NAVY SMALL BUSINESS INNOVATION RESEARCH PROGRAM
Submitting Proposals on Navy Topics

Phase I proposal (5 copies) should be addressed to:

Topics #N86-001 through #N86-011

Office of Naval Research
800 North Quincy St.
BCT #1, Room 528
Attn: Code 400 SBIR Program, Topic No. ___
Arlington, VA 22217-5000

Topics #N86-012through #N86-030

Commandant of the Marine Corps
Headquarters, U.S. Marine Corps
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Washington, D.C. 20380

Topics #N86-031 through #N86-046

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Naval Medical Research and Development Command
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Topics #N86-091 through #N86-126

Naval Surface Weapons Center
White Oak
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Topics #N86-127 through #N86-134

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Topics #N86-135 through #N86-151

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Warminister, PA 18974

Topics #N86-155 through #N86-158

Naval Underwater Systems Center
New London Laboratories
Bldg. 80, Room 2081
Smith Street Entrance
Attn: Code 10 SBIR Program, Topic No. ___
New London, CT 06320

Topics #N86-159

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Naval Chemical Systems Center
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Panama City, FL 32407

Topics #N86-160 through #N86-162

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Topics #N86-163 through #N86-164

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Topics #N86-171

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Navy Personnel Research and Development Command
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San Diego, CA 92152

Topics #N86-172 through #N86-174

Joint Cruise Missiles Project Office
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Topics #N86-175

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Topics #N86-178 through #N86-181

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Topics #N86-182 through #N86-190

Commander
800 North Quincy St.
BCT #1, Room 528
Attn: Code 400 SBIR Program, Topic No. ___
Arlington, VA 22217-5000

N86-001 TITLE: Acoustic Measurement Techniques

CATEGORY: Research

DESCRIPTION: Sophisticated sensing techniques and materials with specific properties including reliability, and more accurate, reliable, and versatile acoustic techniques for sensing and measuring parameters of interest to the Navy will provide options and improvements in instrumentation for sensing operational parameters and for characterization and reliability assurance of naval materials. The interest is in exploiting the power of acoustic measurement techniques, especially those that are only now possible with rapid advances in other technologies and in computing power. There is a need for basic research that will develop innovations in acoustic methods for measurement of parameters of fluids and solids and advance the state-of-the-art in acoustic measurement instrumentation. The interests are to conceive and demonstrate proof-of-principle for innovations in acoustic measurement methods and to implement some of them in ways that will find theoretical results to the putting together of several proven techniques heretofore not used in combination. The applications include nondestructive evaluation, transducer calibration and characterization, materials research, measurement of radiated noise and other sound fields, and sensing of environmental parameters.

N86-002 TITLE: Chemical Intelligence for Automated Systems

CATEGORY: Research

DESCRIPTION: Requirements exist for the development of chemical sensing and measurement capabilities in areas that include drugs of abuse, chemical defense, contamination control and cabin atmosphere monitoring, optimization and control of specific chemical processes, and chemical intelligence for automated systems, e.g., robots used to monitor and control materials processing for device fabrication. Concepts related to the development of fast, “smart” chemical micorsensors and miniaturized instrumentation for detection and analysis are being sought. Particular emphasis will be given to fiber-optic based systems. Research emphasizing new sensing phenomena, selectivity of response to particular chemical species, and information enhancement of chemical measurements are examples of research areas of interest.

N86-003 TITLE: Generation of High Voltage Sub nanosecond Pulses

CATEGORY: Exploratory Development

DESCRIPTION: Commercially available sub nanosecond electrical pulsers suffer from two limitations: low voltage levels and/or considerable pulse-to-pulse jitter. A pulser which overcomes these limitations would open up new avenues of research in diverse areas, especially high-resolution radar and radar target identification via natural resonance extraction. One promising approach is through the use of a picosecond mode-locked laser to control a semiconductor switch in a high voltage line.

The objective of this work would be to demonstrate a working laboratory model of an electrical pulser delivering 1 kV pulses with widths of 100 ps or less at repetition rates of about 500 Hz; the pulse-to-pulse jitter would have to be no more than a few picoseconds. The later phases of the effort would involve manufacturing a prototype that would demonstrate sufficient stability and reliability for commercial applications.

N86-004 TITLE: Oriented Protein Monolayers/Multilayers on Metallic Surfaces

CATEGORY: Exploratory Development

DESCRIPTION: The Langmuir Blodgett technique has been used to transfer surface films of amphipathic lipids at air/water interfaces to solid surfaces. There is a need for an extension of this technique that would enable the transfer of protein films to solid (metallic) surfaces and preserve their structures. The proteins of greatest interest are those capable of transferring electrons (e.g., redox enzymes) to and from the metal.

N86-005 TITLE: High Temperature Adhesive Systems

CATEGORY: Research

DESCRIPTION: The joining of composites to composites, composites to metals, and metals to metals by adhesive bonding is currently limited to use temperatures well below the glass transition temperature of the adhesive. High temperature adhesive systems are lacking for use temperatures above approximately 350°F.

The objective of this research is to develop new classes of adhesives through the use of preceramic or inorganic precursor materials. A preferred adhesive is one that can form a bonded system under low temperature forming procedures, yet will maintain integrity under cold-dry and hot-wet use conditions. A further objective of this research is to develop adherend surface preparation procedures that will form stable adherend/adhesive interfaces.

N86-006 TITLE: NDE of Adhesive Bonds

CATEGORY: Research

DESCRIPTION: The use of adhesive bonding to join structural materials is limited by the lack of inspection techniques to determine whether the adherend surface has been properly prepared, whether the adherend surface has been degraded after surface preparation techniques but before bonding, whether a durable bond has been formed, and whether a bond that has been exposed to use conditions has maintained its integrity.

The objective of this research is to develop innovative noninvasive inspection techniques that can make these determinations.

N86-007 TITLE: Extensible Databases

CATEGORY: Research

DESCRIPTION: Research and development in the database management systems are has traditionally concentrated on supporting business applications. Recently the design of database systems capable of supporting non-traditional application areas such as CAD/CAM and CLSI, scientific and statistical applications, expert database systems, and image/voice processing has emerged as an important direction of database systems research. These new applications differ from more conventional applications (e.g. transaction processing, record keeping) in a number of critical aspects, including data modeling requirements, processing functionality, concurrency control, recovery, access methods, and storage structures. A number of groups are attempting to meet the demands of these new applications by either building interfaces on top of existing relational database systems or by trying to extend the functionality of such systems. These approaches may appear promising, but are not likely to provide acceptable performance. Research is needed which will lead to design methods for database management systems that are flexible enough to permit extensions to operations such as data modeling, query processing, access methods, storage structures, concurrency control and recovery.

N86-008 TITLE: Fundamental of Solid State Batteries

CATEGORY: Research

DESCRIPTION: A number of solid electrolytes, including polymer-based systems, exist which have ionic conductivities sufficiently high for use in solid state batteries. Investigations of slid state electrochemical cells and their electrochemical behavior are required before solid state batteries can be developed. Emphasis should be given to systems involving polymer/based electrolytes which are capable of practical charge/discharge rates at or near room temperature. Issues which need to be addressed include materials compatibility, electro node-electrolyte interface formation and interfacial composition, impedance, and electrical behavior. Kinetic investigations are needed to establish the factors determining rates and to identify approaches to catalysis in solid-state systems.

Included in the scope of this work are cycling studies of prototype cells to determine the effects of charge/discharge on cell behavior, stability and electrochemical performance.

N86-009 TITLE: Systematic Grammar and Instruction Dialogue

CATEGORY: Exploratory Development

DESCRIPTION: The task is to produce a comprehensive formal theory of instructional dialogue within the framework of systemic grammar. The theoretical analysis must be sufficiently general to encompass both human-human and human-computer instructional dialogue. It must be sufficiently formal to support the principled design and implementation of natural language interfaces for intelligent tutoring systems. The work should make contact with on-going psychological and artificial intelligent research on learning and knowledge representation in one or more of the following domains: mechanics, hydraulics, electricity, probability, algebra, navigation, or computer programming. The end product of the research effort will be a demonstration version of an intelligent training system in one of these technical areas, incorporating a theory-based natural language instructional dialogue capability.

N86-010 TITLE: Representation of Transient Auditory Events

CATEGORY: Research

DESCRIPTION: Acoustic transients of 100 ms or less within noisy backgrounds provide distinctive cues for the identification of an underwater event or sound source that are more salient than the analysis of steady-state emissions within those backgrounds. However, further research is needed to determine alternate ways to represent those events in either visual or auditory displays. The formats that are advanced would be consistent with the decision rules employed by human operators in the classification of sound sources and long-term memory for those events. The understanding of human performance has been formalized with information-processing models that are applicable over a limited range of sounds but those models need to be re-evaluated and, as necessary, to be revised to account for many more categories of underwater events. Recent advances in database design, faster algorithms, and audio-video technologies should be exploited in the investigation of this problem area. An interdisciplinary approach that utilized concepts from engineering psychology, computer science, and signal processing should be given strong consideration.

N86-011 TITLE: Ocean Optical Property Measurements

CATEGORY: Research

DESCRIPTION: Develop a capability for the measurement of ocean optical attenuation and scattering. Current systems are not capable of separating the two energy loss mechanisms. The ideal measurement device would be capable of rapid, in-situ independent measurement of both attenuation and scattering. It should be capable of operating at depth (to 1000m), and have broad bandwidth (300-800 nm). The objective is to develop a precision tool useful for science measurements that can be adapted to use in survey systems. The information derived from these data is essential for development of oceanic biology behavior models, an understanding of the distribution of dissolved and particulate matter, and development of undersea communication techniques.

N86-012 TITLE: Foliage Penetration Radar

CATEGORY: Advanced Development

DESCRIPTION: The Marine Corps Required Operational Capability Intelligence (ROC INT) 1.05 of 17 May 1976 Lightweight Foliage-Penetration Battlefield Surveillance Device (FOLPEN BSD) states the requirement for a man-packed (30 lbs) radar with the ability to detect moving personnel and vehicles through 300 meters of light to heavy

foliage, and 1500 meters in open terrain. It is desired that advanced development models of this system be developed to test in the Fleet Marine Force.

N86-013 TITLE: Waxless, Reduced Length Military Snow Ski

CATEGORY: Engineering Development

DESCRIPTION: The current snow ski in the Marine Corps inventory requires waxing and is approximately 205om in length. The advantage to this ski is the ability to wax to meet existing snow conditions and an increased downhill speed. There are some appreciable drawbacks to this ski, among them the increased logistical burden of maintaining a variety of different waxes, the time and skill required to wax the ski, and the supervision necessary to ensure all Marines in the unit wax to the same standard. A waxless, reduced length ski would be lighter, eliminate the work associated with waxing a ski, and the shorter length would make it easier for the Marine to learn how to ski, turn, sidestep, and climb. This is extremely waxless, reduced length ski should have a grip surface that's durable, quiet, maintenance free, and provide an adequate amount of grip under all snow conditions. It should also incorporate the metal edges that the current ski has as well as comparable flotation. The length should be between 140-180 cm and the ski should be compatible with the vapor barrier boot currently in use by the Marine Corps.

N86-014 TITLE: Solid State Laser

CATEGORY: Research

DESCRIPTION: Development and demonstration of a solid state laser capable of producing light in the equivalent frequency region of the copper vapor lasers are required. This effort would be basic research because no such device has been demonstrated to date. A demonstration of the technical feasibility in needed prior to attempts at packaging for military applications.

N86-015 TITLE: Amphibious Task Force Simulator/Decoy

CATEGORY: Research/Exploratory Development

DESCRIPTION: Threat forces have the ability to track an amphibious task force (ATF) from embarkation to the final assault phase on the beach. One method of deception which could enhance survivability of the ATF would be a simulator which visually, sonically, and electronically reproduces it in false areas of the ocean. Research is required to see if the simulator is technology feasible.

N86-016 TITLE: Hardware Failures vs. Software Malfunctions, Computing Reliability and Maintainability Data

CATEGORY: Management and Support

DESCRIPTION: Traditional methods of computing reliability, availability and maintainability (RAM) are hardware oriented. Current Command Control systems are complex mixes of hardware and software. Hardware can fail and be repaired. Software does not fail. It either works or does not. It cannot be repaired or corrected in the same manner as hardware. Current methods of RAM computation consider software malfunctions the same as hardware failures thereby distorting RAM data. A method of RAM development that differentiates between hardware failures and software malfunctions is required. Consideration must be given to a method in which repeated occurrences of the same software malfunction are computed in RAM and whether or not the malfunction is minor or impedes system functional performance.

N86-017 TITLE: Infrared Camouflage of Command and Control Equipment

CATEGORY: Exploratory Development

DESCRIPTION: Current Marine Air Command and Control System (MACCS) facilities rely on lightweight camouflage system nets to provide a degree of infrared concealment. However, MACCS radars, Command and Control vans and numerous associated tactical generators are very vulnerable to sophisticated Forward Looking Infrared (FLIR) detection systems and IR weapons. Exploratory development is needed to design and test IR reflective paint, better concealment coverings or nets, generator concealment means, and IR decoy systems to emulate the MACCS. Prototype devices should be low cost and sufficiently developed for field testing with actual command and control systems, radars, and generator equipment. Any innovative IR suppression means that is technically feasible and available should be identified.

N86-018 TITLE: Portable Decontamination System

CATEGORY: Advanced Development

DESCRIPTION: A need exists for the development of an advanced portable decontamination system for use by Marine Corps Battalions. The system must be independent of external power, be capable of supplying 10 gpm of 110°F water for showers or supporting up to four spray wands, with each wand having an output of 1.5 gpm of 250°F water at 1000 psi. The total system weight is not to exceed 400 pounds and can be comprised of not more than six components or kits; while each of the components or kits is not to exceed 100 pounds. The system must be capable of operating on diesel fuel. The objective of the Phase I effort would be to demonstrate the technical feasibility of this proposed portable decontamination system by designing and fabricating a prototype system.

N86-019 TITLE: Integrating Directed Energy Weapons into the Marine Corps (1995-2015)

CATEGORY: Exploratory Development

DESCRIPTION: One factor has remained unchanged since the beginning of warfare: killing, destroying, and defeating an enemy by the utilization of physical weapons. Today we stand on the threshold of a revolutionary change: killing, destroying, and defeating an enemy by the utilization of energy weapons. The recognition of this revolution and the timely seizure of the initiative in embracing, adapting and employing these new weapons are critical to the survival of the Marine Corps as a capable, cost-effective force in readiness.
The objectives of this effort are to:

a. Determine the feasibility applying directed energy weapon technology in the replacement or augmentation of physical destructive devices. Propose specific applications.
b. Conduct cost analysis to determine the life cycle costs for the employment of directed energy weapons proposed in paragraph (1) compared to conventional weapons; and
c. Develop a plan for integrating the weapons recommended in 1. and 2. into exciting Marine Corps plan and programs.

N86-020 TITLE: Amphibious Task Force Camouflage

CATEGORY: Research/Exploratory Development

DESCRIPTION: The Amphibious Task Force (ATF) is detectable by threat forces from embarkation to the final assault. To enhance survivability of the ATF, new and revolutionary means of cover are required. The cover must be visual, sonic and electronic.

N86-021 TITLE: Surviving the Enemy's Use of Directed Energy Weapons (1995-2015)

CATEGORY: Exploratory Development

DESCRIPTION: One factor has remained unchanged since the beginning of warfare: being attacked, assaulted and confronted by the physical weapons of an enemy force. Today, we stand on the threshold of a revolutionary change: being attacked, assaulted, and confronted by the directed energy weapons of an enemy force. The recognition of this revolution and the timely seizure of the initiative in protecting ourselves from, defending against, and countering the directed energy weapons of an enemy force are critical to the survival of the Marine Corps as a capable, survivable force-in-readiness.
The objectives of this effort are to:
a. Determine the feasibility of protecting ourselves from, defending against, and countering directed energy weapons. Propose specific alternative applications;
b. Conduct cost analysis to determine the life cycle costs for the specific alternative applications in 1; and
c. Develop a plan for integrating the applications chosen from 1 and 2 into existing Marine Corps plans and programs.

N86-022 TITLE: Optical Fiber Sensor for Chemical Agent Detection and Identification

CATEGORY: Advanced Development

DESCRIPTION: A need exists for the development of an advanced detection system to provide Marine Corps infantry units with a remote chemical agent detection system which is man portable. The system should incorporate two or more filters or optical discriminators to provide discrimination of chemical agents by infrared absorption/emission characteristics. The objective of the Phase I effort would be to develop and explore the technology of optical fiber sensors for use as a filtered infrared chemical warfare agent detector.

N86-023 TITLE: Develop Method for Rapid Assessment of Expeditionary Airfield

CATEGORY: Research

DESCRIPTION: Airfields located in a Marine Corps areas of action may be conventional paved construction (captured or occupied), or may be constructed from AM-2 matting (Aluminum Landing Matting). Marine aviation elements deploying to these fields must be equipped with an airfield damage repair capability, which meets the specific airfield requirement. The ability to rapidly (within one hour, post attack) assess the battle damage and evaluate where minimum repairs can be made to successfully reestablish air operations is paramount. The method established must be suitable for the expeditionary environment and adaptable to existing weapon systems (either air or ground).

N86-024 TITLE: Compatible Lighting for Night Vision Goggles (NVG's) for Landing Craft

CATEGORY: Engineering Development Management and Support

DESCRIPTION: The Cockpit Illumination of Driver Instructions will blind the NVG's in use by anyone in the cockpit. Aircraft cockpit lighting has been successfully filtered with blue/green covers and indirect illumination. This approach should be applied to the LCAC internal cockpit lighting design and external navigation lights to accommodate the use of NVG's by the Pilot/Driver/Navigator.

N86-025 TITLE: Single Broadband Tactical Manpack Radio

CATEGORY: Research

DESCRIPTION: Design/develop one radio to handle the entire tactical bandwidth (2mHz-3 GHz) and which possesses the capability to choose from multiple modulation schemes. Additionally, the radio should possess a single, standard generic communications security device to ensure inter/intraoperability in the security arena. Finally, it should be reemphasized that the technology to fulfill these requirements is here today. Hopefully, future technology developments will provide weight and size reductions that could also include the super high frequency (SHF) bandwidth (3 gHz-30gHz) in a manpackable form and could expand the bandwidth of the proposed radio even further. The impact of such development would be threefold: 1. Improve inter/intraservice operability; 2. Provide a capability for graceful communications degradation in combat; 3. Reduce maintenance cost and complexity.

At present, infantry line (i.e. combat) units tactical radio nets operate within three distinct portions of the frequency spectrum and utilize a variety of radios. With advancing technology, specifically very large scale integrated (VLSI) chips, great reductions in size and weight for HF, VHF, and UHF radios can be achieved. This is evidenced by the quantum size and weight improvements in the AN/PRC-104 versus it predecessor, the AN/PRC-47. Unfortunately, with present technology, the expansion of Manpack radios into the SHF and higher portions of the frequency spectrum, is constrained by the relatively large size of the crossed field oscillators (e.g. magnetrons, reflex klystrons, etc.) required to produce these frequencies. However, much larger bandwidths in a radio could, nevertheless, be achieved. This could increase the frequency range of an individual radio to include the HF, VHF, and UHF portions of the spectrum through modern advances in broadband linear amplifiers. The combination of VLSI size/weight reductions and broadband amplifier spectrum expansion in a single manpackable radio offers a tempting alternative to present battlefield communications.

N86-026 TITLE: Aerostat, Blimp, RPV/Airborne Early Warning for USMC

CATEGORY: Research

DESCRIPTION: Currently the Marine Corps has no organic airborne early warning (AEW) capability. Three alternatives to a manned AEW aircraft are: aerostats, blimps, and remotely piloted vehicles (RPV's). An in-depth research analysis of the capability, cost, feasibility, manpower impact, and risk of each of these alternatives is required. Analysis should consider all logistics aspects of the three alternatives. Affordability within the Navy procurement budget (blimps) and the Marine Corps procurement budget (aerostats and RPV's) should be addressed. A recommended AEW system, if any, should be submitted.

N86-027 TITLE: Variable Speed Compatible Refueling Drogue for Air Refueling

CATEGORY: Engineering Development

DESCRIPTION: At present, the mission of refueling both fixed wing and helicopter aircraft cannot be accomplished without air equipment change to the refueling pods. This is due to the design of the high speed drogue that will not support the weight of the refueling hose at the lower speeds required for helicopter refueling. The challenge is to develop a drogue that will support that 80 refueling hose at airspeeds between 105 KIAS and 250 KIAS.

N86-028 TITLE: Multi-Static Radar (Passive) Applicability for Small Radar Cross

CATEGORY:

DESCRIPTION: Research is required in the area of multi-static radar receiver applicability for detection and correlation of small radar cross-section aircraft. The study should determine the feasibility and affordability of using multi-static radar technology to reacquire and track small radar cross section targets that may be undetectable by conventional radars.

N86-029 TITLE: Research for Mobile Electronic Warfare Support System (MEWSS) Enhancement

CATEGORY: Research

DESCRIPTION: The Mobile Electronic Warfare Support System is to be modular, self-contained, electronic warfare system installed in a Light Armored Vehicle. An enhanced system is envisioned that will be capable of detecting, locating, and degrading enemy command, control, and communication (C3) systems operating in a frequency range beyond the current system capabilities. The prototype, partial-capability system, is only capable of performing jamming and DF operations in the frequency range of the currently used RACAL RJ3100 jammer, and WatkinsJohnson AN/PRD-10 DF (direction finding) system. The research is to explore available and anticipated systems that will meet the requirements of an enhanced system.

N86-030 TITLE: High Speed Digitizer

CATEGORY: Exploratory Development

DESCRIPTION: In connection with ongoing USMC technology, development of electro-optics for land mine detection and survey, the need for very high speed and high-repetition rate digitizer has been identified, the requirement is for a device capable of digitizing (to at least eight-bit accuracy) a signal occurring at a rate of 15 KHz lasting on the order of 200 nanoseconds, with the digitization sampling the signal at least every nanosecond over the entire 200 nanosecond period. Higher accuracy levels would be of value as would a longer sampling window.

N86-031 TITLE: Electronic Beam Scanning for Command, Control, Communications Countermeasures (C3CM) Applications

CATEGORY: Exploratory Development

DESCRIPTION: In the future Battle Group, more effective applications of C3CM will be required to optimize the capabilities of Navy combatant platforms. Innovative approaches utilizing new technology are needed to provide software and hardware to efficiently control electronically scanned, agile beam antennas. Specific improvements desired include reduction in weight complexity, and cost. These technologies have potential applications in many of the Navy ESM, EW, and C3CM programs. Currently these techniques are used primarily in only the most expensive projects.

N86-032 TITLE: Enhanced HF Propagation Prediction

CATEGORY: Exploratory Development

DESCRIPTION: High Frequency radio propagation between two points is predicted with sufficient speed and accuracy by the MINIMUF 3.1 algorithm for many applications. However, when problems requiring arrays of Maximum Usable Frequencies are run on small processors such personal computers, the computer time for MINIMUF algorithm limits the breadth of computations and displays that can be accommodated. An innovative hardware/software approach to provide very fast execution of the MINIMUF algorithm thus unloading this specialized task from the host processor is needed. Once unloaded, the host processor can be programmed using conventional software to manipulate large MUF arrays in new and more meaningful ways to support Naval use of HF propagation with relatively inexpensive personal computer type hardware.

As a goal, execution of each point pair should occur in one millisecond or less. One approach that suggests itself is to build a dedicated peripheral card for an IBM type personal computer using a machine language coded microprocessor. However, different innovative approaches might yield significant advantages over this.

N86-033 TITLE: Fiber Optics Based Local Area Network

CATEGORY: Research

DESCRIPTION: This effort is to provide a conceptual design of a fiber optics based local area network (LAN) which will distribute radar video to remote control indicators (RCI's). The LAN will also be used to provide control for RCIs as well as track file information. The task is (1) to develop the LAN protocol for this application and determine its performance for various numbers of RCIs, (2) conceptually design the fiber optics network, including optical switching, cabling, connectors, environment, and interface electronics and (3) to assess the impact of the LAN on current Identification Friend or Foe (IFF) shipboard systems.

N86-034 TITLE: Lightweight Broadband Shipboard High Frequency Antenna

CATEGORY: Exploratory Development

DESCRIPTION: Examine concepts for a broadband high frequency (2-30 megahertz) naval shipboard transmit and receive antenna for use with frequency agile communications systems. The antenna must meet severe environments of shock, vibration, salt spray, ice and stack gas. Lightweight, low takeoff angle, omni-directional pattern and high efficiency are desirable characteristics. A voltage standing wave radio (VSWR) of less than 3 to 1 is necessary across the band with a transmit power of approximately 1 kilowatt peak envelope power.

N86-035 TITLE: Manufacturing Cost Analysis – Gallium Arsenide Monolithic Microwave Integrated Circuits

CATEGORY: Exploratory Development

DESCRIPTION: Performa a cost analysis of various manufacturing techniques for gallium arsenide monolithic microwave integrated circuits (GaAs MMICs) designed for military systems. The analysis should project probable innovative batch fabrication techniques to be used to manufacture hybrid circuits vs. the totally monolithic approach. Custom and standard designs should be compared and the cost impact of computer-aided manufacturing or other innovative fabrication techniques should be assessed. The cost analysis should also include factors such as packaging, testing, performance, and reliability. A report is to be prepared which summarizes the results of this analysis. The report will be used in planning future GaAs MMIC development programs.

N86-036 TITLE: Naval Countermeasure Controller

CATEGORY: Exploratory Development

DESCRIPTION: U.S. Naval Electronic Countermeasure assets for protecting the fleet from anti-ship missiles have expanded considerably in recent years. Laboratory ECM engagement simulations have demonstrated that considerable enhancement of Battle Group survivability can be achieved by coordinating the usage of these assets, which are spatially distributed on ships, aircraft, remote operated airborne platforms and on decoys launched from aircraft and ships. EW systems are needed as control mechanisms that can execute these coordinated ECM tactics in the real-time of naval battles. Coordination of data from radar, ESM and other sensors (including off-board), and knowledge of platform locations must be intelligently and automatically utilized to achieve predictable effectiveness. Knowledge of currently deployed ECM controllers, relevant data and communications link capabilities, Naval weaponry and operating procedures is required.

N86-037 TITLE: Power Converter, 110VAC to 8 VDC

CATEGORY: Engineering Development

DESCRIPTION: The use of lithium batteries in the AN/PSC-2 Digital Communications Terminal (DCT) aboard ship is discouraged because of an unacceptable hazard to personnel.
A Power converter is required to convert standard shipboard 115 VAC input power to 8 VDC output power to drive the AN/PSC-2 DCT. A converter that can be accommodated in the battery well of the DCT is desirable and must be hazard-free to the DCT operator.

N86-038 TITLE: Remote Under Ice, Ice Thickness Measurement

CATEGORY: Exploratory Development

DESCRIPTION: An urgent need exists today for a capability to remotely measure the thickness of ice as accurately as possible (minimum accuracy of plus or minus 10%) over eighty percent of the Arctic region. The principal area of interest is the Polar Cap, Barents and Kara Seas regions. The measurement would be: 1. made from an underwater platform without restricting its movement except for perhaps allowing its speed; 2. accurate to within plus or minus 10%; 3. made in near real time. The results would be printed on a permanent paper medium as well as visually displayed. Internally housed equipment should be lightweight and consume not more than one standard rack of electronic equipment. Present ice thickness measurement techniques principally use Microwave, Synthetic Aperture Radar or Sonar. Sonar is the least desirable technique to be employed in ice thickness measurement.

The objective of this task is to develop a technique for remotely measuring Arctic ice thickness from a submerged moving platform while imposing minimum restrictions on the platforms movement. The technique would meet the requirements stated above. As a minimum, the work under this task would consist of literature search, development of ice measurement technique, in depth analysis of measurement technique, and assessment of feasibility/risk analysis.

N86-039 TITLE: Satellite Surveillance and Countermeasure

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 multisensor correlative processing. Applications range from satellite shipboard sensor and countermeasure systems to support Naval objectives in worldwide ocean surveillance and targeting.

N86-040 TITLE: Signal Processing: Broadband Cross-correlation Technique Development

CATEGORY: Exploratory Development

DESCRIPTION: Narrow band spectral analysis forms an important part of Signal Processing techniques for the detection of targets/objects that may be imbedded in various types of noise backgrounds. However, the spectra emitted by many objectives is broad-band in nature and requires a different signal processing approach to maximize probability of detection for a fixed probability of false alarm. In high signal-to-noise environments the detection performance of an autocorrelator and cross correlator are about the same. In low signal-to-noise environments, the detection performance of the crosscorrelator is superior to the autocorrelator. The results of this research will be applicable to the detection of both radar and sonar targets which emit few/no discrete tonals but whose emission is primarily broad energy.

The objective is to extend the theory of signal detection to the case where the signal to be detected has an unknown random parameter, namely doppler, whose apriori probability density is unknown and the background noise is additive, white and gaussian (AWGN). Apply this theory and other relevant theory to the development of an adaptive broadband cross correlation receiver or matched filter receiver. Utilizing real world or simulated data, analyze the detection performance of this receiver (measures of goodness may be taken to be the detection index,

processing gain, etc.). Develop the optimum and sub-optimum receiver structures for the signal and noise regimes mentioned above, using real world or simulated data, compare the detection performance of the optimum and sub-optimum receivers; develop correlator/matched filter, the optimum receiver (if different from cross-correlator) and the sub-optimum receiver. Examine the "learning features" of the broadband correlator receiver and relate these to the receiver memory requirement.

N86-041 TITLE: Solid State Radar Transmitter Amplifier Modules

CATEGORY: Exploratory Development

DESCRIPTION: Define a five-year development plan for solid-state radar transmitter amplifier modules. The plan is to be based on the study of present and planned S-band radar systems. At frequencies of L-band (1-2 GHz) and below, solid-state modules have been successfully used in phase array radar transmitters. At X-band (8-10 GHz), the performance and cost goals for solid-state modules are well defined. At S-band (304 GHz), there is a lack of definitive performance and cost goals. Under this task, existing and planned radar systems are to be studied with a view toward defining common sets of solid state transmitter amplifier modules which could be used in a variety of systems. The study should take into consideration microwave tube approaches as well as competing solid-state approaches such as bipolar transistors and field effect transistors. A report is to be prepared which summarizes the study results and outlines a five-year solid state transmitter amplifier module development program with projected cost estimates for such a program.

N86-042 TITLE: Submarine Antenna Mast Design

CATEGORY: Engineering Development

DESCRIPTION: Develop a faired mast for submarine mast-mounted antennas that would exhibit the required strength yet be producible by standard production methods. The faired mast must meet the hydrodynamic and strength requirements of MIL-A-23836 and the TRIDENT and SSN21 ship specifications.

N86-043 TITLE: Submarine Erectable Whip Antenna for Towed Buoy

CATEGORY: Advanced Development

DESCRIPTION: The submarine's communication buoy has an erectable ship antenna, which protrudes from sea surface when in raised position and allows buoy to transmit and receive at HF/UHF. A new design concept is needed to improve reception/transmission and reliability while in operating environment.

N86-044 TITLE: Tailoring Contract Data Requirements

CATEGORY: Research

DESCRIPTION: This research shall support the DOD "Streamlining Initiative" of the SPAWAR Specification Control Advocate.

The Contract Data Requirement List (DD Form 1423) is the formal tool to list all data required by a government agency from a contractor in any specific acquisition project. The entries in this list are dictated by the engineering aspects for each acquisition project and the requirements for data must comply with wide ranging and diverse aspects such as testing, reproducibility, scheduling, and other technical process related activities. The form provides little freedom of "how to express" the data requirement, and it can be observed that high and low cost positions for data manipulations are described with identical brevity.

Investigate the possibility of restructuring the details of the DD Form 1423 to promote tailoring. Establish systematic guidelines relating the entries of the DD Form 1423 (e.g. block 16) to cost and value relationships. Develop trade-off criteria for data ordered correlating the benefits/value to the cost to develop, produce, and deliver the data product.

N86-045 TITLE: Technological Upgrade of Air Traffic Control and Identification System

CATEGORY: Advanced Development

DESCRIPTION: Feasibility studies that explore technological advances are needed in order to upgrade the operational performance of existing shipboard and shore board TACAN, IFF and air traffic control systems. Proposals are solicited that address innovative concepts for signal collection, distribution and processing with emphasis on potential high pay-off in advanced development. Investigation should include potential uses of materials (composites, ceramics, etc.), components (detectors, sensors, wave guides, etc.), and technologies (local area networks, fiber optics, etc.). Purpose is to establish a foundation for accelerated upgrade of operational performance of existing and planned systems with respect to parameters, such as sensitivity, interference, immunity, survivability, and reliability.

N86-046 TITLE: Logistics of Anticipated Technology Innovation in Electronic Systems and Device Design

CATEGORY: Exploratory Development

DESCRIPTION: The electronic system and device technologies are advancing at rapid range. These technologies are being driven by non-military applications such as the cellular phone and, in many cases, by foreign industry. To exploit this advancing technology and to refocus the driving application to military designs, new concepts and new techniques of logistics, modernization, and system design are required. The Navy's lengthy pipeline required to phase in new technologies must be shortened significantly. A new dynamic approach to this problem is required. This effort will be to investigate the logistics of anticipated technology innovation in electronic system and device design and develop an approach that will shorten the modernization pipeline. Among those programs that are considered critical at this time are high power bipolar and silicon field effect transistors for RF power amplifiers, L band and above.

N86-047 TITLE: Threshold Corrosion Fatigue of Welded Shipbuilding Steels

CATEGORY: Exploratory Development

DESCRIPTION: The use of fracture mechanics fatigue crack growth analyses requires fundamental information about how materials behave in the low crack growth rate, and threshold regime, while in a marine environment. The threshold stress intensity parameter is typically employed to characterize or define the state of stress below which fatigue crack growth rate is zero or undetectably small. The fatigue behavior in this regime is analogous to that in the endurance limit region of the S-N diagram. The threshold stress intensity parameters are difficult to obtain even in air, because of the required sensitivity for the measurement instrumentation. The data-gathering difficulty is compounded in the case of corrosion fatigue because accurate crack measurements for long-term periods in seawater are required. Therefore, a significant effort must be expended to facilitate development of methods to determine low crack growth rate and threshold data in seawater.

Once an appropriate experimental technique is developed, it is anticipated that various fatigue crack growth variables, such as temperature and level of cathodic polarization could be explored. Such data should also be obtained for different shipbuilding steels. The weld and heat-affected zone also ultimately should be characterized.

The objectives of this effort are to determine the threshold stress intensity parameter for corrosion fatigue crack growth rates as the threshold is approached. This would be accomplished by:

a. developing a test technique appropriate for determining the threshold stress intensity parameter and corrosion fatigue crack growth rate within the long-life regime in seawater and for variables of interest (temperature, level of cathodic protection, etc.).

b. Demonstrating validity of the technique by obtaining limited threshold data for the base metal of a representative Navy steel at two levels of cathodic protection and two temperatures, nominally 20 and 4 degrees C.

In accomplishing the above two objectives, the project should ensure that accelerated test procedures are considered, and that relative accuracy of different crack length measurement techniques and differences between substitute electrolytes are quantified.

N86-048 TITLE: Remote EM Sensor Technology

CATEGORY: Exploratory Development

DESCRIPTION: Develop sensor, signal processing and telemetry technology applicable to EM sensors that can be covertly deployed from a submarine platform. Compact EM sensors are desired covering the VLF millimeter, infrared and visible EM spectrum. Various aspects of fiber optic technology may be employed to provide optical remote processing and telemetry. Affordability must be a prime consideration.

N86-049 TITLE: Advanced Propulsion Concepts

CATEGORY: Exploratory Development

DESCRIPTION: Develop concepts for advanced propulsion system for nuclear submarines with increased power density over existing systems. A synergistic combination or power plant, transmission and propulsor are desired to allow increased speed and/or power with less weight and volume. Such a propulsion system must either be inherently quiet or be capable of quieting with existing technology.

N86-050 TITLE: Assessment of Fiber Reinforced Plastics for Combatant Submarine Structures

CATEGORY: Exploratory Development

DESCRIPTION: Perform a feasibility study to determine the applicability of fiber reinforced plastic composite materials for combatant submarine structures, such as the pressure hull, high pressure gas flasks, weapon stowage structure, control surfaces, bed plates, pipe hangers and non-built-in tanks. The study should assess the capability of industry to develop the structures, potential reduction of life cycle coats, weight savings that can be achieved and the associated technical risks for development.

N86-051 TITLE: Miniaturized Magnetic Sensors

CATEGORY: Advanced Development/Exploratory Development

DESCRIPTION: Show feasibility for developing a miniaturized orthogonal magnetic sensor, capable of detecting field changes of 1 nanotesla while operating in a field environment of 20 oersteds. Sensor elements shall be not more than 10 cm cubed in volume (not including electronics). The sensor shall operate at normal room temperature with a stability and drift of 1 nanotesla per hour. Measurement of alternating fields (AC) in the 60 Hz and lower region is also desirable.

(Note: Proposals that closely match these specifications will be considered).

N86-052 TITLE: Anti-fouling Materials or Techniques for Sound Transparent Sonar Domas

CATEGORY: Exploratory Development

DESCRIPTION: Develop new anti-fouling materials or techniques to prevent marine growth on submarines and surface craft without requiring special handling for personnel protection during installation and removal.

N86-053 TITLE: Evidential Reasoning Algorithms for Shipboard Decision

CATEGORY: Exploratory Development

DESCRIPTION: AI-based decision aids will play an increasing role in assisting ship commanding officers and unit commanders to perform various complex tasks (e.g. planning allocation of C3 countermeasures, monitoring enemy and friendly ship movements, predicting hostile responses, evaluating proposed courses of action, etc.) Application of AI-based reasoning derived from gradual accumulation of evidence is a critical function in such activities, but is currently supported by a largely ad hoc mixture of techniques derived from statistical analysis.

The contractor will first examine the theoretical bases for these techniques and identify appropriate conditions for application of each technique. The contractor will then analyze the nature of the decision tasks with particular attention to the conditions identified. Finally, the contractor will describe how the techniques can: 1. best be utilized in application to command-level decisions that are often characterized by sparse data, inconsistencies, and disparate decisions goals, and 2. be integrated in practical terms into planned combat support systems.

N86-054 TITLE: Data Fusion Technology

CATEGORY: Exploratory Development

DESCRIPTION: Planned improvements in shipboard data processing capabilities (digital data buses, distributed processors, etc.) will significantly enhance the ability of ship commanding officers to manipulate large amounts of data. The utility of these improvements will be much diminished, however, if the data cannot be readily transformed into information for use in making decisions critical to mission accomplishment (e.g., decreasing ship vulnerability, increasing weapon effectiveness).

The contractor will investigate the feasibility of practical database interfaces that use advanced techniques to interpret requests for such information, autonomously develop calls to the appropriate databases, and assemble the results in decision-oriented format. The databases to be considered will be of diverse form and content, and located both on-board ship and at remote sites. The contractor will also describe how these semi-intelligent interfaces can be made compatible with planned combat systems elements, and the information displays associated with these elements.

N86-055 TITLE: Improved Thermal and Mechanical Properties of Missile Structures Through Use of Graphite Fiber Reinforcement

CATEGORY: Exploratory Development

DESCRIPTION: The graphite fiber is the most versatile reinforcement known. With PAN precursor, tensile strengths up to 1.2 msi will be available in FY1986 and with pitch precursor, modules up to 140 msi will be available. The fabrication technology is now to incorporate these fibers into metal carbon or polymer matrices. The objective of this program is to determine the limits on specific strength and specific modulus that can be obtained in matrices that are applicable to advanced Navy missile systems. This program will identify the fabrication technology needed to combine specific strength (generally required at low temperature) and specific modulus (generally required at high temperature) into a single composite through the use of different types of fibers in a single matrix. This approach will lead to a composite technology that can be tailored to the needs of future Navy Missile Systems. Demonstrations of high specific strength and specific modulus in a single composite will be accomplished in Phase I. Fabrication and processing methods will be developed under the Phase II follow-on program.

N86-056 TITLE: Joining of Thermally Mis-Matched Components for High Velocity Missiles

CATEGORY: Exploratory Development

DESCRIPTION: High velocity missiles (Mach 4-7) require low thermal expansion ceramics for radomes, IR domes, and fuzing windows. The primary missile structure, however, will be a high thermal expansion material such as a super alloy. A transition material is required for dome to structure joints that is a hybrid composite with a graded thermal expansion compatible with the ceramic at the interface and compatible with the super alloy at the opposite interface. Graphite fiber reinforced aluminum or copper (depending on temperature capability required) can provide the required properties. Graphite reinforced metals will be graded by fiver thermal expansion (variable from highly positive to moderately negative) and fiber modules to be thermally and mechanically compatible with ceramic domes. Available products in graphite reinforced A1 and Cu will be surveyed and evaluated with respect to thermal and mechanical properties, reproducibility and cost. Directions for future development will be carefully considered and recommendations will be made for a Phase II development program.

N86-057 TITLE: High Performance Large Diameter Composite Tubes

CATEGORY: Exploratory Development

DESCRIPTION: This project involves use of hot filamentary winding techniques to produce large diameter, lightweight metal matrix composite tubes for missile and space applications. Structural integrity will be determined and mechanical property tests conducted to verify efficiency of fiber and metal property translation in the structure. Consideration will also be given to cost and versatility of fabrication.

N86-058 TITLE: Development of Ceramic Reinforcement Materials for Metal Matrix Composites

CATEGORY: Exploratory Development

DESCRIPTION: This Phase I program will demonstrate production of a discontinuously reinforced metal system, with isotropic characteristics, from commercial mat materials (of the reinforcing medium). Presently, discontinuously reinforced metal materials are produced via a process including a mechanical mixing step to combine and randomly orient the constituents. This project will utilize open-pore mat materials such as A1203 and graphite. The matrix metal is applied via a fluid dip process to initially coat the mat. Subsequent bonding or densification steps would be similar to present composite fabrication techniques (viz., diffusion bonding, braze bonding, H.I.P.). The initial mat characteristics create skeletal forms to allow inexpensive handling and ease of coating without need for mechanical mixing. Plate forms of two reinforcements will be fabricated for test. This process offers versatility beyond any present composite processing system. Since availability of many ceramic, graphitic, metal, and/or organic mat and foam products exists, the unique characteristics in these materials can be utilized. The matrix system could be a variety of graded metals, ceramic metals, or glasses. By judicious selection, material characteristics such as low x-ray absorption, excellent wear resistance, or directional conductivity can be combined with enhanced mechanical characteristics.

N86-059 TITLE: Develop Predictive Methods for Assessing Munitions Sympathetic Detonation

CATEGORY: Exploratory Development

DESCRIPTION: Develop computer programs and methods for assessing the susceptibility of munitions to sympathetic detonation. Acquire and tabulate existing data on Navy munitions sensitivity and develop mathematical models to predict energy transfer to the explosive loads of the munitions and to predict the resulting reactions. Energy transfer occurs from a combination of blast and high speed multiple fragment impact. Also use the models to identify the most useful existing small-scale explosives sensitivity characterization tests. Suggest new tasks if the need is indicated. Provide a catalogue of already existing newly created computer code developed to facilitate usage by the Navy Insensitive Munitions Community.

N86-060 TITLE: Predictive Methods for Assessing Munitions Sensitivity

CATEGORY: Exploratory Development

DESCRIPTION: Develop computer programs and methods to predict the sensitivity of munitions to unplanned stimuli such as heat, shock, and bullet and fragment impact. Acquire and tabulate available energetic materials sensitivity data, develop computer program(s) developed to facilitate usage by the Navy Insensitive Munitions community.

N86-061 TITLE: Artificial Intelligence Signal Processing

CATEGORY: Exploratory Development

DESCRIPTION: Develop artificial intelligence signal processing and information management systems to enhance combat system performance. Such systems should aid target detection, localization and classification. Artificial intelligence systems may either be general, i.e., capable of being utilized in a wide variety of combat systems, or specific, i.e., tailored to specific systems.

N86-062 TITLE: Insensitive Munitions Slow Cook off Protection Concepts

CATEGORY: Exploratory Development

DESCRIPTION: The U.S. Navy has a program to develop insensitive munitions. The goal is to have all ordnance react no more violently than burning when subjected to the stimulus (among several) of a slow cook off test. This is a low heating rate test whereby the ordnance item is preconditioned to 130 deg F then gradually heated at the rate of 6 F deg/hr until unit reaction occurs. Solid rocket motors, missile warheads, and bombs are the ordnance items usually tested, sometimes individually and sometimes in combination. Reactions are typically explosions or detonations even when the same units only burn when heated rapidly in a large fuel fire.

Innovative concepts are sought for developing methods to reduce the reaction violence of ordnance subjected to the slow cook off test. Acceptable approaches include new propellants and explosives formulations, special internal or external liners/insulators, modified or new case designs and case materials, and active or passive add-on devices. Concepts may apply to only one or to all types of ordnance items. Of equal interest are concepts, which can be back fit to existing ordnance, and concepts, which are only practical for new production units. Approaches should add little or no weight or aerodynamic drag to the munitions. There can be no loss in propulsion performance of rocket motors or lethality of warheads and bombs.

N86-063 TITLE: Non-Super conducting Sensors

CATEGORY: Exploratory Development

DESCRIPTION: Develop sensors that are non-super conducting to measure low varying electromagnetic fields in the frequency range of 1-100 Hz. Directional sensitivity of 10 to the negative 12 tesla, is desired. Stability under varying ocean temperatures is required.

N86-064 TITLE: Computer Aided Logistics Modeling

CATEGORY: Research

DESCRIPTION: Computer Aided Logistics Support requires restructuring of the communication principles between involved organizations. They must work now in a complimentary fashion, highly in parallel. An appropriate mix (or composition) of communication factors (such as voice, text, picture, sketch, model, or binary code) which will

not be misunderstood or misinterpreted (i.e., what was said and what was heard) are to be addressed along with addressing and resolving the recognition problems (e.g., incorrect recognition or failure to recognize).

N86-065 TITLE: Non-Contact Ranging System for Collision Avoidance

CATEGORY: Exploratory Development

DESCRIPTION: The increasing number of projected robotic applications involving mobility have highlighted the need for a small modular and inexpensive short range non-contact ranging system to provide for collision avoidance. A multitude of such sensors will be required for a moving platform in order to provide sufficient environmental awareness with regard to object location in order to preclude impacts while in terrain traversibility. While some research is being done in the area and there exist various types of non-contact ranging devices, none are really practical for employment in this scenario. Existing ultrasonic ranging systems are simple and economical, but have numerous drawbacks which make them unsuitable in reality, arising from errors associated with temperature dependence, diverging beam patterns, and specular reflection from target surfaces. Also, laser based ranging systems suffer from inherent system complexity and expense, although overcoming some of the problems associated with acoustical ranging units. Simple near infrared proximity sensors, while low in cost, offer no precise range information, but just a binary indication of target vs. no target. It is desirable to develop for this system in sufficient quantity so as to provide accurate range and bearing information in all directions, thereby allowing the mobile robotic system to model its environment with sufficient accuracy so as to avoid contact with surroundings while traversing the area. The units must therefore be small in physical size, relatively inexpensive, and have low power-consumption, providing output in a timely and practical fashion so as to achieve the stated objective.

N86-066 TITLE: Expert/Rule Based System for Weld Process Control

CATEGORY: Exploratory Development

DESCRIPTION: Welding is an extremely labor intensive operation in the manufacture and repair of ships and shipboard equipment. The weld process itself is often viewed as an art rather than a material science. Subsequently, the quality of welds produced by manual methods varies widely and is extremely operator dependent, necessitating large investments in training and certification overhead. To enhance productivity while at the same time improving resultant weld quality and repeatability, robotic welding systems are being developed for application in Navy scenarios. The look of volume adaptation of conventional industrial welding robots as are successfully employed in the automotive industry. Off-line programming techniques as well as three dimensional seam tracking capabilities are being developed by funded Navy programs to address this problem. There remains, however, the issue of adaptive control of the weld process itself, and NAVSEA funded deployment efforts in this area have taken the form of a knowledge based system to initially set and continuously adjust weld parameters based on sensor feedback and a comprehensive rule base desorbing the weld process itself and the interrelationship of the various weld parameters. The development of a practical model of the weld process and the generation of the appropriate rules for such a rule are needed near term developments.

N86-067 TITLE: Hand Held/Portable Data Terminals

CATEGORY: Advanced Development

DESCRIPTION: NISTARS controls all material at the Naval Supply Centers, with material movement in the automated NISTARS building processed via fixed data terminals by the warehouse worker. This detailed control reduces processing mistakes, allow supervisors to monitor individual training requirements and gives electronic proof of material movement leading to increased accountability and inventory accuracy. Material in the non-mechanized buildings, although under NISTARS control, is processed using physical documents, and is still fraught with the problems inherent to a paper intensive system. A hand held processing device could download information to the non-mechanized worker on the floor or in a vehicle similar to what is being done in the mechanized warehouse, and provide step by step instructions for processing material. This device would interact directly with

the NISTARS central controller to provide “on-line” information on warehouse refusals, quantity changes, unit of issue changes, etc., thereby increasing control by reducing lapsed time between the event and its record in the data base.

N86-068 TITLE: Reduction in Repairables Leadtime R&D Request

CATEGORY: Exploratory Development

DESCRIPTION: Both repair turnaround times and procurement leadtime for repairables have continued to increase. Additions to either repair turn around time or procurement leadtime require increased inventory investment. Additionally, fleet readiness is often adversely impacted because of these lengthening times. R&D efforts need to focus on delineating these key variables of repair turnaround time and procurement lead time. The various actions that can be taken to shorten these times by inventory managers and procurement specialists then need to be defined. Finally, a program must be developed to guide inventory managers/procurement specialists through the decision process.

N86-069 TITLE: Procurement and Inventory Manager Interface R&D Request

CATEGORY: Exploratory Development

DESCRIPTION: This effort will center around contracts awarded via negotiations. Often in the negotiation process, alternative prices and quantities are offered to the government official from the commercial company. The government official does not have the expertise to determine if the alternative prices are reasonable and if increased quantities are in the best interest of the government based upon various factors (e.g., obsolescence, current asset position, etc.). A “real time” system needs to be developed so that the procurement expert can communicate with the inventory manager that such factors as learning curves, fixed versus variable costs, risk of long supply, and budget constraints are taken into consideration.

N86-070 TITLE: Emulation of Non-available Microcircuits

CATEGORY: Engineering Development

DESCRIPTION: Emulation of non-available microcircuits is required to supply DoD system managers with microcircuit parts no longer in production. Industry can view this as a multi-faceted task including emulation of obsolete processes, designs or fabrication techniques. The goal of the tasks is to produce quantities of microcircuits with a minimum of non-recurring engineering. A typical example is the emulation of non-available TTL microcircuit with CMOS technology.

N86-071 TITLE: Innovative Garment Assembly Technique

CATEGORY: Exploratory Development

DESCRIPTION: There is a need to develop new methods of garment assembly techniques, which would decrease the number of skilled technicians currently needed for operating conventional sewing equipment. This exploratory development would be in the area of automatic seam sealing or the formation of a garment as a one-piece suit. This new equipment would have to be able to be operated by unskilled personnel and produce a garment of equal or better quality than conventional sewing techniques at a lower cost to the Navy.

N86-072 TITLE: Durable Polymeric Treatments for Imparting Flame Retardancy to Synthetic (Polyester, Nylon) – Rich Cotton Blend Fabrics

CATEGORY: Exploratory Development

DESCRIPTION: The Navy has a need for a durable (50 launderings, minimum flame retardant (FR) treatment that can be effectively applied to synthetic (polyester or nylon) rich cotton blended fabrics. The finish should be capable of being applied with conventional equipment and should have no significant adverse effect on any of the fabric's other functional characteristics. The Government will supply materials to the contractor for finishing and evaluation.

N86-073 TITLE: Development of Non-Flammable Oxidized Polyacrylonitrile Fabrics

CATEGORY: Exploratory Development

DESCRIPTION: The Navy has a need for durable, non-flammable materials that could be fabricated into protective garments for use aboard ship. The technology used to manufacture oxidized polyacrylonitrile fiber (OPF) needs to be investigated to determine whether it is possible to produce yarns with sufficient strength and reduced fibrillation tendencies so as to provide fabrics suitable for manufacture into protective clothing. The Navy is interested in evaluating four to ten ounce per square yard OPF materials that would possess sufficient strength (80 pounds minimum break strength and 5 pounds minimum tear strength) and abrasion resistance (1000 cycles minimum Taber abrasion), and be dimensionally stable (3% wrap and filling, maximum, when laundered at 140F).

N86-074 TITLE: Industrial Robotics for Printing Facilities

CATEGORY: Advanced Development

DESCRIPTION: Binding operations in the Navy Publications and Printing Service (NPPS) system cost to the Navy $15.8 million annually and require approximately 340 man years. Much of the work being done is manual, highly repetitive, labor intensive, and requires little training. Examples are loading and unloading paper to and from automated duplicators, stitching, drilling, hand collating, affixing address labels, packing, and wrapping.

An overview of bindery operations within the system suggests that approximately 50% of stitching, drilling, and packaging and 10% of sundry labor can be accomplished through robotics. This would provide savings of $2.54 million annually, representing approximately 55 man years of effort. Development of this technology in bindery operations provides an inroad to development in other areas of the printing plants and other functions within Navy acitivites.

Engineering development of a robotic system capable of accomplishing one or more of the above tasks is desired.

N86-075 TITLE: Word Processing/Data Processing Integration

CATEGORY: Exploratory Development

DESCRIPTION: Investigation of the feasibility of integrating existing Tandem work processing software with existing Tandem transaction processing software to support a major procurement application to be exported throughout the Navy Field Contracting System. Deliverables would include an assessment of the possibility of accomplishing a description of alternative approaches including pros and cons, and alternate methods using non-Tandem word processing software.

N86-076 TITLE: On-board Manufacture of Expendable Fuel Tanks

CATEGORY: Engineering Development

DESCRIPTION: An FY=85 SBIR project is being supported for exploratory development of drop tanks that can be easily stored on aircraft carriers in a disassembled state. An alternative to this approach would be an engineering development project that pursues manufacture on board from 1. a plastic-type material that can be molded and 2. a kit of parts that would complement the manufacture (i.e., piping lugs, etc.). Since the storage problem is for the tank, itself, CVs could store the raw material in any number of sizes/shapes and manufacture upon need.

N86-077 TITLE: Fuel Storage Tank Water Bottom Detection System

CATEGORY: Exploratory Development

DESCRIPTION: To reduce tank bottom corrosion and prevent potential fuel contamination, all fuel storage tanks must periodically have water drained from the bottom of the tank. Determining the presence of water at the bottom of a tank is a time consuming and labor intensive process. If a system were available to remotely monitor the occurrence of water bottom, time and monetary resources presently expended to manually perform this task could be substantially reduced. This R&D effort would determine whether a suitable remote water bottom detection system is available. The project would be divided into two phases. During the first phase, a literature review would be conducted to determine whether feasible systems to detect water bottoms currently exist or can be developed. This phase would include technical evaluation of the reliability, accuracy and maintainability of existing equipment and a recommendation for future testing. In the second phase, monitoring systems would be developed/modified and field tested to determine their accuracy, reliability and economic payback.

N86-078 TITLE: Expert System for Retail Inventory Management

CATEGORY: Exploratory Development

DESCRIPTION: Retail inventory management is extremely labor intensive today. The representativeness of the supply is impaired because of inefficiencies inherent in our present system. The various elements of retail inventory management (e.g., item establishment, dues maintenance, record maintenance, exception processing) are all exercises in information processing. Because so many decisions are made today off-line, the utilization of our computer system is much lower than it should be. Data review structures are needed that can be used by retail item managers. They should lead to a common level of expertise that can be programmed into an expert system similar to the analysis being currently conducted at the wholesale level.

N86-079 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, and display medical data for use in Navy outpatient clinics. A systems analysis must be conducted at representative 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.

N86-080 TITLE: Facilitation of Measurements of Specific Absorption Rates

CATEGORY: Exploratory Development

DESCRIPTION: A system is needed to facilitate the outdoor measurement of average radio frequency (RF) and microwave energy absorption (specific absorption rage, SAR) in a full-size man model. Currently, arduous, manual methods are employed in twin-well calorimetric procedures to measure average SAR. These procedures are time consuming and labor intensive. This effort involves the development and testing of mechanical handling and weather protection system is to provide a thermally equivalent environment for both calorimeters and for both man models outdoors with the absence of direct sunlight and rain. The success of the twin-well method relies on the thermal homogeneity of the models and the calorimeters. The mechanical handling system provides a rapid means of removing the models from the nonmetallic support and inserting them into the gradient-layer calorimeters.

The effort will include assembly of all the apparatus at NAMRL and testing with the government-supplied large gradient-layer calorimeters. The tests will include 48-hour tests with calorimeters loaded with water at the same temperature to measure how closely the output voltages track each other. Similar tests will be conducted for the water loads met at a specified difference in temperature. Finally a comparison test will be conducted in which one run will manual manipulation of the models, and a second run will use the developed handling apparatus. A final report describing all experimental results and providing specifications for all apparatus will be required.

N86-081 TITLE: Instrument for Photometric Determination of Surface Roughness

CATEGORY: Engineering Development

DESCRIPTION: Navy dental treatment has sizably increased delivery of resin bonded appliances in order to provide fixed prosthetic services within the constraints of military operations. Failures observed in some of these prostheses have been noted at the bonding resin and metal interface. This may be due to insufficient development of undercut roughness during laboratory etching of the metallic surface. The current method of assessing etch quality in dental prosthetic laboratories uses light microscopy. Light microscopy has recently been shown to be unable to distinguish properly-etched from etched-but less-retentive metal surfaces. Biangular reflection measurements of etched metal surfaces, on the other hand, have shown very good correlation with surface area/volume measurements and subsequent bond strength studies. Navy dental laboratories need a reflection photometry instrument, durable enough for field use, which can be used for reliable quality control of etching procedures on metallic frameworks of fixed dental prostheses.

N86-082 TITLE: Molecular Structures for Avionics and Aviation Materials

CATEGORY: Exploratory Development

DESCRIPTION: Recent advances in biology (genetic engineering, hybridoma, 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 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 and 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 multi-dimensional material matrices and associated structural and functional properties are of interest.

N86-083 TITLE: Fault Tolerant Systems: Design and Evaluation Algorithms

CATEGORY: Research

DESCRIPTION: Develop reliability algorithms for the design and evaluation of parallel processors and networks of computers. The algorithms should be computationally efficient while representing system component dependencies of both hardware and software failures. The algorithms should be capable of representing the logical/physical activities of thousands of nodes. Present reliability modeling techniques are incapable of appropriate representation of fault coverage parameters, (e.g. latent, intermittent/transient, software and hardware faults). The intent is to develop methods which will be applied, mission-critical functions such as aircraft flight control. Approaches are sought which evolve tractable model structures with increasing problem complexity (number of components, dependent relationships as an initial step toward possible realizable numerical implementation to be demonstrated.)

N86-084 TITLE: Correlation of Flight Maneuvers with Mission Flight Purpose Codes

CATEGORY: Research

DESCRIPTION: Flight maneuver data of fleet aircraft operations are currently obtained from counting accelerometers that record cumulative load factor exceedances. These data to not account for gross weight or mission loading configurations. Operational flights are performed in accordance with designated flight purpose codes that generally identify mission loading. A correlation of these loadings with accelerometer data for the relevant flight will provide a basis for incorporating flight purpose code reporting into the Structural Assessment of Fatigue Effects (SAFE) program reporting criteria.

N86-085 TITLE: Fatigue Enhancement of Lugs

CATEGORY: Research

DESCRIPTION: Structural lug assemblies, either bushed or not, have historically been prone to premature fatigue failures. The purpose of this effort is to develop procedures and tooling for fatigue enhancement of lug assemblies. The emphasis will be on developing techniques that are easily implemented, for both new production and reword efforts. Fatigue and crack growth tests will be used to ascertain the effectivity of developed methodologies, used simulated lug geometrics, under constant amplitude and variable amplitude loading conditions.

N86-086 TITLE: Lightweight Sealed Parachute and Harness Assembly

CATEGORY: Exploratory Development

DESCRIPTION: Explore potential concepts for development of a lightweight environmentally sealed parachute and harness assembly to replace NB-8 and similar non-ejection set type parachutes. These types of parachutes represent over 75% of the Navy inventory and require significant annual expenditures for repacking at 210 day intervals. These parachutes are also relatively heavy which results in additonaly costs related to fuel consumption and loss of payload capability. The first phase of this effort is to exlore potential concepts of a system meeting the following requirements; 1. minimum repack cycle of five years; 2. environmentally sealed parachute; 3. quick-donningharness; 4. total weight of parachute and harness less than 17 pounds; 5. vertical descent rate less than 24 ft./sec. with a 265 pound suspended mass; 6. ability to open parachute up to 150 knots and 7. ability for the parachute to glide upon command. This first phase should also define specific requirements for the subsequent engineering development phase.

N86-087 TITLE: Aircraft Velocity Measurements During Carrier Takeoffs and Landing

CATEGORY: Exploratory Development

DESCRIPTION: The actual velocity vectors of aircraft being catapulted from aircraft carriers, and engaging speeds on touchdown and arrestment by recovery systems are critical measurements. This task calls for investigations of available systems that can independently and accurately measure the speed of the aircraft as it disengages from the catapult shuttle, and the speed and sink rate (vertical velocity) as the aircraft touches down and engages the arresting gear. The proposed system should be maintainable, reliable and compatible with the shipboard environment.

N86-088 TITLE: Evaluation of Avionic Equipment Re-racking for the E-2C Aircraft

CATEGORY: Engineering Development

DESCRIPTION: Reliability of the avionics installed in the E-2 depends in part on the environment to which it is subjected. The equipment rack must provide isolation from shock and vibration, protection for wiring and connectors and efficient cooling airflow.

The investigation of improved racking methods will involve the development of prototype racking for high failure, low reliability Weapon System Replaceable Assemblies (WRAs) and the demonstration of their effect in improving system overall performance based on installation of their effect in improving system overall performance based on installation in a test aircraft. Follow-on testing would involve deployment of a test rack in an E-2C aircraft squadron and evaluation of the performance based on reported maintenance data.

N86-089 TITLE: Utilization of New Acoustic Processing Equipment

CATEGORY: Engineering Development

DESCRIPTION: Now high speed acoustic processing equipment is being developed to support Navy requirements. Utilization of this equipment in VP aircraft will provide significantly enhanced mission performance. To take advantage of this equipment's capabilities, the equipment must be configured and packaged so that it conforms to a particular platform's mission requirements and physical constraints.

Studies are required which define UTS-2 configurations that satisfy the P-3C mission requirements, are amenable to the P-3C's physical environment, and are compatible with system architecture.

N86-090 TITLE: Sensor Data Organization, Storage and Recall

CATEGORY: Exploratory Development

DESCRIPTION: Intensive and extensive amounts of data will be acquired and processed by various acoustic and non-acoustic sensor systems in VP aircraft. To assure that maximum use of these data can be made to adequately support mission planning, operations and analyses, the data must be organized and stored in a rapid fashion that supports its rapid recall for continued use to support VP operations, and post mission analyses and mission planning at ground facilities. Studies are required to identify data organization, storage and recall methodologies and technologies that will support VP operations, mission planning and analysis. The methodologies and technologies identified must be consistent with the P-3C's operational environment, sensor systems, methods of operation, and be applicable to the post mission analyses and mission planning environment.

N86-091 TITLE: Missile Batteries

CATEGORY: Research

DESCRIPTION: Developments in the field of conductive polymers have advanced to the point where they should be reviewed for application to lightweight, high reliability, high capacity batteries for missile systems.

N86-092 TITLE: Mathematical Simulation of Battery System By Use of Battery Analogs

CATEGORY: Research

DESCRIPTION: Perform literature search relating to silver oxide/sing battery modeling for review of mathematical simulation. Develop (n) mathematical relations with (n) unknowns for generalized solution from program equations set. Finally, verify simulated model with available battery test data.

Results:

- Definition of design parameters
- Parameters for meaningful correlation
- Mathematical equation sets

N86-093 TITLE: Hydroxyl Ion Mass Transfer and Balance

CATEGORY: Research

DESCRIPTION: Experimentally determine the mass balance deficiencies in silver oxide/zinc battery systems by making detailed calculation of the hydroxyl (OH) mass transfer and balance.

N86-094 TITLE: Computer Keyboard Innovations

CATEGORY: Research

DESCRIPTION: The productivity advantages of keyboard arrangement other than the standard QWERTY are well known but unfortunately remain unpopular because of the large base of traditional typewriter users. The effectiveness of operators using innovative key arrangements for "word processing" activities while engaged in tasks primarily related to computer aided engineering jobs such as design, simulation and technical documentation need to be reviewed to determine if a significant gain in productivity would justify an extensive training/retraining effort. Zero experience, "hunt'n'pecks" and expert typists would be included and assessed as candidate for this training.

N86-095 TITLE: Reliability/Maintainability Prediction and Assessment Techniques for Automated Test Equipment

CATEGORY: Engineering Development

DESCRIPTION: The proliferation of Automated Test Equipment (ATE) in today's testing and production environment is made possible by advancement in the integrated circuit technology. Memory and logic devices with high capabilities and speed can now be produced at a very low cost. This allows the development of smart instruments capable of self-control (i.e. determine 10% and 90% points internally on rise time/fall time measurements), self-correcting (i.e. subtract offset), self-calibration, and self-diagnostics.

The complexity of the instrument lowers its reliability and makes it more difficult to maintain. Reliability predictions using parts count and stress analysis are tools that are used in the prediction. The goal of this project would be to develop a model for reliability prediction and assessing payback for reliability improvement in today's evolving ATE technology.

N86-096 TITLE: Real Time Software Requirement Development

CATEGORY: Engineering Development

DESCRIPTION: Review current real time Automated System Requirements Development Tools and produce a top-level System Requirements Development Tool Specification incorporating the best features. This top-level specification should descrie state-of-the-art software Requirements Development System, which provides:

- User friendliness
- Input and output query capability, so designer and sponsor can check for consistent and properly engineered systems development
- Documentation capability of MILSTWD 1679A, in hard copy
- Description of how the testing of the system requirements would be automated in the Requirements Development Tool

N86-097 TITLE: Diagnostic Test Methodology

CATEGORY: Engineering Development

DESCRIPTION: Investigate and report on the best automated approaches to develop a methodology for thorough diagnostic testing. Consider both equipment and system level diagnostics for large, real time systems.

N86-098 TITLE: Automated Librarian for Computer Software Source Code

CATEGORY: Engineering Development

DESCRIPTION: Develop System Requirements for an Automated Librarian to maintain computer software source code. The Automated Librarian concept must consider, at a minimum, data base security, user friendliness of systems, and automatic backup features.

N86-099 TITLE: Software Performance Model to Token Pass Media Access Strategy

CATEGORY: Advanced Development

DESCRIPTION: Broadband Local Area Network (LAN) technology is being applied to various communications needs. The prototype LAN uses a token pass protocol to support digital communications over a Cable Television (CATV) backbone. Under this project, a performance model may be developed for the token pass protocol. The model will permit specific features of the token pass protocol to be studied in detail. The result will be a tool for verification and tuning of protocol implementation.

N86-100 TITLE: Robust Linear Multi-variable Feedback Design Methods (Application to Robotics)

CATEGORY: Advanced Development

DESCRIPTION: Any realistic analysis technique must take into account the imprecise nature of mathematical models for physical systems, and any design method inspired by it must incorporate adequate robustness guarantee. Several robustness issues should be investigated in the context of Multivariable Systems. The project can be divided into three major components. The first deals with robustness questions in Linear Multivariable Systems when plant uncertainties are structured and appear as parameters in the plant description. Specific topics that could be considered are pole assignment, observers, regulation, asymptotic tracking and transfer function shaping. The aim is to develop the theory as well as accompanying design techniques. Even though this work deals specifically with linear systems, its impact is not limited to such systems as in many occasions a linear model adequately describes the operation of a nonlinear system about some operating point. The second component considers the case when plant uncertainties are unstructured and appear as multiplicative perturbations on the transfer function of the plant. Emphasis can be placed on robust stability and robust sensitivity reduction. Such uncertainties can occur because of

unmodeled dynamics, time delays, diffusion processes, etc., and may also be used to represent perturbation effects that, in fact, are not all uncertain, such as nonlinear elements (provided they are given "conic sector" interpretations). A goal of the entire project would be to incorporate the above mentioned robustness requirements into the development of comprehensive multivariable feedback design methods. The third component considers the application of methods discussed above to a number of robotic manipulator systems with the intent being to evaluate their performance.

N86-101 TITLE: The Use of Robotics in Automatic Factory Assembly

CATEGORY: Advanced Development

DESCRIPTION: The application of robotics in other industries has already shown improvements in quality control, time and cost savings, and reliability. Future applications of robotics to guidance manufacturing processes should have equivalent benefits.

N86-102 TITLE: Evaluation of Functions Represented by Grid Points

CATEGORY: Exploratory Development

DESCRIPTION: A future guidance system might have to derive gravity from a set of values stored on a three dimensional grid of points around the trajectory. The optimum approach requires a tradeoff between the interpolation function, the number of regularity of the grid points, the computer filing system, speed, and memory. Another guidance application would be the derivation of a map in map matching guidance. What is desired is a generalized algorithm and associated techniques which would allow specialization of the algorithm for a particular application to yield an efficient computer program.

N86-103 TITLE: Methodology for Measuring Data Coverage

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 tolerance, data stress testing and iterative conversion 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.

N86-104 TITLE: THLL Based Symbolic Debug Facility on the VAX

CATEGORY: Exploratory Development

DESCRIPTION: The objective is to develop a symbolic debug facility on the VAX that allows the user to specify debug operations in terms of the symbols and line numbers of the source listing of a THLL program. THLL is the TRIDENT Higher Level Language which is used for TRIDENT Fire Control program development and for systems programming on the VAX. Such a symbolic debug facility requires an interface between the THLL compiler and

the VAX Symbolic Debug System. The capabilities of a symbolic debug facility for THLL should be similar to those provided for FORTRAN on the VAX.

N86-105 TITLE: Distributed System Architecture for Real Time Embedded Computer Systems

CATEGORY: Exploratory Development

DESCRIPTION: There has been a definite trend in real time embedded computer systems toward distributed processing. Distributed Systems architectures are being used in embedded real time applications which are both control and computational intensive. The expanding problem domain and the development of powerful militarized microprocessors assure more distributed processing in the future.

There are numerous issues that need to be resolved before such architectures can be used to their best advantage. Among these issues are connectivity, structure and capabilities of the operating systems, applications software layout, communication protocols, synchronization of concurrent processes, fault tolerance, decentralized control, performance, connection of standard as well as unique (application dependent peripherals devices, adding additional processors, and others).

The goal of this research is to identify a system architecture (hardware and software) that facilitates software development and permits the system to be incrementally enhanced (hardware and software) at minimal cost.

N86-106 TITLE: High-Interaction, Transient MHD Modeling

CATEGORY: Research

DESCRIPTION: A need exists for the understanding of high-interaction transient magnetohydrodynamics. For MHD devices to fill the requirements for lightweight, high power-density, electric generators, they must move toward higher interacting parameters and have rapid start/stop capabilities. The high-interaction processes have not been studied due to complexity of the physics. In recent years, extensive modeling has become possible due to the advancements of computers. However, most modeling has been restricted to time-averaged quantities. In this effort transient, high-interaction modeling will be achieved through the inclusion of spatially and temporally non-uniform flow and swirl effects, including free stream and boundary layer turbulence and their time constants.

N86-107 TITLE: Computer Model to Optimize Geometric Decomposition to Shorelinesu

CATEGORY: Exploratory Development

DESCRIPTION: Present vulnerability methodology utilizes a shotline approach to determine penetrator capability. This shotline data is a decomposition of 3D geometric description data. The decomposition involves laying a fixed grid over the geometry and assessing the composition under each grid cell. The accuracy of this method improves as the grid size is decreased, however, this increases total solution time. In fact, there exists some set of irregular shaped/sized grid elements that would comprise the minimum set needed to accurately decompose the geometry. This task would provide methods of determining this minimum set, and produce FORTRAN code to implement the optimal solution.

N86-108 TITLE: Algorithm for Correcting Errors in the Correlation Function Caused by Hetrodyned Signals

CATEGORY: Research

DESCRIPTION: When two detrodyned signals are correlated they produce an undesired “roping” in the correlation function that does not appear when base-banded signals are correlated. The root of the problem is the lack of a

phase rotation correction for the cross-spectrum. An algorithm is needed to remove the roping for both the auto-correlation and cross-correlation functions. The algorithm could be based on any of the following concepts: a modified inverse fast fourier transform, modifications to the cross-power spectrum before applying a standard inverse fast fourier transform, or modifications to the correlation function itself to remove the "roping." Other methods should be documented and analyzed for effectiveness and computational load for implementation on a computer. The best method shall be coded in standard FORTRAN 77 and tested.

N86-109 TITLE: Hindered Aliphatic Amine Synthesis

CATEGORY: Research

DESCRIPTION: There is a need to synthesize a homologous series of hindered aliphatic diamines of the type:

H2NC®2(CH2) x(R) 2CHN2 where x-2 and Rethyl, proply, butyl and t-butyl for use in curing agents for epoxy resins. These compounds are of interest because the sterically hindered amine groups have large reaction rate ratios which lead to cross-linked resins with unique mechanical properties. These compounds must be pure, thoroughly characterized by GC, MS, NMR, IR and elemental analysis. It is necessary that a sufficient quantity of each compound be prepared on order for the Navy to be able to evaluate the mechanical properties of the cured resins.

N86-110 TITLE: Improved Carbon-Epoxy Adhesive

CATEGORY: Exploratory Development

DESCRIPTION: Develop an adhesive system (1 or 2 component) for carbon-epoxy composites with the following properties: pot life 1 hour after mixing; gelation below 90 C at heating rates between 1 and 10 C/min, full strength achieved after 20 minutes at no higher than 150 C; lap shear strengths between 4,000 and 5,000 psi at room temperature; and for a one component system shelf life that should be at least 1 yr at room temperature.

N86-111 TITLE: Toughening of Discontinuously Reinforced Composites via Matrix Alloy Design

CATEGORY: Exploratory Development

DESCRIPTION: Hitherto, all metal matrix composites reinforced with continuous or discontinuous ceramic reinforcements invariably contain popular and readily available alloys. Thus, for system with particulate or whisker SIC series AI alloys are used as matrices. As far as toughness or elongation is concerned, a wide variation exists in these un-reinforced alloys themselves depending upon processing history. Toughness of SiC/Al composites Al alloy matrices is much lower than their un-reinforced counterparts. This is, of course, expected but there is a definite indication that the tougher the matrix, the tougher the composite, given that other factors remain constant.

The objective of this effort is to develop Al alloy matrices with compositions which may differ radically from contemporary alloy compositions. One may differ radically from contemporary alloy compositions. One may consider using only high purity alloying ingredients with extremely low levels of Fe and Si or, conversely, addition of elements which alter the stacking fault energy. Elements which affect or reduce matrix thermal expansion may possibly enhance composite toughness simply by lowering the dislocation density which in turn could benefit fracture toughness. Any of the above approaches, or others may be investigated to improve the toughness of discontinuously reinforced composites via matrix modification.

N86-112 TITLE: Behavior of Metal Matrix Composites at Cryogenic Temperatures

CATEGORY: Exploratory Development

DESCRIPTION: Metal matrix composites are candidates for use as structural materials on satellites and spacecraft. The task is to develop a database reflecting the thermo-mechanical characteristics of these composites at very low temperatures typical or orbital and deep space conditions.

N86-113 TITLE: Corrosion Behavior of Metal Matrix Composites in Hostile Environments

CATEGORY: Research

DESCRIPTION: MMC's are materials with varied interfaces that need protection, and an understanding is required as to how much corrosion does occur and is initiated at the interfaces.

N86-114 TITLE: Preparation and Development of Advanced Battery Catalysts

CATEGORY: Research

DESCRIPTION: Proposals are sought to evaluate potential catalysts and to establish an understanding of the principles of the fundamental electro catalysts processes that occur using selected catalysts in state-of-the-art power sources.

N86-115 TITLE: Improved Design and Construction of a Measurement System for Monitoring the Changes in the Coefficients of Thermal Expansion of Metal-Matrix Composite Thin-Walled Tubing's

CATEGORY: Advanced Development

DESCRIPTION: The linear coefficient of thermal expansion along the symmetry axis of metal-matrix composite tubes can be as low as –x 10 to the 6 per degree C. Along the circumferential direction, this coefficient is an order of magnitude higher. An optical apparatus that allows remote, continuous monitoring of the coefficient of thermal expansion in a vacuum chamber in the temperature range of +190 C is needed for the testing of tubes having lengths ranging from 0.5 feet to 6 feet, diameters ranging from 0.5 to 3 inches, wall thickness ranging from 0.02 to 0.1 inches. The successful proposal must demonstrate the physical principles underlying the design and operation of the apparatus. Considerations for the supporting of the specimens in the vacuum chamber and for the relevant sources of errors in the entire measurements system are necessary.

N86-116 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 assess bond performance under actual loading.

N86-117 TITLE: Laser Cladding Research for High Temperature Coating

CATEGORY: Research

DESCRIPTION: There are a significant number of hardware systems within the Navy that require high temperature coatings. Missile components such as ram inlet ducts and missile exhaust combustors for high mach number, Wide Area Defense Missiles now in development, missile launch rails exposed to hotter and longer burning missiles

requiring higher temperature materials and coatings, and turbine engine components are examples of such hardware systems. Coatings for the systems require a high degree of integrity to survive the combined environments of mechanical wear, high temperature, erosion, and corrosion. Laser cladding offers the potential for providing coatings with extended capabilities and unique properties to meet the above challenges and, therefore, a suitable area for research by laser contractors.

N86-118 TITLE: Fabrication Methodology for Advanced Ceramic Armor Materials

CATEGORY: Exploratory Development

DESCRIPTION: There exists a need to develop manufacturing procedures which will reduce final ceramic materials costs while maintaining or improving the ballistic protection of the ultimate armor system. The desired ceramic plates will have properties similar to boron carbine and/or titanium carbine, but the final ceramic plate cost shall be less than or equal to plates made from alumina. Changes of silicon carbide whiskers as reinforcement materials are desired and shall be considered as options. The product shall be a technical report documenting material properties and manufacturing methodology. Specific recommendation for ceramic systems and associated projected manufacturing costs and availability shall be included in the final report.

N86-119 TITLE: Real-Time, 3D Computer Vision

CATEGORY: Exploratory Development

DESCRIPTION: Investigation of 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).

N86-120 TITLE: Advanced General Purpose Controller

CATEGORY: Exploratory Development

DESCRIPTION: Develop a software/hardware architecture for an advanced, compact; microprocessor based multi-purpose controller for real time sensory understanding and adaptive control of weapons, robots, automation, and other Navy control applications. The concept should employ a highly distributed, hierarchical architecture to enhance performance and flexibility.

Investigations should include software design methodologies, interface designs, protocols, bus architectures, microprocessor selection, computer languages, packaging, and other design parameters.

N86-121 TITLE: High Density Power Sources for Robots

CATEGORY: Exploratory Development

DESCRIPTION: One of the major barriers to continuous autonomous operation of mobile robots is performance of available power sources. Lightweight, long-term stable power sources, which tolerate environmental extremes (e.g. high/low temperature, humidity, shock), are required for he operation of robot control electronics. In addition, bursts of power for mobility, heavy lifting, and other mechanical functions are often required.

High-density power sources that can provide these capabilities over long periods of time with minimal maintenance 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 operation with surge capabilities for high-power demands.

N86-122 TITLE: Mobile Robot Development

CATEGORY: Exploratory Development

DESCRIPTION: Navy mobile robot and remote control systems have requirements to navigate an area and to collect and integrate sensor data.

Studies leading to concept development are needed to consider the following for various types of operational environments (outdoors, indoors, shipboard):

a. mobility
b. autonomous navigation
c. scene mapping and memory
d. sensors and sensor integration for navigation, data collection, decision-making, and communication

N86-123 TITLE: Phase Diagram Determination of High Temperature Ceramic Systems

CATEGORY: Research

DESCRIPTION: Advanced air-breathing propulsion systems, such as ramjet and turbine engines, can demonstrate significant performance improvement over current system through operation at higher temperatures. Higher operating temperatures, and thus performance, are primarily limited by materials capabilities. Carbon/carbon composites show good potential for propulsion system applications due to high-temperature strength, but must be protected from oxidation. The use of ceramic compounds, applied as coatings or forming the matrix of carbon/ceramic composites, offer considerable potential in develop oxidation resistant material systems.

A need exists for the determination of phase relationships of ceramic compounds having potential for providing oxidation resistance for carbon/carbon or carbon/ceramic composites at approximately 5000 F. The binary systems hafnium carbide/tantalum carbide, hafnium diboride/tantalum carbide should be examined. A particularly important output of this work is to determine the minimum temperature at which liquid phases are present.

N86-124 TITLE: Production of High Strength Hafnium Carbide Fiber

CATEGORY: Exploratory Development

DESCRIPTION: Advanced air-breathing propulsion systems, such as ramjet and turbine engines, can demonstrate significant performance improvement over current systems through operation at higher temperatures. Higher operating temperatures, and thus performance, are primarily limited by materials capabilities. Carbon/carbon composites show good potential for propulsion system applications due to high temperature strength, but must be protected from oxidation.

Novel concepts exist for oxidation protection of carbon/carbon composite materials involving the use of alternative oxidation resistant ceramic fibers. Oxidation resistant materials at use temperatures of 50000 F suggest the use of hafnium carbide fiber, which is currently not being produced. The production of hafnium carbide fiber is desired with specific goal of improving strength properties above the state-of-the-art low strength ceramic fibers produced for insulation purposes.

N86-125 TITLE: Erosion Resistant Radome Materials

CATEGORY: Exploratory Development

DESCRIPTION: A need exists to develop composites of NbAl0 and HfSiO mixed with SiO and BN for radome applications. Both SiO and JfSiO have high densities relative to their respective dielectric constants. The high

relative densities should yield good erosion resistance. If these two primary compounds are individually mixed with the proper amounts of silica and boron nitride, the results could be radome composites that exhibit good erosion resistance along with good structural and dielectric properties. High purity, fine grain precursor materials will be required. Mixtures will be cold formed and sintered at atmospheric pressure. Material will be provided for mechanical, impact and dielectric testing. An initial total of six composite variations will be required.

N86-126 TITLE: Improved Underwater Warheads

CATEGORY: Exploratory Development

DESCRIPTION: Due to the major efforts to harden enemy submarines an urgent Navy need is to develop more lethal warheads for underwater mechanisms. This topic involves development of innovative warhead concepts that take advantage of all available damage mechanisms, i.e., bulk shock, directed energy, secondary effects, etc. These concepts should include metallurgy and explosive material improvements as well as advanced design techniques. The effort will include the analysis necessary to develop the warhead designs and provide performance estimates and sub-scale test designs of the most promising concepts for lab and field-testing by NSWC.

N86-127 TITLE: X-Ray Fluorographic Screen or Converter

CATEGORY: Exploratory Development

DESCRIPTION: Develop a fluorographic screen or converter optimized for Real Time Dynamic Radiography. This technique is utilized to observe internal component behavior of a solid propellant rocket during static firing. There are three energy ranges of interest listed in order of priority: 50 KeV, 9 MeV - 15 MeV, and 20 MeV – 30 MeV. Respond to any or all categories in which you feel you have an expertise. Improvements desired over currently available products are: efficiency, brightness, resolution, contrast, and spatial frequency.

N86-128 TITLE: Solid Propellant Characterization

CATEGORY: Exploratory Development

DESCRIPTION: Develop tools and/or techniques to nondestructively detect and characterize (to a depth of .125 - .250 inch) crystalline solids in an electrometric binder. Solids of particular interest are aluminum, ammonium per chlorate and HMI/RDX in sizes of 1-100 microns and a composite solids loading of 60-90 volume percent. Characterization includes detection of agglomeration, particle size distribution and particle size changes.

N86-129 TITLE: Photodepositon of Metal for Multilayer Printed Circuit Boards

CATEGORY: Exploratory Development

DESCRIPTION: Devise a method of photodeposition of metals useful in printed circuits and hybrid circuits to meet the following requirements: Metal runs no wider than .002 inch, spaces between run no wider than .002 inch, demonstrate ability to fabricate multiple layers of metal runs on or in dielectric materials suitable for electronics applications, and must function in a military environment without degradation.

N86-130 TITLE: Fiber Optic Light Source

CATEGORY: Advanced Development

DESCRIPTION: This work is needed to develop a light source for a fiber optic system to be used to verify the "safe" or "armed" condition of a rocket motor arm-fire device of a safety arming device under dark or very low light conditions.

The light source will be used to illuminate either a white letter "S" on a green background or a white letter "A" on a red background so that the "safe" or "armed" condition of the rotor located deep inside the safety-arming device or arm-fire device can be verified visually by simply viewing the end of the fiber optic bundle. The light source must not require any external energy source and must be contained within a volumetric envelope of a cylinder with a diameter of .025 inches and a height of 0.2 inches. The light source must supply light for a minimum of 15 years, the lifetime of the safety-arming device or arm fire device. The "safe" or "armed" position must be capable of being observed without giving away the position of our forces to the enemy.

N86-131 TITLE: Compact Cryogenic Cooler

CATEGORY: Advanced Development

DESCRIPTION: Design and fabricate prototype cryogenic cooler with the following characteristics; cool to 20K a silicon integrated circuit producing no more than .075W heat; maintain temperature uniformity of 0.01 K across a thin silicon device 15 mm on a side; cryogenic unit volume less than 16 cm with nominal dimensions of 2.54 x 5 x 0.5 cm. Design must include Dewer with optical window to view the silicon integrated circuit. The cooler must function reliably after being cycled 400 times. Cooler and power source must provide 5 minutes cooling at 20K following a cool down period of no longer than 20 seconds.

Small cryogenic coolers are used aboard some tactical missiles. There is a continuing need for more efficient cryogenic coolers capable of reaching temperatures lower than 77K. Missile applications require rapid cool down times and provisions for maintaining good temperature uniformity across the item being cooled, Therefore, size, efficiency, low temperatures, and speed are important parameters for new cooler designs.

N86-132 TITLE: On Tool Z – Direction Reinforcement Techniques for Composite Laminates

CATEGORY: Exploratory Development

DESCRIPTION: Composite materials are highly susceptible to damage due to interplay delamination. Reinforcement in the through ply direction (Z direction) substantially reduces this damage. Z direction reinforcement is not used widely in industry because no technique exists to reinforce laminates after they are laid up on the mold tooling.

This effort should develop tools and techniques to reinforce woven or unidirectional composite materials in the Z direction while the laminate is on a female tool. This could include developing stitching techniques where access to the laminate is available from one side only. The tool the laminate will be on must be a standard metal or composite tool. The z direction reinforcement techniques shall not harm the tooling. The techniques developed will be suitable for production manufacturing environment.

N86-133 TITLE: Improved Switching Concept for S-A Devices

CATEGORY: Advanced Development

DESCRIPTION: In "out of line" explosive train type Safe-Arm devices, key elements of the explosive train circuitry are electrically switched in/out to provide interruption to current flow for safety and provide continuity for armed functions. Normal missile environments (vibration, temperature, shock, etc.) produce unacceptable conditions on the contacts of the rotor switch fingers and printed circuit pattern in present S-A devices. These range from small out of spec resistances to open circuits.

The objective of this work is to develop an alternate means of communicating between circuitry used for safety and that used for initiation of the explosive train without violating the basic safety requirements of MIL STD 1316. The use of LTD's, fiber optics or other innovative devices is encouraged. Types of signals used vary form DC to 10 KHz. Voltage available in nominally VDC. Current requirements vary from several milliamps to one amp depending on circuit function. Impedance of switching concepts should be less than 0.02 ohms. Normal missile environments, space, safety, signal power requirements, and compatibility with existing fuze design and fabrication methods shall be taken into consideration. Power interruption and circuit protection are requirements since these switching systems provide signal and power to fuze circuitry in the explosive train of warhead S-A devices.

N86-134 TITLE: Fuze Contract Sensing Transducer

CATEGORY: Advanced Development

DESCRIPTION: This device is needed to detect acoustic emissions or other phenomena that result when plastic deformation occurs in a missile skin. It must be less than 0.1 in volume and operate accurately from –65 F to +165 F. It would be highly desirable for the device to function properly when the outer missile skin reaches temperatures up to 600 F. It must provide a TTL high-level output when any degree of plastic deformation occurs and not provide an output due to any level of vibration that does not cause plastic deformation. For example, vibrations due to operation of the missile's rocket motor, control system or aerodynamic buffeting, hail or rain should not be detected by the transducer. It should operate on 24 VDC to 32 VDC unregulated at least than 50 mz.

N86-135 TITLE: PROM Programming Methodology

CATEGORY: Advanced Development

DESCRIPTION: The method of shorted junction fuse of programming a PROM affects the reliability of the blown fused link or shorted junction fuse. New technology PROMs such as Titanium-Tungesten 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 shored junction and what their values should be in order to guarantee a reliable program bit. This should include determination of the value of burn-in after programming in improved part reliability.

N86-136 TITLE: MOSFET Testing

CATEGORY: Management and Support

DESCRIPTION: A review of the burn-in and life testing requirements of MIL-S-19500 is needed to determine if changes could be made to enhance reliability assurance and/or reduce cost. This would require:

1. a comprehensive study of the present requirements,
2. collection of technical data,
3. analysis of statistical sampling requirements, and
4. a specific recommendation

N86-137 TITLE: Investigate Alternatives to Ceramic Substrates for Interconnection of Leadless Chip Carriers and Other S.M.D.s

CATEGORY: Exploratory Development

DESCRIPTION: The advent of surface mount device has caused a change in interconnect board technology. The most common method of mounting surface mount devices is ceramic substrates. Ceramics continues to suffer from manufacturability and stress sensitivity problems, despite excellent packaging density and thermal characteristics.

In addition, ceramic is not compatible with pinned devices such as pin-grid arrays and pinned chip carriers. Although new board technologies are arising, improvements in packaging density and thermal properties need to be investigated.

N86-138 TITLE: Investigate New Field Repair and Removal Methods for S.M.D.s

CATEGORY: Exploratory Development

DESCRIPTION: Surface mount devices and high pin count devices have not been in use long enough for adequate repair techniques to develop. The complexity of this technology makes old repair methods inadequate, but also makes the cost of individual boards too high not to repair. New techniques of detaching and remounting devices as well as earlier repaired construction techniques, such as sockets need to be investigated.

N86-139 TITLE: Custom/Semi-custom Integrated Circuits

CATEGORY: Engineering Development

DESCRIPTION: The use of custom/semi custom integrated circuits (IC's) in military systems is increasing. This increase is creating the need for studies in design using CAD/CAM software, applications studies, packaging, timing and functional verification, continuing availability, and testability. The use of custom/semi custom IC's in special applications can result in higher reliability, lower power consumption, and lower system costs.

N86-140 TITLE: Simulation Software

CATEGORY: Engineering Development

DESCRIPTION: Design verification and test program development for new components requires the use of simulation software. Software packages are capable of simulation for timing verification as well as function verification. Models for complex parts are obtained from gate level logic diagrams and/or functional descriptions. The expected work includes modeling and simulation of some of the most complex components available.

N86-141 TITLE: Electrostatic Discharge (ESD) Component Field vs. Contract Susceptibility

CATEGORY: Engineering Development

DESCRIPTION: ESD component susceptibility is based on voltage contact using the Human Body Model (HBM) test circuit for establishing limits. The current ESD Classification imply an equivalency between voltage contact and field voltage susceptibility.

N86-142 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.

N86-143 TITLE: Polymide Quartz Multi-layer Board

CATEGORY: Advanced Development

DESCRIPTION: Ceramic integrated circuit packages have a thermal mismatch when mounted on the standard epoxy fiberglass multilayer board. If a polymide quartz multi layer board could be developed, it would provide a much closer thermal expansion match with the ceramic package. This would result in improved reliability and longer life for the electronic package.

N86-144 TITLE: The Physics of Metal Matrix Composites

CATEGORY: Exploratory Development

DESCRIPTION: The use of metal matrix composites in advanced missiles and guidance systems in particular is at the introductory level at this point in time. If a concentrated development program were undertaken to improve our understanding of the physical properties of these materials, their application in areas where strength, stability, and low weight are of critical importance could be made more quickly and without unexpected risk.

N86-145 TITLE: Passive Variable Thermal Resistance Techniques

CATEGORY: Advanced 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 f 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.

N86-146 TITLE: LSI Circuit Evaluation with Electron Beams

CATEGORY: Research

DESCRIPTION: Conduct an assessment of the differences and the significance of the differences between photon and electron beam excitation of LSI circuits. The following electrical parameter (magnitude and time varying response) must be considered in the study. In addition, the thermo mechanical response shall also be considered.

N86-147 TITLE: Dielectric Conductivity Effects Under the Influence of Ionizing Dose Rates

CATEGORY: Research

DESCRIPTION: Determine the effects on dielectric conductivity of common electronics materials over a large does rate regime. Consider the effects of varying spectral content in the impinging X-ray influence.

N86-148 TITLE: Near Net Shape Titanium Tanks

CATEGORY: Advanced Development

DESCRIPTION: Titanium propellant tank segments are currently machined from forgings and welded together. Investigation of processes that could produce hemispheres close to finish dimensions are required. Possibilities

include super plastic forming, hot isocratic pressing, and shear spinning. The goal is to produce tanks at substantially lower cost.

N86-149 TITLE: Direct Attachment of IC's to PCB's

CATEGORY: Advanced Development

DESCRIPTION: Integrated circuit (IC) chips are currently mounted in ceramic or plastic packages, which are in turn mounted on printed circuit boards (PCB's). Lower cost and improved performance could be realized, particularly for very large-scale integrated circuits (VLSI's) if the chips would be mounted directly on the PCB. Techniques need to be developed for chip attachment, interconnection from the chip to the PCB, heat management, and environmental protection.

N86-150 TITLE: Expert Systems for Manufacturing Planning

CATEGORY: Research

DESCRIPTION: The manufacturing planning function is basically a manual operation that relies on the experience and skill of the individual planner. The best planners are those who have many years of experience and are thoroughly knowledgeable of the materials and manufacturing processes involved. The purpose of this research is to investigate the capture of the knowledge base of experienced planners, and the incorporation of this knowledge into an "Intelligent Planning Assistant," or expert system for the planning process.

N86-151 TITLE: Expert System for Insuring Design for Testability Features in VLSI Designs

CATEGORY: Research/Advanced Development

DESCRIPTION: VLSI designers are being faced with increasingly complex function requirements. The density of the designs is in the range of 1,000 to 100,000 gates per chip.

This degree of complexity increases the risk of designs that vary form being difficult to test, to untestable.

Efforts should be directed toward approaches that minimally interfere with the designers' options, while requiring the testability questions to be addressed concurrently with the functional design. A "VLSI Design Assistant" would be used by the designer to make the design both functional and testably acceptable.

The "assistant" would provide the tools necessary to accomplish such designs. It is suggested that a particular technology – such as configurable gate arrays – be chosen at a test vehicle.

N86-152 TITLE: Thermal Insulating Coating

CATEGORY: Basic Research

DESCRIPTION: Formulation of state-of-the-art coatings to insulate weapons from aviation fuel fires in accordance with these parameters:

1. maximum film thickness of 60 mils
2. maximum backside temperature of 500 degrees F after 5 minutes
3. minimum heat flux of 10 BTU/ft cubed – sec.

N86-153 TITLE: Chemical Vapor Deposition Coatings for High Temperature Materials

CATEGORY: Basic Research

DESCRIPTION: Carbon/carbon and other temperature composite materials, for use in gas turbine engines, require environmental protection from oxidation and other forms of gas corrosion attack.

Chemical vapor deposition coating technology provides a capability to uniformly cost complex ship parts. Therefore the development of specific chemical vapor deposition technology for the protection of high temperature composite systems should be addressed. Of particular interest is the use of such coating for raising operating temperature, increasing operating time at temperature and increasing the number of thermal cycles which can be achieved in engines.

N86-154 TITLE: A Miniature Expendable Zoom Lens for Remotely Piloted Vehicle (RPV)

CATEGORY: Exploratory Development

DESCRIPTION: The Navy has a need for a small lightweight low cost zoom lens that can be controlled remotely. This lens will be used with commercially available CCD TV cameras with an 8.8 mm x 8.8 mm format. Typical requirements call for a focal length that varies from 12 mm to 30 mm, an aperture of f/4, a total length less than 60 mm. Concepts, materials and process that will provide performance compatible with CCD array resolution and lightest possible weight and lowest unit are sought.

N86-155 TITLE: Advanced Acoustic Array Development

CATEGORY: Exploratory Development

DESCRIPTION: A need exists for the identification of acoustic noise sources originating from many locations on moving undersea submersibles. With the radiating sources identified, noise-quieting techniques may then be applied to lower the source levels.

The problem is to develop a narrow beam width sonar system/line array capable of spatially resolving noise sources to a minimum of three to give feet a standoff distance of 100 feet. Design constraints would be to minimize main lobe bandwidths, minimize transducer self-noise, have comparable acoustic sensitivity and response to peizo-ceramic hydrophones, and the capability to operate at significant depths of fresh or ocean water. Also required would be the establishment of suitable signal processing techniques which would alloy broadside beam-forming of array elements as well as the individual element output over a broad frequency range.

N86-156 TITLE: Direct Measurement of Free Surface Mechanical Shear Waves in a Noisy Environment

CATEGORY: Exploratory Development

DESCRIPTION: It is required to employ a sensor to measure the tangential components of motion of the free surfaces of vibrating structures at frequencies of 10-30 kHz. The measurements are made inside moving vehicles which subject the sensor to a vibration environment that can mask the desired data the extraneous noise. A demonstration of feasibility would consist of a sensor capable of measuring the desired data while mounted on a platform that was excited by mechanical vibrations in the frequency bands of interest.

N86-157 TITLE: Using a Quad axial Cable to Feed VHF/UHF Mast Mounted Antennas

CATEGORY: Exploratory Development

DESCRIPTION: Shipboard (and especially submarine) antenna design is often driven by the extremely limited space available for location of the antenna radiator. As a result, antennas design for different frequency bands (not operating as an array) are often stacked end to end in collinear arrangements on a single shipment. In addition the usual problem of isolation between antennas, is the quandary of bringing the coaxial transmission line feed for the upper antenna past the lower antenna without the cable becoming a serious parasite to the lower antenna(s). As an alternative to the parasitic feed cable arrangement, certain antenna designs do allow passage of a feed cable through the vertical antenna/mast axis. However, the bandwidth of such antenna designs is reduce because of the necessity of using frequency dependent (tuned) distributed rf networks to isolate antennas attached to a common mast.

The objective of this task is to design a three port, coaxial transmission line device that would accept two coaxial transmission line inputs and combine the cables into a single, quad axial output for feeding attacked antennas. The outer two conductors split off first to feed the lower antenna, while the inner coax continues up the mast to feed an additional antenna.

N86-158 TITLE: Anisotropic Compliant Layers for Turbulent Boundary Layer Control and Flow Noise Reduction

CATEGORY: Exploratory Development

DESCRIPTION: In 1960 experimental results of up to 25 dB reduction in turbulent boundary layer (TBL) wall pressure fluctuations were reported for flow over a compliant layer. The layer, which was similar to coatings evaluated for drag reduction by Kramer, was of anisotropic composite construction. Limited efforts in the past have been unsuccessful in explaining the 1960 experimental results. Recently research has sought to determine compliant surface potential for delay of transition and drag reduction. A combined analytical and experimental approach to determine the TBL noise reduction potential of anisotropic compliant surfaces is needed. The modeling should be capable of handling layers similar to those investigated by Kramer. The experimental approach is to be complementary to the modeling. Experiments must address factors such as accurate determination of material properties of anisotropic layers in addition to measurement of pertinent flow parameters and surface deformation characteristics. The desired end result will allow calculation and experimental validation of the wave vector – frequency spectrum of the pressure fluctuations on and within an anisotropic compliant layer subjected to turbulent flow.

N86-159 TITLE: Pressure Wave Generation

CATEGORY: Research

DESCRIPTION: It is well known that pressure waves generated by a passing ship can be sensed by appropriate transducers and used to satisfy requirements of mine logic. The goal of minesweeping is to artificially generate ship like influence fields to cause premature detonation of the mine. Methods are sought for generating large ship like pressure signatures using towed devices which would be deployed by naval mine countermeasures vessels.

N86-160 TITLE: Quantitative Assessment of Water Contamination of Hydraulic Fluids

CATEGORY: Exploratory Development

DESCRIPTION: A simple method of quantitatively determining the amount of water in hydraulic oils is required. The method must be applicable to hydraulic oils and should be capable of deterring the quantity of water down to 100 PPM. The method shall be operable by field personnel at the organizational level with a minimum amount of training and shall be capable of performing the analysis at the aircraft or support equipment without major facility requirements. The test should be performed within 10 to 15 minutes.

N86-161 TITLE: Power Plant and Storage System for an Electromagnetic Aircraft Launcher

CATEGORY: Exploratory Development

DESCRIPTION: There is a need for an Electric Power Generating and Storage System to be developed for use on naval aircraft carriers.

Must be compatible with a shipboard environment.

Provide analysis and formulate recommendations for possible generating and storage systems and naval use.

N86-162 TITLE: Enhanced CV/CVN Fixed Wing Aircraft Centerline Approach System

CATEGORY: Exploratory Development

DESCRIPTION: A recent Fleet survey found under PE62241N: disclosed the need for significant improvements in the CV/CVN centerline optical landing quite. A review of accident records shows a fourfold incidence rate at night relative to day operations.

Phase I: Devices/analyze a concept CV/CVN centerline optical system(s) displaying aircraft line0up position and the rate of deviation from/towards the centerline position for fixed wing aircraft in the carrier approach/landing pattern. The system shall incorporate a positive "on course" indication to the pilot for both day and night time operations. Examine the engineering and human factor elements for positioning data display at the existing Fresnal Lens Optical Landing System or at a separate location. Assess system feasibility; effectiveness at night; in fox, rain, and other adverse weather; performance with respect to range; system reliability; maintainability; supportability; and affordability. Provide a development plan for (possible) Fleet introduction.

Phase II: Design/fabricate breadboard hardware to ascertain concept feasibility and acceptance.

N86-163 TITLE: Low Cost Power Divider for Electronic Warfare Application

CATEGORY: Advanced Development or Engineering Development

DESCRIPTION: Threat environment generators are used widely in the Electronic Warfare business to simulate threats for systems testing of ECM/ESM systems. The following project is high risk, but potentially high payoff due to its high utility and lowering of test costs.

Design a power divider for application in broad bandwidth threat environment generators used in EW simulation laboratory for design, test, evaluation and integration of EW systems and software. The tasks involves design of a low cost two way power divider that operates over the 0.5 to 4.0 GHz range with greater than 20 dB isolation between ports.

N86-164 TITLE: High Power RF Switch

CATEGORY: Exploratory Development of Advanced Development

DESCRIPTION: Presently, many high-power radio frequency switch devices are constructed in waveguide or strip line configurations using packaged PIN diodes. The switches often have limited bandwidth, power capability, allow switching time, driver interface problems and large weight or volume. An application exists which requires a high-power, single pole double throw (hot) radio frequency switch, which can be switched at rates of at least 125 KHz. The device should be small, easily integrated with other functions, lightweight, have an integrated switch driver, wide frequency bandwidth and be reasonably reproducible. The device should also meet environmental specifications.

This project is relatively high-risk, since no known manufacturer has designed such a device. It has high potential use in a variety of RF countermeasure systems, and would be a significant state of the art improvement for EW countermeasures systems.

N86-165 TITLE: Research in the Application of Training Technology for Attrition Reduction in Hazardous Field Training Environments

CATEGORY: Engineering Development

DESCRIPTION: The shortage of qualified Explosive Ordnance Disposal personnel is a continuing problem affecting the combat effectiveness and operational readiness of Navy units. In FY 84, the Naval School, Explosive Ordnance Disposal Basic Course suffered an overall 37 percent attrition, 44 percent setback rate, and a 52 percent Surface Basic setback rate, at a dollar cost of over $2.5 M. These training attrition problems are compounded by the requirement for second class certification, a requirement which significantly decreases the quota fill rate for those entering the Explosive Ordnance Disposal School. Recently, the Army has successfully tested a hand-held training device in the field. The results demonstrated a dramatic decrease in training attrition coupled with increased performance. Research in the application of the hand-held technology and other computer aided instruction (CAI) techniques to the Navy explosive ordnance disposal training problems may decrease the rate of attrition and incidence of accidental injury both at the explosive ordnance disposal school and at the prerequisite diver training program.

N86-166 TITLE: Expert Systems for Training Analysis and Design

CATEGORY: Research

DESCRIPTION: The training analysis and design process is a length process requiring the development of a large data base of information which is used to produce follow-on documentation. The purpose of this research is to investigate the applicability of expert systems technology to the training analysis and design process.

Efforts should be directed toward approaches for developing intelligent software programs which will provide automation of time-consuming processes and products.

N86-167. TITLE: Digital Representation of Solid Objects

CATEGORY: Exploratory Development

DESCRIPTION: Develop a method for acquiring x, y, z, position data for each pixel of a resolution photographic display of a three-dimensional object. The objective of this task is to device and construct a system which measures both position and intensity for a region of a solid object corresponding to the area subtended by a single pixel on an orthographic projection of the object. The system may employ either pressure sensing, electro-optical, or acoustic techniques.

N86-168 TITLE: Target Acquisition Trainer for Strike Aircrew

CATEGORY: Advanced Development

DESCRIPTION: One of the greatest difficulties in air to ground bombing is the location and identification of targets from altitude. Most bombing errors occur from a misidentification or localization of the target. Previous psychological studies have indicated that pilots who have more practice both in actual combat and in a training environment are much better at acquiring ground targets than those pilots with limited experience. Thus, it appears

that air to ground visual acquisition can at least partly be learned. There is an ongoing requirement to provide enhancements to actual flight training for pilots through the use of simulators and part task trainers.

The initial need in this area is to determine the state of the art video recording, display, and mini or micro computer capabilities that can be utilized to train target detection and classification from various altitudes under various environmental conditions. The system is required to display scenes videotaped or filmed from aircraft that can be integrated into a stand alone computer system. The computer system would provide diagnostic feedback regarding the identification and the classification of various targets. The system should also be flexible enough to be utilized as a trainer for the instruction of point to point aerial navigation.

N86-169 TITLE: Estimating Training System Resource Expenditure for Broad Categories of Training

CATEGORY: Advanced Development

DESCRIPTION: Training system cost estimating methods follow traditional guidelines and, if applied properly, provide high confidence results. However, there are alternate methods which can be applied, some of which have been used effectively within the Department of Defense. The methodology suggested for development is based upon fully describing categories of training and then estimating resource expenditure per unit of training time for each category. Models could be developed which estimate non dollar resources required for facilities, technical training equipment and devices, curriculum development, training staff, materials, supplies and training plant overhead. The models developed for this approach should be adaptable for microcomputer application and should be usable for evaluated alternative training approaches.

N86-170 TITLE: Embedded Training for Airborne Anti-Submarine Warfare

CATEGORY: Advanced Development

DESCRIPTION: The increasing sophistication of equipment requires not only training and practice in the classroom but on the job training while deployed for many months at sea or at forward bases. At present, the training of Naval aircrew utilizes relatively few training sites capable of providing simulation training of the equipment available for various airborne ASW sensor stations. To maintain a high level of proficiency during the periods between major training events at centralized facilities, a system capable of providing simulation training at deployed sites is needed.

The initial need in this area is to determine the state of the art approach to onboard training for the sensors station of the aircraft. The system must be embedded within the tactical computer system, set up various ASW scenarios that can be simulated with their actual onboard equipment, and provide diagnostic feedback as to the aircrew's operation of the equipment against the simulated threat(s).

N86-171 TITLE: Computer-Based Manpower Management Education Software

CATEGORY: Exploratory Development

DESCRIPTION: Job tours of Navy manpower managers usually last only two years. This approximates the amount of time needed on the job to become accomplished in using the "tools of the trade" manpower management models. A "manpower systems simulator" is needed to replace many aspects of on the job training, which is both slow and inefficient as a means of transferring information. The objective of this work is to design computer graphic simulators of manpower management systems. The purpose is to facilitate managerial acquisition of knowledge on the fundamental behavior of personnel systems and the models used in managing those systems. The simulations will take the form of "management games" which employ management decision scenarios to drive mathematical models of manpower systems. Interactive feedback mechanisms are then used to simulate the management problem environment of manpower planners. A collateral but important aspect of this effort is the evaluation of artificial intelligence software and Symbolic hardware/software in the development of management games.

N86-172 TITLE: Approximation to the Combination of Complete RF Signal Sources

CATEGORY: Exploratory Development

DESCRIPTION: The requirement to combine a number of signal sources in a radar simulation of detection and acquisition of cruise missile targets has severe impact on computer resources. The addition of various signal returns to the radar requires the use of complex arithmetic's algorithms in order to take into consideration the signal's gain and phase.

An approximation to this arithmetic's process which would speed the simulation run time would be very desirable. This approximation must take into account the gain and phase of each signal in the combination process to some demonstrated degree of accuracy under stated conditions and assumptions.

N86-173 TITLE: RF Seeker Automatic Ship Target Classification for Cruise Missiles

CATEGORY: Exploratory Development

DESCRIPTION: Ship target classification and selection are important operational capabilities for cruise missiles, since potential ship targets significantly outnumber our missiles. Ideally, ship targets need to be classified and then the "high valued" ship target selected for attack by the missile system.

The automatic ship target classification system development should include the fundamental system concept, RF seeker considerations, feature extraction and selection processing techniques, and classification algorithms. Ship target selection should be described and included in the classification subsystem. Also, the expected tactical performance payoffs for cruise missile applications should be considered.

N86-174 TITLE: Programmable Real Time Holographic Image Modulators for Cruise Missile Application

CATEGORY: Exploratory Development

DESCRIPTION: Investigate the potential for implementing image processors using programmable holographic techniques to process, in real time, images generated by terminal guidance imaging seekers. Develop a system architecture assuming a radar scanned array input and a state of the art framing rate. Address the feasibility of implementing a "missile sized" processor and the potential for demonstrating a prototype design for Phase II.

Consider in the above effort the response time implications at missile speeds and the resolution/response time trade-offs to achieve accurate targeting.

N86-175 TITLE: Synthetic Line Hardware

CATEGORY: Exploratory Development

DESCRIPTION: Synthetic lines are widely used in marine applications because they are lightweight, corrosion resistant, easy to handle and have a relatively high strength-weight ratio. They are found on Navy vessels as mooring lines, lifting lines, guys, stays, and tow lines to name a few uses. Deficiencies in the current applications are in part caused by deficiencies in associated hardware. These deficiencies also limit the potential of synthetic line for a wider range of Navy applications. The current techniques and hardware used with synthetic lines were adapted from wire rope technology. As a result, the associated hardware is heavy and is usually the weak link in the line system because the differences in mechanical properties between steel wires and synthetic fibers have not been adequately addressed. Handling this hardware, which can weigh over 300 pounds is both difficult and hazardous. In addition, corrosion of metallic and fittings is a major problem.

N86-176 TITLE: Metallurgical Modeling of Micro shrinkage

CATEGORY: Exploratory Development

DESCRIPTION: AS turbine engine contractors turn to castings as a solution to the high cost of engine parts, there is concern for micro shrinkage in these parts. Micro shrinkage continues to be the number one problem with castings in the field. There is a strong need to understand how it occurs and what its three-dimensional characteristics are. Hipping is being used to seal micro shrinkage. However, commercial hippers report that they occasionally have unexplained failures to close internal micro shrinkage. The situation is not tolerable as greater reliance is placed on castings and the assumption that the ideal properties exist in manufactured parts of a critical nature. Such structures include impellers, blisks, frames, fan blades, and cases. A method is therefore needed to model the physical morphology of micro shrinkage and how it forms during the solidification process. This knowledge can then be used to develop processes that will eliminate the presence of micro shrinkage in critical Navy aircraft propulsion components. This will increase safety and aircraft readiness.

N86-177 TITLE: Gas Turbine Augmenter Acoustic Characterization

CATEGORY: Exploratory Development

DESCRIPTION: Naval gas turbine augmenters currently experience operability and durability problems associated with acoustic resonance. Very little is known other than empirical correlations – these correlations have been inadequate in addressing current problems, and future configurations will be a more severe environment regarding resonance. The proposed program would analytically and/or experimentally characterize acoustic resonance in a reactive environment in an attempt to develop and design acoustically insensitive augmenter components.

N86-178 TITLE: Tools for Acoustic Transducer Development

CATEGORY: Exploratory Development

DESCRIPTION: The further improvement of the reliability and performance of underwater acoustic transducers requires the development and use of some deign tools that are not available. Some of the problems can be overcome by the development of computer-aided engineering models and measurement techniques related to various non piezoelectric materials in longitudinal vibrator transducers. The use of suitable models with correctly measured parameters would rectify the problems that influence the reliability, life cycle cost, and general development of improved Navy transducers. This task involves the improvement of existing techniques for the development and improvement of design considerations for non piezo electric, non metallic, compliant materials used within the structure forming the basic vibrator or the DUMILOAD thereof. Since these techniques will be used by the Government to evaluate proposals, this requirement for models and techniques needs to be furnished by an independent organization, not associated with the development of such sources by private industry.

N86-179 TITLE: Applications Software Synthesizers

CATEGORY: Research/Exploratory Development

DESCRIPTION: The need with regard to software is the ability to produce software for large complex systems that is robust, reliable, and easy to change.

In the past, a special system called an “Applications Software Generator” has been used to assist the applications programmer to integrate existing application software program parts with new program parts. This approach facilitates change of software, and reduces the probability of programming errors through the reuse of existing program parts. This approach has been successful in a limited way at the programming language level; however, it fails to address the aspects of the software development process which give rise to the software errors that are most difficult and costly to fix, the successive refinement which translates the applications knowledge into programming

knowledge. This effort will extend these ideas into the applications domain through the development of applications software synthesis technology.

This technology will permit and support the semiautomatic derivation and reservation of the implementations for applications computer progress from the formal specification of the software at the level, in the terms and from the perspective of, the applications domain, and provide for the rapid generation of automated synthesizers for particular applications.

The work will explore unique combinations of AI, knowledge-based approaches and modern software engineering technology.

N86-180 TITLE: Systematic Software Design and Generation

CATEGORY: Research/Exploratory Development

DESCRIPTION: This technical program involves the development of design constructs and components to rapidly build software systems. The objective is to develop an approach for low cost rapid generation of software design and components for families of systems coupled with automatic transformation techniques for building systems. This requires development of a technique for defining and specifying reusable components for the software engineering environment; development of a method for defining and specifying an environment using pre defined components; expansion of so that the environment specification becomes the environment family specification (which contains every member of a certain class of environments) and the method includes a technique for generating the design of any particular family member; development of approaches for building environments from a variety of pre-existing components; development of specialized strategies for doing quality assurance on environments within a given family; and build a small support system.

N86-181 TITLE: Masked Technology for Ion Beam Lithography

CATEGORY: Advanced Development

DESCRIPTION: The pacing technical problem in masked ion beam lithography is the fabrication of the all silicon crystalline thin membrane diameter silicon wafer.

A systematic approach to the development, evaluation and optimization of a techniques (equipment and process) for the deposition of a defect-free, heavily boron doped epitaxially grown layer on a 110 single crystal silicon n-type substrate.

This effort is in support of the Navy “Masked Ion Beam Lithography” system development of a high throughput, production compatible micro pattern replication technique of GLSI, VHSI circuit with 500 nanometer (and smaller) design rules.

N86-182 TITLE: Smoke Control Aboard Ship

CATEGORY: Exploratory Development

DESCRIPTION: In order to evaluate and improve systems and procedures for smoke control aboard ship, safe and effective techniques and equipment for conducting smoke movements tests are needed. This involves defining realistic performing, safe smoke stimulants and equipment measure visibility and concentration. The smoke stimulants and measurement procedure must be covalent, portable and have minimum impact on personnel and ship equipment. Assembly and packaging of existing technologies into a new system and procedures is acceptable.

N86-183 TITLE: Wake Measurements in Propeller Rotating Coordinate System

CATEGORY: Exploratory Development

DESCRIPTION: Under some circumstances the unsteady flow experienced by a rotating propeller blade is not easily described by measurements made in the fixed coordinate system. Methods are required to experimentally measure the flow field through a propeller as viewed from the propeller rotating coordinate system. Measurements are the time dependent velocity at several positions along the propeller span for propellers of diameter approximately one foot and rotational speed of 6000 rpm operated in air at 100 ft/sec. The frequency response should be up 3000 Hx.

N86-184 TITLE: Automatic Inflation Device for Life Preservers

CATEGORY: Engineering Development

DESCRIPTION: Automatic inflation devices for life preservers are available, but they are expensive and can only be reused after rearming by the manufacturer. The Navy needs an inexpensive, reliable automatic inflation device for life preservers but with a manual override. Reaching needs to be accomplished by Fleet personnel. The engineering development should focus on a mechanical device as opposed to a squib fired device. Units must be humidity and corrosion resistant and compatible with existing manifolds and carbon dioxide units in the Fleet.

N86-185 TITLE: Constant Tension Spooling Device for Wire Rope and Cables

CATEGORY: Engineering Development

DESCRIPTION: Constant tension spooling devices for wire rope and electro-mechanical cables are required at shore and tender based IMAs. Such equipment provides smooth transfer of wire rope and cable from shipping spools onto the ship as well as aiding in distributing constructional stretch throughput the whole cable length.

Specifically, a constant tension spooling device is desirable which is simple, compact and light crane portable. It should be self powered, capable of handling ropes and cables within a diameter range of ¼ - ¾ inch.

Techniques that may be considered include electric, pneumatic and hydraulic driven reeling systems, either separately or in combinations.

N86-186 TITLE: Non-Destructive Test Equipment for Stainless Steel Corrugated Core Spot welded Sandwich Panels

CATEGORY: Exploratory Development

DESCRIPTION: The David Taylor Naval Ship R&D Center has been involved in the test and evaluation of stainless steel corrugated core spot welded sandwich panels for naval deckhouse applications. This R&D has led to the use of corrugated core panels on naval combatants. There is a need to develop suitable NDT inspection tools to ensure adequate spot weld integrity of stainless steel corrugated core spot-welded sandwich panels for shipboard use. This proposal is intended to utilize existing NDT technologies to develop and procure methodology and hardware for corrugated core spot-weld panels. Using this equipment, spot weld flaws (if any) will be detected and recorded to support the Navy certification of corrugated core spot welded sandwich panels.

N86-187 TITLE: Navy Surface Effect Ship (SES) Seakeeping Assessment Computer Program

CATEGORY: Exploratory Development

DESCRIPTION: The Navy has an urgent need for a means of predicting the seakeeping characteristics of Surface Effect Ships (SES). A computer program that does this should be capable of predicting SES motions for an SES of any form and of any displacement. It should predict these SES motions for various conditions of speed, heading to the sea, and for various sea states. It should also predict these motions with and without heave motion attenuation devices, and for various classes of such devices. This SES Seakeeping Assessment Computer Program should be useful in selecting favorable SES designs and design approaches, and in selecting subsystem parameters in the conceptual and preliminary design phase of the ship design process. These quantitative ES seakeeping assessments will be used to make predictions of the percent operability of given SES designs in given ocean area for specified operations.

N86-188 TITLE: Tough High Modulus Castable Plastics

CATEGORY: Research

DESCRIPTION: Tough, high modulus casting materials are not available. In general as the modulus increase, the brittleness of the plastic also increases. High modulus (over a million psi) impact resistant castable plastics are needed for various applications. The processing techniques for these castable materials must also be cost effective. Optimal properties include room temperature cure, low viscosity, and good surface definition or low profile.

N86-189 TITLE: Long Life Non-Skid Coatings for Flight and Hangar Decks

CATEGORY: Research

DESCRIPTION: Current non-skid coatings are organic resins with inorganic particles that provide a skid-resistant surface for aircraft and Fleet personnel. Non-skid life is normally 18 months of less. High solids coatings are being explored, but profile and weight impact need to be addressed. Inorganic coatings such as thermal spray hold the potential for long life performance. Initial work with aluminum thermal spray indicated porosity and adhesion problems to conventional deck. Typical coating properties that would be evaluated include bond strength, coefficient of friction, impact resistance, porosity, and wear resistance.

N86-190 TITLE: Micro bubble Detector

CATEGORY: Exploratory Development

DESCRIPTION: A reliable micro bubble detector with particle/bubble discrimination capability is required for the development of a cavitations nuclei control. The ability to control cavitations nuclei is in the laboratories offers a significant payoff in minimizing the cavitations scaling problem in model propeller cavitations testing.

Holography has been shown to have the ability to measure the size, concentration, and shape of bubbles, particles, and organic matter. This capability makes holography useful for monitoring cavitations nuclei in water tunnel and ocean water. A portable device is required which can have a sampling tube with optical windows placed in it. The device would illuminate water samples in a typical water path length and be able to resolve nuclei down to 5 microns in diameter moving at speeds up to 10 meters per second.