBER: DACA39-87-C-0031

JAMES M GLYNN

TITLE:

LASER RANGING SENSOR FOR WATER LEVEL MONITORING

TOPIC# 266 OFFICE: WES

THE U.S. ARMY CORPS OF ENGINEERS (COE) OPERATES A LARGE NUMBER OF GAGES TO MEASURE AND MONITOR CHANGES IN TIDE AND WATER LEVELS. THESE GAGES ACQUIRE ESSENTIAL DATA FOR HYDROLOGICAL STUDIES, HYDROGRAPHIC SURVEYS, FLOOD CONTROL AND FLOOD WARNING MISSIONS. NONE OF THE

SUBMITTED BY

EXISTING GAGES FULLY MEET THE COE REQUIREMENTS FOR A RELIABLE, ACCURATE, UNATTENDED GAGE WITH REMOTE QUERY, COMMAND AND DATA ACCESS. AN ALTERNATIVE TO EXISTING GAGING TECHNIQUES IS THE USE OF LASER RANGING TECHNOLOGY, WHICH WARRANTS SERIOUS CONSIDERATION FOR TRANSFER APPLICATION TO MEET THE COE TIDE GAGE REQUIREMENT. SHENANDOAH SYSTEMS COMPANY PROPOSES THE CONCEPTUAL DESIGN, DEVELOPMENT AND DEMONSTRATION OF A REAL-TIME SATELLITE REPORTING TIDE GAGE SYSTEM BASED ON LASER RANGING TECHNOLOGY TO OVERCOME EXISTING GAGE DEFICIENCIES AND FULFILL ALL COE REQUIREMENTS.

SHIELDING TECHNOLOGIES (OLD: T&E INT'L)
2023 EMMORTON RD
BEL AIR, MD 21014
CONTRACT NUMBER:
DAVID J KATSANIS
TITLE:
VENTED SUPPRESSIVE SHIELDS (VSS) AS PROTECTIVE BARRIER
EXPLOSIVE OPERATIONS
TOPIC# 215 OFFICE: TECOM

THIS IS A PROPOSAL TO INVESTIGATE TECHNICAL FEASIBILITY AND COST EFFECTIVENESS OF VENTED SUPPRESSIVE SHIELDS (VSS) PROTECTIVE BARRIERS FOR EXPLOSIVE OPERATIONS. VSS WILL FUNCTION AS OVERPRESSURE, FRAGMENT AND THERMAL SUPPRESSORS TO PREVENT PROPAGATION OF CONFLAGRATION OR DETONATION WITHIN AND BETWEEN TEMPERATURE CONDITIONING UNITS, THEREBY IMPROVING THE SAFETY OF OPERATIONS IN THE VICINITY OF THE TEMPERATURE CONDITIONING UNITS AND ALLOWING FOR SAFE REDUCTION OF QUANTITY-DISTANCE REQUIREMENTS. IN PHASE I, VSS ENCLOSURE AND SEPARATOR CONCEPTS WILL BE DEVELOPED FOR TEMPERATURE CONDITIONING UNITS FOR AMMUNITION TESTING. TWO LEVELS OF SUPPRESSION WILL BE CONSIDERED: (a) SUPPRESSION OF ROUND-TO-ROUND PROPAGATION TO MINIMIZE THE MAXIMUM CREDIBLE EVENT, AND (b) PREVENTION OF PROPAGATION BETWEEN TEMPERATURE CONDITIONING UNITS. INFORMATION FROM PRIOR INVESTIGATIONS OF SUPPRESSION WILL BE APPLIED TO DESIGN AN EXPERIMENT TO DETERMINE SEPARATOR DESIGN PARAMETERS TO MITIGATE ROUND-TO-ROUND PROPAGATION. VSS DESIGNS CAN BE ENCLOSURES OR BARRICADES DEPENDING ON THE OPERATIONAL REQUIREMENTS. DESIGNED VSS WILL BE MODULAR TO FACILITATE RECONFIGURATION, IF THE OPERATION IS CHANGED.

SIGMA RESEARCH CORP
394 LOWELL ST - STE 12
LEXINGTON, MA 02173
CONTRACT NUMBER: DAAD05-87-C-0028
STEVEN R HANNA
TITLE:
METEOROLOGICAL INFLUENCES ON SMOKE/OBSCURANT EFFECTIVE
TOPIC# 189 OFFICE: TECOM

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 162
BY SERVICE
FISCAL YEAR 1987
ARMY

SUBMITTED BY

THE U.S. ARMY HAS A NEED TO ESTIMATE WHETHER DIFFERENCES ARE SIGNIFICANT IN SMOKE/OBSURANT EFFECTIVENESS FOR A SINGLE MUNITION FROM ONE TIME TO ANOTHER OR FOR TWO MUNITIONS UNDER SIMILAR CONDITIONS. THE PROPOSED RESEARCH WILL DEVELOP A FRAMEWORK FOR ACCOUNTING FOR THE INFLUENCE OF METEOROLOGICAL CONDITIONS ON THESE DIFFERENCES, AS WELL AS THE INFLUENCE OF ERRORS IN OBSERVED DATA AND THE EFFECTS OF STOCHASTIC FLUCTUATIONS. THE SYSTEM WILL BE TESTED WITH U.S. ARMY SMOKE/OBSURANT FIELD TRIAL DATA. RECOMMENDATIONS WILL BE MADE ON THE OPTIMUM COMPONENTS OF THE PREDICTIVE SYSTEM AND ON FUTURE FIELD PROGRAMS THAT COULD BE USED TO FUTURE TEST SYSTEM.

SIGMA RESEARCH INC
8710 -148TH AVE NE
REDMOND, WA 98052
CONTRACT NUMBER: DAAL04-87-C-0061
DAVID K THOME
TITLE:
SYNTHETIC PULSE TECHNIQUE FOR NDE OF THICK FIBER-REINF
COMPOSITES
TOPIC# 107 OFFICE: MTL

THICK FIBER-REINFORCED COMPOSITES WILL BE OBTAINED AND EVALUATED USING AN ADVANCED ULTRASONIC INSPECTION METHOD TO CHARACTERIZE THE MATERIAL FOR CRACKS AND DELAMINATIONS, POROSITY AND DENSITY VARIATIONS. THE ADVANCED ULTRASONIC INSPECTION METHOD IS BASED UPON SYNTHETIC PULSE TECHNOLOGY, WHICH WAS ORIGINALLY DEVELOPED FOR RADAR APPLICATIONS. A SHORT, HIGH ENERGY, BROADBAND PULSE IS REPLACED WITH A MUCH LONGER FREQUENCY-MODULATED BURST, COVERING THE SAME BANDWIDTH WITH MUCH GREATER ENERGY. THIS LEADS TO IMPROVED SENSITIVITY AND RESOLUTION. CONVENTIONAL TRANSIENT-PULSE TECHNIQUES WILL BE USED FOR COMPARISON. ADVANCED AND CONVENTIONAL METHODS WILL BE APPLIED IN BOTH THROUGH-TRANSMISSION AND PULSE-ECHO GEOMETRIES. THROUGH-TRANSMISSION PROVIDES ATTENUATION INFORMATION WHICH CAN BE RELATED TO POROSITY AND TO DENSITY VARIATIONS. PULSE-ECHO INSPECTION PROVIDES SIZE AND LOCATION INFORMATION FOR CRACKS, DELAMINATIONS AND PORES. X-RAY RADIOGRAPHY WILL ALSO BE USED TO PROVIDE ADDITIONAL INFORMATION ON POROSITY AND DENSITY VARIATIONS FOR TECHNIQUE EVALUATION. DESTRUCTIVE TESTING WILL PROVIDE THE NECESSARY INFORMATION TO CORRELATE THE ULTRASONIC AND RADIOGRAPHIC TEST RESULTS AND WILL

SUBMITTED BY

PROVIDE QUANTITATIVE ASSESSMENT OF THE INSPECTION TECHNIQUES.

SILICON DESIGNS INC
1445 NW MALL ST
ISSAQUAH, WA 98027
CONTRACT NUMBER: DAAL02-87-C-0064
JOHN C COLE
TITLE:
AN INTEGRATED CIRCUIT FOR AIR FLIGHT SENSOR SIGNAL PRO
TOPIC# 50 OFFICE: HDL

THE PURPOSE OF AN AIR FLIGHT SENSOR SUBSYSTEM IS TO DETECT THE SIGNATURE OF FLIGHT CONDITIONS AFTER A PROJECTILE HAS BEEN SAFELY FIRED. THIS INFORMATION, WHEN COMBINED WITH OTHER CHARACTERISTICS OF PROJECTILE FIRING, SUCH AS ACCELERATION, PROVIDES POSITIVE INDICATION WHEN IT IS SAFE TO ARM THE WARHEAD. WE PROPOSE TO BUILD THE FLIGHT SENSOR SIGNAL PROCESSING AS A SINGLE, CUSTOM INTEGRATED CIRCUIT. THE SIGNAL PROCESSING CHIP DESIGN WHICH WE PROPOSE IS AN INNOVATIVE APPLICATION OF SWITCHED-CAPACITOR FILTERS, WHICH HAVE BEEN EXTENSIVELY USED IN RECENT YEARS FOR LOW-POWER AUDIO FILTERS IN SINGLE-CHIP CODECS. THE CHIP WOULD BE MOUNTED ON A SMALL HYBRID SUBSTRATE CONTAINING A FEW DISCRETE COMPONENTS. AN AIR FLIGHT SENSOR TRANSDUCER COULD BE LOCATED ON THE SAME SUBSTRATE OR COULD BE LOCATED SEPARATELY. THIS DESIGN HAS THE POTENTIAL FOR AUTOMATED, LOW-COST ASSEMBLY NEEDED FOR HIGH VOLUME PROJECTILE APPLICATION.

SILICON DESIGNS INC
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CONTRACT NUMBER: DAAL02-87-C-0064
JOHN C COLE
TITLE:
A LOW-COST MINIATURE VOID SENSOR
TOPIC# 54 OFFICE: HDL

MECHANICAL G-SWITCHES ARE PRESENTLY AVAILABLE THAT SENSE WHEN THE ACCELERATION EXCEEDS A SPECIFIED VALUE. CONTACT RESISTANCE IS A PROBLEM EVEN WITH NEWLY FABRICATED MECHANICAL G-SWITCHES. MECHANICAL

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 164
BY SERVICE
FISCAL YEAR 1987
ARMY

SUBMITTED BY

CONTACTS ARE ALSO SUBJECT TO SWITCH BOUNCE AND DAMAGE DURING THE INITIAL SHOCK OF IMPACT. SILICON DESIGNS HAS DEVELOPED A PROCESS FOR BUILDING MICROMECHANICAL SENSE ELEMENTS ON THE SURFACE OF A SILICON WAFER THAT CONTAINS SENSING CIRCUITRY FABRICATED WITH STANDARD INTEGRATED CIRCUIT (IC) TECHNOLOGY. THIS ALLOWS THE LARGE QUANTITY PRODUCTION OF ACCELEROMETERS WITH SOPHISTICATED ACCOMPANYING ELECTRONICS AT A LOW COST. EACH TRANSDUCER CHIP IS THEN PACKAGED MUCH LIKE STANDARD ICs. SENSE ELEMENTS CAN BE DESIGNED FOR A WIDE RANGE OF ACCELERATIONS. HIGH RELIABILITY, LOW-COST G-SWITCHES CAN BE BUILT WITH THIS TECHNOLOGY THAT DO NOT RELY ON METAL-TO-METAL CONTACTS. IN ADDITION, EACH SENSOR CAN BE INDIVIDUALLY CALIBRATED AFTER FABRICATION, RESULTING IN HIGH PRODUCTION YIELDS. WE ANTICIPATE THAT ELECTRONIC G-SWITCHES CAN BE MANUFACTURED USING THIS TECHNOLOGY IN HIGH VOLUMES FOR LESS THAN \$5 EACH, POSSIBLY IN THE \$2-3 RANGE, DEPENDING ON THE TEST REQUIREMENTS.

SKIMETRICS INC
19 GLENGARRY RD
WINCHESTER, MA 01890
CONTRACT NUMBER: DAAK60-87-C-0045
DR PAUL BURSTEIN
TITLE:
METHOD FOR MEASUREMENT OF THICKNESS AND DISTRIBUTION O
ON TEXTILES
TOPIC# 181 OFFICE: NATICK

MEASURING THE THICKNESS OF A FUNGICIDE COATING ON AN UNDERLYING TEXTILE FABRIC IS APPROACHED FROM TWO PERSPECTIVES, BOTH OF WHICH EXPLOIT THE DIFFERENT X-RAY SCATTERING PROPERTIES OF THE COATING AND BASE MATERIALS. BOTH METHODS PROVIDE A QUANTITATIVE MEASURE OF THE THICKNESS OVER 100% OF THE COATED AREA, WITH COATING THICKNESS RESOLUTION OF APPROXIMATELY 10%. BOTH METHODS ARE NONCONTACT AND CAN BE APPLIED IN A FACTORY ENVIRONMENT. TECHNICAL RISK FOR EITHER METHOD IS LOW, BUT THE UNSTATED REQUIREMENTS HAVING TO DO WITH THE COATING TYPE AND THICKNESS AND WITH INSPECTION ENVIRONMENT WILL FAVOR ONE OF THE TWO APPROACHES. THE WORK PLAN SHOWS HOW THE SELECTION OF THE BETTER OF THE TWO METHODS WILL BE MADE, AND THE PERFORMANCE VERIFICATION CONDUCTED. THE OUTPUT OF THE PHASE I PROGRAM IS A REPORT, AN INSTRUMENT DESIGN, AND A PROGRAM PLAN FOR A PHASE II

SUBMITTED BY

FABRICATION AND IMPLEMENTATION OF A PROTOTYPE DEVICE.

SOFTWARE PRODUCTIVITY SOLUTIONS INC
PO BOX 361697
MELBOURNE, FL 32916
CONTRACT NUMBER: DAAB07-87-C-A042
DR J KAYE GRAU
TITLE:
AUTOMATED REUSABLE COMPONENT SYSTEM (ARCS)
TOPIC# 299 OFFICE: C/A

THE PRIMARY OBJECTIVE OF THIS SBIR WILL BE TO DEVELOP A SOFTWARE TECHNOLOGY INCLUDING METHODOLOGY AND TOOLS TO AUTOMATE THE REUSE OF SOFTWARE COMPONENTS. SPECIFICALLY, VARIOUS CLASSIFICATION SCHEMES AND RETRIEVAL TECHNIQUES WILL BE EVALUATED. THE PHASED AUTOMATION DEVELOPMENT WILL EVENTUALLY RESULT IN A SYSTEM WHICH AUTOMATES THE STORAGE AND RETRIEVAL OF REUSABLE COMPONENTS INTO/FROM A REUSABLE COMPONENT LIBRARY. VERIFICATION OF COMPONENTS WILL ALSO BE SUPPORTED.

SOFTWARE PRODUCTIVITY SOLUTIONS INC
PO BOX 361697
MELBOURNE, FL 32936
CONTRACT NUMBER:
DR J KAYE GRAU
TITLE:
EXPERT SYSTEM FOR SOFTWARE DESIGN ANALYSIS
TOPIC# 304 OFFICE: AMSEL/PA

THIS RESEARCH EFFORT WILL IDENTIFY A SET OF ANALYSES THAT WILL PROVIDE OBJECTIVE MEASURES AND ASSESSMENTS OF SOFTWARE DESIGNS. THE RESULTING ASSESSMENTS WILL PROVIDE VALUABLE INPUT TO GOVERNMENT AND CONTRACTOR PERSONNEL DURING THE TOP-LEVEL AND DETAILED DESIGN PHASES OF SOFTWARE DEVELOPMENT PROGRAMS, AND AT THE PRELIMINARY AND CRITICAL DESIGN REVIEWS. THE MEASURES AND ASSESSMENTS RESULTING FROM THE ANALYSES WILL BE PROVIDED IN THE FORM OF OBJECTIVELY DETERMINABLE SOFTWARE DESIGN METRICS. EMPHASIS WILL BE PLACED ON METRICS THAT ARE APPROPRIATE FOR REAL-TIME AND MULTIPROCESSOR APPLICATIONS. METRICS THAT CAN BE OBTAINED EARLY IN THE DESIGN PROCESS, AND WHICH CAN BE

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USED TO PREDICT LATER LIFE CYCLE COSTS AND QUALITY WILL BE OF PARTICULAR INTEREST. THE UNDERLYING THEME OF THE APPROACH WILL BE AUTOMATION OF THE IDENTIFIED ANALYSES USING A COMBINATION OF EXISTING TECHNIQUES AND TOOLS, INCLUDING EXPERT SYSTEMS TECHNOLOGY. A PROTOTYPE AUTOMATED ANALYSIS TOOL WILL BE DEVELOPED AS PART OF THE RESEARCH EFFORT.

SOUTHWEST SCIENCES INC
1570 PACHECO ST - STE E-11
SANTA FE, NM 87501
CONTRACT NUMBER: DACA33-87-C-0028
DR ALAN C STANTON
TITLE:
A DIODE LASER HUMIDITY SENSOR FOR COLD ENVIRONMENTS
TOPIC# 261 OFFICE: CRREL

MEASUREMENTS OF ATMOSPHERIC HUMIDITY IN COLD REGIONS OR WINTER FIELD ENVIRONMENTS ARE DIFFICULT USING EXISTING METEOROLOGICAL INSTRUMENTATION. IN GENERAL, PRESENT FIELD INSTRUMENTS FOR UNTENDED HUMIDITY MEASUREMENTS ARE PLAGUED BY LOW SENSITIVITY AND DRIFTS IN CALIBRATION, RESULTING IN POOR ACCURACY AND LOW RELIABILITY. WE PROPOSE A NEW INSTRUMENTATION CONCEPT FOR FIELD MEASUREMENT OF HUMIDITY, BASED ON ABSORPTION OF NEAR-INFRARED RADIATION FROM LOW-COST, COMMERCIAL InGaAs LASER DIODES. ADVANTAGES OF THE LASER DIODE HYGROMETER INCLUDE HIGH SENSITIVITY ACROSS THE FULL RANGE OF EXPECTED TEMPERATURES, FAST TIME RESPONSE, NO DEGRADATION OF PERFORMANCE NEAR SATURATION, AND SIMPLE CALIBRATION. THE UNDERLYING CONCEPTS OF THIS APPROACH WILL BE TESTED IN PHASE I USING LABORATORY BREADBOARD INSTRUMENTATION. THESE TESTS WILL EMPHASIZE EVALUATIONS OF SENSITIVITY, ACCURACY, AND CALIBRATION STABILITY, INCLUDING MEASUREMENTS OF HUMIDITY UNDER CONDITIONS SIMULATING WINTER FIELD ENVIRONMENTS. WE BELIEVE THAT COMPACT AND RELIABLE INSTRUMENTATION BASED ON THIS CONCEPT CAN BE DEVELOPED FOR UNTENDED FIELD OPERATION IN COLD ENVIRONMENTS AS WELL AS A WIDE RANGE OF OTHER APPLICATIONS WHERE SENSITIVE HUMIDITY MONITORS ARE REQUIRED.

SOUTHWEST SCIENCES INC
1570 PACHECO ST - STE E-11
SANTA FE, NM 87501
CONTRACT NUMBER: DAAD09-87-C0036
DR ALAN C STANTON
TITLE:
A DIODE LASER SENSOR FOR MEASUREMENT OF HYDROGEN CHLOR
TOPIC# 205 OFFICE: TECOM

SUBMITTED BY

LARGE QUANTITIES OF TOXIC HYDROGEN CHLORIDE (HCl) GAS ARE EMITTED DURING SOME MISSILE LAUNCHES, POSING A SERIOUS SAFETY HAZARD TO LAUNCH SITE PERSONNEL. EXISTING INSTRUMENTATION FOR MEASURING HCl CONCENTRATIONS DOES NOT HAVE ADEQUATE TIME RESPONSE OR SENSITIVITY, AND IS SUSCEPTIBLE TO INTERFERENCES FROM OTHER MISSILE EXHAUST GASES. WE PROPOSE A NEW INSTRUMENTATION CONCEPT FOR LAUNCH SITE MEASUREMENT OF HCl, BASED ON ABSORPTION OF NEAR-INFRARED RADIATION FROM LOW-COST, COMMERCIAL InGaAsP LASER DIODES. ADVANTAGES OF THE LASER DIODE MONITOR INCLUDE HIGH SENSITIVITY ACROSS THE FULL RANGE OF EXPECTED HCl CONCENTRATIONS, FAST TIME RESPONSE, SIMPLE CALIBRATION, AND COMPATIBILITY WITH FIBER OPTICES. THE UNDERLYING CONCEPTS OF THIS APPROACH WILL BE TESTED IN PHASE I USING LABORATORY BREADBOARD INSTRUMENTATION. THESE TESTS WILL EMPHASIZE EVALUATIONS OF SENSITIVITY, ACCURACY, AND CALIBRATION STABILITY. WE BELIEVE THAT COMPACT AND RELIABLE INSTRUMENTATION BASED ON THIS CONCEPT CAN BE DEVELOPED EITHER AS A SELF-CONTAINED PACKAGE FOR UNTENDED OPERATION, OR AS A FIBER-OPTIC NETWORK OF LOW-COST INSTRUMENTS FOR CENTRALIZED MONITORING OF HCl CONCENTRATIONS AT CRITICAL LOCATIONS.

SPACE DATA CORP
1333 - W 21ST ST
TEMPE, AZ 85282
CONTRACT NUMBER: DAAD09-87-C-0038
BRUCE BOLLERMAN
TITLE:
MULTI-SENSORY TRACKING MOUNT CONTROL
TOPIC# 203 OFFICE: TECOM

A COMPREHENSIVE PROGRAM OF ALGORITHM DEVELOPMENT, PARALLEL-PROCESSING MICROCOMPUTER HARDWARE DESIGN, AND SOFTWARE SPECIFICATION DEVELOPMENT IS PROPOSED FOR A MULTI-INPUT TRACKING MOUNT CONTROLLER. ADAPTATION OF THE LATEST STATE VARIABLES, ADAPTIVE AND DIGITAL CONTROL TECHNOLOGIES, IS INCLUDED IN THE PROPOSED PROGRAM. SPACE DATA CORPORATION HAS AN IN-DEPTH THEORETICAL AND APPLICATION ENGINEERING BACKGROUND IN THE DEVELOPMENT OF DIGITAL CONTROL SYSTEMS FOR VARIOUS AEROSPACE APPLICATIONS SUCH AS VEHICLE CONTROL, EXOATMOSPHERIC PAYLOADS ATTITUDE CONTROL, SPACE SHUTTLE PAYLOADS GIMBAL SYSTEMS POINTING CONTROL, AND GROUND-BASED TELEMETRY TRACKING SYSTEMS. THE COMPANY IS CURRENTLY DEVELOPING FOR NASA A LARGE PAYLOAD (3,000 LB) ALL-PURPOSE SPACE

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SHUTTLE GIMBAL AND DIGITAL CONTROL SYSTEM; AND A SMALL, VERY HIGH-PERFORMANCE GIMBAL SYSTEM (80 Hz BANDWIDTH) FOR A FORTHCOMING SDI SPACE SHUTTLE TRACKING AND POINTING EXPERIMENT. SDC HAS ALSO DEVELOPED VARIOUS KINDS OF LAND-BASED AND SHIPBOARD TELEMETRY TRACKING SYSTEMS FOR ANTENNA DIAMETERS FROM ONE METER TO OVER TEN METERS (IE, 34 FEET DIAMETERS). ALL OF THESE SYSTEMS UTILIZE COMPANY-DEVELOPED MICROPROCESSOR CONTROLLERS AND CONTROL SOFTWARE. KEY MEMBERS OF THE COMPANY HAVE BOTH FORMAL EDUCATION AND PRACTICAL DEVELOPMENT EXPERIENCE IN ADVANCED CONTROL SYSTEMS THEORY AND MICROCOMPUTER SYSTEMS HARDWARE AND SOFTWARE DEVELOPMENT.

SPACE TECH CORP
2324 MANCHESTER CT
FORT COLLINS, CO 80526
CONTRACT NUMBER: DAAD09-87-C-0102
MICHAEL ANDREWS
TITLE:
COMPUTER ARCHITECTURE FOR KALMAN FILTERING
TOPIC# 212 OFFICE: TECOM

SIGNAL PROCESSING ALGORITHMS ARE MULTIPLY/ACCUMULATE INTENSIVE. NOVEL METHODS USING ADVANCED IC DEVICES ARE NEEDED. RADAR DIGITAL SIGNAL PROCESSING AND SPREAD SPECTRUM PROCESSING TASK INCLUDE FFT, LMS, L, CONVOLUTION, AND SPECTRUM ANALYSIS. AS EXAMPLES, 32 X 32 MULTIPLIER, 64 X 64 MULTIPLIER, PARALLEL MULTIPLIER AND FLOATING-POINT PROCESSING ARCHITECTURES ARE SOUGHT FOR PROCESSING SPEEDS AT 10 NANOSECOND. MICROPROGRAMMABLE DESIGNS ARE TO BE STUDIED FOR DEVELOPING HIGH SPEED ARCHITECTURES. EXPLORATORY DEVELOPMENT IS PROPOSED TO DESIGN AND DEVELOP SPECIALIZED HIGH SPEED CASCADABLE SIGNAL PROCESSING CIRCUITS FOR CASCADABLE MODULES TO PROCESS RANGE AND RANGE RATE DATA, REAL-TIME KALMAN FILTERING, REAL-TIME TARGET MOTION RESOLUTION (TMR) PROCESSING OF MRS-36 AND FPS-16 RADARS DATA, AND PROCESSING IMAGE/PATTERN INFORMATION FOR REAL-TIME TRACKING CONTROL OF OPTICAL TRACKERS. ALL THESE IMPROVEMENTS SHOULD ALLOW US TO INTEGRATE SEVERAL ARRAY PROCESSORS.

SPARTA INC
7926 JONES BRANCH DR - STE 1070
MCLEAN, VA 22102
CONTRACT NUMBER: DAAA15-87-C-0039
CARL F MUCKENHIRN
TITLE:
LABNET OPERATING SYSTEM AND HOST WORKSTATIONS
TOPIC# 94 OFFICE: BRL

SUBMITTED BY

MOST COMPUTING AND RESEARCH LABORATORIES ARE NOW INSTALLING, OR HAVE INSTALLED, DATA COMMUNICATIONS NETWORKS TO ALLOW EASY DATA SHARING AND ACCESS TO ASSORTED COMPUTING FACILITIES, E.G., A VAX OR CRAY MAY BE ACCESSED FROM A PROGRAMMER WORKSTATION. THIS METHOD OF RESOURCE SHARING ALLOWS FOR ONLY LIMITED INCREASES IN COMPUTATIONAL POWER BY THE PARALLEL EXECUTION OF PROGRAMS. THIS PROPOSAL ADDRESSES TECHNIQUES WHICH WILL INCREASE COMPUTATIONAL POWER BY TAKING ADVANTAGE OF PARALLELISM INHERENT IN A RICHLY INTERCONNECTED COMPUTING COMPLEX. BY EXECUTING A PARTICULAR PROGRAM ON A PARTICULAR MACHINE IT IS UP TO THE USER TO EXPLICITLY GAIN ACCESS TO THE MACHINE AND EXECUTE THE APPROPRIATE PROGRAM. THIS REQUIRES THAT EITHER EACH USER MAINTAIN SEPARATE ACCOUNTS ON EACH POTENTIAL MACHINE, OR ALL MACHINES HAVE A 'GUEST GUEST' OR EQUIVALENT LOGIN. NEITHER OF THESE SITUATIONS IS DESIRABLE. THE TECHNIQUE PROPOSED ALSO REDUCES ADMINISTRATIVE AND USER BURDENS BY ADMINISTERING THE ENTIRE NETWORK AS A SINGLE COMPUTING COMPLEX. THIS RESEARCH PROGRAM WILL DEVELOP A GENERALIZED, DISTRIBUTED LABNET OPERATING SYSTEM (DISTLOS) ARCHITECTURE, DESIGN DISTLOS FOR A HOMOGENEOUS SYSTEM, AND PROVIDE A DEMONSTRATION OF A PROTOTYPE DISTLOS ON A SYSTEM OF DISTLOS WORKSTATIONS.

SPARTA INC
21 WORTHEN RD
LEXINGTON, MA 02173
CONTRACT NUMBER: DAAA21-87-C-0141
DANIEL WYSCHOGROD
TITLE:
CLOSED LOOP VISION GUIDED ROBOT
TOPJC# 7 OFFICE: ARDC

PHASE I WILL ADDRESS ISSUES IN HIGH-ACCURACY, CLOSED-LOOP VISION GUIDED ROBOT MOTION. IT IS PROPOSED TO USE IMAGE FEATURES WHICH CHANGE WITH THE POSITION OF A ROBOT MOUNTED CAMERA. THE VALUES OF THESE FEATURES COMBINED WITH KNOWLEDGE OF THE FEATURE JACOBIAN IN ROBOT CO-ORDINATES WILL BE USED TO CORRECT MANIPULATOR POSITION ALONG A TRAJECTORY. THE MAJOR PHASE I TASK IS TO ANALYTICALLY DETERMINE THE JACOBIAN OF A SET OF FEATURES FOR AN ACTUAL MANIPULATOR AND CREATE A COMPUTER SIMULATION TO PROVE FEASIBILITY. ADDITIONAL TASKS INCLUDE DETERMINATION OF OPTICAL SYSTEM REQUIREMENTS FOR A HARDWARE IMPLEMENTATION AS WELL AS INITIAL DESIGN FOR THE EXPANSION OF THE

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 170
BY SERVICE
FISCAL YEAR 1987
ARMY

SUBMITTED BY

SIMULATION MODEL TO INCLUDE ARM DYNAMICS.

SPARTA INC
PO BOX 1354 - 1055 WALL ST/STE 200
LA JOLLA, CA 92038
CONTRACT NUMBER: DAALO4-87-C-0057
DR H M BERKOWITZ
TITLE:
SHOCK ABSORBER FILLER MATERIALS FOR METAL/CERAMIC/META
ARMOR
TOPIC# 113 OFFICE: MTL

METAL CERAMIC COMPOSITES ARE CURRENTLY USED FOR ARMOR APPLICATIONS. MANY CURRENT ARMOR APPLICATIONS CONSIST OF TILES OF CERAMIC MATERIAL SUPPORTED ON A METAL OR COMPOSITE SUBSTRUCTURE. IN SOME APPLICATIONS, A METAL STRUCTURE IS ALSO USED IN FRONT OF THE CERAMIC TILE ARRAY, MAKING A CERAMIC SANDWICH. OTHER CONCEPTS UTILIZE SPHERES OR PLATELETS OF CERAMIC CONTAINED BETWEEN METAL LAYERS. IN ALL CASES, A FILLER MATERIAL IS USED BETWEEN MATERIALS IN A METAL/CERAMIC/METAL COMPOSITE. THE CHOICE OF THE FILLER IS BASED UPON ITS ABILITY TO MINIMIZE THE SHATTERING OF THE CERAMIC WHEN IMPACTED BALLISTICALLY. INNOVATIVE FILLER MATERIALS ARE SOUGHT TO IMPROVE STRUCTURAL INTEGRITY. THIS PHASE I SBIR EFFORT WILL ANALYTICALLY DETERMINE THE PROPERTIES DESIRED OF FILLER MATERIALS IN METAL/CERAMIC/METAL COMPOSITE SANDWICH ARMOR, IDENTIFY THOSE MATERIALS THAT EXIST WHICH POSSESS THE DESIRED PROPERTIES, DETERMINE HOW NEW MATERIALS CAN BE FABRICATED THAT HAVE THE DESIRED PROPERTIES, AND PLAN THE PHASE II SBIR PROGRAM UNDER WHICH WE WILL FABRICATE MATERIALS AND TEST SPECIMENS AND EXPERIMENTALLY VERIFY THE PHASE I RESULTS.

SPARTA INC
23293 S POINTE DR
LAGUNA HILLS, CA 92653
CONTRACT NUMBER: DAAE07-87-C-8063
MICHAEL L LOPEZ
TITLE:
QUICK-DISCONNECT COOLANT HOSE CLAMP
TOPIC# 169 OFFICE: TACOM

SUBMITTED BY

A BROAD SELECTION OF STANDARD AND CUSTOM CLAMPING DEVICES HAVE BEEN DESIGNED AND MANUFACTURED TO SOLVE THE NEEDS OF THE AIRCRAFT, APPLICANCE, AUTOMOTIVE, FARM IMPLEMENT, AND MARINE INDUSTRIES. ALTHOUGH EXISTING HOSE CLAMPS INCORPORATE MANY DESIRABLE FEATURES CONSISTENT WITH COOLING SYSTEM APPLICATIONS, NO SINGLE DESIGN CURRENTLY MEETS THE FOLLOWING CRITERIA: UTILITY-FAST REMOVAL AND INSTALLATION WITHOUT TOOLS AND A LOW PROFILE TO MINIMIZE CLEARANCE REQUIREMENTS; MAINTAINABILITY - PROVIDE CONSTANT RADIAL FORCE INDEPENDENT OF TEMPERATURE AND PRESSURE, VIBRATION PROOF, INTERFACE SELECTED TO PREVENT DAMAGE TO HOSE, AND CORROSION RESISTANT; AND COST - ECONOMICAL TO PRODUCE IN LARGE NUMBERS AND COST COMPETITIVE WITH EXISTING DESIGNS. THE OVERALL OBJECTIVES OF THE PROJECT ARE TO DESIGN, ANALYZE, AND TEST SEVERAL HOSE CLAMP CONCEPTS THAT HAVE A HIGH PROBABILITY OF MEETING THE UTILITY, MAINTAINABILITY, AND COST CRITERIA ENUMERATED ABOVE AND FOLLOWING A RIGOROUS EVALUATION PROCESS THAT WILL INCLUDE CONCEPT RANKING, SELECT ONE OR MORE CONCEPTS FOR PRODUCTION.

SPARTA INC
23293 S POINTE DR
LAGUNA HILL, CA 92653
CONTRACT NUMBER: DAAB07-87-C-P045
OLIVER CATHEY
TITLE:
INTEGRATED AIRCRAFT SURVIVABILITY EQUIPMENT EFFECTIVEL
TOPIC# 292 OFFICE: EW

SPARTA PROPOSES TO DEMONSTRATE THE APPLICABILITY OF ITS ADEM SIMULATION OF ASE EVALUATION. ADEM CONTAINS HIGH FIDELITY MODELS OF AIRCRAFT, THREATS, AND ASE SYSTEMS. IT IS A MANY-ON-MANY SIMULATION WHICH HAS BEEN USED IN A NUMBER OF ASE DEVELOPMENT PROGRAMS. IN ADEM, AIRCRAFT DYNAMICALLY REACT TO THREATS LIKE REAL PILOTS. ADEM CONTAINS SAMs, AAA, ECM, DRONES, ARMs, FLARES, DECOYS, AND ONBOARD AND OFF-BOARD JAMMERS. IN PHASE I, SPARTA WOULD MODIFY ADEM TO INCORPORATE HELICOPTER FLIGHT DYNAMICS AND EXECUTE DEMONSTRATION CASES FOR THE ARMY.

SPECIAL ILLUMINATION SYSTEMS INC
444 VOLUSIA AVE
DAYTON, OH 45409
CONTRACT NUMBER: DAAD01-87-C-0067
LEE A CROSS
TITLE:
PARALLEL SOLID STATE VIDEO RECORDER
TOPIC# 223 OFFICE: TECOM

SUBMITTED BY

THE USE OF HIGH-SPEED PARALLEL OUTPUT IMAGE SENSORS REQUIRES A HIGH-SPEED PARALLEL INPUT RECORDER WHICH IS CAPABLE OF STORING DATA AT A RATE WHICH IS SO HIGH THAT IT DOES NOT DEGRADE THE RESOLUTION OF THE SYSTEM. CAMERAS EMPLOYING CCD OR CID IMAGE SENSORS CAN BE USED IN PLACE TO HIGH-SPEED FILM CAMERAS ONLY IF THEIR FRAMING RATES ARE COMPARABLE. THE RECORDER DISCUSSED IN THIS PROPOSAL WILL DIGITIZE AND STORE ANALOG DATA FROM THE IMAGE SENSOR AT 10 MHz, THE FASTEST THE NEWEST LARGE MEMORY CHIPS CAN BE ACCESSED. THIS WILL ALLOW PICTURES THAT ARE 256 PIXELS WIDE TO BE RECORDED WITH A FRAMING RATE OF 40 KHz. THE PROTOTYPE SYSTEM WILL RECORD 1024 PICTURES WITH A RESOLUTION OF 256 X 128 EIGHT-BIT PIXELS. THE SYSTEM CAN BE EASILY UPGRADED TO A 256 X 256 PIXEL SYSTEM WITH THE ADDITION OF TWO MORE MEMORY BOARDS. THE RECORDED PICTURES CAN BE VIEWED BY A STANDARD VIDEO MONITOR OR A MICROCOMPUTER CAN BE USED TO READ THE IMAGE DATA THROUGH A COMMUNICATIONS PORT.

SPIRE CORP
PATRIOTS PK
BEDFORD, MA 01730
CONTRACT NUMBER: DAAL01-87-C-0743
STANLEY M VERNON
TITLE:
IMPROVED EPITAXIAL GALLIUM ARSENIDE LAYER GROWTH ON SI
SUBSTRATES
TOPIC# 122 OFFICE: ETDL

THE PROPOSED PROGRAM INVESTIGATES THE USE OF GaAs LAYERS EPITAXIALLY GROWN ON SILICON WAFERS AS SUBSTRATES FOR GaAs ELECTRONIC DEVICES. THE NEW GaAs-ON-SI SUBSTRATES WILL BE LARGER, MORE UNIFORM, MORE RUGGED, AND MORE THERMALLY CONDUCTIVE THAN THE BULK GaAs SUBSTRATES THEY ARE DESIGNED TO REPLACE. GaAs LAYER GROWTH WILL BE ACCOMPLISHED BY METALORGANIC CHEMICAL VAPOR DEPOSITION (MOCVD), WHICH HAS A GREATER POTENTIAL FOR COMMERCIAL SCALEUP THAN COMPETING TECHNOLOGIES. IN PHASE I, UNIFORM GROWTH WILL BE DEMONSTRATED ON 100 mm SILICON SUBSTRATES. THE EFFECTS OF WAFER BOWING FROM THERMAL EXPANSION MISMATCH BETWEEN GaAs AND Si WILL BE MEASURED AND THEORETICALLY MODELED. METHODS FOR REDUCING THE EFFECTS OF GROWTH DEFECTS WILL BE INVESTIGATED. IN PHASE II, THE GROWTH WILL BE SCALED UP TO A LARGER REACTOR AND DETAILED OPTIMIZATION OF THE GROWTH PROCESS WILL BE PERFORMED.

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METHODS FOR ELIMINATING THE EFFECTS OF WAFER BOWING AND THREADING DISLOCATIONS WILL BE DEVELOPED. IN PHASE II, THE PROCESS WILL BE COMMERCIALIZED VIA SPIRE'S EPITAXIAL LAYER SERVICE AND MOCVD REACTOR SALES.

SPIRE CORP
PATRIOTS PK
BEDFORD, MA 01730
CONTRACT NUMBER: DAAB07-87-C-F073
RICHARD TRACZEWSKI
TITLE:
MEPCURY MANGANESE TELLURIDE AND MERCURY ZINC TELLURIDE
FIR DETECTOR MATERIALS
TOPIC# 309 OFFICE: NV

THERE IS A NEED IN THE INFRARED DETECTOR COMMUNITY FOR HIGH QUALITY FILMS THAT WILL PROVIDE OPTIMUM DETECTION QUALITIES AND WHICH CAN BE READILY PROCESSED WITHOUT DEGRADING POTENTIAL DEVICE PERFORMANCE. PRESENT MATERIAL UTILIZATION HAS FOCUSED ON $Hg(1)X Cd(x)Te$. ITS TUNABLE BANDGAP AND HIGH QUANTUM EFFICIENCIES FOR THE 3-5 MICROMETERS AND 8-14 MICROMETERS ATMOSPHERIC WINDOWS MAKE IT PARTICULARLY ATTRACTIVE. HOWEVER, THIS MATERIAL HAS PROVED DIFFICULT TO GROW AND FABRICATE INTO DEVICES. HIGH CONCENTRATIONS OF NATIVE DEFECTS AND THE RAPID DIFFUSION OF IMPURITIES AND MAJORITY ATOMS Hg AND Cd ARE SIGNIFICANT DRAWBACKS OF THIS MATERIAL. METHODS TO ALLEVIATE THESE PROBLEMS HAVE CENTERED ON LOW TEMPERATURE GROWTH TECHNIQUES AND THE USE OF HIGH CRYSTALLINE QUALITY FOREIGN SUBSTRATES. CORRESPONDINGLY, ALTERNATIVE INFRARED ABSORBING FILMS ARE NOW ALSO UNDER INTENSE INVESTIGATION. SPIRE CORPORATION PROPOSES TO INVESTIGATE AND EVALUATE THE GROWTH OF $Hg(1)xMn(x)Te$ AND $Hg(1)xZn(x)Te$, AS ALTERNATIVE MATERIALS TO $HgCdTe$, FOR FIR APPLICATIONS VIA AN MOCVD PROCESS. LOW TEMPERATURE GROWTH TECHNIQUES WILL BE EMPHASIZED AND INVESTIGATED. THE STUDY WILL ULTIMATELY RESULT IN THE IDENTIFICATION OF REACTANT COMPONENTS AND A REACTOR SYSTEM DESIGN FOR LOW TEMPERATURE DEPOSITION OF THESE MATERIALS.

SPIRE CORP
PATRIOTS PK
BEDFORD, MA 01730
CONTRACT NUMBER: DAAB07-87-C-F087
DR MARK B SPITZER
TITLE:
FEASIBILITY OF LOW-COST FABRICATION APPROACHES FOR SUP
AlGaAs LASER ARRAYS
TOPIC# 315 OFFICE: NV

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1
BY SERVICE
FISCAL YEAR 1987
ARMY

PAGE 174

SUBMITTED BY

THIS PROPOSAL ADDRESSES A THREE-PHASE PROGRAM FOR THE REDUCTION OF THE COST OF AlGaAs DIODE LASER ARRAYS. THE INNOVATIVE TECHNIQUES TO BE PURSUED INCLUDE IMPROVED WAFER PROCESSING TO REDUCE THE COST OF THE LASER DEVICES, AND FABRICATION OF A NOVEL HEADER, TO REDUCE THE ASSEMBLY COST OF THE TWO-DIMENSIONAL ARRAYS. THIS HEADER IS ALSO EXPECTED TO IMPROVE THE POWER OUTPUT OF THE LASER ARRAY. THE PROPOSAL HEADER IS BASED ON THE USE OF ANISOTROPICALLY-ETCHED SILICON TO PRECISELY LOCATE THE ONE-DIMENSIONAL LASER ARRAYS IN A TWO-DIMENSIONAL CONFIGURATION. AN INTERCONNECT TECHNIQUE IS PROPOSED THAT COMPRISES USE OF AN INNOVATIVE APPROACH TO SOLDERING. IN PHASE I, THE FEASIBILITY OF THE PROPOSED CONCEPTS WILL BE TESTED. IN PHASE II, IN-DEPTH RESEARCH INTENDED TO RESOLVE PROBLEMS IN ARRAY FABRICATION WILL BE CARRIED OUT, AND PROTOTYPES WILL BE FABRICATED. PHASE III WILL INVESTIGATE COMMERCIALIZATION OF THE TECHNIQUES.

SRS TECHNOLOGIES
PO BOX 9219
NEWPORT BEACH, CA 92660
CONTRACT NUMBER: DAAA21-87-C-0127
FERRIL LOSEE
TITLE:
DETERMINATION OF COATING THICKNESS
TOPIC# 25 OFFICE: ARDC

THE OBJECTIVE OF THIS RESEARCH IS TO DEVELOP A METHOD TO RAPIDLY DETERMINE THE COMPLETENESS AND THICKNESS OF COATINGS SUCH AS WAVES OR POLYETHYLENE ON ENERGETIC MATERIALS WHICH ARE USUALLY NITRO COMPOUNDS. THE APPROACH THAT IS PROPOSED IS TO INCLUDE IN THE COATING A VERY SMALL BUT KNOWN PERCENTAGE OF LANTHANUM OXIDE OR SOME SIMILAR TRACE ELEMENT MATERIAL. AFTER THE COATING IS APPLIED TO THE ENERGETIC MATERIAL, IT IS VIEWED BY A SPECIAL X-RAY RADAR WHICH HAS THE ABILITY TO MEASURE VERY ACCURATELY THE AMOUNT OF TRACE ELEMENT THAT IS PRESENT PER UNIT AREA. BY KNOWING THIS, IT IS THEN POSSIBLE TO DIRECTLY COMPUTE THE THICKNESS OF THE COATING. A DIRECT READOUT SYSTEM IS POSSIBLE. THE PROPOSED PHASE I PROGRAM WILL INCLUDE EXPERIMENTAL MEASUREMENTS TO PROVE OUT THE CONCEPT AND DEMONSTRATE PERFORMANCE FEATURES. THESE MEASUREMENTS WILL BE MADE IN THE SRS TECHNOLOGIES' X-RAY LABORATORY. ALL OF THE REQUIRED EQUIPMENT FOR THESE TEST IS ALREADY ON HAND. THE END PRODUCT FOR THE PROPOSED EFFORT

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WILL BE DETAILED DESIGNS FOR A PROTOTYPE COATING THICKNESS
MEASUREMENT SYSTEM TO BE DEVELOPED AND TESTED IN THE PHASE II PROGRAM.

ST&E INC
1791 BARCELONA ST
LIVERMORE, CA 94550
CONTRACT NUMBER: DAMD17-87-C-7222
DR STANLEY M KLAINER
TITLE:
AN IN-VIVO/IN-VITRO FIBER OPTIC CHEMICAL SENSOR (FOCS)
DIAGNOSIS OF NATURAL AND INDUCED DISEASES OF MILITARY
TOPIC# 332 OFFICE: MEDICAL

THE TECHNICAL OBJECTIVE OF PHASE I IS TO DEMONSTRATE THAT A NEW TYPE OF FIBER OPTIC CHEMICAL SENSOR, USING MONOCLONAL ANTIBODIES AS THE REACTANTS, CAN BE DEVELOPED WHICH CAN RAPIDLY, SENSITIVELY AND SPECIFICALLY IDENTIFY THE PRESENCE OF NATURAL AND INDUCED DISEASES OF MILITARY IMPORTANCE. PHASE I FOCUSES ON THE DEVELOPMENT OF THE SENSOR TECHNOLOGY. THIS IS NECESSARY BECAUSE PRESENT SENSOR TECHNOLOGY IS NOT COMPATIBLE WITH THE ARMY'S NEEDS. IN PARTICULAR, SIZE, SPECIFICITY, SENSITIVITY AND LIFETIME ARE REQUISITES THAT CANNOT BE MET. THE NEW SENSOR APPROACH IS BASED ON THE DEVELOPMENT OF CUSTOM FIBER OPTICS WHICH SHOULD BE ADAPTABLE TO THE ANALYSIS OF SEVERAL TARGET MOLECULES OR CLASSES OF COMPOUNDS BY JUST CHANGING THE ANTI-BODY OR OTHER SENSOR MATERIALS. THIS WOULD ELIMINATE THE NEED FOR A LARGE R&D EFFORT FOR EACH SPECIES TO BE MEASURED. IT IS PROJECTED THAT COMPLETE SENSOR SYSTEMS CAN BE MADE WHICH ARE 10 cm x 5 cm x 3 cm INCLUDING BATTERIES. SENSOR SIZE WILL VARY FROM MORE OR LESS THAN 100 TO 500 MICROMETERS OUTSIDE DIAMETER FOR IN-VIVO AND IN-VITRO MEASUREMENTS RESPECTIVELY.

STAC INC
959 E COLORADO BLVD
PASADENA, CA 91106
CONTRACT NUMBER: DAAD01-87-C-0069
DR JOHN E TANNER
TITLE:
PARALLEL OUTPUT IMAGING SENSOR
TOPIC# 222 OFFICE: TECOM

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 176
BY SERVICE
FISCAL YEAR 1987
ARMY

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WE PROPOSE TO INVESTIGATE AND DEVELOP A PARALLEL OUTPUT IMAGING SENSOR BASED ON A CUSTOM MOS INTEGRATED CIRCUIT. THE SENSOR WILL HAVE AN IMAGING RESOLUTION OF APPROXIMATELY 256 X 256 PIXELS AND OPERATE AT FRAME RATES GREATER THAN 2000 FRAMES/SECOND. THE HIGH BANDWIDTH REQUIREMENTS WILL NECESSITATE PARALLEL OUTPUTS FROM THE CHIP, PERHAPS AS MANY AS ONE OUTPUT PER ROW OF SENSORS. OUR APPROACH WILL UTILIZE STANDARD READILY AVAILABLE CMOS BULK INTEGRATED CIRCUIT TECHNOLOGY SO PRODUCTS ARISING FROM THE R&D CAN BE FABRICATED RELIABLY AND CHEAPLY BY A NUMBER OF VENDORS. WE HAVE DEMONSTRATED THE FEASIBILITY OF FABRICATING PHOTODIODE ARRAYS USING STANDARD CMOS PROCESSES. A SMALL CIRCUIT ASSOCIATED WITH EACH PHOTODIODE IN THE ARRAY PROVIDES A LOGARITHMIC OUTPUT THAT EXTENDS THE DYNAMIC RANGE OF LIGHT INTENSITIES TO GREATER THAN 10,000. OUR ASSOCIATES AT CALTECH HAVE BUILT AND DEMONSTRATED CMOS SCANNING ARRAYS AT NORMAL VIDEO RATES. THE DEVELOPMENT OF A HIGH SPEED PARALLEL OUTPUT VIDEO CAMERA IS A NATURAL EXTENSION OF THIS PRIOR WORK AND LEADS DIRECTLY TO AN INEXPENSIVE PRODUCT WITH WIDE APPLICABILITY IN COMMERCIAL, ACADEMIC, AND MILITARY MARKETS.

STAR MICROWAVE
546 DIVISION ST
CAMPBELL, CA 9508
CONTRACT NUMBER: DAAL01-87-C-00734
ROBERT M PHILLIPS
TITLE:
LOW COST RF INTERACTION CIRCUITS FOR HIGH POWER TWTS
TOPIC# 132 OFFICE: ETDL

STAR MICROWAVE HAS DEVELOPED A NEW CONTRA-WOUND HELIX DERIVED HIGH POWER TWT INTERACTION CIRCUIT WHICH CAN BE PRODUCED FOR A FRACTION OF THE COST OF EXISTING COUPLED CAVITY CIRCUITS. INITIAL COLD TESTS INDICATE THAT THE CIRCUIT WILL PROVIDE UP TO TWICE THE GAIN PER WAVELENGTH AN EFFICIENCY OF COUPLED CAVITY CIRCUITS, IS FREE OF OSCILLATION MODES AND CAN BE TAILORED FOR BANDWIDTHS FROM 5% TO 1/3 OCTAVE AT ALL POWER LEVELS NOW ADDRESSED BY COUPLED CAVITY TWTS. THE CIRCUIT IS PRODUCED FROM SOLID COPPER TUBING USING TRAVELING WIRE EDM, A TECHNIQUE OF SUCH PRECISION THAT THE CIRCUIT CAN BE USED AT FREQUENCIES THROUGH 44 GHz. IN PLACE OF THE CUSTOMARY DIELECTRIC SUPPORT RODS, THE CIRCUIT IS BRAZED INSIDE A BERYLLIA TUBING. THE CON-

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STRUCTION PROVIDES COUPLED CAVITY AVERAGE POWER CAPABILITY. EVEN MORE IMPORTANTLY, IT OVERCOMES THE PEAK RF POWER BREAKDOWN PROBLEM WHICH HAS PREVIOUSLY LIMITED HELIX DERIVED CIRCUITS TO MODEST PEAK POWER LEVELS. THE FIRST OBJECTIVE OF PHASE I IS TO COLD TEST AND DOCUMENT CIRCUITS WHICH WILL BRACKET ALL OF THE ARMY'S NEEDS FOR HIGH POWER TWTS FROM 1 THROUGH 44 GHz. THE SECOND OBJECTIVE IS TO VALIDATE THE REQUIRED CIRCUIT/BEO BRAZING TECHNIQUES.

SUM-X RESEARCH INC
PO BOX 14864
AUSTIN, TX 78761
CONTRACT NUMBER: DACA88-87-C-0010
Wm SHELTON CLARK
TITLE:
CONDUCTIVE COATINGS FOR IMPRESSED CURRENT CATHODIC PRO
TOPIC# 249 OFFICE: CERL

THE PROPOSED PROJECT IS CONCERNED WITH FIRMLY ESTABLISHING THE VIABILITY OF ELECTROACTIVE COATINGS THAT USE CATHODIC CORROSION MECHANISMS TO PROTECT METALS AGAINST CORROSION. THE COATINGS MAY BE USED IN CONJUNCTION WITH IMPRESSED CURRENT CATHODIC PROTECTION TO UNIFORMLY DISTRIBUTE PROTECTION AND TO EXTEND PROTECTION INTO CREVICES AND INTO SPLASH ZONES. DIFFERENT REDOX COUPLE/POLYMER COATINGS SYSTEMS WILL BE DEVELOPED AND TESTED. IN ADDITION TO TESTING CATHODIC ELECTROACTIVE COATINGS, SANDWICH FORMULATIONS INVOLVING CONDUCTIVE COATINGS WILL BE TESTED FOR EXTENDING THE ANODE PORTION OF THE IMPRESSED CURRENT CATHODIC SYSTEMS.

SUNREZ CORP
1148 PIONEER WY
EL CAJON, CA 92020
CONTRACT NUMBER: DAAL04-87-C-0062
DR W NOVIS SMITH
TITLE:
REPAIR OF THICK FIBERGLASS REINFORCED PLASTIC STRUCTUR
TOPIC# 104 OFFICE: MTL

A MAJOR CONCERN FOR MAINTAINING THE PERFORMANCE OF VEHICLE PROTECTED

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1
BY SERVICE
FISCAL YEAR 1987
ARMY

PAGE 178

SUBMITTED BY

BY FIBER REINFORCED PLASTIC (COMPOSITE) ARMOR IS THE REPAIR OF BATTLE FIELD BALLISTIC DAMAGE. THIS FIELD REPAIR MUST BE RAPID, SIMPLE AND RESTORE THE VEHICLE TO ABOUT 90% PERFORMANCE. SUCH A NEW SIMPLE, RAPID REINFORCED (COMPOSITE) ARMOR FIELD REPAIR SYSTEM IF PROPOSED BASED ON A NEW ULTRA VIOLET CURABLE THERMOSET PREPREG AND NEW REPAIR TECHNIQUES. THIS PROPOSED REPAIR SYSTEM WILL HAVE SIX MONTH STOREABILITY, REQUIRE NO EXTERNAL HEAT, IS COMFORMABLE, HAS EXCELLENT PHYSICAL PROPERTIES, IS SIMPLE TO USE, RELATIVELY INEXPENSIVE AND CAN CURE IN 5 MINUTES. IT ALSO REQUIRES NO MIXING, HAS NO OFFENSIVE FUMES, AND REQUIRES ONLY A PORTABLE ULTRA VIOLET LAMP OR ORDINARY SUNLIGHT. AN EVALUATION OF THE OPTIMUM REPAIR/PREPREG CONFIGURATION WILL BE MADE, TEST PIECES REPAIRED, AND A PROTOTYPE REPAIR SYSTEM DEMONSTRATED FOR THE ARMY.

SUSQUEHANNA RESOURCES & ENVIRONMENT INC
84 OAK ST
BINGHAMPTON, NY 13905
CONTRACT NUMBER: DAAA21-87-C-0114
TIMOTHY D MASTERS
TITLE:
INTELLIGENT GUNNER/COMMANDER DECISION AID DEVELOPMENT
TOPIC# 5 OFFICE: ARDC

SUSQUEHANNA RESOURCES AND ENVIRONMENT, INC. (SR&E) WILL DEVELOP A PROTOTYPE INTELLIGENT GUNNER DECISION AID SYSTEM FOR LABORATORY DEMONSTRATION AND VALIDATION WITH ANTONOMOUS TARGET DETECTION, IDENTIFICATION, AND TRACKING; AND INTELLIGENT DISPLAYS FOR MAKING CORRECT AND TIMELY FIRE CONTROL DECISIONS. SR&E CAN MAKE THE BEST OFFER BECAUSE IT HAS THE TECHNOLOGY TO PERFORM AUTOMATED SCENE SEGMENTATION AND DESCRIPTION ON WHICH AUTOMATIC TARGET RECOGNITION (ATR) IS BASED; WHEREAD, OTHERS DO NOT. THE EFFECTIVENESS OF SR&E TECHNOLOGIES HAVE BEEN EVALUATED AND PROVEN. THE FIVE PHASE I OBJECTIVES ARE: TO DEVELOP A COMPREHENSIVE DATA BASE FOR THE EXPERIMENTS; TO GENERATE AN TARGET IDENTIFICATION LIBRARY FOR A LIMITED CLASS OF TARGETS; TO GENERATE FEATURE DESCRIPTORS WITH FLIR IMAGE DATA; TO PERFORM TARGET IDENTIFICATION; AND TO DEMONSTRATE THE RESULTS AND RECOMMEND SPECIFICATIONS FOR A PROTOTYPE ATR SYSTEM. THE EXPERIMENTS ARE FOCUSSED ON THE DISCRIMINATION BETWEEN TRACKED AND WHEELED VEHICLES ON ONE LEVEL, AND BETWEEN TANKS AND APC'S ON ANOTHER. PHASED WORK PLAN FOLLOWS

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ESSENTIALLY THE ORDER OF THE OBJECTIVES. THE DEMONSTRATIONS WILL BE CONDUCTED AT SR&E AND ARDEC WITH A HYBRID ATR SYSTEM: FRONT-END DIGITAL AND REAR-END SYMBOLIC PROCESSORS.

SUTTON M M & ASSOCS
1825 SAN PABLO AVE - STE 202
OAKLAND, CA 94612
CONTRACT NUMBER: DAAD09-87-C-0035

MARK SUTTON

TITLE:

A HIGH INTENSITY SOLAR FACILITY FOR SIMULATING THERMAL ENVIRONMENT

TOPIC# 213 OFFICE: TECOM

THE PROPOSED CONCEPT USES AN INNOVATIVE SOLAR CENTRAL RECEIVER DESIGN TO PRODUCE THE VERY HIGH FLUX DENSITIES AND POWER REQUIREMENTS NEEDED FOR THIS APPLICATION. AN ARRAY OF EQUATORIALLY MOUNTED HELIOSTATS WITH TOROIDAL SHAPED SURFACES ARE ARRAYED IN A TILTED FIELD LAYOUT. THE HIGH FLUX DENSITIES ARE PRODUCED THROUGH A COMBINATION OF THE DESIGNS ABILITY TO PLACE LARGE AMOUNTS OF HELIOSTAT AREA CLOSE TO THE FOCAL ZONE AND THE ABILITY TO CONTROL OPTICAL ASTIGMATISM. UNLIKE OTHER CENTRAL RECEIVER CONCEPTS, THE PROPOSED DESIGN DIRECTS THE CONCENTRATED SOLAR ENERGY TO A GROUND-BASED FOCAL ZONE ALLOWING FOR ANY SIZE AND SHAPE TEST OBJECT AND RAPID EXPERIMENT TURN AROUND. ALSO, DUE TO THE USE OF ONLY A SINGLE REFLECTIVE SURFACE, THE MAXIMUM ULTRAVIOLET CONTENT OF THE INCIDENT SOLAR ENERGY IS MAINTAINED, PROVIDING THE MOST ACCURATE SIMULATION OF A THERMAL NUCLEAR EVENT. A FACILITY BUILT ON THE PROPOSED CONCEPT WILL ALSO HAVE THE ABILITY TO GENERATE ELECTRICAL (OR OTHER) POWER WHEN NOT USED FOR TESTING PURPOSES.

SYMBIOTECH (OLD: VIVCHEM RSCH)

PO BOX 815

CHESHIRE, CT 06410

CONTRACT NUMBER:

EDWARD M DAVIS

TITLE:

DESENSITIZING CARBONACEOUS ADSORBENTS TO THE EFFECTS O

TOPIC# 30 OFFICE: CRDC

SUBMITTED BY

THIS PROJECT WILL DEVELOP TREATMENTS TO REMOVE AND MODIFY SURFACE OXYGEN COMPOUNDS ON CARBON WHICH BIND WATER, THEREBY INTERFERING WITH THE ADSORPTION OF WEAKLY ADSORBING SUBSTANCES. ADSORBENT CARBONS AND ASC WHETLERITES WILL BE PREPARED AND TREATED BY VARIOUS METHODS TO RENDER THEM HYDROPHOBIC. THEY WILL THEN BE TESTED AS TO THE INFLUENCE OF HUMIDITY ON ADSORPTION IN FLOW APPARATUS BY OBSERVING BREAKTHROUGH PHENOMENA FOR FIXED BEDS OF SORBENT MATERIAL AND USING VARIOUS ORGANIC COMPOUNDS AS MODELS FOR TOXIC SORBATES. THE BET SURFACE AREAS AND WATER-SORPTION CAPACITIES OF THE VARIOUS SORBENTS WILL ALSO BE MEASURED. SPECIAL PROBLEMS ASSOCIATED WITH WATER ADSORPTION BY THE POLAR METAL COMPOUNDS IMPREGNATED INTO ASC WHETLERITES WILL ALSO BE ADDRESSED.

SYMBIOTICS INC
122 WINNISIMMET ST
CHELSEA, MA 02150
CONTRACT NUMBER: DAAB10-87-C-0053
DR ROBERT C PASLAY
TITLE:
ACCESS: A COMMUNICATING AND COOPERATING EXPERT SYSTEM
TOPIC# 319 OFFICE: CECOM/SWL

THE INTENT OF THIS PROJECT IS TO PROVIDE A SOFTWARE ENVIRONMENT WHICH WILL ALLOW IMMEDIATE IMPLEMENTATION OF A VARIETY OF COOPERATING EXPERT SYSTEM PARADIGMS. THE ENVIRONMENT, REFERRED TO AS ACCESS, WILL BE DESIGNED TO BE EXPERT SYSTEM REPRESENTATION INDEPENDENT, BE PORTABLE TO ANY HARDWARE WHICH SUPPORTS COMMON LISP, PROVIDE A FLEXIBLE MESSAGE PASSING PROTOCOL AND ALLOW THE USER TO ARRANGE EXPERT SYSTEMS IN ANY TOPOLOGY. ONE IMMEDIATE USE FOR THIS SYSTEM WOULD BE EXPERIMENTAL USING PREVIOUSLY DEVELOPED EXPERT SYSTEMS AS THE KNOWLEDGE SOURCES FOR COOPERATING AGENTS. ALTERNATIVELY, KNOWLEDGE SOURCES CAN BE DEVELOPED WITHIN THE ACCESS ARCHITECTURE WITH THE INTENTION OF CREATING AN ORGANIZATION OF COOPERATING EXPERTS. THE EXISTENCE OF A CONSISTENT, COMPREHENSIVE AND EFFICIENT ENVIRONMENT FOR THE IMPLEMENTATION OF COOPERATING EXPERT SYSTEM PARADIGMS WOULD BE A SIGNIFICANT CONTRIBUTION TO THE FIELD OF DISTRIBUTED ARTIFICIAL INTELLIGENCE.

SYNERGISTIC TECHNOLOGY INC
20065 STEVENS CREEK BLVD
CUPERTINO, CA 95014
CONTRACT NUMBER: DAAL02-87-C-0106
GEORGE A HAMMA
TITLE:
ADAPTIVE CONTROL NONLINEAR MULTI-AXIS VIBRATION
TOPIC# 55 OFFICE: HDL

SUBMITTED BY

MULTIAXIS VIBRATION TESTING CONTRIBUTES SUBSTANTIALLY TO ENVIRONMENT-TEST ECONOMICS AND IMPROVED PRODUCTS. THE EFFECTIVENESS OF STATE-OF-THE-ART MULTI-EXCITER CONTROL SYSTEMS IS LIMITED BY CERTAIN UNAVOIDABLE NONIDEAL DYNAMIC-RESPONSE BEHAVIORS. IT IS PROPOSED THAT THESE TROUBLESOME PHENOMENA BE IDENTIFIED AND QUANTIFIED. IT IS ALSO PROPOSED TO STUDY EXTENSION OF CONTROL CAPABILITIES BY INNOVATIVE REFINEMENTS OF EXISTING STRATEGIES AS WELL AS THE APPLICATION OF EMERGING CONTROLS TECHNOLOGY.

SYNETICS CORP
80 MAIN ST
READING, MA 01867
CONTRACT NUMBER: DAAA21-87-C-0152
ANN T ORLANDO
TITLE:
VOICE ACTIVATED GUN TURRET CONTROL
TOPIC# 11 OFFICE: ARDC

THE OBJECTIVE OF THIS PROPOSED EFFORT IS TO DETERMINE THE FEASIBILITY OF USING VOICE COMMANDS FOR THE CONTROL OF GUN TURRETS. THE APPLICATION OF AUTOMATIC SPEECH RECOGNITION TECHNOLOGY HAS GREAT POTENTIAL FOR EXPANDING CREW CAPABILITIES AND REDUCING CONFUSION IN THE DYNAMIC ENVIRONMENT OF THE ATTACK HELICOPTER COCKPIT. THE TASKS WHICH WILL BE REQUIRED TO DETERMINE VOICE CONTROL FEASIBILITY INCLUDE ANALYSIS OF THE HELICOPTER ACOUSTIC ENVIRONMENT, SELECTION OF APPROPRIATE CONTROL VOCABULARY AND SPEECH SYSTEM SPECIFICATION. IF VOICE CONTROL PROVES TO BE FEASIBLE, IT IS EXPECTED TO SIGNIFICANTLY IMPROVE HELICOPTER CREW PERFORMANCE.

SYSTEMS & PROCESSES ENGINEERING CORP
1406 SMITH RD - STE A
AUSTIN, TX 78721
CONTRACT NUMBER: DAAA15-87-C-0053
NEWTON B PENROSE
TITLE:
COMBAT SUPPORT ROBOTICS ADVANCED CONCEPTS AND SYSTEM A PROGRAM
TOPIC# 324 OFFICE: TPM

SUBMITTED BY

THIS ADVANCED CONCEPTS ROBOTICS PROGRAM WILL PROVIDE THE ARMY WITH THE FOLLOWING: AN INTEGRATED ROBOTICS SYSTEM TRADE STUDY TO IDENTIFY, ANALYZE, AND PRIORITIZE ADVANCED ROBOTICS TECHNOLOGY APPLICATIONS FOR ENHANCING ARMY FORCE STRUCTURES FROM TODAY THROUGH THE YEAR 2010 (COMBAT SUPPORT SPECIFIC). AN INTERACTIVE COST/BENEFIT COMPUTER MODEL--ROBOT ASSESSMENT MODEL (RAM)--A FIRST ORDER TOOL, USED TO EVALUATE THE COST/RISK EFFECTIVENESS OF ROBOTICS SYSTEMS AGAINST TACTICAL SCENARIOS. AN ASSESSMENT OF "LEADING EDGE" ROBOTICS TECHNOLOGY WITH POTENTIAL MILITARY AND COMMERCIAL APPLICATIONS. A COMPREHENSIVE EVALUATION OF ARMY TACTICAL ROBOTIC SCENARIOS AND CONCEPTS WITH RECOMMENDATIONS OF NEAR AND LONG TERM DEVELOPMENT STRATEGIES--OPENING THE GATEWAY TO A PHASE II ROBOT PROTOTYPE.

SYSTOLIC SYSTEMS INC
1065 E BROKAW RD
SAN JOSE, CA 95131
CONTRACT NUMBER: DAAD09-87-C-0077
RICHARD H TRAVASSOS
TITLE:
COMPUTER ARCHITECTURE FOR KALMAN FILTERING
TOPIC# 212 OFFICE: TECOM

TO MEET THE HIGH THROUGHPUT REQUIREMENTS OF DOD SIGNAL PROCESSING APPLICATIONS, HIGHLY PARALLEL ARCHITECTURES NEED TO BE DEVELOPED. IN PARTICULAR, TO PERFORM MULTIDIMENSIONAL KALMAN FILTERING AT SAMPLE RATES APPROACHING 15 KHz INNOVATIVE TECHNIQUES ARE NEEDED TO PARTITION THE PROBLEM FOR REAL-TIME IMPLEMENTATION. THEREFORE, A UNIQUE DECOUPLING OF THE PREDICTOR AND CORRECTOR EQUATIONS IN THE KALMAN FILTER IS PROPOSED TO SPEED-UP COMPUTATIONS BY TWO (2) ORDERS OF MAGNITUDE (100X). THE PROPOSED PARALLELED ALGORITHMS AND ARCHITECTURES ARE WELL-SUITED FOR RECURSIVE FILTERING, IMAGE AND SIGNAL PROCESSING FOR NEXT GENERATION INSTRUMENT RADAR AND TELEMETRY EQUIPMENT.

TACAN CORP
2111 PALOMAR AIRPORT RD - STE 270
CARLSBAD, CA 92008
CONTRACT NUMBER: DAAD05-87-C-0022
DR MICHAEL M SALOUR
TITLE:
HIGH RESOLUTION TEMPERATURE MEASUREMENTS
TOPIC# 195 OFFICE: TECOM

SUBMITTED BY

WE PROPOSE TO INVESTIGATE SEVERAL NEW CONFIGURATIONS OF OPTICAL FIBER SENSORS FOR THE DETERMINATION OF TEMPERATURE. WE EXPECT OUR NEW DESIGN TO HAVE A TEMPERATURE ACCURACY OF 0.01 DEG CELSIUS. THE PROPOSED SENSOR COULD BE USED TO MICROMETEOROLOGICAL MEASUREMENTS OF THE ATMOSPHERE. THIS SENSOR HAS AN ADVANTAGE OVER QUARTZ-CRYSTAL SENSORS, BECAUSE ALL POWER AND MEASUREMENT ELECTRONICS ARE REMOTELY LOCATED FROM THE SENSOR TIP. THE PROPOSED METHOD COMPLIES WITH THE REQUIRED GOAL BUT DOES NOT USE THE QUARTZ CRYSTAL METHOD. THE PROPOSED METHOD WILL HAVE ADDED BENEFIT TO DOD FOR OTHER TEMPERATURE SENSING APPLICATIONS.

TACAN CORP
2111 PALOMAR AIRPORT RD - STE 270
CARLSBAD, CA 92008
CONTRACT NUMBER: DAAA15-87-C-0049
JOHN BELL
TITLE:
FIBER OPTIC REDUNDANT COMMUNICATIONS LINK INTERFACE
TOPIC# 95 OFFICE: BRL

WE PROPOSE TO DESIGN THE INTERFACE BOARD LOGIC IN MODULAR FORM SO THAT IT CAN BE IMPLEMENTED IN APPLICATION SPECIFIC INTEGRATED CIRCUITS (ASIC'S). A HIGH DEGREE OF INTEGRATION IS NECESSARY TO FIT THE LOGIC OF THE HOST INTERFACE AND A MINIMUM OF EIGHT FIBER OPTIC TRANSCEIVERS ON A SINGLE CIRCUIT BOARD. IN ORDER TO MINIMIZE THE DESIGN TIME OF THE INTEGRATED CIRCUITRY THE LOGIC WILL BE PARTITIONED INTO AS MANY SMALL CIRCUIT MODULES AS PRACTICAL, WHICH WILL BE COMBINED INTO HYBRID PACKAGES TO ACHIEVE THE NECESSARY PACKING DENSITY. ALL THE FUNCTIONS OF OPTICAL SIGNAL LAUNCHING AND DETECTION, RECEIVED SIGNAL PHASE LOCKED SPEED MATCHING, CLOCK AND DATA SEPARATION, WORD FRAMING, AND RECEIVED DATA SYNCHRONIZATION TO LOCAL CLOCK FOR EACH LINK CAN BE IMPLEMENTED IN INDIVIDUAL ANALOG AND DIGITAL INTEGRATED CIRCUITS OF MODEST DENSITY AND COMBINED INTO A SINGLE FUNCTIONAL HARDWARE MODULE ON A HYBRID SUBSTRATE.

TACAN CORP
2111 PALOMAR AIRPORT RD - STE 270
CARLSBAD, CA 92008
CONTRACT NUMBER: DAAB07-87-C-F082
MICAHEL M SALOUR
TITLE:
LASER-DIODE-PUMPED VISIBLE SOLID-STATE LASER
TOPIC# 312 OFFICE: NV

SUBMITTED BY

WE PROPOSE HERE TO INVESTIGATE A NEW METHOD OF GENERATING TUNABLE, VISIBLE COHERENT RADIATION. SUCH LASERS CAN BE PUMPED BY SEMICONDUCTOR DIODE LASER ARRAYS, Q-SWIRCHED FOR HIGH PEAK POWER WITH A SMALL ACOUSTO-OPTIC MODULATOR, AND TUNABLE WITH INTERCAVITY BIREFRINGENT FILTER. VISIBLE OUTPUT MAY BE ACHIEVED BY FREQUENCY DOUBLING THE RESULTING OUTPUT.

TACAN CORP
2111 PALOMAR AIRPORT RD - STE 270
CALSBAD, CA 92008
CONTRACT NUMBER: DAAB07-87-C-F070
DR MICHAEL M SALOUR
TITLE:
TUNABLE SEMICONDUCTOR MID INFRARED LASERS
TOPIC# 314 OFFICE: NV

WE PROPOSE TO INVESTIGATE THE POTENTIAL OF USING OPTICALLY PUMPED SEMICONDUCTOR AND SEMICONDUCTOR ARRAYS AS GAIN MEDIA FOR LASERS. WE WILL ALSO EXPLORE MULTIPLE QUANTUM WELL INFRARED LEAD SALT SUPERLATTICES FOR INFRARED LASER OPERATION AT ROOM TEMPERATURE. WE WILL USE A SEMICONDUCTOR ALGaAs DIODE ARRAY AS A PUMP FOR THE EXTERNAL CAVITY, OPTICALLY PUMPED SEMICONDUCTOR LASER. OUR ULTIMATE GOAL IS TO DEMONSTRATE A HIGHLY EFFICIENT (OVERALL EFFICIENCY >2%) LASER SYSTEM WITH LONG LIFETIME THAT IS SUITABLE FOR SPACE COMMUNICATIONS. A METHOD OF PHASE LOCKING SEVERAL OPTICALLY PUMPED SLAVE OSCILLATORS IS GIVEN. EITHER PULSED OR CONTINUOUS OPERATION IS POSSIBLE.

TAU CORP
485 ALBERTO WY - BLDG D
LOS GATOS, CA 95030
CONTRACT NUMBER: DAAD05-87-C-0165
G JEFFREY GEIER
TITLE:
APPLICATIONS OF GPS TO GROUND TARGET CONTROL
TOPIC# 225 OFFICE: TECOM

THE USE OF NAVIGATION INFORMATION FROM THE GLOBAL POSITIONING SYSTEM, PERHAPS IN COMBINATION WITH INERTIAL SENSORS, OFFERS THE POSSIBILITY

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OF VERY HIGH ACCURACY NAVIGATION SOLUTIONS. THIS EFFORT WILL EXAMINE SEVERAL CANDIDATE NAVIGATION SYSTEMS, ALL INVOLVING GPS, TO DETERMINE IF SUCH SYSTEMS COULD BE UTILIZED FOR EITHER MANUAL OR REMOTE CONTROL OF TARGET VEHICLES. A REQUIREMENT OF ROUGHLY TWO METERS FOR POSITION REPEATABILITY HAS BEEN ESTABLISHED. TAU WILL MAKE USE OF AN EXISTING GROUND VEHICLE NAVIGATION SIMULATION IN EVALUATING THE CANDIDATE SYSTEMS; THIS SIMULATION INCLUDES REALISTIC VEHICLE AND TERRAIN MODELS, AND ERROR MODELS FOR GPS, AND OTHER POSSIBLE VEHICLE SENSORS, INCLUDING AN ODOMETER, FULL TWO DIMENSIONAL INERTIAL SYSTEMS, AND INCLINOMETERS. IN ADDITION TO ACCURACY, NAVIGATION SENSOR COST, WEIGHT, SIZE AND COMMERCIAL AVAILABILITY WILL BE CONSIDERED. THE FEASIBILITY/PRACTICALITY OF USING THE PROPOSED NAVIGATION SYSTEM FOR GROUND TARGET CONTROL WILL BE EVALUATING BY ADDRESSING ONBOARD COMPUTER REQUIREMENTS, THE MAXIMUM NUMBER OF VEHICLES WHICH COULD BE CONTROLLED, THE REQUIRED CONTROL RATES, AND THE COMMUNICATION/DATA LINK REQUIREMENTS, ESPECIALLY FOR TELEOPERATED VEHICLES.

TAYLOR S R & ASSOCS
310 S CHICKASAW
BARTLESVILLE, OK 74003
CONTRACT NUMBER: DAAE07-87-C-8065
DR SCOTT R TAYLOR
TITLE:
BARRIERLESS ULTRASONIC AIR CLEANER
TOPIC# 171 OFFICE: TACOM

MILITARY VEHICLE AIR CLEANER SYSTEM PERFORMANCE CAN BE EVALUATED IN SEVERAL WAYS, HOWEVER, ONE OF THE MOST IMPORTANT PERFORMANCE CONSIDERATIONS IS SERVICE LIFE. TODAY, AIR CLEANERS REQUIRE FREQUENT SERVICING IN DUSTY CONDITIONS AND POSE A CONTAMINATION RISK FACTOR TO MEDIA MATERIAL AND MAINTENANCE PERSONNEL DURING CLEANING IN AN NBC ENVIRONMENT. IN FACT, IT IS THIS PARAMETER THAT HAS LED TO THE USE OF THE STAGE SYSTEMS INCORPORATING INERTIAL PRECLEANERS. THE OBJECTIVE OF THE PROPOSED PROJECT IS TO DEMONSTRATE THE FEASIBILITY OF USING AN ULTRASONIC STANDING WAVE FIELD TO CAUSE COALESCENCE OF DUST PRIOR TO SEPARATION IN DEVICES SUCH AS PRECLEANERS, THUS, LEADING TO SUFFICIENT INCREASES IN SEPARATOR EFFICIENCY WHILE DECREASING THE PENALTIES ASSOCIATED WITH INCREASED INITIAL PRESSURE DROPS SO AS TO OBVIATE THE NEED FOR ANY FILTER. PHASE I WILL EVALUATE THE FEASIBILITY OF

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THIS APPROACH THROUGH PARAMETRIC STUDIES FORMULATED TO PROVIDE PERFORMANCE PREDICTIONS ON THE COMBINED SYSTEMS.

TECH-U-FIT CORP
400 MADISON ST - STE #210
ALEXANDRIA, VA 22314
CONTRACT NUMBER: DAAD09-87-C-0037
DR JOHN A MOLINO
TITLE:
TESTING THE FEASIBILITY OF A TELEOPERATED ROBOT FOR FA
REACTOR MAINTENANCE
TOPIC# 202 OFFICE: TECOM

REMOTE ROBOT DEVICES WITH SUPERVISORY HUMAN CONTROL, TELEOPERATORS AND SERVOMANIPULATORS, SHOW GREAT POTENTIAL FOR PERFORMING MAINTENANCE TASKS IN HAZARDOUS ENVIRONMENTS. THE PRESENT STUDY IS DESIGNED TO TEST THE FEASIBILITY OF USING A TELEOPERATED ROBOT TO SERVICE AND MAINTAIN A FAST BURST NUCLEAR REACTOR. SUCH A ROBOT HAS THE POTENTIAL TO SHARPLY REDUCE HUMAN EXPOSURE TO DANGEROUS RADIATION. CONCEPT FEASIBILITY WILL BE TESTED BY SIMULATING CRITICAL MAINTENANCE TASKS ON AN EXPERIMENTAL WORKBOARD CONTAINING ACTUAL NUCLEAR EQUIPMENT COMPONENTS FROM A FAST BURST NUCLEAR REACTOR. A SAMSIN TELEROBOT SERVO-MANIPULATOR WILL BE EMPLOYED TO REMOTELY EXECUTE THESE SIMULATED MAINTENANCE TASKS ON THE EXPERIMENTAL WORKBOARD. NOVICE OPERATORS WILL BE TRAINED TO ACCOMPLISH THESE TASKS WITH THE ROBOT. THEIR LEARNING AND PERFORMANCE WILL BE CAREFULLY MONITORED AND DOCUMENTED. SINCE THE SAMSIN TELEROBOT IS CAPABLE OF VARYING THE AMOUNT OF REFLECTED-FORCE FEEDBACK GIVEN TO THE OPERATORS, THIS PARAMETER WILL BE STUDIED TO DETERMINE OPTIMAL RANGES. IF THE NOVICE OPERATORS CAN BE SUCCESSFULLY TRAINED TO REMOTELY PERFORM THE SIMULATED MAINTENANCE TASKS BY MEANS OF SAMSIN, THEN THE FEASIBILITY OF THE TOTAL SYSTEM, BOTH MACHINE AND PEOPLE, WILL HAVE BEEN DEMONSTRATED.

TECHNICAL SOLUTIONS INC
PO BOX 1148
MESILLA PARK, NM 88047
CONTRACT NUMBER:
DR ALTON L GILBERT
TITLE:
SIMULATION/MODELING OF ROBOTIC VEHICLES ON THE BATTLEF
TOPIC# 330 OFFICE: TPM

AD-A195 727

DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM
(SBR) VOLUME 1 ARMY ABSTRACTS OF PHASE 1 AWARDS 1967
(U) DEPARTMENT OF DEFENSE WASHINGTON DC APR 88

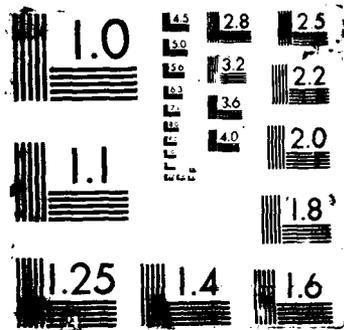
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THE RECENT TECHNOLOGICAL ADVANCES IN COMPUTER SYSTEMS, PRIMARILY THOSE RELATED TO INTEGRATED CIRCUITS, HAVE RESULTED IN MOVING THE ROBOTIC SYSTEM FROM THE CONCEPTUAL DRAWING BOARD TO A FEASIBLE SYSTEM WITH SEVERAL PROTOTYPES, SUCH AS THE DARPA AUTOMATED LAND VEHICLE (ALV), CURRENTLY UNDER DEVELOPMENT. AS THESE PROJECTS MOVE FORWARD REMAINING ENGINEERING PROBLEMS ARE BEING SOLVED, AND, IN ALL PROBABILITY, CURRENT AND EMERGING TECHNOLOGY WILL RESULT IN A FULLY DEMONSTRATED SYSTEM IN THE EARLY OR LATE 1990s. WITH THE EXCEPTION OF VERY DETAILED ENGINEERING LEVEL COMPUTER MODELS IN DEVELOPMENT BY CONTRACTORS SUPPORTING THE ROBOTIC PROGRAM, THERE IS ONLY ONE FUNDED SIMULATION EFFORT (SIMNET) WITH POTENTIAL FOR EXAMINING THE OVERALL SYSTEMS EFFECTIVENESS OF EMERGING ROBOTIC SYSTEMS. AND, THE SIMNET PROGRAM AS NOW DEFINED WILL NOT PROVIDE A LOW COST SIMULATION METHODOLOGY TO ADDRESS ROBOTIC ISSUES EARLY IN RESEARCH STAGE. FURTHERMORE, NONE OF THE EXISTING FAMILY OF ARMY COMBAT MODELS USED BY THE MAJOR ARMY SYSTEMS ANALYSIS ACTIVITIES OR THE AMC LABORATORIES HAVE THE FUNDAMENTAL MODEL ARCHITECTURES TO ADEQUATELY ADDRESS ROBOTIC SYSTEMS AT THE LEVEL OF RESOLUTION REQUIRED. AND, IT IS DOUBTFUL THAT THESE ACTIVITIES WILL SHOW AN EARLY INTEREST IN ADAPTING THEIR CURRENT MODELS TO INCORPORATE ROBOTICS UNTIL DEMONSTRATABLE SYSTEMS ARE AVAILABLE.

TECHNICAL SOLUTIONS INC
PO BOX 1148
MESILLA PARK, NM 88047
CONTRACT NUMBER: DAAA21-87-0112
DR ALTON L GILBERT
TITLE:
OPEN SYSTEMS INTEGRATION OF INTELLIGENT SUBSYSTEMS
TOPIC# 1 OFFICE: ARDC

A REQUIREMENT EXISTS TO INTEGRATE THE RESULTS OF A HIGH-LEVEL FUNCTIONAL EMULATION OF FINITE STATE MACHINES AND VARIOUS INTELLIGENT SUBSYSTEMS INTO MULTIPLE CO-OPERATING PHYSICAL SUBSYSTEMS THAT PRESERVE THE FUNCTION OF THE EMULATION, INTEGRATE STAND-ALONE COMPONENTS, AND PERFORM THE TASKS ASSOCIATED WITH THE INTELLIGENT WEAPONS PLATFORM AUTOMATION (IWPA) PROGRAM OF ARDEC. IN THIS PROPOSAL DEVELOPMENT OF A SYSTEMATIC METHODOLOGY FOR REDUCTION OF COMPONENT SUBSYSTEMS INTO CO-OPERATING SUBSYSTEMS OF AN INTELLIGENT OPEN SYSTEMS ARCHITECTURE

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TURE IS PROPOSED. THIS REDUCTION WILL PRESERVE THE FUNCTIONAL INTEGRITY, INPUT AND OUTPUT RELATIONSHIPS, TIMING, CONTROL LAWS, AND STATE TRANSITION DEFINITIONS OF THE INDIVIDUAL SUBSYSTEMS AND RESULT IN A SPECIFICATION FOR THE INTERFACES AND HARDWARE COMPONENTS OF THE INTELLIGENT SYSTEM, THE STANDARDS FOR THE EMBEDDED SOFTWARE, AND THE MESSAGE-PASSING MECHANISMS REQUIRED TO INTERFACE THE COMPONENT SUBSYSTEMS INTO THE OVERALL SYSTEM. WITHIN THE CONTEXT OF THE IWPA PROJECT, THE CHOSEN ARCHITECTURE MUST SUPPORT THE EMULATED FINITE STATE MACHINES DEVELOPED UNDER THE HIERARCHICAL CONTROL EMULATION SOFTWARE AND REDUCED TO C CODE.

TECHNICAL SOLUTIONS INC
PO BOX 1148
MESILLA PARK, NM 88047
CONTRACT NUMBER: DAAD05-87-C-0030
DR ALTON L GILBERT
TITLE:
TARGET AREA MONITORING SYSTEM
TOPIC# 233 OFFICE: TECOM

AN IMPORTANT REQUIREMENT EXISTS FOR A SYSTEM TO TRACK MULTIPLE SMALL AIRBORNE OBJECTS OVER AN ARRAY OF GROUND VEHICLES. THIS SYSTEM MUST BE ABLE TO LOCATE AND MONITOR BOTH THE AIRBORNE OBJECTS AND THE GROUND VEHICLES. IT IS DESIRED THAT THE AIRBORNE OBJECTS REQUIRE NO MODIFICATIONS TO BE TRACKED. THE SYSTEM SHOULD OPERATE IN DUST, RAIN, SNOW AND FOG. OF PARTICULAR IMPORTANCE IS THE ACCURATE MEASUREMENT OF THE RELATIVE SEPARATION OF THE SUBMUNITIONS AFTER EJECTION FROM THE CARRIER. IT IS PROPOSED THAT AN ADVANCED INTERFEROMETRIC MEASUREMENT (AIM) METHODOLOGY BE USED TO DEVELOP A SYSTEM TO TRACK THE SMALL OBJECTS BY THEIR BACKSCATTER FROM A POWERFUL ILLUMINATOR. THE GROUND VEHICLES WILL BE EQUIPPED WITH BEACONS TO ALLOW TRACKING THEM WITH THE SAME SYSTEM. THE MAJOR DEFICIENCY IN CURRENT SYSTEMS USED FOR THIS IS THEIR INABILITY TO COPE WITH MANY DIFFERENT OBJECTS SIMULTANEOUSLY. THE SYSTEM PROPOSED USES POST FLIGHT PROCESSING WITH THE ABILITY TO ACCURATELY DESCRIBE THE LOCATION AND VELOCITIES OF MULTIPLE OBJECTS. GROUND TARGETS AND A SINGLE LARGE (CROSS SECTION) AIRBORNE TARGET CAN BE TRACKED IN REAL-TIME.

TECHNICAL SOLUTIONS INC
PO BOX 1148
MOSILLA PARK, NM 88047
CONTRACT NUMBER: DAAD09-87-C-0042
DR ALTON L GILBERT
TITLE:
REAL-TIME IMAGE PRE-PROCESSOR
TOPIC# 201 OFFICE: TECOM

SUBMITTED BY

IN REAL-TIME TRACKING AND POST-FLIGHT VIDEOTAPE DATA EXTRACTION APPLICATIONS AN IMPORTANT REQUIREMENT EXISTS FOR RECONSTRUCTING AND ENHANCING IMAGES IN REAL-TIME (60-FIELDS PER SECOND). VARIOUS FILTERING TECHNIQUES MUST BE APPLIED TO THE IMAGES FOR NOISE REMOVAL, EDGE ENHANCEMENT OR OTHER "ORE-PROCESSOR" FUNCTIONS. THESE RECONSTRUCTED AND ENHANCED IMAGES WILL BE USED BY AN AUTOMATIC TRACKING SYSTEM EMPLOYED FOR MISSILE TEST RANGE INSTRUMENTATION. IT IS PROPOSED THAT AN ENTIRELY NEW PRE-PROCESSOR DESIGN BE INVESTIGATED, BASED UPON THE USE OF ARRAYS OF CUSTOM INTEGRATED CIRCUITS TO PROCESS THE IMAGE AND A DEDICATED SPECIAL-PURPOSE PARALLEL PROCESSING ARCHITECTURE. THIS DESIGN CAN PROVIDE RECONSTRUCTION BY MEDIAN FILTERING AS WELL AS ANY DESIRED CONVOLUTION OPERATION (SUCH AS EDGE ENHANCEMENT OR SEGMENTATION), IN REAL TIME. BY DESIGNING IN THIS FLEXIBILITY FROM THE BEGINNING, ANY NEW ALGORITHMS DEVELOPED CAN BE IMMEDIATELY IMPLEMENTED WITHOUT ANY HARDWARE CHANGES REQUIRED. CURRENT PRE-PROCESSORS THAT CAN DO IMAGE ENHANCEMENT OPERATIONS AT 60 FIELDS PER SECOND ARE BASED UPON SOFTWARE ALGORITHM IMPLEMENTATIONS AND ARE ABLE TO DO ONLY A SMALL SUBSET OF THE VARIOUS TYPES OF FILTERING THAT MIGHT BE DESIRED AT HIGH SPEEDS.

TECHNOLOGY APPLICATIONS INC
6621 SOUTHPOINT DR N - STE 310
JACKSONVILLE, FL 32216
CONTRACT NUMBER: DAAK70-87-C-0058
ROBERT A TOUCHTON
TITLE:
INTELLIGENT LOAD MANAGER
TOPIC# 144 OFFICE: BRDC-PVD

TECHNOLOGY APPLICATIONS, INC. (TAI) PROPOSES TO DEVELOP AN ARTIFICIALLY INTELLIGENT LOAD MANAGEMENT AND POWER DISTRIBUTION SYSTEM PROTOTYPE, REFERED TO AS THE LOADMAN DEMONSTRATION PROTOTYPE. PHASE I OF THE PROPOSED EFFORT INVOLVES THE DEVELOPMENT OF A DEMONSTRATION PROTOTYPE AND PHASE II IS TARGETED FOR THE DEVELOPMENT OF A FULL-SCALE PROTOTYPE OF THE SYSTEM FOR ULTIMATE USE IN CONJUNCTION WITH TACTICAL MILITARY SYSTEM IN THE FIELD. THE SYSTEM WILL HANDLE DYNAMIC RECONFIGURATION OF RESOURCE REQUIREMENTS AND AVAILABILITY. CONTINUOUS MONITORING OF POWER AVAILABILITY AND LOAD DEMANDS WILL BE USED TO SCHEDULE THE LOADS DURING NORMAL SITUATIONS, WHILE ALSO PER-

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FORMING PEAK REDUCTION AND RECOGNIZING DEGRADED OR POTENTIALLY DEGRADING CIRCUMSTANCES. WHILE CONTENDING WITH THE SPECIFIC CONSTRAINTS AND PARAMETERS OF THE TACTICAL MILITARY DISTRIBUTION SYSTEM, THE ANALYSIS AND INVESTIGATION WILL REVEAL SOLUTIONS TO A BROADER CLASS OF SCHEDULING PROBLEMS. TAI WILL ALSO BUILD UPON PREVIOUS RESEARCH PERFORMED BY TAI IN THE AREA OF DYNAMIC LOAD SCHEDULING DEVELOPMENT DURING CONSTRUCTION OF THE SPACE STATION EXPERIMENT SCHEDULER (SSES) EXPERT SYSTEM PROTOTYPE FOR NASA.

TECHNOLOGY INTERNATIONAL INC
429 W AIRLINE HWY - STE C
LaPLACE, LA 70068
CONTRACT NUMBER: DAAE07-87-C-8060
RICHARD JARKA
TITLE:
DEVELOPMENT OF REQUIREMENTS FOR ADVANCED ROBOTIC LABOR
EQUIPMENT
TOPIC# 165 OFFICE: TACOM

A STRATEGY IS PLANNED FOR PRELIMINARY DETERMINATION OF ARMY ROBOTIC LABORATORY EQUIPMENT (ARLE). THE ARLE IS PLANNED FOR LABORATORY/FIELD TESTING TO DEMONSTRATE MILITARY POTENTIAL OF ADVANCED ROBOTIC VEHICLES AND TECHNOLOGY; AND FOR EVALUATION OF ROBOTIC CONCEPTS AND SYSTEMS. IN THE FINAL PHASE, GENERAL REQUIREMENTS WILL BE IDENTIFIED. THIS INCLUDES ROBOTIC SYSTEMS AND SUPPORT EQUIPMENT ENCOMPASSING AI EXPERT SYSTEMS, TRACKING, VOICE AND VISION CONTROLS, COMPUTER-AIDED PACKAGES, TERRAIN DISPLAYS, AND MONITORING SYSTEMS. THE EFFORT INVOLVES EXAMINATION OF NEEDS, AND ASSESSMENT OF THE STATE-OF-THE-ART TECHNOLOGY.

TOOMAY MATHIS & ASSOCS INC
PO BOX 3118
BOZEMAN, MT 59772
CONTRACT NUMBER: DAAD07-87-C-0083
J C STOVER
TITLE:
MODEL FOR PORT SCATTER FROM LASERS
TOPIC# 70 OFFICE: LABCOM/ASL

SUBMITTED BY

SCATTER FROM GROUND-BASED LASER PORTS (WEAPONS, COMMUNICATION SYSTEMS, RANGE FINDERS) CAN BE LARGE ENOUGH THAT THE LASER LOCATION MAY BE DETERMINED BY DETECTORS POSITIONED WELL AWAY FROM THE BEAM. PORT SCATTER CAN BE REDUCED, BUT NOT ELIMINATED, THROUGH THE USE OF BAFFLES TO LIMIT DIRECT VIEWING OF THE LASER OPTICS. THIS DOCUMENT PROPOSES DEVELOPING A METHOD TO PREDICT THE SCATTER SIGNAL FROM LASER PORTS GIVEN THE DESIGN OF THE OUTPUT OPTICS AND BAFFLES. THE METHOD INVOLVES COMBINING SCATTER DATA FROM KNOWN TYPES OF COMPONENTS (WINDOW, MIRRORS, LENSES, BAFFLES) WITH A RAY TRACING COMPUTER PROGRAM THAT WILL FOLLOW SCATTER PROPAGATION THROUGH AN OPTICAL SYSTEM. LIGHT THAT IS SCATTERED THREE OR MORE TIMES IS IGNORED. THE OBSERVER IS ASSUMED TO BE IN THE DIFFRACTION FAR FIELD AND THE DETECTOR APERTURE LARGE ENOUGH SO THAT INTERFERENCE EFFECTS CAN BE IGNORED. THE OBJECT OF PHASE I IS TO DEMONSTRATE FEASIBILITY BY CORRECTLY PREDICTING THE PORT SCATTER FROM A SIMPLE He-Ne LASER, BAFFLE COMBINATION.

TRANS-AMERICAN IMMUNOLOGY INC
30 FAYETTE ST
NORTH QUINCY, MA 02171
CONTRACT NUMBER: DAA15-87-C-0048
DRS C BLANCHARD/C TAYLOR
TITLE:
REGENERATION OF IMMUNOLOGICALLY ACTIVE SURFACES
TOPIC# 28 OFFICE: CRDC

THE OBJECTIVES OF THIS STUDY ARE TO INVESTIGATE THE BINDING AND ELUTION OF HUMAN, RABBIT, AND MOUSE IMMUNOGLOBULINS (IgG1, F(ab)2 AND Fab) TO SOLID SURFACES AND TO ANTIBODY. THE BINDING AND ELUTION OF ANTIBODY AND ANTIGEN WILL BE STUDIED ON MICROTITER PLATES AND IMMOBILON FILTERS. ELISA ASSAYS FOR HISTAMINE AND DFP WILL BE SET UP TO MEASURE ELUTION OF HAPTEN-ANTIBODY REACTIONS AND TO ASSAY DFP ELUTION FROM ACETYLCHOLINESTERASE. THE THEORETICAL POSSIBILITY OF USING AN ELISA HISTAMINE ASSAY COMBINED WITH SENSITIZED MAST CELLS AS A SYSTEM FOR DETECTION OF CW AND BW AGENTS WILL BE DETERMINED. ALSO THE USE DFP ANTIBODY TO DETECT DFP BOUND TO ACETYLCHOLINESTERASE AND ITS POSSIBLE USE IN DETECTION OF CW AGENTS WILL BE CONSIDERED.

TSI INC
PO BOX 64394
ST PAUL, MN 55164
CONTRACT NUMBER: DAAE07-87-C-8055
RICHARD J REMIARZ
TITLE:
DEVELOPMENT OF A DUST DETECTOR FOR VEHICLES
TOPIC# 159 OFFICE: TACOM

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 192
BY SERVICE
FISCAL YEAR 1987
ARMY

SUBMITTED BY

FAILURE OF AIR CLEANER SYSTEMS IS A MAJOR CAUSE OF ENGINE FAILURE. A NEED EXISTS FOR A DETECTOR TO INDICATE WHEN PARTICLES ARE ENTERING THE ENGINE. THE PROPOSED DETECTOR PROVIDES A LOW COST SOLUTION TO THE PROBLEM. THE PROPOSED PROJECT WILL CONSIST OF: 1) DESIGNING AND FABRICATING THE DETECTOR; 2) DEVELOPING AND FABRICATING THE SIGNAL PROCESSING ELECTRONICS; AND 3) EVALUATING THE DETECTOR. THE PROPOSED DESIGN WILL PROVIDE A SIMPLE WARNING TO THE OPERATOR, AND CAN ALSO SUPPLY MORE SOPHISTICATED DATA FOR PROGNOSTIC APPLICATIONS. THE PROPOSED PROJECT WILL PROVE THE FEASIBILITY OF THE DESIGN AND RESULT IN THE DELIVERY OF PROTOTYPE HARDWARE.

UNIVERSITY RADIOTHERAPY ASSOCS INC
529 S JACKSON ST
LOUISVILLE, KY 40202
CONTRACT NUMBER: DAMD17-87-C-7218
DR C P SIGDESTAD
TITLE:
DEVELOPMENT OF CHEMICAL PROTECTORS FOR NEUTRON IRRADIA
TOPIC# 280 OFFICE: MEDICAL

THE DEVELOPMENT OF AN EFFECTIVE CHEMOPROPHYLATIC PROGRAM TO PROTECT TROOPS FROM THE LETHAL EFFECTS OF IONIZING RADIATION IS OF EXTREME IMPORTANCE. DRUGS ARE AVAILABLE (ON AN EXPERIMENTAL BASIS) WHICH ARE QUITE EFFECTIVE AGAINST LOW LET RADIATIONS SUCH AS X-RAYS OR GAMMA-RAYS. ONLY RECENTLY HAVE A FEW AGENTS BEEN SHOWN TO PROTECT AGAINST THE MORE DAMAGING HIGH LET RADIATIONS SUCH AS FISSION SPECTRUM NEUTRONS. THIS STUDY WILL CONTINUE THESE INITIAL INVESTIGATIONS, TAKING THE NEXT STEPS IN A DRUG DEVELOPMENT PROGRAM. THE STUDY WILL TEST FOUR (4) DRUG (EACH AT THREE DOSES) FOR THEIR ABILITY TO PROTECT AGAINST THE WHOLE BODY AND CELLULAR EFFECTS OF FISSION NEUTRON IRRADIATION. THE ABILITY OF THE DRUGS TO MODIFY THE REPAIR OF SUB-LETHAL DAMAGE WILL ALSO BE TESTED. THE PROTECTOR RESPONSE USING THE 'BURST' MODE OF OPERATION OR MODIFYING THE NEUTRON TO GAMMA RATIO WITH VARIOUS MATERIALS WILL BE TESTED.

VANGUARD RESEARCH LABS INC
36 S CHESTER
PASADENA, CA 91106
CONTRACT NUMBER: DAMD17-87-C-7223
DONALD E ROUNDS
TITLE:
THE USE OF A ONE STEP IMMUNOASSAY FOR DETECTING INFECT
AGENTS
TOPIC# 332 OFFICE: MEDICAL

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1
BY SERVICE
FISCAL YEAR 1987
ARMY

PAGE 193

SUBMITTED BY

A RECENTLY DEVELOPED ONE STEP IMMUNOLOGICAL ASSAY SYSTEM IS BEING PROPOSED TO ADDRESS THE NEED FOR A RAPID METHOD FOR IDENTIFYING INFECTIOUS AGENTS THAT HAVE MILITARY IMPORTANCE. THE TEST SYSTEM CONSISTS OF A DIPSTICK AND A SEALED ENVELOPE CONTAINING LYOPHILIZED PRECOLORED REACTANTS. THE REACTANTS CONSIST OF MOLECULAR COMPLEXERS OF ANTIBODY MOLECULES WHICH ARE PREAMPLIFIED WITH COLORED AVIDIN/BIO-TIN RESIDUES. THE TEST IS PERFORMED BY THE ADDITION OF TWO DROPS OF THE TEST SOLUTION, TO SOLUBILIZE THE REACTANTS AND PERMIT INTERACTION FO THE ANTIBODIES WITH THE ANTIGEN MOLECULES, IF PRESENT. COLOR IS DEPOSITED ON THE MEMBRANE OF THE INSERTED DIPSTICK TO FORM EITHER A PLUS OR MINUS SIGN DURING AN INITIAL 15 MINUTE INCUBATION PERIOD, TO INDICATE THE PRESENCE OR ABSENCE OF THE ANTIGEN. THE TEST SYSTEM IS PORTABLE, ECONOMICAL, EASY TO USE AND SENSITIVE TO LESS THAN A NANO-GRAM OF ANTIGEN.

VERITAY TECHNOLOGY INC
PO BOX 305 - 4845 MILLERSPORT HWY
EAST AMHERST, NY 14051
CONTRACT NUMBER: DAA15-87-C-0046
EDWARD B FISHER
TITLE:
VERY HIGH BURNING RATE COMBUSTION AND FORMULATIONS RES
TOPIC# 83 OFFICE: BRL

VHBR (VERY HIGH BURN RATE) PROPELLANTS ARE RELATIVELY NEW FORMULA-TIONS THAT INCORPORATE HIVELITE, A BURN RATE MODIFIER MADE BY TELEDYNE McCORMICK SELPH. THIS CLASS OF PROPELLANT EXHIBITS APPARENT BURN RATE FROM ONE TO SEVERAL HUNDRED METERS PER SECOND, WHICH IS SUITABLE FOR TRAVELING CHARGE APPLICATIONS. WHILE RESEARCH CONDUCTED SINCE THE LATE 1970s HAS SUCCESSFULLY DEMONSTRATED THE HIGH COMBUS-TION RATE CHARACTERISTICS OF THIS PROPELLANT, IT HAS ALSO BEEN SHOWN THAT COMBUSTION MAY NOT OCCUR AS IT DOES IN CONVENTIONAL PROPELLANT WHERE LINEAR BURN RATE IS AN APPROPRIATE COMBUSTION DESCRIPTOR. CON-FUSING DATA FROM EARLY COMBUSTION EXPERIMENTS AND MORE RECENT RESULTS INDICATE THAT THE HIVELITE MAY BURN FIRST, LEAVING A POROUS MATRIX WHICH THEN DECONSOLIDATES AND BURNS RAPIDLY. THE OBJECTIVE OF THE PROPOSED EFFORT IS TO FORMULATE AND CONDUCT A RESEARCH PROGRAM TO INVESTIGATE VHBR PROPELLANT PHENOMENOLOGY. THE PROGRAM, CONSISTS OF INNOVATIVE DIAGNOSTIC TESTING, PHYSICAL PROPERTY EVALUATION, FORMULA-

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1
BY SERVICE
FISCAL YEAR 1987
ARMY

PAGE 194

SUBMITTED BY

TION WORK AND ANALYSIS AIMED AT DETERMINING VHBR PROPELLANT
COMBUSTION MECHANISMS, AND SUBSEQUENTLY FORMULATION AND DESIGN
CRITERIA FOR ADVANCED BALLISTIC APPLICATIONS.

VERITAY TECHNOLOGY INC
PO BOX 305 - 4845 MILLERSPORT HWY
EAST AMHERST, NY 14051
CONTRACT NUMBER: DAAA21-87-C-0129
GERALDA STERBUTZEL

TITLE:
ENCASEMENT OF STICK PROPELLANT FOR ARTILLERY CHARGES
TOPIC# 22 OFFICE: ARDC

BUILDING ON THE FOUNDATION OF MORE THAN TWO DECADES OF WORK IN
AMMUNITION DEVELOPMENT AND CHARGE DESIGN, VERITAY HAS RECENTLY DE-
VELOPED SEVERAL NEW TECHNIQUES FOR PRODUCING CONSOLIDATED CHARGES IN
THE SMALL-ARMS PROPELLANT REGIME. THESE TECHNIQUES INCLUDE SOLVENT-
LESS THERMAL TECHNIQUES, A SOLVENT VAPOR TECHNIQUE, AND A PRESSURE-
ALONE TECHNIQUE. OF MAJOR CONCERN IN ALL OF OUR WORK WITH CONSOLI-
DATED CHARGES HAS BEEN THE DEVELOPMENT OF TECHNIQUES TO ENSURE PRO-
TECTION FROM ADVERSE ENVIRONMENTAL EFFECTS AND/OR ROUGH HANDLING.
THE OBJECTIVE OF THE PROPOSED EFFORT IS TO DEMONSTRATE THE FEASIBILITY
OF ADAPTING ONE OR MORE OF THESE TECHNIQUES TO THE MASS PRODUCTION OF
CONSOLIDATED CHARGES IN THE LARGE-CALIBER REGIME. NOT ONLY DO LARGE-
CALIBER CONSOLIDATED CHARGES OFFER THE POTENTIAL FOR IMPROVED BAL-
LISTICS PERFORMANCE, BUT THEY ALSO HOLD THE POTENTIAL FOR SIGNIFI-
CANT REDUCTIONS IN AMMUNITION COSTS.

VIGYAN RESEARCH ASSOCS INC
30 RESEARCH DR
HAMPTON, VA 23666
CONTRACT NUMBER: DAAA21-87-C-0191
SANDEEP GUPTA

TITLE:
DEVELOPMENT OF A DYNAMIC CONTROLLER FOR ROBOT ARMS BAS
SYMBOLIC POLYNOMIAL TECHNIQUE
TOPIC# 6 OFFICE: ARDC

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DEVELOPMENT OF DYNAMIC CONTROLLERS FOR REAL TIME CONTROL OF ROBOT ARMS HAS BEEN DIFFICULT BECAUSE OF THE LARGE AMOUNT OF COMPUTATIONS REQUIRED FOR THE IMPLEMENTATION OF SUCH ALGORITHMS. A COMBINATION OF THE NUMERICAL AND SYMBOLIC MANIPULATIONS IS USED BY THE SYMBOLIC POLYNOMIAL TECHNIQUE TO SIMPLIFY THE DYNAMIC EQUATIONS FOR ROBOT ARMS IN AN OFF-LINE STAGE. COMPUTATIONAL SAVINGS ARE ACHIEVED BY AVOIDING REPETITION OF MATHEMATICAL OPERATIONS ON THE CONSTANT PARAMETERS OF A ROBOT ARM WITH OFF-LINE PROCESSING OF THE DYNAMIC MODEL OF THE ROBOT ARM. THE RESULTING POLYNOMIALS FOR ROBOT ARM DYNAMICS CAN BE EVALUATED INDEPENDENTLY DURING REAL TIME CONTROL BY SIMULTANEOUS COMPUTATIONS IN A PARALLEL CONFIGURATION. DETAILED ANALYSIS AND DESIGN OF A POSITION AND VELOCITY FEEDBACK CONTROL ALGORITHM USING THE DYNAMIC MATRICES GENERATED BY SYMBOLIC POLYNOMIAL EVALUATIONS, WILL BE PERFORMED IN THIS PROJECT. THE CONSTRUCTION OF SUCH DYNAMIC CONTROLLER WILL BE PURSUED IN THE LATER PHASES OF THIS PROJECT. THE PERFORMANCE OF THIS CONTROLLER WOULD BE AN APPRECIABLE IMPROVEMENT OVER THE CURRENTLY USED CONTROLLERS AS IT WOULD ACCOUNT FOR DYNAMIC INTERACTIONS AMONG DIFFERENT JOINTS OF THE ROBOT ARM.

VISTA RESEARCH CORP
3826 SNEAD DR
SIERRA VISTA, AZ 85635
CONTRACT NUMBER: DAAB07-87-C-P057
DR J G CALDWELL
TITLE:
RESEARCH IN ARTIFICIAL INTELLIGENCE FOR NON-COMMUNICAT
ELECTRONIC WARFARE SYSTEMS
TOPIC# 291 OFFICE: EW

THIS PROPOSAL PROPOSES TO INVESTIGATE THE FEASIBILITY OF DEVELOPING A RAPID DEPLOYMENT CAPABILITY FOR TACTICAL COMBAT MODELS. THE CAPABILITY IS NECESSARY TO SUPPORT SAMPLING OF ALTERNATIVE SIMULATED TACTICAL DEPLOYMENTS (STDs), WHICH IS PRESENTLY NOT FEASIBLE TO DO ON A SCALE AND LEVEL OF DETAIL REQUIRED BY EXISTING LARGE-SCALE (THEATER LEVEL OR CORPS LEVEL) TACTICAL COMBAT MODELS. WITHOUT THIS CAPABILITY, THE METHODOLOGICAL FOUNDATION OF USING PRESENT-DAY TACTICAL COMBAT MODELS AS A BASIS FOR TEST AND EVALUATION OF WEAPON SYSTEMS AND EQUIPMENT CENTERS ON THE USE OF A SINGLE STD, AND IS EXTREMELY WEAK. THE AVAILABILITY OF A RAPID DEPLOYMENT CAPABILITY

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 196
BY SERVICE
FISCAL YEAR 1987
ARMY

SUBMITTED BY

WILL ENABLE THE USE OF SAMPLES OF STDs IN TEST AND EVALUATION, AND WILL RADICALLY BROADEN THE SCOPE OF INFERENCE OF TACTICAL-COMBAT-MODEL-BASED ANALYSES, AND JUSTIFY THEIR USE AS A BASIS FOR EVALUATION OF THE COMBAT EFFECTIVENESS OF MILITARY SYSTEMS AND EQUIPMENT.

VMS CONSULTING ENGINEERS
255 HEWLETT NECK RD
WOODMERE, NY 11598
CONTRACT NUMBER: DAAL02-87-C-0116
VICTOR M SERBY
TITLE:
AN ORDNANCE FUZE POWER SOURCE ASSEMBLED FROM COMMERCIA
AVAILABLE BATTERIES
TOPIC# 59 OFFICE: HDL

TWO METHODS FOR ASSEMBLING COMMERCIAALLY AVAILABLE BATTERIES INTO PACKAGES ARE PROPOSED. THESE PACKAGES ARE DESIGNED TO WITHSTAND AND PROTECT THE BATTERIES UNDER HIGH G SETBACK AND SPIN ACCELERATIONS. IN ADDITION, THE BATTERY PACKAGES ARE PRODUCEABLE BY HIGH VOLUME MANUFACTURING TECHNIQUES AT LOW COST.

VRA INC (OLD: FLOW ANALYSIS INC)
9208 RIDGE BLVD
BROOKLYN, NY 11209
CONTRACT NUMBER:
JOHN STEINHOFF
TITLE:
FINITE DIFFERENCE FLOW CALCULATIONS FOR HELICOPTER ROT
CONFIGURATIONS
TOPIC# 115 OFFICE: ARO

THE DEVELOPMENT OF A COMPUTER CODE TO SOLVE FOR THE FLOW OVER A HELICOPTER ROTOR/FUSELAGE CONFIGURATION IS PROPOSED. A MODULAR APPROACH IS TO BE USED WHERE TWO EXISTING FINITE DIFFERENCE CODES, ONE FOR THE ROTOR, THE OTHER FOR THE FUSELAGE ARE MATED. THE INDIVIDUAL MODULES HAVE BEEN PREVIOUSLY DEVELOPED BY THE INVESTIGATORS. THE ROTOR MODULE INVOLVES A BLADE-FIXED COORDINATE SYSTEM. IT HAS BEEN SUCCESSFULLY VALIDATED BY COMPARISON WITH EXPERIMENT FOR TWO ND

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FOUR BLADE ROTORS AND SUBSONIC AND TRANSONIC CASES. THE FUSELAGE MODULE, INCLUDING A GRID GENERATION CODE, HAS BEEN USED TO SOLVE FOR THE FLOW OVER COMPLEX AIRCRAFT CONFIGURATIONS. THE MATING PROCEDURE INVOLVES A UNIQUE "SLIDING INTERFACE" THAT ALLOWS THE GRID USED IN EACH MODULE TO SLIDE PAST THE OTHER GRID ALONG A COMMON INTERFACE AS THE ROTOR ROTATES WITH RESPECT TO THE FUSELAGE, AND YET ENABLES FLOW VARIABLES TO BE TRANSFERRED ACROSS THE INTERFACE WITHOUT REQUIRING INTERPOLATION. THE MODULAR APPROACH PROPOSED WILL ALLOW THE EXISTING CODES PREVIOUSLY DEVELOPED TO BE USED WITH STRAIGHTFORWARD MODIFICATIONS, WITH REQUIRING THE DEVELOPMENT WORK TO BE REPEATED. A SUCCESSFUL FINITE DIFFERENCE CODE FOR THE ROTOR/FUSELAGE PROBLEM WILL BE SUPERIOR COMPARED TO INTEGRAL METHODS WITH RESPECT TO THE TREATMENT OF COMPRESSIBILITY, ACCURACY, AND, IN THE FUTURE, THE INCLUSION OF TURBULENT TRANSPORT TERMS.

WALLACE TECHNICAL CERAMICS INC
1036 HIGHLAND DR
DEL MAR, CA 92014
CONTRACT NUMBER: DAAL02-87-C-0057
CLARENCE L WALLACE

TITLE:

HIGH EFFICIENCY LOW COST CERAMIC ENERGY STORAGE CAPACITORS
TOPIC# 62 OFFICE: HDL

THE DEVELOPMENT OF A NEW GENERATION OF CERAMIC CAPACITOR ENERGY STORAGE CELL IS PROPOSED HAVING THE UNIQUE CHARACTERISTICS OF LOW COST AND HIGH EFFICIENCY (LOW ESR). THESE LARGE CERAMIC DEVICES CURRENTLY REQUIRE PRECIOUS METAL ELECTRODES AND CONSEQUENTLY ARE TOO EXPENSIVE FOR MOST USES. THE COST REDUCTION WILL BE ACHIEVED THROUGH THE ELIMINATION OF THE USUAL PRECIOUS METAL ELECTRODES. THIS IS MADE POSSIBLE BY A SPECIAL MANUFACTURING PROCESS IN WHICH THE ELECTRODE MATERIAL SUBLIMATES WHEN THE CERAMIC IS FIRED. THE ELECTRODES ARE FORMED WHEN THE VOIDS LEFT IN THE FIRED CERAMIC ARE FILLED WITH A LOW COST ALLOY SUCH AS TIN/LEAD. A CENTRIFUGAL PROCESS DEVELOPED BY THE PRINCIPAL INVESTIGATOR IS USED TO DEPOSIT THE ELECTRODES. ELIMINATION OF METAL COST CONSTRAINTS ALLOWS A THICKER ELECTRODE WHICH REDUCES THE RESISTANCE AND SO ALLOWS A MORE RAPID DISCHARGE AND HIGHER PEAK CURRENTS. ELIMINATING THE FIRING TEMP. RESTRAINTS CAUSED BY CO-FIRED ELECTRODE METALS ALLOWS THE USE OF HIGH FIRING

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1 PAGE 198
BY SERVICE
FISCAL YEAR 1987
ARMY

SUBMITTED BY

CERAMICS WHICH ARE STRONGER AND CAN THUS WITHSTAND HIGHER SHOCKS.

WELDING CONSULTANTS INC
889 N 22ND ST
COLUMBUS, OH 43219
CONTRACT NUMBER: DAAL04-87-C-0056
R L HOLDREN
TITLE:
EFFECT OF WELD DISCONTINUITIES ON THE MECHANICAL PROPE
ARMOR
TOPIC# 114 OFFICE: MTL

WELDED JOINTS INVARIABLY CONTAIN IMPERFECTIONS OR DISCONTINUITIES. AS NONDESTRUCTIVE EVALUATION TECHNIQUES IMPROVE MORE OF THESE DISCONTINUITIES ARE DETECTED. IF ARBITRARY ACCEPTANCE CRITERIA FOR WELD DISCONTINUITIES ARE ADOPTED, UNNECESSARY WELD REPAIRS WILL BE REQUIRED. THIS WILL LEAD TO SIGNIFICANT INCREASES IN FABRICATION COSTS, DELAYS IN PRODUCTION AND TO AN OVERALL REDUCTION IN QUALITY SINCE WELD REPAIRS GENERALLY HAVE AN INFERIOR QUALITY TO ORIGINAL WELDS. UNNECESSARY REPAIRS CAN BE AVOIDED BY ADOPTING A MORE RATIONAL APPROACH TO SETTING ACCEPTANCE CRITERIA FOR WELD DISCONTINUITIES. THESE CRITERIA, FREQUENTLY BASED ON FRACTURE MECHANICS ASSESSMENTS, TAKE INTO CONSIDERATION THE GEOMETRY, THE IMPOSED LOADING DURING SERVICE, POTENTIAL FAILURE MODES AND THE SERVICE ENVIRONMENT. THE PROPOSED PROGRAM ADDRESSES INCOMPLETE JOINT PENETRATION, ONE FORM OF WELD DISCONTINUITY WHICH IS FREQUENTLY ENCOUNTERED DURING FABRICATION. THE RESULTS WILL BE COMPARED WITH THE PERFORMANCE OF COMPLETE PENETRATION JOINTS AND WILL BE USED AS A BASIS FOR SETTING ACCEPTANCE CRITERIA FOR THIS TYPE OF DISCONTINUITY. THE PROPOSED MATERIAL IS 5083-H131 ALUMINUM. THE RESULTS OBTAINED SHOULD BE APPLICABLE TO OTHER MATERIALS. HOWEVER, ALTERNATIVE MATERIALS CAN BE SUBSTITUTED IF THESE ARE CONSIDERED MORE APPROPRIATE.

XON-TECH INC
6862 HAYVENHURST AVE
VAN NUYS, CA 91406
CONTRACT NUMBER: DAAL02-87-C-0069
C ALBERT MORENO
TITLE:
SCAN-WITHIN-A-PULSE (SWAP) CONCEPT FOR MULTISTATIC RAD
COVERAGE COORDINATION
TOPIC# 46 OFFICE: HDL

SUBMITTED BY

A CONTINUING DIFFICULTY WITH MULTISTATIC RADAR DESIGN IS COORDINATION OF THE TRANSMITTER AND RECEIVER ANTENNA BEAMS TO COVER THE DESIRED SEARCH VOLUME. CONVENTIONALLY, THE RECEIVING ANTENNA(S) ARE STEERED ELECTRONICALLY AS A FUNCTION OF INTRAPULSE TIME TO THE DIRECTION FROM WHICH TARGET ECHOS COULD BE RECEIVED; THIS PROCESS IS CALLED PULSE CHASING. THE ALTERNATIVE DISCUSSED IN THIS PROPOSAL RESULTS IN LESS COMPLEXITY AT THE RECEIVER(S) WITHOUT ADDING SIGNIFICANTLY TO THE COMPLEXITY OF THE TRANSMITTER. THE CONCEPT INVOLVES A FREQUENCY-SENSITIVE ANTENNA EXCITED BY A WIDE BANDWIDTH PULSE TO CAUSE THE TRANSMITTER ANTENNA BEAM TO SWEEP OUT THE ENTIRE SEARCH VOLUME WITHIN A SINGLE PULSE (THE SWAP CONCEPT). THIS ALLOWS A COMPLEX OF FIXED RECEIVER ANTENNA BEAM(S) TO COVER THE DESIRED AZIMUTH EXTENT. THE RF FREQUENCY OF EACH RECEIVER IS SWEPT IN ACCORDANCE WITH THE DESIRED RANGE COVERAGE. THE ISSUES TO BE STUDIED UNDER THIS PROPOSAL INCLUDE CANDIDATE GEOMETRIES, ANTENNA TYPES, WAVEFORM DESIGN, SNR AND SCR, TARGET AND CLUTTER PROCESSING, RECEIVER TUNING ALGORITHMS, COHERENCY, POTENTIAL RANGE PERFORMANCE, MEASUREMENT ACCURACIES, AND OTHER TOP-LEVEL SYSTEMS CONSIDERATIONS.

Y2 LTD INC

2340 S EL CAMINO REAL - #305

SAN CLEMENTE, CA 92672

CONTRACT NUMBER: DAAA21-87-C-0187

DR YUJIRO YAMAMOTO

TITLE:

EXPERIMENTAL FEASIBILITY STUDY: PIEZOELECTRIC PUMPING
FOR COMMANDABLE SAFETY AND ARM DEVICES FOR LANDMINES

TOPIC# 3 OFFICE: ARDC

A DEVICE WHICH ELECTRICALLY TRIGGERS UNATTENDED WEAPON SYSTEM AT COMMAND (SAFETY OR ARM) WITHOUT A BATTERY IS PROPOSED. APPLICATIONS INCLUDE REMOTE CONTROL OF EXPLOSIVES, FUSING OF MINES, OR ACTIVATING MISSILES. SUCH A TRIGGERING DEVICE WITHOUT BATTERY OPERATES AFTER BEING STORED FOR A LONG TIME, WHILE THE CONVENTIONAL METHOD RELYING ON A BATTERY SUFFERS FROM RELATIVELY SHORT AND UNPREDICTABLE SHELF LIFE OF THE BATTERY. THE DEVICE CAN BE UTILIZED ALSO FOR IDENTIFYING A WEAPON (I.E. MINE) INSTALLED IN GROUND OR WATER FOR REMOVING AFTER THE NEED DIMINISHES. THE DEVICE CONTAINS AN ELECTRIC ENERGY PUMP WHICH SUPPLIES ELECTRIC ENERGY FOR 1) STORAGE AND 2) OPERATING A PIE-

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ZOELECTRIC SWITCH TRIGGERING THE WEAPON. THE EXPERIMENTAL FEASIBILITY STUDY PROPOSED CONCENTRATES IT EFFORTS IN PIEZOELECTRIC ENERGY PUMPING TECHNIQUE. THE DEVICE WHICH CONSUMES NO MEASURABLE POWER DURING THE STANDBY CONDITION, YET IS CAPABLE OF ACCEPTING A REMOTE COMMAND SIGNAL TO OPERATE, SELF-GENERATE ELECTRICITY, ACTIVATE A LOAD, SMALL AND LOW-COST, WILL HAVE MANY MILITARY, INDUSTRIAL AND COMMERCIAL APPLICATIONS.

ZOION RESEARCH INC
214 LINCOLN ST
ALLSTON, MA 02134
CONTRACT NUMBER: DAMD17-87-C-7217
DR ROBERT BURROWS
TITLE:
DEVELOPMENT OF A SIMPLE QUANTITATIVE TEST FOR CHOLINES
ACTIVITY
TOPIC# 274 OFFICE: MEDICAL

WE PLAN TO ADAPT A LABORATORY ASSAY FOR ACETYLCHOLINESTERASE ACTIVITY FOR USE AS A TEST STRIP FOR CHOLINESTERASE ACTIVITY IN SALIVA AND SMALL AMOUNTS OF SERUM. WE ANTICIPATE THAT THIS TEST STRIP WILL BE SIMPLE TO USE AND NOT REQUIRE SPECIAL EQUIPMENT, AND WILL YIELD QUANTITATIVE RESULTS WITH ENZYME ON THE ORDER OF 250 uU. PHASE I EFFORT WILL BE DIRECTED TOWARDS PREPARING THE TEST STRIPS AND VALIDATING THE ASSAY WITH PURIFIED ENZYMES AND FLUID SAMPLES FROM NORMAL INDIVIDUALS.

e/j BLOOM ASSOCS INC
115 DURAN DR
SAN RAFAEL, CA 94903
CONTRACT NUMBER: DAAL02-87-C-0062
GORDON E BLOOM
TITLE:
RESEARCH AND DEVELOPMENT OF A LOW-COST MINIATURE DC-DC
TOPIC# 61 OFFICE: HDL

THIS PROPOSAL PROVIDES FOR THE DESIGN AND DEVELOPMENTAL TASKS OF A UNIQUE DC-TO-DC POWER CONVERTER SYSTEM CAPABLE OF CHARGING A 0.068

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 1
BY SERVICE
FISCAL YEAR 1987
ARMY

PAGE 201

SUBMITTED BY

MICROFARAD CAPACITOR FROM ZERO TO A POTENTIAL OF 3000 VOLTS WITHIN
0.5 SECONDS AFTER APPLICATION OF A DC INPUT VOLTAGE RANGING FROM
20 TO 40 VOLTS. PHASE I WORK EFFORTS AND COSTS ARE DISCUSSED IN
DETAIL, AND A COMPLETE DESCRIPTION OF THE CONVERTER'S OPERATIONAL
FEATURES AND POWER STAGE IS PROVIDED.

ARMY

TOTAL NUMBER OF AWARDS: 331

END

DATE

FILMED

9-88

DTIC