

NAVY SMALL BUSINESS INNOVATION RESEARCH PROGRAM
Submitting Proposals on Navy Topics

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Topics #N85-001 through #N85-007

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Arlington, VA

N85-001 TITLE: Surface Attack on Metals in the Presence of Liquid Metals Research

CATEGORY: Research

DESCRIPTION: Sodium-Potassium eutectic (NaK) has been identified as the primary candidate for use in liquid metal current collectors for super conducting homopolar electric machines. Under certain circumstances (e.g., very large, low speed motors) the use of higher density liquid metals has been found to be acceptable and results in superior electrical machinery. Preliminary experiments have indicated that quaternary or Quinter nary solder-like alloys of various combinations of Bi, In, Cd, Pb, and Sn may be suitable as NaK substitutes at temperatures below 175 degrees F. It is anticipated that the material compatibility with most metallics below 200 degrees F. This research task involves the investigation through literature search and/or direct experiment of the compatibility of the various metallics used in liquid Sn, and GaIn alloys. A particular task is to determine relative solubility of relevant solid metals in the liquids and the degree and type of surface attack or corrosion. This data will serve as a basis for the development of a theoretical model suitable for the prediction of surface phenomena for liquid/solid metal interfaces. The theoretical model may then be used as a guide for future selection of metals and alloys for use with liquid metals in applications involving temperatures in the 0-to-500 degree F range. (Bi-Bismuth; In-indium; Cd-Cadmium; Pb-lead; Sn-Tin; Ga-Gallium).

N85-002 TITLE: Synthesis of Refractory Phosphides

CATEGORY: Research

DESCRIPTION: Develop innovative approaches to the synthesis of phosphides for use as infrared transmitting refractory ceramics. The objective is to produce phase pure material by techniques that are scalable to multi-kilogram lot sizes. Materials must be oxyanion free and have a low enough concentration of other impurities to achieve intrinsic absorption between 3 and 5 m. Binary, ternary, and quaternary compounds should be considered. Consideration should be given to low temperature routes such as reaction in nonaqueous solvents.

N85-003 TITLE: Remote Sensing Systems

CATEGORY: Research

DESCRIPTION: Develop unique or innovative techniques for remote sensing of environmental parameters (e.g., ambient acoustic noise, currents over the ocean water column) that require high data rates, data concentration, and minimum energy consumption. Data retrieval methods, including unit-to-unit transmission or unit-to-satellite/ground station, will be a critical part of this research effort. The objectives are to develop the capability to deploy long-term multiple sensor buoys or moored systems in remote locations. A secondary objective is to minimize the unit costs of such systems to avoid costly recovery operations.

N85-004 TITLE: Implementation of Logistics Software on Microcomputers

CATEGORY: Exploratory Development

DESCRIPTION: The proliferation of microcomputers will lead to new methods of practice for operations research professionals both inside the Navy and in the civilian community. Research over the last twenty years has been towards increasing the size and complexity of algorithms to handle more complex models. Methods now need to be developed to efficiently decompose problems and solve the components on microcomputers.

There are several issues which are significant in the design of such systems. Logistics applications typically require large amounts of data. Efficient management and display of this data using the limited microcomputer memory will require new model structures and algorithms, perhaps hierarchically organized at various levels of aggregation. Applications on mainframe computers prohibit human involvement – those on microcomputers require it. This requirement stems from the limited computations capacity available. The interface must be carefully organized to

take maximal advantage of each of the participants. Many logistics applications require the expertise of a number of people. The software must be designed to allow each member to work independently with coordination and data communication when needed.

The initial phase of this research should be for the development of demonstration technology designed to study these or other issues of microcomputer implementation in a Navy application area. Possibilities for such areas include ship loading, inventory management, maintenance scheduling, and shipment planning.

N85-005 TITLE: Automated Welding

CATEGORY: Research

DESCRIPTION: The Navy has an interest in pursuing new and innovative research in automated welding of high strength, low alloy (HSLA) steels. The HSLA steels are being considered for use in ship construction. This program for welding research may employ advanced high deposition rate techniques or high density beam processes, but is not limited to them. The research focus should be on processes that lend themselves to automation and may include advanced sensors and robotics and mathematical models that predict needed information on seam tracking, weld pool geometry and/or weld integrity.

N85-006 TITLE: Immunopharmacology

CATEGORY: Exploratory Development

DESCRIPTION: A need exists for pharmacologic agents that can activate immune defenses against microorganisms, especially viruses. Agents that activate either nonspecific or specific immunity are of interest, but immune stimulants that protect against a wide variety of infections nonspecifically are of special importance to military medicine. Both prophylactic and therapeutic pharmaceuticals are of interest. Suitable pharmaceuticals must be potentially safe for human use, economical to produce, convenient to use, and enhance resistance to or recovery from infectious agents.

N85-007 TITLE: Strip Mirror Echelons for Photolithography or Laser Annealing

CATEGORY: Exploratory Development

DESCRIPTION: The use of ultraviolet excimer lasers for micro-photolithography or annealing has been impeded by the difficulty in achieving sufficiently uniform illumination of the targets. This solicitation calls for the optics design and mechanical hardware to utilize the recently invented "induced spatial incoherence" technique to achieve ultra-uniform illumination of targets (see R. Lehmberg and S. Obenschain, Optics Comm. Vol. 46, pg. 27, 1983). The ISI technique uses two echelons, each made up of two carefully aligned strip mirrors. (One can also use transmission or refraction echelons.) When alternate mirrors are tilted, the technique should produce nonuniformities of less than + or - 2% in the far field, over a substantial portion of the beam, without speckle. A mirror echelon has already been successfully deployed in laser fusion research with an Nd: glass laser at the Naval Research Laboratory, producing beam nonuniformities less than + or - 10% on a millimeter spot. Phase I of this solicitation calls for an optics and mechanical design that would be appropriate for an excimer laser, with a uniform spot over about one successful contractor would manufacture an iterative series of echelon assemblies that would demonstrate sufficient stability and reliability for commercial applications to photolithography or annealing.

N85-008 TITLE: Chemical Resistant Paints

CATEGORY: Advanced Development

DESCRIPTION: Paints in current use by the Marine Corps act as a blotter to toxic chemicals, especially those expected to be used against the Marine Corps in battle. The available decontamination processes strip the contaminated paints from the surface, which they were protecting.

The objective of this work would be to develop a paint which would be easily applied and be either unaffected by chemical agents or be decontaminated without loss of the protective features of the paint for the metal surfaces.

N85-009 TITLE: Mine Detection Equipment

CATEGORY: Exploratory Development

DESCRIPTION: The Marine Corps requires equipment capable of detecting land mines/minefields at a standoff distance of one to five kilometers forward of combat elements. The equipment must be usable in a field environment, transportable on tactical vehicles, and provide real-time, accurate information on minefield location. A negative response should assure that no mines are present.

N85-010 TITLE: Enhanced Conventional Explosives

CATEGORY: Exploratory Development

DESCRIPTION: The Marine Corps has a requirement for conventional (non-nuclear) explosives which can provide overpressures from 3,000 to 5,000 pounds per square inch over a 20-meter diameter area. The charge, when fielded, must meet current military standards concerning safety, transportability, storage, etc., and be usable in a field environment. Delivery methodology and equipment would be a separate development, once the explosive is satisfactorily attained.

N85-011 TITLE: Decoy Development

CATEGORY: Advanced Development

DESCRIPTION: The Marine Corps requires decoys to simulate various weapons systems, including motor vehicles, tanks, amphibian tractors, artillery weapons, and missile systems. These decoys must have identical thermal, visual, and radar signatures as the items they simulate.

N85-012 TITLE: Algorithm to Predict Levels of Cosite Interference

CATEGORY: Software Engineering Development

DESCRIPTION: The ability to predict the success of communication links in a network requires a level of engineering expertise not generally found in tactical communications officers. This situation is rapidly changing due to the advent of the personal computer (PC). The combination of increasingly sophisticated PCs and the abundance of concomitant software support can significantly augment the communicator's ability to manage his system better. With the aid of a computer, he can more readily contribute to the design and analysis of his node, relying on the computer to provide the answers to detailed, tedious, repetitive engineering procedures while he contributes the crucial parameters of human judgment and decision.

The task is to develop an algorithm, through several levels of refinement, that would be the basis for a computer program to predict levels of interference in a cosite configuration for single-channel and frequency hopping systems. Minimal design requirements should include, but not be limited to, the following characteristics:

- a. use of algorithmic language
- b. design modularity
- c. hierarchical design

- d. uniformity:
 - 1. modules should perform specific functions
 - 2. variables have singular meanings
 - 3. variables values are of fixed range
- e. good documentation:
 - 1. HIPO diagrams
 - 2. structured/N.S. flowcharts

Further activity in this project would be the construction and verification of an actual software program.

N85-013 TITLE: Independent Validation and Verification of Tactical Air Operations Central – '85 Software

CATEGORY: Management and Support

DESCRIPTION: The Tactical Air Operations Central – 1985 (TAOC-85) Engineering Develop Model (EDM) software/firmware is baselined to 1979-1980 military documentation standards. An independent validation and verification plan detailing documentation standards and software function is required in transitioning the EDM software to a production software baseline. As a minimum, this plan should specify the organization of software validation and verification personnel, to include personnel validation and verification responsibilities. The procedures for validating and verifying specified software functions should be listed in detail.

Software program configuration identification procedures to include listings of function, allocated, and product baseline documents, should be provided. Procedures detailing the review of these baseline documents should also be included in the plan. Software code library, software documentation library, and software test library organization and catalog procedures should be provided for in the validation and verification plan. Any other validation or verification information or procedures relating to successful transition of software programs from a developmental to a production baseline should also be provided.

N85-014 TITLE: Lightweight Handheld Electronic Counter Countermeasures (ECCM) Communications Device

CATEGORY: Engineering Development

DESCRIPTION: Current handheld radios do not include ECCM in any form that addresses a spread spectrum capability. In present and future areas of rapid information exchange with the required quick responses by echelons of Command, units must be equipped with a more effective means of transmitting and receiving digital data and voice information. The Marine Corps AN/PRC-68 handheld VHF/FM radio, although including encryption, could include ECCM by modification of the encryption logic and synthesizer, and changing the present channel selection to a broadband characteristic. A combination of pseudo random and frequency hopping, spread spectrum modulation would be addressed to include a margin of low probability of intercept (LPI) and ECCM. The mode of operation would be selectable between LPI/ECCM and the existent mode of operation.

N85-015 TITLE: Tactical Warfare Simulation Evaluation Analysis System/Marine Integrated Fire and Air Support System Interface

CATEGORY: Advanced Development

DESCRIPTION: Produce an Interface Design Specification, in accordance with Military Standard 1679 (or current version thereof), and an operational concept of employment for the interfacing of the Tactical Warfare Simulation Evaluation Analysis System (TWSEAS) and the Marine Integrated Fire and Air Support System (MIFASS).

The TWSEAS is a computer-assisted, real time tactical exercise control system which can monitor actual events as they occur in field exercises (FEX) and as reported by umpires using digital communications links. In the command post exercise (CPX), where only the player's command post is real, TWSEAS simulates the battlefield environment, reports the actions of all simulated units and calculates/reports all combat damage as a result of actions of forces on both sides of the engagement. In order to be successful, combat information must reach the player's command post in a manner which is the same as, or at least very close to, that which is present during actual battle. The TWSEAS must interact with the player's command and control (C2) systems. In the near future, this C2 environment will include the MIFASS. MIFASS will be a C2 system which will integrate artillery, mortars, naval gunfire and air support with the unit scheme of maneuver. As supporting arms actions form a large part of the combat exercise environment, there is a clear need for the TWSEAS and MIFASS to interface.

This effort shall include the software and hardware issues involved in the interface, as well as an analysis of the level of interface required (i.e. manual, semi-automatic, or automatic). This analysis should be supported by the operation and training requirements present during an integrated (i.e. combined FEX/CPX) exercise involving Marine Air Ground Task Forces (MAGTF) at all three levels of command (Marine Amphibious Unit, Brigade, and Force). These requirements include the need to present various information to the exercising staff via these C2 systems, as well as the need to create a realistic combat environment through the simulation of the player's real world C2 systems.

N85-016 TITLE: Tactical Warfare Simulation Evaluation Analysis System/Aviation System Interface

CATEGORY: Advanced Development

DESCRIPTION: Produce a report indicating the most effective means of interfacing the Tactical Warfare Simulation Evaluation Analysis System (TWSEAS) with the current and projected Marine Air Wing (MAW) command and control (C2) systems at the Marine Amphibious Brigade and Force (MAB, MAF) levels. Complicating this problem is the fact that the MAW command and control systems are already largely automated. The goal of this interface is to provide exercise information to the MAW command elements which will allow them to participate in integrated exercises with the other elements of the MAB and MAF.

The TWSEAS is a computer-assisted, real-time tactical exercise control system which can monitor actual events as they occur in field exercises (FEX) and as reported by umpires using digital communications links. In the command post exercise (CPX) where only the player's command post is real, TWSEAS simulates the battlefield environment, reports the actions of all simulated units and calculates/reports all combat damage as a result of actions of forces on both side of the engagement. In order to be successful, combat information must reach the player's command post in a manner which is the same as, or at least very close to, that which is present during actual battle.

The MAW C2 environment contains numerous automated systems with new versions currently being developed. These systems include the Tactical Air Command Central Product Improvement Program (TACC PIP), the aviation portion of the Tactical Combat Operations (TCO) System, and the Tactical Air Operations Central – 1985 (TAOC-85). While TWSEAS does simulate individual flights of aircraft, the training target elements in the MAW are not so much the air controllers but, rather, the command staffs.

This effort should include an analysis of the most beneficial point(s) of interface to support the exercise training objective (i.e., to exercise the MAW command elements). Factors such as the amount and type of required information, the rate of transfer of this information, and appropriate transfer points shall be included. As a follow-on effort, Interface Design Specification could be prepared for the specific interfaces defined in the initial effort. These specifications shall be in accordance with Military Standard 1679 (or current version thereof).

N85-017 TITLE: Marine Tactical Command and Control System (MTACCS) Planning Support System

CATEGORY: Management and Support

DESCRIPTION: The automation of command and control functions by systems in the Marine Tactical Command and Control System will create a complex task and system interface structure. A planning support system is needed to assist systems planners in recognizing interoperability requirements, task allocations, information exchange, and system dependencies. In addition, data must be maintained on command and control system physical interfaces for communications, networking, power, and peripherals. The planning system should be able to provide development/operational status of tasks and interfaces. Information provided by the planning system will assist in targeting task changes, adding new tasks, and assessing both logical and physical interfaces of Marine Corps Tactical Command and Control Systems.

The planning systems should be a microcomputer-based data base system that provides a user-friendly interface for system planners. In addition, simple procedures should be provided to maintain and update the database. The system should be provided to maintain and update the database. The system should be planned to support information tasks and interfaces of the Marine Integrated Fire and Air Support System (MIFASS), Tactical Air Operations Central – 1985 (TAOC-85), Position Location Reporting System (PLRS), Tactical Combat Operations (TCO) System, Marine Air Ground Intelligence System (MAGIS), and Tactical Warfare Simulation Evaluation Analysis System (TWSEAS).

N85-018 TITLE: Implementation of Lightweight Combat Terminal (LCT) Requirements in Commercial Equipment

CATEGORY: Exploratory Development

DESCRIPTION: A set of requirements and an initial functional specification for the LCT have been developed. These requirements and the specification identify the need for a general-purpose, lightweight, computer for use at the battalion level. This device would be used to fulfill the requirements in a variety of functional areas, most notably fire support, intelligence planning, operations, logistics, communications, and air defense. This “generic” device must be capable of being rapidly reprogrammed to meet different functional area requirements. Capabilities to be included consist of word processing, message editing and processing, graphics, display of maps and tactical information, database management, and query, and the capability to interface with printers and plotters to produce permanent copy. The device requires sufficient computing capability and storage to permit stand-alone processing in support of technical analysis, such as communications frequency processing in support of technical analysis, such as communications frequency allocation. The device should meet full military standards, be reliable, and capable of being interfaced with other Marine Corps Tactical Command and Control System (MTACCS) subsystems, such as the Marine Integrated Fire and Air Support System (MIFASS) and the Tactical Combat Operations (TCO) System.

Commercial computer equipment development appears to have reached a stage of ruggedness, reliability, and capability whereby many of the above requirements can be met. What is required is the development of a prototype LCT that would demonstrate the basic capabilities mentioned above using “off-the-shelf” computer equipment that is both ruggedized enough for general field use, but portable enough to be carried easily by one man. The effort should initially focus on the development of a prototype LCT that is capable of performing some, or all, of the operational functions specified in the current documentation. The prototype would then be demonstrated to Marine Corps field units to verify/validate the functional and operational requirements.

N85-019 TITLE: Optimum Equipment Configuration for Marine Integrated Fire and Air Support System/Tactical Combat Operations

CATEGORY: Advanced Development

DESCRIPTION: The current development strategy for the Tactical Combat Operations (TCO) System calls for TCO to be integrated with the Marine Integrated Fire and Air Support System (MIFASS). It is envisioned that TCO will be a software preplanned product improvement (P3I) effort to MIFASS.

Under the previous development strategy, where TCO was envisioned as using MIFASS-developed equipment but existing as a separate system, the necessary suite of equipment was identified and is documented in the TCO level-A

(functional) specification, the System Description Document (SDD), and other technical notes and engineering studies. The new development strategy will require that the additional equipment necessary to support the identified TCO functions be added to the MIFASS suite instead of purchasing an entirely separate suite of equipment for TCO. This addition of equipment will affect various system parameters of MIFASS, such as additional memory required to support both MIFASS and TCO, additional processing power needed, system throughput, etc. What is needed is an analysis to identify the mix of equipment that must be added to the planned MIFASS suite to support the currently defined TCO functions at all levels of command in the Marine Amphibious Force. Also required is an impact analysis to determine the effect of adding this additional equipment on MIFASS as it is currently described in its specification, system description document, and other pertinent documentation.

N85-020 TITLE: Extended Range Ship-To-Shore VHF Multi-Channel Communications Feasibility and Equipment Identification

CATEGORY: Advanced Development

DESCRIPTION: Amphibious Forces Ashore must maintain reliable communications with Amphibious Shipping over 50 to 100 nautical mile ranges. Current VHF Systems cannot accomplish this. The tasks are:

1. Determine the feasibility of using specially designed auto-positioned-directional active array antenna systems to maintain links over the specified ranges in conjunction with sensitive receiver(s) with adaptive radio features (i.e. channel evaluation, automatic link establishment, etc.) and high-powered transmission capability continuously controllable.
2. Identify systems capable of doing the job, systems that can be modified to do the job and/or what it will take (money and time) to do the job.

The ship mode, as well as the shore mode, must be capable of operating in the 30-88 MHz frequency range restricted to the use of 25 kHz bandwidth and providing four 2.4 kHz digital channels capable of passing narrowband secure voice, data, and record traffic.

N85-021 TITLE: C3I Basic Research in Mathematics

CATEGORY: Research

DESCRIPTION: The mission of NAVELEX includes system development in Navy command, control, and communications, and undersea surveillance. Basic research in mathematics can support this mission. Example projects could include development of a new algorithm for undersea surveillance, mathematic research that can prove communication network design or can improve capability to transmit voice submarines, or artificial intelligence (AI) approaches that can support command control, such as AI used in a self-contained situation assessment capability for lower echelon commanders. Projects are requested (not limited to these examples) that can aid the NAVELEX mission through more basic research projects in mathematics.

N85-022 TITLE: Situation Assessment

CATEGORY: Research

DESCRIPTION: Work is underway in the Navy to develop command centers for the top echelons of the Navy Command. The intent of this effort is to develop situation assessment devices, using small computers, for a lower level of command; e.g., the commander of a small ship. The situation assessment capability could aid the commander in, for instance, interpreting radar images or conflicting weather information. The situation assessment device could utilize AI, have some limited learning capability, and be interactive with the user.

N85-023 TITLE: Spare Part Serial Tracking

CATEGORY: Engineering Development

DESCRIPTION: Serial Tracking of entire populations or samples of populations of spare parts has been established as the prerequisite for decisions upon "repair or replace" at specific levels of the work breakdown structure for equipment. Methods are required which permit serial tracking with a minimum involvement of human effort wherever repairs are conducted and repair and maintenance cost arise.

The information shall be used to develop families with "similar behavior" in regard to maintenance and repair requirements. This, in turn, will be the basis for a decision logic, designed to answer specific questions with a tailored database.

The result of this research will reduce the cost of data acquisition for spare parts and, at the same time, increase the accuracy for data as used presently in different data management systems of spare parts.

N85-024 TITLE: Laser Protection Eyewear

CATEGORY: Exploratory Development

DESCRIPTION: It is necessary to develop inexpensive glasses to protect Navy and Marine Corps personnel from eye damage when performing missions in or around lasers. Since these lasers will be tunable and cover several different frequencies, it is desirable to have a device that is not fixed to work at a single frequency. Also, it is desirable that the lens not interfere with normal vision to any great extent.

N85-025 TITLE: High Frequency, Frequency Shift/Phase Shift Performance Investigation

CATEGORY: Exploratory Development

DESCRIPTION: High Frequency Communication suffers in performance due to the time varying nature of the Communication Channel. The primary causative agents are the multiplicity of propagation paths and modes. If one assigns bit error rate (BER) for a given input signal-to-noise ratio (S/N) as a performance measure, then the desired objective should be to minimize the performance measure, then the desired objective should be to minimize the output BER for a given input S/N. One method of controlling the BER is by appropriate error control coding.

The objective of this task is to compare the relative efficiency of existing error control coding schemes, given the above performance measure, when applied to acceptable time delays and Data Terminal Set (MODEM) as rate inherent in Link 11 (TADL A).

N85-026 TITLE: ELF On-Hull Antenna for Submarines

CATEGORY: Exploratory Development

DESCRIPTION: A decade ago, limited analyses and experimental data indicated that the design of an ELF antenna on the hull of a submarine has insurmountable difficulties. With the advance in the measurement techniques, signal processing, and computer technology, a feasibility study may well establish the foundation for the design of such an antenna by adaptive noise cancellation methods. With renewed interest in the ELF system, a hull-mounted antenna has many advantages over the long line antenna in tow.

N85-027 TITLE: Detect ability of Acoustic Emission in Underwater Communication

CATEGORY: Exploratory Development

DESCRIPTION: Submarines prefer to operate in a passive mode without any acoustic emission other than own ship noise and flow noise which cannot be totally eliminated. This attitude or tradition tends to deny all means of underwater communication by acoustics. Progress in acoustic communication has been made in waveform design, coding, and signal processing which greatly reduces the probability for the source to be discovered. With those modern techniques, judicious use of underwater acoustic communication may not necessarily subject the submarine to a greater detectability than that caused by noise generated by the sub. In certain scenarios, a quantitative assessment to the increased risk provides a trade-off to determine whether the benefit to communicate outweighs the additional risk or not. Only an objective evaluation can provide the guidelines for the design of acoustic communication system and can convince the submariners that acoustic communication has its operational value when the situation, scenario, mission, and environment are suitable.

N85-028 TITLE: Jamming Detector

CATEGORY: Exploratory Development

DESCRIPTION: There is a need for a system to monitor radio communications circuits and to indicate when the received signal is corrupted with intentional jamming or other energy. The system may compare the received signal with known characteristics of the transmitted signal to make this determination. It should be applicable across many type signal and modulation formats and across a wide range of frequencies. The techniques used should be robust to jamming signals designed to defeat the system and it should be simple and reliable in design and operation.

N85-029 TITLE: Multi-level Security for Local Area Network

CATEGORY: Exploratory Development

DESCRIPTION: Techniques are sought to handle multi-level security on distributed processing local area networks shared by many users. Demonstration implementations will be required on one of our generic local area networks (Ethernet/Token Ring/Broadband) located in one of our secure test beds.

N85-030 TITLE: Satellite Surveillance and Countermeasures

CATEGORY: Exploratory Development

DESCRIPTION: Develop innovative approaches and new technologies in the areas of Satellite Surveillance Countermeasures and defense. Technologies encompassed include, but are not limited to, microwave electronics, electro-optical, space electronics and multi-sensor correlation processing. Applications range from satellite/shipboard sensor and countermeasure systems to support Naval Objectives in worldwide ocean surveillance and targeting.

N85-031 TITLE: Cost-Effective Operational Satellite Packet Network Terminal

CATEGORY: Engineering Development

DESCRIPTION: The introduction of satellite packet networks will ensure that the Navy's communications assets at UHF/SHF/EHF are used in the most appropriate and efficient manner. A packet network will substantially decrease the transmission delay of a message compared to other techniques for certain types of traffic. The capacity of the satellite is dynamically allocated, using reservation and contention with the allocation process embodied in network protocols. The packet feature is independent of and will be added on top of existing access schemes. A modular cost-effective terminal suitable for shipboard use is needed that can serve as the basis for future Navy satellite packet networks.

N85-032 TITLE: Data Bus Technology/Application Study

CATEGORY: Advanced Development

DESCRIPTION: Data buses are a military necessity in many diverse and expanding applications. The technology has wide interest at the Federal, national (civil), and international levels (both civil and NATO). A survey is required to: 1. identify those organizations involved in developing and/or applying this technology; 2. determine the extent of data bus standardization for various applications; 3. determine trends in technology; 4. identify advantages (including estimated cost savings) and disadvantages experienced with different media, media access techniques, topologies, signal techniques or other technical characteristics identified as peculiar to data bus technology; and 5. summarize for reference the results of the survey.

Experience and professional competency in military electronic/weapons systems, technical/engineering assessment capabilities, and digital/analog telecommunications are essential. Additionally, technical/engineering survey techniques, data collection/analysis, and study report capabilities are required.

N85-033 TITLE: VLF Transmit Antenna Design

CATEGORY: Exploratory Development

DESCRIPTION: A transport VLF (25-30 kHz) transmit system is being defined. The radiating element would be either the 3,000-foot tether of a tethered aerostat or a top-loaded (12 radial top hat) 1,000-foot tower. The design may be applicable to either radiating element, but application to both is preferred. Design work is required to achieve an antenna efficiency of twenty percent or better, assuming a 0.0001 mho/meter ground conductivity. The hardware, including any necessary support equipment, must be reasonably transportable. The desirable features of the design are related to restrictions on site selection, installation time, and crew size required for installation. Site selection restrictions imposed by a conventional ground plane may be used as a baseline for comparison. Installation in five days by a crew of ten people can be used as nominal upper limits for acceptability.

Experience with VLF antenna theory and design is required. Mechanical design of the aerostat or tower is not required. There is a potential for innovative designs which could deviate both from the standard radial wire ground plane design and the customary deployment techniques. Emphasis is placed on feasibility and practicality for transportable applications.

N85-034 TITLE: Small System Applications for SSN Communications

CATEGORY: Advanced Development

DESCRIPTION: A technology assessment is required to investigate state-of-the-art data bus architectures for small systems applications and determine applicability of different architectures to submarine exterior communications.

The investigation of submarine communications system display requirements will assess applicability of video displays to the submarine exterior communications system for system status, system configuration, operator aids, etc.

N85-035 TITLE: Cost Production Technique for Software

CATEGORY: Engineering Development

DESCRIPTION: The programs now available for predicting the cost of software programs are predicted on the ability to size the program. Unless the predictor has worked on a similar program, it is very difficult and sometimes impossible to predict the size and cost of software programs for a new development. Some thought and study

should be directed to determine if there are other critical parameters that could be used to size a program. One approach could use the Type A specification for a given system as the baseline document for such a study.

If such tools could be developed, they could supplement such systems as Software Life Cycle Model (SLIM) which is now available. Effective use of SLIM requires accurate program sizing. Consideration in such a study should be given to program size, complexity, and architecture, as well as test and evaluation. There may be other factors that also should be considered. Organization should involve: first, a study phase which includes a literature search, review of other work, and visits; report of investigation, followed by a formulation phase for the approach; and the final phase, the preparation, and development of a final product. The final product could be a set of tools, probably software tapes used to predict initial cost, and then form the basis for a tracking system to track cost on the software system developed.

N85-036 TITLE: LO2/LN2 Production Components

CATEGORY: Exploratory Development

DESCRIPTION: Cryogenic liquefiers in use by the Navy for shipboard LO2 and LN2 production employ high-speed turbo expanders operating on oil-lubricated bearings. Mechanical shaft seals with buffer gas stages are employed to prevent lubricant leakage and resultant contamination of the process gas. Successful continuous operation of the turbo expanders, and the liquefier system as a whole, depends upon the integrity of the turbo expander shaft seals, and on reliability of the oil lubrication pump and filtering system. Oil contamination from leaking seals and interruption of the turbo expander bearing oil supply occurs frequently in operation, resulting in extensive system downtime and related high maintenance costs. The Navy needs replacement components for the turbo expander/bearing system which are high reliable in operation, and which will eliminate the potential for contamination of the product gases inherent in the present hardware.

N85-037 TITLE: Voice Recognition/Synthesis Technology

CATEGORY: Exploratory Development

DESCRIPTION: Based on current/projected state-of-the-art technology in the area of voice recognition/synthesis, develop concepts for the practical application of this technology to shipboard tactical command and control and command support functions. Concept development should include definition of performance capabilities (vocabulary, error rate, training requirements, etc.), man-machine interaction aspects, and application specific operational benefits analyses.

N85-038 TITLE: Arctic Ice Excitation Technology

CATEGORY: Exploratory Development

DESCRIPTION: Develop concepts, methods, and technologies for direct and indirect excitation of localized regions of arctic ice sheets over a broad range of frequencies. The technologies are aimed at generating nondestructive acoustic/seismic signals that will be coupled by the ice sheet to the under ice seawater. Examples of candidate technologies are remote laser sources and deployed sonobuoy-like devices that can be placed in the ice sheet.

N85-039 TITLE: Small Craft Flotation Foam

CATEGORY: Engineering Development

DESCRIPTION: The Navy currently uses 2#/cu. Ft. closed cell polyurethane foam for small craft flotation. The foam has several problems: it absorbs water over time; it becomes brittle with age; it expands with age; and when it burns, it releases toxic gas. The Navy is interested in obtaining a new closed cell foam with the following

characteristics: in general, meets MIL-P-21929; is durable; has an approximate density of 1#/cu. ft.; can be poured in place; will not sustain combustion; does not release toxic gas when burnt; has low water absorption characteristics; and is inexpensive.

N85-040 TITLE: Low Cost Expendable Fuel Tanks for Carrier Aircraft

CATEGORY: Exploratory Development

DESCRIPTION: In order to provide increased tactical range and/or endurance, most Navy aircraft are equipped to carry auxiliary fuel tanks on selected external weapon stations. These tanks attach to the bomb rack and can be jettisoned using the normal bomb release system. Jettisoning is an exceptional event, occurring only when necessary to increase aircraft combat maneuverability or reduce aircraft weight and drag in an emergency. Auxiliary tanks normally remain on the aircraft throughout a mission. An auxiliary fuel tank is a cylindrical metal container with conical ends to improve aerodynamic shape. The fineness ratio (diameter/length) is typically about 15%. Interior plumbing is provided to permit the introduction of low pressure air which is used to force fuel through a feline to the aircraft interior tankage. The attachment points to the aircraft are two standard bomb lugs spaced either 14" or 30" apart which bracket the tank center of gravity. These are mounted in a strong back structure at the top of the tank which also supports air and fuel connections to mating connectors in the weapon station. The strong back structure also provides a bearing surface for the rack ejector foot as the tank is jettisoned. Currently, tanks are of welded aluminum construction and are delivered to the user fully assembled. Current tank capacities range from 150 to 650 gallons. Auxiliary fuel tanks present a severe logistics problem. For newer aircraft, they tend to be aircraft unique. While peacetime tank environment will be high, necessitating the storage of large numbers of completely assembled spare tanks aboard ship. Combat demand is projected to be so high that carrier aircraft deck loads may be severely stressed to provide space for spare tank requirements. Finally, present tanks are excessively costly. There is a need for a standardized low-cost auxiliary tank in the 300-400 gallon range which can be delivered, disassembled, and stored aboard ship at high density in a nested configuration. Assembly of the tank aboard ship by relatively unskilled personnel should be accomplished in less than two hours. The assembled tank must have a structural integrity equal to current all-welded tanks. In particular, mechanical joints must remain secure and leak proof under the axial loads imposed by catapult launch and arrest and the normal loads imposed by aircraft maneuvering. These criteria must be met whether the tank is pressurized (transferring fuel at 4-6 psi overpressure) or unpressurized. Cost, weight, safety, and tank standardization are all important considerations. Alternative structural materials (e.g., carbon filament composites) should be investigated. Information should be presented to document tank capacity, cost, structural strength, reliability, and ease of assembly.

N85-041 TITLE: High-Speed, Digital Output Engineering Drawing Pictures

CATEGORY: Exploratory Development

DESCRIPTION: The Army, Air Force and Navy are all actively pursuing development of digital mass storage systems for technical data. These efforts are running concurrently with industry development of the optical disk mass storage concept. Methods of output currently available for producing data retained in digital storage include:

- a. electronic page printing systems
- b. electrostatic plotters
- c. pen plotters
- d. computer output microfilm
- e. telecommunications

A significant portion of the requirement in technical data management is the high volume production of engineering drawings up to 30" by 40". This is particularly true in spare parts procurement where many procurement actions at an Inventory Control Point are responded to by many bidders creating a need for thousands of engineering drawings per day. High volume production of these documents in a cost and time-effective manner from digital storage is not available in today's market. A method of producing these documents in full-size format on paper as well as 35mm microfilm mounted on aperture cards is required.

N85-042 TITLE: Seaworthy Syrup/Cup-Type Soda Vending Machine

CATEGORY: Advanced Development

DESCRIPTION: Over the last ten years, “syrup” or “cup” type soda vending machines have virtually disappeared from the use on board ship and have been replaced by can-type machines. The problem with the use of can-type machines is the amount of valuable storage space on board ship which must be used to store the cans that go into the machines. Five gallons of syrup can provide as many drinks as approximately 20 cases of cans while requiring only a fraction of the storage space. However, the “syrup” or “cup” type machines also have problems. The cup often spills when being filled when the ship pitches or rolls as does the refrigeration bath used for cooling. This type of machines has more working parts is more difficult to maintain. Additionally, a poorly proportioned mixture is often provided resulting in customer dissatisfaction. What is needed is the development of a “seaworthy” vending technology that eliminates spilling, utilizes the space-saving advantage of “syrup” type machines and provides a consistent quality dispensed beverage.

N85-043 TITLE: Repair Kit for Navy Chemical Warfare Protective Over garment

CATEGORY: Advanced Development

DESCRIPTION: A kit is required to provide means for repairing small tears (tree inches long or less) to an 85/15 modacrylic/nylon outer shell material used in the U. S. Navy chemical warfare protective over garment. Ideally, the repairs would be made with an adhesive-based patch which could be applied directly over the tear without the use of heat and with no compromise to chemical agent protection. The adhesive should provide sufficient adhesion resistance to prevent separation of the patch from the cloth under shipboard wearing conditions and also when wet.

N85-044 TITLE: Liquid Impermeable/Water Vapor Permeable Material

CATEGORY: Exploratory Development

DESCRIPTION: The Navy has a need for flame retardant material for use in the manufacture of chemical warfare protective garments that, in addition to possessing a high water vapor permeability index, would provide chemical agent protection under wet and dry conditions, including wind-driven salt and rain water and also against the impact of high-velocity chemical agent droplets. A minimum ten-year shelf life will also be required.

N85-045 TITLE: Traction Soles and Heels for Use on Wet and Oily Surfaces

CATEGORY: Exploratory Development

DESCRIPTION: Appropriate sole and heel materials are required to enhance slip resistance of footwear that is worn by Naval personnel working on smooth, wet, and/or oily metal shipboard surfaces.

N85-046 TITLE: Optical Clear Face Piece for Pyrotechnic Hood

CATEGORY: Exploratory Development

DESCRIPTION: Develop an inexpensive, optically-clear plastic face piece measuring approximately 14 inches by 8 ¼ inches with a 4 3/8 inch radius that could be used in the pyrotechnic hood conforming to NCTRF/PD 6183, used to protect the wearer from accidental “flash-off” of pyrotechnic materials. The face piece should be capable of protecting the face from feeling pain when exposed to a 5500°F thermal blast for a minimum of five seconds, and the optical properties of the face piece should not be significantly degraded as a result of the thermal blast.

N85-047 TITLE: Fire Retardant Foam-In-Place Cushioning Foam

CATEGORY: Exploratory Development

DESCRIPTION: Approximately 100 Navy ships are equipped with foam-in-place packaging systems. The system provides a form-fit cushioning foam for the protection of items to be stowed aboard ships until off-loaded. The foam is generated by combining two chemicals under pressure at a fixed rate at room temperature with the resulting composition sprayed into a fiberboard box to protect a delicate item. The resulting foam is flammable and will contribute to the propagation of a fire ignited from other sources. In order to comply with the criteria established for the Shipboard Passive Fire Protection Program, an improved cushioning foam is required that is nonflammable or fire retardant upon generation and is compatible with existing foam-in-place systems.

N85-048 TITLE: Fire Retardant Treatment of Paperboard Materials

CATEGORY: Exploratory Development

DESCRIPTION: Paperboard materials and cartons are commonly used for the protection of supply items stowed aboard ship. These materials are flammable and will contribute to the propagation of a fire ignited from other sources. In order to comply with the criteria established for the Shipboard Passive Fire Protection Program, a fire retardant chemical treatment is needed to render paperboard materials and cartons used for packaging fire resistant or noncombustible. These materials are necessary to be consistent with nonflammable cushioning materials currently available and under development.

N85-049 TITLE: Computer-Aided Instruction for the Navy Occupational Health Information Monitoring System

CATEGORY: Engineering Development

DESCRIPTION: A Navy Occupational Health Information Monitoring System (NOHIMS) is being developed for collecting, processing, and displaying medical and environmental data for use in occupational illness and accident prevention programs. As part of the acquisition and installation process, the NOHIMS effort requires that a computer-aided instruction module be developed to train functional users on the operation of the system. This computer-aided information module may either be resident on NOHIMS or a separate stand-alone unit. Module documentation, including training materials, will be required.

N85-050 TITLE: Naval Aviation Motivation Test Battery Development

CATEGORY: Advanced Development

DESCRIPTION: Voluntary withdrawal of Aviation Officer Candidates, including pilots and Naval Flight Officers (NFOs), continues to account for about one-third of all attrition from naval flight training. While voluntary withdrawal from Navy Undergraduate Pilot Training is multifaceted, lack of motivation to continue training is the primary reason for such withdrawal. Motivational theory, literature, and tests exist which could (with suitable extension or adaption for aviation usage) account for and predict those who voluntarily attrite from training. The purpose of this research is to: 1. review and report upon human motivation theory, literature, and tests applicable to the selection of Aviation Officer Candidates (pilots and NFOs) for the purpose of completing training within Schools' Command; 2. develop improved methods and procedures for determining and validating reasons for withdrawing from training within schools; and 3. develop and objectively administer and score automated motivational test batter(ies) for predicting withdrawal of pilot and NFO Aviation Officer Candidates from Schools. Provide recommendations and proposal for administering motivation test battery to 800-1000 pilot and NFO Aviation Officer Candidates in Schools' Command and develop and validate prediction equation(s) for predicting motivational withdrawal award. The successful bidder must demonstrate detailed knowledge and understanding of

Navy Undergraduate Pilot Training, motivational theory or literature and tests, and psychometric requirements for test development and validation.

N85-051 TITLE: Measurement of Pulsed Microwave-Induced Acoustic Vibrations

CATEGORY: Exploratory Development

DESCRIPTION: This effort concerns the measurement of waveform parameters (such as predominant frequency and amplitude) that are generated by thermo elastic expansion in three sizes of spherical head models that absorb pulsed microwave energy produced by multimewatt radar transmitters. The approach, in general, uses the hardware assets of the Navy Aerospace Medical Research Laboratory combined with the technical know-how and scientific expertise of the contractor. Miniature hydrophone transducers and brain-equivalent spherical models, along with microwave-anechoic irradiation chambers and radar transmitters that require final testing evaluation before use, will comprise the government-furnished equipment (GFE). The contractor must conduct trouble-shooting procedures and minor repair of the radar transmitters. The products of this effort include: 1. a tabulation of the operational characteristics of the laboratory based radar transmitters; and 2. specific waveform-analysis data related to the acoustic properties of the microwave induced vibrations in the spherical head models.

N85-052 TITLE: Microfilm and Computer Full-Text Search of Archival Documents

CATEGORY: Management and Support

DESCRIPTION: Microfilm, in chronological order, about one hundred thirty eight (138) cubic feet of a variety of unclassified historical archive documents and simultaneously catalog in an organized file system. Provide a retrieval file system software program for the Zenith 120 computer that will support search after input of key descriptors. Finally, enter sufficient predetermined descriptors in the software program to reference corresponding cataloged microfilmed archive documents. Commercially available software meeting search requirements should be given preference.

N85-053 TITLE: Use of Hydrogen as a Breathing Gas in Deep-Sea Diving

CATEGORY: Exploratory Development

DESCRIPTION: This effort is to determine the feasibility of using hydrogen as a breathing gas in diving. Currently, helium-oxygen mixtures are used in all deep-diving operations to alleviate the narcosis produced by breathing nitrogen. However, the world's supply of helium is decreasing. Based on its physical properties, hydrogen has been proposed as a substitute for helium, and some animal and human tests have been conducted in the U.S. and abroad. The initial task is to develop the rationale for the use of hydrogen in diving, and to compile information relative to past and current experimental efforts, especially those efforts being pursued in other countries. This task would determine the state-of-the-art and define current and future research and development needs. This would be followed in later phases by experimental studies to fill gaps in the technical knowledge required for use of hydrogen in human diving.

N85-054 TITLE: Automated Recognition of Helium Speech

CATEGORY: Advanced Development

DESCRIPTION: A mixture of helium and oxygen is the breathing mixture of choice for dives deeper than 200 feet. Because of the difference between this mixture and normal air, the frequency range of human speech is shifted upward. This has often been called the "Donald Duck Effect." This effect makes intelligible communications between the diver at depth and the controller on the surface difficult. Techniques exist for the automated recognition of speech, or at least for the recognition of a set of well-defined words. This effort will be directed at defining those

words which are necessary for communication between diver and controller, evaluating microprocessors for use in recognizing those words as spoken by a diver breathing a helium/oxygen mixture, and evaluating types of displays for communicating the recognized helium speech to the surface controller. Responders should have understanding and experience in the areas of automated speech recognition and human factors engineering.

N85-055 TITLE: Development of a Medical Dictionary and Training Materials for the Navy Outpatient Medical Information System (NOMIS)

CATEGORY: Advanced Development

DESCRIPTION: A Navy Outpatient Medical Information System (NOMIS) will be developed to collect, process, and display medical data for us in Navy outpatient clinics to determine information requirements of the clinics and to develop specifications for systems design. A comprehensive dictionary of data elements must be defined to standardize the outpatient medical record. Training material must be produced to support user needs. Concepts and plans are solicited for a study effort that would lead to development of a prototype data management system that is flexible, interactive and incorporates extensive user-assistance capabilities.

N85-056 TITLE: Development of Test Scenarios for the Navy Occupational Health Information Management System

CATEGORY: Engineering Development

DESCRIPTION: The Navy Occupational Health Information Management System is being developed to provide data storage and retrieval to meet the requirements of occupational safety and health. Test scenarios must be developed to exercise the various routines so that different system configurations can be compared and evaluated. These scenarios will allow the effects of factors, such as average CPU instruction cycle time and disk access time, to be determined and to estimate the average response time for the system simulating various types of clinical operations.

N85-057 TITLE: The Feasibility of a Nondestructive Method for Determination of Mass Distribution Parameters for Anatomical Segments of Nonhuman Primates

CATEGORY: Exploratory Development

DESCRIPTION: At high-energy levels (excess of 120 KEV) the absorption of materials becomes almost completely dependent on the total mass of material traversed by the energy. The exposure of animal body members to a radiation source in a known direction relative to the anatomy would allow for the determination of the mass distribution about the source axis. The exposure around a number of axes (greater than six) would theoretically allow for the determination of the parameters desired. The purpose of this study is to determine the feasibility of using a high-energy radiation source (120 KEV or greater) to evaluate the mass, inertia tensor, and center of gravity of critical anatomical members of nonhuman primates. Phase I of the proposed work should establish from theoretical considerations, the characteristics of the radiation source required and the expected accuracy inherent in the method. Calibration requirements should also be determined. Contractor must have access to a high-energy radiation source and availability of a phantom that simulates radiation cross-section of animal anatomical members.

N85-058 TITLE: Accelerator Prediction Program

CATEGORY: Exploratory Development

DESCRIPTION: Using analytically-determined acceleration setup parameters (i.e., load and cylinder volumes and pressures) develop acceleration prediction model(s) that will result in a family of acceleration-time profiles for metering pins associated with the 6-inch and 12-inch Hvge® impact accelerators. Determine metering pin profile

along with accelerator setup parameters for a specified acceleration-time profile. Phase I of the proposed work will establish the feasibility of developing such models. Prospective bidders must have a demonstrated capability in fluid flow or mass transfer simulation, access to large computing facilities, and access to machinery operations for metering pin fabrication.

N85-059 TITLE: Fiber Optics Local Area Network Design

CATEGORY: Management and Support

DESCRIPTION: Develop a phased schedule approach for planning, budgeting, and installation of a fiber optics based local area network throughout NAVAIRR operated space and to a larger area of concern being all Naval Material Command activities. Investigate and report on "secure" parameters required for such a network. Identify existing installations or proposed sites using fiber optics technology for digital computer communications.

N85-060 TITLE: Broadband HF Antenna Study

CATEGORY: Research and Exploratory Development

DESCRIPTION: Study the development of a broadband high-frequency antenna structure for the TACAMO airframe. The structure(s) should not degrade aerodynamic performance and should allow multiple transmitter inputs. Techniques for development should be evaluated with consideration of maximum efficiency and bandwidth, minimum losses, best indication of resistance, and minimum structural changes to the aircraft. The entire (2-30 MHz) must be considered.

N85-061 TITLE: Molecular Structures for Avionics and Aviation Materials

CATEGORY: Exploratory Development

DESCRIPTION: Recent advances in biology (genetic engineering, hybridoma, and immobilization of enzymes), chemistry (thin films and surface modification), and physics (electrical conduction by charge density waves) suggest possibilities for the manufacture and control of molecular structures of great diversity, complexity, and miniaturization.

The purpose of this program is to obtain relevant research and development on molecular structures for avionics and aviation materials. The R&D is expected to create and demonstrate an understanding of the opportunities and limitations in the building of molecular structures for use in computers, sensors, and electronic/optical magnetic devices. The program also addresses the novel use of biopolymer dynamics, in particular: electron handling, exciton, tunneling, Rydberg state, and semiconductor behavior. It is also recognized that multidimensional material matrices and associated structural and functional properties are of interest.

N85-062 TITLE: Aero elastically Tailored Controls for Missiles

CATEGORY: Research or Exploratory Development

DESCRIPTION: Design a missile control surface, probably using composite materials, which will deform under load in such a way as to minimize chord wise variations in center of pressure. Fabricate a sample of the control surface and test it in a wind tunnel at supersonic speeds.

N85-063 TITLE: Boundary Layer Calculations for Missile Configurations

CATEGORY: Research

DESCRIPTION: To develop computational methods and prepare working transferable computer codes for 3D boundary layer flow calculations about tactical missile configurations. Objective is to provide a method by which to determine the skin friction contribution to the total drag coefficient of a missile which may have air-breathing inlets and fins. At the same time, the methods developed should provide insight and physical understanding of the boundary layer flow properties and character, especially those relating to transition, separation, boundary layer interactions, and turbulence modeling. The methods should consider solutions to 3D differential, as well as integral boundary layer equations, and make use of, and be coupled with, the existing inviscid code results. The investigation should also make use of the existing experimental information with an alternate objective to develop reliable means by which to interpolate and even extrapolate the existing experimental database to flight conditions of interest.

N85-064 TITLE: Unified Symbolic and Numerical Processing for Airborne Surveillance

CATEGORY: Basic Research

DESCRIPTION: Develop innovative concepts for combined symbolic and numerical processing algorithms to enhance the mission effectiveness of the E-20 system through better support of the onboard operators. E-20 hardware and software enhancements, since the introduction of this system, have permitted complex target tracking calculations based on the mathematics of probability, detection, and estimation theory to be implemented. Recent advances in artificial intelligence have led to symbolic processing concepts which might have high payoff if used in conjunction with purely quantitative techniques to implement a unified mission support system to aid E-20 operators in detecting, tracking, sorting, assessing, and reporting targets to off board data suitable for implementing advanced computational concepts. The objectives of this research are: to develop approaches to the naval airborne surveillance mission which use to best mutual advantage the capabilities of human operators, numerical calculations, and symbolic calculations; to determine specific algorithms, both quantitative and symbolic, as well as the executive function controlling both in support of the surveillance mission: and to demonstrate the feasibility and potential payoff of this approach to surveillance.

N85-065 TITLE: Aural Mine Detection and Classification

CATEGORY: Exploratory Development

DESCRIPTION: Develop innovative techniques for sonar signal processing for approximation of target size and orientation by use of aural processed signals. Limitation should be addressed as to discrimination between two targets located in same area, degradation with range, and effects of target size and composition.

N85-066 TITLE: Review of State-of-the-Art Sonar (10-30 kHz) Transducer Window Materials

CATEGORY: Engineering Development

DESCRIPTION: This task involves an investigation of new materials being used or being developed which may have applications as sound transparent sonar windows. The review should be directed at materials which could provide the lowest loss of sonar acoustic signals in the 10 to 30 kHz range as it travels through the material. Trade-offs of material thickness vs. strength vs. acoustic loss should be determined. Most sonar systems on ships have a window in front of the transducer, which is part of the hull structure. A need for strength at the lowest loss in the transmitted signal is required.

N85-067 TITLE: PASCAL Compiler Optimization

CATEGORY: Engineering Development

DESCRIPTION: Provide an analysis that can be optimized to allow more complete coverage of PASCAL statements and speed up existing compiler capabilities

N85-068 TITLE: Signature Testing of a General Purpose Computer

CATEGORY: Engineering Development

DESCRIPTION: The increasing complexity of logic design has made testing increasingly more difficult for sequential machines. The use of signature analysis in testing sequential machines may be a solution.

Develop a method to employ signature analysis in testing of any general purpose sequential machine. Identify methods to be used to identify any hardware augmentation required. Estimate of augmentation requirements, fault coverage, number of signatures and execution time shall be generated. The number of states of the machine shall be determined and the algorithm employed to generate the signatures shall be defined.

N85-069 TITLE: Application of Nonprocedural Languages to Embedded Weapon Systems Software Development

CATEGORY: Advanced Development

DESCRIPTION: Investigate the use of nonprocedural languages and techniques to automate and accelerate the development of applications for complex, real-time, embedded, distributed, micro-processor based environments. Consider as major constraints the need for high reliability in all systems operations, ease of operations, and periodic modifications of software components.

As a second phase, identify a nonprocedural language and a set of procedures that will serve as a framework for developing prototype tasks. Also, develop several prototype tasks to demonstrate feasibility.

N85-070 TITLE: TRIDENT Higher-Level Language Syntax Directed Editor

CATEGORY: Advanced Development

DESCRIPTION: The objective is to develop a text editor for the VAX computer that has the normal screen-oriented and line-oriented capabilities and can be run in a "program mode." In this mode, the editor will consider the text being edited as a program in the TRIDENT Higher-Level Language (THLL). The feasibility of building such a system on the basis of an existing editor and an existing computer should be determined.

Some of the capabilities of the systems should be to allow the user to locate references to a symbol, the definition of a symbol, the beginnings and ends of bracketed constructs (block, IF, CASE, parenthesized expression) both of current level or any enclosing level. Syntax errors should be reported while the program text is being developed.

N85-071 TITLE: The Automated Development of Test Cases for Large Real-Time Software Systems

CATEGORY: Research

DESCRIPTION: The objective of this research is to develop a methodology for the automated generation of test cases for large real-time software systems which are programmed in a block structured language. Current methodologies are applied only to small programs and do not take into consideration the combination of such programs into a large system.

Proposals are invited which apply existing technology to the systems concept, or propose new methodologies for accomplishing the task. Proposals are also invited which address interactive systems which aid the test case developer.

Proposals should address the task as a two part effort: 1. the identification of a methodology; and 2. the actual implementation of a prototype model.

N85-072 TITLE: Automated Software Generation Systems for Large, Embedded Real-Time Software

CATEGORY: Research

DESCRIPTION: Major increases in productivity for development of software for large, embedded real-time computer systems can perhaps best be achieved through automation of the entire software development process. Such automation would require automatically transforming a specification of the problem statement to a computer code which represents the solution. The solution produced should satisfy some criteria for correctness. Research in this area should identify the processes and issues associated with this automated transformation and investigate the feasibility of producing the end result. Such issues to be addressed include the form of the requirements specification, analysis of requirements, transformation of requirements to code, correctness and reliability of the code, documentation produced, and any other factors identified.

N85-073 TITLE: Software Metrics for Large, Embedded Real-Time Software

CATEGORY: Research

DESCRIPTION: Management and development personnel of large, embedded real-time software efforts could benefit from the acquisition and use of the appropriate software metrics. However, such metrics are seldom available and are impractical to obtain at the stage of development where they are most needed. The goal of this research is to identify those metrics which can be most beneficial to the software development effort and to derive techniques for obtaining such metrics. Of particular interest are metrics which support subject management (cost, schedule, manpower, risk, etc.), software reliability, capacity management (performance analysis and planning) and software quality. The techniques for acquiring such metrics should pose the least additional burden on the development personnel and systems configuration. An investigation of how the metrics will be used by management and development personnel should be performed.

N85-074 TITLE: Corrosion Resistance Coating for Heat Transfer Surface

CATEGORY: Exploratory Development

DESCRIPTION: Development of high conductivity, high emissivity, galvanically compatible coatings for resistant thermal surfaces is needed.

N85-075 TITLE: Sensors

CATEGORY: Engineering Development

DESCRIPTION: Develop new sensors using specific potential, micro conductivity, piezoelectric magnetometer, and temperature techniques for nonacoustic detection of undersea objects.

Develop submarine mounted sensors for measuring surface thickness. A potential need exists for a reliable sensor that can be mounted on FBM and attack class submarines for accurately measuring the thickness of surface ice in northern patrol zones.

Develop sensors designed for improved oceanic current measuring techniques. Advanced sensors in this area would have a wide application ranging from more accurate measurement of fluid flow across the launch area of FBM

submarines to passive detection of interval waves caused by submarines could be beneficial to improved accuracy program.

N85-076 TITLE: A Methodology for Measuring Data Coverage of Test Cases for Large Real-Time Software Systems

CATEGORY: Research

DESCRIPTION: The object of this research is to develop a method of measuring the effectiveness of test cases developed for large real-time software systems. The main area of concern is how well the test cases cover allowable data utilization. Specific areas of concern involve the testing of data tolerances, data stress testing, and iterative convergent testing.

Proposals which address only areas of currently well-defined methodologies, such as type conversion testing, etc., will not be accepted.

Proposals should be written so as to address the task as a two-part effort: 1. the development of a methodology; and 2. the implementation of a prototype

N85-077 TITLE: Physical Oceanographic Measurements

CATEGORY: Engineering Development

DESCRIPTION: The objective of this effort is to study methods for the development of Doppler velocimeters and nonmechanical devices to measure ocean current speed and direction. Devices are for use on surface ships which use deep ocean transponders to accurately determine ship's position. The effort includes a review of Acoustic Doppler Current Meter (ADCM) technology, assessment of the performance of the existing Navy and DoD devices, and appraisals of the state-of-the-art further developments.

N85-078 TITLE: Meteorological Instrumentation

CATEGORY: Engineering Development

DESCRIPTION: Perform studies relative to improved upper atmosphere sounding systems (Omega/LORAN SONDES) for measurement of high-altitude winds. Studies would include automation of data processing to reduce the manpower currently required.

N85-079 TITLE: Long-Term Material Properties of Epoxy Grout Systems

CATEGORY: Advanced Development

DESCRIPTION: Determine the material properties of epoxy grout (hardness and elasticity, and mechanical bond strengths) to substrates (e.g., steel) as a function of long-term cyclic loading and environmental exposures. The grout system is used to fill the annulus between two concentric, large diameter metallic tubes.

N85-080 TITLE: Nondestructive Inspection of Bonded Metallic/Elastomeric Interfaces

CATEGORY: Advanced Development

DESCRIPTION: Develop nondestructive inspection techniques to quantify the percentage and location of metallic/elastomeric interfaces that have become unbonded due to material failure of the bond joint and/or corrosion

of the metallic substrate. Access is limited to the elastomeric member which is irregular/nonsymmetrical in cross-section.

N85-081 TITLE: Extended Life and No Maintenance Slip Ring

CATEGORY: Engineering Development

DESCRIPTION: Conduct feasibility investigation (analysis/design/test) of the development of an extended life/no maintenance slip ring. It should contain about 30/32 transmission circuits; have an MTBF of about 25,000 hours, continuous operation at about 0.25 RPS; should be about 0.5 inch in diameter and a 1.5 inch length; and circuit impedance less than 100 milliohms.

N85-082 TITLE: Expert Systems for Large, Embedded Real-Time Software

CATEGORY: Research

DESCRIPTION: Software development for large embedded computer systems is a complex process that could potentially benefit from the application of expert systems technology. The purpose of this research is to investigate the applicability of such technology to the software development process for this class of system.

Efforts should be directed toward approaches for constructing an "Intelligent Software Assistant" which will be capable of advising management and software development personnel on all aspects of software development including feasibility, risk, project progress, performance cost and other issues identified.

N85-083 TITLE: Real-Time, C-D Computer Vision

CATEGORY: Exploratory Development

DESCRIPTION: Investigation passive machine vision concepts for use in robot Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM), and other military applications that will provide range and classification of objects in three-dimensional space in real time (video frame rates).

N85-084 TITLE: Human Factors Related to Military Applications of Robots

CATEGORY: Exploratory Development

DESCRIPTION: Robots and other forms of flexible automation will play an important role in extending the capabilities and improving the productivity of a limited military work force. It is extremely important that this equipment be carefully engineered to be compatible with the environment in which it will be operated.

Investigations are required that will lead to advanced man-machine interfaces that are well matched to the military personnel who will operate and support robotic devices. Such issues as human engineered controls, safety, training systems, maintenance and repair, diagnostics and other man-machine interface considerations should be investigated.

N85-085 TITLE: Power Sources for Robots

CATEGORY: Exploratory Development

DESCRIPTION: One of the major barriers to continuous autonomous operation of mobile robots for military applications is the inadequate performance of available power sources. Lightweight, long-term stable power is

required for the operation of robot electronics. In addition, bursts of power are required for mobility, heavy lifting and other demanding mechanical functions. Power sources that can provide both of these capabilities over long periods of time and in a single lightweight package are of great interest.

Advanced power systems, including hybrid concepts that integrate available power sources, should be investigated to meet the needs for long-term, low-level robotic operations with surge capabilities for high-power demands.

N85-086 TITLE: Directed Energy Weapons, Weaponization Technology Development

CATEGORY: Exploratory Development

DESCRIPTION: Defense against antiship cruise missiles in the <10nmi zone requires the ability to engage multiple simultaneous targets with low radar cross-section and a variety of flight profiles. Trends toward low-altitude, high-speed saturation attacks launched from long-range places significant pressure on an engagement defense system. A technology that offers hope of making a revolutionary change in Anti-Air Warfare/Anti-Ship Missile Defense (AAW/ASMD) is Directed Energy Weapon (DEW).

Perform an investigation into and conduct an analysis of the technology areas necessary for weaponization of a DEW-type system. Determine areas which must be pursued in developing such a system from an AAW/ASMD standpoint. Investigate such parameters as pointing accuracies, pointing rates, reaction times, firing rates, and total shots required. Compare these with existing capabilities to determine technology areas that may need extensive development efforts.

N85-087 TITLE: Atmospheric Dispersion of Ordnance Products

CATEGORY: Exploratory Development

DESCRIPTION: The products formed by conventional explosive detonation, propellant burning, pyrotechnic functioning, and similar processes, enter the atmosphere and are dispersed by winds and atmospheric turbulence. A need exists to determine the downwind concentrations of these products by mathematical modeling. Several dispersion models are available for common forms of air pollution, but limited attention has been given to the special problems connected with ordnance testing and ordnance disposal.

N85-088 TITLE: Computer Model of Hot Spot Formation in Energetic Materials

CATEGORY: Research

DESCRIPTION: The task is to develop a computer model of the formation and growth of ignition sites in explosives and propellants that is both numerically accurate and phenomenologically correct. For many ignition scenarios, the energy deposited in the material is insufficient to cause reaction if the energy is deposited uniformly over the bulk of the material; yet, ignition occurs. This leads to the postulation of some mechanism of energy concentration into "hot spots." Many mechanisms have been postulated: pore collapse; adiabatic compression; shear banding; jetting; etc. The objective of this work would be to develop a model to accurately describe this phenomenon.

N85-089 TITLE: Advanced Damage Model Development

CATEGORY: Exploratory Development

DESCRIPTION: A need exists for the development of advanced models for predicting the damage inflicted on targets by air and/or underwater weapons. The task requires that finite element codes and models be upgraded to treat the following topics: large dynamic plastic deformation; perforation; erosion of penetrators; spalling; crack growth; fluid-structure interaction; and propagation of strong shock and detonation waves through several media.

Not only are new capabilities added to the codes, but basic improvements in the codes themselves are made. These include modular architecture; numerically stable interfacing between the modules; efficient integration; and “user friendly” pre- and post-processing. Supporting experimental efforts to validate the models are planned in detail.

N85-090 TITLE: Acoustic Modeling

CATEGORY: Exploratory Development

DESCRIPTION: Develop a dedicated model for the dynamic response of a viscoelastic multi-layered material using 3D finite element methodology. The model must accurately describe the viscoelasticity of the problem and be capable of accepting cylindrical perforations in the layers. The computer code should be written in standard FORTRAN and predict the surface complex impedance and acoustic loss as a function of frequency for a harmonic input force.

N85-091 TITLE: Air-Free Kevlar/Urethane Composites

CATEGORY: Exploratory Development

DESCRIPTION: It is desired to construct an acoustically transparent Kevlar reinforced polyurethane composite. It is known that even small amounts of air in a composite can seriously degrade the transparency of such composites. The major difficulty arises when using large diameter Kevlar cords, 0.140 inches diameter, five ends per inch. In this case, the urethane does not fully penetrate the cords, leaving some trapped air behind. Some way must be found to effect total impregnation of the cords in some manner that lends itself to economical manufacturing.

N85-092 TITLE: Electrically Conducting Polymers

CATEGORY: Research

DESCRIPTION: An electrically conducting polymer would be attractive because of the considerable weight savings that would result compared with copper. Polymers generally are electrical insulators (conducting less than 10⁻⁸ mho), but certain highly conjugated systems (such as polyacetylenes) are conductors (conductivity greater than 10⁰ mho). A disadvantage of these systems is that the same chemical structure that gives rise to the conductivity also makes these polymers very susceptible to oxidation. The goal of this project would be to develop a polymeric system with conductivity greater than 10 squared mho but good oxidation resistance. The use of dopants would not be considered in this program.

N85-093 TITLE: High-Frequency Dynamic Mechanical Measurement Apparatus for Polymers

CATEGORY: Exploratory Development

DESCRIPTION: The measurement of dynamic mechanical properties, modulus and loss factor, for polymers (plastics and rubber) is of continuing interest. Because of the broad relaxation ranges in these materials, measurements must be made over many decades of frequency range from 10Hz to 25kHz. It is desired to extend these measurements to 100 kHz.

N85-094 TITLE: Three-Dimensional Braiding of Composite Materials Reinforcements

CATEGORY: Exploratory Development

DESCRIPTION: There is a need for research in innovative methods of three-dimensional braiding for composite reinforcements. Principally, the work will involve developing methods of implementing Adjacent Yarn Position

Exchange (AYPEX), a new type of three-dimensional braiding. The emphasis will be on developing hand-operated braiders and using these to develop hybrid weaves which are combinations of 3D orthogonal weaves and 3D braids.

N85-095 TITLE: Development of Ceramic Foam Reinforcements

CATEGORY: Exploratory Development

DESCRIPTION: Proposals are sought to study and determine the applicability of ceramic foams as reinforcing media for metal-matrix composites. Foam structures can be fabricated with highly regular, uniform structural composition and, when infiltrated with matrix metal, could result in composite materials with exceptionally uniform composition without the use of elaborate mixing and processing methods. It is necessary to identify ceramic foam characteristics in detail to define their suitability as reinforcements in metal and possibly ceramic matrices. Such aspects as foam architecture, porosity, shape of the ligands which constitute the foam, crystallite orientation, etc., need to be investigated.

N85-096 TITLE: Corrosion Behavior of Metal Matrix Composites in Hostile Environments

CATEGORY: Exploratory Development

DESCRIPTION: Proposals are sought to determine the corrosion behavior of various metal matrix composites in hostile environments such as salt spray, stack gases, etc. In addition, protective coating studies will be incorporated in the study to determine their effectiveness in inhibiting corrosion.

N85-097 TITLE: Preparation and Properties of Pure Synthetic Iron Pyrites, FeS

CATEGORY: Research

DESCRIPTION: Iron pyrite, FeS, derived from naturally occurring mineral sources, is employed as the active cathode material in primary molten salt batteries (thermal batteries). The goal of this research program is to study synthetically prepared FeS, as a substitute material for eliminating a serious voltage "spike" problem that occurs upon activation of thermal batteries and that is caused by impurities present in the naturally occurring cathode material.

N85-098 TITLE: Adhesive Bond Evaluation

CATEGORY: Research

DESCRIPTION: Nondestructive testing of adhesive joints is a problem which has plagued the nondestructive testing community for decades. Currently practiced ultrasonic techniques can often determine whether a bond has occurred, but the prediction of bond strength relies heavily on assumptions which are often unfounded. The reliability of such strength predictions might possibly be improved by a combination of an applied mechanical stress in conjunction with a nondestructive measurement. Development of practical means for both applying stresses and evaluating their effects on bond interfaces may provide a reliable means of assessing bond performance under actual loading.

N85-099 TITLE: Eddy Current Inspection of Graphite-Epoxy Composites

CATEGORY: Research

DESCRIPTION: Graphite-Epoxy composites are often used in environments which subject these materials to impact damage. Such damage often results in broken or displaced fibers. Preliminary research has shown that eddy current testing may offer a suitable means of detecting hidden damage, yet many fundamental questions remain unanswered.

A thorough understanding of the interrelationships between probe characteristics, frequency, penetration depth, damage position, damage type, damage size, and fiber density must be gained before eddy current testing of graphite composites can proceed to more advanced development.

N85-100 TITLE: Nondestructive Testing of Ordnance Items

CATEGORY: Exploratory Development

DESCRIPTION: The quality of ordnance related components directly affects their safety and reliability. Defects occurring in either manufacturing or long-term storage can easily escape detection, thus adding a degree of uncertainty in weapon performance. Principal areas of concern include voids in explosives, debonding of propellant from rocket motor cases and degradation of the mechanical properties of explosives and propellants. Innovative approaches in areas such as, but not limited to, ultrasonic or radiography may have bearing on the above problems.

N85-101 TITLE: Clutter Suppression Processing for Infrared Search and Track (IRST)

CATEGORY: Exploratory Development

DESCRIPTION: The pacing technical problem in IRST development is that of clutter discrimination for target declaration at useful ranges with acceptable false alarm rates. The essential element in achieving this goal is the development of optimum signal processing algorithms to exploit maximally the differences between targets and clutter backgrounds. A systematic approach for developing, evaluating and optimizing such algorithms is needed. This project is intended to redress this deficiency and will entail: 1. application of appropriate mathematical formulations of classical detection theory for extracting signals from noise; 2. development of mathematical relationships which are applicable to signals embedded in non-stationary random processes; and 3. surveying and investigating existing IR clutter signal processing algorithms, developing new ones and optimizing the most promising of them. To perform these tasks, appropriate computer simulations will be developed and exercised.

N85-102 TITLE: Infrared Cloud/Sea Modeling and Underlying Fundamental Physics

CATEGORY: Exploratory Development

DESCRIPTION: This effort is in support of the Navy's Background Measurement and Analysis Program (BMAP). It is directed toward the development of engineering working models of infrared cloud and sea clutter models to be used in the evaluation and design of Infrared Search and Track (IRST) devices by means of system simulation. The eventual goal is the delivery of a documented computer code which can generate spatial and perhaps temporal clutter radiance maps from experimental ground and air truth measurements taken during the background clutter data acquisition by the BMAP sensor. The underlying fundamental physics of cloud clutter dynamics is being sought which will lead to the development of superior models. Innovative mathematical physical approaches such as nonlinear dynamics, hydrodynamics, nucleation theory; metastable states and phase transition theory are suggested in part in this behalf. Simple laboratory demonstration cloud experiments are encouraged.

N85-103 TITLE: Numerical Algorithm for Predicting the Dynamics of Underwater Explosion Bubble

CATEGORY: Research

DESCRIPTION: Development of computational methods and numerical schemes which can accurately predict the evolution of the underwater explosion bubble and its interaction with structures. The ultimate objective is to develop such capabilities for general three-dimensional flow fields and configurations, accounting for such essential features as energy dissipation, bubble migration and deformation, etc.

N85-104 TITLE: Accelerometers, Longitudinal Strain Sensors and Torque Sensors

CATEGORY: Exploratory Development

DESCRIPTION: A new, cheap magneto elastic metal has been developed at the Naval Surface Weapons Center that has the highest sensitivity ever known for torsional and longitudinal strain sensing. A highly sensitive torsional and longitudinal accelerometer model also exists. Low frequency response is excellent. The material can be used in its present ribbon form or can be possibly sputtered in a "chip-like" technology. Distributed arrays of miniature sensors can thus be developed. Such devices can impact on passive sonar, mines (pressure sensors), robotics and projectiles. The technology must be industrialized before it can be used in military systems.

N85-105 TITLE: Broadband Display Technology

CATEGORY: Advanced Development

DESCRIPTION: Develop interactive and interpretive display techniques to provide sensor operators with better capability to perform broadband detection, classification, and localization. This task would support the airborne acoustic signal processing system (AQA-7 and UYS-1) Broadband Enhancement Program as well as the Low Cost Sonobuoy effort.

N85-106 TITLE: Mine Sensors and Signal Processing

CATEGORY: Exploratory Development

DESCRIPTION: The most effective naval mines contain a device capable of detecting the location, course and type of potential underwater or surface target vessels at a distance without generating signals from the mine. The contractor will define an approach based upon proven technology, conduct an analysis to determine the operational characteristics (range, accuracy, noise immunity, power consumption, etc.) of the device and prepare a development plan describing the cost and schedule for all phases: design, fabrication, test, evaluation, reliability and producibility reviews, production and logistic support.

N85-107 TITLE: Improved Towed-Array Processing

CATEGORY: Exploratory Development

DESCRIPTION: Develop an adaptive processing algorithm to cancel interfacing signals arriving at a linear towed array. The main effect of this algorithm would be to remove signals arriving in side lobes from the main bearing response.

N85-108 TITLE: Broadband Tracking Algorithm Development

CATEGORY: Research

DESCRIPTION: Conduct an analysis to propagate in time a four-dimensional probability distribution function in x, y, x (x velocity) and y (y velocity) in a two-dimensional grid by using "bearings only" techniques. Evaluate tracking capability of various current and proposed Broadband Sonobuoy/Processor Systems using this algorithm.

N85-109 TITLE: Cross-Correlation Processor

CATEGORY: Exploratory Development

DESCRIPTION: Develop cross-correlation processor to be embedded in the surface ship towed-array system, #SQR-17V(4). The cross-correlation inputs will be a. towed-array split-beam pairs; and also b. towed-array full-beams/sonobuoys/hull-beam data. This processor will be later utilized at sea to demonstrate inter-sensor/inter-platform real-time bearings/multi-path processing.

N85-110 TITLE: Minefield Theory Methodology

CATEGORY: Exploratory Development

DESCRIPTION: Development of minefield and mine countermeasure theory and related analytical models which can treat the entire stockpile-to-target sequence and be used to evaluate complex multi-port and campaign-level scenarios. Near-term application of this improved methodology will allow more realistic predictions of the effectiveness of various minefield designs; permit more efficient utilization of available mining assets; provide a capability to accurately determine stockpile requirements; and realistically compare the attributes of new mine design concepts.

Specific items of interest are new applications of computer intensive techniques to serve as tools for minefield planners and hardware designers. Examples are: computer-aided design techniques, artificial intelligence methodology, and statistical methods for validating complex minefield analysis models on the basis of small samples of field measurements.

N85-111 TITLE: Interface Studies

CATEGORY: Research (6.1)

DESCRIPTION: Study and determine the properties of the interface between aluminum and graphite in graphite-aluminum composites. The results of the study should show clearly the effect of different interfaces on the transverse properties of graphite-aluminum composites.

N85-112 TITLE: Doppler Shifted Chaff

CATEGORY: Exploratory Development

DESCRIPTION: Modern efforts to provide a capability for radars to detect and track air targets in the presence of chaff rely on high-velocity resolution, and to a lesser extent, high-range resolution. The requirement to operate in high-target-density situations and to provide automatic handling of the various operations leading to engaging targets has led to radar mechanizations whereby chaff and other clutter signals are removed by fixed and adaptive MTI-computations prior to any tracking operations. The properties of chaff that allow this are that it quickly slows to local air speed.

The contractor shall design and fabricate a low-cost S-band amplifier in an RF repeater configuration with separate isolated receive and transmit antenna elements (vertically polarized) with a programmable frequency offset. Maximum elements (vertically polarized) with a programmable frequency offset. Maximum doppler-shifted radar cross-section is desired, consistent with an ERP of about 1 watt per square meter. Minimum volume is desired in a configuration which can accommodate a battery and parachute. Ultimate use will require launching from a chaff hopper either individually or, preferably in a two-stage operation.

N85-113 TITLE: Characterization of Damage in Composite Materials

CATEGORY: Exploratory Development

DESCRIPTION: It is not currently possible to nondestructively quantify composite material damage. The purpose of this study would be to investigate techniques which could be developed and then utilized to ascertain the extent of

damage sustained by a motor case or interstage structure. This data could then be applied to an accept-reject criteria for damaged structures.

N85-114 TITLE: High-Speed Turbine

CATEGORY: Advanced Development

DESCRIPTION: Design and fabricate a turbine wheel for missile power generation applications, capable of delivering high efficiency (40%) at high speeds (250,000 RPM) operating on inert gas (helium, argon, nitrogen). The size of interest is two inches in diameter or less, with a power output of 2 HP. Emphasis should be on efficiency, lightweight and reasonable cost. Designs capable of operating with warm gas (2500°F) are also of interest. Testing with warm gas could be conducted by the Navy activity monitoring the effort.

N85-115 TITLE: Rate-of-Descent/Altitude Transducer

CATEGORY: Management and Support (Test and Evaluation support)

DESCRIPTION: Development of a Rate-of-Descent transducer capable of sensing the rate of descent and altitude within a range of 0-400 feet over a temperature range of -55 C to +65 C. The accuracy shall be within ± 1.7 of reading over the entire range. The development of this transducer would allow it to be used instead of existing techniques to provide an on-board system which can be interrogated at given decision points.

N85-116. TITLE: Passive Variable Resistance Techniques

CATEGORY: Engineering Development

DESCRIPTION: Thermal stability and the absence of large thermal gradients are key design elements in maintaining accuracy through improved stability of critical alignments and also aids in improved performance of the inertial components.

A technique whereby the thermal resistance across a heat flow path can vary as a function of the heat flux present would result in improved thermal stability in critical areas. In particular, the development of a compact passive variable thermal resistance device would represent a unique advance in thermal design.

N85-117 TITLE: Declassification of Magnetic Bubble Memory

CATEGORY: Engineering Development

DESCRIPTION: The objective of the project is to develop a nondestructive and fail-safe method of quickly declassifying Intel bubble memories. The goal is to develop a technique which can be applied to standard electronic modules (SEM) or can be used in a factory environment. The present methods of erasing Intel bubble memories have shortcomings in that they either destroy the device, are cumbersome to apply, are slow or are not verifiable (because they erase the bubble map and seed bubble as well as the data). The results of this effort could relieve security classification problems that would otherwise exist at shipyards, tenders, trainers, and factories during integration and test, as well as during normal or faulted system alteration.

N85-118 TITLE: Electrical Analysis of VLSI Interconnections

CATEGORY: Engineering Development

DESCRIPTION: Achieving high thruput VLSI/VHSIC benefits at the system level requires increased wiring density at high digital speeds; these result in more complex interconnection configurations.

Analytical techniques exist to predict electrical performance (ZO, time delay, cross talk, etc.) of simple configurations. These techniques required extension and development to be suited to three-dimensional, more complex wiring patterns.

Improved techniques will allow design optimization and development of CAD "wiring rules."

N85-119 TITLE: Evaluation of Undershoot Effects on NMOS Microcircuits

CATEGORY: Advanced Development

DESCRIPTION: The effects of negative voltage pulses (resulting from signal reflections) on the input signal pins of NMOS technology microcircuits are largely unknown. A test and evaluation program which identifies and quantifies immediate and long-term performance and reliability degradation as a function of NMOS device type and/or input structure, negative voltage pulse amplitude and duration, and other electrical and environmental parameters is required in order to properly specify and apply NMOS devices in military electronic systems.

N85-120 TITLE: EPROMS Evaluation

CATEGORY: Advanced Development

DESCRIPTION: There is a need for an evaluation of the applicability of UVEPROMS and EERPOMS for military use. Program retention is of prime importance to military applications. A study should be undertaken that will define the effects of environment on data retention (i.e., what conditions will affect data retention and how much in tactical systems).

N85-121 TITLE: PROM Programming Methodology

CATEGORY: Advanced Development

DESCRIPTION: The method of shorted junction fuse of programming a PROM (i.e., the characteristics of the programming pulse (amplitude, ramp, how many, etc.)) affects the reliability of the blown fused-link or shorted junction fuse. New technology PROMs such as Titanium-Tungsten of shorted junction have not been studied from the viewpoint of military programmability. This study should determine what factors affect the reliability of the blown or shorted program bit. This should include determination of the value of burn-in after programming in improving part reliability.

N85-122 TITLE: Alpha Particle Effects

CATEGORY: Advanced Development

DESCRIPTION: The trend in IC technology has been toward decreasing geometry and increasing the number of components compromising a single device. This shrinkage, along with other factors, can lead to alpha particle and secondary cosmic ray-induced soft errors. The purpose of this effort would be to look at and analyze the sensitivity of 64K and 256K DRAM comparing the various types and manufacturers.

N85-123 TITLE: Package Electrostatic Discharge (ESD) Susceptibility

CATEGORY: Advanced Development

DESCRIPTION: ESD has been identified and verified as a costly and all too frequent failure mode for today's and tomorrow's small geometry microcircuits. Current efforts are underway to identify susceptibility by technology (CMOS, T-L, etc.). It is felt that certain package types may be more susceptible during the assembly and testing processes than others. The purpose of this effort would be to conduct a statistically based study among more popular military packages used by various microcircuit manufacturers.

N85-124 TITLE: Advanced Sensor Development

CATEGORY: Engineering Development

DESCRIPTION: Emerging technology may make it feasible to develop new sensors of specific interest to the U.S. Navy. Technological advances in the areas of Special Potential (SP), micro-conductivity, piezoelectric magnetometers and high resolution temperature measurement techniques may permit new measurements and increased accuracies.

Specifically, the applications for these sensors would include measurement of surface ice thickness from a submerged submarine. The need exists for a device that can be mounted on FBM and attack class submarines that would accurately measure the thickness of ice in northern patrol areas.

New sensors and improved accuracy of existing developments in the field of ocean temperature measurements and micro-conductivity would have wide application ranging from more accurate measurement of fluid flow across the launch area of FBM submarines to passive detection of internal waves generated by submarines.

N85-125 TITLE: Very High-Speed Integrated Circuits

CATEGORY: Engineering Development

DESCRIPTION: Research and development work to date in the field of Very High-Speed Integrated Circuits (VHSIC) indicates significant promise for the use of devices in special applications where extreme compactness, minimal power consumption, and high reliability are required.

The expected work would consist of applied studies in the area of VHSIC technology for use in airborne missile systems at S-band and L-band for applications in telemetry and navigational transmitters and translators.

N85-126 TITLE: Improved Temperature Sensing Systems/Instrumentation

CATEGORY: Advanced Development

DESCRIPTION: Fast response rate coupled with high accuracy temperature sensing system is needed in the range of ambient to 1000F temperature environment. Rates associated with missile launcher eject chamber applications encompass temperature changes of hundreds of degrees Fahrenheit in less than 10 milliseconds.

N85-127 TITLE: Small, Self-Contained Aircraft Fatigue Data Recorder

CATEGORY: Exploratory Development

DESCRIPTION: A requirement exists to develop a small, self-contained and self-powered solid-state recorder to measure and store multiple levels of normal acceleration and/or strain exceedance data. The system size must be minimal for easy installation and removal at a variety of structural locations minimal for easy installation and removal at a variety of structural locations on Navy aircraft. The recorder must be capable of storing at least one month of data from operational aircraft. Data could be stored as exceedance counts (number of times that normal acceleration or strain exceeds selected levels) or as counts of peak-to-valley cycles (number of times that excursions

of normal acceleration or strain occur within selected ranges), but other data formats are not excluded. Features to permit resetting of the exceedance levels or ranges and to exclude small variations of the measured parameters are desirable.

N85-128 TITLE: High-Performance Porous Materials

CATEGORY: Exploratory Development

DESCRIPTION: High-performance porous materials are required for the development of laminar flow technology. Laminar flow offers significant payoff to undersea submersibles by providing drag reduction and reduced radiated noise.

Specifically, it is highly desirable to develop the technology to fabricate contoured exisymmetric shells up to 21 inches in diameter. These shells must be high strength (pressure differential of several hundred psi), corrosion resistant (sea water environment), have very uniform flow properties and have smooth surfaces and contours.

Technologies that have been considered include powdered metallurgy and electron beam drilling. These techniques may be improved or new technology developed to achieve the desired product.

N85-129 TITLE: Superconductivity Projector

CATEGORY: Exploratory Development

DESCRIPTION: A possible low-frequency underwater acoustic projector would employ one or more superconducting coils used with one or more normally conducting coils. Each of the normally conducting coils is connected to a radiating piston. The driving force is the oscillating magnetic force between pairs of coils. The problem is to design and test coil and piston mounts that maximize the electro-mechanical coupling, minimize thermal losses, minimize eddy current effects and provide an efficient, dynamically-balanced mechanical coupling to the acoustic medium.

N85-130 TITLE: Object Detection in Very Shallow Water

CATEGORY: Exploratory Development

DESCRIPTION: Means are sought of detecting and localizing objects of oil drum size in water depths 10-30 feet where surf conditions and burial of objects by natural means render conventional acoustic methods inadequate. Air, surface or subsurface sensor platforms may be considered.

N85-131 TITLE: Solid-State Electronic Wind Sensor

CATEGORY: Exploratory Development

DESCRIPTION: Development of a solid-state (no moving part) wind measurement and direction sensor would alleviate many of the serious at-sea maintenance problems associated with the existing anemometer. Develop new/adapt existing commercial grade solid-state sensors for operation in a naval environment. The sensor shall be capable of 0-100 knot measurement range with a ± 1.0 knot accuracy for 0-60 knots and ± 2.5 knots through 60-100 knots. Directional accuracy is ± 2 degrees through 0-360 degrees. The sensor shall be designed to pass the following qualification tests:

Temperature, Low 0°C – MIL-STD-810, Method 502

Temperature, High 50°C – MIL-STD-810, Method 501, Procedure 1

Humidity – MIL-STD-810, Method 507, Procedure IV

Salt Fog – MIL-STD-810, Method 509
Icing – MIL-E-16400, Paragraph 3.3.5.8
Shock – MIL-S-901, Grade B, Deck Mounted, Class 1, Lightweight
Vibration – MIL-STD-167-1, Type 1

Electronic Equipment – MIL-E-16400, Paragraph 4.8.5
Electromagnetic Interference – MIL-STD-461 & MIL-STD-462

N85-132 TITLE: Secure Video Doppler

CATEGORY: Engineering Development

DESCRIPTION: Video doppler information is a major requirement to evaluate the performance of most aircraft and ground launch missiles. Presently, this analog signal requires substantial video bandwidth. It is the parameter which is most guarded in missile testing because it provides the ultimate answer to the success of the firing. Under the present internal climate, the aircraft and missile industries will be required to secure their telemetry data.

This study is intended to provide technical information as to the best system approach to the solution of video doppler data with respect to secure TM requirement. The study will also provide the information to include standard telemetry data which has been encrypted on the same data link. These guidelines will lead to the designation of the design of the equipment necessary to accomplish this task.

N85-133 TITLE: Automatic Computer Image Generation Data Base

CATEGORY: Exploratory Development

DESCRIPTION: Aircraft pilot training in simulators is an established technology that uses computer image generation (CIG) to produce the visual scenes that are displayed in the simulated cockpit. The visual scene databases are currently modeled by hand; that is, it requires at least one, sometimes two people, a photogrammetrist and a data base modeler, to get from raw terrain or cultural data to a useful, modeled CIG database modeler, to get from raw terrain or cultural data to a useful, modeled CIG database. The objective of this task is to combine a number of disciplines to develop approaches, techniques, hardware, and software to do automatic CIG database generation. The primary data source would be photography, probably high altitude and perhaps stereo. Some of the disciplines required would be photogrammetry, computer vision and artificial intelligence. It is envisioned that the "recognition" capabilities of the "machine" would be limited to a repertoire of objects of generic type (it would not have to distinguish between a Chevrolet and a Cadillac). The database developed would not be an exact replica of the raw photographic data, but a close approximation adequate for training and requiring very much reduced storage capacity.

N85-134 TITLE: Eye Attitude Sensor

CATEGORY: Exploratory Development

DESCRIPTION: A system capable of measuring the pointing direction of a pilot trainee's eye relative to his helmet is required for an eye coupled display system being developed for a flight-training simulator. The required performance is an accuracy of one degree of arc in pitch and azimuth anywhere within a 90-degree cone centered on the forward direction. Since the pilot's head is free to move in any direction, systems which restrict head movement, either in position or orientation, are not suitable. Another performance requirement is a response time which must be less than 10 milliseconds and preferably less than 5 milliseconds. If the system samples, the sample rate must be at least 120 Hz and preferably less than 5 milliseconds. If the system samples, the sample rate sensor should add no more than 300 grams of head supported weight to the pilot's helmet, though off-helmet components have no restrictions other than noninterference with the pilot's freedom of movement or freedom to observe a wide-

angle display projected on a spherical dome of three to six meter radius surrounding the simulator cockpit. A production cost of less than \$100K should be a design goal.

N85-135 TITLE: Computer Simulation of Electronic Countermeasures (ECM) Displays

CATEGORY: Exploratory Development

DESCRIPTION: For the purposes of training Navy radar operators to identify standard classes of electronic countermeasures (ECM), there is a requirement for a substantial video-recording library or realistic "jammed" radar displays. The current method of acquiring the samples has been to film operational radar displays either during naval exercises or using plerside signal-generation equipment. This approach has proven to be expensive and had yielded only a small number of samples of each of the standard ECM types. Furthermore, the video recording quality has been uneven.

As an alternative means of acquiring samples of realistic-looking jammed radar displays, the possibility of generating the displays via computer simulation with graphic output should be considered. This would require modeling the radar display, jamming targets and environmental effects to a level that would produce radar displays that are close to the real thing.

Development of an inexpensive methodology for computer simulation of these ECM displays is required.

N85-136 TITLE: Expert Systems to Automatic Digital Scene Matching Area Correlator (DSMAC) Scene Selection and Scene Enhancement

CATEGORY: Exploratory Development

DESCRIPTION: Use newly developed expert systems and knowledgeable engineering technology to implement automation of DSMAC scene selection now done reliably only by a few trained experts. This technique utilizes knowledgeable engineers who work alongside the current experts for 3-6 months. The knowledgeable engineers extract the facts and decision rules from the experts and codify them into a reasoning structure. By repetitive test and refinement, the computer-based Expert System can replace the expert. The study shall also investigate techniques to enhance the DSMAC reference scene using smart algorithms or Artificial Intelligence approaches for Image Exploitation.

N85-137 TITLE: Optimal Cruise Missile Maneuvers Against Gun Systems

CATEGORY: Exploratory Development

DESCRIPTION: Survivability of cruise missiles against Naval Gun Systems is influenced by several interrelated factors. The purpose of this study will be to evaluate the maximum survivability that is gained from optimizing a cruise missile's end-game maneuvers. A trade-off study should be conducted comparing trajectories with two-dimensional maneuvering at low altitudes and those trajectories with one-dimensional maneuvering at sea-skim altitudes (i.e., those trajectories lying in a ship's radars multipath regime). Maneuvers studied will be constrained to maintain a high portability of the cruise missile hitting the target ship.

N85-138 TITLE: Modeling Advanced Gun System Predictors

CATEGORY: Exploratory Development

DESCRIPTION: Existing computer models listed to conduct survivability studies for cruise missiles against Naval Gun Systems are based on track filtering technology of the 1960's. The latest innovations in track filtering technology were made in the mid 1970's and were refined over the past decade. The objective of this work is to

design and code the modern algorithms to provide a computer model which will be relevant for studies of Gun System Predictors that may exist in foreign systems in the early 1990's.