The Department of Defense

DoD DEPARTMENTS/AGENCIES:

Department of the Army

Department of the Navy

Department of the Air Force

Advanced Research Projects Agency

Defense Nuclear Agency

Strategic Defense Initiative Organization

DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM (SBIR)

FY 1992 SBIR SOLICITATION

PHASE I AWARD ABSTRACTS

NAVY PROJECTS

VOLUME II

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This report presents the technical abstracts of the Phase I proposals that resulted in contract awards from the Fiscal Year 1992 Solicitations of the Department of Defense (DoD) Small Business Innovation Research (SBIR) Program. The Army, Navy, Air Force, Defense Advanced Research Projects Agency (DARPA)[1], 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 FY92. Navy, Air Force, DARPA[1], DNA, and SDIO participated in Program Solicitation 92.1 (Closing Date: 10 January 1992), and Army, Navy, and DARPA[1] participated in Program Solicitation 92.2 (Closing Date: 1 July 1992). The selection of proposals for funding was made from proposals received by the Military Services and Agencies.

FY 1992 SBIR PROGRAM

	Number of Topics		Proposals Received		Phase I Awards	
	92.1	92.2	92.1	92.2	92.1	92.2
Army	0	177	0	1841	0	260
Navy	106	82	1495	832	127	92
Air Force	181	--	2128	--	229	--
DARPA[1]	129	97	1301	911	105	77
DNA	25	--	172	--	22	--
SDIO	16	--	734	--	209	--
Total	457	356	5,830	3,584	692	429
Grand Total	813		9,414		1,121	

Of the 1,121 Phase I awards, 158 awards went to minority-owned businesses and 95 awards were to woman-owned businesses. Overall, 12 percent of the FY92 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.

[1] As of March 15, 1993, DARPA changed its name to Advanced Research Projects Agency (ARPA). However, DARPA is used in this publication because the FY92 topics were issued and awards were made under the DARPA name.

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

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

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

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

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

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

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

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

The "Small Business Innovation Act of 1986" (P.L.97-443) extended the "Sunset Clause" to 1993 and increased the taxation of the extramural research and development budget to 1.25 percent. The latest SBIR re-authorization law (P.L. 102-564), signed October 28, 1992, extends the program through 2000, doubles the taxation to 2.5 percent by 1997, and increases the average Phase I and Phase II award agreements.

ABI
5491 BEARD ROAD
SPRINGFIELD, OH 45502
Phone: (513) 526-8861
Topic#: 92-177 ID#: 92N10-034
Office: NAWCTRN
Contract #:
PI: Erik Buck
Title: Innovative Power Module
Abstract: At the end of Phase I, ABI will deliver a working "subscale" power module which runs on diesel fuel and has an output of approximately 25 horsepower at 3600 RPM. The overall size, exclusive of fuel pump, cooling, and oil tank, will be approximately the size and shape of a roll of kitchen paper towels, about 15 cm diameter and less than 40 cm long, and less that 20 lbs. weight. Phase II will develop a full-scale 250 horsepower engine which weighs less than 250 lbs. and is configured for use in aerial vehicles.

ACCURATE AUTOMATION CORP.
1548 RIVERSIDE DRIVE, SUITE B
CHATTANOOGA, TN 37406
Phone: (615) 622-4642
Topic#: 92-153 ID#: 92N2D-011
Office: NSWCDDWO
Contract #:
PI: Robert GEZELTER
Title: Aircraft and Cruise Missile Mission and Route Planning in Near Real-time
Abstract: Aircraft and cruise missile mission and route planning is a time-consuming and inflexible operation today. This effort proposes to use cooperative-competitive neural networks and Hierarchical Scene Structures for multi-source and multisensor data fusion procedures that will build flexible data structures. These structures can then be accessed by a route planning neural network to generate coordinated aircraft/missile strike plans in minutes instead of days. An innovative form of the cooperative-competitive neural network will perform matching of complex structures and determine global goodness of match measures, a valuable new technology applicable to many purposes. This is done by defining an intermediate form of data representation at the structure level to allow identification of distinctive combinations of regions and their features as well as the standard individual regions and their features.

ADCOM SYSTEMS TECHNOLOGY, INC.
PEABODY OFFICE BUILDING
PEABODY, MA 01960
Phone: (508) 535-8008
Topic#: 92-049 ID#: 92N1A-178
Office: NAVSEA
Contract #: N60921-93-C-0164
PI: Dr Elie J BAGHDADY
Title: Radar High Angle Resolution Techniques
Abstract: Innovative techniques for radar high angle resolution are proposed for investigation in a Phase I effort to enable the resolution of the direction of arrival (DOA) of returns from multiple targets that fall within one beam width and within the same range and Doppler Cells. The techniques proposed emphasize the pursuit for optimal utilization of available aperture space, by a combination of arrangement of antenna elements and advanced, sophisticated signal processing techniques, implemented in state-of-the-art technologies that enable their realization for the maximum achievable performance. Alternative approaches are described which hold significant promise for realizing the objectives of the subject SBIR topic. It is proposed to explore these approaches analytically for the radar application, and generate conclusive expressions and quantitative illustrations for meaningful comparisons and analytical proofs of concepts/techniques. Implementation design analyses will be performed that will define the trade-offs and the technical risk for ultimate developments. Definitive high angle resolution techniques will be formulated, performance predictions will be derived, implementation latitudes will be established, and a plan for proof-of-technique experiments and hardware development program for Phase II.

ADVANCED COMMUNICATION SYSTEMS, INC.
1900 NORTH BEAUREGARD STREET
ALEXANDRIA, VA 22311
Phone: (703) 553-4389
Topic#: 92-026 ID#: 92N47-083
Office: SPAWAR
Contract #: N00039-93-C-0031
PI: Bassem Girgis
Title: Performance Modeling for Automatic DAMA Control
Abstract: A discrete event computer simulation will be developed and used to evaluate the expected performance of the UHF satellite communications Automatic Demand Assignment Multiple Access (Auto-DAMA) Subsystem. Phase I will describe UHF DAMA traffic scenarios, define design requirements for the Auto-DAMA computer model and develop a model of fundamental

, single channel Auto-DAMA operations. Phase II will enhance the model to incorporate multi-channel operations and advanced DAMA resource management algorithms, and use the model to evaluate the performance of DAMA order wires under conditions of expected traffic loading

ADVANCED OPTICAL SYSTEMS, INC.
1103 DEBORAH DRIVE
HUNTSVILLE, AL 35801
Phone: (205) 880-0548
Topic#: 92-077 ID#: 92N32-162
Office: NSWCDDWO
Contract #: N60921-92-C-0171
PI: HARTMAN
Title: Ultra Lethal Targeting by Optical Recognition ULTOR
Abstract: The Navy desires to demonstrate an optical processing system capable of target aim point selection in an infrared image, in real time. Advanced Optical Systems, Inc. (AOS) has demonstrated with optical processing: aim point selection in visible imagery, in clutter; target recognition in infrared imagery; and small feature recognition internal to a target, in simulated IR imagery. We propose to combine lessons learned from each of these tasks with an innovative hybrid processing architecture, in order to provide robust aim-point selection in the infrared. The keys to successful real time aim-point selection in cluttered infrared images are: Adaptive control of image preprocessing; Proper design of filters; and Dual channel optical processing architecture. AOS proposes a correlator in which the preprocessor is controlled by the features of the Fourier transform plans and the output of the correlator. In this innovative approach a neural network will learn the relationship between preprocessor parameters and Fourier plane features, with quality aim-point correlation as the criteria. The result will be preprocessing which adapts so that the image presented to the correlator is modified to provide the best aim-point selection.

ADVANCED SYSTEM TECHNOLOGIES, INC.
12200 EAST BRIARWOOD AVENUE
ENGLEWOOD, CO 80112
Phone: (303) 790-4242
Topic#: 92-085 ID#: 92N32-154
Office: NSWCDDWO
Contract #: N60921-93-C-A369
PI: GOETTGE
Title: An Extensible Expert System for Analysis of Complex Real-Time Distributed Systems
Abstract: Increasing Navy use of embedded computer systems results in stringent requirements for real-time performance, reliability, and cost. Computer systems are critical embedded components of Naval warfare systems. The demands on embedded computer systems are increasing in terms of information processing and storage/retrieval. The designer must analyze results across many dimensions to identify critical design components and initiate design changes that meet numerous requirements simultaneously. These mission critical distributed computer systems are too complex to engineer without automated support. Currently available stand-alone support tools provide no help for managing complex design tradeoffs between performance, reliability, and cost. Previous research results can provide a basis for developing an expert system for extensible, multi-measure design evaluation of real-time distributed systems. The Phase I effort will determine the feasibility of developing an expert system/ performance modeling tool to provide extensible support for engineering complex real-time, distributed systems. The proposed tool will be of immediate use by the Navy. It will result in lower cost, greater reliability, and higher performance while reducing developmental and operational risks. Because the expert system will be extensible, it will be applicable to a wide range of Naval systems.

ADVANCED TECHNOLOGY INCUBATOR, INC.
31275 NORTHWESTERN HIGHWAY, SUITE 150
FARMINGTON HILLS, MI 48334
Phone: (313) 737-9132
Topic#: 92-117 ID#: 92PMT-034
Office: NAVAIR
Contract #:
PI: ZVI YANIV, PH. D
Title: Matrix-Addressable Liquid Crystal Displays for Visual Landing Aids
Abstract: The objective of this project is to use the newest advance in the technology of Ferro-electric Liquid Crystal (FLC) displays so that they can be used for Visual Landing Aids as well as other applications. Currently FLC's suffer from serious mechanical and temperature limitations due to the fact that mechanical stress alters the structure of the liquid crystal material. We propose to stabilize the cell by the introduction in the liquid crystal material of a small amount of monomer which, upon polymerization, will produce "volume stabilization" of the cell. The feasibility of this approach will be demonstrated by the delivery of a sample cell that will have been tested under conditions of mechanical shock and vibration as well as elevated temperature. The cell will be delivered with suitable electronics and software to demonstrate the moving slot required for the

Visual Landing Aid.

AERODYNE RESEARCH, INC.
45 MANNING ROAD
BILLERICA, MA 01821
Phone: (508) 663-9055
Topic#: 92-074 ID#: 92N32-028
Office: NSWCDDWO
Contract #: N60921-93-C-0192
PI: Dr Paul L KEBABIAN
Title: An Underwater High-Pressure Gauge for Warhead Evaluation
Abstract: Change induced in the wavelength of ruby R-line fluorescence. Time of the resolution will be 0.1 microseconds. Axi innovative detector of this wavelength shift avoids the need for a dispersive optical system and streak camera, as previously used. The fluorescence will be excited by an argon ion laser. Materials having less temperature sensitivity than ruby, and the use of non-laser excitation sources.

AEROMETRICS, INC.
550 DEL REY AVENUE, UNIT A
SUNNYVALE, CA 94086
Phone: (408) 738-6688
Topic#: 92-178 ID#: 92N10-068
Office: NAWCTRN
Contract #:
PI: William D. Bachalo, Ph.D.
Title: An advanced Laser-based Airflow Sensor for Non-intrusive Diesel Engine Characterization
Abstract: This proposal is concerned with the development of a rugged, accurate and non-intrusive electro-optical device to reliably measure the unsteady airflow into a reciprocating internal combustion engine. The principle of operation of the proposed sensor is laser Doppler velocimetry, a technique that allows for velocity measurements without interfering with the flow. The proposed sensor presents the following advantages when compared to other methodologies: it is robust; it requires no calibration; its sensitivity to changes in environmental conditions is minimal; presents no fouling problems; it can be used to measure both the inlet and exhaust streams; it is highly accurate; and has a very high frequency response. The sensor can be used for both laboratory and in flight tests. New processing techniques, and recent advances in solid- state technology make the construction of this rugged sensor possible. It is expected to be competitive with existing airflow measurement technology, both in terms of performance and price. Since laser Doppler velocimetry is an interferometric technique, the presence of contaminants or other substances in the inlet stream will only affect the signal-to-noise ratio of the signals, but not the velocity measurements. Also, since the technique is optical in nature, no obstructions or foreign objects are present in the inlet stream path. These features make this unique sensor to be highly reliable and accurate, while not affecting the engine's performance.

ALPHATECH, INC.
50 MALL ROAD
BURLINGTON, MA 01803
Phone: (617) 273-3388
Topic#: 92-020 ID#: 92N47-076
Office: SPAWAR
Contract #: N60921-92-C-A390
PI: Ms. Kendra Moore
Title: Mobile Surveillance Systems (NBS) Performance: Analytical Capability
Abstract: The objective of this research is to determine the feasibility of using advanced Petri technology to analyze the performance of large-scale sensor and C3 (i.e., C3I) systems. The US Navy is developing future C3I systems to support its mission and fundamental warfare tasks. The decision of which C3I systems to fund and field and how to integrate them into a given platform must be based on the contribution of the C3I system to overall system effectiveness. ALPHATECH has developed an interactive, graphical simulation tool called Modeler, specifically for quantitative C3I system performance evaluations. Modeler uses advanced Petri nets models of sensors, communications, and concepts of operation to relate low-level technical parameters to overall mission effectiveness. ALPHATECH has extended this tool to interact with external signal processing and data fusion algorithms, and used it to assess the performance of alternative designs and technologies for certain air defense systems. ALPAHTECH proposes to use Modeler to provide quantitative evaluation of a specific mobile surveillance system (MSS), Combat DP. In Phase I, we will model, simulate, and analyze the performance of Combat DP at a level of detail sufficient to produce output representative of Combat DP. In Phase II, we will develop a robust, full- scale model of Combat DP.

ALPHATECH, INC.
50 MALL ROAD
BURLINGTON, MA 01803
Phone: (617) 273-3388

Topic#: 92-047 ID#: 92N1A-164
Office: NAVSEA
Contract #: N60921-92-C-0173
PI: Dr Haralampos TSAKNAKIS

Title: Accurate Low Sample Rate Tracking of Highly Maneuvering Targets Using H-to Infinity- Nonlinear Filters

Abstract: This exploratory development proposal addresses a class of novel algorithms specifically designed for tracking and engaging maneuvering air, naval or ground targets. The key technical innovation is the development of linear and nonlinear target tracking algorithms using the recent results in H(Infinity) estimation methodology to modify the classical Kalman filter and extended Kalman filter algorithms; these H(Infinity) based tracking algorithms actively hedge against "worst-case" target maneuvers and therefore ensure more robust tracking accuracy performance than do classical algorithms. Of particular interest is the version of these H(Infinity) tracking algorithms in which frequent (low data rate) radar measurements of the target(s) are being made, and the constrained target kinematic differential equations (linear or nonlinear) are used for target state prediction between successive measurements Robust prediction of the maneuvering target motion can also be incorporated into the algorithm, because H(Infinity) algorithms take advantage of "directional" information which is influenced by the desired prediction time. Phase I will demonstrate the performance improvement of these new tracking algorithms and the performance tradeoffs associated with reducing the data rate and the degree of maneuver acceleration. Phase II will integrate the phase I algorithms with other adaptive features, and demonstrate their performance tradeoffs using both simulated and, perhaps, actual data.

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

Topic#: 92-127 ID#: 92PMT-104
Office: NAVAIR
Contract #:
PI: THOMAS G. ALLEN

Title: SAR/ISAR Real Time Image Processing for Air ASW Platforms

Abstract: Using SAR/ISAR imagery to detect and classify small targets in cluttered environments for ASW applications requires careful examination of the full array of image processing, computer vision, and related methods in order to identify those that are well-matched to the problem and thus offer promise to exploit the specific spatio-temporal characteristics that distinguish targets from environmental clutter. In this proposal we describe an effort to accomplish this task; we describe several recently-developed, advanced methodologies that appear to hold special promise. In particular, in addition to standard methods of image analysis, we intend to exploit i) recent advances in multi-resolution and fractal image processing, including methods based on the wavelet transform; ii) nonlinear image analysis methods based on morphological filtering that deal with particular pattern characteristics that distinguish targets and clutter; and iii) spatio-temporal image analysis methods, aimed at exploiting the differences in the temporal coherency of targets and some sources of clutter.

AMALGAMATED TECHNOLOGIES, INC.
13901 N 73RD STREET
SCOTTSDALE, AZ 85260
Phone: (602) 991-2901

Topic#: 92-082 ID#: 92N32-102
Office: NSWCDDWO
Contract #: N60921-93-C-A373
PI: SUSAI

Title: Non-Toxic Coating to Replace the Cadmium Coating Used on Naval Fasteners - Zinc-Based Coating Alloy Development Program

Abstract: The most important reason for reduction and subsequent elimination of cadmium coating in fasteners is the high potential health hazard. Industry is eliminating this metal from usage where ever possible. A family of zinc based alloys has shown favor for replacement. Binary systems with several other elemental additions have been investigated by workers in the plating field and found to be credible alternatives to cadmium. However, opportunities exist for building on this work and providing even better coatings for cadmium replacement with longer life and improved mechanical properties. Corrosion resistance and mechanical properties of modified alloys will be examined and compared for a determination of the best coating. Three different processes are proposed for experimental work using zinc base complex coatings. Materials selected for this study are zinc nickel cobalt manganese, and zinc nickel cobalt with chromate film and with manganese phosphate film. These materials will be subjected to a series of corrosion and durability tests. Results are expected to be positive and lead to new coatings for industrial and defense applications.

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

Topic#: 92-081 ID#: 92N32-101
Office: NSWCDDWO
Contract #: N60921-93-C-0135
PI: LIN

Title: Integrated Fuzzy Decision Logic and Artificial Neural Network for Submarine Classification

Abstract: American GNC Corporation (AGNC) proposes to develop early submarine classification methodology. The proposed target discrimination in the decision hierarchy, i.e., detection, classification, recognition, identification, and characterization, will eventually lead to reliable, timely, and accurate submarine classification. Anticipated innovations include: 1) Spectral signature extraction which takes into account the target signature variability, environment, and sonar operation conditions to generate most submarine acoustic signals for early classification in various vibration modes; 2) Optimized recognition approach which results from the integration of different methods based on distinct signature domain and knowledge of the targets of interest; 3) Classification with artificial neural network which take advantages of the learning feature of neural network to both identify submarine signals which were learned before, and to classify suspicious submarine signals which may or may not be known before; 4) Classification with integrated fuzzy decision logic and artificial neural network which blends the approximate reasoning capability of the fuzzy decision logic and learning feature of neural network. The deliverable for Phase I will be the discrimination methodology for tactical applications. Capability extension and performance enhancement of the proposed system will also be made along Phase I period as the research progresses. In Phase II, the validated target recognition system and associated algorithms will be fully developed, tested, and documented. Hardware and software necessary to implement the early submarine classification system will be developed with various submarine models. The end product will be tailored ready for embedded applications.

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

Topic#: 92-149 ID#: 92N2D-006
Office: NSWCDDWO
Contract #:
PI: Dr Charlie YANG

Title: Integrated ATR with Fuzzy IR Image Processing

Abstract: The integrated automatic target recognition (ATR) design provides a promising approach to achieving high performance based on multisensor data fusion, processing methodology integration, and target/environmental/contextual information incorporation. In this proposal, American GNC Corp. (AGNC) will take advantage of the tolerance of imprecision offered by fuzzy logic and apply it to IR image scene modeling and pattern matching. It will also investigate the integration of fuzzy logic and neural network to blend the approximate reasoning capability of the fuzzy logic and the adaptive learning feature of neural network in target recognition. Phase I will demonstrate the benefits of such a fuzzy system in the integrated ATR system for tactical applications such as cruise missile looking for relocatable targets. The main innovations of the proposed approach are: (1) Integration of methodologies in every level of automatic target recognition processing: (2) Organization of scene models and input image structures based on fuzzy membership functions and fuzzy restrictions to increase tolerance to imprecision: (3) Augmentation of robustness of scene models and matching process and reduction of sensitivity to image quality and preprocessing: (4) Scene model generation which takes into account individual characteristics, deviations in image acquisition, and noise effects present in the training images. In Phase II, the algorithms of scene modeling and image processing for expert system and integrated ATR system will be fully developed, tested, and documented. The validated algorithms will be reduced to integrated circuit scale chip sets.

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

Topic#: 92-030 ID#: 92N47-142
Office: SPAWAR
Contract #: N00039-93-C-0046
PI: Mr. R. Richard Avent, III

Title: Video Compression Using Neural Networks

Abstract: The U.S. Navy has identified a need for development of an innovative data compression technique to facilitate distribution of video and animated environmental products over low bandwidth communication channels. To address this need, American Research Corporation of Virginia (ARCOVA) proposes the development of an intelligent data compression interface for transmission of video imagery, graphics and multi-dimensional array fields to environmental computer systems at shore sites and ships. The program technical objectives include identification of environmental database specifications,

selection of an optimal neural network paradigm, training and testing of the neural network paradigm selected, and design of a user interface. Successful completion of these objectives will result in an automated data reduction system capable of achieving maximal compression with minimal lo The significance of this effort is the innovative use of neural networks for compression and distribution of video and animated data for use on newly developed environmental computer equipment and systems. Since neural networks have been shown to be faster and more accurate than traditional data compression techniques in similar applications, ARCOVA will demonstrate a proof-of-concept system for video image compression that is superior to current methods.

ANADAC, INC.
1330 BRADDOCK PLACE
ALEXANDRIA, VA 22314
Phone: (703) 271-6970
Topic#: 92-038 ID#: 92N1A-003
Office: NAVSEA
Contract #: N00024-92-C-4303
PI: Robert L Harper
Title: Integrated Logistic Support Life Cycle Cost Model
Abstract: Project objectives are to develop an innovative method for estimating total logistics life cycle costs for Navy systems/equipment, provide for trade-off analysis between competing designs, and select the lowest logistics life cycle cost. This exploratory effort will produce a methodology for estimating each of the logistics cost drivers associated with each phase of the life cycle that can be tailored to the requirements of an acquisition program. Total life cycle cost will be derived as a compilation of life cycle phase costs for concept exploration and definition; demonstration and validation; engineering and manufacturing development; production and deployment; operation and support; and including deactivation and disposal or reclamation. The effort will utilize cost estimating relationship (CER) development techniques and parametric modeling for application to each of the ten logistics disciplines identifying a common set of parameters for different levels of system/equipment technology.

ANALYTIC ENGINEERING COMPANY
1590 FINCH WAY
SUNNYVALE, CA 94087
Phone: (408) 737-0745
Topic#: 92-134 ID#: 92N0A-021
Office: NAWCWAR
Contract #:
PI: DR. NISAR SHAIKH
Title: Thin Film Saw Devices for In Situ Monitoring of Composite Processes
Abstract: The use of fibrous composites has greatly increased in the Navy. These composites have introduced challenging problem in process manufacturing of these materials. Dielectric sensors as well as ultrasonic embedded wave guides have been successful in cure monitoring; however, they have two severe handicaps: 1. Placement is limited to trimmings since the inclusions weaken the material; 2. The region monitored by the sensors is very small compared to the size of typical parts, requiring an impractical number of sensors. Thin film sensors,capable of covering the entire part, would solve both these problems. The proposed research, drawing on the well-developed technologies of thin film deposition and acoustic devices, would advance and adopt the surface acoustic wave (SAW) device technique to develop thin film/foil distributed sensor surfaces. Thus the proven technique of ultrasonic cure monitoring can be made noninvasive and effective over the entire surface of tools used in production. Phase I efforts will etch surface wave (Rayleigh & L-cr) devices on the tools and construct piezoelectric sensor foils that can be attached to the surface tools or placed in the lining of vacuum bags. Testing will be done on small composite plates. Phase II efforts will advance to life-size samples.

ANALYTICAL SERVICES & MATERIALS, INC.
107 RESEARCH DRIVE
HAMPTON, VA 23666
Phone: (804) 865-7093
Topic#: 92-156 ID#: 92N13-063
Office: NAWCFTEG
Contract #:
PI: Dr. Siva Mangalam
Title: A Novel True Airspeed Indicator for Helicopters
Abstract: A completely new approach is proposed for the accurate measurement and display of the true airspeed of helicopters in hover, low-speed and forward flight. Unlike conventional instruments, the proposed innovation will be characterized by high-frequency response and high sensitivity across the range of helicopter flight speeds. The proposed device will provide accurate speed indication both at low and at high airspeeds. The innovation items from the following significant advances made by AS&M in recent years: (a) the discovery of a direct coupling between airspeed and frequency of flow oscillations at the

leading-edge stagnation region, and (b) the invention of constant voltage anemometry. A probe of specified geometry with closely-spaced, micro-thin multielement sensors will be used in conjunction with constant voltage anemometers to determine the true airspeed as well as the flow angularity. The frequency of the electrical output signals from the instrument will be related to the true airspeed of the helicopter. The one-time calibration of the airspeed indicator will be dependent on the probe geometry but independent of the installation (e.g., H-60).

ANAMET LABORATORIES, INC.
3400 INVESTMENT BLVD.
HAYWARD, CA 94545
Phone: (510) 887-8811
Topic#: 92-145 ID#: 92N0A-083
Office: NAWCWAR
Contract #:
PI: ROCKY RICHARD ARNOLD, PH.
Title: Innovative Fracturing System for Thick Aircraft Canopies
Abstract: The Phase I research proposed herein provides for using the tremendous energy and pressure generated by embedded detonating cord (EDC) to not only sever an acrylic canopy but, more importantly, create and propagate cracks that weaken and fracture the canopy. The approach is firmly based on the use of fracture mechanics principles combined with tailored experimental testing to confirm important hypothesis. Prior experience of Anamet and our consultant, Dr. George C. Sih, with the fragilization of Navy canopies and the redesign of the Navy F-18 canopy and mechanical breakers has provided a good understanding of how stretched acrylic canopies fracture. During the early part of the Phase I work, experimental testing to determine the critical strain energy density will be accomplished and used in conjunction with Dr. Sih's theoretical analysis to define potential EDC configurations and charge sizes. Subsequently, small size panels made from stretched acrylic material will be fabricated by Swedlow, Inc. and tested by ET, Inc. Correlations of test data with design predictions will allow for the creation of a design methodology which can be applied and demonstrated on full size canopies during the Phase II effort. At the end of Phase I research, the feasibility of using EDC as the basis for an improved fracturing system for thick canopies will have been demonstrated. Most notably, this new fracturing system will not obscure pilot vision and both noise and debris will be minimized by virtue of developing systems which use the minimum amount of EDC charge.

APPLIED PHYSICS, INC.
31 HIGHVIEW AVENUE
NANUET, NY 10954
Phone: (914) 623-7258
Topic#: 92-144 ID#: 92N0A-080
Office: NAWCWAR
Contract #:
PI: PAUL H. FRISCH
Title: Proposed Design of An Improved Capability Electronic Ejection Sequencer (ICEES)
Abstract: In multi-place jet aircraft the ejection problems are compounded beyond the head, neck and spinal injuries, windblast exposure and flail injuries, but now also include collision probabilities with other ejectees. The problem actually becomes one of collision avoidance by timing or sequencing the ejection to optimize a clean contact free egress, and controlling the rocket thrust magnitude and/or direction The proposed solution focuses on the monitoring of the multiple ejection seat inertial positions and controlling the sequencing of the seat firing and control of the ejection seat gimbled rocket motors to avoid overlap of the multiple ejection seat envelopes. In order to properly control the gimble or sequence the ejection the seat envelope and relative real time position in 3D space of each seat and the aircraft and possibly the canopy must be known. The control criteria for crash avoidance must be established and finally a detailed knowledge of the ejection platform and projected ejection trajectories will be necessary. It is proposed that each ejection platform, canopy, and aircraft itself be instrumented with a microprocessor based acceleration measuring device tracking of each inertial coordinate system as measured relative to the ground. The dosimeters will measure the platform linear and angular accelerations via commercial available sensors, and attitude of each platform. The position information can be compared to the positions of the other monitored platforms and projected ejection envelope or profile. Based on the comparison the ejection sequencing can be altered to maximize impact avoidance, or the rocket thrust vector can be controlled to alter the seat ejection envelope.

APPLIED RESEARCH ASSOC., INC.
4300 SAN MATEO BLVD NE
ALBUQUERQUE, NM 87110
Phone: (303) 980-8007
Topic#: 92-075 ID#: 92N32-031
Office: NSWCDDWO
Contract #: N60921-93-C-A365
PI: YATTEAU
Title: Missile Battery Damage Prediction Methodology

Abstract: Warhead design calculations and weapons effectiveness estimates require a methodology to predict the terminal ballistic structural response and the associated functional damage to operating missile batteries subjected to warhead fragment impacts at speeds up to 16,000 ft/sec. The objectives for the proposed Phase I study effort are to develop a candidate structural representation for the missile batteries of interest, to select an appropriate baseline fragment penetration and target response model, to identify requirements for new model developments, and to develop a test and analysis plan for completing development of objective missile battery damage prediction methodology to be accomplished during the Phase II effort.

ARCTECH, INC.
14100 PARK MEADOW DRIVE
CHANTILLY, VA 22021
Phone: (703) 222-0280
Topic#: 92-095 ID#: 92N3B-011
Office: NWSC
Contract #: N00164-93-C-0028
PI: Daman S. Walia
Title: Development of an Integrated Reclamation Process for Explosives
Abstract: The current practice of disposal of propellant wastes by open pit burning is of increasing enviromental concern. However, no economica viable alternatives have yet been proven. The ARCTECH proposed approach is to develop an integrated technology combining leaching of the waste reclamation of ammunium perchlorate (and possibly aluminum too), followed by degradative decontamination treatment of the resultant organic residue via biological composting. The general scope of work is to optimize the critical processing steps (crystal lization and drying), which would allow recovery of ammonium perchlorate as a high specification ordnance grade, and to establish whether composting will allow safe land disposal. Laboratory scale experiments are proposed, using pure emmonium perchlorate solutions for investigation of crystallization/drying behavior, and pure organic binder for the composting studies. Evaluation and analysis of the products obtained from each experiment will be performed. Preliminary economics of the integrated scheme will be etablished.

ASTRON CORP.
470 SPRING PARK PLACE
HERNDON, VA 22070
Phone: (703) 471-0600
Topic#: 92-017 ID#: 92N07-055
Office: MCRDAC
Contract #: M67854-92-C-0236
PI: Ed Farren
Title: Combined Antenna Systems for Assault Amphibian Use
Abstract: Monopole and dipole antennas have been determined to radiate most efficiently when the size of the antenna is proportional to the frequency being transmitted or received, i.e. one-quarter, one-half or one wavelength. As the operating frequency is varied from that ideal frequency nulls begin to develop which threaten the integrity of the communication link. Experience has shown that small excursions (+ 50% of the resonent frequency) can be achieved without degrading performance by use of matching devices. But, larger bandwidths such as 30 to 90 MHz are normally accommodated by active high impedence tuning devices and couplers. Experience has also shown that antennas which are located in close proximity to each other tend to limit each others performance unless electrical isolation on the order of 30 dB is achieved. Finally, antenna array performance is best achieved by reducing the potential for intra antenna reaction and complicity. This investigation will evaluate new low impedance passive broadbanding techniques which minimize array complexity, maximize intra antenna isolation to produce a low profile high performance vertical antenna array which supports two transceivers and operates in the 30 to 90 bandwidth.

ASTRON CORP.
470 SPRING PARK PLACE
HERNDON, VA 22070
Phone: (703) 471-0600
Topic#: 92-052 ID#: 92N1A-212
Office: NAVSEA
Contract #: N00024-92-C-4311
PI: Hai TRAN
Title: Low Profile Submarine Antenna Array
Abstract: Due to the limited space and the need for flush mounting charactistics, a new and novel series of antenna systems for communications and ECM is proposed. It is proposed to use dielectromagnetic (DM) materials to miniaturize antennas and for RF DM lens to focus the RF signals into the below the surface antennas. An Astron pioneered subminiatur direction finding system using DM materials, will be modified and further improved to permit its operation in a flush mounting submarine perescope system. The result is a smaller communication and ECM antenna covering much wider bandwidths than previously considered a possibility.

ATLANTIC APPLIED RESEARCH CORP.
4 A STREET
BURLINGTON, MA 01803
Phone: (617) 273-2400
Topic#: 92-100 ID# [illegible]N03-011
Office: DTRC
Contract #: N00167-93-C-0016
PI: David S. Greeley
Title: Calculation of Maneuvering Forces on Submersibles with Ducted Propulsors
Abstract: A method is proposed for calculating the vertical and horizontal forces and moments developed by a ducted propulsor on a submerged vehicle operating at a small angle of attack. The key element of the computational method is the development of an equivalent actuator disk representation of induced velocities, forces, and moments developed by the actual rotor in which varies with radius and position angle, reduces the actual unsteady propulsor flow to an equivalent steady flow field that can then be coupled with a steady flow analysis of the duct, submersible hull, and control surfaces in order to obtain the maneuvering forces on the entire configuration. A method is also proposed for computing the convection of the hull boundary layer due to crossflow, which generates the non-uniform inflow to a ducted propulsor during maneuvers. These two computational building blocks, to be developed during the Phase I effort, would be incorporated into a complete hydrodynamic model for maneuvering submersibles during a Phase II contract.

AURORA FLIGHT SCIENCES CORP.
10601 OBSERVATION ROAD
MANASSAS, VA 22111
Phone: (970) 336-9363
Topic#: 92-109 ID#: 92N01-020
Office: ONR
Contract #:
PI: John S. Langford Ph.D.
Title: Low Cost Dual-Use Platforms for Environmental Sensing
Abstract: Unmanned aircraft and lightweight instruments are a dual-use technology that offer dramatic new opportunities to both the atmospheric research community and to operational missions of the US Navy. Aurora Flight Sciences is the first company in the world to develop an unmanned aircraft, Perseus, specifically for enviromental sensing missions. The purpose of this proposal is to use Perseus as a demonstration platform for lightweight enviromental sensing payloads of interest to the Office of Naval Research. Two candidate payloads are discussed in this proposal (one for tropospheric research and one for operational weather reconnaissance). During Phase I, a description of the sensor/platform system, what would be measured, and why a remotely controlled platform is scientifically/fiscally superior to the present methods of making such measurements would be documented. Phase I will produce a report that identified concepts to be tested in phase II, Aurora will build the system identified in Phase I and demonstrate its predicted capabilities.

BD SYSTEMS, INC.
385 VAN NESS AVENUE, SUITE 200
TORRANCE, CA 90501
Phone: (310) 618-8798
Topic#: 92-181 ID#: 92N13-014
Office: NAWCFTEG
Contract #:
PI: Dr. J. James Butts
Title: Wireless Airborne Instrumentation System
Abstract: A small self-contained "transmitter" module, consisting of a modulated optical retroreflector, and an optical receiver module, consisting of a laser diode light source and a photodetector, is proposed. These modules together comprise a retrocommunications data readout system which can easily meet the objectives of data transmission from remote parts of a test aircraft or missile to a central acquisition systme without the need for connecting wiring, without the need for supplying power to the remote location, and while operating in the environment of a modern jet fighter aircraft. The retro transmitter can be made very small, say the size of a rivet or smaller, and can be thin and flat if desired enabling easy integration into or onto the aircraft or missile skin. The power required on the remote transmitter is small, consisting only of the power needed to modulate the retro return of the retroreflector. A battery comparable to a wrist watch battery should suffice. Ruggedness obtains as a result of the small size and compactness of the device and because of its insensitivity to alignment and displacement. EMI immunity obtains because of the use of a narrow band of optical wavelengths to effect data transmission.

BENTHOS, INC.
49 EDGERTON DRIVE
NORTH FALMOUTH, MA 02556
Phone: (508) 563-1000
Topic#: 92-060 ID#: 92N1A-294
Office: NAVSEA
Contract #: N00024-92-C-4305
PI: Ben Allen
Title: Development of A Submarine Inspection Remotely Operated Vehicle
Abstract: Benthos, a leader in the development of Remotely Operated Vehicle (ROV) systems, has conceptualized a miniature ROV system capable of providing a method of inspecting and maintaining submarine systems and components located in free flood areas while the submarine remains waterborne. Important advantages of the ROV system are that it will allow the Navy to conduct submarine inspection and maintenance operations that previously have either required the ship to be placed in dry dock or the use of divers. The ROV is small and is configured to allow entrance, unencumbered maneuvering, and egress without removal of protective grids and structural elements of the free flood areas. The ROV will be capable of transmitting real time video and other sensor data via an umbilical to a surface or ship-mounted operator control and monitoring station. Simple tools and devices can be fitted to the ROV to allow maintenance activities. The ROV can also be used to position and apply other surface deployed inspection, maintenance and repair tools. The ROV system concept and its operational use meets all Navy safety requirements and is within the capabilities of submarine Intermediate Maintenance Activities (IMAs). The concept incorporates standard Benthos production ROV modules and components minimizing development risk, allowing rapid future finalization and commercialization of the proposed system, and, most importantly, resulting in low cost production systems. The objective of the Phase I effort is to fully define a specification for a Phase II prototype system. During Phase II a prototype will be fabricated, demonstrated in a Navy IMA environment, and refined to a final preproduction configuration. During Phase III the ROV system will be commercialized.

BESTECH GROUP OF AMERICA, INC.
396 BROADWAY
NEW YORK, NY 10013
Phone: (212) 226-4874
Topic#: 92-013 ID#: 92N07-021
Office: MCRDAC
Contract #: N00164-93-C-0178
PI: Daniel Hsiung
Title: Super Thin Rechargeable Plastic Battery
Abstract: This proposal attempts to take advantage of the new material technologies (of our invention) pertaining to rechargeable batteries with possible military applications. We propose to use polyaniline film as anode; metallic lithium, zinc, etc. as cathode; and flexible polyvinyl alcohol film as electrolyte. The use of solid electrolyte will eliminate the evolution of hydrogen gas, and the use of film electrode will significantly reduce battery weight because of the use of conducting polymer as anode. These super thin plastic films will render the battery susceptible to being shaped, cut and molded into any conventional and non-conventional shapes. Due to the absence of liquid electrolyte, this battery will be ruggedized to minimize power loss from punctures, such as bullet holes. The plastics, which we use in this battery, whether conducting or non-conducting, will withstand temperatures ranging from 30 to 140 degrees Fahrenheit. The technologies we have invented-the manufacturing methods of large area polyaniline film and flexible PVA film, and the assembly method of Super Thin Multilayer Rechargeable Plastic Batteries-will make our attempt possible and successful.

BIOLOGICAL COMPONENTS CORP. (BCC)
3000 SAND HILL ROAD, 4-230
MENLO PARK, CA 94025
Phone: (415) 854-8070
Topic#: 92-006 ID#: 92N40-066
Office: ONT
Contract #: N60921-92-C-0146
PI: Zhongping Chen
Title: Dynamic Holographic Nonlinear Optical Materials
Abstract: The goal of this Phase I SBIR is to deliver prototype materials capable of sustaining real-time holographic recording. The key approach will be the use of bacteriorhodopsin thin films as read/write holographic storage media. During the six month period that is the subject of this grant proposal, we plan to test the feasibility of this approach by performing the materials development and characterization experiments described in Section E. Briefly, the specific objectives of this Phase I proposal are to: a. Develop a process to make prototype, uniform, optical quality thin films of bacteriorhodopsin or bacteriorhodopsin-polymer films; b. Test the holographic properties of the thin films of bacteriorhodopsin, including diffraction efficiency, sensitivity and response times; c. Develop concepts and designs for materials improvements that optimize the quality of bacteriorhodopsin films for dynamic holography. During Phase II, we plan to produce and optimize the bacteriorhodopsin variants conceptualized during the Phase I effort. Properties to be optimized include protein growth and expression parameters, synthesis techniques

and materials processing and deposition techniques.

BIOLOGICAL COMPONENTS CORP. (BCC)
3000 SAND HILL ROAD 4-230
MENLO PARK, CA 94025
Phone: (415) 854-8070
Topic#: 92-072 ID#: 92N32-017
Office: NSWCDDWO
Contract #: N60921-93-C-A353
PI: CHEN
Title: Rapid Data Access Through Optical Processing
Abstract: The goal of this Phase I Shirt is to deliver a prototype data storage medium capable of two-photon three-dimensional read/write capability. The key approach will be the use of oriented bacteriorhodopsin in a transparent polymer matrix enclosed within an optical glass cube with two transparent indium tin oxide electrodes on opposing sides. During the six month period that is the subject of this grant proposal, we plan to test the feasibility of this approach by performing the materials development and characterization experiments described in Section E. Briefly, the specific objectives of this Phase I proposal are to: two-photon three-dimensional optical storage media based on oriented bacteriorhodops in polymer cubes; capabilities of the data storage cubes, including read speed, write speed, cyclicity and signal/noise capability for extended read/write cycles; on the two-photon three dimensional data storage approach. During Phase II, we plan to produce and optimize the bacteriorhodopsin cubes conceptualized and tested during the Phase I effort. We will also implement the parallel storage device concepts generated during the Phase I effort.

BLOCK ENGINEERING, INC.
164 LOCKE DRIVE
MARLBOROUGH, MA 01752
Phone: (508) 480-9643
Topic#: 92-187 ID#: 92N44-011
Office: NAWCWPTM
Contract #:
PI: Dr. Kevin Silk
Title: Dual Mode Infrared (IR)/Millimeter Wave (MMW) Measurement System
Abstract: Recent advances in the development of low cost components for Infrared Detection and Millimeter Wave integrated circuits have created an opportunity to develop a low cost multi-domain sensor suite for integrated air-to-ground and air-to-air data collection. The Phase I study will examine the application of dual band (3-5 um and 8-12 um) IR detection from a single sensor device or single chip; such a chip is commercially available. Tradeoffs of performance, cost, technical risk and ease of integration with ATMS III will be performed for IR systems including the present Agema 782. The ability to maintain calibration in flight by periodic self calibration will assure precise radiometry and potential coordination with IR spectral data. Time registration for data fusion is a standard feature of our system designs. A parallel effort will examine the application of an existing 94 Ghz sensor and airborne data collection system (Joint Project Chicken Little follow on) integrated with a new 35 ghz front end. This study team has in-depth IR data collection experience and has just completed over 300 hours of MMW airborne data collection. A full data collection, reduction and target analysis system is available. Methods to develop fused algorithms on target sets will be examined.

BLOCK ENGINEERING, INC.
164 LOCKE DRIVE
MARLBOROUGH, MA 01752
Phone: (508) 480-9643
Topic#: 92-188 ID#: 92N44-010
Office: NAWCWPTM
Contract #:
PI: Dr. Kevin Silk
Title: Multi-Spectral Scene Generation For Hardware-In-The-Loop (HWIL) Laboratories
Abstract: Block Engineering is pleased to propose a program to develop and analyze an IR reflecting/RF transmitting screen for dual mode hardware-in-the-loop (HWIL) testing of missile systems. We bring to the project directly relevant experience which includes designing, building, testing and delivering. * A dual mode (IR/RF) scene projector using a unique "dichroic" to combine the scenes and present them simultaneously to the system under test. * Rugged gimbal-mounted IR scene projectors for HWIL testing with multiple dynamic targets and background. * Reliable fixed installation IR scene projectors for factory testing (target, background, EOCM). * A dual mode (IR/RF) scene projector (targets, EOCM, background). The Navy's requirement is a practical extension of our previous dual mode (IR/RF) work, in which the RF was reflected and IR, transmitted. We have two preliminary ideas, based on a dielectric reflector and capacitive/inductive mesh screens, to meet the requirement and welcome the opportunity to explore these approaches. Block Engineering, newly reorganized as a small business, has a thirty year history of innovation in electro-optics. This experience is embodied in the core technical team of seasoned professionals

with a combined service to Block Engineering of over 100 years.

BOSTAN RESEARCH, INC.
380 SYCAMORE MILLS ROAD
MEDIA, PA 19063
Phone: (215) 565-6104

Topic#: 92-129
Office: NAVAIR
Contract #:
PI: NICK BOSTAN

ID#: 92PMT-154

Title: VTOL-UAV Based on the Aircraft With Circular Rotating Wing (ACRW) Concept

Abstract: The ACRW is a revolutionary new design of a high speed, VTOL aircraft with STOL and CTOL capabilities. The aircraft consists of a circular rotating wing (CRW) which is rotatably mounted to the fuselage. The CRW has the shape of a specially designed disk, is free of aerodynamically active flight controls or propulsion members and provides lift for forward flight and gyroscopic stabilization of the aircraft attitude. The fuselage will house the payload and the propulsion and control means. We have researched the ACRW aerodynamic theory, performed design calculations, conducted wind tunnel tests and computer analysis of the flow about the CRW. The wind tunnel tests and the computer analysis show a significant increase in the lift over drag when the wing is rotating as opposed to the fixed wing. Recently we have built two radio-controlled models and successfully investigated some of the ACRW flight characteristics. Bostan Research, Inc. is proposing to demonstrate the ACRW feasibility as a high speed VTOL UAV by testing three radio-controlled flying models. We have already built two new models and a third will be built during Phase I R&D. The models will have an identical configuration and mode of operation as the proposed ACRW-UAVs. The test results and flying principles will be equally applicable to aircraft of larger or smaller sizes having different configuration and uses. The enhanced aerodynamic characteristics together with the wing gyroscopic stability and artificial stiffening due to centrifugal forces, could make the ACRW the first truly efficient, high speed VTOL aircraft.

BRENNAN & ASSOC., INC.
3614 SUNSET LANE
ARLINGTON, TX 76016
Phone: (817) 261-3333

Topic#: 92-146
Office: NAVAIR
Contract #:
PI: JAMES BRENNAN

ID#: 92PMT-194

Title: Life Cycle (LCC) Oriented for Naval Aircraft

Abstract: The primary task output of Phase I will be the formulation of a LCC Model Requirements Specification describing the approach to be used in Phase II to develop a flexible, meaningful PC-based LCC model particularly sensitive to the Navy Aircraft Carrier application. The model specification will embody the results of extensive research into the carrier application, existing LCC models, and input data availability. It will use the best features of the existing models and new capabilities, such as Monte Carlo simulation for sensitivity analyses and graphical presentation of results for ease of decision making. The bottom line will be a tool for cost control on future Navy Aircraft Carrier applications.

CAMBRIDGE ACOUSTICAL ASSOC., INC.
80 SHERMAN STREET
CAMBRIDGE, MA 02140
Phone: (617) 491-1421

Topic#: 92-114
Office: ONR
Contract #:
PI: Joel M. Garrelick

ID#: 92N01-083

Title: Proposal for Analyzing Energy Dissipation Mechanisms to Improve Fidelity of Acoustic Scattering Predictions

Abstract: Anticipated computing advances will greatly enhance the Navy's ability to compute submarine target strength. This capability can be an important diagnostic and design tool for T.S. control. While the complexity and size of the scattering problem makes it necessary to solve large sets of structural-acoustic equations, especially at mid-frequencies, it is not sufficient to achieve high fidelity predictions. A number of other outstanding issues must be resolved. One is the lack of mathematical descriptions of the dominant energy dissipation mechanisms associated with hull and internal structure vibrations other than acoustic radiation. Such mechanisms include dry friction or Coulomb damping, viscous damping, e.g., of flexural waves, isolation mounts, and at stress concentration, air damping etc. Regardless of computing power this limits the fidelity of predictions for those T.S. components affected by submarine elasticity; the launching, propagation and scattering of elastic waves. It is the purpose of the proposed Phase I work to ameliorate this situation by identifying candidate mechanisms, developing mathematical descriptions for their behavior, criteria for required input parameters, and providing solution techniques compatible with conventional structural-acoustic numerical methods.

CASDE CORP.
2800 SHIRLINGTON ROAD, SUITE 600
ARLINGTON, VA 22206
Phone: (703) 845-9221

Topic#: 92-133
Office: NAWCWAR
Contract #:
PI: CHARLES ZANIS

ID#: 92N0A-015

Title: Tooling Concepts for the Fabrication of Large, Complex Composite Structures

Abstract: The goal of this proposal is to define and evaluate several innovative tooling concepts for the effective and affordable manufacture of large, complex, high quality composite structures. An acceptable concept(s) will be thermally responsive, dimensionally stable, durable, and easy to fabricate and repair. This Phase I effort will consist of a trade study based on the evaluation of various innovative tooling concepts to a set of defined requirements. Specific requirements of a tooling system will be defined and prioritized to create quantitative selection criteria. Details of current state-of-the-art and new innovative tooling techniques will be compiled. One innovative tooling concept that will be considered is a hybrid composite tool composed of carbon and glass fibers impregnated with a geopolymeric matrix. The geopolymer matrix is a ceramic/polymer type material that has a low CTE and can be processed at relatively low temperatures. Internal ply layers would contain a heated section made up of glass fibers surrounding a heating element made from carbon fibers. As assessment will be made of each tooling concept based on the quantitative selection criteria. The most viable tooling concepts(s) will be selected as a basis for a Phase II demonstration program.

CEMCOM RESEARCH ASSOC., INC.
1919 HALETHORPE FARMS ROAD
BALTIMORE, MD 21227
Phone: (410) 247-0012

Topic#: 92-065
Office: NAVSEA
Contract #: N00024-92-C-4317
PI: Dr Sean WISE

ID#: 92N1A-359

Title: Innovative Manufacturing of Advanced Composite Components.

Abstract: Low cost, automated fabrication of composite components for submarine use is proposed that allows limited quantities of parts to be produced in an efficient and cost effective manner. The method relies on intergration of computer based automated pattern fabrication technology such as stereolithography (SLA) with "prototype" chemically bonded ceramic (CBC) matched die tooling to flammability, outgassing and seawater resistance requirements. CandiDate composite materials and submaring components will be reviewed and items identified that can be made using this technology. A general cost analysis will be performed on the proposed fabrication method and a detailed analysis will be done on a selected component. Due to the low cost associated with the methods proposed, a small component will be selected and made as part of the technology demonstration. Full integration of the production process from computer aided design through manufacture will allow short run production to be accomplished for unit prices comparable to mass production.

CENTER FOR REMOTE SENSING
P.O. BOX 9244
MCLEAN, VA 22102
Phone: (703) 848-0800

Topic#: 92-019
Office: SPAWAR
Contract #: N00039-93-C-0049
PI: Human Ganguly

ID#: 92N47-030

Title: Ionospheric Predictions Using GPS

Abstract: This project sets forth a plan to utilize commercial GPS receivers for real time ionospheric prediction at a remote location. The project will demonstrate the feasibility of using commercial receivers and evaluate the accuracy and applicability of these measurements for improvements in HF propagation. For this we propose to survey the available receivers and select one or more for demonstration. We develop the software for converting GPS measurements to TEC. This software will include phase averaging of the pseudorange to improve TEC accuracy, satellite and receiver bias removal, and time averaging. Furthermore, we address issues on security plan, multipath mitigation and calibration. Along with TEC measurements we also investigate the utilization of phase and amplitude scintillation data. We thoroughly address various approaches and particularly the use of physical ionospheric models for improving the prediction of HF ionospheric parameters at the remote location.

CERTEK CORP.
P.O. BOX 45
WAYLAND, MA 01778
Phone: (617) 275-9121
Topic#: 92-015 ID#: 92N07-029
Office: MCRDAC
Contract #: N00167-92-C-0022
PI: Allan B. Chertok, P.E.
Title: Electric Rotary Motion Actuator Feasibility Study
Abstract: The feasibility of high specific torque rotary electric actuators with mechanical lockout capability is investigated for replacement of medium to high pressure hydraulic devices currently used to operate, stow, or extend combat vehicle appendages. The feasibility study is directed toward an illustrative application requiring 12,000 lb. in torque capacity, 180 degrees of rotation, weight under 50 lb. and a body diameter less than 8 in. The design includes an electronic power invertor and microcomputer controller. A preferred concept employs a high tractive force density permanent magnet electric motor, optimized for short duty-cycle service, which is coupled to harmonic drive torque multiplier. The package design is pressure balanced to permit seawater submerged operation at various depths.

CHARLES RIVER ANALYTICS, INC.
55 WHEELER STREET
CAMBRIDGE, MA 02138
Phone: (617) 491-3474
Topic#: 92-174 ID#: 92N0A-088
Office: NAWCWAR
Contract #:
PI: DR. GREG L. ZACHARIAS
Title: Hybird Fuzzy Logic Flight Control Systems
Abstract: The Phase I study will develop and demonstrate a hybrid fuzzy logic controller for a high performance aircraft atability augmentation system. Our proposed approach combines genetic algorithms (GAs) and fuzzy logic controllers (FLCs) with an optimal pilot model for predicting handling qualities metrics. An FLC will be designed to deal with static/dynamic instabilities, plant uncertainties, and large variations in flight conditions, for a reduced order model of a high performance aircraft. A genetic algorithm (GA) will be used to optimize the attributes of the FLC, including membership functional form and parameters, the FLC rule base, and the defuzzification process. FLC fitness, in the GA context, will be evaluated via the use of the Optimal Control Model (OCM), an analytic model of the pilot which can support the computation of closed-loop piloted performance and handling-qualities metrics. We propose to evaluate feasibility of the approach via four tasks. We will: (1) define a limited-scope (FCS design problem, and specify the hybrid FCS architecture; (2) develop and optimize the design in CASYS, a system description language; (3) validate performance and compare with a conventional FCS approach; and (4) generate requirements specification for full development and validation.

CHI SYSTEMS, INC.
GWYNEDD PLAZA III, BETHLEHEM PIKE AT SHEBLE LANE
SPRING HOUSE, PA 19477
Phone: (215) 674-8710
Topic#: 92-161 ID#: 92PMT-280
Office: NAWCFTEG
Contract #:
PI: DANIEL D. RILEY
Title: Anthropometric Guidance for E-2C Crewstation Redesign
Abstract: CHI Systems proposes to develop and exercise a methodology that will enable pilot anthropometry and eye positioning data to be used to optimize the selection and placement of electronic displays in the E-2C cockpit. In Phase I we will (1) define electronic information display options and human factors issues that impact display selection and placement, (2) identify E-2C critical pilot tasks that impact display selection and placement, (3) specify design techniques and tools that facilitate Hawkeye pilot eye position and anthropometric data collection and analysis, (4) construct Phase II plan and schedule for E-2C pilot anthropometric and eye-point data collection, analysis, and utilization, and (5) document Phase I findings and associated recommendations. In Phase II we will (1) collect actual E-2C pilot anthropometric and eye position data using fleet and readiness squadrons, (2) translate these data into a form that is meaningful to E-2C display suite development, and (3) produce guidelines for E-2C display selection and placement.

CHI SYSTEMS, INC.
GWYNEDD PLAZA III, BETHLEHEM PIKE AT SHEBLE LANE
SPRING HOUSE, PA 19477
Phone: (215) 542-1400
Topic#: 92-165 ID#: 92PMT-294
Office: NAWCFTEG
Contract #:
PI: ALLEN L. ZAKLAD, PHD
Title: Analysis of E-2C Long Duration Missions
Abstract: CHI Systems Inc, proposes to study the E-2C mission and to determine the conditions under which its traditional 4-5 hour duration can be extended without additional detrimental effects on aircrew performance. In Phase I we will (1) identify and assess key factors in E-2C fatigue via knowledge acquisition from current aircraft domain experts using interview, survey, and literature search, (2) make preliminary assessment of methods to reduce the aircrew fatigue effects, (3) assess the feasibility of adapting the existing PERFECT (PERFormance Effectiveness of Combat Troops) model for simulating aircrew effectiveness, (4) document the analysis of key aircrew fatigue factors, design information on the PERFECT model, a preliminary assessment of extended duration mission achievement, and a Phase II plan. In Phase II, we will (1) establish the endurance limit conditions under which Hawkeye aircrews can maintain effectiveness, (2) select and validate fatigue factor effects, procedures, (3) use the adapted PERFECT model to assess candidate procedures and technologies for reducing fatigue effects on long-duration E-2C missions.

CIENCIA, INC.
111 ROBERTS STREET, SUITE K
EAST HARTFORD, CT 06108
Phone: (203) 528-9737
Topic#: 92-121 ID#: 92PMT-074
Office: NAVAIR
Contract #:
PI: DR. SALVADOR M. FERNANDEZ
Title: On-line Hydraulic Pump Condition Monitoring System
Abstract: Development of an advanced a spectroscopic sensor for on-line monitoring of hydraulic pump health status will be pursued. The proposed sensor will provide real-time information on wear status and will generate advance warning of impending catastrophic failure. If successful, the proposed technology will bring to on-line real-time sensing sophisticated spectroscopic diagnostic analysis now available only off-site in the laboratory.

COHERENT TECHNOLOGIES, INC.
P.0. BOX 7488
BOULDER, CO 80306
Phone: (303) 449-8736
Topic#: 92-027 ID#: 92N47-090
Office: SPAWAR
Contract #: N00039-93-C-0047
PI: Stephen K. Hannon
Title: A Pulsed Solid-State Coherent Lidar for Naval Wind Sounding Applications
Abstract: A pulsed coherent 2 Vm diode-pumped solid-state lidar has excellent capability of meeting Navy requirements for remotely measuring atmospheric wind fields. The proposed 2 #m diode-pumped coherent lidar will be capable of pulse energies of -20 mJ/pulse and a PRF of > 100 Hz, with a pulse duration of 200 us. Coherent Technologies, Inc. has developed the first 1.06 and 2.09 Vm flashlamp-pumped Coherent lidars. A 5 mJ/pulse diode-pumped 2.02 Vm transmitter has also been demonstrated. For this effort, a coherent lidar computer simulation will be utilized in optimizing systems performance and in determining design parameters. As existing 2 Vm coherent lidar system will also be utilized to experimentally confirm many critical design parameters. An overall design will be established using the results of the simulation and field test efforts. Operational issues will be emphasized in the study effort. Component technologies will be reviewed in detail in the development of a plan leading to operational

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PALO ALTO, CA 94302
Phone: (415) 321-5630
Topic#: 92-110 ID#: 92N01-034
Office: ONR
Contract #:
PI: F.K. Owen
Title: Laser Fluorescence Anemometer for Oceanographic Instrumentation
Abstract: Efficient and cost effective ocean outfall dilution systems are essential to the health of the ocean environment. Unfortunately, wasterfield transport and subsequent ocean outfall dilution are complex functions of the local ocean stratification and currents and the outfall and diffuser locations and design. Variables such as effluent discharge riser spacing, diameter and jet afflux velocity determine the depth of submergence, wastefield thickness and dilution. Detailed field measurements of outfall

performance are few and there is insufficient data with which to assess the performance of existing mathematical prediction models. Turbulence models which attempt to predict multiport riser mixing must include the influence of velocity-concentration cross-correlations. Unfortunately, little or no information is available on the form or magnitude of these cross-correlations. Extensive measurements are required to help to establish a waste water mixing data base which could be used both as a mixing modeling guide and for design purposes. Detailed, non-intrusive optical measurements of riser turbulent mixing characteristics will provide new information on riser mixing effectiveness and the effects of changes in ocean current magnitude and direction. These measurements will be made with a new optical probe which will be designed and tested in a simple water tank during Phase I.

COMPUTER AND INFORMATION SCIENCE, INC.
34 TIMBERGREEN CIRCLE
DENTON, TX 76205
Phone: (817) 565-2767

Topic#: 92-030 ID#: 92N47-131
Office: SPAWAR
Contract #: N00039-93-C-0048
PI: Paul S. Fisher

Title: Video Compression with Application to Navy Environmental Products

Abstract: An algorithmic solution to the compression of continuous video images containing Navy environmental data such as a weather briefing is proposed. The technique described is an extension to the multiresolutional algorithms used presently for compression, and particularly an extension of the wavelet transform. A company developed technique image analysis system will be coupled to the transform theory to provide the necessary compression to enable transmission of continuous video over low bandwidth communication lines such as HF communication used in ship to ship communications. Because these continuous images can be considered from a three dimensional viewpoint with small changes between frames, the concept proposed is to apply an extended three dimensional transform to those regions where change has occurred.

CONCEPTUAL SOFTWARE SYSTEMS, INC.
17962 SUN KNOLL DRIVE
YORBA LINDA, CA 92686
Phone: (714) 996-2935

Topic#: 92-085 ID#: 92N32-155
Office: NSWCDDWO
Contract #: N60921-93-C-A375
PI: ANDERT

Title: Intelligent Real Time System Assessment Tool

Abstract: Real-time systems often suffer from performance inconsistent with client needs and expensive revisions late in the development life cycle. This is due to development methods and computer-aided design tools relying heavily on an informal and inaccurate process for communicating requirements. A methodology and supporting tool set is needed to integrate requirement details with a system's design and analysis. This project proposes an intelligent real-time system assessment tool (ExpeR/T) that integrates requirement specification, systems design, software design, and design assessment. It will provide the client and engineer with an automated tool that suggests design improvements when system model analysis detects problems. ExpeR/T utilizes an innovative combination of methods, techniques and concepts which are currently treated as disjoint and separate issues in the technical literature. It combines the concepts of real-time systems analysis, software structured analysis, and English-like requirements specifications. These concepts are integrated through a combination of artificial intelligence experts system rules, graphical system design, English-like requirements specifications, design analysis, and design modeling/simulation. During Phase I, ExpeR/T requirements will be defined, preliminary design of system design diagram transformation and quality evaluation will be performed, and a proof-of-concept ExpeR/T prototype will be developed.

CONCEPTUAL SOFTWARE SYSTEMS, INC.
17962 SUN KNOLL DRIVE
YORBA LINDA, CA 92686
Phone: (714) 996-2935

Topic#: 92-101 ID#: 92N47-306
Office: SPAWAR
Contract #: N00024-92-C-4300
PI: Ed P. Andert

Title: Ship Producibility Lessons Learned Intelligent Database

Abstract: Improving ship producibility is the key method for reducing U.S. Navy ship construction cost without compromise to mission capability. Producibility in ship design is impeded by differing mind-sets about ship design and construction between the Navy and shipyards. Knowledge of potential producibility problems during early ship design would allow changes to be made early, significantly reducing costs. A ship producibility lessons learned intelligent database (L(to the 2nd power)DB) of design and construction knowledge could improve the naval ship design process. This project will develop a user-friendly, interactive,

and intelligent database for documenting and tracking design producibility lessons learned. The ultimate objective is to incorporate the L(to the 2nd power)DB with the ship design database currently under development by the Navy. This integration will provide ship designers with on-line access to both design information and design decision ramifications. During Phase I of this effort, the database element relationships for the L(to the 2nd power)DB will be defined, proof-of-concept database and user-interface prototypes will be built, and an intelligent user-interface component will be investigated. Database element relationships will be defined using Nijssen's Information Analysis Method (NIAM) techniques and the database prototype will utilize the NAVSEA CAD 2 System relational database software.

CONDUCTUS, INC.
969 WEST MAUDE AVENUE
SUNNYVALE, CA 94086
Phone: (408) 737-6705
Topic#: 92-010 ID#: 92N40-141
Office: ONT
Contract #: N61381-92-C-0058
PI: Mark Colclough
Title: 77 Kelvin SQUID Magnetometers as Detectors of Metallic Objects
Abstract: Superconducting Quantum Interference Devices (SQUIDs) are the most sensitive detectors of magnetic fields. Their remarkable sensitivity has created interest in their use as detectors of mines and submarines, but their value to date has been limited by the need to cool them with liquid helium. This situation has now changed, as SQUIDs now operate at 77K in liquid nitrogen. We propose a design study to evaluate the performance of such high temperature SQUIDs, to identify Navy applications that are made possible because of the reduced cost, weight and size of systems utilizing such SQUIDs, and to design a prototype system for Navy use.

CREARE, INC.
P O BOX 71
HANOVER, NH 03755
Phone: (603) 643-3800
Topic#: 92-050 ID#: 92N1A-191
Office: NAVSEA
Contract #: N00024-92-C-4334
PI: Javier A VALENZUELA
Title: High Performance Thermoelectric Heat Sink
Abstract: An innovative approach for increasing the cooling capacity and efficiency of miniature thermoelectric coolers is proposed. Compared with current thermoelectric coolers, the proposed device will have three major advantages: (1) almost a factor of two increase in maximum cooling capacity, (2) several fold increase in efficiency (when operating at cooling loads comparable to that of present devices), and (3) very compact packaging. These features will allow effective cooling of high heat dissipation and temperature sensitive devices in high density electronic packaging applications. In Phase I we will quantify through analysis the potential gains in performance and evaluate the feasibility and cost of fabricating the device. If proven feasible, we will design a prototype thermoelectric cooler to be fabricated and tested in Phase II.

CREARE, INC.
P.O. BOX 71
HASNOVER, NH 03755
Phone: (603) 643-3800
Topic#: 92-090 ID#: 92N1F-003
Office: NCEL
Contract #: N47408-92-C-7012
PI: PAUL H ROTHE
Title: Impact Mechanism for Seawater Rock Drill
Abstract: An innovative piston-less impact mechanism for a seawater hydraulic rock drill is proposed. Compared to the current poppet-kicker port cycle, and potentially higher impact energy. The proposed mechanism eliminates heavily loaded sliding elements, a chief problem in current mechanisms. The pistonless impact mechanism requires no protective coatings or complex, close tolerance machining. It relies on abrupt deceleration of a rapidly moving water column to create a waterhammer at the bottom of the drive cylinder. By simplifying the impact mechanism, it offers increased reliability and lower manufacturing costs while retaining compatability with existing seawater hydraulic power supplies. In Phase I, we will design a waterhammer impact mechanism and perform proof-of-principal tests to demonstrate the feasibility of the impact mechanism. If proven feasibile, we will design a waterhammer-driven rock drill to be fabricated and tested in Phase II.

CYBERNET SYSTEMS CORP.
1919 GREEN ROAD SUITE B 101
ANN ARBOR, MI 48105
Phone: (313) 668-2567
Topic#: 92-012 ID#: 92N07-014
Office: MCRDAC
Contract #: M67854-92-C-0192
PI: Charles J. Jacobus
Title: Standardizing Control Unit/Robotic Vehicle Controls and Interfaces
Abstract: The DOD operates logistics, defensive, and assault operations in the most hazardous environment constructed by man, namely the modern battlefield. In the 21st Century, the battlefield environment will become so deadly that any exposure of personnel will have high lethality. Applying battlefield robotics will enhance personnel safety and will Aid force multiplication. However, "man-in-the-loop" control systems are a prerequisite in the unstructured battlefield environment. We Suggest standardized vehicle retrofit kits which incorporate manual override because many of the vehicle systems currently in use have automated counterparts which will still be used in manually operated modes. And finally, standardization and simplification of operator controls will be required since insertion of the technology should involve minimal training and specialization. In the proposed effort we will review current technology options and will produce a System Concept Document (SCD) describing the requirements and preliminary design for a family of standardized kit components for Marine vehicle teleremote retrofit. Because this effort is synergistic with a number of similar activities already underway, we expect to be able to prototype selected kit subsystems for a Phase I demonstration.

DAMILIC CORP.
6290 MONTROSE ROAD
ROCKVILLE, MD 20852
Phone: (301) 881-5580
Topic#: 92-067 ID#: 92N1A-394
Office: NAVSEA
Contract #: N00024-92-C-4308
PI: Dr Walter J CHAPPAS
Title: Radiation Cured Elastomers for Shock and Noise Reduction Applications
Abstract: The United States military, especially the U.S. Navy, relies on a vast array of systems that require vibration damping shocks and mounts. Over the year, the increasingly severe demands of modern naval warfare have produced increasingly quiet systems. Unfortunately, the materials used for the manufacture of elastomeric vibration damping and shock mounts have remained essentially unchanged. Surprisingly, one of the simplest parts of a naval vessel, a simple rubber shock mount, is one of the most unreliable, and be (relative to its purchase price) one of the most expensive to replace. The loss of a vibration shock mount's damping characteristics can result in the reduction in the vessels acoustics, and ultimately, the loss of the vessel to the fleet when in for repair. New radiation cured elastomers offer low-cost method for the production of noise and shock damping products with exceptional resistance to aging, crack initiation, and crack growth.

DANIEL H. WAGNER ASSOC., INC.
2 EATON STREET
HAMPTON, VA 23669
Phone: (804) 727-7700
Topic#: 92-023 ID#: 92N47-348
Office: SPAWAR
Contract #: N60921-92-C-A391
PI: DISCENZA
Title: Anti-Surface Warfare Tactical Decision Aid ASUWTDA Research and Development
Abstract: The proposed research will develop a requirements document, demonstration system, and (in Phase II) a working prototype for ASIUWTDA. This decision support system will be designed to operate within the JOTS/NTCSA as a fully contained and integrated package. Its menu structure has already been designed and implemented in demonstration form by the proposing firms. The interface is designed to support the development and management of ASUW decision data from situation assessment through engagement planning and battle damage assessment. ASUWTDA will integrate the firms' current Navy research in surveillance decisions aids (SSPS) and engagement planning (CLASP/THEAM) plus offer a full-capability multiple hypothesis correlator (MUSSLE).

DANIEL H. WAGNER ASSOC., INC.
2 EATON STREET
HAMPTON, VA 23669
Phone: (804) 727-7700
Topic#: 92-033 ID#: 92N47-188
Office: SPAWAR
Contract #: N00039-92-C-0210
PI: Dr. W. Reynolds Monach
Title: Surveillance Resource Allocation and Planning System (SRAPS) Research Development
Abstract: This proposal research will develop algorithms and systems for optimizing the allocation of acoustic surveillance

resources. SRAPS will have access to the best acoustic prediction models and data. Settings which provide good performance in one acoustic environment may be subpar in o ier environments. We propose to design SRAPS to interface with SPARS to take advantage of existing and planned SPARS features. This is a low risk approach because Wagner Associates is currently developing a search module for M APB, based on CCAS, which is interoperable with SPARS. SRAPS will feature advanced mathematical techniques in integer programming. The resource allocation problem belongs to a set of integer programming problems which is called "NP-hard." An approach is described which will produce near-optimal solutions with short runtimes. Also, the SRAPS user interface will incorporate good hum an factors design and lead surveillance system operators in a logical fashion through the process of determining system settings. The sequence of operator prompts will be designed so that the current situation will determine priorities and recommendations. Phase I will consist of algorithm development and system interface design. Phase II will provide a full-scale working prototype system suitable for operational evaluation and implementation.

DATAMAT SYSTEMS RESEARCH, INC.
13944 SO. SPRINGS DRIVE
CLIFTON, VA 22024
Phone: (703) 222-5996
Topic#: 92-157
Office: NAVAIR
Contract #:
PI: B. K. GOGIA
ID#: 92PMT-249
Title: Training Systems Domain Modeling Process
Abstract: A major problem in reusability is the creation of components that can be reused in applications other than the application for which they were originally designed. Software reusability has long held out the unrealized promise of increased productivity. It is accepted that within product development, reusing of software components will greatly reduce time and thus save money. It is our belief that the process to generate the domain model, and the techniques and tools necessary to develop the models are not understood by the software engineering community as a whole and even less so in the flight simulation community. We feel it is necessary to first understand the methodology and its ramifications which promotes the software reusability. The domain models will promote the reusability of software artifacts, other than code, which could be used in development of the next generation of flight simulation systems. This is a proposal to develop the process for domain modeling for flight simulation domain. The proposal will take into account the modeling techniques appropriate for software reusability for future flight simulators.

DATASONICS, INC.
P O BOX 8
CATAUMET, MA 02534
Phone: (508) 563-5511
Topic#: 92-083
Office: NSWCDDWO
Contract #: N60921-93-C-0152
PI: DALTON
ID#: 92N32-134
Title: Underwater Tactical Data Lin
Abstract: There is a requirement for a reliable tactical underwater data link to link under- water and surface Navy assets. In this Phase I effort, we propose to evaluate 3 alternative techniques which are potential solutions to meeting the requirement, as well as recommend the one which is the most feasible. The 3 techniques include 2 long range, relatively low data rate (100-500 and 1200 bits/sec) configurations, and a short range, relatively high data rate, (10 kbit/sec) configuration. The 2 long range configurations are a multiple convergence zone acoustic data telemetry system that uses Quadrature Phase Shift Keying (QPSK) or Digital Coded Phase Modulation (DCPM) at data rates of 100-500 bits/sec, and a system that employs a surface RF buoy to relay acoustic data telemetry from a subsea source that uses Frequency Shift Keying (MF$K) modulation at a data rate of 1200 bits/sec. The 3rd, high data rate technique, is intended for short range, low power, Low Probability of Intercept (LPI) applications and uses the QPSK technique at a data rate of 10 kbits/sec. Our evaluation effort will encompass open water tests using existing 1200 bits/sec acoustic modems modified to implement the various modulation schemes and allow us to evaluate various performance factors such as power efficiency, reliability, data accuracy, and transducer design. The deployed system will also allow us to analyze performance under different environmental conditions.

DCS CORP.
1330 BRADDOCK PLACE
ALEXANDRIA, VA 22314
Phone: (703) 683-8430
Topic#: 92-166 ID#: 92PMT-297
Office: NAWCFTEG
Contract #:
PI: MICHAEL MASSIMI
Title: Use of Helmet Mounted Displays on the E-2C
Abstract: The objective of this SBIR project will be to research the applicability of helmet mounted displays to the E-2C mission. Specifically, since almost all helmet mounted displays are developed for the fighter/attack fixed-wing mission or the attack/scout rotary-wing mission, the question as to whether the available and near-term technology is readily adaptable to the E-2C AWACS mission requirements. To answer this question, in-depth analysis of mission related operational requirements will be performed to determine minimum performance requirements for any display system to meet. Research into helmet mounted display technology will then be performed to determine if current technology can meet these requirements. As part of this analysis, helmet mounted displays will be compared to flat panel displays to assess the effectiveness of the two technologies in meeting the operational requirements. Finally, a research roadmap will be proposed for further study in the effective display of information for the E-2C crew. The combined research, analysis, and assessments will form the basis for a recommended approach in meeting the needs of the E-2C cockpit crew.

DDL OMNI ENGINEERING CORP.
8260 GREENSBORO DRIVE
MCLEAN, VA 22102
Phone: (703) 903-9777
Topic#: 92-061 ID#: 92N1A-308
Office: NAVSEA
Contract #: N00024-92-C-4301
PI: Victor A Speziali
Title: New Applications of Underwater Ship Husbandry (USH) Technologies to Submarines
Abstract: The Underwater Ship Husbandry (USH) techniques and procedures currently in use by the Navy to provide Inspection/Repair/Maintenance (IRM) capabilities have greatly enhanced the readiness posture of the surface combatant and auxiliary fleet. The utilization of fully engineered and documented procedures for performance of waterborne IRM activities represents a substantial cost savings in the life cycle management of surface vessels. Various commercial initiatives in USH may also provide techniques that can be applied to the submarine fleets as well. This Phase I study effort is proposed to build a database of existing NAVSEA approved USH procedures and related commercial procedures which meet the criteria to be established under this study for technology transfer to fit submarine requirements. The database developed will provide the basis for the analysis and decision portions of the study. This process leads to the evaluation and recommendation conclusion which will be the study results as presented in the final report. These recommendations will provide the necessary data required to continue the program into the Phase II effort.

DECISION DYNAMICS, INC.
8601 GEORGIA AVENUE
SILVER SPRING, MD 20910
Phone: (301) 565-4040
Topic#: 92-103 ID#: 92N47-242
Office: SPAWAR
Contract #: N00024-92-C-4299
PI: Louis Alfeld DSC
Title: Shipyard Productivity
Abstract: This proposal offers an innovative methodology to measure and improve shipyard productivity. The methodology creates a cooperative reporting environment in which labor and management seek to accomplish identical performance goals. Measures distinguish between two kinds of labor lost due to reasons beyond labor control. Lost time includes such activities as waiting for materials or equipment, crew reassignment or rework due to design changes. Counts of work actually accomplished divided by the hours actually worked at that task provide a "true" unit rate that accurately measures labor performance for each task. Measures of lost time hours, categorized by reason, provide a prioritized list of problems requiring management action. Regular identification of the best unit rates and recognition for crews that set new performance records generates positive feedback to both labor and management. The ratio of the best rate to the average rate serves as an indicator of management performance. Projecting the hours required to complete the remaining work quantifies the potential worth of pursuing alternative productivity gains. The methodology is simple to apply, requires minimum extra time or paperwork. allows crews to measure and report their own productivity, and costs little to implement.

DECISION DYNAMICS, INC.
8601 GEORGIA AVENUE
SILVER SPRING, MD 20910
Phone: (301) 565-4040
Topic#: 92-106 ID#: 92N47-300
Office: SPAWAR
Contract #: N00024-92-C-4295
PI: Louis Alfeld DSC
Title: Quantifying the Costs of Shipbuilding Delays
Abstract: This proposal presents a system dynamics model of the shipbuilding process that can be used to quantify the cost of shipyard construction delays. The system dynamics methodology models the myriad cause-and-effect relationships that define the shipbuilding process. The model, presented in clear diagrammatic form, includes the complex web of feedback linkages responsible for the dynamic behavior of the ship construction process. This dynamic behavior includes the ability to replicate the "wave of disruption" that, once triggered by a delay, often seems to propagate itself far beyond its starting time (and place). Analysis of the causes for delays and their impact on system behavior will lead to discovery of effective policies and actions to limit their detrimental effect on USN ship construction costs and schedules. The simulation model will build upon the USN shipbuilding model development already accomplished under SBIR N91-147.

DEEGAN RESEARCH GROUP, INC.
39 PORTER LANE
PORTSMOUTH, RI 02871
Phone: (401) 683-1799
Topic#: 92-066 ID#: 92N1A-369
Office: NAVSEA
Contract #: N00024-92-C-4316
PI: Mr Thierry DEEGAN
Title: Format D Battery Module
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 cause 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 power system has been proposed to provide uninterruptable power. This system is heavy, complex, and potentially unreliable. An alternative to the DC system is proposed. High-discharge rate battery technology exists that can support the operation of the combat system through a bus shift transient. Other battery system support only memory; this concept maintains full operation. The battery proposed is manufactured in a shape that allows it to fit unused Format D slots in the Common Electronic Equipment Enclosure used by the AN/BSY-1 and AN/BSY-2. The work proposed establishes the feasibility of the battery unit and demonstrates its operation in a simulated combat system electronic drawer.

DEVELOSOFT CORP.
1630 30TH STREET, SUITE 121
BOULDER, CO 80301
Phone: (303) 442-5729
Topic#: 92-183 ID#: 92N13-043
Office: NAWCFTEG
Contract #:
PI: Mark Yager
Title: A Hybrid Expert System And Neural Network
Abstract: A difficult problem of software configuration control is to determine the effects of a contractor's change to "frozen" software. The test team must ascertain the extent and nature of changes and how much regression testing may be needed. A hybrid integration of an artificial neural network (ANN) and knowledge-based expert system (KBE) is proposed to provide parameterized estimates for effects due to software changes. The ANN will be constructed automatically from documentation (i.e. specifications, CASE tools, etc...). Each neuron will represent a module with interconnections representing functional dependencies. The ANN will "learn" cause and effect relationships of software changes by being trained on examples describing actual changes and their effect (failure or non-failure). An operator will perturb the system based on a proposed software change; the KBE will determine pertinent information, utilize the ANN to obtain probabilistic estimates of failure, and determine the following parameters: * number of modules indirectly affected * probability a failure will occur within the module(s) * probability a failure will occur in other modules * minimum amount of testing time needed to reach an operator input confidence level * optimal testing strategy given an operator input amount of test time available

DIGITAL SYSTEM RESOURCES, INC.
12450 FAIR LAKES CIRCLE, SUITE 500
FAIRFAX, VA 22033
Phone: (703) 263-2826
Topic#: 92-126 ID#: 92PMT-119
Office: NAVAIR
Contract #:
PI: FRED BLOCH
Title: Automatic Broadband Matched Filtering
Abstract: The continually evolving threat, including quieter submarines and the reemergence of third world diesels, has significantly impacted narrow band system performance. As a result, future passive acoustic detection performance in many new tactical environments will be primarily reliant on broadband processing. The inability to perform effectively under these evolving requirements will pose a significant threat to our overall ASW mission capabilities. New processing approaches focusing on the broadband acoustic threat characteristics in shallow water environments must be investigated to ensure the continued effectiveness of the ASW missions. The objective of this project is to evaluate existing algorithms and to identify and define innovative broadband processing algorithms for DIFAR sonobuoys. These broadband processing algorithms, by definition, will have improved detection performance over current techniques. These innovative algorithms will automatically sample different frequency bands and bandwidths to measure their energy content and will use this information to shape the frequency spectra. This will provide a dynamic adaptive matched filtering capability which will automatically maximize the broadband signal to noise performance in real time. The adaptively filtered data will be directionally processed and sorted by bearing. The end result will optimize the overall broadband detection and bearing estimation performance of the DIFAR buoy.

DISPLAYTECH, INC.
2200 CENTRAL AVENUE
BOULDER, CO 80301
Phone: (303) 449-8933
Topic#: 92-117 ID#: 92PMT-031
Office: NAVAIR
Contract #:
PI: LAURA PAGANO-STAUFFER
Title: Ferroelectric Liquid Crystal Display for Visual Landing Aids
Abstract: The proposed project aims to develop a 640 x 480 pixel ferroelectric liquid crystal display panel which is 150 x 100 mm in size. The panel will be used to provide an electro-optically controlled image for projection by the optical system of stabilized optical landing aids and will have a frame rate of 90 Hz. It will replace the fiber optic block and the electro-mechanical subsystems which move them in the current stabilized systems. The feasibility of the approach will be established in Phase I by developing a set of performance specifications from a system-wide point of view, developing a combination of FLC material and electrical driving waveforms and then demonstrating with small evaluation panels that they meet the operational specifications for the panels. Feasible technical paths for producing and testing full size panels and for designing and building a field testable woring model will be identified during Phase I and implemented during Phase II.

EAST, INC.
5419 SOUR GRUM DRIVE
CENTREVILLE, VA 22020
Phone: (703) 968-9855
Topic#: 92-159 ID#: 92PMT-262
Office: NAVAIR
Contract #:
PI: DR. JERRY L. WEST
Title: Environmental Degradation Model for Infrared Acquisition and Tracking
Abstract: Topic N92-159 stated a NAVAIR requirement for environmental degradation models to enhance the effectiveness of PC-based training devices. The purpose of this Phase I SBIR effort is to demonstrate feasibility of upgrading NAVAIR training devices with environmental degradation models using real world infrared video of target and background scenes. Phase I objectives will seek to (1) identify efficient PC-based degradation algorithms for environmental modelling (2) investigate real scene database and computer processing requirements for simulating infrared weapon performance in varying environmental conditions, (3) determine architectures for upgrading NAVAIR training devices for infrared Maverick and SLAM with environmental degradation modules. Multimedia technologies will be considered to optimize PC configuration for video storage, image processing, dynamic simulating and graphic realism. PC-based training devices for the laser and infrared Maverick will provide proof of concept opportunities for the proposed Phase I and Phase II SBIR effort.

ELECTRA MAGNETIC APPLICATIONS
7605 PARK DRIVE
OMAHA, NE 68127
Phone: (303) 980-0070
Topic#: 92-034 ID#: 92N47-191
Office: SPAWAR
Contract #: N00039-93-C-0094
PI: Frederick J. Eriksen
Title: An Integrated ECP for Low Cost EMP Protection of Navy Sites/Stations
Abstract: The development of an innovative low cost RHP hardening approach is proposed for Navy sites/locations. The Hardening solution ie defined in the form of an ECP, and focuses on reducing costs by having an integrated approach to the design, fabrication, installation, testing, and maintenance of the shield systems. The approach uses prefab parts as much as possible. The coat effectiveness of several concepts for shielding material will be explored, including mesh, foils, and composites. An expert system is proposed for tailoring the design approach to unique features of the site/stations being hardened.

ELECTRO-RADIATION, INC.
39 PLYMOUTH STREET
FAIRFIELD, NJ 07004
Phone: (201) 808-9033
Topic#: 92-172 ID#: 92N0A-119
Office: NAWCWAR
Contract #:
PI: MURRAY W. ROSEN
Title: NCTR/ECCM Approaches for Aircraft Target Identification in an ECM Environment
Abstract: The Phase I project investigates and defines new and improved NCTR/ECCM algorithms that will counter and negate the effects of sophisticated countermeasures. The project examines radar, NCTR, EGM and ECCM issues and alternate implementation approaches. Candidate NCTR/ECCM include: natural target and spectral redundancy algorithms: and homodyne signal processing in multiple bandwidths. Phase I conducts radar NCTR processing and ECM research: defines NCTR/ECCM objectives and constraints; investigates and defines new and modified ECCM techniques; conducts trade offs and selects techniques; determines NCTR/ECCM performance and technical feasibility; outlines prototype implementations to evaluate the techniques; and develops a plan for future NCTR/ECCM demonstration.

ELECTROCHEMICAL TECHNOLOGY CORP.
1601 DEXTER AVE. N.
SEATTLE, WA 98109
Phone: (206) 285-7404
Topic#: 92-139 ID#: 92N0A-041
Office: NAWCWAR
Contract #:
PI: DR. THEODORE R. BECK
Title: Electrodeposition of Polymer Coatings in Aircraft Fuel Tanks
Abstract: This proposal is in response to the topic objective to apply and control the application of multilayer seal coatings on all surfaces of integral fuel tanks. An alternate polymer deposition method is proposed to meet the objective without the need for expensive, complex sensors and controls. A polymer coating, composed of Teflon and a second resin, is to be deposited electrochemically from aqueous solution. This polymer coating process automatically gives a uniform coating free of pinholes. A pretreatment prepares the surface of aluminum tanks for polymer electrodeposition. The polymer coating process can be adjusted to obtain any coating thickness desired. The polymer coating process uses an aqueous system which obviates expensive environmental and safety constraints associated with the organic solvents currently-used in coating fuel tanks. Corrosion, fuel-compatibility, and adhesion tests will be carried out to evaluate the coatings. Deliverables from Phase I will be test data and a demonstration small-scale simulated fuel tank. A successful process from Phase II will be licensed to manufacturers.

EVANS FINDINGS CO, INC.
P O BOX 4158
EAST PROVIDENCE, RI 02914
Phone: (401) 434-5600
Topic#: 92-066 ID#: 92N1A-374
Office: NAVSEA
Contract #: N00024-92-C-4314
PI: David A Evans
Title: Electrochemical Capacitor Power Support System
Abstract: Submarine combat systems have power support systems to carry them through temporary electrical supply outages caused by switching between unparalleled ac power sources. A simper, lighter, more reliable, and less expensive power supply is desired. Support systems based on capacitive energy storage are attractive for this application. They are power-rich, simple, reliable, safe, quiet, and maintenance-free. The goal of the proposed effort is to establish the feasibility of double-layer capacitor technology for the power support system. In Phase I, a single capacitor will be designed that delivers 15 kW average power

for 0.1 seconds. It will have a sealed package, be capable of 15- to 120-V operation via external buss connections, and have a volume less than 1 cubic foot. One capacitor will be constructed per this design. Its performance will be measured and compared with the design goals. The capacitor will be delivered to the Navy for further evaluations. Successful completion of the proposed Phase I activity will yield a simple and reliable breadboard power system. It will be capable of delivering one-fifth the power specified for the eventual power support system.

F&H APPLIED SCIENCE ASSOC.
7105 GREENE STREET
PHILADELPHIA, PA 19119
Phone: (215) 248-3418
Topic#: 92-035 ID#: 92N47-203
Office: SPAWAR
Contract #: N62269-93-C-0505
PI: P. R. Herczfeld
Title: Modulated Pulse Laser Radar System
Abstract: The overall goal of this proposed program is to develop a novel system for the detection of targets immersed in water. The program is based on the synergism of two established technologies, LIDAR and conventional microwave RADAR. The specific objectives of the Phase I investigations are: (l) to develop, in consultation with sponsor, a set of detailed specifications for the overall program -. to assure optimal coordination with sponsor\'s needs; (2) to design a microwave modulated optical transmitter; (3) to perform analytic and computer simulation studies of the propagation of various pulse shapes through a water model that includes temporal and spatial pulse stretching effects, and to verify the model using available data; (4)to investigate advanced detection and signal processing techniques; (5) to develop preliminary design of proof of concept experimentation. The objectives of the Phase II studies will be the design and implementation of a proof of concept experiment and a comprehensive design of the hybrid optical- microwave radar.

FARACHEM TECHNOLOGY, INC.
300 EAST AUBURN AVE.
SPRINGFIELD, OH 45505
Phone: (513) 325-4191
Topic#: 92-111 ID#: 92N01-055
Office: ONR
Contract #:
PI: Dr. E. Jennings Taylor
Title: Remote Sensing of Crevice Corrosion
Abstract: Crevice corrosion is a form of localized corrosion that occurs within crevices or at shielded surfaces where stagnant solution is present. Crevices corrosion is particularly problematic for the Navy in networks of seawater piping where the numerous gasketed junctions are susceptible to crevice corrosion. Since the crevice corrosion is almost always confined to within the crevice itself, the pipe joints must be periodically disassembled and visually inspected for evidence of crevice corrosion. This process is time consuming, tedious, and expensive. Based on the mechanistic aspects of crevice corrosion, we will investigate three novel remote sensing concepts for crevice corrosion. These concepts are applicable to pipes of varying sizes and are capable of being developed into a remote diagnostic procedure for crevice corrosion. Such a procedure is adaptable to portable instrumentation for the detection of crevice corrosion within an assembled gasketed pipe joint. This instrumentation will eliminate the requirement for disassemble and visual inspection of pipe joints and will be of great benefit to the Navy.

FIBER & SENSOR TECHNOLOGIES, INC.
P.O. BOX 11704
BLACKSBURG, VA 24062
Phone: (703) 231-4224
Topic#: 92-140 ID#: 92N40-245
Office: NAWCIND
Contract #:
PI: Kent A. Murphy
Title: Composite Embedded Optical Fibers for Communication Links
Abstract: Optical fibers have been embedded in polymer and metal matrix composites for fourteen years; this work has identified methods for embedding and limitations due to fiber-matrix interactions and interconnection methods. Concurrently, breakthroughs in fiber-based local area networks have led to reconfigurable fault tolerant architectures. By embedding the elements of such networks into advanced composites, structurally-integrated avionic circuit module and intra-aircraft high speed communication may be supported onboard future military aircraft. Such systems require the sequenced development of methods for the integration of fibers, fiber components and supporting electronics and optics into composite material systems and structures. The objective of the proposed SBIR program is to study the first phase of this development process-the integration of fibers and first-level fiber interconnect capability into polymer and metal matrix composites. Fiber & Sensor Technologies (F&S) and its university subcontractor, the Fiber & Elec Optics Research Center (FEORC) at Virginia Tech, are major

innovators in the smart materials and structures field. Together, they have performed more than 100 relate embedded fiber/composite materials research programs for government agencies and aerospace companies. The proposed program will build directly upon their substantic experience embedding optical fibers and fiber communication system elements in polymer and metal matrix composites.

FLAM & RUSSELL, INC.
506 PRUDENTIAL ROAD
HORSHAM, PA 19044
Phone: (215) 674-5100
Topic#: 92-049 ID#: 92N1A-182
Office: NAVSEA
Contract #: N60921-93-C-0169
PI: Jeffrey F Bull
Title: Radar High Angle Resolution Techniques
Abstract: Existing radars are very powerful and perform many functions. However, they have difficulty resolving multiple targets in the same range cell with similar doppler shifts when the targets are close in angle. Typically, targets closer than one beamwidth of the radar\'s aperture cannot be resolved with conventional radar processing. Signal processing techniques that increase the angular resolution of radars beyond the Rayleigh resolution limit are said to provide "superresolution". Superresolution techniques require intense, numerical operations upon a covariance matrix. Unfortunately, conventional radars do not directly provide the covariance matrix. In this Phase I effort we propose to investigate techniques to increase conventional radar\'s angular resolution through the use of superresolution processing as an "applique". The following innovative techniques are proposed for Phase I and elaborated upon in the proposal: o Indirect covariance matrix measurement o Processing only where targets have been detected o Subarraying to reduce computations and data collection Flam & Russell, Inc. has a great deal of experience implementing superresolution processing to a number of systems; direction finding, radar cross-section measurement as well as non destructive evaluation systems. Thus, we possess the right ingredients to add increased angular resolution of conventional radars in an efficient, cost-effective manner.

FLAM & RUSSELL, INC.
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Phone: (703) 231-6144
Topic#: 92-078 ID#: 92N1A-445
Office: NAVSEA
Contract #: N60921-92-C-0169
PI: RICHARD E. NANCE
Title: Establishing Software Development Process Control Through Process Quality Indicators
Abstract: To produce and maintain product quality we contend that one must control the development and maintenance processes through the collection, examination and analysis of both process and product indicators. Process indicators provide measures that reflect the effectiveness of software development and maintenance activities. Product indicators provide measures that indicate the extent to which desirable, quality attributes are present (or absent) in the product (documentation and code). Establishing process control requires a foundational underpinning that (a) reflects a complementary integration of maintenance and development activities, (b) the identification and definition of a (semi-) automated data collection and analysis process which employs quality indicators that are definitively linked to the existence of process and product attributes, the use of acceptable software engineering principles, and (c) the formulation and use of control methods that are designed to work within the defined automated process and to provide decision support capabilities. Based on previous experience, and building on our previous research results, we propose to define a foundation that can be used as a springboard for establishing software development process control. Results from this effort are expected to make significant contributions to software engineering technology by providing a blueprint by which organizations can establish a controlled software development process.

FOSTER-MILLER, INC.
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Phone: (617) 890-3200
Topic#: 92-037 ID#: 92N47-221
Office: SPAWAR
Contract #: N00039-93-C-0052
PI: W.E. Schroeder
Title: Interactive 3D Display System
Abstract: Standard CRT display technology does not work well in Lofargram analysis. CRTs induce fatigue which reduces user effectiveness. This program proposes use of a new computer interface device which allows both the generation of more effective (data-rich) displays and faster more intuitive interaction between display and operator. The basis of the interface device is location of the operator\'s point of attention in 3-space using eye-tracking. The program also proposes to measure visual fatigue

using eye-tracking. In Phase I a prototype improved Lofargram display will be developed as a proof-of-principle testbed for the utility of these concepts. A display based on these principles fusing data from multiple sonar sensors is proposed for Phase II development.

FOSTER-MILLER, INC.
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Phone: (617) 890-3200
Topic#: 92-070 ID#: 92N32-003
Office: NSWCDDWO
Contract #: N60921-93-C-A352
PI: DOMASH
Title: Improving the Availability of Diffractive Optics
Abstract: Diffractive elements for the subdivision, redirection or shaping of laser beams are an increasingly important component requirement for emerging laser-based technologies of optical computing, optical interconnects, and holographic data storage systems. To date, however, the software and fabrication methods to design and create them have been available only to a few researchers. A particular requirement exists for laser array generators to address SEED devices. Phase I research will demonstrate that a high performance 6 x 6 Dammann grating can be successfully fabricated with equipment, such as scanning electron microscopes, whose total capital cost does not exceed $250K. Phase II research will proceed to generate a 64 x 64 beamlet array on an infrared transparent substrate, and plan and develop the software and hardware base for a convenient, moderate cost commercial service to offer binary optic elements of all kinds to U.S. researchers. Such a service will support American competitiveness in optical computing, optical data storage, diffractive optics, and other emerging technologies.

FOSTER-MILLER, INC.
350 SECOND AVENUE
WALTHAM, MA 02154
Phone: (617) 890-3200
Topic#: 92-087 ID#: 92N36-029
Office: NUSC
Contract #: N66604-93-C-0360
PI:
Title: Energy-Absorbing Structural Epoxy Resin for "Silent" Composites
Abstract: Advanced underwater vehicles currently require a thick outer coating of elastomer to dampen noise radiating from excited structures to seawater. This increases weight, size, drag and detectability if the coating is damaged. Foster-Miller proposes to reduce the acoustic coating requirement more than 60% by making the composite structures intrinsically energy-absorbing. In Phase I, we will combine commercial materials to produce a semi-interpenetrating network (SIPN) epoxy/elastomer resin that maintains structural integrity because of separated phase morphology, absorbs energy over a broad range of frequencies (100 to 4000 Hz) and temperatures (-10 C to 40 C) and is processible via filament winding. We will apply our experience in undersea acoustic materials, polymer design, polymer synthesis and composite processing to provide the Navy with a complete evaluation of key technical issues, including: tailoring the SIPN in both acoustic and structural properties, processing the SIPN into composites and measuring acoustic and mechanical properties. Phase I will demonstrate the feasibility of producing "silent" composites that maintain the strength and stiffness of unmodified composites. In Phase II, we will refine the process and filament-wind prototype 21 in., heavy-walled composite tubes, 48 in. in length, with end fittings for testing at NUSC.

FOSTER-MILLER, INC.
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Phone: (617) 890-3200
Topic#: 92-096 ID#: 92N3B-024
Office: NWSC
Contract #: N00164-93-C-0027
PI: Uday K. Kashalikar
Title: Superior Gr/Cu SEM-D Heat Sink
Abstract: In submarine electronics modules, heat dissipated by electronic devices is typically transported along the length of the heat sink (upon which ICs are mounted) to the water cooled side walls. The current pure copper SEM-D heat sink limits the power dissipation per card to 26W in order to maintain acceptable device junction temperatures. Foster-Miller will demonstrate an innovative Gr/Cu metal matrix composite (MMC) heat sink which offers a 25 percent reduction in thermal impedance over the current copper component. The key bottleneck for MMCa-low z-directional conductivity-will be removed by adding z-directional fibers to the planar preform using a Foster-Miller proprietary process. Additionally, the MMC heat sink will have a tailored planar CTE in the card region (thereby obviating a complaint layer) and high planar thermal conductivity. The cumulative effect will be a 6 to 10 C reduction in the device junction temperature (thereby >50 percent reduction in device

failure rate) for the same power density, or alternatively, a 25 percent increase in the power dissipation at current device junction temperatures. Additionally, the 45 percent lighter Gr/Cu heat sink will accrue significant savings in the electronics system and structural weight. During Phase I Foster-Miller will fabricate and test MMC specimens representative of three critical regions-card, rib and bend region; of the Foster-Miller SEM-D heat sink concept. This will lead into Phase II when the design and processing will be optimized and high properties will be consistently demonstrated in full scale Gr/Cu SEM-D heat sinks.

FOSTER-MILLER, INC.
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Phone: (617) 890-3200

Topic#: 92-120
Office: NAVAIR
Contract #:
PI: DR. MARK A. DRUY

ID#: 92PMT-051

Title: Investigation of Imide/Graphite Composite Degradation Mechanism

Abstract: Foster-Miller, Inc. (FMI) proposes to establish at the molecular level the mechanism of degradation of mechanism will result in modifications of current imide resins and new resin development. The innovation in the proposed Phase I program is our solution for the prevention of galvanic induced degradation of imide based composites. Our proposed solution involves modifying the BMI resin by placing novel moieties in the polymer chain. The modification to the BMI matrix resin will not compromise its mechanical or thermal properties. We will demonstrate the feasibility of the entire concept by fabricating test coupons, subjecting them to a laboratory galvanic process, and determining the bearing strength of the test coupons. A Phase II program will develop at the laboratory level modified bismaleimide resins and composites and/or conduct synthesis studies on new resin approaches to meet the requirement for elevated temperature composites at greater 250 degrees F. This Phase II effort will involve a test matrix that demonstrates processing and mechanical properties as well as to compare to baseline materials.

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Topic#: 92-123
Office: NAVAIR
Contract #:
PI: DANIEL E. BULLOCK

ID#: 92PMT-088

Title: Unique Fiber Optic Sensor System for Residual Stress Measurement on Graphite Composites

Abstract: Foster-Miller proposes to develop a novel translaminar embedded fiber optic sensor system to measure residual stresses in graphite/epoxy composites. The proposed system has been demonstrated by Foster-Miller to successfully monitor the structural integrity of a composite laminate subjected to edge delamination stresses. The system uses a short gauge length fiber optic Bragg grating sensor and a novel fabrication technique which permits through thickness insertion of the sensor without damage to the sensor or the composite properties. The Phase I program will demonstrate that the embedded sensor is capable of measuring residual stresses due to thermal effects and post cure stresses from drilling and machining. These results will be correlated to analytical predictions.

FOSTER-MILLER, INC.
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Phone: (617) 890-3200

Topic#: 92-138
Office: NAWCWAR
Contract #:
PI: DR. MARK A. DRUY

ID#: 92N0A-035

Title: Novel Fiber Optic Infrared Spectroscopic NDI Technique for Galvanic Degradation of Composites

Abstract: Foster-Miller proposes to develop a novel fiber optic infrared spectroscopic nondestructive inspection (NDI) technique which will provide quantitative information on the severity of galvanic induced degradation of composites. This new infrared NDI system will enable the navy to detect and track any galvanic degradation of graphite/polyamide composites in use on naval aircraft so that appropriate maintenance actions can be performed. Specific goals of the program are to demonstrate that the infrared technique can detect the onset of corrosive attacks before loss of mechanical properties and quantitatively correlate progressive degradation to loss of bearing strength. A conceptual design of a portable system suitable for in field use by navy maintenance personnel will be presented in Phase I. This will serve as the basis for scale-up and implementation of this NDI technique and actual field testing by the navy during Phase II.

FOSTER-MILLER, INC.
350 SECOND AVENUE
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Phone: (617) 890-3200
Topic#: 92-142
Office: NAWCWAR
Contract #:
PI: RAMKI IYER
ID#: 92N0A-053
Title: A Smart NDE Technique for Metallic Aircraft Structures
Abstract: As the existing aircraft fleet ages, concerns over fatigue failure become more urgent. Frequent inspection intervals become necessary as dictated by the worst case aircraft of that make/model. These inspections usually require aircraft teardown which could cause damage itself. Individual aircraft monitoring would eliminate the need for fleet-wide grounding and inspection and allow for a tailored inspection/repair program. The concept proposed consists of tagging the aircraft structure with magnetostrictive particles which would generate signatures based on the loading history of the structure. This concept allows for quick, accurate, easily accessible inspection of the aircraft structure. The individual aircraft's health could be determined in real-time, thereby lowering inspection/repair costs while increasing operational readiness.

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Phone: (617) 890-3200
Topic#: 92-148
Office: NAVAIR
Contract #:
PI: ROBERT F. KOVAR
ID#: 92PMT-215
Title: Environmentally Degradable Chaff Packet
Abstract: Chaff dispensed from under the aircraft wing in plastic packets is effective against radar threats and provides added space for protection against IR threats. However, falling packets can strike the wing causing damage, and the release of non-degradable packets that might be toxic to fish and wildlife causes environmental problems. Foster-Miller proposes to develop technology for 100 percent biodegradable chaff packets that are compatible with the D-46/ALE-39 dispenser and will not cause impact damage to the aircraft. We will select a biodegradable polymer and control its impact strength. Chaff packets will be fabricated that withstand normal handling and g-forces, but disintegrate upon impact with a wing. The packets will sink in seawater, be edible to fish and wildlife and biodegrade into harmless products within weeks of environmental exposure. In Phase I, we will deliver 16 biodegradable chaff packets and a final report that includes a scale-up plan. In Phase II, we will refine the process and scale up to produce 20 sets of packets. Commercialization will begin in Phase I, since our team includes a chaff packet manufacturer. The principal investigator and this Foster-Miller facility have Secret clearance status and extensive experience in polymer processing.

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Phone: (617) 890-3200
Topic#: 92-151
Office: NAVAIR
Contract #:
PI: ARTHUR D. JACKSON
ID#: 92PMT-234
Title: AH-1W Ballistic Tolerance Improvement Project
Abstract: The problem - The AH-1W requires additional armor protection to improve the aircraft and aircrew ballistic tolerance. Foster-Miller proposes to develop a solution to this problem through an analysis of three interconnected variables which will result in an AH-1W ballistic tolerance system. The three interconnected variables are: The projected threat to the airframe/aircrew as well as the vulnerability of the airframe. The materials available to increase the AH-1W's ballistic tolerance. The attachment technique to be used to apply the selected material to the aircraft. To this end, Foster-Miller proposes a two-part Phase I effort with the principal goals of: Part 1 - Analysis of (a) vulnerability; (b) ballistic materials; (c) attachment/integration techniques. Part 2 0 Demonstration of (a) ballistic performance and (b) mock-up kit installation. Please note that one of the integration techniques that will be evaluated is a patented system known as LAST Armor - U.S. Patent No. 4,928,575 which has been certified for flight safety by U.S. Army AVSCOM.

FOSTER-MILLER, INC.
350 SECOND AVENUE
WALTHAM, MA 02154
Phone: (617) 890-3200
Topic#: 92-186
Office: NAWCWPNS
Contract #:
PI: Dr. Arthur Nelson
ID#: 93N37-017
Title: Laser Beam Steering Via the Pockels Effect

Abstract: Nonlinear optical polymer (NLOP) materials offer important advantages over ferroelectric (LiNbO3) and semiconductor (GaAs) materials for the fabrication of very high speed elector-optic devices, including modulators, switches, and multiplexers. The basic electronic interaction in NLOP yields high elector-optic coefficients with low dielectric constant resulting in potential device operation at speeds exceeding 100 GHz. For this effort Foster-Miller proposes to develop a unique integrated optic structure in NLOP materials which is capable of near instantaneous steering of an input laser beam. The device consists of a channel waveguide/electrode array, which will be computer modeled in Phase I. Also during Phase I, channel waveguide structures will be developed in NLOP material and completely characterized for the beam steering application. During Phase II a complete breadboard integrated optic chip will be fabricated in NLOP and completely characterized for microwave operation. The team of scientists from Foster-Miller and the University of Lowell assembled for this project are uniquely qualified for this effort with many years of experience in NLOP preparation, NLOP optical and electrical measurements, characterization of very high speed integrated optic devices.

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Topic#: 92-099 ID#: 92N03-016
Office: DTRC
Contract #: N00167-93-C-0009
PI: Chaoqun Liu

Title: Multilevel Adaptive methods for Application to Steady & Time Dependent 3D Reynolds-Average Navier-Stokes Solver
Abstract: Development of the capability to predict flow fields around naval ships,submarines in particular, both accurately and efficiently is crucial to the Navy in the design of naval ships. State-of-the-art Reynolds-averaged Navier-Stokes solvers are capable of predicting the general flow field a=out an appended submarine , but there are two major shortcomings: the long computing time required and the lack of resolution of the vortical flows generated in junctures and appendage tips of the sulxnarine. The multilevel adaptive method can overcome these two shortcomings by improving the rate of convergence of the solver by an order of magnitude,therefore significantly reducing computing time, and by placing denser grid distributions strategically in regions where the vortical flow dominates, enabling accurate resolution of the vortical flow. The implementation of the multilevel adaptive methods with an existing 3-D Reynolds-averaged Navier-Stokes solver, such that the vortical flows generated by appended submarines can be both accurately and efficiently predicted, is the main goal of the proposed Phase I project. The improvement and the development of more accurate and efficient numerical schemes is the goal of the Phase II project.

FUENTEZ SYSTEMS CONCEPTS, INC.
11781 LEE JACKSON HIGHWAY
FAIRFAX, VA 22033
Phone: (703) 273-1447

Topic#: 92-028 ID#: 92N47-105
Office: SPAWAR
Contract #: N60921-92-C-A354
PI: Thomas C. Housman

Title: Classification and Sanitization Expert System (CASES)
Abstract: This project will investigate the availability, sufficiency and clarity of guidance in security directives to design 8 rule based Classification and Sanitization Expert System (CASES). Consistent with such guidance a system will be designed that automatically classifies cryptologic raw data consistent with classification guides for both the sensor system and the signal of interest and then automatically and reliably invokes sanitization procedures uniquely appropriate to the sensor system, signal of interest and specific requirements for Essential Elements of Information EEI. The system will automatically and reliably manage security classification labels, data packet definitions and data integrity assurance procedures and automatically implements the procedures required to control the access to the sanitized information by processing systems not authorized to operate at the SCI level. Based on the Navy\'s current plans for Surface Cryptologic Systems the project will also investigate and document at least one alternative for implementing the expert system module in OUTBOARD, COMBAT DF, BGPHES, CCSC (or equivalent NTCS-A Workstation), CCSS and future systems using the Common Cryptologic Workstation (CCW).

GAMRY INSTRUMENTS, INC.
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LANGHORNE, PA 19047
Phone: (215) 757-7439

Topic#: 92-008 ID#: 92N03-022
Office: DTRC
Contract #: N00167-92-C-0090
PI: Max R. Yaffe

Title: Improved Electrochemical Test System For Evaluation Disbandment of Organic Coatings

Abstract: Currently available Electrochemical Impedance Spectroscopy (EIS) Systems cannot be used to measure the degree of corrosion protection afforded by thick, high quality organic coatings. The impedance at which a coated metal\'s behavior switches from capacitive (due to the coating) to resistive (due to coating defects) is indicative of coating quality. Unfortunately, the impedance at which the switch occurs can be as high as 1012 ohius/cmX on a high quality coating. This project will develop and demonstrate a prototype EIS system capable of measuring 101 ohio impedances at 1 mHz and a 10 mV AC exaltation voltage. A special low current potentiostat that can measure femtoamp AC currents is the critical portion of the new system.

GORCA SYSTEMS, INC.
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Topic#: 92-031 ID#: 92N47-151
Office: SPAWAR
Contract #: N00039-93-C-0080
PI: Ken Abend

Title: Synthetic Aperture for Surveillance Applications Using A Towed Array

Abstract: This proposal addresses the use of synthetic aperture processing techniques in low resolution towed array sonar eyeteme for ASW applications. The proposed approach will apply theme techniques to enhance Gignal to noise and bearing resolution despite (a) uncertainties in the knowledge of the 9onar trajectory, (b) inaccurate estimates of the speed of sound as a function of depth, and (c) unknown target trajectories. Self-cohering (auto-focusing) techniques are used to adaptively compensate for the errors caused by deviation of the target and array trajectories from a linear path, and also for inaccuracies in the estimated speed of sound. A series of wideband pulse are transmitted toward the target area; the large bandwidth break up the ABM target into several range cells. Two self-cohering algorithms that have been successful in synthetic and inverse synthetic aperture radar, called the dominant scatterer algorithm and the 9patial correlation algorithm, are used to extract the corrections needed to compensate the errors from the measured echoes. The bearing coordinate of the image formed after applying the self-cohering corrections to the data will be scaled and shifted if the target trajectory is not known. E9timatea of the target trajectory can be used to remove this distortion.

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Topic#: 92-141 ID#: 92N0A-043
Office: NAWCWAR
Contract #:
PI: DR. P. C. SEKHAR

Title: Novel Conducting Polymers as Efficient Corrosion Scavengers and Anti-Corrosion Coatings

Abstract: This proposal targets the design and synthesis of functionalized conducting polymers as effective corrosion inhibitors and as scavengers useful for the advanced needs of naval aircraft and other equipment. The novel materials will be able to poise the mixed potentials of metals in the most stable region therefore preventing the corrosive degradation process. The existing coating schemes involve very stringent conditions during manufacturing and do degrade in due time. We propose a new approach to this problem, which consists of using suitably designed conducting polymer coating. The advatages of the novel conducting polymer based coatings include: (1) applicability to wide variety of metals, (2) improved stability towards naval environment, (3) durability, (4) light weight, and (5) cost effectiveness. A combined theoretical modeling and experimental approach will be adopted to investigate and optimise the influence of functional groups on the electrochemical properties of conducting polymers, redox potentials, and the metal/polymer interface interactions.

HITTMAN MATERIALS & MEDICAL COMPONENTS
9190 RED BRANCH ROAD
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Topic#: 92-050 ID#: 92N1A-194
Office: NAVSEA
Contract #: N00024-92-C-4321
PI: Allan S Gelb

Title: Development of Small, High-Efficiency Thermoelectric Cooling Devices

Abstract: Hittman proposes the development of a closed lattice design thermoelectric cooler for the cools of microcircults.

Appropriate minimal cost manufacturing techiques will be developed for this thermoelectric module. An advanced heat sink concept will be evaluated and various designs integrated with the cooler design. Hittman will develop a description of the materials and manufacturing techiques necessary to manufacture and demonstrate a working prototype of an integrated closed lattice thermoelectric cooler/advanced heat sink device.

I-KINETICS, INC.
19 BISHOP ALLEN DRIVE
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Phone: (617) 661-8181

Topic#: 92-112
Office: ONR
Contract #:
PI: Dr. Bruce H. Cottman

ID#: 92N01-062

Title: A Module Interconnection Framework for Collaborative Workflow

Abstract: Modern team-based collaborative workflow requires the ability for applications to communicate and control each other. Interoperability of applications requires a common module interconnection framework (MIF). Phase I will extend the design and development of an existing MIF, called Catalyst. Catalyst emphasizes enabling large scale, organization-wide information systems. The MIF will include facilities for application integration, reliable data management, and collaborative workflow automation and management. The key components of Catalyst are: 1. I-Gates enable the integration of in-place vendor and proprietary in-house applications into a MIF. 2. An I-Bridge enables applications that support one MIF standard to interoperate with applications that support another MIF standard. However, an I-Bridge can be developed for approximately the same cost as integrating two different applications. Intergrating frameworks instead of individual applications realizes a significant reduction in system lifecycle costs. 3. FrameScript workflow specifications assist different workgroups in automating complex series of control and data flow transactions between different applications. This key innovation enables the management of domain-specific methodologies with explicit workflow scripts that can be developed, shared, and evolved.

IAP RESEARCH, INC.
2763 CULVER AVENUE
DAYTON, OH 45429
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Topic#: 92-098
Office: DTRC
Contract #: N61533-92-C-0091
PI: Antonios Challita

ID#: 92N03-006

Title: Liquid Metal Brush Contacts

Abstract: We propose to develop liquid metal current collectors for Navy homopolar ship drives. Our concept utilizes a collector leaf (of finger brush) to deliver a film of liquid metal to the slipring surface. The proposed system has active collector actuation which helps maintain a stable film through improved slipring tracking. Our collector concept is aimed at improving serviceability while maintaining electrical performance. Multiple collector modules mounted to the return conductor form a collector ring. Each module consists of three parts; a manifold, a collector leaves assembly, and a guide block. Collector maintenance (if required) will involve only the replacement of the collector leaves assembly. Our Phase I effort will result in concept level drawings of the liquid metal current collector system needed for Navy homopolar ship drives. We will develop the tools needed to make knowledgeable design decisions. We will use these tools to perform a concept design of the ship drive collectors. In Phase II, we will continue collector development through testing at IAP Research, Inc. and the David Taylor Research Center.

INDUSTRIAL QUALITY, INC.
19634 CLUB HOUSE ROAD
GAITHERSBURG, MD 20879
Phone: (301) 948-2460

Topic#: 92-185
Office: NAWCWPNS
Contract #:
PI: Harold Berger

ID#: 93N37-004

Title: Improved Thermal Neutron Imaging Method

Abstract: Improved neutron imaging methods, to couple with the new availability of non-reactor sources for neutron radiography, are needed to expand the use of this nondestructive testing method. this proposal addresses the development of improved scintillators for thermal (and cold) neutron imaging and the development of a complete imager employing new solid state cameras. This new approach for neutron imaging offers the promise of improvements in terms of signal-to-noise ratio, dynamic range, contrast and spatial resolution. The imaging detector can be used for both prompt response and static situations. The program will include a comparison of neutron scintillators, including new materials such as boron nitride and gadolinium oxide-based ceramic scintillators. comparisons of selected scintillators used with a 12-bit CCD camera system will be made with

present state-of-the-art thermal neutron imaging systems. These evaluations will point the way toward the development of an improved neutron imaging system for development in Phase II, one that will couple well with new accelerator neutron sources. Although the major emphasis in Phase I will be thermal neutron imaging, attention will also be given to neutron imaging in other energy ranges.

INFOMETRICS
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Phone: (301) 589-2500
Topic#: 92-011 ID#: 92N40-150
Office: ONT
Contract #: N00167-93-C-0021
PI: Anthony N. Mucciardi, PhD
Title: Noncontact Ultrasonic Measurement Technique for Surface Stress Distribution
Abstract: Improved methods are required to measure surface stress in the structural design, evaluation, and monitoring of naval ship structures. The method should be capable of noncontact measuring of surface stresses, scanning and recording stress fields due to static and dynamic loads, and producing color stress plots which can be compared to finite element analysis. A portable PC-based ultrasonic C-scan instrument with air-coupled transducers is proposed to meet these specifications. Ultrasonics provides a direct relationship between the elastic properties of materials, which encompasses stress, and sound wave propagation. This relationship is readily modeled, predicted, and quantified using finite element analysis. Phase I will demonstrate feasibility of a noncontact ultrasonic method to measure surface stress distribution on naval structures. This will lead to the development, during Phase II, of a prototype instrument for use on naval structures in shipyard, shipboard, and laboratory environments.

INFRARED FIBER SYSTEMS, INC.
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Phone: (301) 622-9546
Topic#: 92-182 ID#: 92N13-038
Office: NAWCFTEG
Contract #:
PI: Danh C. Tran
Title: Low Loss Infrared Fiber Imaging Bundles
Abstract: Imaging bundles of infrared fibers will be developed for use in an IR scene generation system. The fibers will be made from zirconium fluoride glass for the 3-5 micron region, and chalcogenide glass for the 8-12 micron region. Low loss chalcogenide glass fibers will be developed by improving the perform and fiber processing techniques, and using high purity starting materials and glasses. In particular, optimized cladding will be developed, scattering defects minimized, and purification improved to achieve lower loss. The fibers will then be formed into coherent bundles for image relay applications.

INNOVATION ASSOC., INC.
P.O. BOX 1306
ANN ARBOR, MI 48106
Phone: (313) 995-9338
Topic#: 92-002 ID#: 92N40-029
Office: ONT
Contract #: N66001-92-C-7012
PI: Frederick Schellor
Title: AUM/UUV-a Virtual Environment for Undersea Telepresence
Abstract: Time-delays and limited sensory feedback of remote telerobotic systems tend to disorient teleoperators and dramatically decrease the operators\' performance. To eliminate these effects, Innovation Associates will design a Virtual Environment for Undersea Telepresence (VEUTel) system. The VEUTel system will correct the problems associated with low band- width feedback by totally immersing the operator in a virtual reality simulation of the remote telerobotic environment. The VEUTel system will intercept operator commands and provide instantaneous graphical simulation of the effect of the command on the telerobot, while relaying the commands to the remote telerobot. The system will insure the integrity of the simulation by using visual and/or range updates from the remote environment to correct the simulated environment, if discrepancies between the simulated and remote environment occur.

INNOVATIVE MANAGEMENT DECISIONS
12030 SUNRISE VALLEY DRIVE
RESTON, VA 22091
Phone: (703) 860-0866
Topic#: 92-102 ID#: 92N47-321
Office: SPAWAR
Contract #: N00024-92-C-4322
PI: Terry A Bresnick
Title: Management Decision-Making Database

Abstract: The objective of the proposed research is to demonstrate the feasibility of enhancing program management decision making. This enhancement will be realized through a decision support system that employs a database of systems acquisition information. The database will consist of key parameters affecting program manager decision making. The user interface for the database will employ expert systems technology so as to guide the user through the most effective sequence of searches for the problem that is being faced. Phase I will involve 4 tasks. In task 1, we will develop a taxonomy of critical program manager decisions, issues, and data elements. In task 2, we will define a data collection methodology for developing and organizing the components of the taxonomy into a program managers\ database. Data will be collected from a limited number of program management offices (PMOs) to test this data collection plan and to enable the development of a prototype system. In task 3, we will design and implement a database that supports the decision taxonomy of task 1. A prototype decision tool for using the proposed database via a expert system shell will be developed in task 4.

INRAD, INC.
181 LEGRAND AVENUE
NORTHVALE, NJ 07647
Phone: (201) 767-1910
Topic#: 92-007
Office: ONT
Contract #: N00014-92-C-0127
PI: Dr. Kee-Chang Yoo
ID#: 92N40-079
Title: "Growth of Single Crystal Beta Silicon Carbide"
Abstract: Two methods for growing large beta-SiC proposed: (l) top-seeded solution growth under high pressure and (2) sublimation. We believe these two are the most promising techniques for producing large hauls, of beta-SiC, suitable for use as substrates for epitaxial growth of beta-SiC thin films. In the top-seeded solution growth method, pure silicon will be used as the solvent. The growth chamber will be pressurized up to 1000 psi to increase the solubility of carbon in the silicon melt. The growth temperature will be below 2OOO\'C, which is the phase transformation temperature of SiC from beta to alpha phase. In the sublimation method, SiC powder contained inside a graphite cavity will be vaporized by induction heating. Vapor species are transported to and deposited onto closely lattice- matched single crystal seeds of CVD-grown beta-SiC or bulk TiC. Crystals of beta-SiC that are grown will be well characterized with respect to crystal perfection. The growth technique that proves more promising will be further developed and optimized in Phase II.

INTELLIGENT REASONING SYSTEMS
647 CREED AVE.
LAS CRUCES, NM 88005
Phone: (505) 527-1317
Topic#: 92-113
Office: ONR
Contract #:
PI: Mark R. DeYong
ID#: 92N01-076
Title: A High-Speed Object Recognition Chip Based on a Biologically-Realistic Hybrid Temporal Processing Element
Abstract: Intelligent Reasoning Systems (IRS) is developing an integrated active vision system (AVS) based on design principles derived from experimental analysis of mammalian visual systems. The AVS design is based on a asynchronous analog encoding of location and motion data, and a custom VLSI Hybrid Temporal Processing Element (HTPE) developed by and available solely to IRS (patent pending). The HTPE can operate on analog data at frequencies in excess of 100 MHz, allowing rapid oversampling methods to be used for resolution enhancement, motion detection, and multiple-template matching. HTPEs have low device count and power dissipation, and can be fabricated in small layout areas. The AVS is intended for eventual on-board application in robots, intelligent machine tools, and other autonomous sensory-motor systems that require visible, IR, or similar input. Binocular fusion will be used to derive depth information by comparing the primary-feature maps generated by feature detectors for two spatially-separated retinas. The goal of this Phase I proposal is to evaluate the feasibility of a binocular object recognition system for the AVS based on the HTPE.

INTERNATIONAL BUSINESS ASSOC., INC.
9245 SKY PARK COURT, SUITE 100
SAN DIEGO, CA 92123
Phone: (619) 560-8584
Topic#: 92-154
Office: NAVAIR
Contract #:
PI: WANG TANG
ID#: 92PMT-245
Title: Terrain Contour Matching (TERCOM) Map Placement
Abstract: A cruise missile mission planner has to select a route with a high probability of inflight survivability and to assure enroute navigational accuracy. The objective of this study is to develop automated tools to help cruise missile mission planners determine the optimum route and best reference sites so that viable TERCOM maps can be constructed to meet tactical

requirements. The specific objective during the Phase I work is to develop a technique to determine the f[illegible]ibility of the proposed approach for identifying the best combination of factors for the development of TERCOM maps to meet tactical objectives. The terrain roughness can provide only an indirect index to predict the suitability of TERCOM site selection. A more direct approach is to use the Monte Carlo simulation technique for the purpose. In the direct simulation proposed herein a reference terrain map and a sample realistic map error will be combined to create the on-board TERCOM map. The measurements of a radar altimeter and a baro-damped inertial navigation system will be generated. Four different trajectory orientations and three different sizes of on-board maps will be evaluated, each of which consists of 441 trials uniformly placed on the map. A performance table that summarizes the results of the simulation will be used to determine the suitability of the area under consideration as a TERCOM site and to support two modes of operation: (1) mission specific, and (2) non-mission specific.

INVOCON
9001 I-45 SOUTH, STE. 560
CONROE, TX 77385
Phone: (713) 364-1291
Topic#: 92-181
Office: NAWCFTEG
Contract #:
PI: Karl Kiefer
ID#: 92N13-019
Title: Wireless Airborne Instrumentation System
Abstract: During flight testing, an aircraft's performance is evaluated using data obtained from sensors placed throughout the airframe. The data is transmitted to a central data acquisition center via hardwire connections. This hardwire system has been found to be unsatisfactory due to high costs incurred from installation and removal. The ideal solution to reducing costs would be a data collection system that could be easily installed and removed. Invocon has developed a system which satisfies the above criteria. Consisting of both hardware and software, the system is an Artificial Intelligence (AI) data communications network that incorporates remote sensor units which can be easily installed without wiring. They can also be powered for extended periods of time with internal batteries or can connect to the aircraft bus power. Utilizing data gathering units that communicate via radio, the network implements both narrow and wide band communications to obtain the efficiency of a high speed system with very low power consumption. At the data analysis center, an operator can program the data gathering units to respond to specific instructions. We propose to demonstrate the capabilities of this AI data communications network in a non-flying airframe test. At the conclusion of Phase I, the viability of a wireless airborne instrumentation system will be proven.

ISORCA, INC.
PO BOX 414
GRANVILLE, OH 43023
Phone: (614) 587-3262
Topic#: 92-067
Office: NAVSEA
Contract #: N00024-92-C-4331
PI: Charles E Meteer
ID#: 92N1A-387
Title: Develop Handbook and Specification for Low Loss (DAMPED) Shock and Vibration Isolators and Dim Pads
Abstract: The Navy has used for year in submarines, soft, resilient, high displacement, low natural frequency rubber type mounts. Reference NavSea 0900-LP-089-5010, 29 August, 1977, "Navy Resilient Mount Handbook and Specification" and Mil Spec #D-24709 (SH) "Dim Isolation Pads." However, today in submarines, where space is critical, more and more electronic cabinetry producing higher frequency signals that are critical, and life cycle cost of resilient mounts (sag, shift, and drift) is excessively high has created a requirement for low loss (damped) mount systems. There are many applications where the standard mounts do not do the job. DARPA recognized this problem over three years ago and issued an RFQ for developments of low loss (damped) mount systems. My information is that this was never awarded. There are standard damped mounts available from several manufacturers and literally hundreds have been used in submarines without a Mil Specification. It is proposed to develop an initial handbook of sizes and loads available, applicable to the Navy applications where a damped mount system is required. Also, to develop a Mil spec for these mounts.

J P LABORATORIES, INC.
120 WOOD AVENUE
MIDDLESEX, NJ 08846
Phone: (908) 469-6670
Topic#: 92-039
Office: NAVSEA
Contract #: N00024-92-C-4329
PI: Dr G N PATEL
ID#: 92N1A-019
Title: A Low Cost Self Indicating Radiation Dosimeter
Abstract: In order to replace the DT-60/PD dosimeter system, the Navy needs a casualty dosimeter which can be used to

determine personnel dose exposure (50-1,000 rads) during potential nuclear conflict. The dosimeter should cost less than $2, should have shelf-life of 20 years and can be read without an equipment. A unique class of compositions will be used to prepare the dosimeter. The dosimeter will develop color when irradiated when irradiated with 20 - 5,000 rads of gamma rays. The color intensity will be proportional to the dose. The dose can be estimated with better than 20% accuracy using a calibrated reference color chart. The dosimeter will be having shelf-life of more than 20 years. The cost will be less than $2 per dosimeter.

JARDON & HOWARD TECHNOLOGIES, INC.
12424 RESEARCH PARKWAY
ORLANDO, FL 32826
Phone: (407) 381-4300
Topic#: 92-045 ID#: 92N1A-141
Office: NAVSEA
Contract #: N00024-92-C-4319
PI: Mary R Carroll
Title: Training for Submarine Desktop Computer
Abstract: The Navy Desktop Computer (DTC) hosting the Submarine Fleet Mission Program Library (SFMPL) is a dynamic computer system capable of providing support across a spectrum of activities from basic administrative duties to complex tactical decision making support. Readily available access to training for personnel using this system is critical to ensuring that its capabilities are used. This training is not currently available. In Phase I, JHT will provide a comprehensive plan to develop, implement, test and validate embedded, interactive training for the DTC hardware and one SFMPL program. This plan will ensure that individualized training can be made available on the DTC without interfering with any of the primary SFMPL program training requirement. The training will be accessible by individual crew members and will eliminate the requirement for an instructor. One SFMPL program will be selected and implemented based on the JHT plan to demonstrate the effectiveness of the embedded approach. Phase II will consist of implementing the plan for the remainder of the SFMPL and testing/validation of the interactive training system on typical fleet submarine personnel.

LIVERMORE SOFTWARE TECHNOLOGY CORP.
2876 WAVERELY WAY
LIVERMORE, CA 94550
Phone: (510) 449-2116
Topic#: 92-069 ID#: 92N32-179
Office: NSWCDDWO
Contract #: N60921-93-C-0114
PI: JOHN O. HALLQUIST
Title: Advanced Computer Code Development for Underwater Explosion Analysis
Abstract: The interaction of underwater explosions with naval structures is an extremely difficult subject. Because it needs both solid/ structure (Lagrangian approach) and fluid (Eulerian approach) to work together. The current state of the art analysis code, however, can handle only either solid/structure dynamics part or fluid dynamics part entirely but not both. The purpose of this proposal is based on the state of the art Lagrangian finite element code DYNA3D, developed by Dr. John O. Hallquist to handle short duration impact and penetration problems. Eulerian capability and its coupling with Lagrangian code will be added to DYNA3D to be well suited for fluid-structure interaction problems.

LNK CORP.
6811 KENILWORTH AVENUE
RIVERDALE, MD 20737
Phone: (301) 927-3223
Topic#: 92-001 ID#: 92N40-007
Office: ONT
Contract #: N60921-92-C-0134
PI: Dr. Srinivasan Raghavan
Title: A Synergic Expert-Neural Network System to Identify Relocatable Targets using Multi-Sensor Fusion
Abstract: The central focus of this proposal is on building an automatic target recognition system for identifying relocatable targets by integrating information from multiple sensors using a synergistic framework of neural networks and expert systems. This framework is ideally suited for incorporating human expertise of both perceptual and qualitative reasoning processes . From our prior experience in this area (NADC N62269-90-C-0567), we find the key to an efficient solution lies in using a composite architecture combining an expert system with a hybrid neural subsystem. We propose a the level processing system for identifying the relocatable targets. The first level of this system addresses issues related to data representation and registration between sources . The second level achieves feature extraction and parallel recognition results using neural networks. The third level consists of a decision making expert system with fuzzy logic reasoning to achieve a collective decision from the multiple sources using an object-oriented representation of the target.

LTA INTERNATIONAL, INC.
3300 NORTH RIVERSIDE DRIVE
INDIALANTIC, FL 32903
Phone: (407) 242-2320
Topic#: 92-055 ID#: 92N1A-248
Office: NAVSEA
Contract #: N00024-92-C-4309
PI: Robert G Witherow
Title: Tethered Airborne Imaging System
Abstract: The LTA Phase I task will develop a point design of a tethered airborne imaging system capable of extending the imaging capability of submarines and surface ships. The tethered platform will be a stable, inflatable aerostat deployable from submarine and surface ships capable of carrying an imaging system payload of up to 20 pounds in winds of up to 70 mph without grounding. The baseline aerostat will be a scaled down version of an existing LTA aerostat, the Mk6Y. The electrically conducting tether will be modified to incorporate fiber optics to provide an air to ground telemetry and command link. An existing LTA aerostat mooring system will be modified for a rapid deployment scenario and environmentally hardened for sea board operations. Aeronix, the imaging payload subcontractor, will develop a point design imaging payload which will be compatible with a variety of imaging sensors. The imaging payload will include software/hardware for data processing, down link formatting, command and telemetry, and power supply/conditioning. Flight performance analyses of the integrated system will be conducted and system/subsystem specifications will be developed.

LYNNTECH, INC.
111 EAST 27TH STREET
BRYAN, TX 77803
Phone: (409) 822-3149
Topic#: 92-111 ID#: 92N01-046
Office: ONR
Contract #:
PI: Mihaly Novak
Title: Portable Electronically Based Method for the Nondestructive Remote Sensing of Crevice Corrosion
Abstract: Corrosion in the crevices of gasketed joints in the presence of seawater have been particularly troublesome for the Navy and may cause serious damage in assembled seawater pipe joints. The disassembling of numerous pipe joints comprising gasketed flanges is tedious, slow and is a costly way for crevice corrosion inspection. Therefore, a need exists for new nondestructive techniques of crevice corrosion detection. Some of the existing nondestructive techniques, e.g., electrochemical techniques, scanning current probe, and scanning potential probe, are based on corrosion examination from the water side, i.e., sensors have to be introduced inside the pipelines. These are impractical and not necessarily relevant to localized crevice corrosion. Techniques which may be used without penetrating the pipeline system include ultrasonics, radiography, eddy current measurements and neutral radiographic spectroscopy. However, most of them suffer from low signal-to-noise ratios. The innovative approach proposed here is based on the application of four probe resistivity measurements for the detection of pit formation and thickness changes of flange alloys in gasketed pipe joints caused by crevice corrosion. This approach has the dual advantages of being nondestructive and very simple. The probe is attached on the outer surface of the flange, and there is no need for disassembling a flange. If shown to be successful in the detection of thickness changes due to pits formed at the metal part of the gasket/flange crevices, this technique has the potential to be easily designed as a fast remote sensing technique for crevice corrosion detection of gasketed pipe joints. The main advantages would be that the sensing probe apparatus can be easily adapted for inspection of different sizes of flanges, quickly mounted and dismantled, easily maneuvered on the outer side of the joint, and the costs for development and application of this technique will be very low. By means of multiple and repeated resistivity measurements of the whole area of possible attack by crevice corrosion, and after graphical data processing by computer, an image may be obtained.

M.L. ENERGIA, INC.
P.O. BOX 1468
PRINCETON, NJ 08542
Phone: (609) 799-7970
Topic#: 92-175 ID#: 92N0E-047
Office: NAWCLKE
Contract #:
PI: Dr. Moshe Lavid
Title: Environmentally Benign Disposal of Substances
Abstract: Research into the possible unconventional engine candidates that e2cclude the use of pistons, rotors (Wankel type), lever arm mechanisms, and conventional aerodynamic turbine components, reveals a surprisingly vast array of pumping machinery. Therefore, this Phase I feasibility study will provide the opportunity to investigate a variety of design approaches potentially capable of meeting the current RPV/UAV heavy fuel propulsion requirements. Inherent specific performance limitations of piston and turbine engines dictates scale reduction will demand greater design discipline relative to the physics that govern their performance. The preferred system concept incorporates a combination of innovative translations of rotary to reciprocating motion resulting in a compact design of high mechanical efficiency. High thermal efficiency will be achieved by

the incorporation of low surface/volume geometry. The design makes extensive use of synergism.

MANAGEMENT SUPPORT SERVICES, INC.
1426 TWIN BRANCHES CIRCLE
MARIETTA, GA 30067
Phone: (404) 640-1906
Topic#: 92-066 ID#: 92N1A-372
Office: NAVSEA
Contract #: N00024-92-C-4310
PI: Timothy P CRAMPTON
Title: Rack Mounted/LRU (Line Replacement Unit) Distributive Back-up Power System
Abstract: Abstract available from the NAVY SBIR office. Contact Mr. Vincent Schaper at (703) 696-2760.

MASSA PRODUCTS CORP.
280 LINCOLN STREET
HINGHAM, MA 02043
Phone: (617) 749-4800
Topic#: 92-088 ID#: 92N36-013
Office: NUSC
Contract #: N66604-93-C-0409
PI: Donald F. Massa
Title: Low Frequency Spark Gap (Plasma) Transducer
Abstract: The spark gap underwater sound transducer is a 50-year-old technology which was studied at length during the late 1950's, principally by Edgerton at MIT and by Caulfield at the Woods Hole Oceanographic Institution. Originally it was intended as a low-frequency sound source for sub-bottom seismic exploration. In Phase I, the spark gap transducer will be studied, analyzed and converted from a seismic transducer to a transducer more suited for compact-size low-frequency sonar applications. This will be accomplished by integrating the spark gap source with mechanical or hydraulic resonators or wave filters. A breadboard model will be constructed and tested.

MATERIALS SCIENCES CORP.
930 HARVEST DRIVE
BLUE BELL, PA 19422
Phone: (215) 542-8400
Topic#: 92-078 ID#: 92N32-054
Office: NSWCDDWO
Contract #: N60921-93-C-0126
PI: CHATTERJEE
Title: Nondestructive Evaluation of Reinforced Ceramics for Radomes
Abstract: Fiber reinforced ceramics for future generation radomes and suitable nondestructive test methods for their evaluation will be considered. Types, sizes, locations of possible flaws and anomalies in fiber architecture and other microstructural details of materials in use and of new materials under development will be identified. Critical sizes and other parameters for such anomalies will be determined based on analytical and/or semi-empirical estimates of their adverse effects on dielectric and thermomechanical properties of selected material systems. Few NDT methods, which may include ultrasonics, radiography, various microscopy, computed tomography, thermal imaging, etc , will be selected based on current knowledge of their capabilities (to detect flaws of expected sizes) and/or analytical simulations. Selected methods will be used in NDT on samples of procured materials and the results studied, compared and interpreted. Cost, advantages and improvements needed in the methods will be analyzed for selection of a couple of methods for possible prototype devices to be considered for Phase II.

MATERIALS SCIENCES CORP.
930 HARVEST DRIVE, SUITE 300
BLUE BELL, PA 19422
Phone: (215) 542-8400
Topic#: 92-171 ID#: 92N0A-123
Office: NAWCWAR
Contract #:
PI: BRIAN J. SULLIVAN, PH.D.
Title: Detection of Thermal Damage in Composite Materials
Abstract: Fiber reinforced composites are being used increasingly as primary structural components in avionic application. The organic matrix composites used in these applications, when exposed to extreme thermal environments, undergo chemical and physical changes which adversely impact their mechanical properties. Therefore there is a critical need for reliable and effective NDE methods to assist in determining the integrity and serviceability of these composites. Of particular interest here is thermal damage of a dispersed nature, along with overall matrix degradation due to a change in the resin glass transition temperature, both of which are difficult to detect by conventional methods, and thus "advanced" NDE techniques must be applied in attempts to detect them. To assist in the feasibility assessment of NDE methods for detecting such damage, specific analytical problems which must be addressed. These include the interpretation of NDE data in characterizing the type and extent of thermal damage,

and the quantification of the effect or the thermally induced damage on load carrying capability of the composite. The primary objective of the Phase I technical effort will be to identify those NDE methods which demonstrate the greatest potential for detecting non-isolated thermally induced damage in graphite epoxy composites. As a secondary objective, the techniques will be classified according to the degree of damage quantification they provide, and the difficulties associated with assigning levels of damage based on the interpretation of the NDE signals.

MATHTECH, INC.
5111 LEESBURG PIKE
FALLS CHURCH, VA 22041
Phone: (703) 824-7440
Topic#: 92-038 ID#: 92N1A-010
Office: NAVSEA
Contract #: N00024-92-C-4307
PI: Jo Ellen HAYDEN
Title: Life Cycle Cost - a Tool For Designers and Logisticians
Abstract: In this SBIR proposal, Mathtech first describes the Life Cycle Cost process, including information on types of models, types of costs, usefulness of various costing methodologies in the various life cycle phases, and descriptions of analogy, parametric, and engineering estimating methodologies. Also included is information on what qualities are essential if a model is to be useful. Mathtech then describes its approach to developing an LCC model for use in NAVSEA, specifically to study the out-year logistics impacts of various competing equipment designs. Several existing models, from which the new model might be developed, are discussed. Finally, possible sources of input data are discussed, and forms of output data are proposed.

MATHTECH, INC.
5111 LEESBURG PIKE, SUITE 702
FALLS CHURCH, VA 22041
Phone: (703) 824-7429
Topic#: 92-167 ID#: 92PMT-304
Office: NAWCFTEG
Contract #:
PI: JO ELLEN HAYDEN
Title: Engineering Economy Analysis of an Inter-Communications System Conversion for the E-2C
Abstract: In this SBIR proposal, Mathtech describes the current and proposed Intercommunication Systems (ICS) for the E-2C aircraft, and demonstrates its technical competence in this area. A discussion of Life Cycle Cost analysis, including information on types of models, types of costs, usefulness of various costing methodologies in the various life cycle phases, and brief descriptions of analogy, parametric, and engineering estimate cost estimating methodologies are then provided. Possible sources of input data for the analyses are listed, and deliverable products are described. This project contains a clear benefit to the government in that a rational basis for either retention of the current ICS. or selection of a replacement ICS, will be demonstrated and documented.

MDL, INC.
616 CENTRAL AVENUE SE
ALBUQUERQUE, NM 87102
Phone: (505) 842-6335
Topic#: 92-039 ID#: 92N1A-020
Office: NAVSEA
Contract #: N00024-92-C-4328
PI: Dr Larry A HARRAH
Title: A Radiachromic, Visually Read, Personnel Dosimeter
Abstract: A bulk cast, radiachromic dye sensitized, plastic dosimeter for ionizing radiation is to be examined. A visually read, transparent device which colors on radiation exposure is proposed. This device is read visually by comparison with dyed paper or card stock to give an estimate of exposure dose without the need for any electronic equipment. The system is based on triphenyl methane leuco dyes in solution in bulk cast polymers derived from ring substituted derivatives of polystyrene. the sensitivity, stability and utility of this concept are explored as are the conditions necessary for visual dose estimation.

MELLER OPTICS, INC.
P.O. BOX 6001
PROVIDENCE, RI 02940
Phone: (401) 331-3717
Topic#: 92-118 ID#: 92PMT-040
Office: NAVAIR
Contract #:
PI: TED TURNQUIST
Title: Deterministic High Speed Grinding of Sapphire Domes
Abstract: Sapphire, and other hard brittle materials, are highly regarded as missile domes because of their high mechanical strength and thermal characteristics. Conventional finishing processes used to provide for the final configuration of the domes

can be as much as 50 percent or more of the total cost. A new fabrication process for sapphire domes is proposed to reduce the cost of grinding from a scooped dome blank to a prepolished stage by 20 to 30 percent. Specialized sapphire grinding tools and abrasives will be integrated with the high speed, statistically controlled CIM prototype system currently in use at the University of Rochester. The OPTICAM System had already demonstrated a 20 to 30 percent reduction in the fabrication times for several common glasses. A new fabrication process for grinding a sapphire dome to a prepolished condition will be developed and tested. We seek to prove that a similar time reduction can be achieved in sapphire. A second sapphire dome will be fabricated from a scooped blank to the same accuracy using conventional methods. These times will be used as a baseline for evaluation of the high speed technique.

MHM CONSULTANTS
5903 MOUNT EAGLE DRIVE
ALEXANDRIA, VA 22303
Phone: (703) 329-8027

Topic#: 92-086
Office: NUSC
Contract #: N66604-93-C-0361
PI: Michael H. Moore

ID#: 92N36-003

Title: Multi-Static Active Sonar: Contact Association and Data Fusion

Abstract: The new high-powered sources for active sonar systems like MSS are expected to produce a much larger amount of "data", much of which is clutter. This situation will greatly complicate the information processing (IP) tasks, especially in the area of the already difficult data association problem. At the same time, all of the traditional tasks remain: fusion of contact reports from different sensors (possibly of different types), compensating for missed detections, etc. This proposal offers to meet these demands by decomposing IP into two stages: a data association stage, which will be accomplished by efficient and computationally inexpensive mathematical programming techniques, and state-estimation stage, which will be accomplished using traditional techniques on the pre-associated data. Experience has shown that this approach can work for the multi-static systems of interest.

MICHAEL HUNG, INC.
3130 QUAIL RIDGE CIRCLE
ROCHESTER, MI 48309
Phone: (313) 370-2238

Topic#: 92-058
Office: NAVSEA
Contract #: N00024-92-C-4327
PI: Judy C Hung

ID#: 92N1A-272

Title: Shearography for Non-Destructive Bond Evaluation for Submarine Hull Coatings

Abstract: This proposal aims to develop and adapt a novel optical technique called digital shearography for non-destructive bond evaluation of submarine hull coatings. Shearography is somewhat analogous to a large number of strain gages as it permits full-field measurement of strain distribution. It detects flaws in materials by-detecting flaw-induced strain anomalies. Being full-field, non-contacting, and not requiring installing strain gages, the technique appears to have the potential for development into a practical technique for nondestructive evaluation of large objects such as submarine. Despite being a young technique, shearography has already been accepted by the rubber industry for nondestructive evaluation of tires, and by the aerospace industry for nondestructive evaluation composite materials. The proposed investigation aims to prove the feasibility of extending shearography to inspecting rubber to metal bonds. The immediate goal is to accomplish the above objective, and the ultimate is to develop shearography into a fully automated and user-friendly tool for nondestructive evaluation in field/production environments.

MIKROS SYSTEMS CORP.
3490 U S ROUTE NO 1
PRINCETON, NJ 08540
Phone: (609) 987-1513

Topic#: 92-083
Office: NSWCDDWO
Contract #: N60921-93-C-0144
PI: BURNS

ID#: 92N32-122

Title: New System Concept for Long Range Underwater Communication of Tactical Data

Abstract: A new system concept is proposed which could greatly improve the Navy's ability to conduct Anti-Submarine Warfare (ASW). The concept involves the long range communication of the Battle Group's tactical data to deeply submerged submarines via a sophisticated and very high performance acoustic data link. The proposed system will operate in conjunction with Link-11 and will transmit the same tactical data to submarines that the rest of the Battle Group receives on a real-time basis. A new dual purpose Data Terminal Set (DTS) is required to modulate/demodulate the Link-11 waveform, as well as the new waveform required for reliable underwater operation. No changes are necessary to the NTDS. This is an extremely important capability

that the Navy currently does not have.

MILLIMETER WAVE TECHNOLOGY, INC.
1395 S MARIETTA PARKWAY
MARIETTA, GA 30067
Phone: (404) 425-9382
Topic#: 92-051 ID#: 92N1A-202
Office: NAVSEA
Contract #: N00024-92-C-4325
PI: Dennis J Kozakoff
Title: RAM Plastic Periscope Plastic Head
Abstract: A submarine periscope is modeled as a cylindrical metal reflector poking out of a rough sea. The time variant component of its radar cross section (RCS) behaves as a Swerling Type I target whose magnitude can be reduced by application of RAM. Various options exist for incorporation of RAM into an outer periscope head which can be retrofitted to equipment already at sea. These options include encapsulating or compound molding RAM into a finished part. Injection molding the head from a resistive plastic matrix is another possibility. The research herein looks at detailed mechanical and electrical requirements, and methodology for incorporating RAM into a plastic periscope outer head. As part of this research, flat panel samples of material are fabricated and electrically tested. Consideration is given to cost, producibility, and combat survivability of the finished parts.

MISSION RESEARCH CORP.
735 STATE STREET
SANTA BARBARA, CA 93102
Phone: (805) 963-8761
Topic#: 92-088 ID#: 92N36-023
Office: NUSC
Contract #: N66604-93-C-0407
PI: Mr. Gary R. Hess
Title: Repetitive, Energetic, Plasma Projector System (REPPS)
Abstract: Scientists at Mission Research Corporation (MRC) have developed a concept for a sound projector (Repetitive Energetic Plasma Projector System (REPPS) which may have sonar countermeasure applications. The projector would utilize the well-known technique of an electrical discharge in water to produce a very energetic, broad-band, acoustic pulse. An original hypothesis on how to optimize the electrical to mechanical energy conversion efficiency has been validated by MRC's recent Plasma Driven Water Shock (PDWS) work for the Defense Nuclear Agency (DNA). Recent advances in pulsed power technology have made possible very compact and powerful systems that ten years ago were not feasible. In addition, recent demonstration of Water's capability as a high energy, repetitive, switching fluid further enhances this technique for a system application. We propose to design a complete REPP System, design and test in water a plasma projector element and sonar dome. The objective is to explore the development of a high source level (280 oB), broadband acoustic source.

MOLTECH CORP.
ENGINEERING BUILDING - SUNY
STONY BROOK, NY 11794
Phone: (516) 632-7565
Topic#: 92-013 ID#: 92N3B-613
Office: MCRDAC
Contract #: N00164-92-C-0179
PI: Terje Skotheim
Title: Rechargeable Lithium Batteries - a New Battery Chemistry Based on Polymer Electrolyte and Polymeric Cathodes
Abstract: A new battery chemistry based on ambient temperature Lithium ion conducting polyorganosiloxane network polymer electrolyte (PE) and polymeric redox (PRC) cathode materials has been developed at Moltech Corporation. The components of the battery system are processable materials that can be used in the fabrication of an all solid state thin film polymer electrolyte batteries of any shape, size and capacity. Prototype 2.0 mAh capacity cells in the thin film flat planar configuration showed about 80% cathode utilization at C/10 rate, excellent rechargability with more than 800 cycles at 3 different C-rates and long shelf life. Based on our preliminary cell data, we propose to optimize the cell components in the design of a scaleup prototype and evaluate the electrochemical performance. Thin film rechargeable batteries of various capacity will be fabricated to determine the energy and power densities, cycle life, rate capability, charge retention capability, cycling performance and overcharge and overdischarge phenomen. Finally an attempt will be made to assess the use of the proposed Lithium/polymer electrolyte/PRC redox battery systems to power military communication equipment, portable computers and other electronic devices.

MOUNTAIN OPTECH, INC.
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BOULDER, CO 80301
Phone: (303) 444-2851
Topic#: 92-137
Office: NAWCWAR
Contract #:
PI: D. TIM PENNEY
ID#: 92N0A-025
Title: Military-Grade 3.5-Inch Rewritable Optical Disk Drive
Abstract: The objective of the proposed effort is to identify and investigate the technology status of suitable digitally-adaptive electronics and 3.5-inch rewritable optical heads, which will operate in severe environments, for incorporation into a SEM-E package. Mountain Optech intends to examine the outcome of its seven years of development experience with 5.25-inch military and rugged optical disk drives for synergy with the smaller form factor military requirements. It is believed that much of the MOI-developed digitally-adaptive electronics, which allow a drive's focus and track servos and read/write electronics to compensate for environmentally induced effects, will be capable of functioning in the smaller form factor with minor modifications. Mountain Optech also intends to investigate the possibility of utilizing the latest innovations in sub-micron chip technology which are evolving from the commercial optical disk drive industry.

MSNW, INC.
P.O. BOX 865
SAN MARCOS, CA 92079
Phone: (619) 489-9471
Topic#: 92-120
Office: NAVAIR
Contract #:
PI: DR. JOHN T. PORTER
ID#: 92PMT-050
Title: Imide/Graphite Composite Degradation Characterization
Abstract: Metal/Bismaleimide composite couples will be tested using systematic variation of electrolyte composition, atmosphere, and metal composition to establish the damage mechanism(s) for couples exposed to salt water and for correlation with observed field behavior. Scanning electron microscopy examination will be employed to identify the location and character of localized attack. The results of these studies will be used to identify the most promising strategies for minimizing or eliminating the sources of damage.

MUDAWAR THERMAL SYSTEM, INC.
1217 DRAWBRIDGE
LAFAYETTE, IN 47905
Phone: (917) 463-5258
Topic#: 92-136
Office: NAWCIND
Contract #:
PI: Wolfgang Leidenfrost
ID#: 92N40-240
Title: Subcooled Liquid Change of Phase Thermal Management for Electronic Packaging
Abstract: The proposed work involves assessment of the feasibility of removal of large, concentrated heat fluxes from multi-chip circuit boards in high performance aircraft by means of liquid jet impingement cooling with subcooled change of phase. Previous studies have shown that, unlike many other types of liquid immersion concepts, the thermal performance of the proposed concept is more sensitive to coolant velocity than to flow rate. Thus, performance can be greatly enhanced by reducing jet width (in order to increase jet velocity) without increasing the coolant flow rate. Key features of the proposed jet impingement concept are its ultra high heat dissipation capabilities, up to 660 Watts per device using FC-72, small pressure drop and simplicity of design and fabrication. The key objectives of the proposed project are designing a single multi-jet manifolding plate which can be accommodated within the geometrical constraints of avionics cooling modules, modeling the development of vapor bubbles on the device surface (to establish design guidelines for preventing dryout and ensuring complete condensation of the bubbles prior to exiting the module), and designing the module itself, maximizing the use of commercially available hardware.

MUITISPEC CORP.
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CHERRY HILL, NJ 08003
Phone: (609) 751-0013
Topic#: 92-009
Office: ONT
Contract #: N66001-92-C-7011
PI: Dr. David Sheby
ID#: 92N40-096
Title: Signal Representation for Nonlinear and/or Nonstationary System Identification
Abstract: An innovative approach is proposed for the analysis of nonlinear and/or nonstationary signals and systems/sources that generate them. This approach is based on a canonical functional representation which yield multidimensional measurements of the nonlinear and/or nonstationary characteristics and allow system identification beyond usual linear and time-invariant

(stationary) models. This approach can be applied to acoustic, electromagnetic and communication signals to extend recognition/classification capabilities beyond traditional linear time/frequency domains and reduce false alarm rates. The proposed techniques utility/power will be demonstrated by detailed analytical derivations, computer simulations, and test results on acoustic end radar data representing detection/classification tasks of interest to the Navy. MultiSpec has considerable experience with nonlinear and/or nonstationary analysis of real data in areas of importance for the Navy. Ultra-wideband radar is enhanced when converted into a system identification task and higher-order signal analysis tools are used for target characterization. Data from ultra-wideband radar discrimination experiments using targets of metal, clutter, and radar absorbent materials are shown in terms of bispectra and nonlinear kernels. Theory, simulations, and actual results from underwater acoustic data show the achievable with our new techniques for nonstationary analysis of transient signals.

N.TEXAS RESEARCH & DEVELOPMENT CORP
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Phone: (817) 565-4679
Topic#: 92-107
Office: ONR
Contract #:
PI: Jose M. Perez
ID#: 92N01-003
Title: Experimental Nonlinear Dynamics of Laser Systems
Abstract: We propose an experimental study of controlled regimes in an Nd-doped yttrium aluminum garnet (Nd:YalG) laser and in small ensembles of coupled CO2 lasers (2-4) modules coupled according to different schemes). Nd:YA1G lasers are believed to display an intrinsic chaotic behavior-1 at sufficiently high pumping power. Long experimental time series from such a system will be re-examined and the reliability of the numerical estimation of the Lyapunov spectra checked against recently proposed criteria2. Some other criteria of distinguishing chaos from an "amplified noise"-3 will be used. An attempt will be made to obtain the chaotic regime of lasing for this laser by different means such as periodic modulation of some system parameters, radiation injection from another lasing unit and different feedback schemes -4. Being sure that the system indeed resides on a low-dimensional attractor for some of the tested regimes, we intend to reexamine the technique of stabilization of unstable periodic orbits embedded in an attractor by the occasional proportional feedback method-5 already demonstrated effective for the Nd:YA1G laser-1 in the autonomous chaotic regime. The experience from this series of experiments will be used in an attempt of controlling intrinsic and/or induced chaos in small arrays of up to four coupled CO-2 lasers. Different coupling schemes and array geometries will be used. There is a theoretical and restricted experimental evidence that at least some coupling schemes (e.g., two CO2 lasers optically coupled by a semitransparent mirror-6) are indeed chaotic and can be described by low dimensional systems of ODE's. The same as above methods of testing chaos will be used and the stabilization of the periodic orbits attempted for some of the realizations of coupled arrays.

NAVMAR APPLIED SCIENCES CORP.
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Phone: (215) 675-4900
Topic#: 92-170
Office: NAWCWAR
Contract #:
PI: ELLEN MCGRODY
ID#: 92N0A-007
Title: Ladar Identification Technology Demonstration
Abstract: The Phase I effort will provide an integrated design for a CO2 LADAR that meets the performance criteria of: (a) maximum volume = 3 ft.3, (b) minumum power = 75 watts, cw, (c) laser stability < 20 Hz (see discussions in Section III) over 1 msec and 20 KHz over 1 sec, (d) maximum weight = 200 lbs: and to provide a real-time demonstration plan for performing long-range identification. Phase I will examine the new IR&D design of a stable laser oscillator (STALO) to determine its ability meet the revised stability requirement of 20 Hz over 1 msec. The impact of this new design on overall system parameters i.e. size, weight, and volume will be assessed. Current laboratory equipment has demonstrated 100 watts at less than 100 lbs. and a volume of 2 ft. 3 all of which presently meet the remaining requirements for the SBIR. Phase I will also examine methods of providing accurate pointing and tracking for the LADAR equipment. Standoff ranges (> 50 nmi) impose stringent requirements for such. Existing facilities and equipments will be investigated to determine feasibility of interfacing the LADAR equipment to achieve required performance for the ground-to-air demonstration. The design of these equipments will be such that they can be incorporated into aircraft for subsequent Phase III development by the Navy. Issues of standoff ranges against airborne targets will be assessed as to their impact on the design of a stable oscillator laser power output and optical aperture. Modifications to existing equipments will be defined in Phase I for implementation during Phase II. Phase II will demonstrate the capability of a LADAR to perform standoff against aircraft type targets.

NEOTERIC TECHNOLOGIES, INC.
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Phone: (205) 650-4601
Topic#: 92-104 ID#: 92N47-267
Office: SPAWAR
Contract #: N00024-92-C-4298
PI: James W Neiers
Title: Ship Design Life Cycle Costing Assistant
Abstract: This project establishes the baseline for developing a usable ship design Life Cycle Cost (LCC) estimating assistant that adequately accounts for Producibility and Operation and Support (O&S) costs. Existing Cost Estimating (CE) methodologies are unsatisfactory, primarily due to their dependency upon data that is impossible or impractical to get, especially during the acquisition phase and particularly pertinent to O&S costs. This effort provides a review of the many CE methodologies, initiatives to improve shortcomings, and research into their efficacy. A prime result will be the identification of the critical causal relationships of LCC drivers, minimal essential data, and potential sources of that data. Concentrating on those critical elements, favorable CE methodologies will be augmented with a CE expert system to provide a CE assistant usable for ship design trade-offs in early program phases. Augmentation includes the structure of a corporate data base of program LCC experience across programs, use of operational simulators to expand the experience base with synthetic data from "what-if" scenarios, and navigation and parameter generation help to interface to specialty engineering models throughout DoD and industrial organizations. Approaches to acquire and preprocess actual O&S data will also be identified.

NEURODYNE, INC.
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Phone: (617) 437-9106
Topic#: 92-128 ID#: 92PMT-128
Office: NAVAIR
Contract #:
PI: THERESA W. LONG
Title: Learning-Optimal Control for Unmanned Supermaneuverable Technologies (LOCUST)
Abstract: The development and implementation of nonlinear, learning control systems for Unmanned Air Vehicles (UAVs) will have three major impacts upon their capabilities; increased survivability, extended range of operations, and reduced development costs. The Learning Optimal Control for Unmanned Supermaneuverable Technologies (LOCUST) system will team Neurodyne, Inc. and Sikorsky Aircraft in the utilization of neural network based system identification techniques and optimal control methods to rapidly learn changes in a vehicle's aerodynamic behavior and adapt to sudded meteorological effects while ensuring flight stability. The combined use of neural networks and nonlinear supermaneuverable flight control approaches will also utilize the nonlinear characteristics of the vehicle's dynamical response to increase maneuverability and thus increase survivability. In this effort, Neurodyne and Sikorsky will leverage current research programs in neural networks, nonlinear control, and UAV technology to ensure successful development of LOCUST. The investigators will further leverage in-house and commercially developed on-board sensors and processing techniques to increase both autonomy and range. LOCUST development will also benefit from the investigator's experience in research and development of neural network based reconfigurable flight control systems for the McDonnell F-15 aircraft and RC UAVs to ensure development of a cost-effective, robust adaptive control system.

NKF ENGINEERING, INC.
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Topic#: 92-079 ID#: 92N32-082
Office: NSWCDDWO
Contract #: N60921-93-C-0122
PI: POURDEYHIMI
Title: Measurement of Shipboard Coatings to Prevent Corrosion Failures
Abstract: The current method of assessing the condition of paint protective coatings is by human visual evaluation using ASTM pictorial guides for comparison and condition definition. This is purely subjective and the results are affected by area size and geometry and human interpretation. By developing an automated vision system that can enhance the paint surface image and provide an objective assessment, one would provide a means of obtaining more accurate and consistent results. The approach of this research is to use the ASTM pictorial guides and painted plate samples to establish the usual characteristics of the paint failure mechanisms. Using available electronic hardware, a number of programming techniques for image processing and analysis would be explored to provide assessment of enhanced images of paint. Both visual light and infrared red frequency band reflected energy imaging techniques will be included.

NORTHWEST TECHNICAL INDUSTRIES, INC.
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Topic#: 92-097 ID#: 92N25-006
Office: NCCOSC
Contract #: N66601-92-C-7015
PI: Alan W. Hare

Title: The Use of Explosive Welding to Create Protective Coatings for Liquid Metal Combustion Containment

Abstract: The purpose of this effort is to develop a technique for protecting Hastelloy S from corrosion caused by liquid lithium. This can be achieved by coating the Hastelloy S with a refractory metal (tantalum, molybdenum, and tungsten). Northwest Technical Industries proposes to use explosive welding to metallurgically bond a thin layer of tantalum, molybdenum and tungsten to Hastelloy S. The objectives of this effort are: 1. Determine the parameters required for explosively welding tungsten to Hastelloy S. 2. Determine the parameters required for explosively welding molybdenum to Hastelloy S, and 3. Determine the parameters required for explosively welding tantalum to Hastelloy S, and 4. Perform ultrasonic testing on each material sample. To accomplish each objective several interations of each material combination will be required to obtain the optimum parameters.

OCEANEERING TECHNOLOGY, INC.
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Topic#: 92-015 ID#: 92N07-040
Office: MCRDAC
Contract #: N00167-92-C-0031
PI: James L. Finney

Title: Electrical Rotary Motion Actuator

Abstract: Abstract: Future land and amphibian combat vehicles will eschew hydraulically-powered subsystems in favor of direct electric analogues where available to take advantage of the higher inherent efficiencies, reliabilities and safety possible from eliminating a power conversion process using hydraulics. A relatively high-torque, partial turn actuator has been identified as a subsystem needing development. Specifically, an actuator with the following general specifications has been identified as appropriate for the AAAV: * 270 VDC operation * 12,000 inch-pound rotational torque capacity * 180 degrees of rotation * 50 pound weight * 8-inch body diameter * Positive locking capability to full torque with less than 5 degrees slippage * Suitable for operation submerged in seawater * Rotation rate of 3 RPM equivalent under full torque * Combat level reliability In conjunction with a program to develop a high-reliability, long-lived ROV (remotely operated vehicle) for application in the offshore oil industry, Eastport International, Inc.(EII), has been working with a similar group of requirements for an underwater valve adjusting tool. Our proposal is to adapt the elements of this ROV subsystem now undergoing design evaluation to the specific requirements of this SBIR, enhancing the SBIR concept by incorporating ideas already apparent from the ongoing torque tool study.

OLYMPIC LOAD & TEST, INC.
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Phone: (206) 683-4527

Topic#: 92-010 ID#: 92N40-130
Office: ONT
Contract #: N60921-92-C-0148
PI: Reed D. Copsey

Title: Liquid High Explosive Testing for Shallow Water Mine Clearing

Abstract: The U.S. Navy and Marine corps must be prepared to assault beaches laden with land mines and proximate to a region of water ranging from the beach high water mark to a depth of 80 feet which may also be laden with anti-ship mines. An effective method is required to counter this mine threat, which is compatible with naval assault time-lines, existing fleet assets, insensitive munitions requirements, volume and weight restrictions and is cost effective. Olympic Load and Test, Inc. (OLTI) and its parent company C Tech Development Corporation, aB a consequence of significant independent research into the use of binary liquid high explosives have developed a Shallow Water Countermine concept which meets these requirements. OLTI research into the use of liquid high explosives for countermine operations has resulted in the evolution of an elegantly simple and cost effective approach to clear a beach assault lane of mines. The concept is compatible with existing U.S. Naval fleet assets, and offers an unprecedented level of explosive storage and employment safety. During Phase I, OLTI will perform a series of instrumented underwater explosive tests to provide a database for system design and Phase II large scale testing.

OMNITECH ROBOTICS, INC.
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LITTLETON, CO 80127
Phone: (303) 933-0239
Topic#: 92-012 ID#: 92N07-080
Office: MCRDAC
Contract #: M67854-92-C-0193
PI: David W. Parish
Title: Standardized Teleremote Kit for Marine Corps. Vehicles
Abstract: Teleremote control of a USME or other conventional vehicle can be simplified through the use of a standardized kit for teleremote control. This standardized kit requires actuators, linkages control electronics, vehicle driving sensors, provision for generic payloads and sensors, and a communications link to a portable control unit. Omnitech Robotics, Inc. is proposing to design an innovative, flexible, and low cost solution to such a standardized teleremote kit for USMC vehicles under the proposed phase I activity.

ORINCON CORP.
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Phone: (619) 455-5530
Topic#: 92-086 ID#: 92N36-030
Office: NUSC
Contract #: N66604-93-C-0406
PI: Mr. Jon H. Petrescu
Title: Multistatic Active Sonar: Contact Association and Data Fusion
Abstract: With the advent of bistatic and multistatic active sonar systems, innovative techniques are required to maintain association of acquired and reacquired contacts. Contact association and data fusion will address three issues. The first issue concerns processing on a single receive platform, where incorrect associations of the Multistatic System Sonar (MSS) Sequential Detector are detected and corrected by the Geographic tracker. The second issue will address multiple receive platforms, with consort data fusion processing occurring on a single receive platform. ORINCON proposes to modify the MSS Information Processor (IP) to examine the performance and effectiveness of single hypothesis trackers (SHT) versus multiple hypothesis trackers (MHT) in the bistatic and multistatic operating environment. For the third issue, ORINCON will identify a method of recognizing and removing range-ambiguous contacts in the tracker, thereby reducing one false alarm contributor. ORINCON will identify performance enhancements over the current MSS tracker algorithm and demonstrate that a MHT tracker operating on ownship data and single hypothesis track data transfers from other receivers can provide better performance that single hypothesis trackers linked together.

ORINCON CORP.
9363 TOWNE CENTERE DRIVE
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Phone: (410) 290-3280
Topic#: 92-127 ID#: 92PMT-111
Office: NAVAIR
Contract #:
PI: DR. S. LAWRENCE MARPLE, J
Title: SAR/ISAR Real-Time Image Processing for Air ASW Platforms
Abstract: Three signal processing approaches are proposed here to better exploit the SAR/ISAR signal differences between sea surface noise clutter/speckle and periscope/other small manmade target signatures that have been used in previous algorithms. A special high-resolution, two-dimensional (2-D) spectral analysis approach for creating the SAR/ISAR image, rather than using the traditional 2-D fast Fourier Transform (FFT), is demonstrated to significantly reduce clutter while sharpening the resolution of target signatures. After the radar image is formed, two other signal processing techniques can be used to enhance detection of small targets in the presence of image clutter. Polycorrelation techniques (specifically, the biocoherence) are shown to yield uniquely distinctive signatures between target-in-clutter regions and clutter-only regions of SAR imagery. Time-versus-frequency representation (TFR) signal processing techniques can better exploit the Doppler signature difference between targets and clutter, as demonstrated with helicopter radar data in this proposal.

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Phone: (619) 455-5530
Topic#: 92-150 ID#: 92PMT-224
Office: NAVAIR
Contract #:
PI: MR. DONALD K. OWEN
Title: Air ASW Acoustic Clarification
Abstract: The ASW threat in the current, post-cold-war environment is the slow-moving, low-target strength, quiet diesel submarine. The shallow water environments they typically operate in make the task of detection even more difficult. These

conditions will require the use of an active sonar with a classifier architecture that can operate robustly in a variety of harsh environments. ORINCON proposes to develop both classification feature algorithms and feature vector classifier architectures. Features that are useful in both monostatic and multistatic scenarios will be developed. Classical feature vector classifiers as well as neural network classifiers will be examined. We have specific experience using neural networks to classify active returns recorded with the BSY-1 system and the Low Frequency Active (LFA) system. Automatic classification systems of this type provide 360-degree classification coverage, assistance to inexperienced operators, and the ability to "dig" targets out of clutter and reverberation. ORINCON proposes to identify techniques for active classification and define promising active classification algorithms. We will identify existing recorded data collected during Fleet operations for algorithm testing. A general method to prepare simulated recordings of active returns in a realistic background is also presented and a plan to solidify it is proposed.

PACIFIC-SIERRA RESEARCH CORP.
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Phone: (310) 820-2200
Topic#: 92-160
Office: NAVAIR
Contract #:
PI: RONALD S. BIRD
ID#: 92PMT-272
Title: FLIR Training System
Abstract: The team of Pacific-Sierra Research Corporation (PSR) and the University of Dayton Research Institute (UDRI) propose four tasks: (1) identify FLIR/NVG training requirements and develop a preliminary training syllabus, (2) select appropriate training techniques based on Task 1 results, (3) identify a candidate training medium, and (4) prove medium viability utilizing a prototype demonstration system. Because of extensive previous involvement supporting the Naval Air Systems Command, Armstrong Laboratories, and the Center for Night Vision and Electro-Optics on EO training requirements research and training systems development, the PSR/UDRI team is able to focus effort primarily on Task 4. As a result, the risk associated with a successful Phase II demonstration will be extremely low.

PHOTONIC SYSTEMS, INC.
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Topic#: 92-046
Office: NAVSEA
Contract #: N60921-92-C-0144
PI: Dennis R Pape
ID#: 92N1A-155
Title: Advanced Signal Waveform Classifier
Abstract: The rapidly changing military signal environment has reduced the probability of detecting and correctly identifying signal emitters with conventional signal analysis techniques. Increasingly complex waveforms covering large spectral band-widths are now being used. In addition, the number of active emitters has increased dramatically. Coupled with this rapidly rising processing load is the use of techniques designed to counter the signal database identification process; for example intentionally increasing the parameter limits of the emitter or changing one or more of the emitter operating parameters. Clearly new signal processing techniques are needed for both emitter detection and identification. Our approach addresses both of these problems with an optical signal processor/receiver for emitter detection and angle-of-arrival determination followed by a neural network uses a unique classifier scheme already proven to work well in EW pulse classifier applications, and optical emitter detection and identification applications.

PHYSICAL OPTICS CORP.
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Topic#: 92-005
Office: ONT
Contract #: N60921-92-C-0136
PI: Gajendra Savant, Ph.D.
ID#: 92N40-051
Title: Highly Rugged and Highly Stable Terahertz Electrooptic Switches and Modulators
Abstract: The goal of this program is to develop an organic nanosecond speed nonlinear optical material that responds in the 700 nm to 1.5 Km region of the spectrum, and to fabricate a modulator based on it and POC\'s USP 5,067,788, Nov 26, 1991. Phase I effort will involve integrating POC\'s recent advances in stabilizing poled X(2) polymer with an ultra high speed (> 5 GHz) optical modulator in a monolithic multilayer structure consisting of surface plasmon wave polarization resonant coupling. Although the poled organic polymer in the thin film configuration (which is consistent with POC\'s patented modulator) offers many advantages over photorefractive crystals including a large ED coefficient and low dielectric constant, the decay of the ED

coefficient due to relaxation is a serious problem. In fact, this is exactly the issue POC intends to address in Phase I, based on its ongoing efforts involving crosslinking and optimized processing. POC will work closely with Jeff Lindsay of the Naval Weapons Center, China Lake and Prof. Sukant Tripathy of the University of Lowell, MA. During Phase II, we will optimize the material results of Phase I and produce EO plasma modulators to be integrated with fielded Navy systems. .

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Topic#: 92-077
Office: NSWCDDWO
Contract #: N60921-93-C-0142
PI: SADOVNIK

ID#: 92N32-039

Title: Nonlinear Optical Processing with Phase Coding for Infrared Target Discrimination

Abstract: As a solution to the problem of autonomous target identification selection based on IP image data, Physical Optics Corporation (POC) proposes to build a novel all-optical nonlinear system. This real-time processor will have a narrow band intensity response, enabling it to single out a certain temperature range pertaining to the target of interest. In order to improve a previously known method for input image coding, POC proposes a new concept of phase encoding. This technique eliminates the halftone recording "bottleneck": a need for complicated halftone screen design for hard-clipping recording media. The technique is expected to achieve three orders of magnitude input dynamic range and a higher light throughput, even for high-number diffraction orders. A variety of phase recording materials will be examined to demonstrate the feasibility of this concept, while Phase II research will be aimed toward real time implementation of the proposed all optical non-linear processor for narrow band discrimination. This will be done using POC\'s erasable photopolymer and optically addressed spatial light modulator. Phase II will result in an integrated optical system consisting of a nonlinear preprocessor and an optical neural network for effective pattern recognition.

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Topic#: 92-089
Office: NUSC
Contract #: N66604-93-C-0358
PI: DR. FREDDIE LIN

ID#: 92N36-034

Title: Interference Filter Based Optical Shutters With Broadband and High Light Blocking Capabilities

Abstract: Physical Optics Corporation (POC) proposes to extend the interference filter technology that it has developed for broadband, high OD, nonpolarizing filters to the protection of optical sensors. Currently, POC manufactures optical filters in the visible to near IR spectrum for soldier eye protection and automotive/architectural window glass. Based on a proprietary non-uniform interference filter technology, POC can adjust the bandwidth of the filters (from 5 nm to 450 nm) and achieve high optical density (OD operations (OD>6). Higher OD (>8) and wider broadband (>700 nm) operations can be achieved by a cascade of filters. This program proposes to embed POC's electro-optic polymers into the interference filter structure to obtain controlled variable

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Topic#: 92-108
Office: ONR
Contract #:
PI: Dr. Freddie Lin

ID#: 92N01-013

Title: An Optically-Assisted 3-D Cellular Array Machine

Abstract: In order to increase the data processing/communication abilities of the next generation real-time image processing systems, Physical Optics Corporation (POC) proposes to design a VLSI chip or chip set which will incorporate both electronic and photonic processing/communication hardware elements in one system. By using new techniques, a 3-D, Optically assisted cellular array "machine" for real-time image processing operations could be achieved and would outperform conventional, strictly electronic image processing systems. In addition to the benefit of scaleable expansion, photonic interconnect technology will allow a compact, 3-D system packaging solution without introducing the problems of heat dissipation and crosstalk that are encountered in conventional 3-D electronic signal processing hardware. Phase I work will include the designs for both electronic processing element photonic interface units which constitute the basic building blocks of the proposed 3-D, optically assisted cellular array machine. In addition, the architectural design of a real-time image processing system will also be implemented. A number of algorithms will be simulated in this conceptual system in order to demonstrate the performance of the proposed

optically assisted cellular array machine.

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Phone: (310) 530-1416
Topic#: 92-169
Office: NSWCDDWO
Contract #:
PI: Jay HIRSH
ID#: 92N2D-041
Title: Real Time Adaptive Optical Processor Based on Novel Temporally Evolving Reference Algorithms
Abstract: Recent significant advances in components, architectures, and design philosophy have at last made optical automatic target recognition (ATR) competitive with or even superior to its electronic alternative. Obviously the specific scene that is encountered (noise, obscuration, decoys, camouflage, etc.) is beyond anticipation. Thus the required system must be adaptive and tolerant, yet highly accurate. POC proposes to develop an optical correlator system incorporating novel algorithms for processing target image information. The system will be designed to recognize and track targets, then perform aim point selection in real time. The principal novelty of our approach is the development of a temporally evolving reference filter algorithm to adaptively extract target features in the presence of clutter, noise, or obstructions. Successful development of this system would greatly increase both offensive and defensive military capabilities. To determine the feasibility of POC's approach, the Phase I program will go from theory to a limited demonstration of the concept. Successful completion of Phase I will prepare us to design and demonstrate a deliverable prototype system in Phase II.

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Phone: (505) 835-2951
Topic#: 92-076
Office: NSWCDDWO
Contract #: N60921-93-C-A366
PI: BUCKLEY
ID#: 92N32-038
Title: New Generation Vulnerability/Lethality Code
Abstract: This research will develop a new generation vulnerability/lethality code based on advanced ray tracing methods. This new code will replace the current vulnerable area method and its inherent limitations. The new method will integrate the lethality code with utilities for generating 3D target models and other inputs associated with the vulnerability/lethality process. All of the code elements will be integrated into a graphical user interface for ease of use.

PIASECKI AIRCRAFT CORP.
P.O. BOX 360, SECOND STREET, WEST
ESSINGTON, PA 19029
Phone: (215) 521-5700
Topic#: 92-129
Office: NAVAIR
Contract #:
PI: FREDERICK W. PIASECKI
ID#: 92PMT-161
Title: Vertical Takeoff and Landing Unmanned Aerial Vehicle for Maritime and Close Combat Applications
Abstract: The unique criteria applicable to UAV shipboard operations will be identified and a specification established, including deck tie-down, launch and retrieval and hangaring/handling procedures. A baseline design to these criteria, with weight and balance and performance estimates, will be developed. Evaluation of the characteristics of weight, size, power, operational safety and operational control/handling qualities will be made. The command system will make maximum use of existing procedures and consoles where desirable. Effects of shipboard radar EMI will be a primary consideration in the design of the UAV automatic flight control system. A launching and retrieval system will be sized to match the vehicle's characteristics including weight, power required, stabilization system and deck handling from hangar to takeoff/retrieval position. Separate or ship's compressed air or steam will be investigated for auxiliary takeoff thrust for vertical launching. A plan for Phase II demonstration of a full-scale flight vehicle will be developed and included in the final report of the Phase I flight vehicle design activity.

PLANNING SYSTEMS, INC.
7923 JONES BRANCH DRIVE
MCLEAN, VA 22102
Phone: (703) 734-3400
Topic#: 92-018
Office: SPAWAR
Contract #: N00039-93-C-0028
PI: James F. Forren
ID#: 92N47-01
Title: Automatic Detection of Acoustic Signals on LOFAR grams Using Image Processing Technology

Abstract: The LOFARgram has long been a standard means of representing sonar signals in a combined time-frequency presentation. The LOFARgram represents a particular way of casting the time-frequency distribution of acoustic energy as a 2-dimensional image. Thus it is natural to apply the techniques of image and seismic processing to the problem we address in this proposal; namely, the need for additional capabilities for the automated detection of the full spectrum of acoustic radiation in passive undersea data and enhanced presentation to the operator. Our approach to this problem is to apply the techniques of image and seismic processing in conjunction with public and commercial image and signal processing packages to develop, on a desk top computer, a multi-dimensional signal processing testbed or tool kit which can be used to enhance desired features in time series data. The data will be display Gd in the LOFARgram format, after processing. When the tool kit is completed one or two processes will be analyzed and ROC curves developed as time allows.

PRINCETON ELECTRONIC SYSTEMS, INC.
11 GLENGARRY WAY
CRANBURY, NJ 08512
Phone: (609) 275-0070
Topic#: 92-162
Office: NAWCFTEG
Contract #:
PI: CHUNI L. GHOSH
ID#: 92PMT-284
Title: Study of Display Controls Technology for 32C Cockpit
Abstract: The present E2C cockpit does not support the display of tactical information from the combat information center. The use of flat panel displays in the E2C cockpit will make it possible for pilot and copilot to observe tactical information in a form similar to that presented to the Naval Flight Officer operators in the CIC compartment. The addition of reconfigurable displays will lead to a reduction of scan time during certain flight situations. There are a number of problems like high illumination level, severe space constraints, difficulty of accessing the controls etc. During the phase I study we will study the civilian and military controls technology to find the best controls technology to solve the problems of the E2C cockpit. Three alternative approaches will be presented to solve the problems of the cockpit controls and of image and data visualization. The present controls and the display technologies as well as future technologies that will be available in the next decade will be thoroughly studied for the purpose of the recommendations.

PRODUCT PLANNING, INC.
2125 OXFORD ROAD
DES PLAINES, IL 60018
Phone: (312) 296-1000
Topic#: 92-064
Office: NAVSEA
Contract #: N00024-92-C-4312
PI: Bernard Bishop
ID#: 92N1A-343
Title: Advanced Towed Array Handling
Abstract: Today\'s submarine towed array handling system operating parameters an methods are equivalent to those used in the late sixties. Attempts to utilize conventional cable handling methods are not suitable for array handling, and appropriate methods have not yet been defined. Outboard system volume, weight, system complexity, installation complexity, and cost far exceed acceptable standards for a handling system. Today\'s systems should be operating at double their present retrieval speed while at double ship\'s present deployment speed. To achieve both functional and operational advantage will require a new handling system concept rather than a larger machine. The proposed X-DRUM(TM) Capstan has the advantage of potentially meeting existing and next generation needs. Because of its bi-helical camming principle, bend radius is elliptically multiplied and size reduced proportionally as the square. It could provide an S-bend offset without guide tubes, which is a useful feature for submarine system installations. Its fixed drum simplicity and length to diameter aspect ratio also make this design best suited for outboard submarine installations. The intent of this feasibility study is to investigate high strength array messenger design and the possibility of dual stacked messenger operation. The advantage of dual messengers would be total encapsulation of the array, initial self threading of an array, and the capability to push the array for deployment. Our Phase I concept study will determine the probability of multiple stacked messengers and their maximum configural strength. These exploratory development concerns are primary because of submarine equipment location and reliability.

QUADRANT ENGINEERING, INC.
55 CHERRY LANE
AMHERST, MA 01002
Phone: (413) 549-4966
Topic#: 92-110
Office: ONR
Contract #:
PI: James B. Mead, PhD
ID#: 92N01-032
Title: 4-Dimensional Remote Sensing of the Marine Boundary Layer with a Digital Beamforming Radar Wind Profiler

Abstract: This proposal describes a proposed four-dimensional turbulence profiling radar for shipboard use. This radar, termed the Turbulent Eddy Profiler (TEP), is a unique system that continuously monitors the intensity of atmospheric turbulence over approximately three thousand volume cells and updates these measurements several times a minute. Using a technique called digital beamforming the TEP system simultaneously monitors all pixels within the field of view of the radar, making TEP a true four-dimensional remote sensing tool. The proposal details our objective of developing a shipboard TEP system, designed specifically for Marine Boundary Layer (MBL) research. During phase I, Quadrant Engineering will interact with scientists and engineers participating in the MBL Accelerated Research Initiative (ARI), supported by ONR, to design a system to meet the scientific needs of the program.

QUEST INTEGRATED, INC.
21414-68TH AVENUE SOUTH
KENT, WA 98032
Phone: (206) 872-9500
Topic#: 92-109
Office: ONR
Contract #:
PI: Dr. Jack J. Kolle
ID#: 92N01-021
Title: Low-Cost Photogrammetry Platform
Abstract: The proposed study will evaluate the feasibility of adapting medium format metric camera systems for aerial photogrammetry from an unmanned aerial vehicle (UAV) platform. The new generation of UAVs have the capacity to carry medium format (up to 5 cm x 7 cm) metric cameras suitable for precision photogrammetry. These platforms also offer autonomous operations and simplified takeoff and landing options that minimize pilot skill requirements. This development will reduce the cost of photogrammetric monitoring of large structures in remote regions. We plan to apply the system to the study of sea ice deformation. A UAV would allow cost-effective, repetitive imaging of rafting, ridging and lead formation associated with floe scale interactions of polar sea ice. Photogrammetric techniques will allow quantitative measurements of horizontal displacements associated with these deformations. Stereophotogrammetry offers the potential to map the sea ice topography. The proposed work will include an evaluation of development requirements to provide the vibration isolation, tilt stabilization, environmental controls, and motion compensation required for aerial photogrammetry and stereophotogrammetry. Evaluations of flight planning, image processing requirements, and Arctic logistics will also be carried out.

RESEARCH DEVELOPMENT CORP.
11835 COOPERS COURT
RESTON, VA 22091
Phone: (703) 391-0156
Topic#: 92-158
Office: NAVAIR
Contract #:
PI: KEVIN WENZEL
ID#: 92PMT-252
Title: "Virtual" Air Intercept Control (AIC) Architectures for Training Air Intercept Control Procedures
Abstract: The Radar Intercept Operator (RIO) on fighter jets requires initial and ongoing training in all aspects of air intercept control procedures. Current training methods require the presence of an instructor in both initial and ongoing training of perishable skills. This increases the cost and decreases the practicality of training as the RIO must be present at a training facility to receive training, thereby taking time away from the job. The proposed work would augment the activities of the human trainer by using artificial intelligence (AI), intelligent tutoring system (ITS) and virtual reality (VR) techniques to develop automated, self-contained, and portable training devices for maintaining perishable skills. This would enable the RIO to receive training at his convenience with minimal disruption to his duties. Phase I will be devoted to a task analysis of RIO training requirements and to development of a proff-of-concept system. Phase II will be devoted to developing a full-scale training system.

RESEARCH OPPORTUNITIES, INC.
2200 AMAPOLA COURT
TORRANCE, CA 90501
Phone: (310) 533-5149
Topic#: 92-082
Office: NSWCDDWO
Contract #:
PI: KENDALL
ID#: 92N32-111
Title: Non-Toxic Coating to Replace the Cadmium Coating Used on Naval Fasteners
Abstract: Concerns of environmental and human toxic contamination is resulting in a search for alternate approaches to the use of cadmium and chromate materials for corrosion protection. The following innovative approaches for the development of non-toxic coatings for steel fasteners are proposed: i) non-aqueous electrodeposition of aluminum, 2) carbonyl deposition of iron, and 3) air sprayed polymer/aluminum blended powders. The ion vapor deposition of aluminum offers potential as a process.

but of special importance is the non-aqueous electrodeposition of aluminum from an organic electrolyte in a non-hydrogen atmosphere. A novel rare earth oxide surface treatment chromate-free for aluminum must be evaluated further. Carbonyl processing furnishes high purity non-corrosive iron as an ideal steel coating material. New polymers offer potential especially when blended with aluminum such as phenolic/aluminum. Evaluation will be based upon salt spray, acid salt spray, multiple retightening, alternate immersion and scratch testing in order to provide the data for comparison with the attributes of cadmium. Research opportunities, inc. Offers a very mature experienced team in metals processing, polymers, and fastener technology to conduct the program in Phase II, manufacture of the selected candidate(s) will be scaled up for evaluation and coating cost assessment.

RESEARCH OPPORTUNITIES, INC.
2200 AMAPOLA COURT
TORRANCE, CA 90501
Phone: (310) 533-5149

Topic#: 92-096 ID#: 92N3B-019
Office: NWSC
Contract #: N00164-93-C-0026
PI: WILLIAM C. RILEY

Title: Polymer and Metal Matrix Composites for Thermal Management in Electronic Devices

Abstract: Graphite fiber with thermal conductivity three times copper, high modulus and negative thermal expansion will be used to demonstrate the use of both aluminum and organic matrices for the sem d heat sink. Composites will be tailored to match the thermal expansion of the printed wiring board and alternatively, to provide a maximum thermal conductivity in the direction of heat flow. Fibers will be used through the curvature of the sem d heat sink. For organic matrix composites, a copper-coated graphite fiber tow will maximize thermal conductivity and prevent fiber fraying at the curvature. In metal matrix, the effect of fraying at the curvature on mechanical properties will be minimized by the use of a cloth preform. There should be no degradation of thermal conductivity. The thickness of the metal matrix composite in contact with the printed wiring board will be a controlled variable. Evaluation will be carried out using a sem simulator and surface strain measurements. Measurements will be made before and after thermal cycling. The potential impact of the composite concept on module reliability and weight saving will be assessed. The Phase II program will emphasize property producibility, data base development, and demonstration of heat sink performance in actual sem e devices.

RESEARCH OPPORTUNITIES, INC.
2200 AMAPOLA COURT, SUITE 101
TORRANCE, CA 90501
Phone: (310) 533-5149

Topic#: 92-135 ID#: 92N40-226
Office: NAWCIND
Contract #:
PI: William De La Torre

Title: Recent Advances In Composites For Electronic Packaging

Abstract: High thermal conductivity, thermal expansion (CTE) control, and maximum specific stiffness make composite materials important candidates for improvements in electronic packaging. Components that can be impacted include thermal planes, chip carriers, core constraint for printed wiring board (PWB), card holders, and the outer construction (boxes). High thermal conductivity graphite fibers (negative CTE) will be evaluated for PWB constraining cores in organic matrix and for thermal plane in aluminum matrix. SIC/AL will be evaluated for card holder and chip carrier. Comparison will be make with more recent composite concepts including glass matrix composites and particulate diamond substituting for SIC. The Phase I study will show through analysis and experimentation, composite properties that are expected for each application. The potential for composite utilization will be assessed both for individual components and multiple composite components in a single electronic package. Potential impact on system capability, reliability and weight/volume savings will be assessed. Of particular interest is a module with all components tailored to chip CTE. The Phase II program will be oriented to composite design data base, assembly of selected components for performance demonstration, performance assessment, identification of Navy system utilization, and system impact analysis.

RGS ASSOC., INC.
CRYSTAL PARK TWO-SUITE 104
ARLINGTON, VA 22202
Phone: (703) 769-5867

Topic#: 92-062 ID#: 92N1A-325
Office: NAVSEA
Contract #: N00024-92-C-4306
PI: Dr Richard G STIEGLITZ

Title: Information Resources Management (IRM) Project Manager Tools

Abstract: As budget constraints tighten, reliance on information resources to produce cost savings will increase. Effective

management techniques and automated tools are needed to help IRM project managers control ADP system design, development, implementation and change processes. Recent advances in Personal Computer (PC) technology provide new tools to control system development projects throughout their life cycle. NAVSEA has invested in these PC tools for its professionals; thus creating the opportunity to integrate the tools to allow IPM project managers to efficiently plan and execute system development projects. During Phase I, RGS will evaluate the IRM project management processes to define methodologies for controlling IRM projects and requirements for automated tools. Criteria will be developed to tailor the methodology and tasks for unique requirements of individual ADP development projects. Our Phase I effort will produce: (1) a requirements document prepared in the format of a Functional Description (FD) to describe the management methodology and use of the automated tools, and (2) a prototype of the automated tools which integrates off-the-shelf software packages for database management, optical imaging and expert systems in a PC environment. The FD will serve as the design document for development of the prototype, which will confirm the viability of the management strategy while demonstrating the usefulness of automated tools.

RTWARE, INC.
714 NINTH ST., SUITE 206
DURHAM, NC 27705
Phone: (919) 286-3114
Topic#: 92-112
Office: ONR
Contract #:
PI: Richard Clarke
ID#: 92N01-066
Title: Module Interconnection Framework for Software Producibility
Abstract: We propose research into the design of a Real-Time Distributed Module Interconnection Framework (RTD-MIF) system for use in the development of distributed, real-time computer software. Real-Time capabilities will include abnormal event processing, RT/FT events and on-line system monitoring and control. The resulting system will have the ability to compose, integrate and monitor the performance of software modules in a variety of domains, particularly real-time distributed applications. The research will also formalize the mathematical semantics of the system, using partial-ordering constructs (directed acyclic graphs) and temporal logic semantics. We will utilize an existing distributed real-time spreadsheet package (ControlCalc from RTware, Inc.) designed specifically for process control and monitoring. The Polylith (Purtilo, 1991) system will be used for interfacing software modules. The RTD-MIF will use MIF capabilities to generalize and extend its existing ability to manage and analyze real-time date, events and distributed processes in diverse environments. Deliverables: 1)Detailed design document for extending Polylith into an RTD-MIF. 2)Formal mathematical semantics of an RTD-MIF. 3)Prototype implementation of Polylith-based RTD-MIF. 4)Design and implement a subset of a running RTD-MIF application based on a distributed, real-time spreadsheet.

SACHSE ENGINEERING ASSOC., INC.
2361 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VA 22202
Phone: (703) 415-4446
Topic#: 92-105
Office: SPAWAR
Contract #: N00024-92-C-4296
PI: DUFFY
ID#: 92N47-272
Title: A Methodology for Managing Strategic Defense Technologies
Abstract: Technology development is advancing at a rapidly growing pace. It can be expected that it will continue to grow and indeed, that this growth will accelerate on a world-wide basis. Friendly nations and potential adversaries alike must be expected to have greater access to advanced technology. Our nation and our Navy is faced with a rapidly changing and potentially dangerous world situation that demands we pursue a robust and innovative approach towards our technology development programs. To maintain technological advantage, a methodology must be developed which permits a timely assessment of current and emerging technologies in order to determine, in an atmosphere of reduced budgets, which to support. This project involves the identification of categories and types of strategic technology data and the means by which it can be acquired, the development of the requirements for and an evaluation of existing data bases to store collected data in a structure which permits analyses, and the development of a Strategic Technology Analysis and Decision Methodology. The Phase I tasks are designed to identify in detail all factors which influence the technology decision process and to demonstrate the methodology using a prototype technology.

SATCON TECHNOLOGY CORP.
12 EMILY STREET
CAMBRIDGE, MA 02139
Phone: (617) 661-0540
Topic#: 92-094 ID#: 92N1F-036
Office: NCEL
Contract #:
PI: DARIUSZ A. BUSHKO
Title: Magnetostrictive Downhole Propulsion System
Abstract: A need exists for a downhole propulsion system to pull lengths in excess of 10,000 feet of steel pipe/cable up to 4 inches in diameter through various types of consolidated soils and bedrock. This must either eliminate or provide sufficient force to overcome the friction of moving the pipe/cable through the borehole. SatCon proposes to develop a downhole propulsion system employing a linear motion magnetostrictive actuator and a simple hydraulic clamping mechanism. A magnetostrictive rod provides repetitive, high-force linear actuation which, when combined with a properly synchronized clamping mechanism, results in forward motion of the whole assembly through a downhole. Magnetostriction technology offers ruggedness, very high power density, and compactness. A unit force capacity (defined as the maximum pulling force for unit downhole area) of 10,000 psi is readily obtainable with this approach. In addition, the design is explosion proof (no spark generating components, low voltage powering) and inherently reliable (very limited number of components and no high speed rotating parts). Finally, the system is capable of operating in a wide range of downhole diameters and different types to sediment. The proposed Phase I effort includes para- metric modelling of the device, evaluation of its performance, and detail design of a system for specific sponsor-selected operating conditions. Phase II effort would involve a construction and exhaustive field testing of the downhole propulsion system laboratory scale model design in Phase I.

SCHWARTZ ELECTRO-OPTICS, INC.
3404 N. ORANGE BLOSSOM TRAIL
ORLANDO, FL 32804
Phone: (407) 298-1802
Topic#: 92-107 ID#: 92N01-007
Office: ONR
Contract #:
PI: Dr. Madhu Acharekar
Title: Nonlinear Dnamical Control of Laser Arrays
Abstract: The subject of Chaos has been investigated since the turn of the century, it wasn't until the recent advances in Chaos that the importance and scope of the field was realized. It was believed that random Chaotic variations were too complicated to describe mathematically and statistical descriptions were the only means of understanding these dynamic systems. Now it is known that these chaotic systems are not just random fluctuations but are totally deterministic. More importantly they can be controlled by studying the nature of the Chaos and applying small perturbations to the systems parameters. SEO with the help of Dr. Bandy's group at Oklahoma State University, propose to use the recent techniques of stabilizing nonlinear dynamic systems on a diode pumped external cavity resonator. Experimental and computer modeling of laser the external resonant cavity will be conducted with different stabilizing parameters studied.

SEPARATION SYSTEMS TECHNOLOGY, INC.
4901 MORENA BLVD., SUITE 809
SAN DIEGO, CA 92117
Phone: (619) 581-3765
Topic#: 92-092 ID#: 92N1F-002
Office: NCEL
Contract #: N47408-92-C-7011
PI: Clyde E. Milstead
Title: Development of a New Feed Channel Spacer for Reverse Osmosis Elements
Abstract: Although major advances have been made in membrane transport properties during the last 20 years, spiral-wound element construction has remained virtually unchanged. Element suppliers have continued to use a 31 mil thick feed channel spacer, first pioneered by DuPont in the mid 1960\'s. There is continuing evidence that this mesh spacer configuration is a major contributor to membrane fouling by forming "dead areas" of low flow behind the spacer segments which trap the foulants. During cleaning operations, these foulants may be loosened from the membrane surface but cannot be flushed out of the element. The fouling materials remain trapped within the mesh spacer and redeposit on the membrane upon repressurization, thereby obviating the effects of the effects of the cleaning operation.

SHERWIN, INC.
5530 BORWICK AVENUE
SOUTH GATE, CA 90280
Phone: (310) 861-6324

Topic#: 92-122
Office: NAVAIR
Contract #:
PI: RONALD G. SHERWIN

ID#: 92PMT-077

Title: Alternative Dyes and Water Treatment Procedures in Inspection Penetrant Methods

Abstract: Significant environmental issues face inspection penetrant users and manufacturers, including minimizing the release of petroleum or solvent-based wastes into waste water, and waste water treatment. The contractor proposes to develop alternative water-based liquid dye penetrant formulations using chemiluminescent and naturally luminescent materials. The contractor proposes also to document procedures for recycling penetrants from waste water and for reducing the need to dump penetrants from large systems.

SIGNATRON ACQUISITION CORP.
110 HARTWELL AVENUE
LEXINGTON, MA 02173
Phone: (617) 861-1500

Topic#: 92-048
Office: NAVSEA
Contract #: N60921-93-C-A316
PI: Steen A Parl

ID#: 92N1A-157

Title: General Purpose Hardware Test Set for Rapid Verification of Low Error -False Alarm- Rates in Digital Com and Radar

Abstract: Real time hardware channel simulators are critical elements in the design, debug and testing of communication systems. Signatron has for over 20 years been a pioneer and leading developer of channel simulators for a wide range of special purposes, including radar, sonar, and Satellite, microwave, troposcatter, HF, and meteor scatter communications. The objective of the proposed effort is to provide a new hardware simulation capability that can, in effect, operate faster than real time by using Importance Sampling (IS) techniques to artificially emphasize error-generating events. Signatron has used IS in many radar and communications computer simulations and has identified the key issues affecting faithfulness of the simulation, particularly the difficult issues relating to the hardware simulation. While IS simulation is relatively simple for memoryless systems, it is less efficient, and generally more complicated, for the most common case of systems with memory. A novel approach for adapting the IS simulator to a system, and solving the problems with unknown delay with memory, is proposed. The Phase I effort will study the implementation issues and a *validation methodology*. A general purpose additive noise simulator design will be developed and the extension to multiplicative (fading) systems will be evaluated using IS techniques already developed at Signatron. The specification for the Phase II advanced development will be developed to meet the widest range of military and commercial applications possible.

SIMPEX TECHNOLOGIES, INC.
732 N. DIAMOND BAR BLVD, SUITE 116
DIAMOND BAR, CA 91765
Phone: (714) 396-0720

Topic#: 92-119
Office: NAVAIR
Contract #:
PI: BERNARD K. STU

ID#: 92N14-276

Title: High Resolution Dimensional-Control-Sensors for Microelectronics Manufacturing Process

Abstract: The objective of this effort is to develop a multitude of process control sensors necessary to cover the entire spectrum of microelectronics process control needs. These non-contact sensors will have the speed, the resolution, the compatibility, and close loop capability for process control feedbacks. Simpex, through its past efforts with the U.S. Army, has successfully developed a wide variety of dimensional/process control sensors and techniques for monitoring and detecting a majority of microelectronics process needs. These intelligent sensors include structured illumination, custom optics, high resolution encoders, intelligent system controllers, software routines and drivers that control these sensors. In order to complement the full spectrum of process control needs for microelectronics manufacturing, additional sensors were identified and proposed in this effort. Simpex, through a Tech-Transfer/Cooperative effort with the Idaho National Engineering Laboratory, Department of Energy is proposing to develop a Laser Ultrasonics Measurement Sensor. This sensor technology is non-contact, can monitor minute drifting of manufacturing processes in microseconds, to the precision of 0.02 microns, and will have the intelligence to provide feedbacks for real-time dimensional control of microelectronics manufacturing processes. Other sensors such as Micro-Leveling Sensors and Illumination Calibration Sensors will also be developed under this proposed effort. These added sensors will complement the previously developed sensors to support the entire spectrum of sensor needs.

SIPPICAN, INC.
7 BARNABAS ROAD
MARION, MA 02738
Phone: (508) 748-1160
Topic#: 92-080 ID#: 92N32-096
Office: NSWCDDWO
Contract #: N60921-93-C-0123
PI: WHALEN
Title: Ocean Environment Sensor
Abstract: The proposed effort will investigate the technical feasibility, system requirement, performance specification, and cost of an expendable ocean sensor system to measure several important environmental parameters. The ability to make these measurements quickly, accurately, and at low cost impacts a number of tactical scenarios. The proposed effort will rely heavily on proven and low cost sonobuoy technology. A survey of existing sensor technology and performance verses cost tradeoff will be completed. Sensors particularly suitable for remote sensing from an expendable buoy in a dynamic ocean environment will be emulated. The use of an expendable buoy as part of a complete data acquisition system will be defined. The data acquisition system will utilize existing hardware to the fullest extent possible to reduce development cost and allow timely fleet implementation.

SPACE APPLICATIONS CORP.
6632 S. 191ST PL, SUITE E-103
KENT, WA 98032
Phone: (206) 656-0140
Topic#: 92-150 ID#: 92PMT-220
Office: NAVAIR
Contract #:
PI: JOHN S. CAROTHERS
Title: Acoustic Signal Classification Using Unconventional Techniques
Abstract: Advances in active acoustic systems exacerbate the problem of signal classification in a high contact-density environment. Increased contact loading forces the operator to classify contacts more rapidly, reducing his effectiveness. The key to early classification is an understanding of target response in terms of vibrational mode and localization of dominant contributors. Phase I will develop this understanding of target response and permit synthesis of classification methods utilizing unconventional signal processing techniques. These techniques, in conjunction with visually-based image processing techniques, will form an integrated detection and feature extraction process that promises improved detection and extraction of low-SNR features (such as modal response) contained within beam-formed, time-frequency data. We seek to understand the key signature features revealed by this analysis approach, with a focus toward automation of the process. Phase I will evaluate the feature extraction and classification capabilities of the unconventional techniques, which include wavelet transforms, higher-order spectral analysis, time-frequency distributions, and image processing, on simulated acoustic data. We will also research the applicability of advanced GUI methods to user displays and controls. Phase II will implement a Combined Acoustic Signature Analysis Station for validation of the most promising techniques against real measured data.

SPEARS ASSOC., INC.
249 VANDERBILT AVENUE
NORWOOD, MA 02062
Phone: (617) 769-6900
Topic#: 92-017 ID#: 92N07-060
Office: MARCOR
Contract #: M67854-92-C-0223
PI: Minh T. Nguyen
Title: Combined Antenna System for Assault Amphibian Use
Abstract: The primary objectives is to show that a low profile, high performance, multi-band vertical antenna for simultaneous use of multiple spread spectrum transceivers can be designed, developed, and produced. Antenna configuration concepts will be developed, assessed, and analyzed through computer modeling using the Method of Moments (Numerical Electromagnetic Code). RF network simulation and analysis will be performed to cyathouize appropriate networks to provide wideband matching and efficient RF signal transfer between the antenna system and multiple VHF transceivers. Advantage will be taken of Spears' extensive library of computer software modeling and design tools that are directly applicable to this advanced antenna development.

SPECTRA RESEARCH, INC.
7071 CORPORATE WAY, SUITE 108
DAYTON, OH 45459
Phone: (513) 436-4454
Topic#: 92-180 ID#: 92N13-008
Office: NAWCFTEG
Contract #:
PI: Paul D. Zidek
Title: Anechoic Chamber Radiated Environment (ACRE)

Abstract: Spectra Research Inc. (S*R) proposes to configure off-the-shelf specialized antennas for installation in the wall of an anechoic chamber to provide a quick look test capability where fine direction of arrival (DOA) is not required. Several technical approaches to the antenna installation will be evaluated to determine the best technique to use before actual installation. S*R will subcontract to Georgia Tech Research Institute to apply their expertise in RF radiated environments to select the best approach and support the design of the billboard array alternative. The team will develop a preliminary design for movable billboard arrays than can be used to rapidly change DOA during the test of electronic systems. The arrays will be fabricated, installed and tested during a phase II effort.

SPECTRAL SCIENCES, INC.
99 SOUTH BEDFORD STREET, #7
BURLINGTON, MA 01803
Phone: (617) 273-4770
Topic#: 92-039 ID#: 92N1A-022
Office: NAVSEA
Contract #: N00024-92-C-4313
PI: Dr Mitchell R ZAKIN
Title: Polymer Radiation Dosimeter (POLYRAD)
Abstract: This proposal addresses the need for a new generation of low-cost self-indicating casualty dosimeter. The application involved is determination of personnel dose exposure during a nuclear conflict. The major specifications for this dosimeter include: (1) a minimum sensitivity range of 50-1500 R, (2) simple dosage indication without the aid of external devices, (3) long-term (20 yrs) storage stability, and (4) low cost (less than $2 per dosimeter). Spectral Sciences, Inc. (SSI) proposes to develop the POLYmer RAdiation Dosimeter (POLYRAD) which has the potential to meet or exceed these target polymerization chemistry. The primary goal of the Phase I effort is an experimental proof-of-concept demonstration of the approach. The specific objectives include: (1) initial screening of several candidate polymer systems, (2) characterization of the radiation dose dependence of the polymerization chemistry, and (3) preliminary design of the Phase II brassboard POLYRAD device. In Phase II prototype POLYRAD dosimeters would be constructed, tested, and calibrated.

STD RESEARCH CORP.
PO BOX C
ARCADIA, CA 91066
Phone: (818) 357-2311
Topic#: 92-044 ID#: 92N1A-119
Office: NAVSEA
Contract #:
PI: Dr Gregoire S WINCKELMANS
Title: Time-Domain Electromagnetic Sounding for Underwater Object Detection
Abstract: Defense of naval assets requires reliable systems to detect, locate and classify, with confidence, underwater objects ranging from mines to underwater vehicles to submarines. The proposed program will demonstrate the feasibility of efficient controlled-source time-domain electromagnetic (TDEM) sounding systems/methods to serve this purpose. To date, TDEM sounding methods have been developed and applied mainly for geophysical applications: probing of the earth\'s crust and upper mantle, ore and oil prospecting, monitoring of seismically active zones, geothermal sources, etc. In light of recent developments (high power portable MHD generators, highly sensitive magnetic induction sensors, highly sophisticated mathematical models and numerical algorithms for unfolding the underlying structure), it appears that TDEM sounding is also a promising technology for underwater object detection. The technical objectives of the Phase I effort are: (1) a POC through an innovative and affordable scaled-down experiment, (2) a support study consisting of an analysis of experimental data and of further development of scaling laws, and (3) an assessment of the concept feasibility with respect to ship board use requirements in light of current and future technology. A Phase II award would perfect the concept to a point at which a prototype system for ship use can be developed, including (1) design and development of a full-scale system and (2) further development of the sophisticated numerical models to improve the proposed concept with respect to location and classification of underwater objects.

STOTTLER HENKE ASSOC., INC.
916 HOLLY ROAD
BELMONT, CA 94002
Phone: (415) 595-1692
Topic#: 92-068 ID#: 92N1A-431
Office: NAVSEA
Contract #: N60921-93-C-A392
PI: Richard H. Stottler
Title: A Case-Based Reasoning Approach to Intelligent Tutoring
Abstract: The goal of this proposed research is to prove the feasibility of a software solution to provide intelligent tutoring for the REGIS Training Center. Because students often learn best by example, we intend to design a tutoring system around example problems. We will apply the Artificial Intelligence (AI) technique of Case-Based Reasoning (CBR) to elicit and

represent the example problems (or cases) and provide explanations to students on problem solving techniques. The system would be sensitive to a student\'s knowledge o problem solving principles and tailor the teaching sessions accordingly. The body of knowledge contained in the system could be expanded over time simply through addition of more problems. An intelligent tutoring system is an exciting supplement to traditional classroom instruction. It offers the possibility of individualized teaching and allows the student to work at his own pace, somewhat mitigating the problems of staff cutbacks and increasing complexity of subject area. In Phase I, we will design a generic intelligent tutoring system using a case-based reasoning paradigm. The feasibility of the system will be proven through implementation of a proof-of-concept prototype in a specific domain.

STRUCTURAL COMPOSITES, INC.
PO BOX 1300
MELBOURNE, FL 32902
Phone: (407) 951-9464
Topic#: 92-087
Office: NUSC
Contract #: N66604-93-C-0408
PI: Ronnal F. Reichard
ID#: 92N36-002
Title: Energy Absorptive Resin Materials for Undersea Structure radiated Noise Reduction
Abstract: Fiber reinforced plastic (FRP) materials are used to produce lightweight, high strength hull structures, propulsors, and equipment foundation. All of these undersea structures are required to be energy absorptive. FRP materials offer significantly increased energy absorption with respect to conventional materials used in these applications. Innovative technology is needed to formulate FRP resins that will effectively reduce acoustic transmissions within this type of construction. Hybrid resin systems, such as polyurethane-polyester, urethane-acrylate, rubber modified resins, and thermoplastic fiber/thermoset resin combinations, provide the potential for high acoustic damping and will be evaluated in this research program. The prime focus of this work will be the development of high strength resin systems based on existing technology that will reduce radiated noise in undersea structures. These resin formulations will be evaluated using proven energy absorption design approaches for FRP laminates, which can reduce acoustic emissions in undersea structures without degrading structural efficiency. A test program is defined to evaluate the acoustic transmission levels, over a frequency range of 100 Hz to 4000 Hz, and the structural properties of the FRP laminates. Structural Composites, Inc. (SCI) is uniquely qualified and possesses all of the capability in-house to perform this work, with the exception of specialized test equipment that must be used. Our successful experience, our interactive relationship with the resin and materials manufacturers, and our innovative approach to the problem make SCI the most promising key to a solution.

STRUCTURED MATERIALS INDUSTRIES, INC.
ENTERPRISE DEVELOPMENT CENTER
NEWARK, NJ 07102
Phone: (201) 471-3589
Topic#: 92-071
Office: NSWCDDWO
Contract #: N60921-93-C-0125
PI: KIM
ID#: 92N32-014
Title: Infra Red Detector Array on a Silicon Compatible Substrate
Abstract: Development of HgCdTe FPAs on Mg2Si/Si will reduce thermal expansion mismatch of the sensor substrate and the signal collector substrate, which will result in lower device noise levels and also lower the processing costs. Significantly lowering the cost of FPA's will allow broader application of these devices. films of Mg2Si on Si (100) substrates for Infra Red Focal Plane Arrays (FPA) using a Remote Source Molecular Beam Epitaxy (MBF) technique. In remote source MBE, vapors are transported from remote elemental source reservoirs and feed through regulating valves into a hot effusion manifold which is located beneath the sample. Films will be deposited in a single source MBE deposition chamber which is connected to an UHV surface analysis chamber (equipped with LEFD, AFS, UPS, and SIMS) through a UHV sample transfer system. The process parameters for the growth of Mg2Si will be investigated. The stability of Mg2Si/Si films under thermal cycling between room and liquid nitrogen temperatures will be studied using LFED, SFM, and TFM analysis. In phase I, samples will be processed as far as possible in an LPE HgCdTe FPA process line. In phase II, HgCdTe FPA\'s will be constructed on the Mg2Si buffer layers and functional devices would be fabricated and characterized.

SYNAPTICS, INC.
2860 ZANKER ROAD, #206
SAN JOSE, CA 95134
Phone: (408) 434-0110
Topic#: 92-113
Office: ONR
Contract #:
PI: Dr. John Platt
ID#: 92N01-072
Title: Object Recognition Chip (ORC)

Abstract: Synaptics has demonstrated that it is possible to design and produce a commercial integrated circuit capable of imaging and recognizing a single-font character set. This device-called the I1000-includes an area imager (silicon retina), two single-layer analog neural networks and digital control. It appears possible to extend the I1000 architecture to create a single chip capable of recognizing simple objects. This device-called ORC-will have electrically programmable parameters so that it can be tailored to the recognition of user-defined objects. The parameters are learned off-line in a computer systems simulating the ORC neural networks, but receiving actual images produced by the ORC silicon retina. The ORC will recognize objects despite some variation in scale, orientation, and shape of the objects. The basic objective of this research effort is to define the specific architecture of the ORC and assess its technological feasibility. The ultimate objective is to be able to produce a cost-effective general-purpose object recognizer for commercial and military applications.

SYNETICS CORP.
540 EDGEWATER DRIVE
WAKEFIELD, MA 01880
Phone: (617) 245-9090
Topic#: 92-041
Office: NAVSEA
Contract #:
PI: Kevin O'Donnell
ID#: 92N1A-077
Title: PC Based Computer Model and Simulation
Abstract: This project will develop a PC-based computer simulation for evaluating the effectiveness of alternative Anti-Air Warfare (AAW) system configurations. The solution technique will be based on a methodology developed by SYNETICS, combinatoric enumeration with pruning. This methodology computes the system measures of effectiveness by combining the effects of all possible outcomes weighted by the relative likelihood of occurrence of each outcome. Advantages of this methodology include: (1) detailed modelling of system parameters similar to complex Monte Carlo simulations, (2) reduced execution time by pruning scenario outcomes from the overall system measures of effectiveness, (3) retaining high accuracy by pruning lower probability (i.e., lower influence) scenario outcomes, and (4) the ability to reduce the system to a Monte Carlo model by disabling the pruning option. The Phase I prototype will include implementation of the user interface architecture in a Microsoft Windows or DOS-based windows environment. This interface will provide user control of all variable input parameters, simulation execution, ad output data presentation. The prototype will demonstrate feasibility of the implementation with representative inputs and outputs; full implementation will occur in Phase II.

SYNETICS CORP.
540 EDGEWATER DRIVE
WAKEFIELD, MA 01880
Phone: (703) 848-2550
Topic#: 92-042
Office: NAVSEA
Contract #: N00024-92-C-4318
PI: Rudolph F MARIK
ID#: 92N1A-098
Title: Combat System Distributed Operating System
Abstract: Commercial standardization activities are currently developing interface standards for distributed processing systems that support software portability and interoperability in an open system environment. A key element of open system implementations is the operating system for the distributed environment. The purpose of this Phase I task is to evaluate available commercial products and identify likely candidates for future implementations, and to develop the basis for detailed specification of distributed operating system service requirements and performance characteristics. The Navy can effectively benefit from commercial development by choosing appropriate distributed operating system service requirements and performance characteristics that are in conformance with the evolving commercial standards, yet can satisfy Navy requirements. The work proposed under Phase I will : (1) develop the basis for quantitative determination of combat system distributed operating system performance requirements; (2) develop the basis for specification guidelines for a combat system distributed operating system; and, (3) provide an unbiased, objective engineering evaluation of available commercial distributed operating systems which would have potential application to shipboard combat systems in the 2000 and beyond.

SYSTEM DYNAMICS INTERNATIONAL, INC.
4140 NW 27TH LANE, SUITE E
GAINESVILLE, FL 32606
Phone: (904) 371-8035
Topic#: 92-132
Office: NAVAIR
Contract #:
PI: WILLIAM R. GRAHAM
ID#: 92PMT-179
Title: Multi-Sensor Integration for High Altitude Bombing
Abstract: The US Navy has identified a need to accurately attack ground targets with weapons delivered from advanced

high-altitude aircraft. The high altitude bombing concept affords enhanced aircraft survivability since weapons can be released beyond the range of ground-based enemy air defenses even when operating near the target area. However, to ensure accurate guidance to the target area and ultimately a high probability-of-kill, such weapons are expected to be equipped with an inertial measurement unit (IMU), a GPS receiver, and possibly a narrow field-of-view seeker. Consequently, in order to realize a high-performance, cost effective system, it is anticipated that state-of-the-art sensor configurations and innovative IMU transfer alignment algorithms will be required to optimize the high-altitude bombing concept. The focus of this proposed research is to: (1) identify candidate state-of-the-art sensors for high-altitude aircraft/weapon systems, (2) postulate and evaluate innovative aircraft/weapon sensor configurations, and (3) conduct tradeoff analyses to characterize the feasibility of the candidate configurations. Detailed mathematical models will be formulated to characterize the error behavior of each sensor, and representative aircraft and weapon flight trajectories will be generated. Candidate configurations consisting of alternative aircraft/weapon sensors, aircraft-to-weapon transfer alignment procedures, and weapon midcourse guidance aiding schemes (e.g., GPS-aiding) will be postulated. The candidate configurations will be embedded into a computer simulation which will be employed to generate weapon system alignment error, navigation error, and seeker pointing error time-histories. Based on these projected errors, performance/risk/cost tradeoff analyses will be conducted for each candidate configuration. The most promising configurations will be selected for in-depth analyses to be conducted under the subsequent Phase II effort.

SYSTEMS CONTROL TECHNOLOGY, INC.
2300 GENG ROAD
PALO ALTO, CA 94303
Phone: (402) 293-1559
Topic#: 92-154 ID#: 92PMT-242
Office: NAVAIR
Contract #:
PI: JOHN H. MORDESON
Title: Terrain Contour Matching (TERCOM) Map Placement
Abstract: Determining sites to build new TERCOM maps has proven to be a very complicated and time consuming task, as evidenced in both SIOP cruise missile planning and Operation Desert Storm. The cruise missile planner, with some difficulty, can determine needed candidate TERCOM sites, but all too often, because of insufficient terrain roughness, the Defense Mapping Agency (DMA) is unable to create a TERCOM at this location. According to DMA, as many as 90% of the TERCOM requests they receive are infeasible or repeat infeasible requests. As a result, the planner is left with unsatisfied TERCOM needs, and DMA's time is wasted. SCT has been developing an interactive graphics program for the Air Force which integrates our operationally proven cruise missile routing algorithms with DMA-endorsed TERCOM site validation criteria. This program provides a window based user interface with graphical plots, optimal path computations, data management of past and present TERCOM requests, TERCOM site validation tests, request form production, and message handling between DMA and the STRATCOM. This technology can be adapted to meet the Navy's specific TERCOM planning needs at a low cost with minimal or no risk. This nuclear planning tool will result in TERCOM requests being sent to DMA which are not only feasible, but which truly satisfy the cruise missile routing needs.

SYSTEMS ENGINEERING & ANALYTICS, INC.
554 LONG HILL ROAD
GROTON, CT 06340
Phone: (203) 445-7620
Topic#: 92-053 ID#: 92N1A-223
Office: NAVSEA
Contract #: N00024-92-C-4326
PI: Paul S Brewster
Title: Universal Submarine Electronic Equipment Packaging
Abstract: Since submarine construction and modernization costs are soaring higher and higher, ways to reduce those costs are continually under review. Historically there are many submarine applications for readily available commercial electronics equipment. However, most commercial electronics equipment will not survive and provide the desired performance in the rigorous submarine environment. The cost of adapting commercial electronics equipment to the submarine environment is very expensive and in some cases prohibitive. The development of an innovative low-cost universal submarine electronics equipment packaging alternative to the repackaging approach currently applied to commercial electronics equipment will provide for cost effective submarine adaptation of commercial electronics equipment. The ultimate goal of the Universal Submarine Electronics Equipment Packaging Engineering Development is to reduce the cost associated with adapting readily available commercial electronics equipment for use in the submarine environment and thereby achieve significant overall submarine construction and modernization cost benefit.

SYSTEMS TECHNOLOGY, INC.
13766 S. HAWTHORNE BLVD.
HARHORNE, CA 90250
Phone: (415) 961-4674
Topic#: 92-155
Office: NAWCFTEG
Contract #:
PI: Warren F. Clement
ID#: 92N13-059

Title: Minimum Simulation Cues Required for the Rotorcraft Shipboard Landing Task

Abstract: Rotorcraft shipboard landing task simulation requires a satisfactory level of fidelity for each simulator component. The components include the aircraft mathematical model, environmental models, the simulator visual system, the motion system, the cockpit, associated computers, and component integration. A systematic study is proposed to quantify the minimum levels of fidelity required for each factor associated with simulating the rotorcraft/ship landing task. Rotorcraft/shipboard landing simulation fidelity will be evaluated in terms of fleet pilot training and in terms of supporting and eventually largely supplanting the dynamic interface (DI) flight testing performed by the Naval Air Test Center (NATC). The Phase I technical objective is to determine the minimum set and fidelity of simulation cues required for helicopter shipboard landing training and for developing DI launch/recovery envelopes. This objective will be accomplished in three tasks: (1) review and document previous work to quantify the level of fidelity of rotorcraft/ship landing simulations, (2) consider the overall task and evaluate the individual factors that make up each component of the simulation task, and (3) develop a proposal to quantify in Phase II the required fidelity of the individual factors that make up each component of the rotorcraft/ship landing task.

SYSTEMS TECHNOLOGY, INC.
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Phone: (310) 679-2281
Topic#: 92-164
Office: NAWCFTEG
Contract #:
PI: WALTER A. JOHNSON
ID#: 92PMT-291

Title: Use of Heads Up Displays in the E-2C Cockpit

Abstract: The technical objective of the Phase I effort described herein is to determine whether a "virtual" improvement in the E-2C aircraft flying qualities in the carrier environment can be achieved by having the pilot use a head-up display (HUD). In order to accomplish this objective, existing military and civilian HUD technology will be surveyed to determine what might be available for use in the existing E-2C cockpit without major airframe interruptions. At least three candidate systems will be selected for presentation, with their particular rationales, in report format. The Phase I work plan will assay the merits of a head-up display (HUD) for the E-2C in terms of six key display characteristics: (1) identification of critical mission phase(s) and tasks, (2) the elements of the display, (3) the display content, (4) the display format, (5) the symbology, and (6) cost/feasibility assessment of most promising HUD systems. This technical approach employs closed-loop analysis of the pilot's tasks associated with a specific vehicle operational profile or mission phase. The resulting multiloop feedback (and feedforward) structures reveal, in detail, not only the content, format, and dynamic properties of essential pilot information requirements but also appropriate piloting control techniques, which can be helpful in training as well as in predicting flying qualities.

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Phone: (310) 679-2281
Topic#: 92-173
Office: NAWCWAR
Contract #:
PI: THOMAS T. MYERS
ID#: 92N0A-110

Title: Active Control of Fighter Maneuvers

Abstract: An original approach to application of active control in fighter maneuvering is proposed. This will involve a problem-driven design process tailored to exploit new developments in robust multivariable control theory to serve the needs of real world flight control design. This process emphasizes the formulation of application-specific design requirements as the key to practical implementation of new multivariable synthesis methodologies. Requirements formulation includes the development of new multivariable lower order equivalent systems (MLOES) models for representation of basic requirements and their interface with various multivariable synthesis procedures. These will be used in a process involving directed optimization in which the overall flight control system will be developed as a related suite of multi-loop designs distinguished and integrated by functional modality.

TANNER RESEARCH, INC.
180 N. VINEDO AVE.
PASADENA, CA 91107
Phone: (818) 792-3000
Topic#: 92-003
Office: ONT
Contract #: N66001-92-C-7016
PI: Massimo Sivilotti
ID#: 92N40-041
Title: Bidirectional Modifiable Synaptic Element for Artificial Neural Networks (ANNs)
Abstract: To build fast inexpensive artificial neural network hardware, a high-performance but compact synapse circuit is required. Digital implementations require large synapse circuits. Existing analog synapse designs are highly non- linear or require expensive fabrication processes. Our new linear synapse circuit is small, allows for on-chip learning, and uses standard CMOS bulk technology and so resulting neural network chips can be fabricated inexpensively by many vendors. We propose to develop, simulate, layout, and fabricate our new linear synapse circuit during Phase I. We expect to show density improvements of more than 100 over existing circuit designs.This proposed research applies our experience in analog circuits and neural network circuits to create a major improvement in functionality of artificial neural network systems.

TANNER RESEARCH, INC.
180 NORTH VINEDO AVENUE
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Phone: (818) 792-3000
Topic#: 92-108
Office: ONR
Contract #:
PI: Andrew Moore
ID#: 92N01-008
Title: Real Time Image Enhancement with Resistive Grids
Abstract: The dynamic range of modern image sensors can exceed the range of a video monitor by an order of magnitude or more. This means that fast and intelligent range compression and image enhancement must be interposed between the sensor and display for effective surveillance and target tracking. Digital hardware can enhance an image in real time, but the common method for range compression on digital hardware, linear filtering, can severely distort the image. We propose to research and develop integrated analog image processors with nearest-neighbor interconnect architectures that carry out nonlinear filtering for range compression and image enhancement at video rates. The nonlinear filtering intelligently compresses the range without distortion. Digital processors, which consume orders of magnitude more power than this kind of processor, are not capable of applying a similarly effective and distortion-free algorithm in real time. Our Phase I effort will include the design, fabrication and test of circuits to improve the state of the art of such processors, and will include the demonstration and evaluation of an EXISTING low-resolution analog video image processor. Our approach will utilize commercial CMOS/bulk integrated circuit technology; products arising from this R&D can be fabricated reliably and economically by a number of vendors.

TECHNICAL RESEARCH ASSOC., INC.
410 CHIPETA WAY
SALT LAKE CITY, UT 84108
Phone: (801) 582-8080
Topic#: 92-040
Office: NAVSEA
Contract #: N00024-92-C-4332
PI: Mr Joseph K Weeks
ID#: 92N1A-030
Title: Advanced Gun Barrel Design
Abstract: High rate-of-fire weapons are subject to significant barrel erosion as projectile velocity and burst lengths are increased. Bore temperatures exceeding the melting point of steel can be easily reached because of the low thermal conductivity of the steel barrel. Barrels comprised of copper/graphite composite materials potentially have an order of magnitude greater thermal conductivity than steel and could significantly decrease bore temperatures. A copper/graphite composite barrel will be designed and analyzed for thermal performance. A manufacturing process for producing these composite barrels using liquid metal infiltration will be investigated. Feasibility will be demonstrated by manufacturing and testing a small barrel.

TECHNICAL RESEARCH ASSOC., INC.
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SALT LAKE CITY, UT 84108
Phone: (801) 582-8080
Topic#: 92-096
Office: NWSC
Contract #: N00164-93-C-0025
PI: Mr. Joseph K. Weeks
ID#: 92N3B-003
Title: Polymer and/or Metal Matrix Composite Materials for Thermal Management of Electronic Devices
Abstract: Heat sinks in the Navy Standard Electronic Module could be improved by increasing the thermal conductivity of the heat sink, decreasing its density and providing a better match between the coefficient of thermal expansion of the heat sink and the electronic circuit boards. Based upon a proprietary fiber coating technology, TRA proposes to investigate the production of

copper/graphite composite heat sinks made by liquid metal infiltration. Feasibility of producing a Format D heat sink which incorporates offsets and variations in material thickness will be demonstrated by fabricating a prototype heat sink. The physical and thermal properties of the heat sink will be measured and compared with predicted values. Improved thermal conductivity will be obtained by incorporating highmodulus, high conductivity graphite fibers into the composite.

TECHNOLOGY DEVELOPMENT, INC.
TWITTY PARK-RESEARCH DRIVE
ROLLA, MO 65401
Phone: (314) 341-3614
Topic#: 92-095
Office: NWSC
Contract #:
PI: David S. Wulfman
ID#: 92N3B-015
Title: Process for Qualification of Reclaimed Explosive Valuables
Abstract: Abstract available from the NAVY SBIR office. Contact Mr. Vincent Schaper at (703) 696-2760.

TECHNOLOGY INTEGRATION, INC.
54 MIDDLESEX TURNPIKE
BEDFORD, MA 01730
Phone: (617) 275-4545
Topic#: 92-121
Office: NAVAIR
Contract #:
PI: GEORGE P. SUCCI
ID#: 92PMT-073
Title: Aircraft Hydraulic Pump Condition Monitoring System
Abstract: We propose to develop a device that monitors aircraft hydraulic pumps. This device will use two key sensor technologies: vibration measurements on the pump housing and electromagnetic sensing of pump debris particles. Signals from these sensors are fed into a micro-computer. Two signal processing strategies will be employed: traditional measurement of the signal characteristics, and a neural net analysis of the signal. The processing will indicate the onset, and severity, of the pump failure. Thus, pumps can be removed before they fail in flight, or generate excessive debris that contaminates other mechanical devices on the hydraulic line. These sensor technologies are non-invasive and non-destructive.

TECHNOLOGY/ENGINEERING MANAGEMENT, INC.
P O BOX 1186
GOLDEN, CO 80402
Phone: (303) 279-2271
Topic#: 92-081
Office: NSWCDDWO
Contract #: N60921-93-C-0147
PI: MIGNOGNA
ID#: 92N32-100
Title: The Application of Linear Programming Discriminant Analysis Techniques to Early Submarine Detection
Abstract: Navy SBIR Topic No. N92-081 solicits proposals for exploratory development of methods for processing active sonar returns which will permit earlier classification of submarines. In our opinion, the most promising approach for rapid advancement in this area will focus on the application of improved decision making and signal interpretation algorithms to currently available signal processing technology. This proposal is for a program of basic research and exploratory development to develop an improved signal interpretation algorithm for classifying a digitally processed acoustic signal based on an approach known as linear programming (LP) discriminant analysis. It is proposed the LP discriminant analysis, as a pattern classification technique, be applied to the pattern vector obtained by digitizing the spectral shape of a sonar signal. LP discriminant analysis offers several advantages over classical discriminant analysis including freedom from the classical statistical assumptions and significantly enhanced classification power. These properties make the technique well suited to pattern recognition applications including the training of neural networks.

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595 BERKSHIRE DRIVE
STATE COLLEGE, PA 16803
Phone: (814) 867-8709
Topic#: 92-124
Office: NAWCTRN
Contract #:
PI: Tedric A. Harris
ID#: 92N10-019
Title: Establishment of a New Rolling Contact Bearing Life Calculation Method
Abstract: Rolling bearings for aircraft gas turbines and power drives are designed to meet endurance requirements basically determined according to the Standard fatigue life calculation method. This method is based on Lundberg-Palmgren fatigue life theory as modified by reliability, material and lubrication factors. As aircraft load and speed requirements increase,

this method results in bearings of increasing size, significantly adding to the size and weight of the gas turbines and power drives. Newly developed life prediction methods recognize the existence of a fatigue limit stress. If the stresses an operating bearing experiences do not exceed the limit stress, the bearing can achieve infinite life. Bearings designed using these new methods will have smaller diameters, weigh less and cost less. This Phase I project will investigate these new methods and analytically evaluate the utility of each by comparing fatigue lives so predicted with actual fatigue life data accumulated by aircraft engine and power drive manufacturers. To conduct the evaluation, computer programs BBEAN2 and CYBEAN2 will be used for bearing performance analysis. Assuming reasonably successful comparison of actual and analytical data, a Phase II project will further develop a practicable method using the fatigue limit stress for aircraft bearing design.

TETRA CORP.
3701 HAWKINS STREET NE
ALBUQUERQUE, NM 87109
Phone: (505) 345-8623
Topic#: 92-088 ID#: 92N36-032
Office: NUSC
Contract #: N66604-93-C-0359
PI: Chri. M. Young
Title: Advanced Low Frequency High Efficiency Spark Gap Sonar Transducer Development Program
Abstract: The Navy has a need for compact low frequency sonar sources for a wide range of applications. In particular, there is a need for low frequency high level signals generated from relatively small sonar transducers. This proposal is to develop an advanced form of the spark gap or plasma transducer utilizing recent major advances at Tetra Corporation in low frequency high efficiency high power acoustic generation from spark gap sonar transducers. This technology has the potential of generating very low frequency sonar (10-100 Hz) at high efficiency (in the 80-90 percent range) in a vry small size package. Two recent inventions at Tetra Corporation provide the technology base for this dramatic advancement in transducer technology.

TEXAS RESEARCH INSTITUTE AUSTIN, INC.
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AUSTIN, TX 78733
Phone: (512) 263-2101
Topic#: 92-057 ID#: 92N1A-262
Office: NAVSEA
Contract #: N00024-92-C-4302
PI: Alan V Bray
Title: Accelerated Life Testing Development for Determining the Reliability of SSN-21 Hull Coatings
Abstract: The integrity of rubber-to-metal bonds is an area of reliability concern, particularly in systems that are exposed to the harsh conditions of the marine environment. Accelerated life testing (ALT) is a technique used to obtain reliability data in a compressed time frame, allowing lifetime performance predictions and failure mode analyses to be made prior to equipment installation. By performing activation energy laboratory experiments on samples of the SSN-21 hull coating material, TRI/Austin will determine the ratio of accelerated aging rate, under elevated stress conditions, to real-time aging rate. information, an ALT exposure schedule will be designed that can aging; by repeating the exposure schedule, the lifetime reliability and performance characteristics of the SSN-21 hull coating may be predicted. An existing computer software ALT design model will be refined to provide the ability to incorporate different service operating conditions, in-port climates, and activation energies. The computer model will allow modification of mission profile information, through convenient user-interface options, in order to produce new ALT

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Phone: (512) 263-2101
Topic#: 92-065 ID#: 92N1A-354
Office: NAVSEA
Contract #: N00024-92-C-4320
PI: Alan V Bray
Title: Development of Polymer Composite Sonar Transducer Mounting Brackets
Abstract: Sonar transducer mounting hardware installed on current U.S. Navy submarines is constructed from metallic materials that have been found to have costly corrosion problems. Metallic transducer mounting brackets are heavy, are constructed from expensive corrosion resistant metals, use expensive corrosion resistant surface treatments and incur high maintenance costs due to replacement in as little as two years of service. High corrosion rates in mounting hardware also reduces sonar system availability and reliability. TRI/Austin is presently developing high performance polymer composite sonar transducer brackets to replace the current metallic TR-317 and DT-276 transducer brackets. The prototype brackets are injection molded using advanced polymer resin systems highly loaded (40% to 60%) with long glass fibers and mineral fillers. Cost analyses have shown that the TR-317 composite brackets cost under $10 to manufacture at low volume mold runs (100 parts) and cost under

$5 at high volume mold runs (10,000 parts). Current metallic TR-317 brackets cost the U.S. Navy $19 per part. Laboratory and field tests have shown these composite brackets to be a viable low cost, light weight, high strength and corrosion free replacement for their metallic counterparts. Recent MIL-S-901-D explosive shock testing has qualified the brackets for Fleet development. TRI/Austin will utilize the expertise and composite material technology advances gained from its current development effort to develop polymer composite replacement brackets for the metallic DT-537 and DT-538 hydrophone assembly brackets.

THIN FILM CONCEPTS, INC.
ONE WESTCHESTER PLAZA
ELMSFORD, NY 10523
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Topic#: 92-004 ID#: 92N40-036
Office: ONT
Contract #: N66001-92-C-7014
PI: Dr. Leslie Weinman

Title: Stability of Hi-Layer and Tri-layer Contacts to High Temperature Superconductors

Abstract: Stable, chemically inert, low resistivity contacts are required to take advantage of devices being manufactured utilizing various high Tc oxide superconductors. The usual disruption in the oxidation state of the superconductor results in a significant degradation of the contact. Current contact technology utilizes noble metals such as Au, or Ag for the interconnections, but they are expensive and not compatible with Al or Cu interconnections found in most integrated systems. We have recently filed a Patent entitled, "Bi-layer low resistance contact to High Tc Oxide Superconductors." The technique described in this patent will be shown in this proposal to allow a general methodology to fabricate very stable, low resistance contacts to high temperature superconducting devices. During Phase I we will investigate the mechanical and thermal stability of bilayer contacts, initiate experiments to determine the optimum material for these systems, and extend the methodology to tri-layer systems. We will utilize XPS, Auger and electrical and thermal measurements to evaluate these new systems.

TIBURON SYSTEMS, INC.
2085 HAMILTON AVENUE
SAN JOSE, CA 95125
Phone: (408) 371-9400

Topic#: 92-056 ID#: 92N1A-258
Office: NAVSEA
Contract #:
PI: Gregory M Pope

Title: Automated Software Regression Testing, Analysis and Reporting

Abstract: The overall technical objective of the proposed Phase I research is to review the existing capability of the PMO-411 Data Capture System and recommend an approach which will allow it to perform automated and configuration controlled regression tests on the AN/SQQ-89. Specifically, this research will review the existing capability, analyze the current architecture, analyze the configuration control of benchmarks, conduct fact finding interviews, research current software test tool technology, prepare a Software Development Plan, evaluate the use of Ada, and prepare a cost benefit analysis for using the Data

TIMEPLUS, INC.
1339 CANTON ROAD, SUITE H
MARIETTA, GA 30066
Phone: (404) 422-7542

Topic#: 92-163 ID#: 92PMT-287
Office: NAWCFTEG
Contract #:
PI: ROBERT M. CHAMBERLAIN

Title: Flat Panel Display Technology for the E-2C Cockpit

Abstract: The E-2C cockpit is currently equipped with analog instrumentation that is rapidly becoming unsupportable. Retrofit of the E-2C with flat panel, multi-function displays will resolve the supportability problem and will provide new mission support capability for the pilot and copilot. This new capability has the potential of dramatically improving the mission effectiveness of the E-2C. This research project will identify the constraints and operating environment and survey existing and planned cockpit display technologies. TimePlus will determine E-2C cockpit retrofit requirements and trade off display technologies against the constraints operating environment, requirements and schedule to recommend 3 technology approaches for the retrofit program. The Phase II study plan tasks will generate a display subsystem specification for the E-2C retrofit, analyze the potential for a Navy-standard multi-function cockpit display, and develop an advanced crew concept for executing command and control mission in the E-2C with enhanced pilot and copilot functions.

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Topic#: 92-179
Office: NAWCTRN
Contract #:
PI: Bernie Miron

ID#: 92N10-088

Title: Adaptable 1553 Bus Controller And operator Station Improvements For Aircraft Engine Testing

Abstract: The standard 1553 Bus Controller and related engine test facility improvements will give NAPC a standard controller interface for testing engines equipped with FADECS. This effort will make hardware and software improvements to the operator station to add real-time data display, consistent operator test control, record/playback functions and rapid configuration change capabilities. The application of advanced domain modeling and QFD techniques will improve the requirements analysis process. This will result in a balanced analysis of the total system to ensure system changes result in improvements to key problems.

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Topic#: 92-024
Office: SPAWAR
Contract #: N00039-93-C-0050
PI: Thomas S. Seay

ID#: 92N47-069

Title: Acoustic Communication from Integrated Undersea Surveillance System (IUSS) to Naval Forces

Abstract: There are four key elements to the successful design and ultimate deployment of an acoustic underwater communications system for IUSS/ASW tactical connectivity. First, the properties and limitations of the undersea environment must be understood and characterized. Second, the communications link design must provide robust and efficient performance in the presence of the highly variable undersea environment. Third, the offered connectivity, data rates, and reliability must provide tactical utility without significant degradation of prime ASW sensor capabilities. Fourth, maximum utilization of existing and planned subsystems already present or planned for installation must be a key element of the overall design, and additional component development, production, and installation cost should be modest, so that the overall system is affordable. The proposed approach incorporates all the above elements. Characteristics of the communication function include bandspreading, multipath resistance, error correction, and higher data rates for links with benign acoustic conditions. The Phase I effort will survey the operational and planned ASW platform and IUSS resources, design and overall acoustic communications system including operational concept and connectivities, model and analyze link performance accounting for the detailed acoustic environment, and design the acoustic transceiver capable of performing as required for the communications system.

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Topic#: 92-095
Office: NWSC
Contract #: N00164-93-C-0012
PI: H. M. Stoller

ID#: 92N3B-014

Title: Military Qualification of Reclaimed Explosives

Abstract: Disposal of surplus explosives is a major problem due to lack of storage space, environmental restrictions on OB/OD, and expected increase in active program retirements due to military downsizing. Military use of reclaimed explosives is an attractive alternative, with major cost benefits. but is inhibited by current material specifications and general concerns over material performance. An investigation into processes for the reclamation of bulk explosives and explosive constituents will be conducted. Reclaimed materials will be characterized with respect to physical, chemical, thermal stability, and sensitivity characteristics. Applications for use of reclaimed bulk explosives and explosive constituents within the military will be identified. Material requirements for such use applications will be quantified and compared with material characterization information. Procedures to establish a qualification methodology will be formulated and military use development program will be outlined; both to be accomplished in Phase II. TPL is active in commercial uses of demilitarized explosives and propellants. It has proposed one military use for reclaimed PBX and conducted preliminary testing to evaluate performance capabilities. Its in-house chemistry expertise will support extraction studies. CETR will provide thermal stability and sensitivity testing support. Combined, the team has all the capabilities to achieve the desired objective.

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Topic#: 92-131
Office: NAVAIR
Contract #:
PI: H. M. STOLLER

ID#: 92PMT-174

Title: An Investigation of Semiconductor Technology for a 20mm Radhaz Safe Primer

Abstract: The M52 primer used in 20 MM ammunition presents a radiation hazard in the intense electromagnetic environment encountered aboard Navy ships. Shields or attenuators are not feasible for small components such as the M52. Semiconductor technology for RF-resistant primer device applications is a promising innovation. An investigation will be conducted into relevant semiconductor technologies. Two design concepts, labeled semiconductor initiator (SCI) and semiconductor bridge (SCB), will be the probable focus of the investigation. Antenna coupling analysis, in-line RF resistance testing of primer devices, nondestructive testing, and temperature sensitivity will be employed as evaluation criteria. Ability to meet Navy specifications will be established. A Phase II development plan will be formulated. TPL is developing semiconductor primer devices for DOD applications. This proposed effort will be supported by consultants active in the development of semiconductor initiation technology. Experimental facilities exist to support the proposed program.

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Topic#: 92-176
Office: NAWCTRN
Contract #:
PI: Dr. Richard W. Brotzman,

ID#: 92N10-023

Title: A Hydrophobic Ceramic Composite Air Filter

Abstract: A filter is required to remove airborne contaminants from the intake air in small displacement diesel engines. The filtration system must be simple, lightweight, and produce negligible pressure drops across the air intake. The filter will be fabricated by sol-gel techniques using a patent pending ambient pressure drying procedure that offers net-shape, low-cost fabrication with precise control of membrane pore structure. Combined with ceramic fiber reinforcement, the sol-gel process enables the fabrication of tough, low cost, high performance filters. Cylindrical filters will be chemically aged, dried, and infiltrated to control membrane pore size and pore size distribution. A hydrophobic layer will be covalently bound to the surface of the filter to prevent airborne contaminants from wetting and fouling the filter. Characterization will include thermal stability, mechanical properties, pore size and pore size distribution, filtration efficiency, in-line pressure drop, and wetting. TPL, supported by the research studies of the Center for Micro-Engineered Ceramics at the University of New Mexico, represents state-of-the-art expertise in ceramics, composites, sol-gel processing, and filter technology.

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Topic#: 92-152
Office: NAVAIR
Contract #:
PI: RICHARD A. MCKINNEY

ID#: 92PMT-238

Title: Development and Testing of Helicopter Crew Seat/Cushion to Increase Survivability

Abstract: This Phase I program would examine the feasibility of developing aircraft seat cushions that can help crews of the AH-1W to survive crashes. The effort will focus on adapting novel hydraulic air cushioning structures (HACS) to absorb the impact energy of a crash. These HACS structures, which are elastomeric compounds with controlled air-flow passages, when incorporated within the seat or cushion, could absorb tremendous amounts of impact energy during a crash. Combined with current stroking seat technology, the cushions could significantly reduce the average rate of 14.5 G and the maximum G currently experienced in helicopter seat drop tests conducted by Simula. With these shock absorbing qualities, the cushions have the potential to render certain kinds of crashes more survivable. The cushions would not be highly expensive and could be easily designed to be retrofitted to existing aircraft. In addition, later Phase II studies could investigate the incorporation of fire retardant materials to aid in the survival of post-crash fires.

ULTRAMET
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Topic#: 92-097 ID#: 92N25-010
Office: NCCOSC
Contract #: N66001-92-C-7013
PI: Robert H. Tuffias, Ph.D.
Title: Protective Coatings for Containment of Liquid Metal Combustion
Abstract: The Navy is developing liquid metal combustion as the power source for the propulsion systems of several advanced underwater vehicles. Parts made from Hastelloy alloy are used to contain the liquid metal reaction. This environment is extremely hostile: molten lithium at 2OOO-3OOOF causing corrosion, erosion, and/or melting of the Hastelloy alloy, and often failure. In this Phase I program, Ultramet proposes to apply innovative materials and processing to demonstrate the viability of coatings for the protection of Hastelloy alloys from the effects of molten lithium at 2OOO-3OOOF. The overall goal of the program is to extend the operating range and survivability of advanced underwater vehicles powered by liquid metal combustion. To ensure success, Ultramet has teamed with the Garrett Fluid Systems Division (GFSD) of Allied-Signal Corp., a leader in liquid metal combustion engines.

ULTRAMET
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Phone: (818) 899-0236
Topic#: 92-125 ID#: 92N10-008
Office: NAWCTRN
Contract #:
PI: Arthur J. Fortini, Ph.D.
Title: Interfacial Coatings for SiC Fiber-Reinforced Titanium Matrix Composites
Abstract: Continuous silicon carbide (SiC) fiber-reinforced ordered titanium intermetallic alloy (Ti3Al) matrix composites are enabling materials for next-generation turbojet compressor and hypervelocity vehicle airframe applications. They possess unique combinations of several attractive properties such as high specific strength, high specific stiffness, and excellent fatigue and creep resistance. However, several key issues challenge the fabrication and application of these composites, led by their complex interfacial Phenomena. In this Phase I Program, Ultramet Proposes to deposit single-layer, graded, and duplex interlayers of refractory metals and/or ceramics by chemical vapor deposition (CVD) to eliminate interfacial reactions, eliminate the weak carbon layer on commercially available SiC fibers, and ease thermal stress at the fiber/matrix interface, Ultramet will collaborate with other experts to coat fibers, fabricate and characterize the composites, and screen the material systems Proposed for the interlayers.

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Phone: (303) 761-2137
Topic#: 92-016 ID#: 92N07-053
Office: MARCOR
Contract #: N00167-92-C-0039
PI: ROBERT REHN
Title: In-Arm Drive System for Wheeled and Tracked Vehicles
Abstract: Unique Mobility, Inc. ("Unique") has invented a novel means of constructing a brushless DC motor, using conventional materials, which permits operation at high speed with high efficiency and high power output. Unique\'s primary focus is on the application of its motor technology to land vehicle drive systems. It is proposed that this technology be applied in a distributed electric drive system for a track laying or wheeled vehicle wherein each of the road wheels are separately powered and the motors and gear reduction are integrated and part of the road arm and wheel hub assembly. The road arm and wheel hub assembly could also be utilized from a common component point of view in a conventional main sprocket driven tracked vehicle.

VECTOR MICROWAVE RESEARCH CORP.
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Phone: (703) 683-3399
Topic#: 92-168 ID#: 92N2D-029
Office: NSWCDDWO
Contract #:
PI: Ronald T CRABB
Title: ECM Payloads For UAVs
Abstract: The spatial separation offered by UAVs (Unmanned Air Vehicles) negates many advantages of advanced monopulse radar and IR seeker designs. UAVs provide unusual EW payload design freedoms - EW protection of naval surface ships is emphasized. Unique ship considerations include relatively large RCS, limited speed and maneuverability, short warning times,

long counter-targeting engagement durations, unusual IR characteristics, multiple ships to be defended, and widely variable engagement geometries. Vector will define an effective, practical, and affordable EW payload that counters both targeting and homing (radar and IR) functions - advanced threat technology dictates requirements and system design. Vector Microwave Research has previously identified and tested an RF ECM technique set for UAV applications - a set to be expanded based on a reassessment of the advanced threat. Vector will add IRCM approaches which accommodate unique UAV constraints. Comprehensive digital modeling will evaluate effectiveness of the additional techniques. Information exchanges with UAV platform developers and the UAV JPO will better define information, mechanical, thermal, and electrical interfaces between EW payload and candidate UAV platforms (counter-rotating rotors and tilt rotor designs). System definition includes concept of operations (Command, Control, and Coordination with the AN/SLQ-32(V)/54), interface requirements (payload-UAV-ships via UAV datalinks), and tactics.

VERITAY TECHNOLOGY, INC.
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Phone: (716) 689-0177
Topic#: 92-040 ID#: 92N1A-041
Office: NAVSEA
Contract #: N00024-92-C-4304
PI: James Q TALLEY
Title: Advanced Gun Barrel Design
Abstract: Advanced guns for future Naval systems such as Phalanx will incorporate innovative high-performance chemical and electrical propulsion concepts such as cased telescoped ammunition (CTA) and electro-thermal chemical (ETC) guns to achieve high ballistic performance. The combination of high performance, high firing rate (over 1000 rounds per minute per barrel), and extensive burst fire duration imposes extreme heating loads on the barrels that cannot be withstood by conventional barrel design techniques. In recent years, new materials, coating, platings, and manufacturing techniques have been developed that may be successfully applied to high-performance gun barrel design. High melting temperature yet resilient ceramics, coating and sputtering techniques for applying high temperature materials, and new metals and compound design techniques incorporating liners, etc., are conceptually promising but need to undergo design and evaluation. During the proposed program, candidate materials and processes for advanced gun barrel design will be identified and evaluated. The Phase I effort will include interior ballistic simulations to help define the thermal and pressure environment; formulation of innovative barrel design concepts that take advantage of material properties; structural design analyses to evaluate material configurations in the ballistic environment; and heat conduction simulations to evaluate thermal response and behavior under burst-fire conditions. It is anticipated that one or more advanced barrel design configurations will be shown to be feasible and suitable for experimental development and evaluation during Phase II.

VERSATRON CORP.
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Phone: (707) 433-3000
Topic#: 92-015 ID#: 92N07-051
Office: MARCOR
Contract #: N00167-92-C-0039
PI: John Speicher
Title: Electrical Rotary Motion Actuator
Abstract: This project will address the design and layout of an electric rotary motion actuator for use on amphibious assault vehicles (AAVs) or similar vehicles. This system will greatly enhance the survivability and reliability of such systems through a modular approach to vehicle control. This approach allows the modern concept of modular vehicle system control, such as is used on aircraft, to be applied to AAVs. Several innovative features will be incorporated in the design. These are: 1. A compact, high torque, low inductance brushless motor. 2. A compact, high power density PWM electronic driver. 3. A motor to driver commutation interface designed for high power thruput. 4. A very compact high strength gear reduction system. These features will be designed, analyzed via computer simulations and a layout of the mechanical system will be generated. The drive electronics will be packaged in an envelope compatible with the system. The resulting deliverable engineering model mock-up will demonstrate the packaging of a 12,000 lb-in output torque, 180 degree rotation system less than 8 inches in diameter and weighing less than 50 pounds. Power for the system will be supplied by 270 VDC power bus. Control commands will be input via the vehicle bus and could be proportional or bi-stable, depending on the overall system requirements. Alternately, a simple high/low logic command or an analog control signal could be used as input commands.

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Topic#: 92-021 ID#: 92N47-039
Office: SPAWAR
Contract #: N00039-93-C-0090
PI: Steve Hart
Title: Protocols for DATA/Voice Networking
Abstract: ViaSat proposes to develop a set of protocols to allow voice users to efficiently use the full range of available digital networks available to Navy platforms. The protocols will have extensive flexibility, in order co work on narrow-band HF channels, as well as higher bandwidth packet oriented networks. By decoupling the voice link control information from the actual voice data, we can take advantage of multimedia networks to provide for separate transmission paths. By aggressively manipulating the underlying vocoded structures we can also obtain additional compression. Since the voice will share the same digital networks as data users, the Navy will obtain great benefits in total network performance, no longer needing to set aside special channels for voice. ViaSat will provide characterizations of the full range of RF media which can be used for voice, and provide protocol parameters for compatibility with each of these media types. ViaSat will also develop the means to connect into the public switch network, to provide "direct-dialing" from any participating platform to the world of telephone communications. The proposed approach provides direct support for the Copernicus architecture.

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Phone: (619) 438-8099
Topic#: 92-022 ID#: 92N47-049
Office: SPAWAR
Contract #: N00039-93-C-0089
PI: Mark Dankberg
Title: SHF SATCOM Networking
Abstract: Our clean-sheet-of-paper architectural concept is different from any used by the Navy at either UHF or EHF. It takes advantage of the unique attributes of DSCS space and ground segments, compared to other MilBatcom systems. Still, our innovative networking concept is compatible with current and Planned small shipboard SHF terminals. It focuses on the SHF modems and network controllers. It builds on emerging Navy VME standard architectures and uses IF outputs suitable for AN/WSC-6 SHF terminals. The Proposed Phase I work includes analysis and simulation to quantify system Performance under a variety of satellite configuration, terminal, operational, and traffic models. A successful Phase I feasibility Program leads directly to an SHF on-the-air Phase II Proof-of-concept demonstration, including measurements to verify Performance Predicted in Phase I. The high pay-off Phase II program is tailored for a Phase III opportunity to feed the Powerful networking equipment into mainstream SHF terminal Procurements. Our concept builds on ViaSat's expertise in key technologies related to SHF networking, including: anti-jam, low Probability of exploitation signaling and coding, satcom modems, embedded-multiuser Time-of-Day encryption, and Demand Assigned Multiple Access network management. The major benefit of the proposed work is to offer the Navy a near-term affordable

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Topic#: 92-026 ID#: 92N47-084
Office: SPAWAR
Contract #: N00039-93-C-0030
PI: Mark Dankberg
Title: Performance Modeling for Automatic DAMA Control
Abstract: ViaSat, Inc. is pleased to present our comprehensive and creative methodology for modeling the performance of Automatic DAMA control systems. Our approach provides an objective, quantitative, unambiguous, and systematic environment for defining what "performance" really means to fleet satcom users. We then who how to use this environment to compare the performance of candidate DAMA controller strategies. Our performance modeling environment takes into account all of the aspects of automatic DAMA control, including; the constraints due to DAMA terminals and technical interface standard,s selection of observable statistics to measure, definition of system stochastic input parameters, and computer software that ties it all together. The proposed Phase I work includes analysis and simulation to quantify system performance under a variety of satellite configuration, terminal, operational, and traffic models. It also includes actual real-time simulation of candidate automatic DAMA control strategies that prove the value of the performance model. A successful Phase I feasibility program leads directly to a UHF on-the-air Phase Ii proof-of-concept demonstration, including measurements to verify performance predicted in Phase I. The high pay-off Phase II program is tailored for a Phase III opportunity to feed the powerful network controller into mainstream UHF satcom programs.

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Topic#: 92-114 ID#: 92N01-089
Office: ONR
Contract #:
PI: Dr. Mohammed Ettouney

Title: Stochastic Analysis of Submerged Complex Systems

Abstract: The uncertainty in the magnitude and spatial distribution of concentrated masses internally attached to a shell submerged in an acoustic media is considered. The governing probabilistic equations are derived, and the supporting computer code is developed. The method will result in the statistical properties of important output measures, such as the structural velocities as well as the far field pressures. Among those properties are the expected values and variances. The method is shown to be computationally efficient. It is general enough to account for submerged complex structures as well as large number of random variables, such as concentrated masses and/or uncertain internal boundary conditions (impedances). The flexibility of the method makes its extension to more demanding and complicated systems straightforward. Using such a probabilistic methodology makes it possible to correlate test results to analysis results in a systematic way, to better understand analysis results, to identify important sources of noise in the system, and finally to have an optimal design of structures which are submerged in an acoustic fluid.

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Topic#: 92-084 ID#: 92N32-138
Office: NSWCDDWO
Contract #: N60921-93-C-A311
PI: WISNOSKY

Title: The Drawing Specification Interface Retrieval System

Abstract: This extraordinary development will culminate in a cutting-edge tool for monitoring changes in Federal, Industrial, and Military drawings, specifications, and standards. This tool will be supported by an intelligent data linking methodology, which will permit instantaneous updating, tracking, and retrieval through existing automation methods. State-of-the-art data storage and processing techniques will be employed; early indications lead towards neural-network processing techniques and linked object-oriented database technologies. The development of such a tool promises to be extremely valuable for developers, configuration managers, inventory and production managers, field operators, policy-makers, cost analysts, and others. The need for such a tool has been repeatedly demonstrated to Wisdom and its clients for several years. It can offer tremendous savings in human and capital resources, drastically reduce time to production, and increases in product performance, through effective, useful technical information transfer. Given recent technical advances, the timing is ripe for this technically feasible tool. Wisdom feels that it has the technical capability and experience, without equal, to develop such a tool.

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NAVY Topic#: 92-108
PHYSICAL OPTICS CORP.
TANNER RESEARCH, INC.

NAVY Topic#: 92-109
AURORA FLIGHT SCIENCES CORP.
QUEST INTEGRATED, INC.

NAVY Topic#: 92-110
COMPLERE, INC.
QUADRANT ENGINEERING, INC.

NAVY Topic#: 92-111
FARACHEM TECHNOLOGY, INC.
LYNNTECH, INC.

NAVY Topic#: 92-112
I-KINETICS, INC.
RTWARE, INC.

NAVY Topic#: 92-113
INTELLIGENT REASONING SYSTEMS
SYNAPTICS, INC.

NAVY Topic#: 92-114
CAMBRIDGE ACOUSTICAL ASSOC., INC.
WEIDLINGER ASSOCIATES

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ADVANCED TECHNOLOGY INCUBATOR, INC.
DISPLAYTECH, INC.

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MELLER OPTICS, INC.

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SIMPEX TECHNOLOGIES, INC.

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FOSTER-MILLER, INC.
MSNW, INC.

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CIENCIA, INC.
TECHNOLOGY INTEGRATION, INC.

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SHERWIN, INC.

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FOSTER-MILLER, INC.

NAVY Topic#: 92-124
TEDRIC A. HARRIS, CONSULTING ENGINEER

NAVY Topic#: 92-125
ULTRAMET

NAVY Topic#: 92-126
DIGITAL SYSTEM RESOURCES, INC.

NAVY Topic#: 92-127
ALPHATECH, INC.
ORINCON CORP.

NAVY Topic#: 92-128
NEURODYNE, INC.

NAVY Topic#: 92-129
BOSTAN RESEARCH, INC.
PIASECKI AIRCRAFT CORP.

NAVY Topic#: 92-131
TPL, INC.

NAVY Topic#: 92-132
SYSTEM DYNAMICS INTERNATIONAL, INC.

NAVY Topic#: 92-133
CASDE CORP.

NAVY Topic#: 92-134
ANALYTIC ENGINEERING COMPANY

NAVY Topic#: 92-135
RESEARCH OPPORTUNITIES, INC.

NAVY Topic#: 92-136
MUDAWAR THERMAL SYSTEM, INC.

NAVY Topic#: 92-137
MOUNTAIN OPTECH, INC.

NAVY Topic#: 92-138
FOSTER-MILLER, INC.

NAVY Topic#: 92-139
ELECTROCHEMICAL TECHNOLOGY CORP.

NAVY Topic#: 92-140
FIBER & SENSOR TECHNOLOGIES, INC.

NAVY Topic#: 92-141
GUMBS ASSOC., INC.

NAVY Topic#: 92-179
TIMEPLUS, INC.

NAVY Topic#: 92-180
SPECTRA RESEARCH, INC.

NAVY Topic#: 92-181
BD SYSTEMS, INC.
INVOCON

NAVY Topic#: 92-182
INFRARED FIBER SYSTEMS, INC.

NAVY Topic#: 92-183
DEVELOSOFT CORP.

NAVY Topic#: 92-185
INDUSTRIAL QUALITY, INC.

NAVY Topic#: 92-186
FOSTER-MILLER, INC.

NAVY Topic#: 92-187
BLOCK ENGINEERING, INC.

NAVY Topic#: 92-188
BLOCK ENGINEERING, INC.