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Strategic Defense
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DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM (SBIR)

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FY 1991 SBIR SOLICITATION
PHASE I AWARD ABSTRACTS
NAVY PROJECTS
VOLUME II

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PREFACE

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

FY 1991 SBIR PROGRAM

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

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

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

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

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

INTRODUCTION

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

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

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

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

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

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

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

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

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

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

(BCC)GICAL COMPONENTS CORP.
3000 SAND HILL ROAD
MENLO PARK, CA 94025
Phone: (415) 854-8070

Topic#: 91-341
Office: NSWCWO
Contract #:
PI: John H. Sangster

ID#: 14135

Title: Biomolecular Computing for Automatic Target Recognition

Abstract: The goal of this Phase I SBIR is to propose concepts for pattern recognition techniques for use in automatic target recognition (ATR) systems. The key approach will be the use of bacteriorhodopsin thin films as read/write holographic storage media in Fourier transform autoassociative pattern recognition architectures. We plan to test the feasibility of this approach by constructing a simple, unoptimized prototype ATR system and testing its performance. Briefly, the specific objectives of this Phase I proposal are to: a. Develop and test a prototype of a Fourier transform autoassociative automatic target recognition system in order to develop device concepts; b. Test the use of holographic thin films of bacteriorhodopsin in the above device; c. Develop concepts for optical, computer interface and materials improvements based upon test results from the optical bench prototype. During Phase II, we plan to build a second generation ATR system, using improvements in materials technology licensed from Syracuse University. In addition, the electronic and optical design of the ATR will be refined based upon Phase I results.

ACCU-SORT SYSTEMS, INC.
511 SCHOOL HOUSE ROAD
TELFORD, PA 18969
Phone: (215) 723-0981

Topic#: 91-312
Office: NAVSUP
Contract #:
PI: Steven M. Luscinski

ID#: 13022

Title: Automated Passenger Order Recognition

Abstract: A bar code scanning system that provides in check processing of DoD travel orders. The system will determine seating priority for travelers to alleviate long lines and congestion as travel volume increases in the future. The system can be expandable to include passenger/baggage reconciliation and will have considerable commercial application. This system will be accomplished by using a leading experienced bar code system manufacturer with unique airline experience to determine the exact parameters of the program and design a fully integrated system that will not only address current needs, but handle future expansion as well. Implementing the program includes preclassification of all travelers, bar coding tickets, using the travel and leave paper priority codes to expedite check in and eliminate the majority of the manual processing. The system will also provide the option of using the manual method if necessary. Phase I includes survey of current military and civilian airlines requirements and practices and will present a recommended system description.

ACTRAN SYSTEMS, INC.
3275 PROGRESS DRIVE
ORLANDO, FL 32826
Phone: (407) 281-1901

Topic#: 91-101
Office: NAVSEA
Contract #: N00024-92-C-
PI: JSCOTT THORNTON PH D

ID#: 12289

Title: A NOVEL REFRIGERATION SYSTEM FOR POTENTIAL SHIPBOARD USE

Abstract: A novel refrigeration system based on sound thermodynamic principles is described. It is proposed that a low power tested prototype be designed, built and tested in Phase I.

ADAPTIVE SOFTWARE, INC.
101 WOODMUN DRIVE, SUITE 15-A
DAYTON, OH 45431
Phone: (513) 253-5555

Topic#: 91-303
Office: ONT
Contract #:
PI: Herbert B. Lichtman

ID#: 12742

Title: SVD-Based Detection of Internal Waves in SAR Imagery

Abstract: Although satellite-based SAR is sensitive enough to pick up the modulation effects of internal waves, the signal-to-noise ratio (SNR) of this observable is believed to be too low to afford detection of enemy submarines. Adaptive Software proposes that with a new interpretation of singular value decomposition, the SNR can be improved enough to allow automated detection of submarine paths. While most SVD-based analyses try to isolate one or more singular planes that contain the strongly-correlated signals of interest, the proposed approach is to remove those planes that can be shown to contain little or no information of interest. Rissanen's MDL metric for model order determination will guide the removal of strong interference,

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

while a derivative of Shannon's entropy metrics will guide the removal of uninformative noise planes. This preprocessing will allow a stochastic edge detector to find the path over which a submarine has altered the statistical character of the waves.

ADVANCED COMMUNICATION SYSTEMS, INC.
1900 N. BEAUREGARD ST.
ALEXANDRIA, VA 22311
Phone: (703) 486-2282

Topic#: 91-047 ID#: 11447
Office: SPAWARS
Contract #: N00039-91-C-0193
PI: Mr. Thomas Costello

Title: Non-developmental Item Software Application to Undersea Warfare Systems

Abstract: The Integrated Undersea Surveillance System (IUSS) is assessing the feasibility of applying non-developmental (NDI) software to help satisfy IUSS platform mission objectives. ACS proposes to integrate Government owned NDI communication, link control and message/data processing software into a Unix based DTC-2. Primary communication links of interest are the Tactical Receive Equipment (TRE) and the Officer in Tactical Command Information Exchange Subsystem (OTCIXS). Integration and control of these links can be accomplished through the use of one of several NDI software packages identified by ACS. The resulting capability will provide mobile IUSS platforms multiple operational capabilities at a fraction of the cost, space and weight when compared to the alternative implementations. Additionally, the DTC-2 will provide an open hardware and software environment for the addition of future IOSS specific NDI software. The feasibility, tradeoffs, and expected system performance of the proposed NDI software capabilities will be investigated during Phase I.

ADVANCED MARINE ENTERPRISES, INC.
1725 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VA 22202
Phone: (703) 979-9200

Topic#: 91-098 ID#: 11908
Office: NAVSEA
Contract #: N00024-92-C-4019
PI: JOHN J SLAGER

Title: REVISION OF AIRCRAFT CARRIER WEIGHT VERTICAL CENTER AND SPACE ALGORITHMS

Abstract: The proposed research is directed toward the improvement of the relationships used during the early stages of U.S. Navy aircraft carrier design for estimating weights, vertical centers of gravity (KG) and required areas and volumes. The principal focus will be on updating the relationships used in the NAVSEA Aircraft Carrier Design-Synthesis Model. Specific objectives will be as follows: (a) To provide a consistent weight, KG and area/volume database, as derived from the design documentation for previous aircraft carriers, (b) To take into account any changes in aircraft carrier design practices, especially at the subsystem level, which have occurred in recent years, the aircraft carrier design-synthesis model in recent years (e.g. the hull form generation capability) in order to increase the accuracy of the estimates for a new design, and (c) To make use of techniques developed during nine years of experience in updating the estimating algorithms for the NAVSEA Destroyer Design-Synthesis Model.

ADVANCED ROTORCRAFT TECHNOLOGY, INC.
1804 N. SHORELINE BLVD., STE.
MOUNTAIN VIEW, CA 94043
Phone: (415) 968-1464

Topic#: 91-216 ID#: 10679
Office: NATC
Contract #: N00421-92-C-0001
PI: Hossein Saberi

Title: Real Time Helicopter Blade Element Tail Rotor and Interference Models

Abstract: Single rotor helicopters have often encountered an Unanticipated Right Yaw (URY). This occurs predominantly at low speed in ground effect with the relative wind from the left or rear. This appears to be caused by aerodynamic interference phenomena that can only be analytically modeled by a free vortex wake model with ground effect. ART has developed such a model and will incorporate it in FLIGHTLAB, a software environment developed by ART for simulation prototyping and parallel processing. A FLIGHTLAB based rotorcraft simulation with Blade Element and Tail Rotors will then be coupled to this vortex wake model and the results will be validated against wind tunnel data for various wind directions and velocities. Once validated, the model will be implemented in real time using parallel processing. A finite state dynamic inflow representation of the vortex wake model will be used in the real time implementation to reduce computation. Piloted evaluations will be conducted on a simulator of the Navy's choice, driven by a FLIGHTLAB system. The resulting simulation can be used to improve designs and piloting techniques to minimize the URY problem. Source code generated by FLIGHTLAB can be used to port the model to fielded trainers for enhanced training support.

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ADVANCED SCIENTIFIC CONCEPTS, INC.
2441 FOOTHILL LANE
SANTA BARBARA, CA 93105
Phone: (805) 966-3331

Topic#: 91-303 ID#: 12865
Office: ONT
Contract #:
PI: Roger Stettner, Ph.D.

Title: Development of a Staring Underwater Laser Radar Receiver

Abstract: This proposal describes an innovative and proprietary multiple detector focal plane assembly (FPA) designed to be used for high resolution 3 dimensional imaging (staring) underwater laser radar. This FPA design has the following characteristics: -Can be used to determine the time-of-arrival of a laser pulse at each detector element in the array independent from the other detector elements in the array. -Depth resolution is better than 1/2 meter. -Very low noise and very high dynamic range, preliminary design has 12 bits dynamic range. -Preliminary design is for a 10 x 10 array but the number of detectors per array can definitely be increased. -Very compact and low power. -All signals are fully digitized within the FPA. -Low cost in volume production. -Preliminary design has been modeled in PSPICE to confirm operating characteristics.

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

Topic#: 91-329 ID#: 13777
Office: NAVAIR
Contract #:
PI: Edward A. Sturm

Title: Biodegradable Reflective Chaff Material

Abstract: The use of metallized glass fibers as dipoles to reflect and confuse threat radars is a long proven military technology. The simplicity of chaff and the expected long term use of weapon systems which can be defeated by chaff guarantee its utility for many years to come. Advanced Technology Materials (ATM), Inc. has already developed a process for fiber metallization which is suitable for Production of degradable millimeter wave smoke materials" Applicability of these fibers has been demonstrated by the U.S. Army CRDEC. The method of manufacture enables uniform coating on a wide variety of filamentous substrates. Thus, conductive metal coatings can be deposited onto degradable fibers permitting testing and training of personnel without concern of long term environmental impact. In Phase I, ATM will survey Potentially suitable substrate materials with proven degradability. Metallization of selected materials will be investigated. Process optimization will be Performed to yield a demonstration sample and long term feasibility evaluation. In Phase II, Product optimization and scale-up will be addressed along with further development of stable packaging for the degradable chaff material.

AERODYNE RESEARCH, INC.
45 MANNING ROAD
BILLERICA, MA 01821
Phone: (508) 663-9500

Topic#: 91-001 ID#: 10412
Office: ONT
Contract #: N00014-92-C-2004
PI: Dr. David D. Nelson

Title: Ozone Depletion Potential Determination of Shipboard Fire Extinguishing Agents

Abstract: Halon 1301 (CF3Br) is currently in wide spread use on naval vessels as an effective and non-toxic active agent in fire suppression systems. Unfortunately, future manufacture and use of CF3Br may be severely restricted due to its role as a potent agent in stratospheric ozone depletion chemistry. Alternative fire suppression chemicals need to be identified and assessed to replace Halon 1301 in naval systems. This proposal addresses the determination of atmospheric chemical lifetimes and stratospheric ozone depletion potentials for replacement fire suppression chemicals, which will be a major reactor in the environmental acceptability of any proposed substitutes for Halon 1301.

ALLOY SURFACES COMPANY, INC.
100 LOCKE ROAD
WILMINGTON, DE 19809
Phone: (302) 762-8900

Topic#: 91-330 ID#: 14090
Office: NAVAIR
Contract #:
PI: John A LaFemina

Title: IR/RF Expendable

Abstract: U.S. Navy aircraft face a variety of threats which use sophisticated infrared (IR) and radio-frequency (RF) devices for homing in on targets. These missiles may either be IR or RF guided or use a combination of the two. Current U.S. Navy aircraft use separate expendable for IR and RF threats. Since the quantity of expendable is limited, and the identity of the type of threat unknown, a single IR/RF expendable would provide protection from both types of threat without the concern of

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identifying the of threat. This will extend the protection envelope since more expendable will be available to protect the aircraft. The cost will also be reduced once one expendable performs two functions. A dual mode expendable must possess equal effectiveness as with each individual mode, be able to fit into the existing constraint volume, and be safe in its operation. Alloy Surfaces (ASC) proposes to use its activated metal (AM) as the IR component and metallized glass chaff as the RF component in this program. ASC has compiled an extensive data base of AM materials and candidate materials for this particular application have already been identified. ASC will mix candidate IR and RF materials and optimize dispensing methods and design of the IR/RF payloads.

ALPHATECH, INC.
EXECUTIVE PLACE III 50 MALL RD
BURLINGTON, MA 01803
Phone: (617) 273-3388

Topic#: 91-297 ID#: 13114
Office: ONR
Contract #:
PI: James C. Deckert

Title: Condition-Based Machinery Maintenance

Abstract: Three new techniques have been developed over the past 36 months that offer significant potential for on-board monitoring of mechanical systems to detect and classify incipient failures. The first is the wavelet transform, and its extension to wave packets, as a means for isolating changes in signal structure in terms of scale as well as time. The second is an extension of classical time-series analysis to multiresolution representations of a time signal, with algorithms to estimate characteristic functions of the spectrum of the signal at each resolution. The third is the maturation of artificial neural network technology to the point where it may be reliably considered as an element of an on-board diagnostic system. This effort combines all three into a comprehensive approach to incipient failure detection and classification. The front-end of our proposed classifier extracts novel feature sets offered by the wavelet transform and the multiresolution time series spectral estimators. These define a feature space on which a classical neural net classifier may be trained and evaluated.

ALPHATECH, INC.
EXECUTIVE PLACE III
BURLINGTON, MA 01803
Phone: (617) 273-3388

Topic#: 91-360 ID#: 13877
Office: NWC
Contract #:
PI: Thomas G. Allen

Title: Multi-resolution Wavelet Image Tracking

Abstract: The introduction of a whole new class of transform methods, notably the wavelet transforms, which permit decomposition of observed phenomena into different physical scales and the computational leverage provided by multiscale image processing techniques, when applied to multisensor image data, promises to increase the sensitivity and reliability of image processing systems in several applications. This proposal offers to evaluate the feasibility of multiscale statistical methods, generalizing wavelet transform methods, for solving two key problems of many image tracking systems: identification of textured background and estimation of optical flow based on sequences of images. The products would be software implementation of algorithms for the two problems and an analysis of their performance using simulated and video images. The images would represent one optical sensor viewing a single target moving in a structured, time-varying background.

AMERICAN GNC CORP.
9131 MASON AVENUE
CHATSWORTH, CA 91311
Phone: (818) 407-0092

Topic#: 91-262 ID#: 11626
Office: NWC
Contract #: N60530-91-C-0195
PI: Ching-Fang Lin

Title: Advanced Integrated Fuzing and Multimode Guidance System

Abstract: Integrated fuzing and multimode guidance algorithms are proposed that include a fifth-state estimator to supply the airframe control information to guide a missile to a predefined orientation, and hence aid in fuzing and detonation of aimed warheads by reducing target modeling requirements and eliminating enhanced image information requirements. By decoupling target and missile motion and using that information to create further predictive terms, the system is able to overcome such problems as jamming near intercept, and can increase the kill probability when the missile velocity angle is predicted and employed in aimed warhead applications. A three phase research program is proposed for which the ultimate objective is to develop an integrated sensing, estimation, guidance and fuzing engineering design and evaluation capabilities to support advanced missile system engineering efforts. Improved guidance performance, through removal of the LOS ratebias effect using the

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proposed system, is manifested in a number of ways, including reduced miss distance, reduced tendency for the missile to oscillate about a null value of the LOS rate, and reduced missile response time. The deliverable for Phase I will be an integrated design methodology consisting of all relevant algorithms for the sensing, estimation, guidance and fuzing of the advanced missile. The effectiveness of the design methodology shall be demonstrated via a design and simulation effort on a generic a DOF missile model. In Phase II, the integration sensing, estimation, guidance and fuzing design and evaluation capability will be developed. In Phase III, appropriate hardware together with the corresponding validated software shall be implemented so as to demonstrate the design capability.

AMHERST SYSTEMS, INC.

30 WILSON ROAD
BUFFALO, NY 14221

Phone: (716) 631-0181

Title: Multiple Aircraft Range Display System

Abstract: This SBIR Phase I effort will provide a basis for the development of an inexpensive, software-based, extensible Multiple Aircraft Range Display System. This system will have a modular design, and make use of commercially available graphics workstations. In addition, whenever possible, the system design will make use of existing, government-owned hardware, software and analysis tools. This approach will further reduce development cost and risk. The proposed design concept for the multiple aircraft range display system will permit NWC personnel to monitor and evaluate the progress of flight test exercises in real time. This system will permit multiple viewing perspectives and is capable of displaying the locations of test resources, weapon flyouts and threat weapons effectiveness. These results can be viewed on both large screen displays and graphics terminals. In addition, the Amherst Systems-range display system design concept will permit NWC personnel to quickly perform post-mission analysis to better determine whether their stated test objectives have been met prior to completing the test activities. In this capacity, the range display system will provide analysis tools to replay key portions of the test exercise and identify when key events occurred.

Topic#: 91-250

ID#: 11015

Office: NWC

Contract #: N60530-91-C-0278

PI: Robert J. Meidenbauer

AMRON CORP.

2001 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VA 22202

Phone: (703) 415-2670

Title: Time-Frequency Representation Using an Improved Wigner Distribution

Abstract: The objective of the work proposed here is investigation of a new time-frequency distribution to improve the response of Lofargrams, correlograms and other images to acoustic transients. The proposed tasks are data collection, implementation of a Choi-Williams proof-of-concept system, optimization of that system on real data, estimation of its performance and production of a preliminary statement of a Phase II proposal. Phase II: a real-time display system, compatible with existing Navy systems, will be developed. Phase III will see transfer of this system into IUSS.

Topic#: 91-040

ID#: 13237

Office: SPAWARS

Contract #: N00039-92-C-

PI: DR STEPHEN LANE

AMRON CORP.

2001 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VA 22202

Phone: (703) 415-2670

Title: Fractal Image Analysis, Automation, and Detection for the Integrated Undersea Surveillance System

Abstract: The IUSS has an urgent need for more efficient methods of signal processing. To meet this end, submarine detection and classification systems must be reexamined and modified. This proposal examines the potential of an innovative technique called fractal image analysis to aid operators to accurately and efficiently detect and classify submarines in a passive sonar environment. Fractal image analysis is an excellent choice for Undersea Surveillance because it has been successfully applied to other images to classify regions and to detect and enhance edges. Further there is reason to believe that sound radiated from submarines follows a fractal model. In Phase I a single fractal measure will be applied to a limited set of Lofargrams. The proposed work includes collection of data for fractal analysis, writing and debugging of fractal analysis code, optimization of the parameters of that code, evaluation of the optimized code on real data and preparation of a preliminary plan for Phase II work integrating fractal analysis and automation. Phase II will see automation of the method and its application to other fractal

Topic#: 91-041

ID#: 11324

Office: SPAWARS

Contract #: N00039-92-C-0077

PI: Dr. Stephen Lane

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measures and other images of interest in the surveillance problem. An operational system will be developed in Phase III.

ANADAC, INC.
1735 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VA 22202
Phone: (703) 892-9500

Topic#: 91-150 ID#: 12268
Office: NAVSEA
Contract #: N00024-92-C-4080
PI: NANCY WILLIAMS

Title: NAVSEA INTEGRATED LSA PROCESS MODEL

Abstract: Project objectives are to identify and model the integrated LSA process to facilitate implementation of policy and guidance for the accomplishment of integrated logistic support of Navy systems and equipment acquisitions. Outcome of process modeling will include the identification and proposed resolution of redundancy inherent to the current system, depiction of the logical information flow among LSA and all ILS elements, establishment of a common baseline for all ILS guidance and policy implementation, and support of the development of the CALS IWSDB.

ANAMET LABORATORIES, INC.
3400 INVESTMENT BOULEVARD
HAYWARD, CA 94545
Phone: (415) 887-8811

Topic#: 91-160 ID#: 13348
Office: NSWC
Contract #: N60921-91-C-A345
PI: ROCKY RICHARD ARNOLD

Title: Creation of Methodology for Predicting Fragment Impact Damage to Operating Rocket Motors

Abstract: The objective of this Phase I research is to develop the methodology necessary to predict damage to operating rocket motors as a result of warhead fragment impact. Methodology, as used in this work, means the definition and specification of numerical procedures, semi-empirical formulae, and available experimental data to be used in a procedure, the result of which is the calculation of key system parameters which prescribe the rocket motor's proximity to failure. The approach adopted for this effort includes a comprehensive review of available information and data to first identify and postulate potential failure mechanisms. Subsequently, Anamet and its subcontractors, Lockheed and SRI, will define the predictive methodology to be used with each failure mechanism. Emphasis will be placed on semi-empirical methods as these offer reasonable accuracy without being excessively complex, time-consuming, or expensive. More elaborate hydrodynamics computational procedures will be considered when appropriate. Each failure mechanism and associated predictive methodology will have a corresponding experimental simulation test defined during Phase I effort. The experimental simulation is necessary to validate and add confidence to the predictive methodology being developed. Phase I effort will demonstrate the feasibility of using semi-empirical approaches to establish useful predictive methodology to the Navy.

APA OPTICS, INC.
2950 NE 54TH LANE
ELAINE, MN 55434
Phone: (612) 784-4995

Topic#: 91-292 ID#: 12972
Office: ONR
Contract #:
PI: Dr. Jim M. Van Hove

Title: Al_xGa_(1-x)N High Electron Mobility Transistors for High Temperature Applications

Abstract: GaN high electron mobility transistors or HEMTs are proposed for use as high temperature electronic devices. HEMTs are excellent for both power and low noise amplification since they possess a high carrier concentration and an enhanced carrier mobility. GaN has a large bandgap of 3.2 eV, which gives it a greater breakdown voltage and a higher saturated electron velocity than GaAs. GaN, in addition, is stable in air to ground 800 degrees C which makes it ideal for high temperature use. High quality GaN films can be deposited using LPMOCVD on sapphire. This technique is commonly used for GaAs epitaxy and has been used on a production level. We have previously demonstrated during a SBIR phase I program enhanced electron mobilities in AlGaIn/GaN heterojunctions. In addition, we have fabricated point contact diodes using GaN that operated at temperatures as high as 700 degrees C. The proposed Phase I program will evaluate the high temperature characteristics of AlGaIn HEMT layers and demonstrate the necessary fabrication procedures needed for the HEMT device. In Phase II, AlGaIn HEMT layers will be grown, fabricated and tested at elevated temperatures greater than 400 degrees C. These devices will then be used to fabricate an operational amplifier capable of operating at 325 degrees C.

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APPLIED HYDRO-ACOUSTICS RESEARCH, INC.
656 QUINCE ORCHARD ROAD
GAITHERSBURG, MD 20878
Phone: (301) 840-9722

Topic#: 91-050 ID#: 11472
Office: SPAWARS
Contract #: N00039-91-C-0220
PI: F.A. Ryder

Title: Survey and Evaluation of Techniques for Measurement of Acoustic Sensor Position in Long Towed Arrays, Using Internal or External Data or

Abstract: The proposed Phase I effort consists of analysis and evaluation of techniques for measurement of acoustic sensor positions in long towed arrays for use in reducing performance degradations due to array motions and distortion. Present and future array designs and operating environments will be considered, with specific attention to non-acoustic sensor suites and capabilities. A survey of shape estimation methods used or being considered for use in tactical and surveillance arrays, as well as in commercial applications, will be documented, with an evaluation of capabilities and limitations. Particular attention will be applied to processing algorithms that use data from one or more heading sensors within the array with emphasis on identifying additional data that will improve on the effectiveness of current techniques, and on identifying methods of satisfying these additional requirements. Consideration will be given to: the array and sensor suite; sources and data from the tow platform; the use of deployables; and exploitation of other external elements in the Undersea Warfare environment. A detailed recommendation and technical description will be provided with a plan of action for implementation and demonstration of a preferred method in sea testing.

APPLIED SCIENCE AND TECHNOLOGY, INC.
35 CABOT ROAD
WOBURN, MA 01801
Phone: (617) 933-5560

Topic#: 91-258 ID#: 11566
Office: NWC
Contract #: N60530-91-C-0259
PI: Evelio Sevillano, Ph.D

Title: ANTI-REFLECTION COATINGS FOR DIAMOND FILMS

Abstract: We propose to develop an anti-reflection (AR) coating for diamond films optimized to enhance the transmission in the 8 to 12 micron region of the spectrum. The metal-oxide materials to be evaluated have good optical transmission in this spectral region and refractive indices near the Optimum value of 1.55 for a diamond AR coating. Since a secondary purpose of the coating is to protect the diamond from oxidation at high temperatures (1000oC), the metal-oxides are chosen with high melting temperatures. Initial coatings will be deposited using ion assisted deposition. The optical properties of the AR coatings will be measured and compared with uncoated diamond films. Nanocrystalline diamond material will be used as window material to minimize the scattering losses. Adhesion to the diamond substrate will be evaluated.

AQUIDNECK MANAGEMENT ASSOC., LTD.
28 JACOME WAY
MIDDLETOWN, RI 02840
Phone: (401) 849-8900

Topic#: 91-202 ID#: 10588
Office: NUSC
Contract #: N66604-92-C-0301
PI: Frank S. Hale

Title: Simultaneous Engineering Automation

Abstract: A new generation of engineering and manufacturing automation design tools are now emerging as a result of the pioneering work that has been done in object-oriented programming technology. Unlike conventional procedural language approaches, the object-oriented programming approach allows data structures and procedures to be defined for generic classes of objects. System performance, RNA, and cost data as well as design rules, government standards, manufacturing and engineering data will be stored in relational databases for easy access through a comprehensive Structured Query Language (SQL) support system. The SQL commands are embedded in the underlying processing language (LISP) automatically. With this powerful facility, the Concept Modeler can update or extract RNA information from databases residing in different machines using the standard SQL language understood by relational database products, and enter this new data into software production programs such as TIGER, PREDICTOR, etc. and run these programs. AMA will evaluate existing RNA and cost models for potential inclusion in the combined system database.

ASPEN SYSTEMS, INC.
184 CEDAR HILL STREET
MARLBOROUGH, MA 01752

Topic#: 91-101 ID#: 12287
Office: NAVSEA
Contract #: N00024-92-C-4077

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Phone: (508) 481-5058

PI: HAMED BORHANIAN

Title: HFC-134A SHIPBOARD SCREW COMPRESSOR REFRIGERATION SYSTEM

Abstract: Due to the forthcoming ban on all ozone depleting refrigerants, the Navy needs new refrigeration technologies to replace those using such chemicals. The proposed system uses some of the inherent design advantages of a screw compressor to adapt it to a vapor compression refrigeration system using refrigerant HFC-134a. HFC-134a has no ozone depletion potential. The use of screw compressors can overcome all the technical difficulties associated with HFC-134a and its lubricant. Thus, rather than having to rely on unproven non vapor compression technologies, the Navy can use a proven, highly reliable, cost effective and safe refrigeration system to satisfy its refrigeration requirements.

ATLANTIC AEROSPACE ELECTRONICS CORP.

Topic#: 91-345

ID#: 14055

470 TOTTEN POND ROAD

Office: NSWCWO

WALTHAM, MA 02154

Contract #:

Phone: (617) 890-4200

PI: Meg Noah

Title: High-Speed Low-Cost Signal Processor for Multi-Band IR Fuzes

Abstract: This proposal seeks to establish the feasibility model for a high-performance inexpensive multi-band IR processor based on morphological signal processing, to be incorporated into the Navy's next generation of IR fuzes. Our unique processing approach is based on very simple computational circuits which can be implemented in compact, high-speed, low-power, low-cost gate array logic. Furthermore this nonlinear processing approach has resulted in robust target detection performance, sometimes even exceeding state-of-the-art algorithms which require massive computation. This innovation has been demonstrated for one-dimensional as well as two-dimensional real sensor multi-band data. In Phase I we will: 1) determine the IR characteristics of air targets of interest and background clutter, 2) demonstrate short range detection of powered and unpowered air targets based on our simple processing approach, 3) use NAVSWC detector array output data to quantify detection performance, and 4) identify an appropriate family of IR-fuzed munitions and develop a high-level processor architecture specific for this application. The anticipated results of Phase I will be a proof of concept that reliable detection can be achieved within the IR fuze form factor. A hardware processor prototype will be built in a Phase II effort to fully test and validate the multi-band IR fuze.

ATSS, INC.

Topic#: 91-082

ID#: 11798

P.O. BOX 5487

Office: NAVAIR

SAN BERNARDINO, CA 92412

Contract #: N00140-91-C-3290

Phone: (714) 889-2562

PI: Liam S. Groener

Title: UAV Heat Exchanger Development

Abstract: The cooling systems used with the diesel engines of unmanned aerial vehicles (UAVs) consists of a large liquid-to-air heat exchanger. This heat exchanger requires a large frontal area, which can lead to packaging problems and an increase in the UAV's aerodynamic drag. ATSS has developed a technology for fabricating extremely compact heat exchangers, which uses etched and bonded laminated foil stacks. Analyses indicate that, relative to conventional heat exchanger designs, a factor of more than five reduction in core volume can be achieved with the ATSS approach. The proposed Phase I effort includes analytical studies and limited fabrication and experimental studies to demonstrate the approach.

AURA SYSTEMS, INC.

Topic#: 91-280

ID#: 12531

2X35 ALASKA AVENUE

Office: PMTC

EL SEGUNDO, CA 90245

Contract #: N0429A-91-C-0096

Phone: (213) 643-5300

PI: Rogers Saxon, PhD

Title: Telemetry Realtime Intelligent & Monitoring System: Conceptual Development And Demonstration

Abstract: Telemetry analysts monitoring flight tests must perform red-line checking and make rapid decisions in realtime based upon data that is often contaminated with noisy or missing values. Analyst experience is critical to success. It would be highly beneficial to provide intelligent aids to those analysts. These aids must have the content of a carefully crafted expert system, but operate in the real world of noisy data and high data rates. The goal of this SBIR is to develop such a system for missile test monitoring: the Telemetry Real Time Intelligent Monitoring System (TRIMS). Aura Systems specializes in intelligent, realtime telemetry systems, and has a toolkit that can be used to craft a TRIMS solution. The center of this toolkit is the Aura

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Linkage server (TM) front end which performs rapid data filtering and anomaly detection at realtime data rates. Linkage Server communicates at a symbolic level with a sophisticated expert system shell in which the diagnosis of red-line conditions is performed. Rich graphical displays will be used. Aura proposes to demonstrate in Phase I its unique architecture for realtime intelligent monitoring using missile data from the Pacific Missile Test Center, and to expand in Phase 2 into a full TRIMS workstation.

AUTOMATIX, INC.
755 MIDDLESEX TRUNPIKE
BILLERICA, MA 01821
Phone: (508) 667-7900

Topic#: 91-183 ID#: 13569
Office: NSWC
Contract #: N60921-91-C-0149
PI: SCOTT COLE

Title: AUTOMATED DIE BOND INSPECTION SYSTEM USING MACHINE VISION

Abstract: The objective of this program is to develop advanced automated inspection systems which utilize machine vision sensing and processing techniques to inspect high-reliability microelectronics for critical Navy applications. The proposed automated systems will address visual inspection tasks which are now performed manually. These include die bond inspection, chip placement and orientation verification, wire connectivity inspection, etc. Phase I tasks mainly include: a brief review of related work; an analysis of application requirements particularly focusing on Navy's needs and applicable military microelectronics workmanship standards; an investigation and prototyping of applicable vision sensing and vision processing approaches; an evaluation of alternative such approaches and selection of most promising ones for full implementation under Phase II; and development of a preliminary system design addressing overall system hardware and software architecture and issues such as user interfacing, part programming, CAD interfacing, integration with other systems in the assembly line, encoding of applicable standards, etc. The system prototypes in both Phases I and II will be developed using advanced state-of-the-art machine vision systems. On the basis of the above work, needs for future R&D will be identified and the Phase II effort will be planned.

AVCON-ADVANCED CONTROLS TECHNOLOGY
19151 PARTHENIA STREET
NORTHRIDGE, CA 91324
Phone: (818) 886-0250

Topic#: 91-253 ID#: 11030
Office: NWC
Contract #: N60530-91-C-0239
PI: CRAWFORD R. MEEKS

Title: MAGNETICALLY SUPPORTED ULTRAPRECISION BEARING DEVELOPMENT

Abstract: This proposal proposes an approach to describe & demonstrate magnetically supported ultraprecision bearing for seeker and scanner applications. The magnetic support design approach is based on a novel homopolar magnetic circuit implemented by means of a combination of permanent bias fields and active control fields. The concept includes a control system which incorporates error signals from the magnetic bearing position sensors as well as from external sources (e.g., inertial sensors). The magnetic support is designed to reduce scanner torque noise, axial and radial runouts, and also to provide high bearing stiffness for platform maneuvers. The design approach minimizes the magnetic support size, weight and power compared to other approaches. The bearing design provides full five-axis support and control and no other bearings are required. The project provides a hardware demonstration and test data. The magnetic support specifications are: axial and radial stiffness greater than 5×10^5 pounds/inch; axial and radial runout less than 3×10^{-6} in; power consumption less than 10 watts. The design approach is scalable to larger and smaller scanners than the one demonstrated. The design has provisions for adding an integral precision shaft angle encoder and torque motor.

BAND, LAVIS & ASSOC., INC.
900 RITCHIE HIGHWAY
SEVERNA PARK, MD 21146
Phone: (301) 261-1078

Topic#: 91-210 ID#: 10795
Office: NCEL
Contract #: N47408-91-C-1222
PI: DANIEL L WILKINS

Title: Kinetic Chain

Abstract: The proposed development involves the characterization, evaluation and modification of a chain-shock absorber utilized commercially. These shock absorbers can be assembled as "links" to form a length of "chain" with the desired shock absorbing characteristics. This chain can either be incorporated between the ship's anchoring chain and a bouy, between the bouy and its anchor, or between the ship's anchoring chain and its own anchor.

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

BARRON ASSOC., INC.

ROUTE 1, BOX 159

STANARDSVILLE, VA 22973

Phone: (804) 985-4400

Topic#: 91-297

ID#: 13048

Office: ONR

Contract #:

PI: Dr. S. Eugene Parker, PhD

Title: Machinery Diagnostics Using Polynomial Neural Networks

Abstract: The vibration signatures (mechanical, acoustic, and electromagnetic) produced by machine components may be used for machinery diagnostics. By regularly measuring vibration levels, defects can be detected and diagnosed before causing extensive damage or failure, a process known as predictive maintenance. The main advantage of predictive maintenance is that problems can be identified without disassembling a machine, or even removing it from service. Conventional machinery diagnostics generally require significant human involvement and expertise. Essential requirements include data pre-processing for feature extraction, detection of signals of interest, and classification of these signals. Automated systems often utilize deductive approaches that fail to capitalize on the benefits offered by inductive techniques such as neural networks; these benefits include performance advantages and reduced development and maintenance. Machine diagnostics is essentially a pattern-recognition task, for which neural networks are ideally suited due to their speed and ability to recognize complex high-dimensional relationships. Classification polynomial neural networks emphasize discrimination among fault classes and thereby offer advantages over estimation neural networks for diagnostics applications. Signal-processing and pattern-recognition algorithms, and the hardware on which they run, are sufficiently advanced for rapid on-line detection and classification of changes in the condition of electro-mechanical systems. -

BIOINDUSTRIAL TECHNOLOGIES, INC.

1930 S AUSTIN AVE

GEORGETOWN, TX 78626

Phone: (512) 869-0580

Topic#: 91-175

ID#: 13478

Office: NSWC

Contract #: N60921-91-C-0181

PI: DANIEL H POPE

Title: BIOCORROSION/BIODETERIORATION/BIOFOULING OF COATED METALS

Abstract: Microbiologically influenced corrosion (MIC) of most industrially utilized alloys, including those used in many Naval applications, is well established. MIC of coated and cathodically protected materials is also well documented. The proposed research would examine the roles of naturally occurring members of MIC communities other than bacteria; the algae, protozoans and fungi in MIC processes, including deterioration of coating and corrosion of metals. It is proposed to use traditional microbiological, chemical and metallurgical analyses for a portion of the tests. Other tests will be done to determine the ability of current (in ZRA configuration) and electrochemical noise measurements to give information about corrosion rates due to microbes and different metabolic activities (e.g., photosynthesis vs. respiration, recognizable as different electrochemical noise patterns). The ultimate goal of the research is to develop a commercially available device which can be used to monitor microbial activities, including those in MIC processes, in an on-line, real-time mode. The device should be sensitive, inexpensive and able to differentiate MIC from other forms of corrosion. Such a device would allow MIC to be monitored in susceptible systems and allow mitigation measures to be assessed for effectiveness without having to perform destructive evaluation.

BIOTRONICS TECHNOLOGIES, INC.

W226 N5558 EASTMOUND ROAD

WAUKESHA, WI 53186

Phone: (414) 537-1112

Topic#: 91-295

ID#: 13065

Office: ONR

Contract #:

PI: Kenneth J. Schlager

Title: A Cost-Effective Fluorometric Approach to In-Situ Monitoring of MIC

Abstract: A fluorometric approach to the identification and characterization of microbially influenced corrosion (MIC) is proposed. All living cells, including bacteria and other microorganisms, contain nicotinamide adenine dinucleotides (NAD) which serve as cofactors in many metabolic reactions. The reduced forms [NAD(P)H] are high energy molecules which fluoresce at 460nm when irradiated with light at 340nm. This fluorescence property of NADPH may be used to measure microorganism cell concentration and activity using a small, portable, low-cost fluorometric analyzer. Fluorometric measurements of NADPH may be supplemented by detection of other natural microbial fluorophores such as tryptophan, tyrosine and ATP. In the proposed Phase I program, Biotronics will build a bench-type (not portable) fiber fluorometer which will be evaluated by the Institute for Applied Microbiology (University of Tennessee/Oak Ridge National Laboratory) which has had extensive experience in the study of microbially influenced corrosion. Fluorometric identification of MIC provides a number of advantages as a laboratory or field

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

procedure: 1. Well-established microbial phenomenon The fluorescence of bacteria and other microbes has been convincingly demonstrated in both laboratory investigations and on-line biochemical process control. 2. Cost-effective, compact instrumentation The MIC application should allow for the development of an inexpensive, compact, portable, special purpose fluorometer suitable for both laboratory and field usage.

BKM, INC.
5141 SANTA FE STREET
SAN DIEGO, CA 92109
Phone: (619) 270-6760

Topic#: 91-353 ID#: 13949
Office: NAPC
Contract #:
PI: Dr. N. John Beck

Title: Catalytic Plasma Torch -A Low Voltage, Self-Timed Ignition System

Abstract: Recent advances in the development of low compression ratio diesel-fueled engines have revealed a need for improved ignition of the fuel/air charge. Conventional spark ignition or glow plug systems do a poor job of igniting the fuel-air mixture. Other disadvantages include weight, cost, electrical interference and low reliability. The unique Catalytic Plasma Torch (CPT) ignition produces a large volume of ignition reactants compared to SI. It eliminates lean misfire and is self timing. Since the CPT operates on low power DC voltage, it is lighter and lower in cost. The proposed project will demonstrate the CPT ignition in a low compression rotary engine using JP-5 fuel and compare CPT performance with the existing glow plug ignition. BKM is an engineering research company specializing in advanced engine concepts. It has developed and is currently marketing the Servojet fuel injection system.

BOULDER MICROWAVE TECHNOLOGIES, INC.
4216 PIEDRA PLACE
BOULDER, CO 80301
Phone: (303) 492-2433

Topic#: 91-275 ID#: 11685
Office: NWC
Contract #: N60530-91-C-0281
PI: David C. Chang

Title: Omnidirectional Circularly-Polarized Conformal Microstrip Antennas

Abstract: We propose to develop a computer-aided design (CAD) tool equipped with a unique database for designing omnidirectional, circularly-polarized wraparound microstrip antennas. In the Phase I effort, we will characterize the design process systematically and establish a CAD methodology. The goal of Phase I is to demonstrate the viability of such a tool. The end product of Phase I will include a sample wraparound microstrip antenna design for missile telemetry with a prescribed set of design criteria.

BREAULT RESEARCH ORGANIZATION, INC.
4601 EAST FIRST STREET
TUCSON, AZ 85711
Phone: (602) 795-7885

Topic#: 91-269 ID#: 11672
Office: NWC
Contract #: N60530-92-C-0006
PI: Dr. Steve C. Johnston

Title: Spectral Analysis of Stray Light

Abstract: During the Phase I development we will investigate and study approaches for the evaluation of the stray light characteristics of a rotating free gyro type IR seeker in the frequency domain. Since this is a fundamentally new area of stray light analysis, we will begin by developing insights into the utility of this technique by examining the signatures of various internal (thermal emission) and external (scatter, diffraction, etc) stray light sources in the frequency domain. Ultimately this technique will be examined for its applicability to the improvement of seeker performance. While current stray light analysis programs can analyze very complex system geometries, they can do so for only a single static configuration at a time. Our methodology is therefore divided into two steps: We will perform a series of conventional stray light analyses on a generic free gyro seeker in the temporal domain, and then Fourier transform the results to obtain the performance in the frequency domain. Since the analyses techniques are equally valid for internal and external stray light sources, this technique is applicable to all types of commercial and military systems.

BRIMROSE CORP.
5020 CAMPBELL BOULEVARD
BALTIMORE, MD 21236

Topic#: 91-140 ID#: 12392
Office: NAVSEA
Contract #: N00024-92-C-4034

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Phone: (301) 931-7200

PI: JOLANTA I SOOS

Title: A UNIQUE HIGH POWERED BLUE/GREEN LASER COMMUNICATION SYSTEM FOR SUBMARINES

Abstract: A unique blue/green high powered laser system for tactical submarine communications is proposed. The proposed system combines the concepts of double beams modulation (DBM) and optoelectronic heterodyne (OEHD) has many advantages over the current incoherent optical system (because of the spatial incoherence caused by extreme turbidity, the conventional coherent detection is impossible) provides the needs for real-time, wideband communication between submarine and surface combatant. It can transmit very high frequency, wide bandwidth, analog, digital or video signal simultaneously up to tenth of a GHz. It offers the ability for multichannel transmitting and switching. By adopting the OEHD, it not only increases the detection sensitive over the conventional incoherent system, but also simplifies the design of the receiver. The system can be very compact, mechanically reliable and low power consumption by opto-electronic integrating and directly diode pumping "KTP Star." A second harmonic generator (SHG) which converts the laser to blue/green with efficiencies over 65%. In Phase I, Brimrose will construct a proof-of-concept laser transmitter-receiver system. Should this work become classified, Brimrose has a secret facility clearance. Also, under the SBA from the Office of Innovation Research and Technology's sixth year results to Congress, June 1989, Brimrose was selected from 9,000 companies for outstanding SBIR Commercialization Progress and Success.

BUSINESS AND ENGINEERING TECH SER

P O BOX 409

PORTSMOUTH, RI 02871

Phone: (401) 847-2138

Title: SUBMARINE COMBAT SYSTEM OPERATOR TRAINING WORKSTATION CONCEPTS

Abstract: This task will identify the issues concerning Combat System training requirements. In addition to functional needs, the issues of ease of system upgrades and rapid prototyping will be addressed. Initial input data will be obtained from Naval training Plans, and existing training device capabilities. This will identify the levels of required training and the skills that must be taught. A workstation market survey will be conducted to identify candidate workstations that have the potential to satisfy the training needs. After an analysis of workstation capabilities versus training requirements, a candidate workstation will be selected. Additional studies and development will be conducted on this workstation. The results of this effort will be documented in a report identifying recommended Phase II activities.

Topic#: 91-136

ID#: 12172

Office: NAVSEA

Contract #: N00024-92-C-4028

PI: RICHARD SWANSON

CAMBRIDGE ACOUSTICAL ASSOC., INC.

80 SHERMAN STREET

CAMBRIDGE, MA 02140

Phone: (617) 491-1421

Title: FEASIBILITY STUDY OF SCALED SURFACE SHIP MODEL FOR UNDEX EXPERIMENT

Abstract: Shock vulnerability is an important design consideration for naval surface ships and submarines. Although analytical procedures exist for evaluating the response to shock of elastic structures immersed in water, verification is by means of shock tests. The current practice of shock testing full scale surface ships is costly and does not facilitate the development of new hull forms and structures. The primary objective of the proposed study is to evaluate the feasibility of scaled model shock testing for surface ship designs. This work will entail defining phenomena important to underwater explosive shock, determining relevant scaling relationships, and evaluating conflicting requirements for scaling. To the extent possible, the existing data base of surface ship shock tests will be used to verify or supplement analytical results. Based on the conclusions of this study, guidelines for physical test hardware will be developed.

Topic#: 91-099

ID#: 11917

Office: NAVSEA

Contract #: N00024-92-C-4057

PI: MIGUEL C JUNGER

CAMBRIDGE RESEARCH ASSOC., INC.

1430 SPRING HILL ROAD, SUITE 2

MCLEAN, VA 22102

Phone: (703) 790-0505

Title: Control System Design Methodology for Automatic UAV Landing Systems

Abstract: Cambridge Research Associates proposes to develop a design methodology to be applied to the automatic unmanned air vehicle (UAV) landing control problem. The methodology will be used to determine landing control system requirements

Topic#: 91-318

ID#: 13696

Office: NAVAIR

Contract #:

PI: Michael D. Veal

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for UAVs , specifically for maritime UAVs which must land on ships subject to a variety of sea conditions. Cambridge will expand upon UAV simulations already developed at its Integration Simulation Laboratory, and will utilize recent advances in dynamic interaction theory. Dynamic interaction control theory will be used to first determine an "impedance" for the UAV that optimizes landing Probabilities, and then specify control requirements which achieve the optimal impedance for a given air vehicle. This methodology will be implemented across a spectrum of air vehicle classes, subject to varying environmental conditions. Thus, the methodology will determine control requirements as a function of air vehicle parameters, and environmental conditions.

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

Topic#: 91-137 ID#: 12177
Office: NAVSEA
Contract #: N66604-92-C-0713
PI: DR BRIAN G DIXON

Title: A HIGH IMPACT STRENGTH LOW INSERTION LOSS SONAR WINDOW

Abstract: High frequency, high strength sonar, windows are required for submarine operations at locations that make them highly susceptible to damage from impact of objects in the water. During arctic operations they are also exposed to ice loads and fast changing temperature extremes associated with surfacing through ice. This Phase I research studies the feasibility of functionalizing polyethylene fibers so that the resultant epoxy or polyurethane sonar windows possess superior strength and reduced insertion losses at high frequency. Ultrahigh molecular weight polyethylene fiber will be surface treated and then formed into composites based on polyurethane and epoxy. Acoustic properties of these composites will be measured and master curves be obtained using the time-temperature superposition technique. Tensile strength will be used to evaluate the effects of surface treatment on composite strength. If successful, this research will identify new acoustic materials for use in high frequency sonar dome applications. Phase II will involve further testing of composites, selecting the better combinations of materials based on these tests, and writing procurement specifications for inclusion in the system procurement solicitation for Phase III.

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Topic#: 91-201 ID#: 10910
Office: NADC
Contract #: N62269-91-C-0249
PI: Frank Keohan

Title: Waterborne Polyurethane Binder Resins for Compliant, Non-Aerosol Aircraft Coatings

Abstract: Aliphatic polyurethane resins have become the predominant technology for military aircraft coatings due to their superior weather and chemical resistance, durability, and flexibility. Their application, however, frequently requires significant dilution with volatile organic solvents. The use of such solvents is becoming severely restricted due to environmental and worker safety concerns. A method for preparing a high performance waterborne binder system for aircraft topcoats is proposed which can significantly reduce the need for volatile organic solvents in their application. The proposed research explores the feasibility of chemically modifying conventional polyurethane resins for water dispersion and cure via a unique crosslinking mechanism. The ultimate objective of the program is to develop a coating system capable of being applied from a non-aerosol container with the handling characteristics, shelf stability and cured properties of conventional polyurethane-based topcoats, but with much lower levels of volatile organic compounds.

CAPE COD RESEARCH, INC.
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Topic#: 91-224 ID#: 10586
Office: NOSC
Contract #: N66001-92-C-7000
PI: Francis Keohan

Title: Novel Radiation Resistant Adhesives for Fiber Optic Bobbin Fabrication

Abstract: A novel modified acrylic adhesive is proposed which can significantly improve the adhesive bonding step in fiber optic payout bobbin fabrication. This research explores the feasibility of modifying acrylic-based adhesive formulations with novel elastomeric additives to produce a new class of controlled adhesive strength materials which can be readily applied in optical fiber winding operations. The proposed adhesive also has the benefit of improving the fiber optic assembly's resistance to ionizing radiation. The ultimate objective of the program is to develop an adhesive with good handling characteristics, shelf stability, curing conditions, stability and controllable adhesion to typical optical fiber cladding and secondary coatings. In the

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

proposed study, the methodology for preparing these novel optical fiber adhesives will be developed and the adhesive properties of selected materials evaluated. Both the static: (tensile and peel) adhesion and the dynamic mechanical properties of these materials will be studied.

CARLOW ASSOC., INC.
8315 LEE HIGHWAY
FAIRFAX, VA 22031
Phone: (703) 698-6225

Topic#: 91-058 ID#: 11542
Office: SPAWARS
Contract #: N00039-91-C-0237
PI: Dr. Thomas B. Malone

Title: Technology to Establish and Support the Role of Man in Computer Security Systems

Abstract: The objective of the proposed effort is to provide computer security system designers with methods and data for determining the appropriate roles of humans in computer security functions and establishing design requirements and criteria for design of user-computer interfaces and decision aids to support the assigned role of man. The effort will also provide research to define guidelines for determining when human performance degradations are expected to exceed tolerances for effective system operation. Phase I objectives are to: 1) identify requirements and problems for human involvement in computer security operations; 2) develop design requirements and functional specifications for an automated tool to assist in the determination of the role of the human in computer security activities; 3) develop design requirements and functional specifications for decision aids and user-computer interfaces to support human-assigned security tasks; 4) identify research requirements for specifying human performance limits; and 5) develop requirements and constraints in a trusted computer system evaluation criteria which address human performance and man-machine interface design issues for maintaining computer security.

CARTWRIGHT ELECTRONICS, INC.
655 W. VALENCIA DRIVE
FULLERTON, CA 92632
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Topic#: 91-194 ID#: 10957
Office: NADC
Contract #: N62269-91-C-0423
PI: T. McDonald

Title: Small Baseline Vector Scoring

Abstract: Tactical missile development requires not only miss distance, velocity and time of closest approach but also missile attitude and trajectory during intercept. Cartwright Electronics, Inc. (CEI) has developed scalar scoring systems which have demonstrated accuracy and target resolution compatible with vector scoring requirements. Use of sub-scale targets such as the EON-345 imposes severe antenna spacing constraints which must be resolved if satisfactory vector scoring is to be accomplished on these targets. The primary Phase I objective is this simulation of vector scoring accuracy as a function of antenna array configuration using simulated radar intercept data. A second Phase I objective is the evaluation of algorithmic enhancements for potential incorporation in a Phase II proof of concept vector scoring system simulation. A third Phase I objective involves the development of a system concept for use with the small baseline array algorithms studied.

CHARLES RIVER ANALYTICS, INC.
55 WHEELER STREET
CAMBRIDGE, MA 02138
Phone: (617) 491-3474

Topic#: 91-152 ID#: 13631
Office: NSWC
Contract #: N60921-91-C-0186
PI: Dr. Alper K. Caglayan

Title: A Hybrid Neural Network/Expert System Approach to Multiple Target Recognition

Abstract: Multiple target recognition systems are real-time information management systems which process and assess multi-sensor data, and present the best options to a decision maker. The effectiveness of current multiple target recognition systems is limited by the increasing speed of modern weapon systems, and the increasing number of different types of sensors. The most important characteristic of sensor data in multiple target tracking is the uncertainty of its origin. This uncertainty can arise not only from clutter, interference and multi-path effects, but also from multiple targets in the same neighborhood. A hybrid artificial neural network and expert system approach can significantly enhance the performance of current multiple target tracking systems. Here, we propose a hybrid neural network/expert system approach to multiple target recognition based on our in-house hybrid neural network/expert system development tool NueX. In particular we propose to develop a hybrid neural network knowledge based multiple target recognition system, and demonstrate feasibility by implementing a prototype demonstration. Our proposed system would correlate multi-sensor data to provide target classification and threat assessment.

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Such a tactical decision would greatly ease the workload on the ship commander.

CHENG TECHNOLOGY & SERVICES, INC.
259 SAN GERONIMO WAY
94086, CA 94086
Phone: (408) 720-9912

Topic#: 91-215 ID#: 10933
Office: NAPC
Contract #: N00140-91-C-3268
PI: T. Cheng

Title: High Speed Diesel Fuel Injection Techniques

Abstract: A new concept utilizing a computer control pulse network to drive a two-phase flow diesel engine to electronically control the timing, advanced angle, pressure, and injection duration, which is mechanically simple and compact. The commercial type application will be to all the new generation diesel engines in the future. The diesel cycle started with injecting coal powder, but until a mechanical fuel injector was invented by Cummins, it was not a viable commercial engine. This invention may be the next step in advancing diesel technology. The proposed technology directly converts electric energy into pressure pulse of short duration without mechanically moving parts.

CHI SYSTEMS, INC.
GWYNEDD PLAZA III
SPRING HOUSE, PA 19477
Phone: (215) 542-1400

Topic#: 91-310 ID#: 12908
Office: SPAWARS
Contract #:
PI: James Stokes

Title: Voice Data Entry for NISTARS

Abstract: The proposed effort initiates the development of a voice data entry capability for NISTARS warehouse workstations. The approach focuses on the design of the voice interface for a single workstation type, at the level of the human/machine dialog. The design process will be driven by two principal concerns: controlling the impact of recognition errors on interface performance and alternately on worker productivity; and integrating secondary, voice-related interface activities with worker production tasks. The detailed structure for information exchange across the voice channel specified in the design will define the capabilities and limitations of the fully implemented NISTARS voice data entry system. The completed design will include variants to encompass visual and auditory feedback, design options which drastically alter structural choices. A plan will be developed for implementation of the voice data entry system as designed. Based on the performance implications of the design and the projected implementation and maintenance costs, a cost benefit assessment will be performed.

COMMONWEALTH TECHNOLOGY, INC.
5875 BARCLAY DRIVE
ALEXANDRIA, VA 22310
Phone: () -

Topic#: 91-306 ID#: 13838
Office: MCRDAC
Contract #:
PI: ROBERT A. HUNSICER

Title: ELECTRICAL RE-CHARGE SYSTEM

Abstract: PROPOSES A SECONDARY BATTERY ABLE TO RECHARGE. THE PROJECT DELIVERABLE WILL BE A FINAL SYSTEMS CONCEPT DOCUMENT. VARIOUS FORMS OF ENERGY CONVERSIONS WILL BE STUDIED. FAILURES AS WELL AS SUCCESSES WILL BE DOCUMENTED. THE FORMS OF ENERGY CONVERSION WILL INCLUDE CHEMICAL/ELECTRICAL CONVERSIONS (NEW BATTERY SYSTEMS); THERMAL/ ELECTRICAL CONVERSIONS; MODERN PHOTOVOLTAIC CONVERSIONS; PIEZO-ELECTRIC CONVERSION; VOLTAGE TRANSFORMATION; ENERGY STORAGE USING DOUBLE LAYER CAPACITORS AND EUTECTIC SALT MIXTURES.

COMPUTER COMMAND AND CONTROL CO
2300 CHESTNUT STREET
PHILADELPHIA, PA 19103
Phone: (215) 854-0555

Topic#: 91-300 ID#: 12841
Office: ONT
Contract #: N60921-92-C-0045
PI: Dr Xiang Ge

Title: Reverse Engineering of Assembly Code

Abstract: The Navy possesses millions of lines of real-time programs in the CMS-2 high level language within which are embedded numerous segments of Direct code in the MACRO assembly language. The interfaces between the two levels of

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languages are in some cases specified through Directives, but are mostly implicit. The reverse engineering mix of high level and low level languages poses a new problem not attacked in the past. The proposal offers an innovative approach, similar to that being presently employed in a Navy sponsored project for reverse engineering CMS-2 programs to Ada. The proposal will in fact create the capability to reengineer MACRO and mixed CMS-2/MACRO programs. The basic innovation in the approach uses an Entity-Relation-Attribute (ERA) graph, for both representing the program in memory and for displaying and updating it in a CASE system. This representation will be used by a variety of proposed algorithms that explicitly resolve the implicit relationships and greedily simplify the graph. It is proposed to utilize Digiml's DEC design and its Methodology Implementation Facility (MIF) for customizing DEC design. This system is available through a cooperation agreement with Digital. The proposed automation will: 1) define the interfaces between segments of assembly level Direct code and the CMS-2 high level code within which they are embedded, 2) define interfaces between these programs and the executive system that controls the computer operation, 3) perform program decompilation to condense the Direct code to a more readable higher level language, 4) generate graph representations of the design of the Direct code and its interfaces to the CMS-2 code (tree and data flow graphs), 5) associate explanatory text with the graphs, 6) display the graphics and text to facilitate understanding by a user engaged in program maintenance or conversion, 7) provide interactive support for graphically updating program design and 8) produce documentation in report form. Phase I will consist of designing the proposed system. Phase II will consist of system implementation.

COMPUTERS AND CONCEPTS ASSOC.

17411 LAKEVIEW DRIVE
MORGAN HILL, CA 95037
Phone: (408) 723-5103

Topic#: 91-339 ID#: 14009
Office: NSWCWO
Contract #: N60921-91-C-A389
PI: Michael W. Evans

Title: Software Survival Skills Workshop

Abstract: The case study workshop provides a cost effective, accessible way to assist managers, engineering, configuration management, and assurance personnel to focus on, and respond effectively to, the problems which typically arise during development and enables participants to learn the tools, techniques, and methods essential to successful software engineering. The case will be appropriate to the NISMIC environment and systems application requirements and structured to simulate actual project development from beginning to software acceptance. Participants learn how to initiate and evaluate the software planning process; to identify, provide, and evaluate requirements; to evaluate the design process and monitor the coding process; to effectively manage test and integration; to develop and evaluate project management and controls; to initiate and control configuration management; and, to plan and conduct effective audits, reviews, and inspections.

COMPUTERS AND CONCEPTS ASSOC.

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Topic#: 91-339 ID#: 14010
Office: NSWCWO
Contract #: N60921-91-C-A388
PI: Michael W. Evans

Title: The Risk Assessment Support Tool (RAST)

Abstract: The Risk Assessment Support Tool (RAST) would be an automated adaptation of an existing and well evolved assessment process and associated comprehensive questionnaire. A description of an assessment being planned will be interactively described to RAST and the RAST would select the appropriate questions and criteria to be used for that assessment. The knowledge base for RAST is a table of project characteristics adapted from DOD 7935.1. The assessment data base consists of coded questionnaire files with weights assigned for evaluation of answers to the assessment questions. The RAST will be PC based and will print out completed questionnaire sets automatically for review.

CONDUCTUS, INC.

969 WEST MAUDE AVENUE
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Topic#: 91-316 ID#: 13724
Office: NAVAIR
Contract #:
PI: Randy W. Simon

Title: Cryocooled HTS Josephson Electronics

Abstract: The discovery of high-temperature superconductivity has opened up the possibility of developing high-performance electronic and sensor systems based on Superconducting Quantum Interference Devices (SQUIDs) and on Josephson junction

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

based Integrated circuits (JJIC's) that operate at temperatures near the boiling point of liquid nitrogen. Recent advances in HTS Josephson junction technology at Conductus have greatly enhanced the viability of near-term demonstrations of significant circuits for aviation missions. Both magnetometer systems for magnetic anomaly detection and high-performance signal processing circuits are now within the scope of near-term demonstration. The current state-of-the-art in cryocooler technology provides the opportunity for integrated systems combining SQUID or JJIC-based circuits within self-contained cryogenic packages. With the proper identification of a candidate Josephson circuit and an appropriate cryocooler system to the cooling and noise-immunity needs of the Josephson circuit, a viable superconducting system can be demonstrated that obviates the need for cryogen-based cooling and provides a reliable means of inserting superconductive electronics into real aviation systems.

CREARE, INC.
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Topic#: 91-101 ID#: 12292
Office: NAVSEA
Contract #: N00024-92-C-4075
PI: Wdodd STACY

Title: INNOVATIVE STIRLING CYCLE REFRIGERATOR

Abstract: We propose using an innovative Stirling cooler for shipboard refrigeration. This design eliminates the friction, wear, and seal leakage problems of current Stirling coolers, and will provide a high reliability, long-life refrigerator. The use of near ambient pressure air as the working fluid makes this machine environmentally benign and immune to problems with leakage in the cooler envelope. The refrigerator is an array of small cooling "modules" making it insensitive to failures of any individual module. This design also enables very simple scaling to different cooling capacities by the addition or removal of cooling modules. The thermodynamic basis and critical component reliability for this machine design have already been experimentally demonstrated in previous work. The feasibility demonstration in Phase I will therefore focus on scaling and optimizing the thermodynamic parameters and physical configuration to this specific application and an experimental verification of our design method at these conditions. The design will address cooling performance, dimensions, integration requirements, weight, and fabrication methodology, and will set the stage for fabrication and testing in the second phase.

CREE RESEARCH, INC.
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DURHAM, NC 27713
Phone: (919) 361-5709

Topic#: 91-292 ID#: 12986
Office: ONR
Contract #:
PI: Dr. John W. Palmour

Title: Development of 6H-SiC CMOS Transistors for Insertion into a 3500C Operational Amplifier

Abstract: Silicon carbide possesses a unique combination of properties, not available from other more common semiconductors, which allow it to operate in certain severe environments. These properties include a wide bandgap, a high melting point, high breakdown electric field, and high thermal conductivity, as well as excellent resistance to chemical attack and mechanical damage. As such, it is being examined throughout the world for employment in temperature, radiation and Exp resistant electronics, high frequency/high power devices as well as blue LEDs and UV photo-detectors. Although, the excellent properties of SiC have been known since the 1950's, its development as a semiconductor has been severely limited until recently, primarily because of difficulty in growing high quality, large area, single crystal-line material from which to fabricate devices. The development of a process for growing single crystal boules of 6H-SiC at North Carolina State University and the further improvement in process control and crystal size and quality at Cree Research, Inc. has lead to rapid advances in SiC device development and performance. Cree is in production of the world's only commercially viable blue light emitting diode (LED) using 1 inch diameter wafers produced from these boules and is in the process of scaling up to 1.375 inch production. Cree has demonstrated a complete range of field-effect transistors (MOSFETs, MESFETs, and JFETs) in SiC which can operate at temperatures in excess of 400°C. In many high temperature applications, analog circuits will be needed to provide an interface to high temperature sensors or actuators. These circuits will be required to provide conditioning of low level sensor signals and the transmission of signals over long cables in noisy environments. It is proposed to develop 6H-SiC CMOS transistors during Phase I for insertion into an operational amplifier which can operate continuously at 350-C in Phase II.

DAEDALUS ENTERPRISES, INC.
P.O. BOX 1869
ANN ARBOR, MI 48106

Topic#: 91-014 ID#: 10560
Office: USMC
Contract #: N61331-92-C-0024

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Phone: (313) 769-5649

PI: Randall W. Zywicki

Title: Large Area Fast Spectroradiometer

Abstract: The U.S. Navy and Marine corps has identified the need for a fast field-portable spectroradiometer. This capability will allow marine corps and Navy personnel to detect targets in a cluttered background. The targets can range from mines to tanks and rocket launchers. The backgrounds can range from rocks and small bushes that clutter minefield scenes to dense foliage that conceal large vehicle. Multispectral scene analysis can be used to detect targets in camouflaged or concealed backgrounds. To meet this application, a design capable of acquiring 256 spectral bands over a 375 by 500 pixel area is proposed. A built-in computer and digital signal processor will perform radiometric corrections, banding, band ratioing, and image processing tasks. An innovative design that combines high throughput, imaging, holographic gratings with high frame rate OCD-s, a framing mirror, state-of-the-art digital signal processors, flat panel displays, and large capacity digital recorders is proposed for the Large Area, Fast spectroradiometer. The instrument will give Marine corps and Navy personnel a field portable instrument that can image a multi-spectral scene in less than 0.25 sec and process and display the data in 20-30 seconds.

DAEDALUS RESEARCH, INC.

1533 SUMAC DRIVE

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Topic#: 91-212

ID#: 10849

Office: NAPC

Contract #: N00140-91-C-3289

PI: Edward H Allen, PhD

Title: VTOL PROPULSION BOOST BY MEANS OF TORQUE AUGMENTATION FROM AN ELECTRIC MACHINE.

Abstract: Contractor will examine the feasibility of hybrid powerplants in small V/STOL air vehicles that combine internal combustion (IC) engines and pulsed power electrical augmentation machines. The IC engines will be sized to meet the average power needs of the mission while the electrical machine will need above-average peaks (such as occur during take-off and landing) and be reconfigured to supply power during periods of below average demand. The long term objective of hybrid powerplants is to permit the application of numerous, especially rotary-type IC engines to V/STOL configurations, more-or-less eliminating the need for special, higher power engine designs for such applications -at least in the small output ranges contemplated for unmanned air vehicles.

DAI, INC.

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Topic#: 91-147

ID#: 12243

Office: NAVSEA

Contract #: N00024-92-C-4068

PI: WILLIAM B HUMPHREY

Title: MODELING SHIPBUILDING CONTRACT CHANGES

Abstract: This Phase I SBIR research effort is directed at the exploratory development of a prototype automated mathematical model that will function on a microcomputer and be capable of forecasting the cost and schedule effects of individual ship contract changes. The technical objectives of DAI's proposed Phase I research effort will be first to demonstrate the technical feasibility of establishing a relationship among the resources required to accomplish a contractual change to a ship construction contract and the technical, cost, and schedule metrics and projections; second, to develop flow charts which define the logic flow inputs, decision points and outputs which represent the process model; and third, to develop, test, validate and document the model.

DANIEL H WAGNER ASSOC.

STATION SQUARE TWO

PAOLI, PA 19301

Phone: (215) 644-3400

Topic#: 91-054

ID#: 11526

Office: SPAWARS

Contract #: N0039-91-C-0232

PI: Bernard J. McCabe

Title: Fluctuation Processes for use in Acoustic Detection Models

Abstract: Operations analysis of Naval engagements requires a model for the detection process, and in particular, for passive acoustic sensors. Such models depend in turn on having a model for acoustic fluctuations, a term which typically describes all residual uncertainty in the sonar equation components. This project will develop a rationale for an acoustic fluctuation process which is a composite of processes which represent uncertainties and variations in component processes that include: transmission loss, background noise, target radiated noise, and recognition differential. Phase I will mainly involve a review of potential sources of data for each of the components and for the composite process. Each component will be fit to standard stochastic

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process models and the results tested for goodness-of-fit. Plans will also be made to fill gaps in the data base by interpolation and extrapolation of the parameters in the fitted model.

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Topic#: 91-111 ID#: 11991
Office: NAVSEA
Contract #: N00024-92-C-4023
PI: ROBERT J. LIPSHUTZ

Title: ASW DATA FUSION A MONTE CARLO APPROACH

Abstract: The objective of this proposal is to improve an existing Monte Carlo tracker that fuses positive nonacoustic data and positive and negative acoustic data, yielding probability distributions for the target location and velocity. Five improvements are proposed: 1. Incorporate positive and negative information from towed arrays, 2. Incorporate Doppler information into the velocity estimates, 3. Account for a distribution of target depths correlated to the target speed, 4. Account for the correlation between target speed and signal strength, 5. Account for directional ambient noise. We plan a full suite of tests to measure the effectiveness of the tracker using both simulated data and real data collected from Navy exercises.

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Topic#: 91-126 ID#: 12087
Office: NAVSEA
Contract #: N00024-92-C-4010
PI: DAVID P KIERSTEAD

Title: PASSIVE TMA USING ITERATED KALMAN FILTERS AND GAUSSIAN SUMS

Abstract: DHWA proposes to develop algorithms for long-range, passive target motion analysis (TMA). The algorithms will use extended filters similar to those found in current algorithms (JASA, MPKAST, and MTST), but will unify and extend these techniques in important ways. We hope to eliminate most of the problems associated with current methods. The differences among current algorithms, and their limitations, are usually traceable to the coordinate system and the points at which linearizations are performed. Three principles emerge: a. Linearizations are unavoidable; b. Linearization points should be consistent—simultaneous linearizations should be performed about the same point, sequences of linearizations should be performed about points which form a track consistent with the motion model and the data; and c. The final solution should be independent of the coordinate system used to express it. We will use an iterative procedure which produces the likelihood target track independent of the coordinate system. An information manager will combine the results of several trackers (operating under different hypotheses) to produce a composite, non-Gaussian TMA solution. The system will account for critical information which goes unprocessed in current algorithms. Examples are: acoustic predictions; periods of gain, loss, or holding; and known operating characteristics.

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Topic#: 91-172 ID#: 13465
Office: NSWC
Contract #: N60921-91-C-A309
PI: W R MONACH

Title: PREDICTED TACTICS OF ADVERSARIES

Abstract: The proposed project is to develop a database management system which will estimate the probable tactics and intentions of an adversary surface, airborne, or submarine target. This system will consist of routines to (1) access a database of potential enemy tactics and intentions, (2) create these tactics and intentions entries by sophisticated automated and manual methods, and (3) estimate the probable tactics and intentions of targets based on current intelligence and other tactical data. This information on probable enemy tactics and intentions will then be fed into a system which will predict target location and produce recommended search and surveillance plans. In Phase I we will write a definitive paper study describing the recommended design for this system and demonstrating its feasibility. In particular, we will discuss data sources and algorithm and interface design. This will prepare for Phase II, in which a prototype full scale system will be developed. In Phase III, we intend to integrate it into an operational Navy target localization and search and surveillance planning system. In this project we will use techniques from the Surface Search and Surveillance Planning System (SSPS) and the PACSEARCH historical analysis database management system to model and analyze target tactics.

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

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Topic#: 91-184 ID#: 13579
Office: NSWC
Contract #: N60921-91-C-A356
PI: W R MONACH

Title: PROTOTYPE AAW DATA FUSION AND COMMAND SUPPORT SYSTEM PADCS

Abstract: The proposed project is to develop a Prototype AAW Data Fusion and Command Support System (PADCS) which will (1) provide a continuous and easily assimilated display of the best information concerning the location and possible intentions of enemy airborne units based on (a) the automatic input of current tactical data, both organic and offboard/SCI and (b) the management of this track data using advanced data fusion techniques, using all available intelligence and contact attribute data such as ELINT, estimates of probable enemy tactics, and previous unsuccessful search for the targets, and (2) provide tools for decision support, including ones which recommend plans for asset management, battle management and assessment, sensor management, communications assessment, cover and deception effectiveness, screen/formation effectiveness, readiness assessment and replenishment planning, and detailed assessment of I&W data. In Phase I, we will develop a detailed Type A document for PADCS and a prototype demonstration system. The demonstration system will contain multiple-hypothesis correlation algorithms, fuse all available data, and recommend plans for asset, sensor, and battle management. In Phase II, we intend to improve and develop the system into a full scale PADCS. In Phase III, we intend to integrate it into an operational Navy AAW system such as Aegis.

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Topic#: 91-185 ID#: 13587
Office: NSWC
Contract #: N60291-91-C-A343
PI: WALTER R STROMQUIST

Title: AN INFORMATION SYSTEM FOR ECM/ESM CONTACTS

Abstract: The proposed project is to develop an information system for processing ECM/ESM contact reports on board a Navy surface ship. The system will combine reports from organic and remote (OTH) sensors with other available information and with reasonable assumptions concerning target tactics in order to provide information of value to the mission commander. Our approach is to combine two existing systems, SSPS and MATCH, under development by this firm. SSPS is a versatile single-target tracker capable of proposing search plans and evaluating plans designed by the user. MATCH is a correlation algorithm designed to process large report volumes using ELINT and other attributes for correlation. We will supplement this combination with new techniques for automatic recognition of tactically significant target behavior and for use of an intelligence data base. We will also investigate use of new single-target tracking techniques in this application.

DCS CORP.
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Topic#: 91-076 ID#: 13202
Office: NAVAIR
Contract #: N00019-91-C-0268
PI: Dave Thompson

Title: AH-IW Attack Helicopter Cockpit Workload Reduction

Abstract: The complex avionics and sophisticated tactics necessary to deliver precision guided munitions and counter modern military threats place a significant burden on the capabilities of the attack helicopter and the physical and cognitive capacities of their aircrew. These constraints dictate that future avionic designs and cockpit layouts alleviate some of the aircrew's workload during ingress, weapons employment, and egress to optimize their performance. Crew workload reduction is a major design consideration for upgrades to the AH-IW cockpit and avionics suite. DCS proposes to conduct research which will define candidate tasks suitable for a workload reduction program, and then identify available technologies to automate or minimize these cumbersome tasks. The resultant data will be organized and recommendations provided for an integrated solution to the deficiencies in terms of both technology and human factors. Considerations for increased survivability, greater growth potential, and ease of integration will also be incorporated into the recommendations. DCS will propose a viable alternative that is cost-effective and technically feasible.

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Topic#: 91-218 ID#: 10678
Office: NATC
Contract #: N00421-92-C-0003
PI: Richard T. Flaherty

Title: Automated Forward Looking Infrared (FLIR) Resolution Measurement Development

Abstract: Minimum Resolvable Temperature (MRT) is probably the best known and most useful FLIR specification parameter. MRT is a figure of merit which measures both the sensitivity and spatial resolution of a FLIR and is directly related to field performance. The traditional MRT test requires trained observers and is labor intensive. Since MRT is a subjective measure, the results vary between observers. There is a need to develop a test system which can accurately and objectively measure MRT in the lab and in the field environment. DCS has developed a technique for objective MRT which can be modified for the Naval aircraft environment. This requires development of a suitable relay scheme to capture the displayed test pattern and then to register this image in an image processor. The DCS AutoMRT measurement technique will be modified to reflect these improvements. The final step will be to incorporate these modifications into a design specification for producing a prototype AutoMRT unit.

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Phone: (703) 683-8430

Topic#: 91-222 ID#: 11890
Office: NATC
Contract #: N00421-92-C-0005
PI: Abraham Isser

Title: Integrated Passive Targeting Equipment

Abstract: DCS will conduct a systematic survey and evaluation of currently available passive day/night targeting systems potentially useful on the LAMPS MK III helicopter. The goal will be to highlight the system(s) providing the best complement to the LAMPS helicopter and its ASW/anti-surface missions from among airborne passive targeting systems available worldwide. This will be accomplished by first reviewing the functional requirements of such a system in light of the specific LAMPS missions and existing avionics. A critical systems requirement document will be developed and used to identify candidate NDI and mature hardware solutions. An analysis phase will follow with critical comparisons between candidate capabilities, reliability and maintainability requirements, sensor performance modeling, airframe and user interface requirements, and size, weight and power requirements. Finally an integrated system test plan will be prepared so that the Navy will be able to validate conclusions of this study in the field.

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Topic#: 91-320 ID#: 14066
Office: NAVAIR
Contract #:
PI: Richard J. Riordan

Title: Advanced Integrated Helmet-Display Systems

Abstract: The objective of this project will be to build a comprehensive compendium of research, design, and operational considerations for integrated helmet display systems for use in tactical aircraft. The differing design considerations and operational scenarios of both fixed-wing aircraft and helicopters will be considered. Applicable standards and specifications applied to helmet and display equipment will be examined to identify any limitations or conflicts that they may impose on system development. The broad range of research and system development work by both government and industry will be reviewed. Development and operational testing of helmet display components and systems will be reviewed for "lessons learned". Technology development roadmaps will be assessed to identify technology gaps and transition opportunities. The combined assessments will form the basis of recommended design and acceptance criteria for performance optimized, multi-mission advanced integrated helmet display systems.

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Topic#: 91-323 ID#: 14073
Office: NAVAIR
Contract #:
PI: David L. Thompson

Title: Human Factor Considerations for Tactical Aircraft Symbol Sets

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Abstract: The mission requirements and operational environments of today's tactical fighters tax the cognitive skills of the aircrew and the advent of new and more sophisticated systems have rapidly increased the amount of displayed information available to the operators. The result is cluttered and confusing formats and an excessive number of display pages. DCS proposes new tactical aircraft symbol sets utilizing a methodology based on operational and mission requirements, technological considerations, and human factors. The resulting symbol sets will be distributed in an intuitive menu format and automatically activated when possible. The DCS approach is designed to promote format flexibility, reduce aircrew workload, and enhance mission effectiveness.

DECISION DYNAMICS, INC.
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Topic#: 91-147 ID#: 12413
Office: NAVSEA
Contract #: N00024-92-C-4069
PI: LOUIS ALFELD DSC

Title: A MODEL OF SHIPBUILDING CHANGES

Abstract: This proposal describes a prototype simulation model of the shipbuilding process that predicts the cost and schedule impact (increase, decrease, no change) of individual ship construction contract changes. Such construction contract changes include additions, deletions, modifications, interruption and acceleration of work processes or materials. The model clearly identifies the core cost of each change as well as the delay and disruption cost associated with each change. Cost calculations result from an assessment of the impact of each contract change on work scope, productivity and schedule pressures. Model development is based on the proposer's extensive research and direct experience with construction and shipbuilding simulation models. The model includes a flow chart of the decision steps within the construction change process. The model runs on a PC using commercially available software.

DECISION-SCIENCE APPLICATIONS, INC.
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Topic#: 91-153 ID#: 13635
Office: NSWC
Contract #: N60921-91-C-0187
PI: Eric S. Baker

Title: Dual Mode Seeker Testbed

Abstract: Decision-Science Applications, Inc. (DSA) proposes to develop and demonstrate a dual-mode seeker testbed (DMST) capable of evaluating mode-switching criteria based on integrated sensor phenomenology. The application of this criteria will allow the missile to discriminate against background interference and clutter as well as passive and active countermeasures. The mode-switching criteria will be implemented in algorithms for combining RF Doppler and IR tracker outputs in order to minimize each sensor's limitations and complement their performance. The significance of using a simulation testbed to investigate RF/IR dual mode sensor integration and fusion algorithms is underscored by the ability to systematically explore a mix of conditions in a realistic situation. Thus, a thorough evaluation of concept effectiveness can be performed. DSA plans to develop an innovative testbed environment that will provide meaningful and illustrative results that characterize dual mode sensor integration algorithm performance.

DEEGAN RESEARCH GROUP, INC.
39 PORTER LANE
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Topic#: 91-202 ID#: 10589
Office: NUSC
Contract #: N66604-92-C-0299
PI: Thierry Deegan

Title: Combined Models for Combat System Assessment

Abstract: Tactical performance, reliability, and cost are complimentary factors in system design but there is no one tool to effectively compare attributes in these disparate disciplines. There are computer programs to estimate system performance against the threat, computer models to predict reliability in a given environment, and cost models to estimate both acquisition and operations over the life of a system. These modeling programs are unique and independent. None considers the factors of the others. Decision makers in the procurement process must weigh subjectively the comparative model results for performance, reliability, and cost subjectively. A single integrated modeling program that includes tactical performance, reliability, add cost would give project managers the capability to compare directly the factors that control the design of his system. The proposed effort investigates the existing modeling programs for tactical performance, reliability, and cost. It will

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determine the best method to combine them or their essential algorithms into a unified system analysis model and will present a design for a model that can be implemented in Phase II.

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Topic#: 91-204 ID#: 10617
Office: NUSC
Contract #: N66604-92-C-0344
PI: David W. Conway

Title: HF Power Supply for Submarine Combat Systems

Abstract: Reliable and continuous power to submarine electronics is essential for mission execution and for the safe operation of the ship. Digital electronics cannot continue operation through even very short power outages caused by bus transfer devices, that have historically been sufficient for analog combat systems. The restart and reload that a digital system must execute after a short power interruption and the subsequent confusion that results while operators recover the tactical picture are a hazard to the ship. A central, auctioneered DC powersystem has been proposed to provide uninterruptible power. This system is heavy, complex, and potentially unreliable. An alternative to the DC system is proposed. New materials are available that allow a doubling of the power density of the power supplies on the electronic cabinets. The proposed concept uses two auctioneered power supplies on each drawer, either of which can carry the load of the drawer. The work proposed takes an existing 100-watt unit and scales it up to a four-unit network with approximately 1,000 watts to demonstrate efficiency, stability, load sharing, and low electromagnetic emissions.

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Topic#: 91-205 ID#: 10595
Office: NUSC
Contract #: N66604-92-C-0300
PI: Thierry Deegan

Title: Submarine Combat System Architecture with Workstations

Abstract: Current submarine combat system architectures reflect a weak linkage from operational requirements to implementation. Architectures range from those with large central computers to those with clustered distributed processors. Single points of failure, data bottlenecks, and processor conflicts result from architectures that do not have operational requirements as their basis. The effort proposed uses an expert in submarine operational requirements and combat system reliability modeling to formulate an architectural model. It is expected that the model will result in a basic architecture that will include robust workstations about a redundant central data handler. The model will iterate architectural parameters about this concept to determine the operationally significant characteristics of the system.

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Topic#: 91-309 ID#: 13680
Office: MCRDAC
Contract #:
PI: Dr. Paul Cowell

Title: Tactical Cryptologic Exploitation of Over-The-Horizon (OTH) Radar

Abstract: Navy combatant ships have a requirement to detect and track all ships, aircraft and missiles of tactical significance to the battle group. EMCON by own forces or opposing forces reduces the effectiveness of the Navy's cryptologic systems, creating a need to regain vital lost information. Over-the-horizon radars detect and track aircraft and ships at long ranges by bistatically processing ionospheric backscatter radiation. This proposal exploits the use of existing OTH radars to enhance U.S. Navy cryptologic capabilities. This work will define and develop the required signal processing algorithms, provide a system design for bistatic processing of OTH radar signals, and evaluate the performance of the recommended system design and its potential tactical value to a battle group commander.

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Topic#: 91-016 ID#: 10745
Office: SPAWARS
Contract #: N00039-92-C-0063
PI: STEPHEN J. URBAN

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Title: DATA COMPRESSION OF GEOPHYSICAL DATA

Abstract: The purpose of the proposed program is to investigate, design, and implement a data compression technique to support the timely transfer of large volumes of geophysical data on limited bandwidth data links. Delta proposes to analyze the technical requirements for the compression system, investigate a wide range of compression techniques, measure the compression of the most promising candidate techniques by use of computer simulation, select the best technique, and prepare a compression system design using this technique.

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Topic#: 91-277 ID#: 11697
Office: NWC
Contract #: N60530-91-C-0232
PI: ALLEN R. DEUTERMANN

Title: HORACE DATA CHANNEL EQUIPMENT

Abstract: This document is a technical proposal to develop Data channel equipment which meets the HORACE protocol (NRC TP 7025). The equipment consists of a video encoder with integral data multiplexer and a companion data demultiplexer. This development will permit transmission of digital TV signals and PCM encoded signals over a single data link. The proposed system, which conforms to the standard, can operate over a wide range of PCM data rates, without operator intervention.

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Topic#: 91-052 ID#: 11510
Office: SPAWARS
Contract #: N00039-91-C-0218
PI: Jeanne Secunda

Title: Integrated Training System Architecture In Support of Active Sonar Systems

Abstract: The U.S. fleet must deploy mobile active sonar surveillance assets, including monostatic, bistatic, and multistatic platforms. Critical to effective employment of these assets is the availability of a training process which effectively addresses the unique needs of mobile active sonar personnel. This research and development project will develop an integrated training system architecture derived from such training concepts as learning theory instruction, trainee motivation, and cognitive science. The end result of this research will include a training system which encompasses all facets of knowledge transfer and skill proficiency and includes all essential learning environments: -classroom instruction -shore based simulation/stimulation -on-board/workstation/deak top trainer -embedded capability In light of continuing budget and resource constraints specific attention will be paid to evolving manpower reduction techniques referred to under the general heading of intelligent tutoring systems. By integrating all facets of the training pipeline in this manner, SPAWAR will benefit from the full range and variety of research related to the cognitive structure of curriculum and instructional strategies.

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Topic#: 91-133 ID#: 12143
Office: NAVSEA
Contract #: N00024-92-C-4041
PI: F H BLOCH

Title: AN OPPORTUNITY FOR COST AVOIDANCE THROUGH INFUSION OF COMMERCIAL PROCESSOR TECHNOLOGY

Abstract: Requirements for higher throughput capabilities drive system designers to special purpose computers, or processors. These are often combinations of modular processing resources, memory, control, and I/O. As the number and capability of these required to solve each problem grows, the architecture, or "glue", that holds them together becomes of utmost importance. Current processing resources, whether for signal or information processing are often bottle necked by the system with enough speed so that the processors are not idle. Many existing projects have developed application software which is currently adequate but which will require enhancement or expansion in the future to meet the new threats. Much of this application enhancement could be performed in a non-military system if the existing software could be executed in a commercial, modularly configurable processor system using state-of-the-art processing resources. This would allow for maintenance of existing software and permit resource expansion so that additional sensors could be processed, augmented processing modes could be added, or additional bandwidth could be used. These capabilities could be added without the complete redevelopment of the application software if the commercial system architecture were capable of efficiently executing the existing software while allowing for the required

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

enhancements to be added. Advanced processor architectures which use new technology hardware and software for computing and memory resources could provide the improved performance necessary for enhanced threat detection.

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Topic#: 91-135 ID#: 12161
Office: NAVSEA
Contract #: N00024-92-C-4037
PI: JEANNE SECUNDA

Title: SUBMARINE COUNTER MEASURES AGAINST NEW TECHNOLOGY ACTIVE SONARS

Abstract: New technology active sonars represent an increasingly dangerous threat to the US submarine fleet. Jamming and other countermeasure strategies are needed to render this technology ineffective. Innovative techniques for self-screening jamming, stand-off jamming, and evasive maneuvering are proposed along with a methodology for identifying additional alternatives and methods for evaluation. Nullification of the threat from both monostatic and multistatic sonars is considered along with the consequent vulnerability to complementary passive sonars. One immediate consequence of the preliminary results presented here is that a single, monostatic active sonar can be readily jammed with only the most modest equipment on board a target submarine. Another consequence is that a spatially-diverse multistatic sonar system with inter-receiver passive processing capability (including direct-blast processing) designed to operate in the presence of acoustic countermeasures can probably be defeated only with multiple, sophisticated, stand-off jammers.

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Topic#: 91-139 ID#: 12190
Office: NAVSEA
Contract #: N00024-92-C-4042
PI: DAVID W MURRAY

Title: MITIGATING THE PROBLEMS OF MIGRATING AN/UYS-1 APPLICATIONS TO THE AN/UYS-2

Abstract: Processing requirements for next generation sonar systems will require the use of the AN/UYS-2. This new generation standard signal processor is a parallel distributed processing system that is based on a state-of-the-art data flow methodology using new languages such as Ada, the Processing Graph Method Signal Processing Graph Notation (PGM/SPGN), and the Primitive Interface Definition (PID) Language. Current sonar signal processing applications are programmed for the AN/UYS-1, using SPL/I and SPL Assembly Language. Evolving software methodologies have been employed during the life cycle of the AN/UYS-1; each methodology will have its own unique issues associated with migration to the AN/UYS-2. Programming an application on the AN/UYS-1 and the AN/UYS-2 is similar in some fundamental ways, but there are many significant differences. Some of the major differences between applications developed for the AN/UYS-1 and those developed for the AN/UYS-2 include: -Programming languages are different. -No one-to-one mapping between computer software configuration items (CSCI) exists. -Each architecture has adapted a different run-time support methodology which impacts event scheduling, data management and multiple channel processing. -Fixed point versus floating point hardware implementations. -Operational differences include static versus dynamic reconfiguration capability. This effort will focus on techniques and computer-assisted implementation of these techniques which are needed to expedite the migration of existing (functionally correct) application software from the AN/UYS-1 to the AN/UYS-2 environment. Without such techniques and tools, the transition will be costly and time consuming.

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Topic#: 91-331 ID#: 14103
Office: NAVAIR
Contract #:
PI: Fred H. Bloch

Title: Single Channel Sonobuoy Modular Acoustic Processor (MAP)

Abstract: The proposed Phase I effort will define a single channel sonobuoy processor that is capable of processing any of the current and planned sonobuoys. In addition to the pure processing function, the processor will be capable of storing a significant amount of display data and of being reconfigured, to process data from different sensors, in a short amount of time. The processing system must also be capable of performing auxiliary functions, such as synchronizing with sonobuoy downlink commands, and performing I/O to display, post processing, and control functions. Synchronization between sensors, for cross correlation, for instance, will also be provided. In essence, these analyses will result in the determination of a system

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

architecture, allocating functions between the single channel Modular Acoustic Processor (MAP) and the common support functions and defining inter-function interfaces. As a precursor to definition of the processor, the initial Phase I effort will be to determine what functions the processor must implement, and what functional and physical performance is needed to meet the operational requirements. This will result in a specific recommendation for the internal structure of the processor, including interfaces, processing resources, and storage. Also included in the processor design will be the run time software structure, and the assignment of functions among the various levels of software that will execute on the processor.

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Topic#: 91-223 ID#: 10649
Office: NAVWPNS
Contract #: N60921-91-C-0153
PI: William N. Thurmes

Title: Synthesis of Ferroelectric Liquid Crystal Polymers for Non-linear Optics

Abstract: Virtually all materials currently used for second-order non-linear optical (NLO) applications are crystalline. Although they have high NLO susceptibilities, large crystals have the disadvantages of being both difficult to grow and shock-sensitive. Ferroelectric liquid crystals (FLCS) can self-assemble into materials capable of NLO activity, and are also easily modified. The FLCS made to date have moderately high NLO properties comparable to the most widely-used NLO crystals. However, FLCs have these NLO capabilities only in a narrow temperature range. We herein propose a path of research by which FLCs can be polymerized and frozen into a usable, NLO-active state, thereby forming easily made temperature-and shock-stable NLO-active plastics.

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Topic#: 91-340 ID#: 14049
Office: NSWCWO
Contract #:
PI: Andrew Shlapak

Title: SMALL COMPUTER SYSTEM DEVELOPMENT for SHIPBOARD WEAPON SYSTEM CREW TRAINING

Abstract: This effort proposes the development of an integrated system for the creation and the utilization of weapon system trainer. The trainer will incorporate simulations which are computer based and interactive by design. The focus of the effort is the utilization of present and near term technology to develop the trainer and an authoring adjunct to meet present Navy requirements and provide a platform for future trainers. The effort would evaluate and develop presently available software and hardware products. It would also attempt to develop usable video / graphic ale compression techniques that are cost effective. These techniques would provide evolutionary change in the presentation of material both M cost and efficiency. The effort would also evaluate the hardware necessary for the creation of a weapon system trainer. This interface would utilize CD-ROM technology. The effort would delineate the internal and external interfaces required, along with recommendations for hardware configurations appropriate for use in a shipboard environment. The user interface, both hardware and software, would be developed to be as intuitive as possible to save cost and to promote efficiency of use.

EDGE TECHNOLOGIES, INC.
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Phone: (317) 293-2165

Topic#: 91-256 ID#: 11022
Office: NWC
Contract #: N60530-91-C-0243
PI: Stephanie J. Simonson

Title: Efficient Optical Surface Finishing of Ultrahard Dome Materials

Abstract: Edge Technologies, Inc. proposes to design and build fixtures and modify existing production equipment and processes to experimentally machine ultra-hard domes provided by the Navy. The primary objective is to determine basic feasibility of amorphous silicon oxide chemical machining of cvd diamond domes by determining material removal rate and surface finish obtained under various experimental conditions.

EIC LABORATORIES, INC.
111 DOWNEY STREET
NORWOOD, MA 02062

Topic#: 91-175 ID#: 13483
Office: NSWC
Contract #: N60921-91-C-0156

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Phone: (617) 769-9450

PI: MICHAEL M CARRABBA

Title: A NONINTRUSIVE MONITOR FOR BIOCORROSION/BIOFOULING OF COATED METALS

Abstract: The understanding of mechanisms involved during microbiologically induced corrosion (MIC) of epoxy coated, nylon coated, and polyurethane coated metals in cooling systems is of the utmost importance to Naval operations. Of particular importance are the role of mechanisms by which marine algae and protozoa contribute to the biocorrosion process. There are concerns that electrochemical monitoring methods, through which the majority of biocorrosion information has been obtained, can perturb and interfere with the microbiologically developed ecosystem. This program proposes to study the MIC mechanisms of biocorrosion utilizing a nonintrusive spectroscopic Raman based fiber optic probe with near infrared (NIR) diode laser excitation. Fiber optic Raman spectroscopy will allow the in situ monitoring of aqueous environments by utilizing the characteristic vibrational modes of the reactive species. The Phase I objective is the determination of the feasibility of using NIR Raman spectroscopy as a nonintrusive monitor for biocorrosion studies. The Phase II objective is the development of a prototype fiber optic based transportable/portable shipboard environmental monitoring instrument that is capable of providing mechanistic as well as analytic information about biocorrosion.

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Phone: (617) 769-9450

Topic#: 91-179

ID#: 13513

Office: NSWC

Contract #: N60921-91-C-0157

PI: K M ABRAHAM

Title: INVESTIGATION OF THE RECHARGEABLE LITHIUM COBALT OXIDE CELL

Abstract: The Li/LixCoO₂, methyl formate rechargeable cell will be investigated with emphasis on the following technical objectives: -Determine the amount of Li that can be intercalated in and deintercalated from the CoO₂ structure without adverse effects on its rechargeability. -Establish the voltage limits for discharge and charge within which the cell can be cycled without affecting its rechargeability. -Examine the charge retention of the cell during storage at different temperatures as a function of its state-of-charge.

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Phone: (617) 769-9450

Topic#: 91-259

ID#: 11587

Office: NWC

Contract #: N60530-91-C-0241

PI: Martin W. Rupich

Title: Switchable Polymer Microwave Absorber

Abstract: It is proposed to develop a conductive polymer laminate that can be switched between microwave transmitting and absorbing states, and tuned to intermediate states, by the application of a small dc electrical current. The laminate would have a lightweight polymer construction and could be used to cover any surface as a countermeasure against radar detection. Phase I research will be directed at surveying several candidate conductive polymers for their ability to absorb X-band radiation when doped and transmit it when undoped. Promising materials will be assembled into standalone modulators having a battery-like construction allowing the conductive polymers to be reversibly cycled between transmitting and absorbing states by electrochemical oxidation/reduction. The feasibility of the approach will be demonstrated using in situ microwave spectroscopic measurements during operation of the modulator. The results will be used to specify materials for optimization and scale-up in Phase II.

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Phone: (617) 769-9450

Topic#: 91-333

ID#: 14156

Office: NAVAIR

Contract #:

PI: Dr. Stuart F. Cogan

Title: Electrochromic Canopies

Abstract: The development of variable transmittance electrochromic aircraft canopies is proposed. The canopies are intended for glare and thermal control applications. A wide visible and solar transmittance range is anticipated, allowing electronic displays to be read in high ambient light conditions without overdriving display elements and allowing active control of solar transmittance to augment thermal management in the cockpit. The Phase I objective is to identify electrochromic materials and systems appropriate for canopy applications. A comprehensive review of electrochromic materials and design configurations for

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canopies will be undertaken, and an analysis of anticipated switching performance made. The analysis will include development of an equivalent electric circuit analog that will allow the speed and uniformity of optical switching in full-sized canopies to be modeled. Several demonstration devices will be fabricated as part of the identification and evaluation program. The devices will demonstrate key features of the electro-chromic technology and aid in the identification and quantification of technical limitations. Anticipated switching characteristics of the demonstration devices include: a continuously adjustable luminous transmittance range of <10% to >75%; transmittance controlled by a DC voltage (-1.5V); "fail-safe" to a transparent state; minimal power consumption during switching; no power required to maintain a set transmittance level; and nonpolarizing and nonscattering optical modulation.

ELECTRO-OPTEK CORP.
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Topic#: 91-182 ID#: 13563
Office: NSWC
Contract #: N60921-91-C-0142
PI: C F HUANG

Title: DUAL-BAND INFRARED STARING FOCAL PLANE ARRAY

Abstract: We propose to develop a dual-band infrared staring focal plane array, each pixel of which consists of two separate detectors, fabricated intimately one atop the other by molecular beam epitaxy (MBE). One detector will respond to the medium wavelength infrared (MWIR, 3-5 micron) band and another to the long wavelength infrared (LWIR, 8-12 micron) band. The dual-band detector pixel is a multilayered stack containing an InSb photovoltaic junction on top of an InSb/InAs_{1-x}Sb_x heterojunction, and will response to two spectral bands separately but simultaneously. By using the established MBE techniques, a near-perfect lattice match between the multilayers will first be developed, followed by in-situ doping of the multilayers to complete the photojunctions of the stack. Fabrication of special effusion sources, development of epitaxial processes and demonstration of epitaxy will be made in phase I. The dual-band detector structure along with readout electronics will be optimized in Phase II. A prototype staring array of the dual-band detectors will be demonstrated in phase III, using non-SBIR funds. Once developed, the dual-band staring array will provide a powerful technique for discriminating dim targets against background, clutter, other targets and countermeasures.

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Topic#: 91-254 ID#: 11028
Office: NWC
Contract #: N60530-91-C-0258
PI: C. H. WANG

Title: Poly-Si infrared dynamic scene generator array

Abstract: We propose to develop an infrared (IR) dynamic scene generator, using an array of poly-Si resistors integrated with on-chip control electronics fabricated by a conventional Si process. The special features of the array are high resolution, high frame rate, low blooming, low weight, high yield and large array format. (up to 512 x 512). We will investigate the poly-Si resistor fabrication process on Si, design the on-chip circuit for IR emission control and design a processor for operating the array. Then, we will fabricate a small 5x7 test array to demonstrate the array concept. When successfully developed, each resistor can be programmed to emit IR radiation by heating the resistor to at least 1000 K with a controlled current. When all the resistors of the array are made to radiate independently, a 2-dimensional IR scene is created which is then projected onto a sensor for simulation or testing purposes. Due to its high frame rate, the array is ideal for projecting fast-changing scenes to simulate or test IR dynamics experienced by IR sensors. By virtue of the high yield of the poly-Si resistors, the fabrication of large arrays (e.g. 512x512) becomes possible so that high-resolution and large field-of-view scene generators are achievable. Being small size and low weight, the array is easily modularized for both laboratory and field ruggedized test sets.

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Topic#: 91-260 ID#: 11620
Office: NWC
Contract #: N60530-91-C-0234
PI: G. S. YOUNG

Title: Geometric processor for hardware-in-the-loop simulation.

Abstract: We propose to develop a geometric processor to perform realtime 2-dimensional image transformation, which includes rotation, translation and zooming, of target scenes to be used for hardware-in-the-loop simulation of imaging missile tracker

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

systems. In phase I, we will develop an overall geometric processor concept which can be implemented by off-the-shelf hardware, and design a full processor to meet the speed and realtime transformation requirements, followed by formulating a plan for phase II to construct the processor. The key processor elements to be designed are: architectures for three memories: frame buffer, video storage and display, an anti-aliasing lowpass filter, a system controller, an image coordinate transformer and a hi-linear pixel interpolator. The resultant processor will be capable of manipulating in realtime the geometrical orientations of a dynamic target, contained in a complex scene generated by a graphic computer, as might be seen by the tracker as it tracks the target during deployment. This realtime manipulation will enhance realism in simulation and reduce time and cost in evaluating tracker systems.

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Topic#: 91-303 ID#: 12794
Office: ONT
Contract #: N00014-92-C-
PI: E.L. DINES'

Title: Infrared standoff false target generator for enhancement of AAW and EW

Abstract: We propose to develop an aircraft-deployed infrared (IR) scene generator operating in the mid-wavelength IR (MWIR, 2-5 microns) spectral band for projecting false-target images at standoff ranges of 1 km or longer, to deflect the path of incoming IR-guided surface-to-air or air-to-air missiles. This IR countermeasure (IRCM) system can project false target images at a wide range of angular positions with respect to the aircraft. The path of the incoming enemy missile is thereby deflected, following a false pre-programmed MWIR image of the aircraft at some safe standoff distance from the real aircraft. The generator will use an array of micro resistors, (called MOS-resistors), integrated with on-chip control electronics fabricated by a conventional li process. This array will accept MWIR video imagery and then will convert it into an equivalent MWIR background scene to be combined with a pre-programmed target model. In phase I, we will perform the following key tasks: (1) design the mask layout for fabricating a 256x256 MOS-resistor array, (2) design the appropriate on-chip circuits for controlling the MWIR emission, (3) design the scanner-based projection optics for combining the background and target IR and (4) design a control processor to operate the array. Phase II will be devoted to fabricating the 256x256 array and integrating it to the control processor and optics for demonstrating a complete false-target generator system for countermeasure applications.

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Topic#: 91-251 ID#: 11035
Office: NWC
Contract #: N60530-91-C-0224
PI: WILLIAM H. PINKSTON

Title: IR-FIBER COUPLE DETECTOR/DEWAR ASSEMBLY

Abstract: Many IRE sensor systems using conventional optics incorporate a complex design for the detector element or array geometry, and in many cases use multiple detector/dewars per system in order to satisfy the field of view and resolution requirements. With the improvements in the performance of IR optical fibers, systems designers now have the option of collecting the in-coming radiation with shaped, oriented fiber bundles and routing the energy to simpler detector structures. This should result in lower cost, higher performance, higher reliability systems, assuming high transfer efficiency of the IR energy. This project will extend and further develop a unique expertise at Electro-Optical Systems Inc. for interfacing the IRE fibers to detectors in cryogenic packages. The resulting design and capability will be adaptable to a variety of fiber types and sizes, and detector configuration. A prototype system will be constructed and delivered to demonstrate the design performance, consisting of a 32 element two-wavelength detector dewar.

ELECTROCHEM, INC.
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Topic#: 91-306 ID#: 13840
Office: MCRDAC
Contract #:
PI: DR. VINOD JALAN

Title: THERMALLY ENERGIZED BATTERY RECHARGER

Abstract: A unique means of charging is proposed which will utilize non-burdensome sources of energy such as waste heat from existing heating/cooking devices and logistic fuels which are generally available to the individual marine. They will be reliable, compact, lightweight, durable, inexpensive, and capable of charging standard-issue batteries with no expenditure of human

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

energy and independent of environmental conditions.

ENERDYNE TECHNOLOGIES, INC.

8402 MAGNOLIA, SUITE C

SANTEE, CA 92071

Phone: (619) 562-3061

Title: Burst Data Flywheel

Abstract: The design and implementation of a device that converts burst telemetry data to a continuous and steady data stream. The Burst Data Flywheel will be able to convert the data bursts, which can have a duQ cycle of less than 1000:1, to a very stable stream. The output telemetry data stream frequency is derived by calculating the total number of burst pulses over a period of time. The derived output frequency will be identical to the original input telemetry stream when the system is operating normally. A target application is the inclusion of telemetry data into compressed video streams. Video streams have typically high data rates and are well suited to burst data inclusion.

Topic#: 91-276

ID#: 11716

Office: NWC

Contract #: N60530-91-C-0281

PI: David Moser

ENERGY/MATTER CONVERSION CORP. (EMC2)

9100 A CENTER STREET

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Phone: (703) 330-7790

Title: Advanced Systems and Technologies for Future Naval Warfare Electric Fusion Power for Submarines, Surface and Space Ships

Abstract: Future naval warfare could require higher-speed, greater coverage, and more powerful weapons in a sub-to-space fleet. Large power will be needed to drive advanced Propulsion and armaments (e.g. directed energy weapons) on the ships of this fleet. High-speed surface ships could be hydrofoils of cruiser class tonnage. With sufficient electric drive power these could cruise at 100-160 kts, and present very poor targets for attack while giving complete local control of the sea surface. In addition, much higher-power submarines, running on radiation-free quiet direct-electric drive, would expand the strike and defensive capabilities of the current undersea fleet. Concurrently, deployment of major manned space ships as space-based battle stations, with high-energy electric lasers for space and sea surface attack, would give the Navy great surveillance and monitoring capabilities, as well as enhanced communications. This sub/sea/space Navy of the 21st Century, could provide complete control of the sea lanes on a global basis. All three systems require a new order of electric power system performance. The proposed program will analyze a new concept for direct fusion-electric power, with no nuclear radiation hazards and little waste heat loads, currently DoD-funded, for such power systems, and apply these to future Navy missions.

Topic#: 91-303

ID#: 12805

Office: ONT

Contract #:

PI: Dr. Robert W. Bussard

ENGINEERING GEOMETRY SYSTEMS

275 E. SOUTH TEMPLE

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Title: A Flexible Concurrent Design System for Rapid Prototype Manufacturing

Abstract: Engineering Geometry Systems (EGS) will create a system specification for an integrated system for design and fabrication of custom parts for use in hydrodynamics experiments. The requirements of the system will be identified and a design will be proposed which is based on EGS underlying design for manufacturing technology. EGS technology is especially suited for this custom system since it encompasses B-spline feature based geometric modeling, integrated process planning capabilities with CNC code generation, rapid prototyping through stereolithography, and a modular client/server architecture. This technology is based on the Alpha 1 geometric modeling system, a powerful spline based solid modeling system developed at the University of Utah. This project has involved several million dollars of research investment supplied by contracting organizations including ONR, NSF, and DARPA.

Topic#: 91-296

ID#: 13057

Office: ONR

Contract #:

PI: Glenn W. McMinn

ENSCO, INC.

5400 PORT ROYAL ROAD

SPRINGFIELD, VA 22151

Topic#: 91-043

ID#: 11348

Office: SPAWARS

Contract #: N00039-92-C-0057

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Phone: (703) 321-9000

PI: Jay M. Jacobsmeier

Title: High Latitude Meteor Burst Communications for the Integrated Undersea Surveillance System (IUSS)

Abstract: The Navy's Anti-Submarine Warfare forces need a low cost, reliable and survivable long-haul communications system to augment its current high frequency (HF) and satellite connectivity. HF and satellite communications suffer from serious drawbacks that are only worsened by operation at northern latitudes. Meteor burst communications is a strong candidate because of its inherent low probability of intercept (LPI), its reliability, and its ability to recover quickly from high altitude atmospheric disturbances. We intend to demonstrate the feasibility of networked meteor burst communications to provide an alternate path for Integrated Undersea Surveillance System (IUSS) information. Our network will consist of surface ship, buoy, and shore based terminals. Our approach involves the use of data acquired from the USAF Greenland meteor-scatter test bed and a new algorithm for designing survivable network topologies. Our principal investigator is a leading researcher in meteor burst communications.

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Topic#: 91-255

ID#: 11024

Office: NWC

Contract #: N60530-91-C-0221

PI: Alan R. Layfield

Title: IR Conical Scan Tracker in the Loop

Abstract: This SBIR project will demonstrate the feasibility of a tracker-in-the-loop simulation system that will perform real time evaluation of conically scanned detector array trackers in a laboratory environment. Our work will define, design, and demonstrate the feasibility of an evaluation system that will generate a real time image consisting of target, background, countermeasures, and noise components. This image will be used to evaluate a user developed scanned array based tracker design. The work includes definition and modeling of the image components, the free gyro, and the detector array parameters. Additionally, the outer loop effects of the relative missile-to-target flight geometry will be included to provide dynamic control of the image.

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Topic#: 91-268

ID#: 11671

Office: NWC

Contract #: N60530-91-C-0216

PI: Bruce Klemin

Title: Image Processing For Conical Scan IE Seekers

Abstract: Significant developments have been made in image processing for optically scanned scenes. Image processing methods have been developed for identifying and tracking objects in the presence of noise and structured background. Most of this processing is designed for systems which produce an image based on raster scan technology. The purpose of this project is to demonstrate the feasibility of applying modern image processing techniques to the data from conically scanned, multiple detector arrays. This effort will be based on the use of simulation tools which provide a simulated array data stream for various targets, backgrounds, and countermeasures. Several non-linear image processing techniques will be evaluated in the closed-loop simulation.

EON INSTRUMENTATION, INC.

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VAN NUYS, CA 91406

Phone: (818) 781-2185

Topic#: 91-278

ID#: 11701

Office: NWC

Contract #: N60530-91-C-0231

PI: Keith Peckham

Title: Fast KUTA-class Encryptors

Abstract: The government communications security community needs a fast KUTA-class encryption device which will operate at bit rates up to at least 20 MBPS and will be fully qualified to function in an airborne environment. Existing KUTA-class equipment is not specified to operate at bit rates above 10 MBPS (nominal). Other cryptographic equipment may operate at higher bit rates (up to 50 MBPS), but they do not have the KUTA attributes and are too large to implement into an airborne (missile) platform. KUTA-class encryptors cannot function as stand alone encryptors unless they are interfaced with the proper peripheral voltages and signals which are made available from an Encryption Support Package. The technical objective of this effort will be to develop a small, standardized encryption package with an internally embedded COMSEC device which is

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

qualified to operate in an airborne environment and will provide the user with data encryption input and output functions at rates of up to 20 MBPS. This package will provide all of the necessary isolated electrical voltages and signals to support not only the internal encryptor chip but to also support necessary external peripheral equipment such as encoders and transmitters with their respective filtered power.

ESSCUBE ENGINEERING, INC.
928 JAYMORE ROAD, BUILDING 8,
SOUTHAMPTON, PA 18966
Phone: (215) 364-4053

Topic#: 91-192 ID#: 10951
Office: NADC
Contract #: N62269-91-C-0418
PI: Rodney Noble

Title: Tactical/Operator Aids

Abstract: The S-3B aircraft is the lead platform for the Active Block Upgrade Program for integration and utilization of the ERAPS and ADAR systems. Because of the quantity and complexity of operator choices in deploying and using these systems, tactical operator aids will be required for the integration and utilization of these new active systems. In this Phase I study, specific aids are to be identified for ADAR and/or ERAPS deployment, depth selection, contact classification and tracking. Analyses will be made of the S-3B ADAR and ERAPS A-Level Specifications. A mission sequence will be expanded and refined with a time line analysis or functions performed. Functional allocations will be made and tactical/operator aids identified for deployment, depth selection, classification and tracking. A Functional Requirements Document will be generated and will be the basis for Phase II development of rapid prototype software for the implementation of the tactical aids.

EVOLUTIONARY TECHNOLOGIES, INC.
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AUSTIN, TX 78759
Phone: (512) 338-3208

Topic#: 91-034 ID#: 11271
Office: SPAWARS
Contract #: N00039-91-C-0198
PI: Katherine G. Hammer

Title: Critical-Time/Real-Time Database Management

Abstract: The research will explore designing a software architecture capable of providing critical-time query response. The first two person-months will be spent defining the attributes of the environment and desired functionality. For example, the following appear to be attributes of the environment in which such a system must operate: 1. The data is distributed and stored in heterogeneous hardware/software environments in order to account for the fact the system will need to be easy to modify to take advantage of new technology in a timely manner. 2. Some updates to critical data will be made independent of the system providing the query mechanism. 3. Some data is replicated and consequently updates to one database from some independent application must be detected and updates in semantically related databases made accordingly. 4. Some updates are more important/time-critical than others. 5. Databases stored in different schemas/systems have different levels of integrity. The last four months will focus on prototyping a software architecture to support critical-time query in this type of environment. The contractor will use techniques developed in the process of creating an extensible set of software tools for automating the generation of programs which perform data conversion in the development of this prototype.

FERMIONICS CORP.
4555 RUNWAY ST.,
SIMI VALLEY, CA 93063
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Topic#: 91-002 ID#: 10418
Office: ONT
Contract #: N66001-91-C-7020
PI: Yet-zen Liu

Title: Millimeter-Wave Optical Waveguide Modulator

Abstract: An optical waveguide intensity modulator operating at near 1.5 μ m with 3-dB bandwidth exceeding 20 GHz is proposed based on proven technologies of electroabsorption in InGaAsP/InP heterostructure mature semiconductor processing methods and microwave co-planar stripline design. The proposal emphasizes on the joint effort between industry (Fermionics) and university (UCSD) and hardware development rather than paper study or simulation. The deliverable will be a working prototype complete with rf input port and single mode fiber pigtails at input and output. The modulator will be fully characterized to at least 20 GHz.

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

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Topic#: 91-366 ID#: 13903
Office: NWC
Contract #:
PI: John F. Aubin

Title: Optimized Antennas for Multispectrum Guidance

Abstract: Modern seeker systems that employ multispectrum technology to optimize missile guidance performance are limited by the available volume. Specifically, placement of an IR seeker in the nose of an RF seeker radome creates blockage effects that vary as a function of the angle of the gimbaled RF seeker. The resulting imbalances in the antenna aperture and associated losses can degrade tracking performance. It is desired to optimize the average tracking performance over all seeker/target aspect angles, or preferably, to optimize performance at each required operational aspect angle. The proposal detailed herein describes the use of digital beamforming (DBF) arrays as a means to allow the aperture illumination to be optimized at each aspect angle in the presence of symmetrical or asymmetrical blockage such as presented by an IR seeker. The DBF concept also allows for individual optimization of the sum and difference pattern weights of a monopulse tracking seeker. In addition, calibration techniques allow for the relaxation of RF component performance requirements.

FLUOROCHEM, INC.
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Topic#: 91-170 ID#: 13451
Office: NSWC
Contract #: N60921-91-C-0174
PI: SCOTT B PRESTON

Title: TECHNOLOGIES TO ACCELERATE HETEROGENEOUS REACTIONS PRODUCING ENERGETIC MATERIALS

Abstract: Large-scale synthesis of some energetic materials is not practical because rates are prohibitively slow or dangerously high temperatures must be used. Ultrasound is known to accelerate a variety of chemical reactions. In the proposed program, ultrasound will be used to reduce reaction temperature in Ullmann couplings of picryl chloride and to increase the rate of fluoride ion displacements in fluorotrinitromethane synthesis.

FOSTER-MILLER, INC.
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Topic#: 91-097 ID#: 11886
Office: NAVSEA
Contract #: N00024-92-C-4018
PI: LESLIE S RUBIN

Title: LIGHTWEIGHT MULTIPURPOSE INSULATION SYSTEMS

Abstract: A new class of material, organosilicons, have the potential to provide the Navy with a "single family" system of insulations that can be used for all shipboard thermal, acoustical and fire barrier applications. The need for such a material arises from the fact that as many as six different insulating materials are used on today's ships. The attendant logistical burden associated with this variety of insulations increases purchasing, inventory, installation and quality control costs. A single low cost, lightweight insulation capable of meeting the majority of shipboard applications would provide many benefits. Foster-Miller is proposing a Phase I program to develop and demonstrate feasibility of a "single family" system based on preceramic formulation(s) of polycarbosilanes (PCS). In Phase I, we will produce preceramic PCS foams or fibers that can be fabricated into low density, low friability and low thermal conductivity nonwoven felts and innovative forms of insulation. Samples will be tested to determine thermal and acoustical properties that show improvements over current materials. We will also demonstrate that the flexibility of PCS chemistry will permit the formulation of a family of insulating materials with continuous use temperatures as high as 1100 degrees F.

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Topic#: 91-137 ID#: 12180
Office: NAVSEA
Contract #: N66604-92-C-0715
PI: MR ROBERT KOVAR

Title: HIGH FREQUENCY SONAR WINDOWS

Abstract: Sonar windows based upon glass-reinforced epoxy composites currently show unsatisfactory performance in arctic environments as a result of high acoustic insertion losses and susceptibility to damage upon impact or ice loading. Foster-Miller proposes to investigate new acoustic materials that will enable new composite window designs to satisfy both the acoustic and

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

impact strength demands. We will use our experience in undersea acoustic materials, innovative polymers, and composite material design to provide the Navy with a complete evaluation of key technical issues, including: matching acoustic impedance, reducing self-generated noise in the window, reducing absorption at sonar frequencies due to composite construction, improving impact resistance through resin toughness and fiber strength, improving resistance to the undersea environment and rapid temperature changes, and reducing production and implementation costs. In Phase I we will survey the acoustic and mechanical properties of fiber reinforced polymers, with special emphasis on innovative acoustically transparent materials such as fluoropolymers and silicones. We will also evaluate innovative, layered composites with gradient properties that overcome the deficiencies in current designs. In Phase II, we will refine the process, prepare composite specimens and conduct extensive testing to qualify our innovative composite design for use in Navy submarine sonar windows. Procurement specifications required for the Phase III procurement solicitation will be produced in Phase II.

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Topic#: 91-163 ID#: 13385
Office: NSWC
Contract #: N60921-91-C-A310
PI: WILLIAM E SCHROEDER

Title: REPLACING THE TRACKBALL WITH TRACKED LINE OF GAZE

Abstract: The eye's ability to rapidly shift line of gaze in a changing visual environment makes it potentially an ideal input device for man-machine interface applications. Over the last 25 years, techniques have been developed to monitor eye position. For a variety of reasons, including cost, complexity, and operational inaccuracy, none has been integrated into man-machine interface applications outside of research settings. This program will demonstrate hardware which overcomes these limitations and makes possible an eye-driven cursor or "visual trackball." Concrete implementation details will be developed, demonstrated, and tested by imbedding the device in several working applications. Beyond replacement of the trackball in standard workstations, the eye-driven cursor also reduces the requirement for both flat space and specialized hand-eye coordination skills in "hands-busy" and other restricted applications, making possible complex interaction with the computer with little or no "tactile data entry."

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Topic#: 91-173 ID#: 13476
Office: NSWC
Contract #: N60921-91-C-A358
PI: DR LAWRENCE H DOMASH

Title: OPTICALLY ACTIVATED HOLOGRAMS FOR FIBER OPTIC SWITCHING

Abstract: Sensitive, high speed nonlinear optical materials are desired for many emerging optical technologies including fiber optic switching, optical interconnects, laser hardening and optical computing. No presently available solid third-order material offers large nonlinear effects and picosecond speeds at the same time. Nonlinear optical liquids have been discovered with excellent high speed intensity induced refractive index changes, but by themselves liquids can perform only a few desired functions. In other materials areas, composites have effectively combining properties. In this proposal we explore a new class of composites made by infusing porous photopolymer holographic structures with nonlinear optical liquids to make an optically nonlinear hologram whose grating effects are switched on by an intense laser beam. Such composites may be compared to a synthetic photo refractive grating of good optical quality, high diffraction efficiency, low cost and unlimited size. An optically activated fiber optic switch is one promising application; laser protection is another. As more sensitive liquids are developed, other uses may include spatial light modulators, optical interconnects and other optical computing elements. Phase I experiments will test the fundamental concept of an optically induced nonlinear hologram in a liquid/polymer composite.

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Topic#: 91-178 ID#: 13636
Office: NSWC
Contract #: N60921-92-C-A325
PI: LESLIE R RUBIN

Title: Low Halogen Flame Resistant Jacket Material

Abstract: WE PROPOSE TO IDENTIFY ADVANCED ZERO-HALOGEN POLYMERS AND THEIR BLENDS THAT WILL SUBSTANTIALLY IMPROVE THE PERFORMANCE OF NAVY SHIPBOARD CABLES. IN THIS PROJECT, WE WILL

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EVALUATE CANDIDATE REPLACEMENT MATERIALS, INCLUDING BOTH COMMERCIALY AVAILABLE AND STATE-OF-THE-ART THERMOPLASTICS AS WELL AS NOVEL BLENDS. A WEIGHTED TRADEOFF ANALYSIS WILL BE CONDUCTED TO DETERMINE THE MOST SUITABLE MATERIALS FOR

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Topic#: 91-329
Office: NAVAIR
Contract #:
PI: Robert F Kovar

ID#: 14085

Title: Environmentally Safe Biodegradable Polymer Chaff

Abstract: Conventional chaff, based upon Aluminum-coated fiberglass, is an effective counter-measure against radar-guided threats but when used in training missions, introduces into the environment hundreds of pounds of persistent fibers that might be toxic to humans and wildlife. Foster-Miller proposes to produce 100 percent biodegradable polymer chaff that functions as effectively as conventional chaff in critical Navy and Air Force applications, is 40 percent lighter in weight, is non-toxic if ingested by fish or wildlife and disintegrates into harmless products within weeks of exposure to the environment. We will apply our experience in polymer fiber and film processing, surface-metallization and innovative material development to provide the Navy with a complete evaluation of key technical issues. Biodegradable chaff design concepts such as melt-processed 100 percent biodegradable polymer fibers, shape memory polymer fibers, hollow fibers, polymer films and controlled solubility, biodegradable glasses will be evaluated during the Phase I program. In Phase I, we will deliver to the Navy 2 lb of biodegradable chaff in the form of 1 mil thick fibers cut to 1 in. lengths. In Phase II, we will refine the process, scale-up to larger quantities and submit procurement specifications required for the Phase III procurement solicitation. The Principal Investigator and this Foster-Miller facility have secret clearance status. The successful Phase I program will contribute major improvements to the

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Topic#: 91-293
Office: ONR
Contract #:
PI: Jeffrey Callahan

ID#: 13092

Title: Expendable Autonomous Profiler

Abstract: A major limitation in efforts to improve our knowledge of the ocean for either naval tactical purposes or non-defense applications is the difficulty and cost of obtaining data sets of adequate quality and coverage. While spacecraft and various expendable devices have improved our ability to gather such data, both have drawbacks. This SBIR proposes to examine the feasibility of exploiting newly developed neutrally buoyant technology to overcome some of the shortcomings of spacecraft and conventional expendable oceanographic devices in order to improve the Navy's ability to collect tactically relevant data. PRB Associates and Webb Research are presently involved in a Phase II SBIR that provides some of the desired capabilities. This SBIR would extend that work and focus on developing an air-deployable instrument called Expendable Autonomous Profiler (XAP) for routine tactical use. Such a device could be fitted with a variety of sensors for both defense and non defense applications.

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Topic#: 91-133
Office: NAVSEA
Contract #: N00024-92-C-4035
PI: STEPHEN WINDSOR

ID#: 12147

Title: TRANSPUTER/NEURAL NET ASW DATA CLASSIFICATION SYSTEM

Abstract: A Transputer based ASW data classification system is proposed. Dedicated Transputer Modules (TRAMs), possibly distributed over a Local Area Network (LAN), prepare sensor reports from various sources for input to a Probabilistic Neural Net (PNN). The PNN is implemented on one or more TRAMs, and associates data fields with track classification categories. Measures of confidence are provided at the PNN output nodes and made available to the user. The Phase I program demonstrates the feasibility of such a system to correlate ASW Tactical Decision Aid (TDA) reports. Phase II will then install the analysis system at selected customer facilities.

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

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Topic#: 91-200
Office: NADC
Contract #: N62269-91-C-0503
PI: BYRON HINDERER

ID#: 10878

Title: OFF-BOARD ELECTRONIC COUNTERMEASURES FOR SUBSCALE TARGETS

Abstract: A Phase I program is proposed to perform design trade-offs and develop preliminary design of a practical radar decoy which is capable of being towed behind, and will provide terminal-phase protection for a BQM-74C, or similar, target vehicle. The contractor has an extensive knowledge of towed decoy design technology, components and design options. Therefore, the design will be tailored to the users hierarchy of needs or requirements with operational simplicity at minimum cost to the government. The Phase I program will fully consider transmit and receive antenna configurations, antenna gain and patterns, frequency coverage, antenna isolation, electronic system design, power source, decoy aerodynamics, towline dynamic stability, deployment system (and retrieval, if required), and a variety of other design issues and their interactions. Emphasis will be placed on the design of a system which is inexpensive and simple to use. Special consideration will be given to design issues which are unique to small air vehicles like the BQM-74, including towline tension, which produces external drag and trim inputs to the target vehicle. Since a number of practical design solutions and variations are possible, the final design selection will be tailored to the preferences of the users and subject to government approval. Under a potential Phase II program, final detail design will be completed and one or more complete flyable decoy systems, with decoy, deployment system and ancillary subsystems will be fabricated and delivered.

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PALO ALTO, CA 94301
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Topic#: 91-273
Office: NWC
Contract #: N60530-91-C-0282
PI: Floyd M. Gardner

ID#: 11676

Title: MPSK SYNCHRONIZATION MODES STUDY

Abstract: The acquisition and reacquisition behavior in reception of Differentially-Encoded Multi-Phase-Shift Keyed (DE-MPSK) signals will be analyzed with random and deterministic data patterns. Acquisition/reacquisition strategies will be devised for a DE-MPSK signal format which meets NWC data link requirements. Expected performance will be estimated and a determination made of whether experimental verification will be needed in Phase II. Candidate verification methods will include: 1) analysis, 2) simulation by software or digital hardware, and 3) laboratory test using special purpose equipment with dedicated modems or general purpose test equipment. Performance, cost, flexibility, and accuracy will be estimated for the selected method and an implementation plan for Phase II testbed and experiments will be prepared.

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205 SCHOOLHOUSE ROAD
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Topic#: 91-171
Office: NSWC
Contract #: N60921-91-C-0173
PI: DR PETER D ZAVITSANOS

ID#: 13454

Title: HIGH TEMPERATURE BORON-TITANIUM CHEMISTRY WITH WATER

Abstract: General Sciences, Incorporated (GSI) proposes the thermochemical and kinetic analysis of the $Ti + B + H_2O$ reaction system. The highly exothermic nature of the titanium/boron reaction in its generic state and in combination with binders and oxidizers has been extensively investigated by GSI with several formulations under patent for specific DOD applications. The present effort identifies methods and techniques to pursue an in depth investigation of the Ti/2B system in the presence of water. Rates and mechanisms involved in the participation and synergism of the H_2O will be identified and improvements in the exothermic potential of the system will be investigated.

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Topic#: 91-330
Office: NAVAIR
Contract #:
PI: Michael A Riely

ID#: 14100

Title: IR/RF Expendable

Abstract: GSI proposes the development of an IR/RF expendable utilizing chemical energy to produce both signals. Current

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

studies have shown that GSI'S patented intermetallic fuels are capable of producing extremely high in-band intensities for most military bandwidths, even under high flow conditions. In addition, chemical seeding of the fuel produces high electron cross-section plumes across a variety of radar wavelengths. Critical issues identified for study in this proposal include plume length tailoring and its effect on RCS generated, mass flow of the fuel necessary to provide required IR and RF signatures. These areas will be explored utilizing the facilities available at GSI. Due to the space savings created by the use of the Hi-Therm fuels, a back-up design is planned combining conventional RF chaff in a module attached to an un-seeded Hi-Therm IR fuel. Potential benefits from a successful effort include a lightweight, low cost expendable capable of multispectral simulation. Use of the GSI fuels holds potential for safer manufacturing processes since all materials involved are rated as flammable solids. Potential military spinoff uses include ground based decoys for armored vehicle protection, as well as fixed site aircraft (airfield) protection.

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Topic#: 91-295 ID#: 13064
Office: ONR
Contract #:
PI: Victoria Gonzales-Prevatt

Title: Identification of Specific Protein Markers that Correlate with Initiation and Progression of Microbially Influenced Corrosion

Abstract: Current Techniques for identifying microbially influenced corrosion (MIC) involve a battery of chemical, electrochemical, metallurgical, and microbiological tests. The most common method for detection and evaluation of microbial activity employs plate or tube culture technique. These methods are expensive and time consuming yielding results that may not be truly representative of the consortia of microorganisms involved in MIC. Consequently, significant damage has already occurred before MIC is identified which makes effective treatment difficult resulting in enormous economic losses. Early detection is crucial, so that corrective measures can be promptly and effectively instituted. The objective of this proposal is to identify specific protein markers that correlate with initiation and progression of MIC. Data obtained will form the basis for development of a rapid and economical diagnostic procedure for MIC.

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Topic#: 91-367 ID#: 13855
Office: NWC
Contract #:
PI: Carl A. Beaudet

Title: Application of Mission Support Systems Technology to Navy Fighters

Abstract: This proposal describes GreyStone's understanding of the challenges to providing mission support systems technology to meet the needs of the Navy's fighter community. It describes what we believe to be the driving requirements for mission planning and support for fighter aircrew and aircraft, the critical details of mission support systems technology, and the criteria for achieving the technical objectives of this research effort. A technical plan is offered that will identify specific hardware, software and interface requirements necessary to plan air-to-air tactics, establish the feasibility of mission support for fighters, and provide the roadmap for a prototype demonstration of the unique aspects of fighter mission planning and support.

GUIDED SYSTEMS TECHNOLOGIES
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Topic#: 91-319 ID#: 13688
Office: NAVAIR
Contract #:
PI: J. Eric Corban

Title: Fixed Order Dynamic Compensation for Alleviation of Tail Buffet

Abstract: It is proposed that an active control system be developed to effectively eliminate tail buffet problems experienced by current twin vertical tail fighter aircraft. This system will feather the existing tail surfaces at high frequency and alter the aerodynamic loads on the tail in such a way that tail vibration is effectively canceled. These high frequency feathering commands are expected to be of small magnitude and can simply be superimposed on the Primary rudder commands. Implementation of this innovative approach will require only minimal aircraft modifications. State-of-the-art techniques will be used to design robust fixed order dynamic compensators. Approximate loop transfer recovery of two different full state feedback designs will be compared. One design will be based on frequency shaped cost functionals, the other on H Infinity techniques. Because of the

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lack of both steady and unsteady airflow data at common test conditions for the F/A-18, it is proposed that feasibility demonstration of the control concept in Phase I employ F-15 data. This data base was recently generated using an instrumented F-15 tail section, a validated numerical model of the tail section's structural dynamics, and aerodynamic prediction codes validated with wind tunnel data of a scale F-15 model.

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Topic#: 91-291
Office: NOSIH
Contract #:
PI: Ted W. Prison

ID#: 12990

Title: Applied Chaotic Signal Processing

Abstract: Chaotic signal processing techniques treat signals as geometric objects in a multidimension state space. We have developed a processor for chaotic signals that incorporates several novel ideas. We propose to use this processor to analyze real signals and use the results as a starting place to further define issues in applied chaotic signal processing. The issues include the ability to characterize real signals, detection of low SNR signals, attractor noise reduction, and improvements to detector SNR by characterizing and then reducing ambient and systemic noise.

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Topic#: 91-238
Office: NTSC
Contract #: N61339-91-C-0112
PI: Helen L Moore

ID#: 10769

Title: Subject Matter and Pedagogical Experts for Training Device Curriculum Development

Abstract: The focus of Phase I of this Advanced Development project is the formulation and testing of a "Working Model" of KASE, an instructional tool. KASE can best be described as a prototype design for an automated and enhanced implementation of TRADOC Interservice Procedures for the analysis and design phase of curriculum development. KASE is a conceptual design for a domain independent expert system which emulates the expert knowledge of an experienced curriculum developer. The expert system consists of object-oriented knowledge bases which integrate models of interactive instruction, editors for knowledge acquisition and student information, case studies of previously designed courses, instructional design protocols, instructional objects, and production rules incorporating instructional design principles. KASE facilitates the course development process by capturing domain knowledge from the user/developer and automatically organizing this knowledge in accordance with instructional design principles to generate a detailed design specification for instruction. The design specification includes task analysis, course description, course objectives, terminal and enabling objectives, resource requirements, and design notes. Moreover, KASE queries the user/developer for knowledge about student characteristics, training constraints, and instructional requirements (audience demographics, course parameters); builds instructional objects from this knowledge, and reasons over these objects to determine the most effective instructional strategies to use for a given curriculum development assignment. Finally, KASE accounts for the reasoning which underlies its choices of selected pedagogical strategies.

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Topic#: 91-180
Office: NSWC
Contract #: N60921-91-C-0141
PI: DR GEORGE D WALDMAN

ID#: 13521

Title: MANEUVERING REENTRY BODY AEROTHERMAL ANALYSIS COMPUTER PROGRAM

Abstract: The objective of the proposed effort is to develop and supply an aerothermal analysis computer program to predict shape change and internal distributions for advanced maneuvering reentry body configurations. The temperature approach will be to upgrade the existing MTSCT nosetip and flap computer codes. These codes were developed by Textron Defense Systems and General Applied Science Laboratories under Air Force contract to determine ablation/erosion shape change effects on nosetips, heatshields, and control surfaces of maneuvering RV's. The following tasks must be accomplished to achieve this objective: (1) Weather erosion effects must be implemented in the codes; (2) An internal conduction capability must be added, so that in-depth temperature distributions can be determined; (3) Flowfield and shape-change methodology must be developed and implemented for complex 3-D lifting configurations including lifting surfaces and wings.

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

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Topic#: 91-337 ID#: 14117
Office: NSWCWO
Contract #:
PI: Andrew L. Diamond

Title: A Biologically Inspired Hierarchical Neural Network System for LADAR Object Classification

Abstract: A modular hierarchy of neural networks is proposed as a LADAR ATR (Automatic Target Recognition) system. neural networks perform both the basic segmentation as well as the object classification. HNC and its teaming partner, professor Stephen Grossberg (Director of Boston University's center for Adaptive Systems) propose to develop a LADAR ATR system based upon the earlier work by professor Grossberg et al. in their 1988 publication "Invariant Recognition of Cluttered Scenes by a Self-Organizing ART Architecture: CORT-X Boundary Segmentation". During Phase I of the project a preliminary, non-real time demonstration of the LADAR ATR system will be carried out using simulated LADAR data. This LADAR ATR system will employ the CORT-X and ART (e.g., AKT3 or ARTMAP) neural networks. A design of the Phase II near-real time implementation will also be produced during Phase I.

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Topic#: 91-092 ID#: 12683
Office: NAVAIR
Contract #: N60921-91-C-0045
PI: Dr. Philip Mauer

Title: ULTRA-HIGH SENSITIVITY INTEGRATED HYDROPHONE SENSOR: Using Low-Cost Silicon Micromachined Elements

Abstract: Horizon Technology Group, Inc. and Nanostructures, Inc ("HTG/N") propose to micromachine and test low-cost capacitive hydrophone sensors from single-crystal silicon. These sensors, together with a pre-amp, A/D converter, and serial interface, can be integrated into a miniature low-power package. A conceptual design will be made for a waterproof package and simple light-weight electrical or fiber-optic cabling, for large acoustic arrays. The unique construction of the capacitive sensor allows it to be fluid filled to accommodate high static pressures and explosive shock. Testing will demonstrate these sensors have thirty dB more sensitivity and dynamic range than conventional piezoelectric hydrophones over the audio frequency range. Analysis will be performed to show the cost to fabricate, test, and calibrate the sensors is low because of HTG/N's proprietary design and patented silicon micromachining technology. Major cost savings are expected for large acoustic arrays at both the component and system levels. The sensor's long-term stability and very low sensitivity to ocean temperature and pressure will be demonstrated. For ultra high-sensitivity research applications, a sensor array can be housed in one package, the outputs averaged, or resonant tuned circuits used to enhance S/N and extend dynamic range.

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Topic#: 91-127 ID#: 12098
Office: NAVSEA
Contract #: NOO024-92-C-4055
PI: BEN BREED

Title: ACOUSTIC TOWED ARRAY MOTION DETERMINATION USING HYDRODYNAMICS AND AMBIENT NOISEFIELDS

Abstract: The Navy's ASW detection and classification systems are depending increasingly on the use of towed receiving arrays because they provide the opportunity to obtain a larger mobile receive aperture with less flow noise than occurs with hull mounted arrays. Unfortunately, along with the advantages of a towed array come inherent problems. The main problem is that the array configuration changes with time, due to various factors such as turbulence and the tow-ship's inability to steer in a perfectly straight line, making accurate beamforming difficult. Also, since the towed array acquires other than a straight line motion, beam pointing directions are unstable giving the appearance that targets are wandering. Precise beamforming and bearing estimation on an array depend on knowing the relative location of the sensors to a small fraction of a wavelength of the highest acoustic frequency processed on the array. The acoustic sensor location errors must be particularly small if the benefits of the larger aperture available on a towed array are to be realized. If such efforts are to succeed it will be necessary to know the accurate shape of the array. This in turn requires that the towed array's motion be characterized in any terms available including, most importantly, in terms of the hydrodynamic motion of towed bodies. We propose an innovative solution based on the use of the heading and depth sensors. The solution uses a hydrodynamic equation complex enough to include all important dynamic variables but without being so complex as to have to specify a large number of parameters. The proposed solution includes

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

additional array motion estimation based on estimating noise field changes caused by array motion, particularly sensor to sensor phase changes in a high signal to noise ratio (SNR) narrowband signal.

INTEGRATED DEFENSE CONCEPTS

P O BOX 8347
NORTHFIELD, IL 60093
Phone: (312) 461-4850

Topic#: 91-166 ID#: 13404
Office: NSWC
Contract #: N60921-91-C-A351
PI: TERRENCE LEE

Title: AN EXPERT SYSTEM ARCHITECTURE TO DEVELOP WEAPON CONTROL ICONS

Abstract: In modern naval combat, long range missiles can strike from any direction at any time. Personnel involved in the weapons control process have approximately 30-60 seconds after an incoming missile is detected to reach a decision on how to deal with the incoming air threat. Icons are one type of decision aid which can help personnel involved in the weapon control process react to and process information faster and more efficiently. There have been a number of studies conducted into the use of tactical symbology with graphical displays. As a result, there is a great body of knowledge involving the theoretical aspects of icon development in terms of human engineering, test and evaluation, the role of alphanumeric, developing icons to express military concepts, etc. but there still exists no methodology for the generation of icons which relates the myriad factors which have to be considered and applied in order to develop a successful icon. The purpose of this project is to create an architecture to develop a series of icons. This architecture will lead to an expert system which the Navy can utilize to produce icons to support the weapons control process.

INTEGRATED PARALLEL TECHNOLOGY, INC.

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PLEASANTON, CA 94588
Phone: (415) 734-8855

Topic#: 91-162 ID#: 13363
Office: NSWC
Contract #: N60921-91-C-A347
PI: CALVIN A BUZZEL

Title: INTEGRATED COMPUTING ENVIRONMENT FOR VULNERABILITY MODELING

Abstract: An integrated vulnerability assessment graphics workstation is proposed to provide a computing environment for vulnerability modeling on a high performance graphics workstation. The large memory requirements of vulnerability assessment models coupled with the limited memory of previous generation computers resulted in programs which read/write data slowly from tape drives and are unable to take advantage of the high resolution color graphics, modern database techniques, increased computational speed, and relatively inexpensive local memory of modern computer architectures. Building on a current SBIR Phase II effort, titled the Integrated Vulnerability Analysis (IVA) Workbench, a study, system design, and development of a prototype graphical interface is proposed in Phase I to create an integrated computing environment on a high performance graphics workstation to meet the specific needs of the Naval Surface Warfare Center. The proposed Integrated Vulnerability Assessment Graphics (IVA-G) Workbench offers an opportunity to improve vulnerability analysis, reduce costs, and to provide a modern analysis tool for vulnerability analysts.

INTEGRATED SOFTWARE, INC.

P.O. BOX 060295
PALM BAY, FL 32906
Phone: (407) 984-1986

Topic#: 91-321 ID#: 14121
Office: NAVAIR
Contract #:
PI: Steven A. Von Edwins

Title: Artificial Intelligence Data Generation Unit

Abstract: Integrated Software, Inc. and SAIC propose a Phase I project to determine the system characteristics and demonstrate the feasibility of an Artificial Intelligence Data Generation Unit (AIDGU). The AIDGU will employ artificial intelligence techniques to generate scenarios and data for engagement training systems. The AIDGU will automate training scenario generation, facilitate scenario modification and present an easily used interface to instructors. The AIDGU will be designed to interface with currently deployed engagement training aids. The proposed project (Phase I and Phase II) will result in a detailed task analysis of the automatic data generation process, a requirements specification for an AIDGU and a system to demonstrate the feasibility of building such a system. The Phase I effort will research, and analyze the current data generation process. It will evaluate, quantify and describe current and emerging hardware and software technologies with which to implement the AIDGU. The Phase I effort will also define an AIDGU product to be prototyped in Phase II. Phase I objectives will be accomplished in four tasks: 1) Research data generation requirements; 2) Derive AIDGU system level requirements; 3) Research and analyze

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

alternative technologies and 4) define alternative approaches and designs, and produce the final report.

INTELLICORP.
2000 CORPORATE RIDGE
MCLEAN, VA 22102
Phone: (703) 749-3790

Topic#: 91-239 ID#: 10820
Office: NTSC
Contract #: N61339-92-C-0008
PI: David D. Dodd

Title: Low Cost Automatic Scenario Generator (ASG)

Abstract: Currently scenarios are generated, modified and maintained manually by expert scenario developers. This process requires the instructors to manually identify and initialize each track. Automation of the ASG process will provide two significant benefits over the current manual process: a decrease in the scenario creation time and an increase in the ease with which a scenario can be modified. These two benefits will allow not only a greater number of scenarios to be generated, but also allow the complexity, size or variations for each scenario to be increased. There are three major technical objectives for this Phase I effort. The first objective is to review the current work being done in this area and to analyze the requirements for the ASG. The second objective is to develop a design for building the ASG, and the third objective is to develop a prototype of an ASG to test the design and verify that all of the requirements have been specified. Automatic Scenario

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

Topic#: 91-208 ID#: 10637
Office: NAEC
Contract #: N68335-92-C-0073
PI: Leonard S. Haynes

Title: Quadraped Robotic Vehicle

Abstract: A rescue vehicle which could not approach the area of an accident or of battle damage due to debris blocking its path would be useless when it was needed most. This proposal outlines a novel approach to implementing a legged robotic vehicle which would be usable in situations where tracked or wheeled vehicles could not operate. For the specific application of a rescue/repair vehicle, our system would be able to navigate through obstacles and move to a point of application so as to position one or more robot arms at exactly the point where they are needed for a repair or rescue task. Our vehicle would be extremely agile, having no preferred direction of motion. It could move in any direction without re-orienting its body, or rotate its body without changing its direction of motion. It should easily be able to move at 15 miles per hour, carry 5000 pounds, and its legs could provide active stabilization for its payload, decoupling the motion of the payload from even rough terrain.

INTELLIGENT LOGISTICS
1306 5TH AVE. S.
FARGO, ND 58103
Phone: (701) 237-8203

Topic#: 91-336 ID#: 13991
Office: NSWCWO
Contract #:
PI: Kendall E. Nygard

Title: Automated Aircraft and Cruise Missile Mission and Route Planning Using Parallel Constraint Satisfaction Techniques

Abstract: The project utilizes artificial intelligence techniques, including neural networks and genetic search to address mission planning and route calculation needs for cruise missiles. The project will employ parallel computing techniques consistent with MIMD computer architectures.

INTELLIGENT REASONING SYSTEMS (IRS)
647 CREED AVE.
LAS CRUCES, NM 88005
Phone: (505) 646-5856

Topic#: 91-335 ID#: 13980
Office: NAVAIR
Contract #:
PI: Thomas C. Eakridge

Title: Aircraft & Cruise Missile Mission and Route Planning Using Real-Time Pattern Matching Techniques

Abstract: In this proposal we present a novel approach to aircraft and missile mission and route planning using neural networks. The approach is unique in four aspects: 1) it is a proactive planner that looks at the global topographic characteristics of the battlefield environment when generating plans; 2) it uses a cost surface to determine the advantages or disadvantages of moving through an area by integrating the effects of terrain, weather, and threat into a concise data structure; 3) it uses multi-resolution grid searching to reduce the time required to produce a route, making the best possible use of its computational resources; 4)

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

it is designed specifically for migration into custom VLSI neural network hardware developed at IRS.

INTERACTIVE INTELLIGENT IMAGERY CORP.
1163 CHESS DRIVE
FOSTER CITY, CA 94404
Phone: () -

Topic#: 91-284 ID#: 12728
Office: PMTC
Contract #: N0429A-91-C-0091
PI: ROBERT SIMMEN

Title: GLOBAL POSITIONING SATELLITE TRANSPONDER

Abstract: We will design, develop and deliver prototypes of a transponder which uses Global Positioning Satellite (GPS) data to self to self-locate a test vehicle on a range or elsewhere. Our design will be based on integration of current and projected state-of-art systems from domestic suppliers such as Motorola, Magnavox, Rockwell, Standford Telecommunications and will relay the navigation message to one or more ground sites for tracking of position data. Our Phase I study will provide a review of available hardware and platform trades on the principal design issues of GPS accuracy versus size/complexity, frequency band for transponding considering RFI, antenna size, allocation availability, and datalink strategies to accommodate multiple furnished units in real time.

INTERFACE ENGINEERING
38 RUSSELL ST.
MYSTIC, CT 06355
Phone: (203) 535-7423

Topic#: 91-298 ID#: 12772
Office: ONR
Contract #: N66604-92-C-0303
PI: Stephen S. Gilardi

Title: An Adaptive Compensation System for Performance Improvement of Piezoelectric Hydrophones

Abstract: Hydrophone output level is, in general, inversely proportional to the amount of cable capacitance between the crystal element and the first impedance buffering preamplifier. Inductive tuning can cancel this capacitive loading, but only in a very narrow frequency band. The system proposed here is to be based on the active circuit synthesis of a negative capacitance, which will compensate for the cable capacitance, as well as for the crystal's blocked capacitance, without the frequency dependence of inductive tuning. The system is 'adaptive' in that it will be designed to automatically sense the amount of positive capacitance present in the hydrophone plus cable, and provide a suitable amount of synthetic negative capacitance to significantly improve hydrophone output level and extend high frequency band width, without causing system instability. Theoretical signal to noise performance will be determined and an amplifier with very low noise-figure will be developed for use as the compensation circuit negative capacitance synthesizer and preamplifier. A breadboard system will be fabricated, and tested using a wide band dummy hydrophone circuit. If available from the Government, an actual hydrophone can be tested in an acoustic test facility suitable for high frequency measurements. A survey of available special purpose high frequency probe hydrophones will be performed to assess typical limitations in high frequency response and output level. Expected improvements in performance using the compensation system will be calculated. Hydrophone size can be significantly reduced.

IONICS RESEARCH, INC.
10655 RICHMOND AVE
HOUSTON, TX 77042
Phone: (713) 784-6633

Topic#: 91-169 ID#: 13446
Office: NSWC
Contract #: N60921-91-C-0165
PI: ROBERT D SCHWARTZ

Title: COATING OF ANHYDROUS LITHIUM PERCHLORATE

Abstract: Anhydrous lithium perchlorate is superior in many respects to ammonium perchlorate as an oxidizer. However, anhydrous lithium perchlorate is hygroscopic, and this renders it unsuitable for most applications. We propose to develop a technique for coating anhydrous lithium perchlorate with a thin, protective film of stannic oxide. This will be done by exposing anhydrous lithium perchlorate to stannic chloride vapor in a fluidize bed. An integral component of the research will be the develop of methods for assessing the hygroscopicity and impact sensitivity of coated and uncoated anhydrous lithium perchlorate. These methods will then be used to compare coated and uncoated specimens of anhydrous lithium perchlorate.

ITERATED SYSTEMS, INC.
5550 PEACHTREE PARKWAY
NORCROSS, GA 30092

Topic#: 91-016 ID#: 10715
Office: SPAWARS
Contract #: N00039-91-C-0225

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Phone: (404) 840-0310

PI: ALAN SLOAN / MICHAEL BARN

Title: FRACTAL IMAGE COMPRESSION OF GEOPHYSICAL DATA

Abstract: The objective of this proposal is to demonstrate the feasibility of using a data compression and expansion scheme on geophysical data to achieve data flow of such data between and among Navy ships and Navy shore site with a available Navy communications channels. The scheme will be based on Fractal Transform technology -data representative of that used in Navy environmental support systems will be identified and obtained.

JIREH SYSTEMS

47 HELLERS CHURCH RD.

LEOLA, PA 17540

Phone: (717) 656-9898

Topic#: 91-338

ID#: 14003

Office: NSWCWO

Contract #:

PI: Dr. Oleg Jakubowicz

Title: Connectionist Model for Automatic Target Recognition Based in "Object Recognition by Parts"

Abstract: Dr. Jakubowicz has nine years experience in neural network research and development for the purpose of object and target recognition. In this proposal a work plan is put together for a system to perform Automatic Target Recognition utilizing primitive subobjects as components of the complex objects. This will include devising an integrated model for recognizing complex objects with component identification at an intervening level. The major modules of the model are already constructed at Jireh Systems. A large part of the Phase I project will be aimed at integration of the modules. The model will be implemented on a workstation for a small problem set and demonstrated in Phase I. A final report will describe the resultant model and demonstration results. An important component of any such system is the intelligent sequential control of parallel recognition processes as demonstrated in higher vertebrate animals. Neural networks are proposed for the parallel recognition process while both neural networks and rule based systems are being considered for the sequential control processes.

JOINT VENTURE:NAVSYS CORP/SC SYSTEM

18725 MONUMENT HILL ROAD

MONUMENT, CO 80132

Phone: (719) 481-4877

Topic#: 91-274

ID#: 11666

Office: NWC

Contract #: N60530-91-C-0280

PI: Mark A. Sturza

Title: QPSK and MPSK Transmission and Receiving Equipment

Abstract: Today's telemetry systems use binary frequency shift keying (BFSK) modulation. This modulation format provides good noise immunity and is easy to implement. However, requirements for higher data rates mandates the use of more bandwidth efficient modulation formats. Quadrature phase shift keying (QPSK) is four times more bandwidth efficient than non-coherent BFSK modulation. The proposed study will evaluate various modulation formats to determine their performance parameters including bandwidth efficiency, bit error rates (BERs), noise immunity, and implementation costs. These parameters will be traded-off and compared to the operational requirements to select an "optimal" spectrally efficient modulation format. The modulation formats to be studied included M-ary frequency shift keying (MFSK), M-ary phase shift keying (MPSK), M-ary quadrature amplitude shift keying (M-QASK), and various hybrids. Designs for bandwidth efficient transmitters and receivers will be prepared for development and demonstration during Phase II. This equipment will support a variety of military and commercial applications.

JRS RESEARCH LABORATORIES, INC.

1036 WEST TAFT AVENUE

ORANGE, CA 92665

Phone: (714) 974-2201

Topic#: 91-106

ID#: 11961

Office: NAVSEA

Contract #: N00024-92-C-4020

PI: ROBERT J SHERAGA

Title: PROVIDING FULL ADA SUPPORT FOR THE AN/UYS-2

Abstract: The purpose of this effort is to study, design, implement, and Program and the attendant benefits in life cycle costs, software reusability, and reliability. The AN/UYS-2 is a System that embodies the concepts associated with dynamically distributed parallel processing, particularly as applied to signal and image processing programming tools called the Processing Graph Methodology. However, lower level tools are designed to support hand microcode and assembly level programming and do not take advantage of the potential of Ada. Without the application of Ada, the full potential of the AN/UYS-2 is not realizable. In Phase I, a study and design would be performed to interface and functional requirements. The effort would make maximum use of existing Ada compilation tools and VHDL modelling tools available from CAE/CASE/CAD tool suppliers.

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

In Phase 2, an implementation and demonstration of the Ada based tool set would be performed. The demonstration will address multiple processors and elements and concepts, including that of dynamic distribution.

KVH INDUSTRIES, INC.
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MIDDLETOWN, RI 02840
Phone: (401) 847-3327

Topic#: 91-363 ID#: 13888
Office: NWC
Contract #:
PI: A. Kits van Heyningen

Title: Feasibility Analysis for an Accurate, Miniaturized, Self-Compensating Hall Effect Heading Sensor

Abstract: The purpose of the Phase I work is to identify the best packaging concept for the Hall Effect device and to determine the feasibility of building it. KVH proposes to test and characterize the NWC Hall Effect Breadboard and to generate a packaging feasibility study. KVH will use unique, proprietary capabilities, including a free standing Triaxial Helmholtz Cage to evaluate the NWC concept. KVH will use the analysis results to formulate a packaging concept for the Hall Effect Device in accordance with predetermined DTC objectives. The results will also be applied to a concept refinement which will include investigation of implementing compensation capability and analysis of accessing, or incorporating, vertical reference data. Compensation capability will allow the Hall Effect device to achieve 0.50 installed accuracy. The implementation of vertical reference data will enable the unit to be used as a compass, significantly increasing its marketing potential. KVH will perform a preliminary market analysis to quantify the volume potential for the modified design. KVH proposes four deliverables for the Phase I effort: (1) Breadboard Test Report, (2) Formal Design Review, (3) Packaging/Technical Feasibility Study, and (4) Phase II Proposal.

L-CHEM, INC.
13909 LARCHMERE BLVD.
SHAKER HEIGHTS, OH 44120
Phone: (216) 932-4248

Topic#: 91-081 ID#: 11795
Office: NAVAIR
Contract #: N00410-92-C-B001
PI: W. Michael Lynes

Title: COMPUTER-AIDED-DESIGN AND PROCESS OPTIMIZATION SOFTWARE FOR ELECTROCHEMICAL MACHINING

Abstract: Development of a comprehensive computer aided design (CAD) software package for electrochemical machining (ECM) is proposed. The software will be capable of simulating the overall ECM process, provide predictive cathode tool design and recommend optimal operating conditions. The machining parameters and tool shape will be computed by an analytical model accompanied and enhanced by machine-based instructions. The shape changes (and the current distribution) are derived from Laplace's equation for the potential. This equation is solved in an arbitrarily shaped cell subject to the appropriate electrochemical and fluid mechanical boundary conditions, by a highly efficient finite difference techniques which we have implanted earlier. The numerical computations, machine based instructions and a user-customizable data base will be linked together as an expert system for ECM. To assure competent use and acceptability by non-experts, the software will be robust and user-friendly. The user interface will include menus, on-screen instructions, reasonable default values, and extensive graphics for convenient geometry input and easy interpretation of the results.

LASER POWER CORP.
12777 HIGH BLUFF DRIVE
SAN DIEGO, CA 92130
Phone: () -

Topic#: 91-348 ID#: 14173
Office: NADC
Contract #:
PI: GRAHAM FLINT

Title: HIGH REALISM FILTER FOR THE SIMULATION OF INSTRUMENT METEOROLOGICAL CONDITIONS IN THE T-45 FRONT COCKPIT

Abstract: The scope of our proposed Phase I engineering development program includes full-scale laboratory testing of a wraparound filter, followed by ground testing of a conformal prototype within the cockpit of a T-45 aircraft.

LASER POWER RESEARCH
12777 HIGH BLUFF DRIVE
SAN DIEGO, CA 92130

Topic#: 91-285 ID#: 12522
Office: PMTC
Contract #: N0429A-91-C-0097

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Phone: (619) 755-0700

PI: Graham Flint

Title: Two-Axis Conformal Optical Sensor (TACOS)

Abstract: Many military laser systems have been deployed and more are expected future. Some examples of such systems include laser target designator finders, and laser radar. In order to effectively defend/counter systems, it is advantageous to possess the ability to detect/identify characteristics of the threat laser radiation. Laser Power Research (LPR) proposes a novel, two-axis, conformal, opti (TACOS) which has the capability of detecting the threat laser angle o (AOA), wavelength, pulse length, pulse repetition frequency (PEP) and electromagnetic interference (EMI). These capabilities allow for a hi laser countermeasures (LCM) sophistication than that currently available. Phase I of this program includes proof-of-principal experiment, detailed physical model of the TACOS response to a variety of current laser weapon systems.

LINDSEY ASSOC.

Topic#: 91-364

ID#: 13902

150 EAST PLEASANT HILL ROAD

Office: NWC

CARBONDALE, IL 62901

Contract #:

Phone: (618) 453-3141

PI: Jefferson F. Lindsey III

Title: LOW COST MULTI-SPECTRAL SUB-SONIC RADOME

Abstract: Low cost methods and materials will be evaluated for the design and manufacture a 2 to 18 Ghz radome which will provide sub-sonic environmental protection for a 4-arm spiral antenna and which will also be optically transparent. Candidate materials will include but not be limited to the following materials: borosilicate glasses, polycarbonates and amorphous fluoropolymers. Radome wall designs will include single layer constructions, A-sandwich constructions and other configurations. Extensive computer codes will be used to evaluate the performance of the designs. Limited testing will be performed on unknown properties of materials or material combinations which are developed during Phase I. Up to three approaches will be selected for further development based on performance, manufacturability, and cost.

LJF CORP.

Topic#: 91-263

ID#: 11616

411 SOUTH LONDON AVENUE

Office: NWC

EGG HARBOR CITY, NJ 08215

Contract #: N60530-91-C-0219

Phone: (703) 241-0662

PI: James L. Foy

Title: Physical Models With Thermal Applique

Abstract: Depending on the requirement, the elements of this applique can be heated above, or cooled below ambient. Embedded microcontrollers reduce the load on the host computer used to command the temperature profile.

LNK CORP.

Topic#: 91-357

ID#: 13659

6811 KENILWORTH AVE, SUITE 306

Office: NATC

RIVERDALE, MD 20737

Contract #:

Phone: (301) 927-3223

PI: Gretchen D. Bailey

Title: Low-Cost, Knowledge Tool for Rapid Prototyping and Deployment of Intelligent Tutoring Systems

Abstract: LNK Corporation proposes to design a low-cost, domain-independent, knowledge-based, tabletop Intelligent Tutoring System (ITS) tool that will enable rapid prototyping and deployment of domain-specific ITS applications. This design will include a Teacher Module that can dynamically adapt its teaching strategies and styles in response to the user profile. It will include a Student Profile Module to maintain a dynamic model of the student throughout the course of each instruction session and will enable such profiles to be stored for future sessions. In addition, an Expert Module will be included for modelling the domain of each ITS developed. An adaptive authoring environment will be designed to facilitate rapid development of domain-specific ITSs. To demonstrate the feasibility of the proposed ITS tool, a preliminary prototype will be developed and presented. Based on the Phase I recommendations, design, and demonstrations, Phase II will entail the development of the ITS toolkit prototype.

LOGIX CORP.

Topic#: 91-138

ID#: 12385

2361 JERRERSON DAVIS HIGHWAY

Office: NAVSEA

ARLINGTON, VA 22202

Contract #: N00024-92-C-4030

Phone: (703) 415-1333

PI: JOHN A ROEDER

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Title: AUTOMATED MISSILE ENGAGEMENT PLANNER

Abstract: LOGIX Corporation is proposing to develop an approach and plan to automate the engagement planning function for a single or salvo firing of submarine-launched Harpoon and Tomahawk Missiles. Two specific improvements will be investigated: integrating tactical guidelines into a knowledge-based computer system, and improving the mission effectiveness of a salvo attack. LOGIX will define a prototype to test/prove the improvements. The target hardware for this prototype will be a desktop computer. However, the ultimate goal is for this improvement to be integrated into the submarine combat control system. The submarine platform was selected for this effort because the personnel which would be involved in this task are most familiar with its constraints, tactics and operations. However, the methodology for implementing tactical requirements and most, if not all, of the algorithms defined/developed would be directly applicable to the surface community and the Battle Group scenario.

M. L. ENERGIA, INC.
P. O. BOX 1468
PRINCETON, NJ 08542
Phone: (609) 799-7970

Topic#: 91-344 ID#: 14142
Office: NSWCWO
Contract #:
PI: Dr. Moshe Lavid

Title: Instrumental Diagnostics for Hypersonic Fluid Mechanics Recognition

Abstract: Accurate and non-intrusive measurement of hypersonic fluid mechanics are solicited by NAVSWC for its Hypersonic Tunnel 9 facility. In particular, they seek optical methods for both determination of vibrational and rotational static temperature surrounding a test model and measurement of local wall skin friction. This proposal addresses the latter. It is based on spectrally Filtered Rayleigh Scattering (FRS) technique which has shown potential for measurement hypersonic velocities. The local wall skin friction will be determined from the velocity gradient near the wall. A three-task work plan is proposed with the primary goal of demonstrating feasibility. the first task is modeling of velocity sensitivity. The second task is a laboratory verification. The last task is prototype design for ultimate installation at NAVSWC. The proposed FRS technique has potential for non-intrusively measuring also temperature and density. If feasibility is determined, the designed prototype will be constructed, tested and installed at NAVSWC facility under a phase II contract. This will provide the Navy with a powerful diagnostic method needed for the understanding of the physics of hypersonic flowfields and for the validation of CFD codes.

MAC AULAY-BROWN, INC.
3915 GERMANY LANE
DAYTON, OH 45431
Phone: (513) 426-3421
Title: LONG WAVE LENGTH LASER DETECTION SYSTEM
Abstract:

Topic#: 91-347 ID#: 14184
Office: NADC
Contract #:
PI: AL TORRES

MALIBU RESEARCH ASSOC.
26670 AGOURA ROAD
CALABASAS, CA 91302
Phone: (818) 880-5494

Topic#: 91-193 ID#: 10871
Office: NADC
Contract #: N62269-91-C-0424
PI: Dr. Gerald E. Pollon

Title: COMPLEX RADAR TARGET SIGNATURE GENERATOR

Abstract: The requirement of this Advanced Development project is to perform investigations leading to the definition of an innovative technique for the reliable simulation of realistic end game scenarios by electronically augmenting the radar return signature of expendable targets. A Complex Radar Target Signature Generator (CRTSG) would be installed on board the expendable target vehicle. The CRTSG would be capable of providing a real time response to a homing radar, which would make the expendable target produce a radar signature commonly associated with the threat aircraft which the target is emulating. At a minimum, effects of frequency and aspect angle induced scintillation, Jet Engine modulation (JEM) and multi-bounce glint should be replicated, while correctly handling the modulation of impingent polarization. The following paragraphs will discuss some of the essentials for a Complex Radar Target Signature Generator. Some of the benefits of using a versatile design will also be discussed. Malibu Research has had many years of experience in the radar target and clutter genera-tar field. Our real time target generators have interfaced spatially (RF). with some radars, and in the IF sections of other radars, providing the radar with a complete user controlled radar environment. Our versatile design produces high fidelity replication of complex

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

scenarios well, while accommodating a variety of radar designs.

MANDEX, INC.
8003 PORES PLACE
SPRINGFIELD, VA 22180
Phone: (703) 321-0200

Topic#: 91-286 ID#: 12530
Office: PMTC
Contract #: N0429A-91-C-0093
PI: Mr. David Dublin Jr

Title: Submarine Training Minefield Realtime Tracking System

Abstract: This proposal describes a specific concept for submarine training minefield realtime tracking, including pulse lengths, bandwidths, sequences and system logic; although we do not know the minefield dimensions, prevalent SVPs, bottom reflectivity, etc. These may necessitate changes in the parameters, but starting with a specific design which we can analyze, evaluate, and adapt during phase 1, we are certain to enter phase 2 ready to construct a prototype. This concept is environmentally tolerant, particularly to reverberation and pulse spreading. Each of the 10 transponders transmits only a single ping, at its assigned frequency, as does the submarine. Each listens at all 11 frequencies and determines which transmitter it hears. The distance between submarine and transponders is updated more than that between transponders. The accuracy is 1 yard, but might be improved. The work plan is described in relation to the components of the proposed system and questions which require resolution. It includes building an air simulation using microphones and speakers to check the logic and related components of the transponders. Mandex and its personnel have extensive experience with transponders, logic circuits, underwater acoustics, and other system elements.

MANSOUR ENGINEERING, INC.
14 MAYBECK TWIN DR
BERKLEY, CA 94708
Phone: (415) 642-5464

Topic#: 91-100 ID#: 11927
Office: NAVSEA
Contract #: N00024-92-C-4056
PI: ALAA E MANSOUR

Title: ASSESSMENT OF RELIABILITY OF SHIP STRUCTURES

Abstract: The proposed work (Phases I and II) will provide a methodology for assessing structural reliability level of existing ships. The computerized methodology will estimate failure probability for each identified failure mode. Guidelines will also be provided for improving design criteria for future ships based on sensitivity analysis of reliability levels to variations in design parameters, materials, design criteria and loading conditions. Recommendations will be made of the minimum acceptable reliability levels for each ship type (four ships) and failure mode. Improvements to structural reliability that have the highest payoffs will be identified on the basis of the performed sensitivity analysis.

MARK RESOURCES, INC.
2665 30TH STREET, SUITE 200
SANTA MONICA, CA 90405
Phone: (213) 452-6211

Topic#: 91-196 ID#: 10962
Office: NADC
Contract #: N62269-91-C-0426
PI: August W. Rihaczek

Title: Three Dimensional Radar Imaging for Scoring Applications

Abstract: MARK Resources has developed a new signal processing technology for extracting information about a target from the return signal. It has been applied with considerable success in the discrimination and identification of targets. We propose to apply this technology to the problem of imaging an intercept missile from data collected by several radar antennas on board a drone target aircraft. The specific problems of imaging shifting and fluctuating scatterers will be addressed during Phase I by processing real target data.

MATERIALS AND ELECTROCHEMICAL RESEARCH
7960 S KOLB ROAD
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Phone: (602) 574-1980

Topic#: 91-168 ID#: 13429
Office: NSWC
Contract #: N60921-91-C-0166
PI: DR J C WITHERS

Title: THE DEVELOPMENT OF PROCESSING TO PRODUCE FINE PARTICLE ALUMINUM WITH A PASSIVE COATING OF ALF3

Abstract: The heats of detonation of aluminized explosives and propellants are, in general, considerably higher than for non

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

aluminized materials. However, the inherent oxide on the aluminum interferes with and delays the detonation process. It is possible that the substitution of a fluoride (AlF₃) coating for the oxide in the production of the aluminum powders would lead to earlier participation of the aluminum in the detonation. A process is proposed that in-situ produces an AlF₃ coating on spherical shaped aluminum particles which forms a passive film to oxidation. To avoid producing AlF₃ particles and the sublimation of an AlF₃ coating, which occurs at 1291 degrees C, it is necessary to condense aluminum in the absence of a fluorine atmosphere and react the fluorine with aluminum particles below the AlF₃ sublimation temperature. This program will develop and demonstrate processing to produce a passive AlF₃ film on aluminum particles and characterize as to AlF₃ thickness, perfection and stability of the coating in the presence of moisture followed by delivery of samples to the Navy.

MATERIALS AND ELECTROCHEMICAL RESEARCH

7960 S. KOLB ROAD

TUCSON, AZ 85706

Phone: (602) 574-1980

Title: Spherical Boron Particles From B₂O₃

Abstract: The alkali and alkaline earth metals are too expensive and complicate separating boron from the reducing agent oxide, and carbon that produces a gaseous byproduct oxide also reacts with the boron to form B₄C. An unusual reducing agent which is quite economical can reduce B₂O₃ in the gas phase to produce spherical boron and a gaseous byproduct or in the solid state to produce irregular shape particles. This program will investigate producing spherical boron from the gas phase in a plasma reactor and spheroidal boron in a solid state plasma initiated reaction at a projected price of \$5/lb. or less.

Topic#: 91-245

ID#: 10996

Office: NWC

Contract #: N60530-91-C-0285

PI: Dr. J. C. Withers

MATERIALS TECHNOLOGIES CORP.

57 MARYANNE DRIVE

MONROE, CT 06468

Phone: (203) 261-5200

Title: FILLED, ADHERENT POLYMERIC COATINGS FOR HIGH EMISSIVITY IR THERMOGRAPHY

Abstract: A need exists for a robust high-emittance coating which can be applied on wind-tunnel models to enable measurement of their surface temperatures. Based on over 30 years of experience with carbon-black-loaded polymers, infrared-absorbing agricultural plastics, particle dispersion control and modification, and the control of surface gloss in paint formulations, scientists at the Materials Technologies Corporation have reason to believe that the formulation of the desired coating material and the method of its application is entirely feasible as apparent from the first principles of physical optics. Our novel coating material will represent a significant advance over the currently-available infrared optical blacks. The proposed coating will be applied to the wind tunnel models as a spray. The coating material will be low gloss; and high thermal conductivity, to aid in its stability and utility as a black emitter. Its physical properties will enable it to adhere well to stainless steel, aluminum and other metal substrates.

Topic#: 91-154

ID#: 13632

Office: NSWC

Contract #: N60921-91-C-0152

PI: DR. JOHN N. PIKE

MEGADYNE CORP.

8718 ARLINGTON BLVD.

FAIRFAX, VA 22031

Phone: (703) 280-5232

Title: High Voltage Switch For Slapper Detonators

Abstract: The objective of this project is to develop and build a hardware prototype of a multimode, reusable, high voltage switch for slapper detonator applications. The hardware prototype will demonstrate the design for a high voltage switch that does not exhibit stalling. In addition, the switch can be triggered in three modes: displaced charge, ion injections, and Photo-electric avalanche. The switch also will have an inherent safety feature that prevents breakover to voltages as high as 10 KV until armed. For testing purposes, the switch can be triggered in a ringdown mode over a 1000 times. The switch will be based on a borosilicate envelope with Housekeeper seals and stripline primary conductors. The development of the prototype will demonstrate the electrical and physical characteristics as well as provide a baseline technology for a cost estimate. The anticipated cost for the switch is \$12.00 in hundreds quantities.

Topic#: 91-247

ID#: 11009

Office: NWC

Contract #: N60530-91-C-0262

PI: Marc Rody

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

MEMBRANE DEVELOPMENT SPECIALISTS, INC.
1313-E SIMPSON WAY
ESCONDIDO, CA 92025
Phone: (619) 489-0819

Topic#: 91-354 ID#: 13931
Office: NAPC
Contract #:
PI: Larry A. Lien

Title: Development of a Light Weight, Low Pressure Drop Fuel Filtration System Producing Ultraclean Heavy Fuels.

Abstract: MDS proposes to design, engineer, manufacture and test prototype ultrafiltration spiral wound elements that would provide adequate supplies of high quality heavy fuels to small diesel engines of 25 to 100 hp across a broad spectrum of temperatures. The heart of the technology is the use of polytetrafluoroethylene (TFE .1u pore size) ultrafiltration membrane wound in a spiral design to maximize packing density by selecting proper element materials and leaf lengths. One can engineer a spiral wound ultrafiltration element that will be small and light-weight, yet produce proper volumes of ultraclean fuel across the temperature and engine horsepower ranges the Navy needs. The membrane material, TFE will remove all bacteria, solids greater than .1u and free the entrained water to produce the quality heavy fuels demanded by the close tolerances of the high speed direct fuel injectors intended for these engines. Although the spiral wound elements will be operated in dead-end mode, the spiral wound design and the TFE membrane allows them to be cleaned in a cross-flow manner or unwound, wiped off and rerolled for reuse.

METHODICS, INC.
PO BOX 909
BURBANK, CA 91503
Phone: (818) 972-1704

Topic#: 91-181 ID#: 13529
Office: NSWC
Contract #: N60921-91-C-A342
PI: GARY FALACARA

Title: RESEARCH AND DEVELOPMENT OF A TECHNOLOGY TO SUPPORT GENERALIZED OBJECT-ORIENTED SOFTWARE DEVELOPMENT

Abstract: Because evolution and change are inevitable facets of software development, new methodologies and tools that are based evolutionary life cycles are needed. To address this, an effort for the research and development of CASE technology that intrinsically supports iteration and that promotes an object-oriented approach throughout the life cycle is proposed. The approach will be based upon the use of a life cycle in which object-oriented building blocks are used to specify external boundaries, internal architecture, and implementation detail. Such specifications will be unified by relating them to a common, underlying semantic model which characterizes the composition of each building block, the dependencies between building blocks, and the role of each building block in each form of specification. The semantic model will also be used to insure the completeness and consistency of development information. Additionally, operations (i.e. tools) for the creation, storage, and manipulation of building blocks will be identified and embedded into the semantic model. Once the methodology and semantic model have been formalized, an plan for the implementation of the technology in the form of a CASE environment will be developed. This implementation will be based upon the use of object-oriented data base technology.

METRATEK, INC.
5205 LEESBURG PIKE
FALLS CHURCH, VA 22041
Phone: (703) 671-6500

Topic#: 91-144 ID#: 12221
Office: NAVSEA
Contract #: N60921-91-C-A367
PI: RAYMOND L HARRIS

Title: MICROWAVE PROPAGATION

Abstract: This proposal addresses Phase I of an effort to provide comprehensive quantitative measurements of microwave propagation at low altitudes (i.e., below several hundred feet) above the surface of the ocean. The overall objective of the effort is to provide experimental data for use in the verification of existing computer program microwave propagation models. The proposed approach draws upon an existing METRATEK radar system that has previously been used by METRATEK to perform the same kind of measurement. This system has a unique waveform that will be exploited for the first time in the proposed effort to provide a measurement capability that will greatly expand the detailed knowledge of propagation in oceanic ducts.

METRATEK, INC.
5205 LEESBURG PIKE
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Topic#: 91-303 ID#: 12876
Office: ONT
Contract #:
PI: Raymond L. Harris

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Title: Rapid Area Search for Locating Underwater Mines

Abstract: This project, conducted under the "Advanced Systems and Technologies for Future Naval Warfare" topic, is directed at substantially increasing the U.S. Navy's minehunting capability. It applies a unique radar waveform from an airborne platform with the objective of increasing the present mine location search rate capability by an order-of-magnitude or more.

METRON, INC.
11911 FREEDOM DRIVE
RESTON, VA 22090
Phone: (703) 787-8700

Topic#: 91-111 **ID#:** 11990
Office: NAVSEA
Contract #: N00024-92-C-4022
PI: LAWRENCE D STONE

Title: DISCRETE NON-LINEAR ASW DATA FUSION FOR SHALLOW WATER TRACKING AND SURVEILLANCE

Abstract: Contingency and Limited Objective Warfare Operations may require naval forces to operate close to enemy shores in shallow waters with adverse acoustic environments. The objective of the proposed work is the development of a data fusion system that provides tracking and surveillance in this environment even against diesel threats. Such a system will require the use of multiple sources and receiving arrays. Present day data fusion algorithms are not capable of handling multiple sources and receivers coupled with multiple transmission paths and false alarms. We propose to combine the Likelihood Ratio Tracker (LRT) with matched mode processing to develop a shallow water data fusion system. LRT is a discrete, recursive, non-linear filter that computes estimates of target state (position, velocity, depth) in terms of probability distributions. LRT has demonstrated its ability to process non-linear measurement data with non-Gaussian measurement errors in situations involving active sensors, multiple receivers, multiple transmission paths, maneuvering targets, and false targets. Matched mode processing is a new technique that produces target range and depth estimates from signals received at vertical arrays even in the presence of multiple transmission paths. Matched mode processing is robust to mis-estimation of transmission losses resulting from surface reflections and bottom bounces.

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965 THOMAS DRIVE
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Topic#: 91-195 **ID#:** 10915
Office: NADC
Contract #: N62269-91-C-0425
PI: HOWARD ECKSTEIN

Title: DATA COMPRESSION APPLIED TO DOPPLER SCORING SIGNALS

Abstract: Microcom purposes to study and propose an effective method to compress the Doppler Signals as the ultimate goal is to transmit the resultant data on a narrow band Telemetry Channel. Microcom has previous experience in digitizing and compressing Doppler Data for radar guided missile applications and plans to apply this knowledge to the application of Scoring Systems. An additional benefit of digitizing the Doppler Signals is that the data can now be encrypted in the event that secure transmission of information is required.

MICROCOM CORP.
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Topic#: 91-327 **ID#:** 13848
Office: NAVAIR
Contract #:
PI: CHARLIE ROSEN

Title: DUAL TRANSPONDER FOR RANGING AND DATA COMMUNICATION

Abstract: Microcom will design a Dual Frequency Transponder which will be compatible with the requirements of both the Tactical Aircrew Combat Training System (TACTS) and the Mobile Sea Range (MSH) system. We will modify our existing R-Cubed Transponder (AN/URY-3) by adding an L Band Transceiver to provide the data relay link for TACTS ranges with a Transponder volume target goal of 108 cubic inches. We plan to combine as many functions as possible within the Transponder to eliminate duplication of circuitry. This will result in a smaller, lower cost, more efficient and reliable unit. Our goal is to produce a Dual Frequency Transponder with peak power outputs of 200 watts at 141 MHZ when used for MSR, and 25 watts at L Band when used for TACTS ranges. This Phase I study will provide an engineering analysis to determine the feasibility of adding an L Band Transceiver to the existing R Cubed Transponder design and will determine expected performance parameters for ranging accuracy, receiver sensitivity, and transmitter power output. Issues that will be addressed in the Phase I study will include performance, size and weight goals, environmental parameters, and initial board layouts. In addition to the engineering analysis, Microcom will prepare a design plan and submit a preliminary system design specification which will be

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the basis for development, test, and qualification of a Dual Frequency Transponder in the Phase II project.

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Topic#: 91-328
Office: NAVAIR
Contract #:
PI: CHARLIE ROSEN

ID#: 13844

Title: DATA RELAY SYSTEM

Abstract: Microcom will design a secure Data Relay System for transmission of GPS position, platform sensor, and weapons event data collected from a large number of fleet exercise participants distributed over an extended open-ocean area. We plan to modify our existing R Cubed Transponder (AN/URY-3) design to yield a 400 percent increase in data throughput and add a GPS receiver and Inertial Guidance unit for improved position location of training participants. Our goal is to design a secure Data Relay System operating at 141 MHz with a 4 MHz bandwidth that will have an instantaneous data rate of at least 1 Megabit. To optimize participant data handling capacity, Microcom's Phase I study will determine the feasibility of reducing the present PPM pulse spacing by a factor of 4 (thereby increasing the data rate by 4 times). In addition, alternate technical approaches will be investigated and computer simulations will be conducted to verify anticipated data relay performance. Issues that will be addressed in the Phase I study will include correlation gain, link margin performance, transmitter reliability, secure transmission, size and weight, primary power requirements, and environmental requirements. In addition to the engineering analysis, Microcom will prepare a design plan and submit a preliminary system design specification which will be the basis for development and test of a data relay system in the Phase II project.

MISSION RESEARCH CORP.
735 STATE STREET
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Topic#: 91-186
Office: NSWC
Contract #: N60921-91-C-0140
PI: DR MICHAEL A MOSTROM

ID#: 13589

Title: BTO HIGH POWER MICROWAVE SOURCE FOR NSWC

Abstract: Mission Research Corporation (MRC) proposes to investigate the feasibility of developing, and implementing at NSWC, a new compact and low-weight high-power micro-wave generator. This device uses an electron beam to excite nonaxisymmetric modes in a cavity via its transverse oscillation, and the device performance is insensitive to electron beam parameters such as energy and current. The physical effect exploited and optimized is that of the well-known beam-breakup (BBU) instability. Coupling the instability with the transit-time effect of the electron beam in the cavity, rapid exchange of energy between the electron beam and the preselected electromagnetic mode can occur resulting in the generation of high-power micro waves. To emphasize the physical processes involved, we named this device the Beam-Breakup Transit-Time Oscillator (or BTO for short). The linear growth rate is proportional to the mode frequency and under optimal conditions, the cavity mode TM₁₁₀ exponentiates in only 10 oscillation periods. In addition, the transit time resonance naturally leads to very narrowband output with a typical wavelength in the range of 1-30 cm depending on the cavity radius. The BTO requires no external magnetic field and can achieve high-efficiency (26-47percent) for high-power (> 1 GW) operation.

MISSION RESEARCH CORP.
735 STATE STREET POST OFFICE D
SANTA BARBARA, CA 93102
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Topic#: 91-221
Office: NATC
Contract #: N00421-92-C-0004
PI: George B. Chapman

ID#: 11889

Title: Incorporation of Artificial Intelligence in Sea Control Helicopters

Abstract: The addition of increasingly complex acoustic, non-acoustic ASW, target detection, and tracking equipment on Navy helicopters has greatly increased ASW crew workload. The incorporation of artificial intelligence techniques can help reduce aircrew workload in the area of air, surface, and sub-surface threats. Mission Research Corporation proposes to design a system that performs threat classification in three different but highly complementary ways: classification by threat identity, optical threat response, and threat prioritization. The system uses an entirely data driven approach, allowing for changes in threat and countermeasure systems without system recoding. It utilizes efficient data compression techniques for the management of the large amount of data required to represent threats and countermeasures. The system incorporates an innovative trainable linear optimization technique, the mimic net, for classification by response and prioritization. Sensor data measurement uncertainty

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is mitigated by representing measured threat features in terms of fuzzy sets. We will also evaluate our system's performance by testing it with a set of representative multi-threat ASW scenarios.

MISSION RESEARCH CORP.
8560 CINDERBED ROAD
NEWINGTON, VA 22122
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Topic#: 91-270
Office: NWC
Contract #: N60530-91-C-0007
PI: Richard Smith

ID#: 11673

Title: RF Seeker Near Field Measurement System

Abstract: A feasibility study of a RF-seeker, near-field measurement system, based upon newly established electro-optic (EO) technology, is proposed. The new EO approach represents a substantial improvement upon conventional EO field measurement technology, particularly in the area of nonperturbation of the RF field, a critical problem in near-field measurements close to seeker radome components. The Phase I study will include prototype construction and laboratory tests/demonstrations. The approach utilizes simple, -100 um-sized, all-dielectric sensors bonded to -100 um diameter optical fibers. The sensor system(trans-ducer, fiber, and receiver) will produce a frequency-downshifted signal proportional to a single polarization component of the complex RF electric field. The expected sensitivity will allow complete characterization of local area insertion phase delay and transmission loss using either low-power cw-or else low-duty-cycle pulsed-radiation sources. Detailed analyses and predictions of performance will be made. Testing will be used both to answer various critical questions and to demonstrate a proof-of-principle measurement system. A complete Phase II prototype system will be designed and costed, including data acquisition and analysis equipment and suggested procedures.

MONTEREY TECHNOLOGIES, INC.
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CARMEL, CA 93922
Phone: (408) 625-5285

Topic#: 91-220
Office: NATC
Contract #: N00421-92-C-0007
PI: Robert T. Hennessy

ID#: 11896

Title: Extraction of Human Performance Data from Video Records

Abstract: Monterey Technologies, Inc. will develop the functional, hardware, and software design specifications for a practical system to support efficient extraction, logging, and summary of human task performance data from video recordings and other ancillary data sources. Moreover, this video data extraction system also will be useful as part of a larger system designed to measure the complex human performance of Naval aviators and other military and civilian personnel. The data extraction system design will minimize the time and effort of the subject matter or task "expert" by multiple procedural and hardware means that include some automation. For example, simple marking of events is relegated to early video passes by a lower-cost assistant. Items the expert must judge are extracted, compressed, and placed on random access media to minimize the analysis time required. Support devices such as touch screens, voice recognition, and automatic computer access to the SMPTE time and user codes will support data extraction and reduction at all levels of analysis. No single innovation is seen as the panacea to efficient task data extraction and reduction. Also, because the behavioral items of interest are subtle, reliance on AI methods is likely to be unworkable.

MUSYN, INC.
1009 FIFTH ST. SE
MINNEAPOLIS, MN 55414
Phone: (612) 378-1742

Topic#: 91-261
Office: NWC
Contract #: N60530-91-C-0218
PI: Gary J. Balas

ID#: 11605

Title: Robust, Gain-Scheduled Autopilots for Missiles

Abstract: The function of missile autopilots is to maintain stability of the airframe over the performance envelope, provide adequate airframe response for the guidance system and reduce sensitivity of guidance performance to vehicle parameter variations and disturbances. The autopilots must be robust to predictable variations in plant parameters about some operating point as well as actual uncertainty (which may be smaller than the predicted parameter variations) in the airframe control design model. These problems are approached from two directions in this proposal. The first involves the application of u-synthesis techniques to design several autopilots for a given flight envelope. These designs will emphasize robustness to parameters that vary as a function of time and modelling uncertainties in the control design model. The second direction of the research is to directly design for a single autopilot framework which schedules as a function of several variables. Three novel approaches to

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gain-scheduling are proposed for design. These are: robust, gain-scheduled, state-feedback with quadratic stability; state-space upper bound using observers and state feedback; and D-K iteration with a gain scheduled structure. The goal is to design more robust, better performing for the entire flight envelope.

MVM ELECTRONICS, INC.
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Topic#: 91-173 ID#: 13475
Office: NSWC
Contract #: N60921-91-C-A357
PI: DR MANHAR L SHAH

Title: ALL OPTICAL FIBER OPTIC SWITCH USING FREE CARRIERS IN GAAS

Abstract: An all optical fiber optic switch based upon photo generated free carrier induced optical effects in GaAs, GaAlAs, InP, and other compound semiconductors is proposed. A simple device structure and the possibility of relatively easy fabrication makes the proposed switch an attractive concept to investigate. Modulation of light in fiber optics up to 200 MHz using free carrier induced effects in silicon has been demonstrated. GaAs and other compound semiconductors are expected to show increased sensitivity over silicon. Free carriers in a semiconductor influence its optical properties through conductivity changes which are included in the complex dielectric constant. In the proposed scheme, 850 nm photons generate free carriers through band to band excitation. These carriers can influence the transmission property of 1300 nm light, either through absorption or through Fabry-Perot parameter change. We propose to investigate and characterize the materials, optimize the fiber optic switch configuration, measure the properties of candidate materials with regard to switch application, and generate plans for the prototype switch fabrication in Phase I.

NAVMAR APPLIED SCIENCES CORP.
65 W. STREET ROAD SUITE C-200
WARMINSTER, PA 18974
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Topic#: 91-198 ID#: 10903
Office: NADC
Contract #: N62269-91-C-0561
PI: Philip Yanni

Title: Synthetic Generation of Dynamic Infrared Scenes

Abstract: Commercially available synthetic scene generation systems will be investigated as a baseline system from which infrared imagery can be created. Tradeoffs will be made regarding the scene realism required for sensor evaluation and the cost to achieve this realism. Representative signatures of various terrains, terrain features and targets will be created that present the thermal characteristics associated with the various components of each, their interaction with each other and the effects of location, diurnal cycle, weather, etc. as well as inherent characteristics. Existing mathematical models will be utilized and new models developed that characterize the effects of atmosphere, platform stability, sensor parameters and display/operator interface. The infrared scene generator and math models will be interfaced and will permit dynamic evaluation of sensor performance under varying scenarios. The ability to vary these conditions and locales will also allow for mission planning and potentially lead to predictions on probability of mission success.

NAVSYS CORP. & 3C SYSTEMS CO.
18725 MONUMENT HILL ROAD
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Topic#: 91-283 ID#: 12527
Office: PMTC
Contract #: N0429A-91-C-0088
PI: Mark A. Sturza

Title: TARGET DRONE CONTROL VIA SATELLITE

Abstract: Existing ranges are faced with the requirement to test weapons of increased complexity, range, and firepower. Present ranges are increasingly affected by commercial and recreational activities. The solution is the World Range concept of using the large ocean areas for test and training operations. Today's shore based range facilities and laboratories constitute a significant investment. The goal of World Range is to utilize these facilities more efficiently by connecting them to open sea test areas. The proposed target drone command and control (C) system via satellite link directly supports the goals of World Range. This study will establish the data link and operational requirements for the C system. A list of candidate military and commercial satellites will be compiled and evaluated. Finally, a detailed system implementation for both the drone and shore based equipment will be defined. The C system resulting from this study will have the potential to support numerous government and commercial applications. Any application requiring the transmission of data rates up to 500 KBPS beyond line of sight is a potential candidate.

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NDI ENGINEERING COMPANY
7050 KAIGHN AVENUE
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Title: Arresting Cable Network

Topic#: 91-206 ID#: 10620
Office: NAEC
Contract #: N68335-92-C-0051
PI: Michael Kaminski

Abstract: A new cable network, utilizing a grid-like pendant cables will increase individual pendant cable life and reduce engine wear. Upon completion of a successful design study and associated testing, the grid cable system would enhance reliability and dependability for the existing Mk 7 MOD 3 system installations.

NIELSEN ENGINEERING AND RESEARCH, INC.
410 CLYDE AVENUE
MOUNTAIN VIEW, CA 94043
Phone: (415) 968-9457

Topic#: 91-161 ID#: 13355
Office: NSWC
Contract #: N60921-91-C-A346
PI: STANLEY C PERKINS JR

Title: POST-INTERCEPT TRAJECTORIES OF MISSILE DEBRIS FRAGMENTS

Abstract: A program of work leading to the development of a capability for fragments is proposed. The method used is comprised of an aerodynamic model for calculating forces and moments at each instant in time along the trajectory and a six-degree-of-freedom equation-of-motion solver for calculating the subsequent motion and orientation of the missile fragment. The results of the calculations include the post-intercept flight identification of a kill and the surface footprint of the missile fragments for use in ship vulnerability models. The method will be modified and installed on a high performance graphics workstation with pre-processing to aid in input preparation and post-processing to enhance the interpretation of the results from the method. The method will be demonstrated for several classes of modern threats, and various approaches to validate the method will be provided. A pilot computer code will result from the proposed feasibility study.

NKF ENGINEERING, INC.
4200 WILSON BOULVARD
ARLINGTON, VA 20362
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Topic#: 91-099 ID#: 11913
Office: NAVSEA
Contract #: N00024-92-C-4060
PI: DR MICHAEL P PAKSTYS

Title: FEASIBILITY STUDY OF SCALE SURFACE SHIP MODELS FOR UNDEX

Abstract: The objective of the proposed engineering development is to investigate and develop methodology for the exploitation of structural scaled model test data for the enhanced survivability and reduce cost of surface ship production. This engineering development will focus on the identification of appropriate model characteristics required for the accurate prediction of surface ship structure and equipment response to UNDEX loading utilizing scale model data to minimize full-scale testing. To achieve the goals mentioned above, combination of analysis and structural scale model would be utilized. The analytical part would include a proven computational approach using verified computer codes capable of modeling surface ships subjected to UNDEX loading. Methodologies to address cavitation phenomena, gravitational effects, geometric and material nonlinearities, ocean bottom and surface effects and bubble pulsation are discussed and integrated into a comprehensive approach. The effects which do not scale, such a gravitational effects, energy dissipation and surface tension would be accounted for in our approach by using supportive experimental and analytical data. Illustrative data demonstrating limitations of similitude models are referenced and validating model approaches to address these scenarios are presented. The use of the scale model test data combined with the analysis techniques/automated scaling procedures during the ship design phases are discussed and their advantages are demonstrated.

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Topic#: 91-132 ID#: 12136
Office: NAVSEA
Contract #: N00024-92-C-4040
PI: JOHN J KING

Title: APPLICATION OF EXPERT SYSTEMS IN SUBMARINE COMBAT SYSTEMS

Abstract: This proposal is concerned with identification of operator intensive functions associated with management of submarine weapons employment wherein application of Expert Systems/AI could mitigate overload during time critical evolutions and the

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eventual development of the appropriate Expert System prototype. Specifically, the objectives of this Phase I effort are: 1. Review submarine weapons, employment doctrine, weapon control operator responsibilities. 2. Establish evaluation criteria to be used for selection and prioritization of operator-intensive weapons and employment techniques. 3. Analyze the submarine weapons, employment doctrine, and weapon control operator responsibilities using the evaluation criteria established in (2) to develop candidate applications for AI solution. 4. Develop a conceptual system architecture which would include: a. Functional requirements. Baseline functional architecture. b. Identification of Candidate AI technologies and their application in the prototype system. 5. Prepare detailed Phase II plans which would include: a. Revised and complete prototype functional specification. b. Prototype system development. The results of Phase I will be summarized in a report containing: 1. A prioritized list of operator-intensive weapons employment situations that merit an intelligent computer-based operational advisor. 2. A description of the analysis approach and evaluation criteria used to develop the list in (1). 3. A conceptual system architecture describing the fundamental expert system requirements, candidate fire control techniques and the artificial intelligence for data fusion.

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Topic#: 91-010 ID#: 10513
Office: ONT
Contract #: N66604-92-C-0205
PI: L. SCOT DUNCAN

Title: Conceptual Development of Methods for Cleanout and Deactivation of Lithium By-product Canisters

Abstract: Stored Chemical Energy Propulsion Systems (SCEPS) currently under development by the Navy produce canisters containing lithium, lithium fluoride, lithium sulfide, and other metallic salts. This project develops an approach for safely and economically deactivating, cleaning and recycling the canisters and their contents. The approach utilizes the reaction of lithium sulfurhexafluoride within the canister under controlled adiabatic conditions to deactivate the remaining metallic lithium while minimizing the likelihood of canister damage and then transfers out the molten salts for disposal. Hardware concepts are presented to complete the reaction and transfer processes in a safe and economic manner in a production environment. Concepts are also developed for the subsequent cleaning of the canister and for the recycling/disposal of the reaction products.

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Topic#: 91-291 ID#: 12980
Office: NOSIH
Contract #:
PI: Ziad Haddad, Ph.D.

Title: New Methods for Nonlinear Tracking and Nonlinear Chaotic Signal Processing

Abstract: We propose a method to identify, separate, and classify complex broad-band signals, and, subsequently, to track and localize the typically elusive threats emitting those signals. The proposed methods were developed by the authors, and have already undergone some basic preliminary testing. The classification portion of the algorithm allows one to separate, classify, and identify targets when the received signal is the sum of a few nonlinearly generated components in additive noise. It is therefore particularly relevant to realistic scenarios, unlike other proposed algorithms that cannot handle signals with multiple nonlinear components and/or additive noise. The tracking portion of the algorithm allows one to detect and follow a maneuvering target that is emitting either a nonlinearly generated signal, or a near-linear narrow-band continuous wave (CW), even when the signal is too faint to be seen in a single, typically short, time window.

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Topic#: 91-324 ID#: 13704
Office: NAVAIR
Contract #:
PI: O. DONN GRACE

Title: MULTI-SENSOR INTEGRATION IN F-14D FIGHTER

Abstract: The F-14D fighter aircraft performs tracking and targeting functions using active and passive data from on-board sensors and also using target information from other sources. An integrated data fusion processor is required to perform these functions. The proposed tracking and targeting system would be a multi-target multi-sensor tracking system that would accommodate all data types and would function under all conditions of data availability. All data fusion and processing would be integrated with optimal use of data and would produce a seamless operational environment. The system would also have a multi-hypothesis capability for resolving ambiguous target scenes, as required, and would provide track confidence levels for

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

determining operational priorities. The track confidence levels would be a posteriori probabilities. These probabilities can be readily interpreted and would provide track confidence levels that can be directly compared for prioritizing.

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POST OFFICE BOX 15150
ARLINGTON, VA 22215
Phone: (703) 751-3422

Topic#: 91-244 ID#: 10991
Office: NWC
Contract #: N60530-91-C-0283
PI: Philp A. Shaw III

Title: Deformable Control Surfaces with Shape Memory Alloy Actuators

Abstract: Recent developments in the areas of composite airframe structures and Shape Memory Alloy (SMA) materials have led to new interest in the concept of deformable control surfaces because of the potential benefits of low radar cross section, high reliability and moderate cost. For a missile with deformable surfaces, the composite structures would be largely transparent to radar, and combined with the fine wires of SMA actuators, should result in a lower radar cross section. Biometal and Flexinol are SMAs which have a muscle-like contraction with forces of 20,000 psi. There are three independent fundamental modes of flexure: flexing the missile body itself, fin curling and fin twisting. The proposed Phase I effort will examine areas of uncertainty to determine whether the concept warrants further study and build a body of expertise to be used in Phase II exploration of the concept. Oaktree Automation is actively engaged in the development of innovative SMA applications. Scaled Composites, Inc., with a world-renowned reputation for the design and development of innovative aerospace structures and unique aircraft, will serve as a consultant to provide expertise in aeronautical engineering and composite structures design.

OCA APPLIED OPTICS, INC.
7421 ORANGEWOOD AVENUE.
GARDEN GROVE, CA 92641
Phone: (714) 895-1667

Topic#: 91-352 ID#: 13936
Office: NACP
Contract #:
PI: Michele L. Delatte

Title: Reducing the Toxicity of Beryllium with Hot Isostatically Pressed Alloys

Abstract: For applications requiring ultra lightweight, stiff and thermally stable materials, such as space flight, beryllium is the ideal material. Its acceptance is limited, however, because processing beryllium presents a serious health hazard to workers. In particular, machining beryllium creates toxic dust which can cause berylliosis, a chronic lung disease. This effort will explore whether alloys of beryllium made by Hot Isostatic Pressing can be machined without generating respirable beryllium particles. Four alloying elements have been selected for Phase I: aluminum, magnesium, copper and titanium. Three to four compositions of each alloy will be manufactured under conditions likely to produce finely mixed and homogeneous materials. Calibrated air samples will be taken while each alloy is test machined to determine the quantity of respirable dust produced. Alloys which produce little or no respirable dust and are within 15% of the density of beryllium will be candidates for further study as lower cost materials for beryllium applications.

OFFICE OF NICHOLAS N. RIVERA, PHD
P.O. BOX 565
VIENNA, VA 22180
Phone: (*) -

Topic#: 91-204 ID#: 10612
Office: NUSC
Contract #: N66604-92-C-0343
PI: Nicholas N. Rivera

Title: Submarine Electronic Systems Power Supply

Abstract: This proposal offers to perform confirmatory system studies, design development, and brassboard demonstration of an electronics 270 VDC power source concept to meet the requirements of Topic No. 91-204. The confirmatory system studies will be follow-up to U.S. Navy study efforts completed in 1981 on the same subject. The proposed power source concept is an expanded version of one defined and evaluated in the 1981 Navy study. This power source is represented as a high reliability and efficiency rotating machine consisting of an integrally rectified alternator driven by two induction motors simultaneously and independently powered from two 60 Hz busses. If one 60 Hz power feed is lost the machine will continue to be driven from the second 60 Hz feed without service interruption. The alternator excitation will consist of permanent magnets (PM). The machine will have a single moving component consisting of the induction motor rotors and PM alternator field, all of which will be mounted on a single shaft. There will be no electronic control components. The integrally installed output rectifiers will be conservatively rated to ensure long life and resistance to voltage stress exposure. This should result in a high reliability power supply requiring minimum maintenance.

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

OMNITEK, INC.
P O BOX 9265
ARLINGTON, VA 22209
Phone: (703) 841-0145

Title: MODELING SHIPBUILDING CONTRACT CHANGES

Abstract: A personal computer-driven mathematical model is proposed to enable the forecasting of cost and schedule effects for each contract change imposed on a ship construction contract. The model will accommodate any type change and will include the resolution of additions, deletions, modifications, interruptions, or accelerations of work processes or materials. The model will predict the core cost of the change together with its impact on delay and disruption in construction of a ship. The model program will be flow-charted and documented with source and object code software. The software will be demonstrated on a conventional personal computer system of conventional memory and storage capacities.

Topic#: 91-147 ID#: 12242
Office: NAVSEA
Contract #: N00042-92-C-4095
PI: MR ROBERT J EIN

OPTICS 1, INC.
4035 THOUSAND OAKS BLVD.
WESTLAKE VILLAGE, CA 91362
Phone: (805) 373-9340

Title: Low Cost Head/Helmet Mounted Display for Simulation

Abstract: Wide field high resolution head or helmet mounted displays for the visualization, of real-time or computer generated scenes in simulation and other applications have significant potentials in the military as well as the industrial and commercial arenas. Providing a "virtualworld" form of display needs to take advantage of several key technologies: the display vehicle itself, the optics and associated mechanics to view the display, and the means of integrating the system into an aesthetically pleasing, functional, and ergonomically viable light weight and low cost head mounted package. In this SBIR we will derive innovative and novel means for providing these forms of high resolution displays in a head mounted configuration. Initially we will work with NTSC to jointly review and define the basic system parameters including resolution, field of view, and other key parameters. We will then identify the viable display technologies capable of meeting these requirements, and then we will design the viewing optics configuration and packaging methodology in order to view the display. Once these tasks are complete, we will perform a preliminary opto-mechanical design of the viewing optics and mechanics so as to demonstrate full system feasibility.

Topic#: 91-236 ID#: 11117
Office: NTSC
Contract #: N61339-92-C-0021
PI: Robert E. Fischer

OPTICS 1, INC.
4035 E. THOUSAND OAKS BLVD.
WESTLAKE VILLAGE, CA 91362
Phone: () -
Title: MULTIPURPOSE IR OPTICAL SCANNER
Abstract:

Topic#: 91-346 ID#: 14178
Office: NADC
Contract #:
PI: ROBERT E FISCHER

OPTIMUM STRUCTURAL DESIGN, INC.
339 REVELL HWY
ANNAPOLIS, MD 21401
Phone: (703) 231-5747

Title: ASSESSMENT OF RELIABILITY OF SHIP STRUCTURES

Abstract: At present naval ship structures are designed according to deterministic criteria. These criteria sometimes lead to overdesign or, in some cases, to unconservative design, because they do not account for some critical factors such as uncertainties in analysis, strength, and loads. This is particularly true for the design of advanced unconventional hullforms, for which such factors are very important. The objectives of this project are to demonstrate how to assess the structural reliability of existing naval ships, and to quantify the effect of design changes on the reliability of these ships. This will be accomplished by adapting and combining procedures for structural analysis of ships, and methods for reliability assessment. This project will lay the foundation for developing and applying rational, reliability-based criteria for improved structural design of naval ships. These criteria will be suitable for design of both conventional and advanced ship hulls and they will provide safe and efficient

Topic#: 91-100 ID#: 11883
Office: NAVSEA
Contract #: N00024-92-C-4056
PI: DR E NIKOLAIDIS

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

designs with consistent safety levels.

OPTIPHASE, INC.
1063 POINT VIEW STREET
LOS ANGELES, CA 90035
Phone: (213) 931-6491

Topic#: 91-110 ID#: 11985
Office: NAVSEA
Contract #: N00024-92-C-4011
PI: IRA JEFFERY BUSH

Title: HIGHLY SENSITIVE FIBER OPTIC ACOUSTIC POINT SENSORS

Abstract: Our proposal effort defines an approach to develop a highly sensitive, hydroacoustic, fiber-optic point sensor utilizing a low finesse Fabry-Perot structure as the acoustic transducer. The design concept embodying our approach allows high sensitivity, the ability to operate at hydrostatic depths experienced by military underwater vehicles, and unique digital demodulation scheme capable of supporting many remote sensors with a single laser and receiver/demodulator. We propose that this type of fiber optic hydrophone can be implemented in an array configuration with a completely passive (non-electric) wet end, dramatically reducing the complexity and cost of the wet end processing and telemetering electronics used in conventional array systems. We further propose that the dynamic range and frequency response capabilities of the all fiber point sensor system will surpass those of conventional technology when used in conjunction with the digital demodulation system. During phase I, we propose to identify the sensor design parameters and hardware components best suited to meet the mission and cost requirements for the underwater vehicle. We will demonstrate this design by fabricating a few "single element" sensors with laser and demodulation electronics. Verification of hydro-acoustic performance will be accomplished by conducting laboratory acoustic experiments.

OPTIPHASE, INC.
16555 SHERMAN WAY, UNIT A-2
VAN NUYS, CA 91406
Phone: (818) 782-0997

Topic#: 91-349 ID#: 13019
Office: NADC
Contract #:
PI: IRA JEFFREY BUSH

Title: EMBEDDED FIBER OPTIC SENSORS FOR ARRESTING GEAR CABLES

Abstract: Our proposal defines an approach to develop an embedded fiber optic sensor system for arresting gear cables. Our technical approach utilizes fiber optic sensing techniques to provide real-time monitoring of the cable. The embedded fiber sensor resides within the core of the purchase cable and is sensitized to determine, through acousto-mechanical techniques, strand breakage, which is the main contributor to the weakening of the cable. A signal processor will interface the embedded fiber sensor which will discriminate strand breakage from other dynamic mechanical events. It will also calculate the location of the breakage. The sensor system will also be used to monitor stress, strain, tension and impact loads of the cable. The work performed in Phase I will focus on design studies in three major areas: 1) the technique for embedding the fiber in the cable; 2) the fiber sensing technique(s) most appropriate for locating and discriminating cable weakening; and 3) the signal processing requirements to provide a high probability of detection. Once a suitable approach is defined, a laboratory demonstration of the sensing technique(s) will be performed..

OPTRA, INC.
66 CHERRY HILL DRIVE
BEVERLY, MA 01915
Phone: (508) 921-2100

Topic#: 91-211 ID#: 10827
Office: NACP
Contract #: N00140-91-C-3286
PI: Andrew Lintz

Title: Laser Doppler Fuel Flowmeter

Abstract: OPTRA proposes the development of a Laser Doppler Fuel Flowmeter with zero pressure drop. The sensor will use a technique similar to conventional Laser Doppler Velocimetry (LDV) to directly measure fluid velocity at the center of the fuel line. The non-intrusive sensor uses a solid state laser diode source and silicon detectors so that a compact, rugged, and relatively low cost package could be designed for installation in operational aircraft. OPTRA's unique optical configuration and robust signal processing algorithms will allow LOW techniques, which have until now been expensive laboratory research diagnostic systems, to be implemented into a simple non-intrusive and inexpensive flowmeter with high accuracy desired for all aircraft propulsion systems.

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

ORINCON CORP.
9363 TOWNE CENTRE DRIVE
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Topic#: 91-131 ID#: 12131
Office: NAVSEA
Contract #: N66604-92-C-0342
PI: LARRY BURTON

Title: PASSIVE TORPEDO DETECTION/CLASSIFICATION ALGORITHM DEVELOPMENT (U)

Abstract: The development of algorithms for the timely passive detection and classification of torpedoes using their acoustic radiated signatures is a high priority of both the surface ship and submarine torpedo-defense programs. In the last several years, ORINCON has employed neural network technology in the detection and classification of a number of underwater acoustic signals of interest to the Navy. Neural networks are robust and do not depend on any assumptions about noise or signal distribution. As a result, they can be easily modified to accommodate changing threat signal types with no major system changes. However, in a complex acoustic environment involving ownship, the threat submarine, one or more torpedoes, the false alarm and/or incorrect classification rates with just a neural network may be greater than desired. To further reduce the false alarm rate, increase the number of correct classifications, and provide a higher level scene analysis, an expert system can be utilized either as a back-end process or an adjunct to the neural network. The primary purpose of this Phase I effort is to demonstrate the applicability of this approach by developing a prototype system combining an advanced ADEC-like line tracking algorithm for detection with a gram analysis and monitoring expert system for classification and false alarm reduction. This prototype system would be evaluated using a variety test data supplied by the Navy.

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Topic#: 91-135 ID#: 12157
Office: NAVSEA
Contract #: N00024-92-C-4036
PI: DON K OWEN

Title: SUBMARINE COUNTERMEASURES AGAINST NEW TECHNICAL ACTIVE SONARS

Abstract: New technology active sonars are developing rapidly in their ability to detect, classify, and track submarines. The Navy has identified these sonars as a threat to the US Submarine Fleet and desires innovative techniques to counter this threat. Innovative countermeasures will attack the threat at each point in the threat-s processing chain; these are detection, classification, and tracking. ORINCON proposed to perform a study that examines countering the threat at each point in the threat-s processing chain. ORINCON will examine the strengths and vulnerabilities of new technology active sonars. Monostatic and multistatic systems will be considered. Next, ORINCON will assess the threat-s impact on submarine operations, Peacetime operations, such as maneuvering, will be explored for detection avoidance capabilities, Wartime operations to take direct action against the threat will also be evaluated. Third, ORINCON will identify countermeasures that will effectively nullify the threat. Our thorough understanding of detection, classification, tracking, and tactics will allow us to cover all bases of possible countermeasures. Finally, ORINCON will identify methods for evaluating the selected countermeasures effectiveness. The advantages and disadvantages of each countermeasure will be determined.

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Topic#: 91-297 ID#: 13121
Office: ONR
Contract #:
PI: Thomas W. Brotherton

Title: Condition-Based Machinery Maintenance

Abstract: Caution of faults in mechanical systems such as the gear boxes and bearings onboard helicopters and ships. Current problem solutions use relatively simple metrics to characterize changes in recorded data. The approaches are model-based and of limited utility. In many cases, the interaction of fault conditions with the mechanical system is time-varying and highly nonlinear. Specifying a good analytic model is at best difficult and most likely impossible. An alternative solution is to use neural nets coupled with appropriate feature extractors. Neural nets have been used extensively and successfully at ORINCON to solve detection and classification problems in underwater acoustics. Neural networks assume no underlying model for the events of interest. Rather, the neural network "learns" to detect and classify faults by examination of features from training data which have known fault conditions. In Phase I, ORINCON will develop a prototype system that uses three feature extractors coupled with a multilayer perception neural net to solve the problem. The three features selected are well suited for characterization of the expected fault classes. We will demonstrate the prototype system processing real data supplied by Westland Helicopters.

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

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Topic#: 91-128 ID#: 12102
Office: NAVSEA
Contract #: N00024-92-C-4049
PI: MR GERALD C MOONS

Title: TORPEDO ACOUSTIC PROCESSING U

Abstract: Timely detection, classification, and tracking of torpedo signatures are of high interest to both surface and subsurface ship defense system programs. The majority of the work completed to date has focused on the exploitation of the threat submarine acoustic energy envelope. The purpose of this project is to develop a laboratory feasibility concept demonstration system that makes use of neural networks, feature extractors, and an extended Kalman filter tracker, and is specifically designed to detect, classify, and track torpedo signatures. First, ORINCON will select templates and train neural network retinas to be operated in support of detection, classification, and alert processes. Next, we will implement simulated bearing estimation and tracking routines into a host computer application, and define the triggering algorithms necessary to activate tracker inputs. This will be followed by a laboratory demonstration of single-channel torpedo detection classification, and alerting with simulated bearing inputs to the tracking system. Finally, ORINCON will quantify the neural network detection and classification performance.

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Topic#: 91-155 ID#: 13633
Office: NSWC
Contract #: N60921-91-C-0155
PI: Gerald M. Anderson, Ph.D.

Title: Guidance Algorithms for High Performance Missiles

Abstract: ORINCON proposes to develop a data fusion and multiple target tracking capability using data from multiple sensors for midcourse guidance of a high-performance homing missile. The proposed multiple target tracker will include algorithms to perform the measurement/track association process, based on target attribute data position and velocity data in the measurements and tracks. A capability to discriminate between actual targets and pseudo-targets caused by natural phenomena or counter-measures will be included. The proposed tracking algorithm is an extended Kalman filter that generates estimates of the three position and velocity components of the target. A simulation will demonstrate the feasibility of the proposed system.

PACIFIC-SIERRA RESEARCH CORP.
12340 SANTA MONICA BLVD.
LOS ANGELES, CA 90025
Phone: (213) 820-2200

Topic#: 91-197 ID#: 10949
Office: NADC
Contract #: N62269-91-C-0559
PI: Charles S. Kaufman

Title: Reconfigurable Infrared Detection Assembly for Dual Function Optical Scanner

Abstract: PSR and team member Santa Barbara Focal plane will develop a design for a reconfigurable HgCdTe detector array assembly which is compatible with a GFE Optical Scanner. This new reconfigurable detector array will result in a detector that can provide either an increase in sensitivity or an increase in resolution as compared to existing infrared line scanning sensor systems. The technical approach is to utilize a two-dimensional array of small detector elements that can emulate a variety of focal plane patterns. Detector element activation is software controlled to permit real time manipulation of detector array geometries. The initial baseline technology utilizes HgCdTe in order to operate over the far-IR waveband while operating at liquid nitrogen temperatures. This will allow for the utilization of high reliability closed cycle cryogenic cooling.

PDI CORP.
180 ADMIRAL COCHRANE DRIVE
ANNAPOLIS, MD 21401
Phone: (301) 224-2130

Topic#: 91-207 ID#: 10625
Office: NAEC
Contract #: N68335-92-C-0073
PI: e j Lecourt, Jr

Title: FEEDBACK SYSTEM FOR WEAPONS LOADERS

Abstract: Loading weapons onto Navy and Marine Corps aircraft is currently performed with manual and powered loaders. "Push-up" loaders suffer from not having the ability to automatically compensate for aircraft movement caused by ship motions in a seaway and require three or four personnel to guide the weapons into place. It is proposed to design and analyze a system that measures the proximity of the loader to the aircraft and uses feedback to control position. The load being lifted will also

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be measured. The proposed system will be designed for retrofitting to existing loaders as well as for use in new designs. The technical objective of the Phase I project is to determine the feasibility of the proposed system. Task 1 will establish the requirements for the system. A survey of available sensors will be conducted in Task 2. Conceptual designs for powered and non-powered loaders will be prepared in Task 3. A preliminary design of the most promising concept will be prepared in Task 4. This design will be suitable for building an experimental system for testing in Phase II. Documentation prepared in Task 5 will consist of a description of the system, an evaluation of the feasibility of the system, and recommendations for Phase I. Design drawings and specifications will be included and appendixes.

PDI CORP.
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Topic#: 91-356 ID#: 13764
Office: NATC
Contract #:
PI: E. J. Lecourt, Jr.

Title: Instrumentation System to Measure Ship Motion/Airwake

Abstract: The air disturbance created by a ship's deck and superstructure known as airwake constrains aircraft-ship interaction to varying size safe operating envelopes. Airwake phenomena has been studied and analyzed using wind tunnel models and computer simulation but present day practice still requires ship-aircraft dynamic interface (DI) tests. The technical objective of Phase I is to design a practical instrumentation system which will provide comprehensive quantitative and qualitative data for ship motion measurements and airwakes surveys used to complement DI testing. Task 1 of the project will establish the system requirements through meetings and research. A survey of applicable motion, air flow, and ancillary sensors is performed in Task 2. Task 3 is a survey of data acquisition systems and supporting equipment. Task 4 develops a software specification and performs a survey of available software. The design developed in Task 5 culminates hardware and software specifications, design drawings, and test and operations plans to be used in the Phase II development and testing.

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Topic#: 91-119 ID#: 12328
Office: NAVSEA
Contract #: N00024-92-C-4097
PI: MR. RONALD A. BROWN

Title: BROADBAND OPTICAL COMMUNICATION TECHNOLOGY FOR FAULT TOLERANT FIBER OPTIC NETWORKS, PROVIDING INCREASED PERFORMANCE, THROUGHPUT, AND CAP

Abstract: DOD optical communication requirements have moved beyond the performance capabilities of conventional fiber optic communication technologies. Conventional optical communication networks are limited to baseband communication. However, breakthroughs in new, birefringent crystal technology combined with the application of new heuristic techniques for optical laser power modulation make it possible to provide true broadband optical communications! Polarization insensitive birefringent crystals can multiplex and demultiplex independent wavelengths of light with extremely narrow channel widths and close channel spacings, enabling simultaneous communication of multiple, independent bands of conication channels within the zero dispersion spectral window of a single optical conductor. Multiple communication channels can subsequently be multiplexed and demultiplexed within each communication band (wavelength) using optical laser power modulation techniques, providing truly time domain independent multi-channel optical communications. This has very significant implications for addressing optical communication performance limitations in both the government and private sectors. In Phase I a methodology will be developed for integrating fault tolerant broadband optical technology into existing and next generation DOD optical communication networks, for improving communication throughput, capacity, and reliability. This methodology will also include a technique for providing physical layer Interface compatibility with the FDDI/Safenet II optical communication standard. The feasibility of providing simultaneous voice, data, and/or video optical communication within a single optical conductor will be demonstrated.

PHOTONIC SYSTEMS, INC.
1800 PENN STREET, SUITE 4B
MELBOURNE, FL 32901
Phone: (407) 984-8181
Title: DMD IR Background Scene Generator

Topic#: 91-264 ID#: 11705
Office: NWC
Contract #: N60530-91-C-0215
PI: Dennis R. Papa

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Abstract: Effective ground testing of long-wavelength infrared (LWIR) Proximity fuses requires a system capable of generating realistic IA scenes in the 8-12 micron region of the electromagnetic spectrum. In order to accurately develop and evaluate devices under test the scene generation system must simulate as close as possible the actual IR image seen by the proximity fuse in the field. The Naval Weapons Center (NWC) is developing a scene generation system that uses 1/10 to 1/4 scale models of targets of interest for LWIR proximity fuze testing. While this system can simulate the IR emission of targets of interest, it does not have the capability of simulating the background IR scene surrounding the target. This proposal addresses the development of an IR background scene projector that will produce time-varying background scenes derived from LWIR video imagery for the NWC IR scene generator.

PHOTONICS TECHNOLOGIES
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Topic#: 91-191 ID#: 10887
Office: NADC
Contract #: N62269-91-C-0565
PI: Dr. Greg R. Olbright

Title: CASCADABLE OPTICAL NEURON ON A CHIP

Abstract: Optical neural networks have developed to the point where viable architectures such as optical associative processors for visual perception have been described in detail. Hundreds of papers are published and several topical conferences are held annually on the subject. However, few demonstrations have been reported of actual operating systems due to the unavailability of an "ideal" optical neuron having optic gain-cascadability, high on/off contrast, appropriate two-dimensional geometry and NxN pixel densities, adequate switching speeds, and tolerable switching power requirements. Clearly, architecture design has outpaced device development. In this proposal we describe a revolutionary new device which will meet these requirements. The device which is aptly called an "optical neuron" consists of a vertical-cavity surface-emitting laser monolithically integrated with a phototransistor. These monolithically integrated devices will be cascable and will have high optical gain (thus the ability to be massively interconnected). They will be fabricated using simple planar VLSI technology and emit light perpendicular to the surface. Consequently they are ideally suited to optical Fourier transformations using only lenses. The Phase I project will (1) demonstrate an optical neuron on a chip, (2) design a optimized second generation device, (3) identify a neural network architecture based on the optical neurons, and (4) outline phase-II. Phase II should include the development of, for example, a neural optical computer or a neural network for performing pattern recognition.

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TORRANCE, CA 90505
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Topic#: 91-102 ID#: 11865
Office: NAVSEA
Contract #: N00024-92-C-4072
PI: RICHARD KIM PHD

Title: EFFICIENT FIBER OPTIC NAVIGATION LIGHTS USING THE TOTALLY INTERNALLY REFLECTING LENS

Abstract: The Totally Internal Reflecting lens is a novel optical device that can collimate or concentrate light with nearly 100% collection efficiency. Physical Optics Corporation proposes to complete a production design for a TIR lens suitable for high-efficiency coupling of a lamp's light into a fiber optic cable. The conventional elliptical reflector design currently in use for fiber optic illumination has a fairly low efficiency because efficient designs are large, fragile, and difficult to manufacture. In contrast, the TIR lens is compact and can be molded from polycarbonate to withstand the heat loads of medium-power lamps. Because it surrounds the source, the TIR lens can focus almost all of the source's light onto a small area. For the Navy's navigation light application, a large-diameter optical fiber or fiber bundle could run up the mast to deliver the light to a masthead luminaire that spreads it out into the pattern specified by 72-COLREG. The fiber diameter is selected according to the luminance to be delivered at the masthead, and is expected to be 1/2 to 1 inch. The Phase I effort will result in a complete production lens design for prototyping and testing in Phase II.

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Topic#: 91-119 ID#: 12327
Office: NAVSEA
Contract #: N00024-92-C-4064
PI: TOMASZ JANNSON PH D

Title: FIBER OPTIC WAVELENGTH-SAMPLING LAN BASED INTEGRATED SHIPBOARD IC SYSTEM

Abstract: Physical Optics Corporation (POC) proposes to design and to develop a novel fiber optic LAN/FDDI integrated

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shipboard SC system which will be based on wavelength-sampling-multiplexing (WSM) techniques. These techniques, suggested a few years ago for "flight by light" system applications, never achieved practical feasibility due to poor power budgets and to their immaturity on a physical (hardware) layer level. POC's proposal solves both those problems. POC's approach is based on a novel WSM design and a new generation of non-Lambertian light sources, called ELEDs (edge light emitting diodes), which have excellent power budgets. POC's LAN/FDDI is fully transparent to the type of data transmitted (voice, data, video, etc.), is modular, has high survivability, provides additional coding possibilities, has an extremely high data rate, is immune to EMI, and exhibits strong security capabilities.

PHYSICAL OPTICS CORP.
RESEARCH AND DEVELOPMENT DIV.
TORRNACE, CA 90501
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Topic#: 91-349 ID#: 13017
Office: NADC
Contract #:
PI: R.A.LIEBERMAN

Title: EMBEDDED FIBER OPTIC SENSORS FOR ARRESTING GEAR CABLES

Abstract: The development of a unified methodology for the design of an integrated arrestor gear cable sensor system is proposed. Comparative analysis of critical components and techniques will be conducted using physical testing and mathematical modeling. Specific optical fibers will be screened; attachment and embedding technologies will be investigated; and signal processing methodologies, including pattern recognition based on neural networks, will be studied. The development of a "smart cable" design approach is expected to lead in Phase II to the production of a scale prototype of an arrestor gear cable with an embedded sensor system. This cable will be capable of reporting on its viability both during storage and in "real time" during actual operation. Possible fiber optic sensor technologies that will be investigated include intrinsic interferometric and bend-based sensors for distributed measurements, and reflectometric sensors for individual or multiplexed point sensing. Other sensor approaches will be identified and evaluated during the course of Phase I.

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

Topic#: 91-167 ID#: 13413
Office: NSWC
Contract #: N60921-91-C-0188
PI: W T RAWLINS

Title: HIGH TEMPERATURE IGNITION OF COATED BORON PARTICLES IN A SHOCK TUBE

Abstract: In advanced propellant applications, the ignition of boron particles is inhibited by the build up of a non-volatile boron oxide layer on the outer surfaces. Techniques are currently being developed to prepare boron particles coated with high burning rate metals, in the expectation that such coatings will significantly accelerate the ignition and burning of the boron fuel and thus enhance its overall combustion efficiency. In order to examine systematically the ignition behavior of coated and uncoated boron particles, Physical Sciences Inc (PSI) proposes to measure ignition delays and burning rates of coated and uncoated boron particles behind reflected shock waves in a shock tube. A previously developed, novel radial particle injector will provide uniform, dilute clouds of particles in Ar and Ar/O₂ baths, which will be rapidly heated to selected combustion temperatures (1800 to 3000K) by reflected shock waves. A variety of state-of-the-art optical extinction and spectral emission diagnostics, at visible and infrared wavelengths, will be used to monitor the time-resolved kinetic behavior of particles and key gas-phase combustion species such as BO and BO₂. The results of the Phase I effort will be determinations of the comparative ignition behavior for a limited selection of coated and uncoated boron particles, and definition of more comprehensive Phase II investigations of coated boron combustion phenomena.

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Topic#: 91-213 ID#: 10923
Office: NAPC
Contract #: N00140-91-C-285
PI: Constance L. Senior

Title: Real-Time Optical Measurement of Alkali Species in Air (7531-130)

Abstract: Hot corrosion of jet engines occurs readily in marine environments because of the sodium in the incoming air. To better understand the corrosion process and develop ways to mitigate corrosion requires the ability to measure the sodium concentration in the engine air intake stream. At present, extractive sampling is used to measure sodium; such measurements are not continuous, requiring sometime for sample analysis, and are often in error due to contamination. PSI Technology

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Company proposes to develop an in-situ optical diagnostic method for the measurement of sodium mass loading in air. The proposed method will not interfere with the flow, can be made in real time on a continuous basis, and is capable of quantitatively detecting the sodium loading typical of sea salt aerosol. In Phase I of this program, a prototype instrument which can be used by the Navy in test environments will be designed. Construction and testing of this instrument will be carried out in Phase II.

PHYSICS MATHEMATICS AND COMPUTERS, INC.
PO BOX 787
SOCORRO, NM 87801
Phone: (505) 835-2951

Topic#: 91-162 ID#: 13359
Office: NSWC
Contract #: N60921-91-C-A348
PI: MATTHEW PERINI

Title: INTEGRATED COMPUTING SYSTEM FOR VULNERABILITY ANALYSIS

Abstract: Many vulnerability codes are of the "dusty deck" FORTRAN variety. This research proposes to move a set of vulnerability codes to a modern graphics workstation, and to integrate them with high performance graphics, and a graphical user interface. The resulting system will utilize industry standards such as UNIX, X Windows, and the PHIGS graphics interface to maximize the portability of the system across hardware platforms.

PIASECKI AIRCRAFT CORP.
WEST TERMINUS SECOND STREET PO
ESSINGTON, PA 19029
Phone: (215) 521-5700

Topic#: 91-317 ID#: 13695
Office: NAVAIR
Contract #:
PI: Frederick W. Piasecki

Title: Attack Helicopter Alternative Tail Rotor Applicability

Abstract: 1. The objective is to examine alternative tail rotor concepts for the AH-1W that could result in a more agile and maneuverable, quieter helicopter that is more survivable and less susceptible to battle damage. Additional speed capability and other improvements will be assessed. Specifically, the following alternative design concepts will be explored: a. No Tail Rotor (NOTAR) b. Vectored Thrust Ducted Propeller (VTDP) c. Fan-in-Fin 2. In assessing the relative merits of each of the concepts, the study will include, as a minimum, estimates of the effect on aircraft weight, performance and flying qualities, systems integration requirements, operational limitations, optimized configuration for high speed forward flight, R&M comparisons to the current configuration, agility/ maneuverability considerations and the impact on survivability (e.g. noise, speed). The application of composite materials technology will also be addressed. 3. The product of this study will be a written report incorporating the comparative analysis at the 3 selected design concepts in each of the areas examined and a recommendation for the design concept to be explored in Phase II.

PROMETHEUS, INC.
21 ARNOLD AVENUE
NEWPORT, RI 02840
Phone: (401) 849-5389

Topic#: 91-124 ID#: 12348
Office: NAVSEA
Contract #: N00024-92-C-4062
PI: MICHAEL J LARKIN

Title: ASW SEARCH PLANNING

Abstract: Current capabilities to utilize ASW systems and formulate search plans are limited by the ability to process real-time tactical data. An automated system, exploring state-of-the-art developments in neural network and parallel processing technology, would enhance the ability to process information in a timely manner, and would thus result in an ability to optimize system line-up. We propose to provide an in-depth assessment of current neural network algorithms and parallel processing architectures, and their suitability for implementation in a computer-based system, based on a rigorous analysis of the requirements of the ASW search planning problem. Our report will include a recommendation of design requirements that will enable a prototype system to be built in Phase II of the project.

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Topic#: 91-202 ID#: 10597
Office: NUSC
Contract #: N66604-92-C-0302
PI: James S. Byrnes

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Title: Combined Combat System Models

Abstract: Among the numerous models used today to measure reliability, maintainability, availability (RMA), performance, and cost effectiveness for complex electronic systems, several are of particular importance to the Navy. The principal focus of our Phase I effort will be to evaluate these models, determine the feasibility of modifying them to have system performance reflect RMA and life-cycle cost considerations, and investigate techniques for either combining them or developing a new model with the required capabilities. Our ultimate aim is to produce a Measure of Effectiveness (MOE) which provides a straight forward yet meaningful method of assigning a single number between 0 and 1 to any combat system, such that the closer the number is to 1, the more effective is the system. This MOE will allow the quantification of system mission and cost effectiveness, task definition, RMA, etc.; will be compatible with either statistical or nonstatistical measurements; and will be meaningful for both assessment models and predictive models.

QUANTEX CORP.
2 RESEARCH COURT
ROCKVILLE, MD 20850
Phone: (301) 258-2701

Topic#: 91-157 ID#: 13336
Office: NSWC
Contract #: N60921-91-C-0159
PI: GEORGE M STORTI

Title: IMPLEMENTATION OF INTER-PATTERN ASSOCIATION NEURAL NETWORKS FOR AUTOMATIC TARGET RECOGNITION USING NOVEL ELECTRON TRAPPING MATERIALS

Abstract: We propose using electron trapping (ETTM) materials for the implementation of the interconnection weight matrix (IWM) in an of using ET materials is that they offer a large storage capacity, by which 1.6×10 to the 10 power reconfigurable interconnections are possible. The proposed ET electro-optic neural network can perform 2×10 to the 3rd power associations per second, and recognize 1.5×10 to the 3rd power targets, with shift, scale and 3D rotation in variances.

QUANTIC INDUSTRIES, INC.
990 COMMERCIAL ST
SAN CARLOS, CA 94070
Phone: (415) 637-3049

Topic#: 91-135 ID#: 12162
Office: NAVSEA
Contract #: N00024-92-C-
PI: DR JEFFERY MOSER

Title: SUBMARINE COUNTERMEASURES AGAINST NEW TECHNOLOGY ACTIVE SONARS (U)

Abstract: There are many types of active sonar threats that exist now or will exist in the future. These threats pose a constantly changing challenge to counter them. A very promising countermeasure technique that can be useful against a wide range of threats is being researched and developed. This technique, described in the main body of this proposal, presently has limitations including the ability to counter a wide range of threats. A main objective is to develop a single system that can counter the entire range of possible threats. In pursuit of this goal, a technical advancement to free the countermeasure technique of its limitations is sought. A distance-selective optical hydrophone is proposed to mitigate the limitations of the countermeasure system. It optically measures the acoustic signals at a fixed distance from the hull, so that there is sufficient time to process the insonifications signals before the propagating acoustic waves reach and reflect from the hull. The sensor is a unique heterodyne laser sensor that uses the focal cusp of a focused laser beam to provide the distance selectivity. The suspended particulates in the ocean, which can be enhanced, provide the optical reflectors that will move with the movement of the medium resulting from insonification. The present and future active sonar threats will be investigated, and their characteristics and vulnerabilities explored. The susceptibility to the described countermeasure technique and the advantage of the optical hydrophone against these threats will be investigated.

QUEST INTEGRATED, INC.
21414 65TH AVENUE SOUTH
KENT, WA 98032
Phone: (206) 872-9500

Topic#: 91-257 ID#: 11571
Office: NWC
Contract #: N60530-91-C-0256
PI: Mohamed Hashiah

Title: Polishing of Poly-crystalline Diamond Films

Abstract: Polycrystalline diamond films in an as-deposited condition do not provide the required optical quality to reduce scatter sufficiently for many applications. A research investigation will be conducted to determine the feasibility of achieving an optical-quality surface finish by using abrasive-liquidjets (ALJe) to perform the polishing operation on polycrystalline diamond films. Water, polymerized water, oils and some synthetic fluids will be examined for use in ALJS. A wide range of abrasive

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

materials, covering a wide range of hardness and sizes, will be explored. Examples are silicon carbide, cerium oxide, CBN, garnet and silica sand. A parametric study will be conducted to determine suitable abrasive, liquidjet pressures and flow rates. Several methods of producing ALJS will be tested, including entrainment of dry abrasive powder, entrainment of premixed abrasive slurries and direct pumping of abrasive suspensions jets (ASJ). The effects of variations in the different parameters on applying the ALJ to the surface and on the resultant surface finish will be determined. The parameters to be varied include the traverse speed, number of passes, standoff distance and angle of impact. Polished surfaces will be inspected for correlations with the polishing parameters. The overall technical feasibility of ALJ polishing will be determined, and directions for further development will be identified.

RADIX SYSTEMS, INC.
6 TAFT COURT
ROCKVILLE, MD 20850
Phone: (301) 309-6306

Topic#: 91-130 ID#: 12120
Office: NAVSEA
Contract #: N00024-92-C-4065
PI: JIM HOOPER

Title: ACOUSTIC DYNAMIC RANGE

Abstract: The proposed Phase I effort will develop an acoustic channel A/D converter, and digital decimation filter. The acoustic channel bit will have a dynamic range of 120 dB. Development costs will be lessened by using a hydrophone previously developed. This hydrophone has a 144 dB dynamic range. The channel electronics will be composed of commercially available components. A prototype channel will be built and tested both in air and water. Measurements to be made include self noise, total harmonic distortion, phase accuracy and gain. Systems' Rockville, MD facility and perform the in-the-water tests at Lake Pend Oreille, ID. Phase II will be to build a system for at sea tests on a US Navy test bed.

RD INSTRUMENTS
9855 BUSINESSPARK AVENUE
SAN DIEGO, CA 92131
Phone: (619) 693-1178

Topic#: 91-293 ID#: 13085
Office: ONR
Contract #:
PI: Blair BrumLey

Title: Integrated Navigation System Development

Abstract: The purpose of Phase I of this proposed project is to conduct research to establish the feasibility of developing a flexible, modular integrated navigation system capable of determining true "earth frame" 3-axis platform position, orientation and velocity as a function of time over a wide range of time scales. The proposed approach is to provide a near optimal yet robust processing algorithm to merge navigation inputs from various sources, primarily an inertial navigation system and Doppler and/or correlation velocity sensing molar, but optionally other velocity or position references. During Phase I we will develop a system performance model, investigate alternative processing algorithms and in-situ bias reduction techniques, characterize expected performance, and evaluate size, weight, and power tradeoff, of the sonar, inertial, and navigation processor packages.

RD INSTRUMENTS
98.55 BUSINESSPARK AVENUE
SAN DIEGO, CA 92131
Phone: (619) 693-1178

Topic#: 91-294 ID#: 13079
Office: ONR
Contract #:
PI: Steve Bradley

Title: Phase Coherent Acoustic Telemetry Development

Abstract: This research and development project will investigate the feasibility of data communication with submerged instruments using phase-coherent acoustic telemetry. We will conduct a series of pilot experiment, to determine an efficient modulation method for underwater acoustic data transmission. These experiments will center around real-time data transmission using a variety of promising modulation/coding methods. The experiment sites have been selected to match configurations where real-time data telemetry from remote ADCPe is of interest. The transmitted data will be recorded and processed off-line to determine optimal receiver structures and compare the merit, of a number of signaling methods. The results will be used to make a preliminary design of a prototype phase-coherent modem suitable for vertical telemetry in deep water, and to evaluate the feasibility of phase-coherent telemetry for communication in the highly reverberant shallow-water environment over medium ranges of a few kilometers.

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

REKENTHALER TECHNOLOGY ASSOC. CORP.
P O BOX 5267
SPRINGFIELD, VA 22150
Phone: (703) 418-8411

Topic#: 91-140 ID#: 12195
Office: NAVSEA
Contract #: N00024-92-C-4038
PI: MR JEFFREY S BRUSH

Title: SUBMARINE COMMUNICATION SYSTEM

Abstract: This Phase I SBIR program exploits RTA's recent development of an "Active Magnetic Field Sensor (AMPS)" to the problem of communication with submerged platforms and submarines. Since the AMPS has the potential for discrimination of electromagnetic signals in the ELF and VLF region of the spectrum for generating signals at these wavelengths and for discrimination of ambient background noise and clutter, it is an optimal device for use in underwater communications. The AMPS generates an intense focused magnetic flux with an overriding ELF modulation which can be hidden in a pseudo random noise (PRN) code pattern which propagates through the ocean. Detection of received signals is through use of nonlinear signal processing techniques. In a planned Phase II follows effort, a fieldable prototype system will be developed for Navy evaluation.

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Topic#: 91-291 ID#: 12993
Office: NOSIH
Contract #:
PI: Jeffrey G. Brush

Title: Applications in Signal Processing

Abstract: This Phase I SBIR proposal exploits RTA's recent development of nonlinear dynamics (NLD based processing methodologies to the problem of noise reduction and signal processing in general. RTA will analyze proprietary techniques and advances in the open literature, to identify areas of NLD-based processing that have the best potential to improve signal processing performance. Additionally, RTA will extend the theoretical connection between traditional signal processing and the new, nonlinear techniques. RTA will adapt currently operational, proprietary NLD-based software modules to provide a demonstration of these concepts for this effort. In a planned Phase II follow-on effort, the NLD-based techniques identified in this Phase I effort will be refined and implemented on RTA's MicroVAX systems. Also, the transition to a standalone platform or operational Navy system will be addressed.

REMAXCO TECHNOLOGIES, INC.
11317 SNYDER ROAD
KNOXVILLE, TN 37932
Phone: (615) 691-9643

Topic#: 91-351 ID#: 13926
Office: NAEC
Contract #:
PI: Richard D. Nixdorf

Title: ADVANCED CERAMIC CUTTING TOOLS FOR TITANIUM ALLOYS

Abstract: Titanium metal is used extensively in the fabrication of commercial and military aircraft components due to its ideal strength to weight properties. However, its hostile chemical corrosion effects on other materials make it a difficult metal to machine. This research effort will utilize the thermochemical inertness of Zirconium diboride to titanium to develop a highly efficient cutting tool insert material. This objective will be accomplished by using materials engineering innovations to optimize the zirconium diboride matrix properties, while improving its toughness through the addition of a reinforcement material to form a suitable composite structure. The research effort will optimize material properties and proceed to actual titanium machining tests to correlate insert material properties and machine tool performance.

RESEARCH INTERNATIONAL, INC.
18706 142ND AVENUE NE
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Phone: (206) 486-8731

Topic#: 91-121 ID#: 12063
Office: NAVSEA
Contract #: N00024-92-C-4044
PI: ELRIC W SAASKI

Title: THIN-FILM OPTICAL SPECTROPHOTOMETER FOR MONITORING GAS SPECIES IN SHIPBOARD MAGAZINES

Abstract: A thin-film optical spectrophotometer is proposed for monitoring of gas species in ship magazines. The device incorporates a suite of analyte specific interferometric films, in combination with microcircuitry that recognizes hazard scenarios, to provide early warning of deteriorating conditions.

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

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Topic#: 91-008 ID#: 10493
Office: ONT
Contract #: N00167-91-C-0086
PI: Michael Craner

Title: A Wideband Monopulse Sonar System

Abstract: The main goal of the phase I effort is to develop a preliminary design for a wideband monopulse sonar system useful in analyzing backscattered returns from complex objects in order to localize the scattering centers of the objects. In developing the design, an evaluation will first be made of the cost and performance benefits associated with using PVDF based continuous arrays in place of the more common discrete element line array. Next, the work of Henderson and others in monopulse sonar and radar will be used as a starting point in the development of a preliminary design for the system data acquisition and signal processing front-end. Then, based on identification of the desired outputs of the system, a preliminary design for the post-processing section of the system will be developed which addresses the problems associated with scattering center localization, analysis and display. In phase II, the preliminary design will be finalized and a prototype developed. The results of the prototype testing will be used in phase III to determine appropriate tools to be implemented which will further the goals of the post-process analysis and facilitate commercial application of the system.

RGS ASSOC., INC.
CRYSTAL PARK TWO SUITE 104
ARLINGTON, VA 22170
Phone: (703) 769-5867

Topic#: 91-150 ID#: 12262
Office: NAVSEA
Contract #: N00024-92-C-4079
PI: DR RICHARD G STIEGLITZ

Title: NAVSEA INTEGRATED LSA PROCESS MODEL

Abstract: A structured approach to the LSA process is needed to help NAVSEA managers plan and develop life cycle logistic support for ships, weapon systems and equipments. The CALS initiative, which establishes standards to collect technical data in digital form, provides a unique opportunity to streamline the LSA process. We will develop an integrated LSA process model that applies CALS standards and provides criteria to select LSA procedures for equipment, weapon systems and ship acquisition programs. Our Phase I effort will produce an integrated LSA process model that includes: a. A set of alternative procedures for each LSA process step documented in DFDs. For example, procedures for collecting LSA data are different for GFE and CFE for a ship acquisition program. b. Criteria related to each LSA process step to determine what must be done, who will do it, how it will be done, and when it must be done to support program milestones. c. Decision trees which use Program-specific parameters and milestones from the program manager to apply the criteria and select LSA procedures applicable to the acquisition program. The process model will be a point-of-departure for establishing ILS policy and providing LSA implementation guidance.

ROBERT LEVI ASSOC.
1616 S. EASY WAY
ANAHEIM, CA 92804
Phone: (714) 956-7935

Topic#: 91-217 ID#: 11355
Office: NATC
Contract #: N00421-92-C-0002
PI: Robert W. Levi

Title: Portable Simulator Evaluation Package

Abstract: Operational Flight Trainer and Weapon Systems Trainer acceptance testing can be significantly improved by the use of a portable, computer-based data acquisition and analysis system. This project will develop functional specifications and a preliminary design for a portable simulator test system that will allow evaluation of total simulator fidelity. The system will be designed to make measurements to evaluate the aerodynamic flight simulation, visual system, motion system and simulator throughput delays. Data will be gathered from the host simulation computer and external sensors. Built-in analytical functions will be specified that compare measured data with stored acceptance test criterion. The portable evaluation system will be configured for a particular simulator from data stored on diskettes. Test results will be automatically formatted, stored and presented to the operator. A means for generating and tracking deficiency and status reports will be integral to the system.

SABBAGH ASSOC., INC.
4639 MORNINGSIDES DRIVE
BLOOMINGTON, IN 47408

Topic#: 91-350 ID#: 13008
Office: NAEC
Contract #:

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Phone: (812) 339-8273

PI: L. David Sabbagh

Title: Eddy-Current Probe Testing Station

Abstract: We propose to design an eddy-current probe testing station, built around a PC running Interactive Systems Corp. UNIX (ISC UNIX). The testing station will provide a quantitative evaluation of eddy-current probe performance thereby improving the accuracy and reliability of eddy-current inspection. The station will consist of a model for probe-flaw interactions, a data acquisition system, and a user interface. The model and data acquisition system already exist, and have been tested and validated through previous work at Sabbagh Associates. The user interface will be based upon the popular X Windows system. Phase I of the project consists of getting most of the software running on an 80386 or 80486 computer running ISC UNIX and designing the complete system.

SATCON TECHNOLOGY CORP.

Topic#: 91-249

ID#: 11002

12 EMILY STREET

Office: NWC

CAMBRIDGE, MA 02139

Contract #: N60530-91-C-0213

Phone: (617) 661-0540

PI: Dr. James R. Downer

Title: An Optical Fiber guidance Payout Tension and Torque Measurement System Employing Magnetic Bearings

Abstract: Existing optical fiber guidance payout tension and torque measurement systems (TTMS) have inadequate performance. vibrations limit systems using air bearings and calibrated load cells to sampling rates on the order of ten hertz. Mounting the payout bobbin on an instrumented beam achieves acceptable sampling rates, but, thermal characteristics, elastic coupling, and difficulty in adapting to a rotating bobbin limited performance. SatCon Technology Corporation proposes to develop the next generation test bed for optical fiber guidance payout characterization. A magnetic bearing TTMS will overcome limitations of previous approaches. The magnetic bearings will use servo-controlled magnetic fields to provide contact-free support, avoid vibrational and elastic effects, and improve measurement accuracy. The system will employ a six degree-of-freedom magnetic actuator, previously developed by SatCon, integrated with commercial position sensors, switching power amplifiers, and a state-of-the-art digital signal processor to provide bobbin force and moment data at frequencies sufficiently high that several data points can be obtained as each turn is pulled from the payout bobbin. SatCon has proven track record in applying magnetic bearing system and force-rebalance technology. Scientists from Optelecom, Inc. will augment SatCon's expertise by consulting on optical fiber payout systems.

SATCON TECHNOLOGY CORP.

Topic#: 91-267

ID#: 11654

12 EMILY STREET

Office: NWC

CAMBRIDGE, MA 02139

Contract #: N60530-91-C-0217

Phone: (617) 661-0540

PI: Richard F. Torti, Ph.D.

Title: Mutual Inductive Sensing for IR seekers

Abstract: An innovative application of the position dependence of the mutual inductance between two coils is proposed for sensing the rotational parameters required by a free gyro seeker of a multi-spectrum guidance system. A set of series resonant static transmitting coils excite one or more tuned passive coils moving with the gyro. The rotational position and its rate of change are determined from the measured coupling between moving and fixed coils. This is achieved by correlating the mutual inductance with the angular separation between the two coils. The combination of real time data obtained from the complete set of transmitters can be digitally deconvoluted to obtain position and rate information or used directly with analog processing. Since the coupling is a function of geometry, arbitrarily precise position determinations can be made with a suitable complement of coils at resonant frequencies providing noise suppression, signal processing, and mechanical tolerances are compatible. The technique is inherently noise discriminating since ultrasonic frequencies are used in resonant circuits, yet especially compatible with the optics associated with IR detecting system. Further, these frequencies allow kilohertz data rates. In Phase I, a geometrically appropriate, rudimentary sensor will be designed and tested in a proof of principle demonstration.

SATCON TECHNOLOGY CORP.

Topic#: 91-317

ID#: 13789

12 EMILY ST.

Office: NAVAIR

CAMBRIDGE, MA 02139

Contract #:

Phone: (617) 661-0540

PI: James L. DowTier

Title: An All-Electrically-Actuated "Fan-in-Fin" Tail Rotor for the AH-1W

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Abstract: An alternate tail rotor for the AH-1W will yield an attack helicopter which is more maneuverable, quieter, and less susceptible to battle damage. All of the evaluation criteria cited in the Solicitation point toward using a fan-in-fin tail rotor and developing approaches to eliminate the tail rotor drive train and hydraulic pitch actuation mechanism. Currently, a complex mechanical system delivers power to the tail rotor. In combat, it is a source of battle damage since the tail rotor is a single-point-failure item. Hydraulic variable pitch mechanisms are also a hazard since hydraulic-fluid leaks can ignite on hot engine surfaces. SatCon Technology Corporation proposes to investigate an all-electrically-actuated fan-in-fin tail rotor for the AH-1W. This will extend the fan-in-fin tail rotor concept by adding direct electric drive of the tail rotor via an electric motor and electrical actuation of the pitch mechanism via a magnetostrictive linear actuator. Electric drive eliminates the drive train while electric pitch actuation banishes hydraulics from the tail section. Phase I will evaluate the benefits of the approach via a feasibility/design study. Phase II will develop a conceptual tail rotor system design based on the configuration defined in Phase I.

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Topic#: 91-332 ID#: 14155
Office: NAVAIR
Contract #:
PI: Dr. James R. Downer

Title: Higher Harmonic Control and Actuation System for the Navy H-60 Helicopters

Abstract: Future Army rotorcraft/air-vehicle systems will require advances in survivability, operability and supportability. SatCon Technology Corporation proposes to design, fabricate, and demonstrate an integrated swashplate hydraulic actuation system for control of helicopter vibrations which will allow improvements in all three these areas. This system will improve operability by improving maneuverability, agility, and speed; improve supportability by increasing reliability; and improve survivability by decreasing noise signature. In conventional helicopters, control of the rotor is achieved by the use of a swashplate. For a number of rotor control problems, however, the existing hydraulically actuated swashplate is sub-optimal. Due to the limited frequency response of the swashplate's hydraulic actuators, existing swashplates have insufficient bandwidth to provide active control of higher harmonic helicopter rotor vibrations. However, the actuator bandwidth problem can be alleviated if the existing hydraulic actuators are replaced with a modern state-of-the-art hydraulic System. This approach requires a minimum modification of the existing hardware while achieving a significant reduction in the vibration of the fuselage. Phase I will consist of prove of concept, initial design, and detailed planning for phase II. Phase II will consist of design, fabrication, and testing of the prototype hardware.

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Topic#: 91-359 ID#: 13866
Office: NTSC
Contract #:
PI: Vijay Gondhalekar

Title: Inertial Energy Storage and Roll Control Module

Abstract: The Navy has expressed an interest in developing a combined power and roll control module to improve the utilization of the volume within a missile envelope. Combined power and attitude control modules have been proposed before for orbiting spacecraft with emphasis on high specific energies (kJ/lb). The application of this technology to missiles demands emphasis on achieving a high energy density (kJ/in³) in conjunction with a relatively high torquing capability. However, the power requirements are incompatible with the torque requirement if a simple motor/generator, reaction wheel approach is adopted. The proposal here outlines a program for attacking this challenging problem and presents a viable solution for achieving the desired goals. The component technologies for a successful design do exist. In fact SatCon Technology Corporation is fabricating a 65.4 kJ/lb carbon fibre flywheel unit storing 8.0 NJ of energy and delivering attitude control torques for large spacecraft. Integrating these technologies into a volume constrained package requires an in depth knowledge of flywheel energy storage/retrieval, power conditioning and attitude control techniques. Phase I program will conduct a technology assessment, design a module and evaluate expected performance. Phase II program will build, test and deliver a prototype model.

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201 SOUTH MAIN STREET
DUMFRIES, VA 22026
Phone: (703) 690-6178

Topic#: 91-055 ID#: 11530
Office: SPAWARS
Contract #: N00039-91-C-0055
PI: J. PRICE

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Title: HIGH ASSURANCE TRUSTED SYSTEMS

Abstract: The focus of this proposal is the establishment of the feasibility of generating the functional code for Trusted Computing Base (TCB) modules from machine-parseable description of a security policy model. The TCB Module Generation System (TMGS) would be designed to provide a high degree of assurance that the security properties of the model would be upheld in the code, and would provide the intermediate-level information to known verification tools to aid in the certification of systems containing generated modules.

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NEW HAVEN, CT 06510
Phone: (203) 777-7442

Topic#: 91-005 ID#: 10351
Office: ONT
Contract #: N66001-92-C-7002
PI: Dr. D Gilmore

Title: LINDAR for Networks of Shared Memory Multiprocessors

Abstract: We propose to develop an extensible, cost effective, parallel supercomputer based on low cost, high performance multiprocessors connected via a high-performance local area network. Most of our effort will focus on multiprocessors which are merchant, shared memory systems, though the general ideas would apply as well to networks of SIMD multiprocessor. In particular we will emphasize the development of an extension of SCIENTIFIC-S Linda parallel programming language to this hierarchical environment with a special emphasis on compiler optimizing capabilities.

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Phone: (203) 444-6365

Topic#: 91-125 ID#: 12354
Office: NAVSEA
Contract #: N00024-92-C-4096
PI: CLAYTON K. MORSE

Title: MULTI-SENSOR AUTOMATED CORRELATION AND CLASSIFICATION SYSTEM MSACCS

Abstract: The Multi-Sensor Automated Correlation and Classification System (MSACCS) provides classification and correlation of multi-sensor, multi-platform data by implementing association heuristics and algorithms that (1) recognize the close linkage between classification and correlation, (2) merge facets of both parametric and geometric correlation, and (3) approach the problem from a temporal perspective, providing allowance for data gained and lost with time to contribute to the development of classification. To support the automated aspect, MSACCS intends to incorporate the NWTDB with relational data base, and assumed automated input of all parametric (attribute) data, as is available in the AN/BSY-2 combat system.

SEAKAY MANAGEMENT CORP.
8 PLANT DRIVE
WATERFORD, CT 06385
Phone: (203) 739-5899

Topic#: 91-132 ID#: 12372
Office: NAVSEA
Contract #: N00024-92-C-4039
PI: OREN B. COOKE

Title: EXPERT SYSTEM SUPPORT FOR SUBMARINE COMBAT SYSTEMS OPERATORS

Abstract: AN EXPERT SYSTEM IS PROPOSED TO SUPPORT SUBINE COMBAT SYSTEM OPERATORS. THE SYSTEM WILL BE RESIDENT ON A TACTICAL SUPPORT COMWER INTERFACED TO THE COMBAT SYSTEM. THE SYSTEM WILL EASE THE BURDEN ON COMBAT SYSTEM OPERATORS BY ASSISTING THE OPERATORS IN TACTICAL DOCTRINE BASED PROCEDURES AND IN THE MONITORING OF OPERATING PARAMETERS AND TACTICAL PLANS. PHASE I OF THE PROJECT WILL IDENTIFY OPERATOR INTENSIVE APPLICATIONS WHICH ARE CANDIDATES FOR EXIT SYSTEM SUPPORT AND SELECT CANDIDATES FOR INCLUSION IN THE CONCEPTUAL SYSTEM DESIGN BASED UPON ANALYSIS OF THE EXPECTED PAYOFF.

SEAMORE, INC.
18330 SW 66 STREET
PORT LAUDERDALE, FL 33331
Phone: (305) 680-6093

Topic#: 91-102 ID#: 11864
Office: NAVSEA
Contract #: N00024-92-C-4073
PI: ERIC L MOORE

Title: FIBER OPTIC NAVIGATION LIGHT SYSTEM

Abstract: The proposed project will determine the feasibility of replacing existing distributed electric navigational lighting

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

systems with a distributed light fiber optic navigational lighting system. It will also verify the measure of the potential benefits of fiber optic distributed lighting systems. The proposed project will develop a system consisting of three major component groups: 1) a centralized light source with control which can supply several fixtures, 2) a fiber optic cable to pipe light from the centralized source to several remotely located light fixtures and 3) several navigation light quality optical fixtures to accept piped light and emit it in compliance with the optical requirements of the 72 COLREGS and UL-1104. (for vessels over 50meters in length and in the colors: red, white, green and amber).

SECURE SOLUTIONS, INC.
9404 GENESEE AVENUE
LA JOLLA, CA 92037
Phone: (619) 546-8616

Topic#: 91-061 ID#: 11539
Office: SPAWARS
Contract #: N00039-92-C-0039
PI: Jeff Vigneas

Title: Placement of Network Security Services for Secure Data Exchange

Abstract: The placement of security services within the OSI Reference Model Rest has always been controversial. The objective of this study is to determine the security services required to address Navy threats.

SENTEL CORP.
1735 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VA 22202
Phone: (703) 685-7110

Topic#: 91-114 ID#: 12322
Office: NAVSEA
Contract #: N00024-92-C-4029
PI: ROBERT PROVOST

Title: COMPARISON OF DOD ELECTROMAGNETIC INTERFERENCE (EMI) SPECS TO COMMERCIAL SPECS IN ORDER TO AID THE PROCUREMENT OF NON-DEVELOPMENTAL ITEM

Abstract: The purpose of this project is to develop a readily usable comparison between DoD and non DoD EMI standards and specifications. This comparison will be used to assist the NAVSEA acquisition managers in assessing potential EMI impacts when using non developmental items to meet their needs. SENTEL's systematic approach will use recent studies as a starting point to identify applicable standards and specification. These will be enhanced by further review of indices of standards from all known issuing organizations. Each document will be reviewed and categorized based on the applicability to portions of MIL-STD-4616. Potential relationships will be noted. Detailed analysis will be performed to relate each applicable criteria level for DoD and non-DoD documents. This comparison will take into consideration variations in units and test procedures for each element. A correlation matrix will be developed providing a tabularized comparison of standards and specs for easy review by the acquisition manager. Recommendation will be provided on a method of incorporating these results into a rule-based software program to facilitate the AM's use of this data when determining the impact of EMI on NDI in the electromagnetic environment.

SIGMA GAMMA LAMBDA, INC.
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ANNAPOLIS, MD 21401
Phone: (301) 757-5975

Topic#: 91-130 ID#: 12123
Office: NAVSEA
Contract #: N00024-92-C-4066
PI: STANLEY G LEMON

Title: ACOUSTIC DYNAMIC RANGE

Abstract: A single acoustic sensor channel of a high dynamic range sonar processing system is proposed for design construction and test. The high acoustic dynamic range is provided by an acoustic sensor (hydrophone), a low gain (20db) amplifier and an oversampled sigma delta modulator of 18 (108db) bits or 20 bits (120db). Two different modulators are proposed for test, a monolithic 18 bit encoder would be taken to an approved Navy acoustic test facility where high and low level acoustic pressures would be applied to the sensor in water. The oversampled output of the encoder would be filtered and decimated and analyzed by an FFT/PC analyzer and the sensor channel tested for linearity and total harmonic distortion. A report will be written.

SIGNAL CORP.
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Phone: (703) 354-6706

Topic#: 91-033 ID#: 11234
Office: SPAWARS
Contract #: N00039-91-C-0192
PI: William R. Hahn

Title: High-Resolution Waveform LFAA Acousto-Optic Sonar Processor

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Abstract: The work proposed involves a new proprietary, high throughput, acousto-optic signal processing technique which will enhance the Navy's future warfare Capabilities in Undersea Surveillance and ASW. We propose to develop an acousto-optic sonar correlator that can easily provide the equivalent of 50 GFLOPS of Doppler channel correlation search processing at low cost, small size, and low power. This new acousto-optic processor will process about 3 times more data than current acousto-optic processors, and readily outperform any projected digital signal processors for the near future by perhaps two orders of magnitude. The availability of such a signal processor will make it feasible to use wave-forms with simultaneous range and Doppler high resolution characteristics for active long range low frequency sonar, and provide improvements in ASW target detection, localization, and tracking. In Phase I we propose to demonstrate feasibility and desirability by 1) developing a preliminary design of the acousto-optic correlator system, and 2) assessing the ASW system improvements attainable. In Phase II we would focus on building hardware and developing a Proof-of-Principle testbed incorporating the new acousto-optic signal processor.

SIGNAL ENGINEERING, INC.
8380 MIRAMAR MALL, SUITE 215
SAN DIEGO, CA 92121

Phone: () -

Topic#: 91-287 ID#: 12453
Office: NAC
Contract #: N00163-92-C-0001
PI: BRUCE M HERBERT

Title: DEVELOPMENT OF A LOW COST, INTEGRATED, MULTI-FREQUENCY PERSONAL LOCATOR BEACON & VOICE COMMUNICATION TRANSCEIVER

Abstract: A NEED EXISTS FOR A LOW COST, PREFERABLY HANDHELD ADVANCED SEARCH AND RESCUE SURVIVAL RADIO WHICH NOT ONLY PROVIDES FOR THE TRANSMISSION OF EMERGENCY SIGNAL ON ALL THREE OF THE CARRIERS (ELT, CPL, INTERNATIONAL EMERGENCY SIGNAL TRANSMISSION) BUT ALSO PROVIDES AN EMERGENCY VOICE TRANSCEIVER OPERATING AT 282.8 MHz. SIGNAL ENGINEERING PROPOSES DEVELOPMENT OF A COMPREHENSIVE SPECIFICATE FOR THE BEACON/TRANSCEIVER AND THE PROTOTYPING OF MAJOR PORTIONS OF THE HIGH LEVEL DESIGN PRESENTED IN THIS PROPOSAL DURING PHASE I.

SILHOUETTE TECHNOLOGY, INC.
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MORRISTOWN, NJ 07960
Phone: (201) 539-2110

Topic#: 91-199 ID#: 10890
Office: NADC
Contract #: N62269-91-C-0568
PI: Eugene Dwyer Ph.D.

Title: High Accuracy, High Resolution, Large Format Film Reader and Processor.

Abstract: Large format film based imagery is used in military surveillance, environmental studies, and earth resource management. In many applications, it is necessary to first convert the film imagery to computer compatible data by reading or digitizing before processing of the image data may begin. At present, no single commercially available reader unit offers the speed, precision and film size capability sufficient to satisfy the needs of the intelligence community for the rapid conversion of film imagery to computer data. Silhouette Technology has developed a new technology to make an affordable, desk-top film reader offering rapid and accurate digitization of large film imagery. The device exceeds the capabilities of existing systems, without the use of esoteric materials, or costly precision components.

SILICON DESIGNS, INC.
1445-N.W. MALL STREET
ISSAQUAH, WA 98027
Phone: (206) 391-8329

Topic#: 91-248 ID#: 10999
Office: NWC
Contract #: N60530-91-C-0263
PI: John C. Cole

Title: An Adaptive Contact Fuze

Abstract: Crush sensors and probes used in inexpensive missiles as contact devices are easily damaged by handling or anti-missile defenses. Piezoelectric accelerometer contact fuzes with fixed thresholds have trouble detecting a "soft" impact with an aircraft's aluminum skin in the presence of acceleration noise. An adaptive contact fuze is needed to sense such soft impacts in the presence of rocket motor, wind buffeting and rail/hail noise. Silicon Designs has developed a new low cost accelerometer technology for safe-and-arm devices that has been selected for two Army missiles, AAWS-M and HOMS. We are also developing an electronic retard sensor for bomb fuzes and an Advanced Contact Fuze under contract to NWC. The basic

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technology is radiation-hard to 50,000 rads (Si), and a radiation-hard version to 1 Megarad. We propose to develop an adaptive contact fuze that changes its threshold as a function of the ambient noise so that noise has only a small probability of triggering the fuze. The device would fit into a 20-pin LCC and cost less than \$100 to produce in large quantities. We propose to investigate two different adaptive contact fuzes: one using acceleration and one using acoustic emissions.

SIPPICAN, INC.
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MARION, MA 02738
Phone: (508) 748-1160

Topic#: 91-009 ID#: 10507
Office: ONT
Contract #: N66604-92-C-0177
PI: MARK MANNING

Title: COMPACT HIGH-POWER PROPULSION SYSTEM

Abstract: There is a growing interest in small, high speed autonomous underwater vehicles (AUV's). In particular, the U. S. Navy Submarine Force could greatly enhance its soft and hard kill capabilities as well as detection and classification capabilities through the effective utilization of such devices. Such devices must have variable speed capability and high end speeds comparable to modern submarines and torpedoes to be truly effective. Key to the small size and high speed characteristics of an AUV is the propulsion subsystem. The propulsion subsystem, coupled with its power requirements often size the vehicle or, in reverse, the vehicle's form factor may constrain the propulsion design and ultimate performance. During Phase I, Sippican proposes to perform a comprehensive study and tradeoff analysis of electric power sources, D.C. motor technology and propulsors, taking into account the energy requirements, volume, weight, noise, thermal and hydrodynamic constraints of the proposed vehicle. Also, a Phase II plan will be developed to encompass hardware demonstrations of the major components (i.e. battery, motor, propeller).

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Phone: (202) 442-4355

Topic#: 91-124 ID#: 12347
Office: NAVSEA
Contract #: N00024-92-C-4061
PI: MR ROBERT SMITH

Title: ASW SEARCH PLANNING -INTERACTIVE GEOGRAPHICALLY BASED SEARCH LINEUPS

Abstract: Software shall be developed for the SUN 4 that allows interactive evaluation of sonar system lineups and search plans over a large geographic area of interest. The basis for this evaluation will be the depth combinations and target frequencies (matrix) for multiple receiver locations within the geographic area of interest. The large number of independent calculations will require that an array processor be applied to the task. Once the proposed data has been generated and location. Likewise, a specific sensor and threat can be identified, and a search plan can be computed based on the unique environmental, sensor, and threat characteristics associated with this location. This area-wide search plan information can be applied to the task of allocating search resources over a large area. One indicator of performance homogeneity in the area would be the regional variability in search plan performance measures for a specific sensor. It is logical that a platform be assigned to search a region in which minimal changes to the search plan are required. This information is obtainable from the data described above.

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Topic#: 91-125 ID#: 12083
Office: NAVSEA
Contract #: N00024-92-C-4098
PI: ALBERT P GERHEIM PHD

Title: SENSOR DATA CORRELATION/CLASSIFICATION VIA FUZZY CLUSTERING

Abstract: C-language software shall be developed that will accomplish a crisp clustering of ASW contact reports from ESM, sonar, and other sources. Contacts shall be grouped together so that contacts in the same group originate from the same object. The probability that each object is a given type shall be estimated. The problem shall be partitioned so that positional and signal attribute data are processed separately. Positional data shall be processed by a neural network, which provides a fuzzy clustering of contacts based on an appropriate motion model. A fuzzy clustering of contacts onto threat types can be computed directly by way of a threat data base. The contact and threat clusters shall be combined to form a crisp cluster of contacts. Each cluster of reports shall be associated with additional information on the probable object. Contact motion and distribution models shall be developed as part of the contract and shall be used to train the neural network and to direct the design of the fuzzy cluster combiner. The neural network training shall be accomplished in two stages, first with preliminary, and then with refined contact

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models.

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Topic#: 91-131 ID#: 12370
Office: NAVSEA
Contract #: N66604-92-C-0345
PI: WILLIAM N PUGLIESE

Title: A MULTISPECTRAL-MULTIDIMENSIONAL APPROACH TO AUTOMATIC DETECTION/CLASSIFICATION D/C OF TORPEDOES

Abstract: The objective of Phase I of this project is development of the software logic for automatic detection/classification (D/C) of torpedoes based on exploitation of weapon radiated noise and weapon motion. Achievement of this objective requires the development and technical integration of signal processing and models of weapon noise and own platform sonar self-noise. * Progress for automatic D/C of torpedoes by submarines and surface ships will be researched through detailed contacts with NUSC and NCSC scientists, and the latest D/C techniques will be evaluated. Processing requirements will be determined for all signature elements of torpedo radiated noise including propulsion noise caused by turbine and swash plate engines and electric motor or magnetohydrodynamic (MHD) drive. The use of torpedo sonar transmissions and torpedo radiated noise and the spatial and temporal attributes derived from indications of torpedo position, motion, and changes therefrom will be evaluated. Methods will be developed so that received acoustic data will be processed to deconvolve the medium transfer function, and the host platform noise field from the desired signal through development and use of platform dynamic noise models and medium adaptive acoustic propagation models.

SPACE APPLICATIONS CORP.
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KENT, WA 98032
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Topic#: 91-303 ID#: 12863
Office: ONT
Contract #:
PI: John S. Carothers

Title: Unconventional Signal Processing Using the Cone Kernel Time Frequency Representation

Abstract: Early detection, localization, and classification of submarine threats is an on-going mission within Anti-Submarine Warfare (ASW) programs. To counter the increasingly quiet passive signatures of these threats, the overall Figures of Merit of tactical and strategic surveillance systems have been improved. But as the resulting detection ranges and search volumes increase, so does the frequency and number of detections. Increased contact loading forces the operator to classify contacts more rapidly, reducing his effectiveness. This study addresses the contact loading problem directly by investigating the applicability of the Cone Kernel Time Frequency Representation (CK-TFR) detection and feature extraction technique to ASW. The study will also explore intuitive man-machine interface (MMI) techniques that assist the sonar operator in managing the contact workload. Our approach uses a real-time signal processing testbed and display system to evaluate this alternative technique, identify new classification methods and clues, and explore advanced MMI concepts. Specific issues to be examined include characterizing the performance of the CK-TFR algorithm in a real ASW signal environment, identification of additional potential classification clues, such as unique time-frequency patterns of transients, and user displays and controls which optimize operability.

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Topic#: 91-214 ID#: 10946
Office: NAPC
Contract #: N00140-91-C-3287
PI: P. Shakkittai

Title: Destructive-Interference Mufflers for UAW Engine Noise Suppression

Abstract: State-of-the-art UAVs have reduced covert capability and survivability due their high engine noise signatures. In order to improve their effectiveness in covert operations it is essential that their noise signature be reduced to below 60 dB at 1000 feet for the entire range of their engine operation while simultaneously maintaining the power loss of the engine to less than 2 percent. Conventional mufflers cannot achieve these requirements. A new concept based on destructive interference is proposed to meet these objectives. In this method, noise reduction is achieved by first providing the sound from the noisy source into two parts and then later recombining the parts with the appropriate phase relationship. The engine noise is first reduced by a conventional muffler to a moderate level. Further reduction is then achieved by combining destructively the residual noise (after

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the conventional muffler) with a portion of the primary noise source using a phase-shifter. The Phase I effort is aimed at developing the theoretical basis of this new concept. The theoretical models developed will then be used to design mufflers capable of meeting the requirements.

SPARTA, INC.
23041 AVENIDA DE LA CARLOTA
LAGUNA HILLS, CA 92653
Phone: (714) 768-8994
Title: THERMAL CONTROL METHOD FOR A NAVAL SYSTEM
Abstract: This project will involve thermal control methods in vehicles.

Topic#: 91-003 ID#: 11750
Office: ONT
Contract #: N00014-92-C-2057
PI: Mr J GLATZ

SPARTA, INC.
23041 AVENIDA DE LA CARLOTA
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Phone: (714) 768-3350
Title: Blue-Green Er:Tm Laser

Topic#: 91-004 ID#: 10431
Office: ONT
Contract #: N60530-91-C-0350
PI: ROBERT GROSSO

Abstract: The program proposed here addresses development of efficient, blue-green solid state lasers. These lasers, based upon Er:Tm:YSAG with emission tailored at 455/459 nm, are important for submarine laser communications (SLC) and tactical airborne laser communications (TALC) systems since the emission is located in a seawater transmission window having low attenuation. Also, the 455/459 nm emission is compatible with existing cesium atomic resonance filter receivers. The Er:Tm:YSAG laser proposed here will be pumped by a 355 nm, frequency tripled, Nd:YAG laser. The proposed program represents the first step in developing highly efficient blue-green solid state lasers for SLC/TALC compact, rugged, long life, eyesafe, solid state lasers. The four level nature of the 1D2-3F4 Tm transition, compatibility with existing Cs ARF-s, and ability to be pumped by frequency tripled Nd:YAG lasers makes the Er:Tm:YSAG laser a viable candidate for SLC and TALC roles. The Phase I program is important for providing a feasibility demonstration of a blue green Er:Tm:YSAG laser. A Phase II program will characterize high-power, Er:Tm:YSAG laser performance with SPARTA-S existing Cs ARF receivers.

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Topic#: 91-074 ID#: 13229
Office: NAVAIR
Contract #: N00019-91-C-2028
PI: JOHN GLATZ

Title: ATTACK HELICOPTER DETECTABILITY REDUCTION
Abstract: THE OBJECTIVE OF THIS STUDY IS TO ANALYTICALLY ASSESS THE FEASIBILITY OF USING GRAPHITE FIBER IN COMPOSITES IN HELICOPTER CONSTRUCTION.

SPARTA, INC.
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Topic#: 91-241 ID#: 10979
Office: NWC
Contract #: N60530-91-C-0339
PI: Phil Allen

Title: Digital Computer Modeling Of Directed Energy Weapons (DEWS)

Abstract: SPARTA proposes to develop a functional model which describes the operation and effectiveness of low energy lasers used to attack/suppress bio-optic or electro-optic sensors onboard aircraft. We also propose to integrate this model into at least one government specified 1-on-1 or force-on-force effectiveness code. To construct this model we will draw heavily on the repertoire of directed energy weapons (DEW) models we have developed or acquired as part of many years experience in support of Army DEW and JCTG/AS activities. A key ingredient of our approach is the use of a SPARTA-developed code named LELEM, which computes the probability of damage/effect by a pulsed low energy laser to an ensemble of sensors located on a single vehicle. LELEM is a direct extension of LELAWS, a code currently accepted by JCTG/AS for one-on-one low energy laser weapon engagements. SPARTA-s experience in integrating directed energy weapons models into government codes coupled with our extensive existing weapons and effects models, will allow us to deliver a code at the completion of Phase I which not

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only evaluates the amount of laser radiation delivered to target, but also estimates the degree of damage/effect to each on-board SENSOR.

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Phone: (714) 768-3350
Title: Ultraviolet Renkus Communication
Abstract:

Topic#: 91-308 ID#: 13816
Office: MCRDAC
Contract #: N66001-92-C-
PI: Barry G. Charles

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

Topic#: 91-209 ID#: 10631
Office: NAEC
Contract #: N68335-92-C-0050
PI: Piran Sioshansi, Ph.D.

Title: "Enhanced Loading Capacity and Service Life of Wire Rope Core Materials by Ion Implantation"
Abstract: In 1979 Battelle Columbus Laboratories studied advanced wire rope. However, their excessive cost nullified their utility for improved deck pendent and purchase cable reliability and longer life. Alternatively, extra improved plow steel (EIP) offers the best cost/technical benefit performance. EIP's mechanical properties degrade, however, under several operating factors. First, the high-velocity transverse impact of the arresting hook causes notching between wire elements which can lead to instantaneous failure. Second, when the rope slides across the arresting hook, a white and brittle outer layer (untempered martensite) is formed by the rapid thermal cycling associated with hook abrasion and can result in crack formation and subsequent fatigue failure. Third, abrasion of the deck pendent by the aluminum/epoxy non-skid flight deck can cause notching and failure. Consequently, deck pendants lose 81% of their unabraded fatigue life. Lastly, fatigue also occurs in the purchase cable from repeated cycling through below deck arresting mechanisms. The liabilities are loss of aircraft and navy personnel. Ion implantation offers a germane solution to this critical concern of fatigue and formation of untempered martensite in EIP. Spire's implant technology is well established in combatting high and low-cycle fatigue and/or rolling contact fatigue failure in bearing-grade and tool steels. Spire's recent experience indicates the potential for complete elimination of the problem by implanting the "stinger" hook and cables for total mechanical enhancement. Implants of B, C, N, Si, Y, Cr+Mo, Cr+N, Ti+C, Ta+C, and Nb+N, integrated with materials and mechanical analysis, will constitute the Phase I technical approach. Ion implantation

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Topic#: 91-361 ID#: 13887
Office: NWC
Contract #:
PI: Anton C. Greenwald, Ph.D.

Title: Expendable High Energy Density Capacitors

Abstract: Improved energy density capacitors are needed for strategic and tactical missiles and pulsed power terrestrial installations. Current performance is limited by processing technology and not inherent material properties. Spire Corporation proposes development of a multilayer, thin film capacitor utilizing ion beam assisted deposition and chemical vapor deposition to create perfectly dense ceramic films with high permittivity and high dielectric breakdown strength. The Phase I program would demonstrate a 2 kV single layer capacitor with an energy density exceeding that of conventional tape casting materials. Successful Phase II research and development would produce a prototype twenty microfarad capacitor with a volume less than one cubic inch.

STANLEY ASSOC.
300 NORTH WASHINGTON STREET
ALEXANDRIA, VA 22314
Phone: (703) 684-1125
Title: SUBMARINE COMBAT SYSTEM OPERATOR TRAINING WORKSTATION CONCEPTS

Topic#: 91-136 ID#: 12169
Office: NAVSEA
Contract #: N00024-92-C-4031
PI: ROBERT H CUTSFORTH

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Abstract: Rapidly evolving ASW threats and the emerging roles for our submarine force mandate major improvements in our combat system's capabilities. Successful deployment of these capabilities is totally dependent upon our ability to train our submarine officers and crew. Current combat system trainer methods have proven inadequate. Complex land-based trainer systems are costly and difficult to maintain. Funding, space and presently available on-board computer resources limit the capability of submarine-based training systems. Inadequate training jeopardizes the ship's safety and mission. The gap between the need and availability of operator training continues to grow, commensurate with the complexity of the submarine combat system and the threat. The problem is aggravated by increasing operational demands and decreasing budgets. Workstation technology now provides the means to bridge this gap and provide affordable and effective operator training. Traditional methods of providing a limited number of land-based, high cost, complex systems must be complemented with multiple low cost, high-tech operator-oriented workstation trainers. These trainers would be readily accessible and provide responsive, innovative and motivational training faster, and at a fraction of the cost, of ground work for developing this workstation training capability in the submarine force.

STRESAU LABORATORY, INC.
1400 SOUTH RIVER STREET
SPOONER, WI 54801
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Topic#: 91-282 ID#: 12727
Office: PMTC
Contract #: N0429A-91-C-0087
PI: THOMAS WERGEN

Title: FIRE FREE DAY/NIGHT SIGNAL FOR PRATICE BOMBS

Abstract: THE DEVELOPMENT OF A DAY/NIGHT PRATICE CARTRIDGE THAT WILL NOT START FIRES WILL BE CONDUCTED IN TWO PHASES.

SUMMITTEC CORP.
673 EMORY VALLEY ROAD
OAK RIDGE, TN 37830
Phone: () -

Topic#: 91-281 ID#: 12729
Office: PMTC
Contract #: N0429A-91-C-0092
PI: JOHN L VOLAKIS, PHD

Title: A FINITE ELEMENT-BOUNDARY INTEGRAL METHOD FOR SCATTERING AND RADIATION FROM MICROSTRIP ANTENNAS/ARRAYS

Abstract: A new hybred method for the analysis of the scattering and radiation by conformal antennas and arrays. The method employs a finite element formulation within the cavity and the boundary integral (exact boundary condition) for terminating the mesh. By virtue of the finite element discretization, the method has no restrictions on the geometry and composition of the cavity or its termination. Furthermore, because of the convolutional nature of the boundary integral and the inherent sparseness of the finite element matrix, the storage requirement is kept very low at $O(n)$. These unique features of the method have already been exploited in other scattering applications and have permitted the analysis of large structures with remarkable efficiency. During Phase I of the project, we will explore the method's versatility, capability, and efficiency as applied to microstrip array structures. In particular, the method will be formulated and implemented for characterizing a variety of feed structures to permit the computation of the input impedance and radiation pattern. Finally, the method's effectiveness will be examined for modelling inhomogeneous and anisotropic substrates.

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Phone: (617) 876-3635

Topic#: 91-296 ID#: 13058
Office: ONR
Contract #:
PI: Robert C. Paslay

Title: Integrated Enterprise Product/Process Design System

Abstract: One of the major goals that manufacturing institutions in the United States must achieve in order to be competitive in the world marketplace is getting higher quality products to market faster and cheaper. To accomplish this, they must leverage technologies, both new and old, to their fullest extent. One of the main obstacles to taking advantage of the wealth of software technologies available to these institutions is the problem of integrating these applications into a cohesive cooperative whole. This is a mission critical requirement for several reasons. The current sequential manner in which steps in the process of producing manufacturable product are executed essentially guarantees long and expensive iterations between design, prototyping, and manufacturing. If the various software tools used along the way could be integrated this sequential step by step approach

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would become inherently more of a cooperative concurrent process. Furthermore, if the approach taken to integration were systematic and non-intrusive, new technologies could be added as they become available allowing the coexistence of state of the art technology with established proven technology. This proposal presents an integration framework which provides such a solution.

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Topic#: 91-035 ID#: 11283
Office: SPAWARS
Contract #: N00039-92-C-0054
PI: Richard Fastring

Title: Local Area Network (LAN) Security

Abstract: SYNETICS proposes an innovative and cost-effective means for defining and standardizing security protection protocols for naval ship and shore Local Area Networks (LANS). The approach is to augment a SYNETICS-developed LAN simulation model so as to include the security protocols recommended in the IEEE 802.10 Standard for LAN Security (SILS) and to use this model to determine quantitative impacts of security overhead upon LAN performance with a typical shipboard data load. The approach is innovative in that it provides a technical basis for Navy feedback to the IEEE SILS Committee in a timely manner so as to potentially influence the evolving draft standard. The proposal is cost-effective in that it leverages upon prior and on-going development work by: (a) SYNETICS in the development of the LAN simulation model; (b) by the IEEE committee which is developing the SILS standard; (c) by SYNETICS and NAVSEA SYSCOM in the compilation of a comprehensive shipboard LAN-oriented database for the NFR-9D; and (d) by the government and industrial organizations who are contributing to the Survivable, Adaptable, Fiber Optic Embedded Network (SAFENET) standard.

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Topic#: 91-119 ID#: 12039
Office: NAVSEA
Contract #: N00024-92-C-4063
PI: ALBERT J DESROSIER

Title: FIBER OPTIC LAN BASED INTEGRATED SHIPBOARD IC SYSTEM

Abstract: The U.S Navy has a requirement for an integrated shipboard interior communication system which uses a fiber optic local Area Network (LAN) as a transmission medium, and that will support both voice and data information transfer. Other requirements include use of an "open architecture", use of military and/or commercial standards, is survivable, is modular (for use on various size vessels), and provides both administrative and tactical services. The objective of this Phase I effort is to demonstrate the feasibility of implementing a fiber optic LAN which satisfies the above stated requirements. * SYNETICS proposes to use the Navy's SAFENET II LAN protocol as the basis for the backbone network architecture. A modular node concept is used which can be based on a standard backplane such as VMEbus or the emerging Futurebus+. Administrative Integrated Services Digital Network (ISDN) telephones or tactical terminals may be connected directly to nodes or to intermediate concentrators. The unique use of concentrators provides a method for significantly expanding the network capability without changing the basic system design. Tactical data interfaces and other functions are provided by special node interface modules.

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Topic#: 91-122 ID#: 12064
Office: NAVSEA
Contract #: N00024-92-C-4024
PI: RUDOLPH F MARIK

Title: METHODS OF EXPRESSING INTERFACE DESIGN STANDARDS IDS AND PROTOCOLS

Abstract: Naval shipboard combat system design is beginning a trend toward full integration of sensors, weapons, and command and control systems. This trend necessitates a new, standard methodology for interface specification. The data representation, message format, and data exchange protocols must be clearly specified so that all interconnected equipments can communicate efficiently and effectively. Standards for the means of information transfer are emerging (e.g., SAFENET and Futurebus+), but few standards exist that define the representation and syntax of the information that is generated and used within the combat system. In order to achieve full combat system integration, standards must be developed that will establish uniform data representation and standard message formats. The work proposed under Phase I will develop an innovative methodology for

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expressing Interface Design Specification (IDS) information unambiguously using mathematically logical relations. This work will involve application of two complementary international standards to the problem of definition of tactical data that is transferred between shipboard equipments. The investigations performed during Phase I will: (1) define a methodology for encoding (representation) of data; (2) define a methodology for specifying message formats; (3) automate the process of IDS preparation; and, (4) provide a flexible database which will support the development of a standard message catalog.

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Topic#: 91-300 ID#: 12958
Office: ONT
Contract #: N60921-92-C-0053
PI: William J. Both

Title: Reverse Engineering of Assembly Code

Abstract: The U.S. Navy develops and deploys some of the world's largest, most complex information processing systems that require life-cycle maintenance (LCM) support. Because these systems are used in a real-time environment, they frequently must be modified to reflect changing conditions and to introduce new capabilities. As changes to these software systems are incorporated, particularly changes to the assembly code embedded in high-level languages, the design documentation is rarely updated. Reverse engineering provides this support for the life-cycle maintenance project by providing as much high-level information as possible to be represented in the detailed design documentation. Recognizing the requirement for future reverse engineering efforts, SYNETICS will plan for the future now by integrating all phases of large real-time system generation into one environment. This concept, called Software Total Environment Philosophy (STEP), provides control and consistency for LCM and reverse engineering. SYNETICS proposes to design an innovative automated tool to perform reverse engineering of assembly code. The SYNETICS approach is innovative in that it will provide PDL that will be readily accepted by an Ada CASE tool capable of producing Ada source code, thus fully automating the reverse engineering process.

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Topic#: 91-046 ID#: 11401
Office: SPAWARS
Contract #: N00039-91-C-0226
PI: Robert M. Conner

Title: Automated Computer On-Line Library

Abstract: The primary objectives of this research program is to develop a working "Navy Oceanographic Electronic Library System" (NOELS) for use by the Navy Oceanographic community. The Synex proposal is unique in that NOELS will be prototyped and demonstrated in Phase I. In Phase II, NOELS will be more fully developed using demonstrations of enhancements at predetermined milestones. By the end of Phase II, NOELS will be a fully operational system serving the information needs of Oceanographic Technicians. Synex is experienced in the development of large scale information retrieval systems and has extensive knowledge of the technologies and applications associated with electronic library requirements. An important objective of this research effort is to extend the current state of on-line library systems. The program proposed for this SBIR is divided into four (4) tasks. Taken together, they yield not only a demonstrable prototype, but a baseline that offers modular components including: (1) Document Acquisition; (2) User Front End, which is composed of a Browser and Search/Retrieval interface; and (3) Database Management. NOELS will utilize Commercial-Off-The-Shelf products wherever possible. In addition, Synex will investigate emerging technologies such as handwriting digitization and document imaging for incorporation into the final NOEL solution.

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Topic#: 91-176 ID#: 13486
Office: NSWC
Contract #: 560921-91-C-A353
PI: GEORGE Q PHAN

Title: OPTICAL TIME DOMAIN REFLECTOMETER OTDR FOR FIBER OPTIC COMMUNICATIONS NETWORKS

Abstract: The use of fiber optic networks in data communications has rapidly increased in recent years. Advanced communication networks technologies are now used in a wide range of implementations, from local area networks for personal computers and workstations to parallel processing networks for supercomputers. The growing dependence on fiber optic networks demands the development of an efficient method for finding defects and breaks in fiber optic networks. System & Processes Engineering

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Corporation (SPEC) has developed an OTDR system for the on line, real time analysis of fiber optic networks. SPEC proposes to develop Bipolar, CMOS, and GaAs OTDR ASIC designs for implementing an OTDR plug-in card for a PC or workstation. This development will allow the conversion of PC/workstations into OTDR terminals for locating connectors and breaks in fiber optic networks. The resolution available from this advanced technology OTDR system will range from 1 m to 5 cm—a substantial improvement in OTDR operating range and accuracy.

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Topic#: 91-089 ID#: 12650
Office: NAVAIR
Contract #: N00140-92-C-6000
PI: Robert Anex

Title: Advanced Gas Turbine Engine Operability

Abstract: Future aircraft may incorporate post-stall maneuverability design features to provide a tactical advantage for air combat maneuvering. Post-stall maneuverability is characterized by rapid and large changes in airspeed, angle-of-attack and sideslip. Post-stall maneuverability is the result of two propulsion system features: an engine that has a high thrust-to-weight ratio and the availability of thrust vectoring. The propulsion control system must be designed to protect the engine from a compressor stall that could result from flight with extreme, off-axis inlet inflow angles, and it should be designed to provide a linear dynamic thrust response to pilot generated throttle commands. A model following propulsion control system is proposed to satisfy these design requirements. The forward path model comprises three separate models. A transient model will be used to generate a thrust response that has the desired response properties. A second model will be used to map inlet conditions to a required compressor stall margin. The third model combines engine performance maps and a nonlinear optimization algorithm. To establish the feasibility of the proposed approach, a preliminary design will be performed, and its performance will be evaluated.

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Topic#: 91-237 ID#: 10706
Office: NTSC
Contract #: N61339-92-C-0134
PI: William A. Hart

Title: Development of a Simulator Cuing Fidelity Evaluation Package

Abstract: Simulator sickness is linked to cuing fidelity loss in simulator visual, motion, and instrumentation systems. Current simulator cuing evaluation methods consist of qualitative pilot evaluations, selected testing of hardware, hand reduction of time response data, and limited auto-testing. Lack of standardization has resulted in evaluation techniques lacking efficiency, reliability, and cost-effectiveness. SCT proposes the development of a portable 1486 based, real-time, data acquisition/processing system for evaluating cuing fidelity. This system will incorporate off-the-shelf visual, motion, and cockpit instrumentation evaluation sensors, specialized digital signal processing software, a standard data interface for transferring dynamic simulator data, standard test procedures, and a bin-medical instrumentation package. Compact packaging will allow transportation anywhere in the fleet, or to any training facility. A standard data interface will make it possible to use the same device to test all types of simulators in a quick, and effective manner. Standard procedures will allow standard trainer cuing evaluations, comparison cuing evaluations between trainers, and building of trainers to given specifications without building custom equipment to verify compliance. The resulting higher fidelity trainers will have lower incidence of simulator sickness, and correspondingly improved training transfer and fleet readiness.

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Topic#: 91-355 ID#: 13751
Office: NAPC
Contract #:
PI: Mark R. Anderson

Title: Portable Aircraft Flight Test Instrumentation System

Abstract: To test an aircraft in its operational environment, minimal changes must be made to either the aircraft or its environment. Areas in which such non-intrusive testing methods are needed include the study of the ship/rotorcraft aerodynamic interface, remote site flight testing, and gathering simulation validation data from routine flight tests. To meet these needs, a portable instrumentation package (PINS) will be designed in the Phase I effort. Specific technical objectives of the program are: to develop system requirements based on the data accuracy, resolution, and sampling rates needed for flying qualities and

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performance testing, to develop and evaluate options for access to the signals required from existing production and non-production sensors, and to perform an initial design study of the portable instrumentation system. The specific innovation in the PINS design lies in the use of inertial navigation system (INS) data, in the design of an easily installable air data system, and in the use of a specialized microprocessor controller which will control the entire data recording process. The microprocessor will further allow for other features such as on-line health monitoring, automatic data quality checking and a simplified user interface.

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Topic#: 91-126 **ID#:** 12090
Office: NAVSEA
Contract #: N00024-92-C-4008
PI: MICHAEL G FISK

Title: TIARA -AN ADVANCED TARGETING ALGORITHM USING INTER-ARRAY RANGING

Abstract: The need exists for new algorithms and methodologies for tracking and/or targeting long-range passive contacts since current methods have inherent limitations. The trend toward quieter, more elusive long-range passive contacts also requires new approaches to long range detection and TMA. The approach to be examined under this project would be an acoustic Transient Inter-Array Ranging Technique (TIARA) that could be applied to new technologies, such as the Submarine Fleet Mission Program Library and the ASW Tactical Decision Aid, as well as other combat control systems. TIARA would use the capabilities of two sensor arrays, such as the AN/BQQ-5 spherical and towed array, to determine range and bearing to a transient source. Using the difference between the time of arrival of the transient signals at the two arrays, a set of hyperbolas would be generated; the intersection of the hyperbolas by a line of bearing from either or both arrays would provide a range to the target. TMA algorithm will use the TIARA range and bearing to calculate target speed, range and course. Based on SEA CORP's 10 years of Sonar experience, the proposed effort will (1) define the mathematical basis for TIARA, (2) analyze and assess the applicability to AN/BQQ-5 and related Sonar systems and arrays, (3) develop a TMA algorithm based on TIARA output data, (4) simulate sets of transient data to test the algorithm's response and (5) analyze the methods/procedures used to develop the algorithms for applicability to SFMPL, ASW Tactical Decision Aid and other combat control systems.

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Topic#: 91-219 **ID#:** 11888
Office: NATC
Contract #: N00421-92-C-0006
PI: GERALD L ATKINSON

Title: DESIGN & DEVELOPMENT OF A WORKSTATION FOR THE TEST AND EVALUATION OF TACTICAL EXPERT SYSTEMS

Abstract: THIS PROPOSED PHASE I EFFORT WILL ASSESS THE FEASIBILITY OF DEVELOPING A TEST AND EVALUATION WORKSTATION FOR TACTICAL AIRBORNE EXPERT SYSTEMS. IT WILL ASSIST IN ESTABLISHING THE CAPABILITY TO TEST AIRBORNE TACTICAL EXPERT SYSTEMS AT NATC BY SYNTHESIZING CURRENT RESEARCH AND DEVELOPMENT ACTIVITIES AND WILL BE IMPORTANT FIRST STEP IN DEVELOPING AN EXPERT SYSTEM TEST AND EVALUATION WORKSTATION.

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Topic#: 91-091 **ID#:** 12665
Office: NAVAIR
Contract #: N00019-91-C-0176
PI: Warren F. Clement

Title: Modeling of Rotorcraft and Ship Dynamic Interface

Abstract: U.S. Navy rotorcraft have the unique problem of maneuvering for safe landing onboard ships that are rolling, pitching, and heaving (depending on the ship, its heading, and the sea state). This two-body dynamic situation is further complicated by the aerodynamic wakes generated from the ship's deck and superstructure. To insure the compatibility of a particular rotorcraft and ship under various operating conditions (i.e., sea state, wind over deck (WOD), and weather), the Navy performs dynamic interface (DI) testing using fleet rotorcraft and various ships of opportunity. This is a costly approach and is severely limited by the availability of fleet assets and the weather. There is a need to perform a greater portion of DI evaluation in the laboratory and to rely on actual testing for verification and training. Past efforts to simulate the airwake environment through scale-model

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wind tunnel testing have correctly modeled the steady winds around the ship but produced questionable results with respect to ship-induced turbulence. Recent advances in the field of computational fluid dynamics (CFD) now make it possible to model the full-scale flow field around the ship, including turbulence, even for the two-body problem of a rotorcraft landing on a ship. Such CFD models can be used to show the effects of scale on turbulence and thereby to correct currently deficient model-scale data. The results of the work proposed herein will be a computational procedure for synthesizing a ship-correlated dynamic model of airwake disturbances and interfacing it aerodynamically with a rotorcraft model that is capable of real-time simulation of a specific example of dynamic interface testing. The Phase I study will identify specific computational methodologies for modeling the dynamics of the two bodies and the associated aerodynamics, with sufficient data to demonstrate its feasibility. Phase II will develop a computer code that can simulate this environment for specific combinations of ships, rotorcraft, sea state, and wind over deck.

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Topic#: 91-252 ID#: 11041
Office: NWC
Contract #: N60530-91-C-0260
PI: Massimo Sivilotti

Title: Neural Network Controlled Automatic Gain Control for Low Cost IR Sensors.

Abstract: Low-cost smart sensors will be an integral part of next-generation weapons systems. We propose to research and develop advanced neural network architectures suitable for integration with IR sensors, either at the focal plane itself or tightly coupled to existing imagers, to provide the high-bandwidth signal processing required to meet these system specifications. Phase I will include the design AND FABRICATION of prototype custom integrated circuits to implement a network to perform an automatic gain control (AGC) task. Our approach will be to utilize commercially available CMOS/bulk integrated circuit technology to implement the neural network, in conjunction with an existing IR focal plane array sensor. The network will accept analog inputs from the sensor array, and produce output signals of relatively constant dynamic range. The selection of technology is intended to permit economical and reliable fabrication of the neural network, by a number of vendors. We have already demonstrated the use of such technologies to fabricate continuous-time analog neural networks integrated with visible-light photosensors to extract motion information from a visual scene. We have also demonstrated integrated sensor arrays/neural networks to do real-time feature detection over fixed-size receptive fields.

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Topic#: 91-101 ID#: 12288
Office: NAVSEA
Contract #: N00024-92-C-
PI: DR ROBERT J COPELAND

Title: ADVANCED REFRIGERATION CYCLE FOR SHIPBOARD USE

Abstract: Refrigeration systems for shipboard use must be efficient, mechanically simple, reliable, safe, small, and lightweight. Current systems meet all of these criteria but use chlorofluorocarbons (CFCs). The manufacture of CFCs is being phased-out because of their ozone-depletion potential. TDA Research, Inc. proposes a safe, non-toxic, non-flammable, non-ozone depleting refrigerant which is easily handled in reliable, off-the-shelf hardware. Previous applications of the refrigerant have had unacceptably low efficiency as a result of the work required to compress the refrigerant to high pressures and the large, irreversible losses involved in throttling to the low-pressure evaporator. To solve the problem of low efficiency, TDA modified the cycle to recover the work within the cycle in a simple and mechanically reliable device. With the exception of the new device, all parts of this system can be purchased off the shelf. It is the design and testing of this crucial component which is the objective of the Phase I research. A simple form of the new cycle has an efficiency which is slightly less than that of current CFC-based refrigeration systems, but greater than that of any system reported to-date which does not use CFCs. An advanced version of the cycle can achieve an efficiency which can exceed that of even today's well-developed CFC-based vapor-compression systems.

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Topic#: 91-177 ID#: 13503
Office: NSWC
Contract #: N60921-92-C-A324
PI: DR PETER TB SHAFFER

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Title: A FEASIBILITY STUDY FOR ESTABLISHING A CERAMIC FERRULE MANUFACTURING FACILITY UTILIZING A PROPRIETARY INJECTION MOLDING SYSTEM

Abstract: A feasibility study for establishing a facility for manufacturing ceramic ferrules for fiber optic connectors. All such ferrules are currently manufactured overseas by ceramic extrusion and diamond grinding, which is a labor intensive process. This study will determine the capital and processing requirements for establishing a facility to manufacture ceramic ferrules in high volumes utilizing a unique, proprietary low pressure ceramic injection molding system which has already been demonstrated suitable for producing prototype quantities of net shape ceramic ferrules.

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Topic#: 91-006 ID#: 10468
Office: ONT
Contract #: N61331-91-C-0049
PI: Michael J. Berggren

Title: Detection of Buried Mines by Advanced Seismic Methods.

Abstract: Algorithms will be evaluated by synthetic and laboratory generated data. These data will come from test objects and an existing scanners assembled for that purpose.

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Topic#: 91-190 ID#: 10889
Office: NADC
Contract #: N62269-91-C-0572
PI: Shyam D. Argade, Ph.D.

Title: A Lithium/Chlorine Thermal Battery

Abstract: Lithium-alloy/chlorine thermal batteries offer superior properties, such as long shelf life, high power capacity, high reliability, and ability to operate in a wide temperature range, as well as in dynamic environments. These properties make the lithium-alloy/chlorine thermal battery a viable candidate for the radio frequency decoy battery. The primary focus of this proposed Phase I program is to develop the design of a more reliable and reproducible thermal battery that can tolerate high power drain. The proposed Phase I program objectives are oriented towards developing a safe chlorine storage method, integrating this chlorine storage device with the cell stack and demonstrating the feasibility of a Lithium Chloride thermal primary battery system for the expendable decoy application. The proposed Phase I program consists of studying a number of ways of safely storing chlorine that can be delivered to the cell stack upon thermal activation. Based upon this study, a chlorine storage device will be designed and fabricated. Finally the electrochemical evaluation of the integrated chlorine storage device and the cell-stack battery will be performed. Successful completion of this program will form the basis for a Phase II program in which design, fabrication and testing of a battery prototype is envisioned.

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Topic#: 91-343 ID#: 14053
Office: NSWCWO
Contract #:
PI: SHYAM D. ARCADE, Ph.D.

Title: A HIGH POWER THERMAL BATTERY

Abstract: Lithium thermal batteries offer superior properties, such as long shelf life, high power capacity, high reliability, and ability to operate in a wide temperature range, as well as in dynamic environments. These properties make the lithium thermal battery a viable candidate for the expendable 35 kW sonobuoy battery. The primary focus of this proposed Phase I program is to develop the design of a thermal battery that can tolerate high power drain and yield exceedingly high power density. The proposed Phase I program objectives are oriented towards developing exceedingly thin wafers for electrodes and salt separator matrix. Using novel cathodes, the feasibility of the thermal battery system for the expendable sonobuoy application at the cell stack level will be established. The proposed Phase I program consists of studying a number of cathodes and processing of thin electrode and salt wafers. Based upon this study, a cell stack will be designed and fabricated. Finally, the electrochemical evaluation of the cell-stack will be performed to demonstrate the feasibility of the high power density thermal battery, > 10 kW. Successful completion of this program will form the basis for a Phase B program in which design, fabrication and testing of a battery prototype is envisaged.

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

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Topic#: 91-358 ID#: 13648
Office: NTSC
Contract #:
PI: Mr. Sherman Richardson

Title: Gas Mask Seal Effectiveness Detector

Abstract: Recent military encounters have emphasized the risk of exposure of combat personnel to chemical warfare agents. Protection of these personnel in the field has become an important issue. Gas masks have been developed to filter chemical agents from the air. However due to varying facial features of the wearers or improper donning of the mask, leaks sometimes occur around the seal/skin interface. Technology International Incorporated proposes the development of a seal effectiveness indicator to be incorporated into the seal and detect if contact with the wearers skin is sufficient to form a reliable seal. The indicator will be used primarily for training new recruits. A reliable indicator can also be used in fielded equipment.

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Topic#: 91-057 ID#: 11522
Office: SPAWARS
Contract #: N00039-91-C-0045
PI: Edward M. Scheidt

Title: Investigate Techniques to Develop Highly Trusted Security Features for Workstations

Abstract: The Phase I effort will analyze the security features of workstations will require an integration of advanced COMSEC and computer Hackers, the like are concerns for industry. A sought by industry, to counter threats.

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Topic#: 91-309 ID#: 13685
Office: MCRDAC
Contract #:
PI: Mr. Byron Danzer

Title: Tactical Cryptologic Exploitation of Over-The Horizon (OTH) Radar

Abstract: The three objectives of the research are to: * produce an optimized design for processing bistatic returns from Over-The-Horizon (OTH) radar systems that can be used to construct a prototype processor in Phase II, * design an interface between this processor and an existing cryptologic HPDF system that will associate/combine the detected target data with its related DP information, and * tabulate the additional benefits provided to a ship equipped with such a processor. Project tasks include: * signal modulation definition; * candidate processor design assessment; * modulation mode related blind zone analysis; * overview assessment of the processor designs in a multiple target environment, and as a function of the ratio between the direct path and reflected signal levels; * TDOA/FDOA sub system design analysis; * HFDP system interface design; * search, recognition and processing algorithm simulation/demonstration using an HF digital receiver on live collections; * additional benefit assessment for a suitably equipped ship; and * write a technical report

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Topic#: 91-039 ID#: 11306
Office: SPAWARS
Contract #: N00039-92-C-0054
PI: Joan Tice Lee

Title: Automated Training for the Integrated Undersea Surveillance System

Abstract: Space and Naval Warfare Systems Command has identified a need to develop automated embedded training aids for the Integrated Undersea surveillance System (IUSS) that: will significantly reduce training costs, will allow on-the-job training using real data, provide stand-alone training, enable participation in training scenarios, and require minimum supervision. The IUSS automated embedded training will eventually be implemented on a DTC-2. Primary considerations in the development of embedded training for IUSS include the selection of cost-effective, commercially available computer based training (CBT) development tools that are compatible with the OTC-2, protecting the system database against trainee error if real data is used during training activities, use of as much of the existing classroom curriculum as possible, and providing a seamless transition for the operator from operation to training aids and back. TIBURON has conducted extensive research into the CBT tools available for the DTC-2, and has successfully demonstrated embedded training and on-line documentation for the Moos System for the Cruise Missile Program. TIBURON proposes to utilize a similar approach for embedded IUSS training aids.

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

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Topic#: 91-134
Office: NAVSEA
Contract #: N00024-92-C-4017
PI: DAVID H KASKOWITZ

ID#: 12379

Title: ASW TARGETING SOLUTION INTEGRATION

Abstract: The objective of this project is to develop an approach to the generation of a "best" range/solution estimate based on all the diverse data and solutions that are available to the Submarine Combat Control System. An existing prototype Solution Integration system will serve as the baseline for this effort. The approach taken to design this prototype has been to use the unifying mathematical framework derived from Kalman Filter Theory to generate a single, integrated, statistically accurate range/solution estimate. This procedure provides estimates that are more stable and more accurate than those derived from heuristic means. The baseline Solution Integration system can process fixes, bearing reports, full-state reports, and MATE solutions. The system includes a statistical tracker that incorporates both a constant course and speed motion model and a maneuvering target motion model. It also includes a data manager that controls the input data to assure statistical independence. In the proposed study, this baseline will be extended to: generate solution quality estimates for other TNA algorithms; select data and solutions to be input to the tracker based on solution quality and statistical independence; and generate the optimal range/solution estimate.

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Topic#: 91-141
Office: NAVSEA
Contract #: N00024-92-C-4032
PI: K M WISEHART

ID#: 12203

Title: TRIDENT COMMAND AND CONTROL OVER-THE-HORIZON COMMUNICATIONS

Abstract: Receipt by Trident submarines of OTH-T data currently available to other fleet users may reduce the possibility of detection during execution of the SSBN's primary mission of striking land targets from long ranges. Also, OTH-T data will enable the SSBN to be successfully employed in a secondary fast-attack mode against potential surface and subsurface targets. The main objectives of the proposed effort are to identify the best method of providing OTH-T communications connectivity to Trident submarines and to prototype Trident-specific OTH-T functions within TIBURON's Tactical Data Processor (TDP), the Advanced Tactical Workstation (ATW). ATW will satisfy the overall requirement for an OTH-T data processing capability for Trident submarines. ATW is a low cost, small size, high performance system that provides the tools necessary for surveillance data correlation, tracking, fusion, data management, and display. Other tasks will include performing a site survey of a Trident submarine in preparation for a future installation, a demonstration of a prototype OTH-T communications and data processing capability using ATW with upgraded SSBN functionality, and development of a final report.

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Topic#: 91-240
Office: NWC
Contract #: N60530-91-C-0236
PI: John Feeman

ID#: 10977

Title: Monopulse Radome Error Compensation in the Presence of Aperture Blockage

Abstract: Aperture blockage has become a serious obstacle for air-to-air and air-to-surface dual-mode missiles. The radar antenna of these systems potentially suffers from severe aperture blockage since the IR sensor and its associated lens/window is typically placed on the radome of the missile. Aperture blockage creates several problems for the missile seeker system but the most serious is the distortion of the null in the difference pattern which perturbs the monopulse error signal. Past work has shown that aperture tapering can be used to reduce the sidelobes of a blocked aperture. We believe that tapering can also be used to reduce the monopulse distortion of a blocked aperture. Toyon proposes to explore the effectiveness of various algorithms for modifying the illumination taper to provide a robust method of compensating for distortion of the monopulse error signal. We plan to use the time-tested and proven Toyon NESS model (which computes the E-field of sum and difference patterns as well as the monopulse error signal) for this effort. This model will allow us to synthesize algorithms which modify the illumination function and compensate for distortions at various scan angles.

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Topic#: 91-104 ID#: 11949
Office: NAVSEA
Contract #: N00024-92-C-0021
PI: H M STOLLER

Title: A STUDY OF THE REUSE/REFORMULATION OF NAVY GUN PROPELLANTS

Abstract: The Navy has a growing surplus inventory involving propellants, explosives and pyrotechnics (PEP). Increasing prohibitions on disposal methods requires increased attention be given to reuse applications. Only limited work has previously addressed energy recovery, commodity recovery and reuse applications of nitrocellulosic propellants. TPL is currently addressing reuse applications of plastically-bonded explosives. With its partner, the Center for Explosives Technology Research (CETR), the resources are available to address aging and stability problems, and conduct feasibility experiments to demonstrate reuse potential. Past commercial sales of DOD surplus PEP materials will be investigated for reuse applications. Sponsored reuse/reformulation technologies will be studied to identify high potential applications. Aging and stability issues will be assessed in light of potential propellant/application issues. Critical experiments will be conducted in aging/stability and reuse/reformulation areas. TPL, active in applications of energetic materials, and CETR, with extensive experimental facilities, present the capabilities to develop a solution to the proposed problem.

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Topic#: 91-307 ID#: 13813
Office: MCRDAC
Contract #:
PI: David F. Calvin, Ph.D.

Title: Passive PCM Microclimate Body Undergarment Thermal Management System

Abstract: This Phase I program will investigate the potential for paraffinic phase change materials (PCMs) to provide a light, passive, and non-burdensome body undergarment thermal management system for the USMC. Based on Baterials and technologies developed under eight previous SBIR programs for NASA, USAF, SDIO, and NSF as well as work performed earlier for the Navy, this program should permit individual Marines to operate effectively over a wide range of temperatures for an extended time period. The unique non-toxic, paraffinic phase change materials can be designed to absorb or release heat at high rates and selected temperatures. During the Phase I program, we will define and investigate the requirements for such a microclimate passive body undergarment that would contain no having or active components. With proper selection of PCMs contained within a series of packets in a well-designed vest or undergarment, sufficient heating or cooling can be provided for satisfactory comfort of individual soldiers and permit unpowered and individual rejuvenation without refrigeration. The Phase I studies will include thermal modeling, laboratory and experimental investigations, and produce a System Concept Document (SCD) describing designs and requirements for a passive microclimate garment during a follow-on Phase II effort.

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Topic#: 91-322 ID#: 14123
Office: NAVAIR
Contract #:
PI: Richard A. McKinney

Title: Water Survival Training System For The V-22 Osprey

Abstract: The purpose of this Phase I program will be to assess the water survival training requirements for crew and passengers of the V-22 Osprey. This will be accomplished by comparing the current training procedures for both helicopters and fixed-wing passenger carrying aircraft. Recommendations will then be made regarding methods of addressing the V-22 water survival training system requirements. In addition, new training equipment and water survival equipment requirements will be identified.

TRIANGLE RESEARCH AND DEVELOPMENT C
P.O. BOX 12696
RESEARCH TRIANGLE, NC 27709
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Topic#: 91-243 ID#: 10987
Office: NWC
Contract #: N60530-91-C-0284
PI: David P. Colvin, Ph.D.

Title: Electrorheological Damper Using MicroPCM Fluid

Abstract: A Phase I program is proposed to demonstrate the feasibility, design, fabricate, and test an advanced electrorheological (ER) damper that uses a unique fluid consisting of microencapsulated phase change materials (microPCMs) within a dielectric

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

liquid. Two earlier SBIR programs for NASA and SDIO have already demonstrated that such a novel dielectric ER fluid (1) was non-aqueous and contained no water, (2) possessed superior thermal characteristics and was virtually immune to thermal runaway, (3) could be used over a wide range of temperatures from -50-C to +200-C, (4) could be used within a novel ER damper (developed at TRDC) that operates at a few hundred volts rather than a few thousand volts, (5) can be designed to permit neutral buoyancy of the suspended particles and (6) is both non-corrosive and non-toxic to personnel. The same ER fluid has also been used within a novel ER brake and a cylindrical ER head that demonstrates significant critical damping in two dimensions. During the proposed Phase I program, a prototype, miniature ER damper will be designed, fabricated, and tested utilizing the novel microPCM ER fluid and its characteristics will be determined over a wide range of temperatures.

TRIDENT SYSTEMS, INC.
10201 LEE HIGHWAY SUITE 300
FAIRFAX, VA 22030
Phone: (703) 273-1012

Topic#: 91-086 ID#: 12629
Office: NAVAIR
Contract #: N00019-91-C-0182
PI: WILLIAM A. MINER

Title: VIRTUAL REALITY TECHNOLOGY INCLUDING TRUE STEREO ! INTERACTIVE DISPLAYS FOR ASW AIRCRAFT ENVIRONMENTS

Abstract: Trident System proposes to support the Navy's requirement to identify interactive/virtual reality display technologies for the airborne ASW mission. Current Navy ASW display technology, including hardware, software, and man-machine interfaces (MMI), requires upgrading to prevent operator overload in high data rate and complex data/high display density situations. Major developments in the field of MMI and virtual reality promise to supply the tools necessary for ASW aircrews to accomplish complete data evaluations on station in real time. Such display interface and evaluation tools can mean the difference between mission success or failure. Virtual reality technologies and other forms of display interfaces show significant promise in improving the FPC's situational awareness and the significantly enhancing the analytical tools of the TACCO and ASW operator. To support this requirement, Trident will: (1) define the interface requirements needed to support each generic workstation in the aircraft, including PFC, Tactical Coordinator, and sensor operator; (2) identify and assess the virtual reality technologies, providing a high level survey; (3) identify the potential high payoff technologies, matching the survey of the technology to the requirements generated in the mission study; and (4) prototype, test, and evaluate a selected technology using off-the-shelf hardware and software.

TRIDENT INTERNATIONAL, INC.
CENTRAL FLORIDA RESEARCH PARK
ORLANDO, FL 32826
Phone: (407) 282-3344

Topic#: 91-235 ID#: 10699
Office: NTSC
Contract #: N61339-92-C-0014
PI: Thomas M St.John

Title: HIGH DEFINITION TV PROJECTION via SINGLE CRYSTAL FACEPLATE TECHNOLOGY

Abstract: The proposed evaluation will determine the efficacy of developing and manufacturing a HIGH DEFINITION PROJECTION SYSTEM using CRTs which have faceplates fabricated via SINGLE CRYSTAL FACEPLATE TECHNOLOGY. Specifically, based on faceplate manufacturing data gathered to date, the feasibility of manufacturing 4 inch or 5 inch faceplates will be established. Concurrently, based on luminance versus beam current data gathered to date, projections of performance for larger size faceplates will be made. Assuming that performance characteristics are not limiting, the optimal size projector for the simulator application industry will be evaluated. Specifically, tradeoffs will be made of weight, performance, number c,f units to fill the standard simulator requirement, effect on subsystem parameters; eg, motion base, cost impact at the system level, and the overall effect of advanced microelectronics technologies; ie, surface mounter hybrid, on projector performance, weight and reliability will be assessed. Intrinsic to the evaluation will be the applicability of T1D80 high performance circuitry to the selected projector implementation.

TRIDENT SYSTEMS, INC.
3554 CHAIN BRIDGE ROAD
FAIRFAX, VA 22030
Phone: (703) 273-1012

Topic#: 91-136 ID#: 12167
Office: NAVSEA
Contract #: N00024-92-C-4031
PI: LAURA G HINTON

Title: AN EXPERT SYSTEM -BASED SUBMARINE COMBAT SYSTEM OPERATOR TRAINING WORKSTATION CONCEPT

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

Abstract: A significant opportunity to enhance submarine combat system operator training exists in the development of an expert system-based workstation hosted instructor assistant. This advanced expert System-based submarine combat system operator (SCSO) training workstation would be capable of evaluating operator trainee performance, adjusting the complexity of the training scenarios and providing feedback to the trainee as required. Training method expertise from a spectrum of experienced instructors and other experts in submarine combat system training can be captured and made available to many more trainees. As new techniques are developed or refined they can be easily added to the rule base. The system would be configured to operate either as instructor aid or as a stand-alone operator training system. Successful completion of this project represents a notable advancement in the state-of-the-art for submarine combat system operator trainers.

UNIVERSAL ENERGY SYSTEMS, INC.
4401 DAYTON-XENIA ROAD
DAYTON, OH 45432
Phone: (513) 426-6900
Title: TWT STORAGE STUDY

Topic#: 91-142 ID#: 12205
Office: NAVSEA
Contract #: N00024-92-C-4051
PI: ERIK S BUCK

Abstract: UES proposes to gather data from traveling wave tube (TWT) vendors and users and to analyze that data with respect to identifying factors which enhance or degrade the storage life of TWTs, especially TWTs intended for use in expendables, such as off-board countermeasures and missiles.

UNIXPROS, INC.
16 BIRCH LANE
COLTS NECK, NJ 07722
Phone: (201) 946-0779

Topic#: 91-279 ID#: 11731
Office: NWC
Contract #: N60530-91-C-0279
PI: Arvind Goel

Title: FULLY AUTOMATED SOFTWARE TESTING SYSTEM

Abstract: Testing consumes 30 to 40% of the total development resources and about the same percentage of the total development time in many software systems. It is very labor intensive and expensive; it accounts for approximately 50% of the cost of a software system. Existing Ada/Fortran programs are complex, hard to prove and consequently often riddled with errors. Several areas may remain untested if manual testing techniques are employed due to the cost as well as the inconsistencies brought about by manual testing techniques. The Phase I proposal will research several testing techniques so that detailed requirements for the fully automated software testing system can be established. Software experiments will also be carried out on new techniques and ideas that can contribute to a total automation of the software testing process. To automate the testing process there are many important areas where new and innovative ideas are needed - test software and data generation, test results evaluation, test execution, regression testing, test progress reports etc. Existing testing tools will also be analyzed to determine their suitability for satisfying the requirements of the testing system. The proposal describes the proposed architecture of the testing system which includes a Parser/Scanner, Test Software and Data Generator, Test Execution Driver, Test Coverage Analysis, Report Generator, and Test Manager.

VERITAY TECHNOLOGY, INC.
4845 MILLERSPORT HIGHWAY
EAST AMHERST, NY 14051
Phone: (716) 689-0177
Title: HYPERVELOCITY 25MM TROUND

Topic#: 91-109 ID#: 11978
Office: NAVSEA
Contract #: N00024-92-C-4021
PI: EDWARD B FISHER

Abstract: As a result of extensive work supported by the Air Force, cased telescoped ammunition (CTA) has successfully been demonstrated. Under the sponsorship of the Navy, the Tround ammunition concept, noted for its unique triangular cross-section, has also been successfully demonstrated. The purpose of the proposed program is to incorporate certain features of cased telescoped ammunition and design improvements into the 25mm Tround ammunition concept, resulting in a hypervelocity 25mm round. Current estimates indicate that it should be possible to develop projectile muzzle velocities in excess of 5000 feet per second using the "cased telescoped Tround" (CTT) configuration. The proposing company, Veritay Technology, is in a unique position to perform the proposed effort based on its work in support of both the current 20 and 25mm Tround ammunition configurations and advanced development of the Air Force's cased telescoped ammunition.

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

VERSATRON CORP.
103 WEST NORTH STREET
HEALDSBURG, CA 95448
Phone: (707) 433-3000

Topic#: 91-156
Office: NSWC
Contract #: N60921-91-C-0154
PI: John Speicher

ID#: 13634

Title: High Power Density Actuators

Abstract: This project will develop a high power density actuator for a 9 inch diameter airframe high performance missile tail fin servo. The end result of this effort will be a state-of-the-art actuator that achieves rates up to 1000 degrees/sec in the presence of torques up to 2000 lb-in with typical flight times of 20 seconds or less. Such a system will be powered by advanced thermal batteries which may be integrated into the volume of the control actuator or alternately located elsewhere on the missile. This system will greatly enhance the performance and agility of small diameter missiles not presently existing in the U.S. inventory or elsewhere. This effort will be based on our previous experience with high performance electromechanical actuator systems. Several innovative features will be incorporated in the design. These are: * A compact, very high speed, low inductance brushless motor. * A high power density PWM electronic driver. * A motor to driver commutation interface designed to maximize peak power thrust. The four major areas of the control system design are the: * Thermal Battery * Pulse width modulated (PWM) electronic driver * High speed brushless motor and high strength reduction system. The Phase I objectives are summarized as follows: Computer model the control actuator system; detailed computer model of the PWM driver and brushless motor; thermal battery sizing voltage/current analysis; packaging and reduction drive trade study. Based on the results of the model: * Modify and test existing motors and driver to verify simulation and make a preliminary schematic of the PWM driver and layout of the system design.

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Topic#: 91-242
Office: NWC
Contract #: N60530-91-C-0297
PI: John Speicher

ID#: 10981

Title: 6-Inch Integrated Aero/Thrust Vector Control (TVC)

Abstract: Thrust-Vector Control (IATVC) system for a 6 inch diameter tail control missile. The end result of this effort will be a state-of-the-art control actuation system with the associated mechanisms needed for combined TVC and fin axis control. Such a system will greatly enhance the performance and agility of small diameter Air to Air missiles (5-6 inches). An IATVC system does not presently exist in the U.S. inventory. This effort will be accomplished in part by scaling our previously developed 8 inch IATVC system to 6 inches. Several innovative features will be incorporated in the design. * A yoke linkage design which provides a high gear ratio in a small volume. * A unique brushless motor which has an extremely high torque to inertia ratio. * Use of standard materials and processes which keep production costs down. A two phase approach will be used to accomplish the goals of this program. The Phase I objectives are twofold: * Investigation of the different approaches and identification of the most promising solution. * Mechanical layout of an actuation system using the baselined approach. Completion of Phase I will provide a sound basis for Phase II of the program. The Phase II objectives are as follows: * Refinement of the design for overall system optimization. * Fabrication of an actual full scale IATVC system.

VESTAR, INC.
650 CLIFFSIDE DRIVE
SAN DIMAS, CA 91773
Phone: (714) 394-4112

Topic#: 91-313
Office: NAVSUP
Contract #: N00014-92-C-
PI: Kevin R. Bracken

ID#: 13861

Title: Lyophilization of Liposome Encapsulated Hemoglobin

Abstract: Vestar proposes to develop the methods necessary to lyophilize liposome encapsulated hemoglobin (IEH). The methods and equipment utilized will be commensurate with large-scale lyophilization practices common to the pharmaceutical industry in full accordance with Good Manufacturing Practice (GMP) guidelines. Present practice in freeze-drying of liposomes centers on the use of disaccharides as a cryoprotectant. Initial work will focus on selecting the most suitable disaccharide in terms of maintaining the desirable liposomal properties of mean diameter, component chemical stability and hemoglobin encapsulation and suitability for injection in humans. Following, but to some extent in parallel with cryoprotectant selection work will emphasize cycle parameter identification using a shelf type lyophilizer. The controlling parameters of freezing rate, fill height, container selection, primary and secondary drying temperatures and pressures will be evaluated. Analytical comparison of pre-and post-lyophilization IEH will be done to demonstrate the effectiveness of the proposed cycle. Final tests will be done in

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Vestar's GMP aseptic filling and lyophilization complex utilizing sterile product to demonstrate post process sterility. No in-viva testing of LEH is planned.

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

Title: Mission Area Subnets

Abstract: ViaSat and the Command and Control Systems Division of Rockwell are pleased to present this proposal to develop a Mission Area Subnet (MAS) capability for Naval Tactical Data System (NTDS) subscribers on the Navy's Communication Support System (CSS). MAS capability provides a method for managing adaptive relays and routing among mobile participants in NTDS networks. Adaptive relays addresses a major shortcoming of the current Link-11 system which assumes full broadcast connectivity among all players. MAS provides a context for managing those relays with multicast connectivity to conserve scarce NTDS TDMA time slots. This proposal is integrated into a comprehensive ViaSat-Rockwell multi-topic, multi-phased plan to upgrade the NTDS system into the multi-media CSS environment. The MAS mesh seamlessly with CSS NTDS upgrades for dynamic TDMA, automatic net initialization, internet routing, and tactical data compression. They all build on a wealth of past NTDS work on Link-11, HFAJ/LEIP, MILES, NILE, UNT, and ELS. The proposed work also benefits from ongoing ViaSat programs under CSS SBIR Phase II and Rockwell's ELS activities. The proposed work includes simulation to quantify MAS improvements in NTDS capacity and responsiveness in CSS and ELS, and technical presentations on how to integrate MAS into the CSS framework.

Topic#: 91-017
Office: SPAWARS
Contract #: N00039-91-C-
PI: Mark D. Dankberg

ID#: 10753

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

Title: REMOTE PERSONNEL MONITORING SYSTEM

Abstract: A Remote Personnel Monitoring System that would provides status (condition and position) of personnel throughout the ship to a command/control station is proposed. The personal monitor relays on a spread spectrum transmitter to counteract shipboard interference and keep the unit small and light weight. The system is designed to operate in the shipboard battle damage environment, communicating between ship compartments utilizing a robust wireline modem and existing ship wiring. The overall proposed system is designed to minimize procurement and life cycle cost and not interfere with on going ship operations. Phase I program objectives are to design, simulate, evaluate and document the Remote Personnel Monitoring System concept and required technology. If successful the program would lead to a phase II prototype system for proof of concept.

Topic#: 91-120
Office: NAVSEA
Contract #: N00024-92-C-4048
PI: THOMAS CARTER

ID#: 12333

VIASAT, INC.
46 CHRISTIAN HILL RD
UPTON, MA 01568
Phone: (619) 438-8099

Title: Remote Environmental Data Link

Abstract: This Phase I proposal describes a low cost, two-way satellite data link for retrieval of broadband environmental data from remote sensor sites at sea. The proposed approach uses existing space resources providing a mix of low and high bandwidth users with data rates up to 100 bps per user. Thousands of simultaneous users can be supported depending on the mix of users. Phase I results demonstrate in excess of 1000 simultaneous high bandwidth users can be supported. In addition, several thousand low bandwidth users can be supported. This approach is an adaptation of existing commercial messaging systems for marine applications. The proposed design uses existing Ku-band resources on a secondary basis. The spread spectrum signal processing provides an efficient method for minimizing the interference between secondary and primary Fixed Satellite Service users. Phase I will result in a detailed system architecture that can be implemented and demonstrated in Phase II. Phase I will also result in detailed size, weight, and power estimates for the candidate remote transceiver design.

Topic#: 91-294
Office: ONR
Contract #:
PI: Kenneth A. Gamache

ID#: 13077

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

VISTA RESEARCH, INC.

P O BOX 998

MOUNTAIN VIEW, CA 94042

Phone: (415) 966-1171

Title: INFRARED PROPAGATION NEAR THE AIR-SEA INTERFACE

Abstract: Development of a propagation code to deal exclusively with IR propagation immediately above the air-sea interface and design of an experimental system tailored to testing and verifying the code is proposed. Besides accounting for refraction and absorption, the code will employ an advanced method for calculating the effects of turbulence. Existing, proven models for the environment will be used to the maximum possible extent. The proposed experimental system will use a vertical stack of intense IR point sources to probe the environments over water ranges. Images of the IR sources will be recorded and analyzed for attenuation, mean refraction, wander, and breakup. A direct measurement of the point spread function is proposed.

Topic#: 91-165

ID#: 13392

Office: NSWC

Contract #: N60921-91-C-A368

PI: DR ALAN A BURNS

WINTec, INC.

220 EGLIN PARKWAY, S.E.

FORT WALTON BEACH, FL 32548

Phone: (904) 664-6203

Title: V-22 Stores management System Architecture Definition

Abstract: This project will address a system architecture integrating weapons load out capability with the helmet mounted display/sight (HMDS) in the V-22.

Topic#: 91-073

ID#: 13178

Office: NAVAIR

Contract #: N00019-91-C-0206

PI: Fred L. Bendick

XYBION ELECTRONIC SYSTEMS CORP.

8380 MIRALANI DRIVE

SAN DIEGO, CA 92129

Phone: (619) 566-7850

Title: Development of Extended Red Response for a Gated, Intensified Solid State TV Camera

Abstract: A feasibility study, evaluation, and demonstration will be conducted to provide a credible architecture and design foundation for an extended-red response gated intensified solid state TV camera. This accomplishment will provide the new technologies and integration techniques to allow for rapid development of a deliverable product under Phase II. This development will demonstrate an Indium-Gallium-Arsenide intensifier with spectral response to 1.1 microns. The test camera will be computer controlled and addressable from an external KS-232 source. A high resolution (768 pixel x 493 addressable from an external RS-232 source. A high resolution pixel) solidstate imager will be operated in field mode (60 Image/second) to pixel) solid state imager will be operated in field mode, will provide a RS-170 compatible video output. The resulting intensified TV imager will provide a RS-170 compatible video output. The resulting will be compatible with 1.06 micron laser illumination sources. The new imager will add capabilities to currently available imaging systems. Completion of this effort will enable the U.S. Government, academia, and industry completion of this effort will enable the U.S. Government, academia, to find solutions to applications which are not currently feasible.

Topic#: 91-012

ID#: 10518

Office: USMC

Contract #: N61331-92-C-0024

PI: Dennis E. Caudle

YARDNEY TECHNICAL PRODUCTS, INC.

82 MECHANIC ST.

PAWCATUCK, CT 06379

Phone: (203) 599-1100

Title: Development of Silver-Zinc Cells of Improved Life and Energy Density

Abstract: This SBIR Program is aimed at improving the cycle life and energy density of silver-zinc cells, in general and particularly those used in naval propulsion systems. We intend to achieve those objectives by improving the negative (Zn) electrode and the separators, which are responsible for most of the systems shortcomings. Negative electrode improvements are aimed at limiting the "shape change" or migration of the active material from the top and edges to the center of the plates, creating a depletion and densification problem, which reduces cell capacity by 50% in 50-150 cycles depending on design and mode of operation. An additional goal is to eliminate the formation of zinc dendrites, which may perforate the separators causing cell failure by internal shorting. These improvements can be realized by the introduction of newly developed additives to the negative electrode. Separator improvements are aimed at several goals: increased chemical resistance (for longer life), decreased

Topic#: 91-007

ID#: 10478

Office: ONT

Contract #: N60921-91-C-02505

PI: J. Roberto Serenyi

NAVY ABSTRACTS OF SBIR PHASE I AWARDS

thickness (for higher energy density), and low electrolytic resistance (for better voltage) are most desired. We are proposing to develop several materials which we hope will achieve these goals. Development work on the negative additives and separators and testing of cells containing them is planned.

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(BCC)GICAL COMPONENTS CORP.
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ABARIS
AF 91-123

ABTECH CORP.
ARMY 91-036

ACCU-SORT SYSTEMS, INC.
NAVY 91-312

ACT RESEARCH CORP.
DARPA 91-095

ACTRAN SYSTEMS, INC.
NAVY 91-101

ADAPTIVE SENSORS, INC.
AF 91-087
DARPA 91-143
DARPA 91-145

ADAPTIVE SOFTWARE, INC.
NAVY 91-303

ADAPTIVE SOLUTIONS, INC.
DARPA 91-078

ADAPTIVE TECHNOLOGY, INC.
AF 91-087

ADELPHI TECHNOLOGY, INC.
AF 91-196

ADIABATICS, INC.
ARMY 91-104

ADROIT SYSTEMS, INC.
AF 91-080
SDIO 91-001

ADVANCED COMMUNICATION SYSTEMS, INC.
NAVY 91-047

ADVANCED DEVICE TECHNOLOGY, INC.
SDIO 91-003

ADVANCED ENGINEERING
ARMY 91-081

ADVANCED FUEL RESEARCH, INC.
AF 91-096
DARPA 91-095
SDIO 91-014
SDIO 91-015

ADVANCED MARINE ENTERPRISES, INC.
NAVY 91-098

ADVANCED MATERIAL SYSTEMS, INC.
AF 91-122

ADVANCED RESEARCH AND APPLICATIONS CORP.
DARPA 91-024
DARPA 91-025
DARPA 91-033

ADVANCED ROTORCRAFT TECHNOLOGY, INC.
ARMY 91-175
NAVY 91-216

ADVANCED SCIENTIFIC CONCEPTS, INC.
NAVY 91-303
SDIO 91-003

ADVANCED SPACE DATA CORP.
DARPA 91-236

ADVANCED TECHNOLOGY AND RESEARCH CORP.
ARMY 91-033

ADVANCED TECHNOLOGY MATERIALS, INC.
ARMY 91-137
ARMY 91-243
NAVY 91-329
AF 91-118
AF 91-192
DARPA 91-055
DARPA 91-055
SDIO 91-014
SDIO 91-014
SDIO 91-014

CROSS REFERENCE

ADVANCED TECHNOLOGY TRANSFER, INC.
DARPA 91-068

AEGIS RESEARCH CORP.
ARMY 91-084

AERODYNE RESEARCH, INC.
NAVY 91-001
AF 91-088
DARPA 91-067
SDIO 91-014

AERONAUTICAL TECHNOLOGY ASSOC.
AF 91-201

AEROSPACE DESIGN & DEVELOPMENT, INC.
SDIO 91-003

AETECH, INC.
DARPA 91-210
DARPA 91-214

AF SAMMER CORP.
DARPA 91-239

ALDEN ELECTRONICS, INC.
DARPA 91-236

ALLOY SURFACES COMPANY, INC.
NAVY 91-330

ALPHATECH, INC.
ARMY 91-015
NAVY 91-297
NAVY 91-360
AF 91-195
DARPA 91-113

AMCOMP CORP.
ARMY 91-149

AMERASIA TECHNOLOGY, INC.
DARPA 91-161

AMERICAN GNC CORP.
ARMY 91-077
NAVY 91-262
AF 91-001

AMERICAN RESEARCH CORP. OF VIRGINIA
ARMY 91-014
ARMY 91-021
ARMY 91-155
SDIO 91-002

AMHERST SYSTEMS, INC.
ARMY 91-254
NAVY 91-250
AF 91-081
AF 91-091
DARPA 91-109

AMPARO CORP.
DARPA 91-087

AMRON CORP.
NAVY 91-040
NAVY 91-041

ANADAC, INC.
NAVY 91-150

ANALYSIS & COMPUTER SYSTEMS, INC.
AF 91-025

ANALYTIC POWER CORP.
ARMY 91-011

ANAMET LABORATORIES, INC.
ARMY 91-187
NAVY 91-160

ANRO ENGINEERING, INC.
ARMY 91-043
AF 91-180

ANZA RESEARCH
DARPA 91-002

APA OPTICS, INC.
ARMY 91-146
NAVY 91-292
AF 91-001
DARPA 91-055
SDIO 91-011

APPLIED ANALYSIS, INC.
AF 91-025
AF 91-082

APPLIED HYDRO-ACOUSTICS RESEARCH, INC.
NAVY 91-050

CROSS REFERENCE

APPLIED LOGIC SYSTEMS, INC.

ARMY 91-049

APPLIED MODERN TECHNOLOGIES CORP.

AF 91-067

APPLIED RESEARCH ASSOC., INC.

ARMY 91-106

AF 91-001

AF 91-182

APPLIED SCIENCE AND TECHNOLOGY, INC.

NAVY 91-258

DARPA 91-097

APPLIED SCIENCES, INC.

ARMY 91-183

DARPA 91-071

SDIO 91-004

SDIO 91-013

APPLIED TECHNOLOGY ASSOC.

ARMY 91-170

APPLIED TECHNOLOGY ASSOC., INC.

ARMY 91-045

APPLIED TECHNOLOGY ENTERPRISES, LTD.

AF 91-074

APTEK, INC.

DARPA 91-017

AQUIDNECK MANAGEMENT ASSOC., LTD.

NAVY 91-202

AF 91-048

ARCANUM CORP.

ARMY 91-091

ARKALA

AF 91-001

DARPA 91-131

ASPEN SYSTEMS, INC.

NAVY 91-101

ASSOC. AND FERREN

AF 91-051

ASTRON CORP.

ARMY 91-056

ASTROPOWER, INC.

SDIO 91-005

ATHENA GROUP, INC.

ARMY 91-244

DARPA 91-183

ATLANTIC AEROSPACE ELECTRONICS CORP.

ARMY 91-005

ARMY 91-016

NAVY 91-345

DARPA 91-018

DARPA 91-106

ATN MICROWAVE, INC.

AF 91-100

ATSS, INC.

NAVY 91-082

AURA SYSTEMS, INC.

NAVY 91-280

AURORA ASSOC.

AF 91-099

AUTOMATED ANALYSIS CORP.

ARMY 91-098

ARMY 91-101

AUTOMATIX, INC.

NAVY 91-183

AUTOMATRIX, INC.

AF 91-124

AUTOMETRIC, INC.

ARMY 91-200

AUTONOMOUS TECHNOLOGIES CORP.

SDIO 91-003

AVCON-ADVANCED CONTROLS TECHNOLOGY

NAVY 91-253

AVOCA LABORATORIES

AF 91-141

AVOGADRO ENERGY SYSTEMS, INC.

AF 91-150

CROSS REFERENCE

AXIOM CORP.

AF 91-082

AZTEC SYSTEMS

DARPA 91-232

BAKHTAR ASSOC.

AF 91-001

BALLENA SYSTEMS CORP.

DARPA 91-119

BAND, LAVIS & ASSOC., INC.

NAVY 91-210

BARR DEVELOPMENT COMPANY/LASER TOOLS

DARPA 91-115

BARRETT TECHNOLOGY, INC.

AF 91-070

BARRON ASSOC., INC.

NAVY 91-297

BELMONT INSTRUMENT CORP.

ARMY 91-028

BELTRAN, INC.

ARMY 91-192

AF 91-132

BENCHMARK STRUCTURAL CERAMICS CORP.

DARPA 91-071

BENTHOS, INC.

ARMY 91-102

BERKELEY RESEARCH ASSOC., INC.

ARMY 91-158

BIO-IMAGING RESEARCH, INC.

AF 91-155

BIO-TECHNICAL RESOURCES

ARMY 91-066

AF 91-112

BIODYNAMIC RESEARCH CORP.

AF 91-069

BIOELASTICS RESEARCH, LTD.

ARMY 91-123

DARPA 91-110

BIOINDUSTRIAL TECHNOLOGIES, INC.

NAVY 91-175

BIONIC INFORMATION TECHNOLOGIES CO.

AF 91-202

BIOTEK, INC.

ARMY 91-214

ARMY 91-218

BIOTRONICS TECHNOLOGIES, INC.

NAVY 91-295

BKM, INC.

NAVY 91-353

BOULDER MICROWAVE TECHNOLOGIES, INC.

NAVY 91-275

BOULDER NONLINEAR SYSTEMS, INC.

SDIO 91-003

BREAULT RESEARCH ORGANIZATION, INC.

NAVY 91-269

BRIMROSE CORP.

NAVY 91-140

DNA 91-007

BROADCOM, INC.

AF 91-025

BURKE TECHNOLOGIES, INC.

AF 91-169

BUSINESS AND ENGINEERING TECH SER

NAVY 91-136

CAMBRIDGE ACOUSTICAL ASSOC., INC.

NAVY 91-099

CAMBRIDGE RESEARCH ASSOC., INC.

NAVY 91-318

CROSS REFERENCE

CAPE COD RESEARCH, INC.

ARMY 91-024
ARMY 91-125
ARMY 91-172
NAVY 91-137
NAVY 91-201
NAVY 91-224
DARPA 91-102
SDIO 91-015

CARLOW ASSOC., INC.

NAVY 91-058

CARLENTER RESEARCH CORP.

DNA 91-004
DNA 91-005

CARTWRIGHT ELECTRONICS, INC.

NAVY 91-194

CASCADE MICROTECH, INC.

AF 91-100
DARPA 91-020

CDS, INC.

ARMY 91-067

CENTER FOR REMOTE SENSING

DARPA 91-004

CERACON, INC.

ARMY 91-178
DARPA 91-149

CERAMPHYSICS, INC.

AF 91-139

CERNYLAND OF UTICA

ARMY 91-028

CFD RESEARCH CORP.

ARMY 91-010
AF 91-131
AF 91-189
DARPA 91-178

CHANDLER/MAY, INC.

ARMY 91-085

CHANG INDUSTRY, INC.

ARMY 91-147

CHARGED INJECTION CORP.

ARMY 91-186

CHARLES RIVER ANALYTICS, INC.

ARMY 91-210
NAVY 91-152
AF 91-067

CHEMGEN CORP.

ARMY 91-066

CHEMICAL RESEARCH LAB OF AMERICA

ARMY 91-219

CHEMTECH SYSTEMS, INC.

AF 91-138

CHENG TECHNOLOGY & SERVICES, INC.

NAVY 91-215

CHESTNUT SOFTWARE, INC.

DARPA 91-208

CHI SYSTEMS, INC.

ARMY 91-018
NAVY 91-310
DARPA 91-043

CHIRP CORP.

DARPA 91-082
SDIO 91-003
SDIO 91-010

CHROMEX, INC.

ARMY 91-071

CIM SYSTEMS, INC.

AF 91-126

CLEVELAND CRYSTALS, INC.

SDIO 91-003

CMTG, INC.

AF 91-023

COGENTEX, INC.

AF 91-032

COGNITECH, INC.

AF 91-195

COGNITIVE TECHNOLOGIES, INC.

ARMY 91-150

CROSS REFERENCE

COHERENT TECHNOLOGIES, INC.

ARMY 91-124
DARPA 91-001
DARPA 91-064

COLDING INTERNATIONAL CORP.

DARPA 91-054

COLEMAN RESEARCH CORP.

ARMY 91-253

COLORADO RESEARCH LABORATORY

AF 91-127

COMFOCUS DEVELOPMENT CORP.

AF 91-030

COMMONWEALTH COMPUTER RESEARCH, INC.

ARMY 91-006
ARMY 91-052
ARMY 91-114

COMMONWEALTH TECHNOLOGY, INC.

NAVY 91-306

COMPACT SOFTWARE, INC.

DARPA 91-021

COMPEER, INC.

ARMY 91-048

COMPLEX SYSTEMS RESEARCH, INC.

DARPA 91-078

COMPUTER AIDED PLANNING & SCHEDULING

DARPA 91-003

COMPUTER COMMAND AND CONTROL CO

NAVY 91-300

COMPUTERS AND CONCEPTS ASSOC.

NAVY 91-339
NAVY 91-339

CONDUCTUS, INC.

NAVY 91-316
AF 91-120

CONEXUS, INC.

DARPA 91-183

CONTINENTAL SYSTEMS TECHNOLOGY

AF 91-061

COUSINO METAL PRODUCTS, INC.

DARPA 91-149

COVALENT ASSOC., INC.

AF 91-136

CREARE, INC.

ARMY 91-023
NAVY 91-101
AF 91-059
DARPA 91-178
SDIO 91-007

CREATIVE OPTICS, INC.

ARMY 91-015

CREE RESEARCH, INC.

NAVY 91-292

CRYSTAL ASSOC., INC.

AF 91-119
DARPA 91-063

CRYSTAL SYSTEMS, INC.

AF 91-037

CRYSTALLUME

AF 91-137
DARPA 91-033

CUSTOM ANALYTICAL ENGINEERING SYSTEMS

DARPA 91-013

CUSTOM RESEARCH ENGINEERING

DARPA 91-231

CYBERNET SYSTEMS CORP.

ARMY 91-002
AF 91-025
AF 91-051
DARPA 91-050
SDIO 91-010

CYBEROPTICS CORP.

DARPA 91-028

CYMER LASER TECHNOLOGIES

DARPA 91-112

CROSS REFERENCE

DAEDALUS ENTERPRISES, INC.

NAVY 91-014
AF 91-157

DAEDALUS RESEARCH, INC.

NAVY 91-212
DARPA 91-243

DAI, INC.

NAVY 91-147

DAMASKOS, INC.

ARMY 91-096

DAMILIC CORP.

ARMY 91-097

DANIEL H WAGNER ASSOC.

ARMY 91-234
NAVY 91-054
NAVY 91-111
NAVY 91-126
NAVY 91-172
NAVY 91-184
NAVY 91-185

DASYS, INC.

DARPA 91-199

DATA SECURITY, INC.

AF 91-025

DAWN TECHNOLOGIES, INC.

DARPA 91-027

DBA SYSTEMS, INC.

ARMY 91-021

DCS CORP.

ARMY 91-185
NAVY 91-076
NAVY 91-218
NAVY 91-222
NAVY 91-320
NAVY 91-323

DEACON RESEARCH

SDIO 91-001

DEACON RESEARCH, INC.

AF 91-020

DECISION DYNAMICS, INC.

NAVY 91-147

DECISION-SCIENCE APPLICATIONS, INC.

ARMY 91-018
NAVY 91-153

DEDICATED ELECTRONICS, INC.

ARMY 91-020

DEEGAN RESEARCH GROUP, INC.

NAVY 91-202
NAVY 91-204
NAVY 91-205

DEFENSE GROUP, INC.

ARMY 91-041
AF 91-026

DELFIN SYSTEMS

NAVY 91-309
DARPA 91-187

DELPHI PHARMACEUTICALS, INC.

ARMY 91-028

DELTA G CORP.

DARPA 91-071

DELTA INFORMATION SYSTEMS, INC.

ARMY 91-019
NAVY 91-016
NAVY 91-277

DIGITAL INSTRUMENTS, INC.

AF 91-040

DIGITAL SIGNAL CORP.

DARPA 91-002

DIGITAL SYSTEM RESOURCES

NAVY 91-052
NAVY 91-133
NAVY 91-135
NAVY 91-139
NAVY 91-331

DISPLAYTECH, INC.

NAVY 91-223

DIVISE

NAVY 91-340

CROSS REFERENCE

DRAGON SYSTEMS, INC.
DARPA 91-184

DYNA EAST CORP.
ARMY 91-087

DYNACS ENGINEERING CO., INC.
AF 91-153

E-SORB SYSTEMS
ARMY 91-196

E-TEK DYNAMICS, INC.
DARPA 91-004
DARPA 91-062
DARPA 91-064
DARPA 91-241
SDIO 91-011

EASTERN ANALYTICAL, INC.
ARMY 91-220

EDGE TECHNOLOGIES, INC.
NAVY 91-256

EIC LABORATORIES, INC.
ARMY 91-071
ARMY 91-107
ARMY 91-145
NAVY 91-175
NAVY 91-179
NAVY 91-259
NAVY 91-333
AF 91-179
DARPA 91-101
DNA 91-007
SDIO 91-005

EIDETICS INTERNATIONAL, INC.
AF 91-079

ELCATECH, INC.
ARMY 91-027

ELECTRIC PROPULSION LABORATORY, INC.
AF 91-148

ELECTRO MAGNETIC APPLICATIONS, INC.
ARMY 91-159
DARPA 91-022
DARPA 91-156

ELECTRO-OPTEK CORP.
ARMY 91-232
ARMY 91-240
NAVY 91-182
NAVY 91-254
NAVY 91-260
NAVY 91-303
DARPA 91-060
DARPA 91-175
DARPA 91-176
DARPA 91-242

ELECTRO-OPTICAL SYSTEMS, INC.
NAVY 91-251

ELECTRO-OPTICS CORP.
AF 91-167

ELECTRO-RADIATION, INC.
AF 91-079

ELECTROCHEM, INC.
NAVY 91-306
DARPA 91-008

ELECTRON TRANSFER TECHNOLOGIES, INC.
SDIO 91-014

ELECTRONIC CONCEPTS & ENGINEERING
DARPA 91-231

ELECTRONICS DEVELOPMENT CORP.
AF 91-105

ELECTROSYNTHESIS COMPANY, INC.
AF 91-054

ELMORE ASSOC.
ARMY 91-118

ELTRON RESEARCH, INC.
DARPA 91-074

EMCORE CORP.
SDIO 91-014
SDIO 91-015

EMERSON & STERN ASSOC., INC.
DARPA 91-184

ENERDYNE TECHNOLOGIES, INC.
NAVY 91-276

CROSS REFERENCE

ENERGY COMPRESSION RESEARCH CORP.

ARMY 91-142
DARPA 91-117
SDIO 91-005

ENERGY/MATTER CONVERSION CORP. (EMC2)

NAVY 91-303

ENGINEERED DESIGNS, INC.

ARMY 91-190

ENGINEERING DESIGN TEAM, INC.

DARPA 91-193

ENGINEERING GEOMETRY SYSTEMS

NAVY 91-296

ENSCO, INC.

ARMY 91-162
NAVY 91-043
DARPA 91-017
DARPA 91-086
DARPA 91-226

ENTECH, INC.

SDIO 91-005

ENTERPRISE INTEGRATION TECHNOLOGIES CORP

DARPA 91-031
DARPA 91-052

ENTRON SYSTEMS COMPANY

NAVY 91-255
NAVY 91-268

ENTROPIC RESEARCH LABORATORY, INC.

DARPA 91-038

ENVIROGEN, INC.

AF 91-058

ENVIRONMENTAL BIOTECHNOLOGIES, INC.

DARPA 91-111

ENVIRONMENTAL PHYSICS, INC.

DARPA 91-111

ENVIROSPACE SOFTWARE RESEARCH, INC.

AF 91-051

ENZYME TECHNOLOGY RESEARCH GROUP, INC.

ARMY 91-029

EON INSTRUMENTATION, INC.

NAVY 91-278

EPION CORP.

SDIO 91-014

EPSILON LAMBDA ELECTRONICS CORP.

ARMY 91-002
AF 91-004

EQUIMAX COMMUNICATIONS CORP.

DARPA 91-002

ESKAY ASSOC.

ARMY 91-093

ESSCUBE ENGINEERING, INC.

NAVY 91-192

ESSEX CORP.

ARMY 91-251

ETALON, INC.

SDIO 91-011

EVOLUTIONARY TECHNOLOGIES, INC.

NAVY 91-034

EXCEL SUPERCONDUCTOR, INC.

DARPA 91-055

F&H APPLIED SCIENCE ASSOC., INC.

AF 91-050

FAIRFAX MATERIALS RESEARCH, INC.

SDIO 91-013

FAR WEST SENSOR CORP.

ARMY 91-233

FASTMAN, INC.

ARMY 91-244

FEMTOSCAN CORP.

ARMY 91-007

FERMIONICS CORP.

NAVY 91-002

FIBER AND SENSOR TECHNOLOGIES

SDIO 91-012

CROSS REFERENCE

FIBER CONCEPT, INC.
SDIO 91-013

FIMOD CORP.
DARPA 91-136

FLAM & RUSSELL, INC.
NAVY 91-366

FLUOROCHEM, INC.
NAVY 91-170

FOSTER-MILLER, INC.
ARMY 91-025
ARMY 91-029
ARMY 91-089
ARMY 91-095
ARMY 91-140
ARMY 91-179
NAVY 91-097
NAVY 91-137
NAVY 91-163
NAVY 91-173
NAVY 91-178
NAVY 91-329
AF 91-045
AF 91-054
AF 91-076
AF 91-077
AF 91-113
AF 91-133
AF 91-164
AF 91-166
AF 91-168
AF 91-198
AF 91-199
DARPA 91-010
DARPA 91-025
DARPA 91-070
DARPA 91-099
DARPA 91-100
DARPA 91-124
DARPA 91-136
SDIO 91-005

FRANZ, INC.
DARPA 91-036

FRB ASSOC., INC.
NAVY 91-293

FRONTIER TECHNOLOGY, INC.
AF 91-089
AF 91-140

FTR, INC.
AF 91-116

FU ASSOC., LTD.
ARMY 91-207

FUTURE TECHNOLOGIES, INC.
AF 91-176

GALAXY MICROSYSTEMS, INC.
NAVY 91-133
NAVY 91-200

GARDNER RES CO/SYSTEM ENG. TECH SER
NAVY 91-273

GATEWAY MODELING, INC.
DARPA 91-021

GELEST, INC.
DARPA 91-110

GELTECH, INC.
ARMY 91-242

GEMINI COMPUTERS, INC.
SDIO 91-010

GENERAL FIBER OPTICS, INC.
ARMY 91-117

GENERAL MICROWAVE CORP.
ARMY 91-020
ARMY 91-078

GENERAL SCIENCES, INC.
NAVY 91-171
NAVY 91-330
DARPA 91-125

GENISYS RESEARCH & DEVELOPMENT, INC.
ARMY 91-199

GEO-CENTERS, INC.
AF 91-018
DARPA 91-004
DARPA 91-134
DNA 91-005
DNA 91-005

CROSS REFERENCE

GEO-MICROBIAL TECHNOLOGIES, INC.

ARMY 91-066
NAVY 91-295

GILLIAM-MCKINLEYENGINEERINGCONSULTANTS

AF 91-184

GINER, INC.

AF 91-143

GMA INDUSTRIES, INC.

DARPA 91-042

GREYSTONE DEFENSE SYSTEMS DIVISION

NAVY 91-367

GUIDED SYSTEMS TECHNOLOGIES

ARMY 91-174
NAVY 91-319

GUMBS ASSOC., INC.

DARPA 91-129
SDIO 91-015

HANDLE, INC.

NAVY 91-291

HAYES AND ASSOC.

SDIO 91-005

HELEN L MOORE

NAVY 91-238

HI-Z TECHNOLOGY, INC.

SDIO 91-006

HIGH PERFORMANCE MATERIALS, INC.

ARMY 91-152

HIGHQ, INC.

NAVY 91-180

HITTITE MICROWAVE CORP.

AF 91-003
AF 91-035

HMJ CORP.

SDIO 91-005

HNC, INC.

ARMY 91-197
NAVY 91-337
DARPA 91-078
DARPA 91-110

HOLLI RESEARCH

SDIO 91-006

HORIZON TECHNOLOGY GROUP, INC.

NAVY 91-092

HORIZONS TECHNOLOGY, INC.

ARMY 91-245
AF 91-029

HYPRES, INC.

DARPA 91-114
SDIO 91-015
SDIO 91-015

I-KINETICS, INC.

ARMY 91-050
DARPA 91-052
DARPA 91-188

IAP RESEARCH, INC.

ARMY 91-127
DARPA 91-055
SDIO 91-002
SDIO 91-005

IBIS TECHNOLOGY CORP.

DNA 91-007

ICUCOM, INC.

AF 91-034

II-VI, INC.

DARPA 91-069

ILC TECHNOLOGY

ARMY 91-057

ILLINOIS SUPERCONDUCTOR CORP.

AF 91-026
SDIO 91-005

IMPLANT SCIENCES CORP.

SDIO 91-014

INDUSTRIAL SENSORS ACTUATORS

SDIO 91-001

CROSS REFERENCE

INNOVA LABORATORIES, INC.
DARPA 91-116

INNOVATIVE CONFIGURATION, INC.
AF 91-126
DARPA 91-199

INNOVATIVE DYNAMICS
DARPA 91-241

INNOVATIVE TECHNOLOGY ASSOC.
NAVY 91-127

INRAD, INC.
AF 91-058

INTEGRATED APPLIED PHYSICS, INC.
SDIO 91-005

INTEGRATED DEFENSE CONCEPTS
NAVY 91-166

INTEGRATED OPTICAL CIRCUIT CONSULTANTS
ARMY 91-075

INTEGRATED PARALLEL TECHNOLOGY, INC.
NAVY 91-162

INTEGRATED SENSORS, INC.
AF 91-012
DARPA 91-237

INTEGRATED SOFTWARE, INC.
NAVY 91-321
AF 91-071

INTEGRATED SYSTEMS ASSEMBLIES CORP.
DARPA 91-020
SDIO 91-014

INTEGRATED TECHNOLOGIES FOR MED.
ARMY 91-153

INTELLECTION, INC.
DARPA 91-181

INTELLICORP.
NAVY 91-239

INTELLIGENT AUTOMATION, INC.
ARMY 91-033
NAVY 91-208
DARPA 91-050

INTELLIGENT LOGISTICS
NAVY 91-336

INTELLIGENT MACHINE TECHN CORP.
AF 91-001

INTELLIGENT REASONING SYSTEMS (IRS)
NAVY 91-335

INTERCTIVE INTELLEAGENT IMAGERY CORP.
NAVY 91-284

INTERFACE ENGINEERING
NAVY 91-298

INTERFEROMETRICS, INC.
DARPA 91-099
SDIO 91-011

INTERNATIONAL ELECTRONIC MATERIALS
ARMY 91-152

INTERNATIONAL MICRO INDUSTRIES
DARPA 91-020

INTERNATIONAL POLYMER CORP.
ARMY 91-181

INTERNATIONAL SOFTWARE SYSTEMS, INC.
DARPA 91-211

INTERNATIONAL SOLAR ELECTRIC TECHNOLOGY
DARPA 91-238

INTERSCIENCE, INC.
DARPA 91-232
DNA 91-007

INTERSPEC, INC.
SDIO 91-003

INVENTIVE DEVELOPMENT COMPANY
AF 91-078

IONEDGE CORP.
DARPA 91-111

IONICS RESEARCH, INC.
NAVY 91-169

IONWERKS
ARMY 91-126

CROSS REFERENCE

IRVINE SENSORS CORP.

ARMY 91-247
SDIO 91-003

ITERATED SYSTEMS, INC.

NAVY 91-016

ITERATIONS, INC.

DARPA 91-036
SDIO 91-010

J.A. WOOLLAM COMPANY

ARMY 91-046
ARMY 91-243

JAMESON ROBOTICS

DARPA 91-113

JET PROCESS CORP.

ARMY 91-133
DARPA 91-095

JIREH SYSTEMS

NAVY 91-338

JOHN R. BAYLESS COMPANY

DARPA 91-111
DNA 91-015

JRS RESEARCH LABORATORIES, INC.

NAVY 91-106

JSP INDUSTRIES, INC.

DARPA 91-128

JWA DIVISION, EMADEL ENTERPRISES, INC.

DARPA 91-220

KARTA TECHNOLOGY, INC.

AF 91-065

KC RESEARCH CORP.

DARPA 91-030

KINETICS GEN. IND., INC.

DARPA 91-243

KNOWLEDGE BASED SYSTEMS, INC.

DARPA 91-043
DARPA 91-050
DARPA 91-223

KNOWLEDGE INDUSTRIES

DARPA 91-218

KNOWLEDGE SYSTEMS CONCEPTS, INC.

DARPA 91-041

KONSAL RESEARCH ASSOC.

DARPA 91-054

KTAADN, INC.

AF 91-178

KTECH CORP.

DARPA 91-005

KVH INDUSTRIES, INC.

NAVY 91-363

L & W RESEARCH, INC.

AF 91-116

L-CHEM, INC.

NAVY 91-081

LABTEK CORP.

ARMY 91-004

LANGUAGE SYSTEMS, INC.

ARMY 91-108

LANXIDE CORP.

DARPA 91-126
DARPA 91-150
DARPA 91-152

LASER PHOTONICS TECHNOLOGY, INC.

AF 91-190
SDIO 91-003

LASER PHOTONICS, INC.

AF 91-167

LASER POWER CORP.

NAVY 91-348

LASER POWER RESEARCH

NAVY 91-285
DARPA 91-061
DARPA 91-117

CROSS REFERENCE

LASER SCIENCE COMPANY

SDIO 91-013
SDIO 91-013
SDIO 91-014

LASER SCIENCE, INC.

SDIO 91-003

LASER SYSTEMS AND RESEARCH CORP.

SDIO 91-003

LASERGENICS CORP.

AF 91-005
AF 91-115
AF 91-134

LB&M ASSOC., INC.

ARMY 91-248

LENTEC CORP.

ARMY 91-241

LICA SYSTEMS, INC.

ARMY 91-034

LIFECCELL CORP.

ARMY 91-028

LIGHT SCIENCES, INC.

DARPA 91-128

LIGHTWAVE ELECTRONICS CORP.

DARPA 91-118
DARPA 91-225

LINARES MANAGEMENT ASSOC., INC.

SDIO 91-014

LINDSEY ASSOC.

NAVY 91-364

LJF CORP.

NAVY 91-263

LNK CORP.

NAVY 91-357

LOGIX CORP.

NAVY 91-138

LONE PEAK ENGINEERING, INC.

SDIO 91-003

LYNNE GILFILLAN ASSOC., INC.

DARPA 91-216

LYNNTECH, INC.

ARMY 91-028
AF 91-058

M. L. ENERGIA, INC.

ARMY 91-080
ARMY 91-117
NAVY 91-344
AF 91-057

MAC AULAY-BROWN, INC.

NAVY 91-347

MACH I, INC.

AF 91-013

MACHINE PERCEPTION INTERNATIONAL

ARMY 91-018

MAINSTREAM ENGINEERING CORP.

ARMY 91-070
ARMY 91-092
DARPA 91-221

MAK TECHNOLOGIES, INC.

ARMY 91-180
ARMY 91-254
DARPA 91-003
DARPA 91-142

MALIBU RESEARCH ASSOC.

NAVY 91-193
AF 91-011

MANDEX, INC.

ARMY 91-201
NAVY 91-286

MANHATTAN TURBINE CORP.

DARPA 91-149

MANSOUR ENGINEERING, INC.

NAVY 91-100

MARK RESOURCES, INC.

NAVY 91-196
DARPA 91-001

MARKO MATERIALS, INC.

SDIO 91-013

CROSS REFERENCE

MARLOW INDUSTRIES, INC.

ARMY 91-047

MARTIN SYSTEMS, INC.

AF 91-029

DARPA 91-151

MASSACHUSETTS TECHNOLOGICAL LAB

ARMY 91-121

MATERIALS AND ELECTROCHEMICAL RESEARCH

ARMY 91-018

ARMY 91-170

NAVY 91-168

NAVY 91-245

AF 91-075

DARPA 91-093

MATERIALS SCIENCES CORP.

ARMY 91-164

MATERIALS TECHNOLOGIES CORP.

NAVY 91-154

SDIO 91-011

MAYA DESIGN GROUP, INC.

ARMY 91-148

MAYFLOWER COMMUNICATIONS COMPANY, INC.

AF 91-156

MCMAHAN ELECTRO-OPTICS, INC.

SDIO 91-003

MEDICAL LASER RESEARCH & DEVELOPMENT COR

DARPA 91-083

MEGADYNE CORP.

NAVY 91-247

MEI ASSOC., INC.

AF 91-025

MEMBRANE DEVELOPMENT SPECIALISTS, INC.

NAVY 91-354

MEMBRANE TECHNOLOGY AND RESEARCH, INC.

AF 91-060

AF 91-187

MENTOR TECHNOLOGIES, INC.

ARMY 91-009

ARMY 91-086

ARMY 91-111

MERIDIAN INDUSTRIES, INC.

DARPA 91-129

METAGENE CORP.

ARMY 91-027

METATECH CORP.

DARPA 91-087

METHODICS, INC.

NAVY 91-181

METRATEK, INC.

NAVY 91-144

NAVY 91-303

METROLASER

AF 91-009

AF 91-015

AF 91-101

SDIO 91-003

METRON, INC.

NAVY 91-111

MICRILOR, INC.

ARMY 91-002

DARPA 91-139

MICROCOM CORP.

NAVY 91-195

NAVY 91-327

NAVY 91-328

MICROSCIENCE, INC.

SDIO 91-015

MICROSENSOR SYSTEMS, INC.

ARMY 91-073

MICROTRONICS ASSOC., INC.

DARPA 91-060

MILLITECH CORP.

ARMY 91-134

CROSS REFERENCE

MISSION RESEARCH CORP.

ARMY 91-154
ARMY 91-157
ARMY 91-160
NAVY 91-186
NAVY 91-221
NAVY 91-270
AF 91-064
DARPA 91-023
DARPA 91-024
DARPA 91-087
DNA 91-005

MO-SCI CORP.

ARMY 91-067

MOIRESTRESS, INC.

ARMY 91-171

MOLECULAR TECHNOLOGIES, INC.

DARPA 91-062

MOLTECH CORP.

DARPA 91-033
DARPA 91-101

MONTEREY TECHNOLOGIES, INC.

ARMY 91-015
NAVY 91-220

MORGAN RESEARCH CORP.

DARPA 91-222

MORLOCK ENVIRONMENTAL,, INC.

DNA 91-001

MOTIVAIR CORP.

ARMY 91-045

MRAM, INC.

SDIO 91-011

MRJ, INC.

ARMY 91-021
DARPA 91-151
SDIO 91-012

MSNW, INC.

DARPA 91-070

MTL SYSTEMS, INC.

AF 91-093
AF 91-110

MULTILAYER OPTICS AND XRAY TECH, INC.

ARMY 91-143

MUSYN, INC.

NAVY 91-261

MVM ELECTRONICS, INC.

NAVY 91-173

NANOSTRUCTURES, INC.

DARPA 91-033

NAVMAR APPLIED SCIENCES CORP.

NAVY 91-198

NAVSYS CORP.

AF 91-156
AF 91-171
AF 91-173
DARPA 91-242

NAVSYS CORP. & 3C SYSTEMS CO.

NAVY 91-283

NAVSYS CORP/SC SYSTEM

NAVY 91-274

NDI ENGINEERING COMPANY

NAVY 91-206

NEILLEN TECHNOLOGIES CORP.

ARMY 91-149

NEOCERA, INC.

SDIO 91-015

NEOTRONICS CORP.

ARMY 91-020

NETROLOGIC, INC.

DARPA 91-113

NETWORK DYNAMICS, INC.

DARPA 91-181

NIELSEN ENGINEERING AND RESEARCH, INC.

AF 91-189
NAVY 91-161

NIMBLE COMPUTER CORP.

ARMY 91-060
SDIO 91-010

CROSS REFERENCE

NKF ENGINEERING, INC.

NAVY 91-099

NAVY 91-132

NOMAC ENERGY SYSTEMS, INC.

ARMY 91-191

NONVOLATILE ELECTRONICS, INC.

AF 91-102

NORTH AMERICAN WEATHER CONSULTANTS

AF 91-162

NORTH COAST INNOVATION, INC.

ARMY 91-166

NAVY 91-010

NORTH EAST SEMICONDUCTOR, INC.

SDIO 91-014

NORTH STAR RESEARCH CORP.

AF 91-169

NORTHEAST PHOTOSCIENCES

AF 91-025

SDIO 91-005

NORTHWEST RESEARCH ASSOC., INC.

NAVY 91-291

NOVA ELECTRONICS & SOFTWARE

ARMY 91-040

SDIO 91-003

NTI, INC.

ARMY 91-209

NUMERICAL TECHNOLOGY, INC.

DARPA 91-075

O. DONN GRACE, PHD, INC.

NAVY 91-324

OAKTREE AUTOMATION, INC.

NAVY 91-244

OCA APPLIED OPTICS, INC.

NAVY 91-352

OFFICE OF NICHOLAS N. RIVERA, PHD

NAVY 91-204

OMNIA RESEARCH CORP.

AF 91-006

OMNITEK, INC.

AF 91-060

NAVY 91-147

OMNIVIEW, INC.

AF 91-095

DARPA 91-195

ONYX SCIENCES CORP.

DARPA 91-084

OPHIDIAN PHARMACEUTICALS, INC.

ARMY 91-027

OPHIR CORP.

ARMY 91-012

OPTECH LABORATORY

ARMY 91-128

OPTICAL CONCEPTS RESEARCH

SDIO 91-011

OPTICAL E.T.C., INC.

ARMY 91-074

ARMY 91-082

OPTICAL SENSOR TECHNOLOGY

DARPA 91-161

OPTICS 1, INC.

NAVY 91-236

NAVY 91-346

OPTIMAL ANALYSIS COMPANY, INC.

DARPA 91-183

OPTIMETRICS, INC.

ARMY 91-105

OPTIMUM STRUCTURAL DESIGN, INC.

NAVY 91-100

OPTIPHASE, INC.

NAVY 91-110

NAVY 91-349

OPTIVISION, INC.

AF 91-046

CROSS REFERENCE

OPTO-ELECTRIC

DARPA 91-237

OPTO-KNOWLEDGE SYSTEMS, INC.

AF 91-001

OPTOELECTRIC

DARPA 91-065

OPTRA, INC.

ARMY 91-168

NAVY 91-211

AF 91-021

OPTRON SYSTEMS, INC.

AF 91-025

DARPA 91-080

OR CONCEPTS APPLIED

AF 91-082

ORA CORP.

SDIO 91-010

ORBITAL RESEARCH, INC.

DARPA 91-134

ORINCON CORP.

ARMY 91-058

NAVY 91-131

NAVY 91-135

NAVY 91-297

DARPA 91-068

DARPA 91-106

DARPA 91-109

ORINCON-HAWAII CORP.

NAVY 91-128

NAVY 91-155

ORTEL CORP.

AF 91-033

PACIFIC ADVANCED TECHNOLOGY

AF 91-147

PACIFIC RIM ENGINEERING

ARMY 91-109

PACIFIC-SIERRA RESEARCH CORP.

AF 91-052

DNA 91-001

NAVY 91-197

PDA ENGINEERING

AF 91-073

PDF SOLUTIONS

DARPA 91-182

DARPA 91-198

PDI CORP.

NAVY 91-207

NAVY 91-356

PEN RESEARCH, INC.

DARPA 91-006

PENETRADAR CORP.

ARMY 91-043

PERCEPTRONICS, INC.

DARPA 91-030

DARPA 91-177

PERCEPTUAL IMAGES

ARMY 91-139

PHASE IV SYSTEMS, INC.

ARMY 91-235

PHASEX CORP.

ARMY 91-068

AF 91-186

PHOENIX DIGITAL CORP.

NAVY 91-119

PHONON CORP.

ARMY 91-138

PHOTOGLASS

AF 91-007

PHOTOMETRICS, INC.

AF 91-161

PHOTONIC SYSTEMS, INC.

NAVY 91-264

PHOTONICS RESEARCH, INC.

ARMY 91-242

PHOTONICS TECHNOLOGIES

NAVY 91-191

SDIO 91-011

CROSS REFERENCE

PHYSICAL OPTICS CORP.

ARMY 91-071
ARMY 91-144
ARMY 91-169
NAVY 91-102
NAVY 91-119
NAVY 91-349
AF 91-027
AF 91-038
AF 91-044
DARPA 91-144
DARPA 91-192
SDIO 91-011
SDIO 91-014

PHYSICAL RESEARCH, INC.

DARPA 91-112
DARPA 91-114

PHYSICAL SCIENCES, INC.

ARMY 91-057
ARMY 91-182
NAVY 91-167
NAVY 91-213
AF 91-057
AF 91-144
AF 91-181
AF 91-200
DARPA 91-057

PHYSICON, INC.

AF 91-116

PHYSICS MATHEMATICS AND COMPUTERS, INC.

NAVY 91-162

PIASECKI AIRCRAFT CORP.

NAVY 91-317

PLANAR SYSTEMS, INC.

ARMY 91-137

PLANNING SYSTEMS, INC.

ARMY 91-176

POSITECH, INC.

SDIO 91-010

POTOMAC PHOTONICS, INC.

AF 91-196
DARPA 91-112

PRADEEP K. GUPTA, INC.

AF 91-128

PRECISION COMBUSTION, INC.

ARMY 91-011

PRECISION MEASUREMENT COMPANY

AF 91-197

PRINCETON COMBUSTION RESEARCH LAB.

ARMY 91-035

PRINCETON SCIENTIFIC ENTERPRISES

ARMY 91-117

PRINCETON SCIENTIFIC INSTRUMENTS

ARMY 91-116

PRINCETON X-RAY LASER, INC.

SDIO 91-001

PROMETHEUS, INC.

NAVY 91-124
NAVY 91-202
DARPA 91-045

PROTOTYPE SIMULATIONS

DARPA 91-141

PSI TECHNOLOGY COMPANY

DARPA 91-074
DARPA 91-113

Q-DOT, INC.

AF 91-086
DARPA 91-114

QRDC, INC.

DARPA 91-094

QSOURCE, INC.

SDIO 91-003
SDIO 91-003

QUAD DESIGN TECHNOLOGY, INC.

DARPA 91-076

QUANTEX CORP.

NAVY 91-157
DARPA 91-080

QUANTIC INDUSTRIES, INC.

NAVY 91-135

CROSS REFERENCE

QUANTUM CONSULTANTS, INC.

ARMY 91-014

QUANTUM CONTROLS

DARPA 91-168

QUANTUM EPTAXIAL DESIGNS, INC.

SDIO 91-014

QUATRO CORP.

DARPA 91-096

QUEST INTEGRATED, INC.

ARMY 91-130

ARMY 91-165

NAVY 91-257

AF 91-023

AF 91-024

AF 91-052

AF 91-079

DARPA 91-127

SDIO 91-013

RADCON RADAR CONTROL SYSTEMS

DARPA 91-138

RADIATION MONITORING DEVICES, INC.

ARMY 91-131

AF 91-042

RADIX SYSTEMS, INC.

NAVY 91-130

RADIX TECHNOLOGIES, INC.

ARMY 91-051

AF 91-173

DARPA 91-002

RANTECH COMPANY

SDIO 91-011

RASOR ASSOC., INC.

SDIO 91-004

RD INSTRUMENTS

NAVY 91-293

NAVY 91-294

RECOGNITION RESEARCH, INC.

ARMY 91-204

REDZONE ROBOTICS, INC.

ARMY 91-099

ARMY 91-102

REKENTHALER TECHNOLOGY ASSOC. CORP.

ARMY 91-203

NAVY 91-140

NAVY 91-291

DARPA 91-135

REMAXCO TECHNOLOGIES, INC.

NAVY 91-351

REMTECH, INC.

AF 91-049

RESEARCH APPLICATIONS, INC.

ARMY 91-007

RESEARCH INTERNATIONAL, INC.

NAVY 91-121

RESEARCH PARTNERSHIP

AF 91-024

RESEARCH SUPPORT INSTRUMENTS, INC.

AF 91-159

RESEARCH TECHNOLOGY ASSOC.

ARMY 91-251

RESSLER ASSOC., INC.

NAVY 91-008

RETICULAR SYSTEMS, INC.

ARMY 91-053

ARMY 91-185

ARMY 91-188

SDIO 91-010

REUSE, INC.

DARPA 91-212

REVEO, INC.

SDIO 91-014

RGS ASSOC., INC.

NAVY 91-150

ROBERT LEVI ASSOC.

NAVY 91-217

CROSS REFERENCE

ROBOTIC SYSTEMS TECHNOLOGY

DARPA 91-203

ROCKFORD TECHNOLOGY ASSOC., INC.

AF 91-150

ROOS INSTRUMENTS

DARPA 91-157

RTS LABORATORIES, INC.

SDIO 91-004

RUDOLF, PAUL G.

AF 91-059

S-TRON

ARMY 91-064

SABBAGH ASSOC., INC.

NAVY 91-350

SAN JUAN TECHNOLOGIES

SDIO 91-013

SAPHIKON, INC.

AF 91-037

SARCOS RESEARCH CORP.

ARMY 91-222

DARPA 91-005

SATCON TECHNOLOGY CORP.

ARMY 91-018

NAVY 91-249

NAVY 91-267

NAVY 91-317

NAVY 91-332

NAVY 91-359

SDIO 91-012

SAVANNAH RIVER ASSOC., INC.

NAVY 91-055

SAVI TECHNOLOGY, INC.

ARMY 91-167

SCHMIDT INSTRUMENTS, INC.

AF 91-057

DARPA 91-097

DARPA 91-174

SDIO 91-003

SCHWARTZ ELECTRO-OPTICS, INC.

ARMY 91-112

ARMY 91-173

ARMY 91-249

ARMY 91-252

AF 91-160

DARPA 91-061

DARPA 91-064

DARPA 91-227

DARPA 91-235

SCIENCE AND APPLIED TECHNOLOGY, INC.

AF 91-090

SCIENCE AND ENGINEERING ASSOC.

DNA 91-008

SCIENCE HORIZONS, INC.

DARPA 91-088

SCIENCE RESEARCH LABORATORY, INC.

ARMY 91-079

DARPA 91-063

DARPA 91-112

DARPA 91-227

DNA 91-016

SDIO 91-001

SDIO 91-003

SCIENTIFIC COMPUTING ASSOC., INC.

NAVY 91-005

DARPA 91-036

DARPA 91-036

SCIENTIFIC RESEARCH ASSOC., INC.

ARMY 91-141

AF 91-135

DARPA 91-079

SCIENTIFIC SYSTEMS COMPANY

ARMY 91-003

ARMY 91-129

AF 91-195

DARPA 91-148

SDIO 91-010

SCS TELECOM, INC.

ARMY 91-006

DARPA 91-163

SEAKAY MANAGEMENT CORP.

NAVY 91-125

NAVY 91-132

CROSS REFERENCE

SEAMORE, INC.
NAVY 91-102

SEARCH TECHNOLOGY, INC.
ARMY 91-188
AF 91-109

SECURE SOLUTIONS, INC.
NAVY 91-061

SENSOR PLUS, INC.
ARMY 91-212

SENSOR SYSTEMS GROUP, INC.
SDIO 91-003

SENTEL CORP.
NAVY 91-114

SEPARATION INDUSTRIES
AF 91-142

SEPARATION SYSTEMS TECHNOLOGY, INC.
ARMY 91-001

SETS TECHNOLOGY, INC.
ARMY 91-021

SFA, INC.
AF 91-022

SI, DIVISION OF SPECTRUM 39
ARMY 91-008

SIERRA MONOLITHICS, INC.
SDIO 91-015

SIGMA GAMMA LAMBDA, INC.
NAVY 91-130

SIGNAL CORP.
NAVY 91-033

SIGNAL ENGINEERING, INC.
NAVY 91-287
AF 91-084

SIGNAL PROCESSING TECHNOLOGY, LTD.
DARPA 91-145

SILHOUETTE TECHNOLOGY, INC.
NAVY 91-199

SILICON DESIGNS, INC.
NAVY 91-248

SILICON ENGINES, INC.
SDIO 91-010

SILICON FILMS CORP.
SDIO 91-014

SIMEX SYSTEMS & SOFTWARE CORP.
ARMY 91-062

SIMPEX TECHNOLOGIES, INC.
ARMY 91-161

SIMPSON WEATHER ASSOC., INC.
AF 91-158

SIMULA, INC.
ARMY 91-018

SIPPICAN, INC.
NAVY 91-009

SKW CORP.
DARPA 91-177
SDIO 91-003

SOFTWARE ENGINEERING & TECHNICAL ANALYSIS
DARPA 91-213

SOFTWARE PRODUCTIVITY SOLUTIONS, INC.
ARMY 91-059
DARPA 91-212

SOHAR, INC.
AF 91-085

SONALYSTS, INC.
NAVY 91-124
NAVY 91-125
NAVY 91-131

SONOSCAN, INC.
SDIO 91-013

SOUTHWEST SCIENCES, INC.
DARPA 91-025

SPACE AND AERONAUTICAL SCIENCES, INC.
AF 91-151

CROSS REFERENCE

SPACE APPLICATIONS CORP.

ARMY 91-061
NAVY 91-303

SPACE POWER, INC.

SDIO 91-014

SPACE TECH CORP.

AF 91-106

SPACEBORNE, INC.

DARPA 91-206

SPARKTECH

NAVY 91-214

SPARTA, INC.

AF 91-146
AF 91-174
DARPA 91-006
DARPA 91-013
DARPA 91-048
NAVY 91-003
NAVY 91-004
NAVY 91-074
NAVY 91-241
NAVY 91-308

SPECTRA RESEARCH, INC.

ARMY 91-194
DARPA 91-001

SPECTRAL SCIENCES, INC.

ARMY 91-132
AF 91-022

SPECTRUM PHOTONICS

DARPA 91-063

SPIRE CORP.

ARMY 91-026
ARMY 91-063
NAVY 91-209
NAVY 91-361
AF 91-014
AF 91-028
DARPA 91-060
DARPA 91-062
DARPA 91-081
DARPA 91-097
SDIO 91-014
SDIO 91-014
SDIO 91-014
SDIO 91-014

SQM TECHNOLOGY, INC.

DARPA 91-004

SRA OPTIK

AF 91-188

SRS TECHNOLOGIES

AF 91-031
AF 91-128
AF 91-154

STANLEY ASSOC.

NAVY 91-136

STEINBRECHER CORP.

ARMY 91-013

STERIS CORP.

ARMY 91-219

STOTTLE HENKE ASSOC., INC.

ARMY 91-021
ARMY 91-198

STR CORP.

DARPA 91-075

STRATEGIC FRAMEWORKS, INC.

DARPA 91-183

STRESAU LABORATORY, INC.

NAVY 91-282

STRUCTURED SYSTEMS & SOFTWARE, INC.

DARPA 91-010

CROSS REFERENCE

SUMMITEC CORP.

NAVY 91-281

SUNBURST RECOVERY, INC.

DARPA 91-016

SUPERCONDUCTIVE COMPONENTS, INC.

DARPA 91-076

SUPERCONDUCTIVE ELECTRONICS, INC.

DARPA 91-098

SUPERCONDUCTOR TECHNOLOGIES, INC.

AF 91-092

AF 91-098

SDIO 91-003

SDIO 91-015

SDIO 91-015

SUPERCONIX, INC.

SDIO 91-015

SUPERIOR VACUUM TECHNOLOGY, INC.

AF 91-097

DARPA 91-060

SURFACE OPTICS CORP.

AF 91-114

SURFACES RESEARCH & APPLICATIONS

ARMY 91-100

SURFACTANT ASSOC., INC.

AF 91-056

SURVICE ENGINEERING COMPANY

ARMY 91-022

SYMBIOTECH, INC.

ARMY 91-225

SYMBIOTICS, INC.

NAVY 91-296

SYMETRIX CORP.

DARPA 91-077

SYNCHRONETICS, INC.

AF 91-025

SYNETICS CORP.

NAVY 91-035

NAVY 91-119

NAVY 91-122

NAVY 91-300

SYNEX, INC.

NAVY 91-046

SYSTEMS & PROCESSES ENGINEERING CORP.

ARMY 91-031

ARMY 91-083

ARMY 91-206

NAVY 91-176

DARPA 91-001

DARPA 91-131

SYSTEMS CONTROL TECHNOLOGY, INC.

ARMY 91-021

NAVY 91-089

NAVY 91-237

NAVY 91-355

DNA 91-010

SDIO 91-012

SYSTEMS ENGINEERING ASSOC. CORP.

NAVY 91-126

SYSTEMS EVALUATION LABORATORY IN FLIGHT

SDIO 91-003

SYSTEMS EXPLORATION, INC.

AF 91-062

SYSTEMS SOFTWARE ENGINEERING CORP.

NAVY 91-219

SYSTEMS TECHNOLOGY, INC.

ARMY 91-018

NAVY 91-091

TACAN CORP.

ARMY 91-156

AF 91-163

AF 91-190

TANNER RESEARCH, INC.

NAVY 91-252

DARPA 91-206

DARPA 91-233

TAU CORP.

DARPA 91-078

CROSS REFERENCE

TC SPECIALTY PRODUCTS CO.

ARMY 91-183

TCAM TECHNOLOGY, INC.

AF 91-104

TDA RESEARCH, INC.

ARMY 91-007

NAVY 91-101

AF 91-131

TECHNETICS CORP.

ARMY 91-018

TECHNICAL CERAMICS LABORATORIES, INC.

NAVY 91-177

TECHNICAL EVALUATION RESEARCH, INC.

ARMY 91-054

TECHNICAL IMAGING SERVICES, INC.

SDIO 91-011

TECHNICAL RESEARCH ASSOC., INC.

AF 91-060

DARPA 91-068

TECHNISCAN, INC.

NAVY 91-006

TECHNO-SCIENCES, INC.

ARMY 91-032

TECHNOCHEM COMPANY

NAVY 91-190

NAVY 91-343

TECHNOLOGY INTEGRATION & DEVELOPMENT

AF 91-103

TECHNOLOGY INTEGRATION, INC.

DARPA 91-113

TECHNOLOGY INTERNATIONAL, INC.

ARMY 91-055

NAVY 91-358

TECHNOLOGY MODELING ASSOC., INC.

DARPA 91-027

TECHQUEST, INC.

ARMY 91-212

TECSEC, INC.

NAVY 91-057

TERA RESEARCH, INC.

ARMY 91-205

NAVY 91-309

TERRA TEK, INC.

DNA 91-011

DNA 91-020

TETRA CORP.

ARMY 91-159

DNA 91-015

SDIO 91-002

SDIO 91-005

TEXAS RESEARCH INSTITUTE AUSTIN, INC.

ARMY 91-127

AF 91-149

THERMACORE, INC.

ARMY 91-193

SDIO 91-001

THERMAL SPRAY TECHNOLOGIES, INC.

ARMY 91-177

THIN FILM CONCEPTS, INC.

SDIO 91-015

TIBURON SYSTEMS, INC.

NAVY 91-039

NAVY 91-134

NAVY 91-141

TOP LEVEL, INC.

DARPA 91-036

TORREY SCIENCE & TECHNOLOGY CORP.

DARPA 91-233

TOYON RESEARCH CORP.

ARMY 91-233

NAVY 91-240

AF 91-082

AF 91-174

TPL, INC.

ARMY 91-038

ARMY 91-039

ARMY 91-136

NAVY 91-104

CROSS REFERENCE

TRANS-SCIENCE CORP.

DARPA 91-099

TRANSDUCER RESEARCH, INC.

ARMY 91-073

TRELLIS SOFTWARE & CONTROLS, INC.

DARPA 91-050

TRIANGLE RESEARCH & DEVELOPMENT CO.

NAVY 91-243

NAVY 91-307

NAVY 91-322

TRIDENT INTERNATIONAL, INC.

NAVY 91-235

TRIDENT SYSTEMS, INC.

ARMY 91-113

NAVY 91-086

NAVY 91-136

TRS CERAMICS, INC.

DARPA 91-077

TRYMER COMPANY

SDIO 91-005

TTL TECHNIQUES

DARPA 91-028

ULTRAMET

AF 91-145

AF 91-181

SDIO 91-002

SDIO 91-007

UNIAX CORP.

SDIO 91-014

UNIQUE ELECTRONICS, INC.

DARPA 91-204

UNISTRY ASSOC.

AF 91-108

DNA 91-001

UNITED SIGNALS & SYSTEMS, INC.

ARMY 91-076

UNIVERSAL ENERGY SYSTEMS, INC.

NAVY 91-142

AF 91-115

SDIO 91-014

UNIVERSITY RESEARCH ENGINEERS & ASSOCS.

DARPA 91-054

UNIXPROS, INC.

NAVY 91-279

UTEK, INC.

DARPA 91-185

UTILITY DEVELOPMENT CORP.

ARMY 91-088

VACTRONIC LAB EQUIPMENT, INC.

DNA 91-014

VECTOR RESEARCH, INC.

AF 91-080

VENDELIN ENGINEERING

DARPA 91-156

VENTURE SCIENTIFIC, INC.

ARMY 91-010

VERITAY TECHNOLOGY, INC.

ARMY 91-007

ARMY 91-118

ARMY 91-119

ARMY 91-211

NAVY 91-109

VERSATRON CORP.

NAVY 91-156

NAVY 91-242

VESTAR, INC.

NAVY 91-313

VIASAT, INC.

ARMY 91-115

ARMY 91-245

NAVY 91-017

NAVY 91-120

NAVY 91-294

AF 91-025

AF 91-030

AF 91-171

CROSS REFERENCE

VIRTUAL IMAGE LABS, INC.

DNA 91-001

VISTA RESEARCH, INC.

NAVY 91-165

WAGONER, JAMES E. TECHNICAL CONSULTANTS

AF 91-065

WEST COAST RESEARCH CORP.

AF 91-104

WILFRED BAKER ENGINEERING, INC.

AF 91-053

WINTEC, INC.

NAVY 91-073

WIZDOM SYSTEMS, INC.

DARPA 91-052

XACTON CORP.

SDIO 91-003

SDIO 91-003

XEMET, INC.

DARPA 91-056

XERAD, INC.

SDIO 91-002

XINOTECH RESEARCH, INC.

DARPA 91-208

DARPA 91-209

XONTECH, INC.

ARMY 91-235

AF 91-175

XYBION ELECTRONIC SYSTEMS CORP.

NAVY 91-012

YARDNEY TECHNICAL PRODUCTS, INC.

NAVY 91-007

YELLOWSTONE ENVIRONMENTAL SCIENCE, INC.

DARPA 91-111

ZALLEN INTERNATIONAL ASSOC.

AF 91-072

ZEREN RESEARCH, INC.

ARMY 91-037

ZYTRON LTD

AF 91-191