



# Small Business Innovation Research Program

ABSTRACTS OF  
AWARDS FOR  
FISCAL YEAR 2003

**U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration**

## INTRODUCTION

The Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), through the Small Business Innovation Research (SBIR) program, awarded 16 Phase 1 contracts for FY 2003. These awards of up to \$75,000 each, and totaling approximately \$1.1 million, are for a 6-month effort to demonstrate the feasibility of innovative approaches to the research topics identified in the "DOC/ NOAA SBIR Program Solicitation for FY 2003 (NOAA 2003-1)." Abstracts of the successful Phase 1 proposals submitted under this solicitation, and brief comments on their potential commercial applications, are provided in this publication.

In Phase 2, funding is provided for projects that are most promising after Phase 1 is completed. These awards can be for up to \$300,000 each and for 2 years. The DOC/NOAA awarded a total of 9 Phase 2 contracts in FY 2003 for a total of approximately \$2.1 million. Abstracts of successful Phase 2 proposals and comments on their commercial applications are also provided in this solicitation.

The SBIR program is highly competitive. A total of 118 proposals were received by DOC/NOAA in response to its FY 2003 solicitation. The proposals were independently reviewed by DOC/NOAA scientists and/or engineers. With the funds available, only 16 could be selected. Final selection was based upon the results of the reviews, relative importance to DOC/NOAA needs, relationship to on-going research, and potential for commercialization.

## FY 2003 PHASE 1 AWARD WINNER

FIRM: Atmospheric Observing Systems, Inc.  
8022 Countryside Park, #234  
Niwot, CO 80503

AWARD: \$75,000

PHONE: (303) 817-6854  
FAX: (303) 652-4150  
E-MAIL: jim@aosinc.net

PRINCIPAL INVESTIGATOR: Dr. James R. Smith, President

TITLE OF PROJECT: High Precision Monitoring Instrumentation for Background Methane

SUBTOPIC NO. : 8.1.1R

### TECHNICAL ABSTRACT:

Improved sensors for Methane are needed to implement national and international programs that will better mankind's understanding of global warming and associated climate change. The proposing company has developed a baseline sensor; its detection limit is 23 ppb, or 1% of Methane's background (1800 ppb). With the proposed improvements, this sensor will exceed the levels of performance posed by DOC subtopic 8.1.1R: sensitivity of 10 ppb, low maintenance for extended periods at field sites, less than one liter (NTP) of reference gas per day, and negligible response to platform motion. The technique is NonDispersive Infrared applied to the narrow ( $4\text{ cm}^{-1}$ ) Q-Branch of Methane at  $3.315\ \mu\text{m}$ . In addition to this choice of absorption band, there are many technical innovations that make the instrument functional. But, in summary, the most important innovation will be the system's ability to provide informative observations of background Methane from a global network of field sites at an affordable price.

### SUMMARY OF ANTICIPATED RESULTS:

Detection systems capable of resolving background atmospheric Methane into at least 200 parts (0.5%).

### POTENTIAL COMMERCIAL APPLICATIONS :

High precision Methane detection systems to be deployed on a Worldwide array of platforms (aircraft, ship, buoy, tower, and ground based).

## FY 2003 PHASE 1 AWARD WINNER

FIRM: Metatech APS Division  
5 West 1<sup>st</sup> Street, Suite 301  
Duluth, MN 55802

AWARD: \$75,000

PHONE: (218) 727-2666  
FAX: (218) 727-2728  
E-MAIL: jkappenma@aol.com

PRINCIPAL INVESTIGATOR: John Kappenman, Division Manager

TITLE OF PROJECT: Ground Level Assimilative Model (GLAM) of Geomagnetic Field Disturbance Conditions

SUBTOPIC NO.: 8.1.2R

### TECHNICAL ABSTRACT:

Geomagnetic disturbances have caused wide spread disruptions to power grids throughout North America. It is necessary to fully describe the complex physical manifestation of geomagnetic disturbance environments to model how and to what extent these disturbances impact modern ground-based critical infrastructures. The Ground Level Assimilative Model (GLAM) would provide the general public and operators of land-based infrastructures concerned about GIC impacts a set of geomagnetic storm climatology data in a context that can be readily used in power network models or other infrastructure models. The development would provide a meso-scale resolution geomagnetic storm data. The aspects of the work proposed for Phase 1 can be summarized as follows:

- § Develop, test, and select high-cadence nowcast assimilative model of geomagnetic storm conditions over local and North American continental regions.
- § Validate Nowcast model for various observatory array combinations
- § Develop graphical visualization and 2D gridded datafile capabilities for the GLAM model outputs.

### SUMMARY OF ANTICIPATED RESULTS:

The demonstration and validation of a geomagnetic storm environment model that can be readily implemented for real-time operation in follow-on development work.

### POTENTIAL COMMERCIAL APPLICATIONS:

Both Metatech and other Space Weather vendors would be able to utilize GLAM model outputs to develop commercially tailored forecasts and nowcast services of geomagnetic storm conditions to end-users concerned about these impacts across the U.S.

## FY 2003 PHASE 1 AWARD WINNER

FIRM: Southwest Sciences, Inc.  
1570 Pacheco Street, Suite E-11  
Santa Fe, NM 87505-3993

AWARD: \$75,000

PHONE: (505) 984-1322  
FAX: (505) 988-9230  
E-MAIL: mzondlo@swsciences.com

PRINCIPAL INVESTIGATOR: Dr. Mark A. Zondlo, Senior Research Scientist

TITLE OF PROJECT: Miniature Chemical Ionization Mass Spectrometer for  
Measuring Tropospheric Ammonia

SUBTOPIC NO.: 8.1.4R

### TECHNICAL ABSTRACT:

Southwest Sciences proposes to develop an automated, fast, and compact instrument to measure tropospheric ammonia from light aircraft. Ammonia plays important roles in aerosol particle chemistry, and particle characteristics are critical in understanding climate change and air quality. Existing ammonia instruments are either too large or measure too slowly for use on light aircraft. The unique application of chemical ionization mass spectrometry (CIMS) to a state-of-the-art, miniature mass spectrometer offers the advantages of high sensitivity, small size, and low power consumption (< 200 W). Phase I will investigate the feasibility of detecting ammonia by a CIMS miniature mass spectrometer. At the end of Phase II, a small (30 x 30 x 30 cm) instrument will measure ammonia every 1-10 s with a detection limit of 20 parts per trillion. The proposed technology could also be used to measure other aerosol species such as nitric acid or sulfuric acid.

### SUMMARY OF ANTICIPATED RESULTS:

Its small size and weight (comparable to a small computer monitor), automated operation, and low power consumption (<200 W) will be particularly suited for deployment on NOAA's light aircraft as part of tropospheric chemistry studies. In-situ ammonia measurements will allow for comprehensive modeling of regional air quality, especially fine particle formation and composition.

### POTENTIAL COMMERCIAL APPLICATIONS:

It would have commercial applications in medicine, the semiconductor industry, and the atmospheric chemistry research community. Breath analysis of ammonia is used to diagnose renal diseases in medicine. In the semiconductor industry, ammonia poisons the surface during the wafer fabrication process, and ammonia measurements may help to increase yields.

## FY 2003 PHASE 1 AWARD WINNER

FIRM: Fairfield Technologies, Inc.  
12210 Fairfax Towne Center, Suite 700  
Fairfax, VA 22033

AWARD: \$75,000

PHONE: (703) 968-7800  
FAX: (703) 968-8815  
E-MAIL: kfried@fairfieldtech.com

PRINCIPAL INVESTIGATOR: Kenneth Fried, President

TITLE OF PROJECT: Demonstrate the Feasibility of Building an AWIPS-Based System Grid with Weather Ontology Capabilities

SUBTOPIC NO.: 8.1.7W

### TECHNICAL ABSTRACT:

The AWIPS (Advanced Weather Information Processing System) program is a cornerstone element supporting NWS' mission to protect life and property and enhance the national economy. The challenge of this project is to help NWS harness large amounts of unused computer resources and underutilized data, improve collaboration and cooperation to solve complex problems not currently addressable, to increase budget efficiencies, and improve disaster preparedness and homeland security.

Fairfield Technologies Inc. (FTI) will design and build an AWIPS-based grid, and related weather data management ontology, so NWS local and regional offices and national centers can pool systems resources to address large computational problems relating to NWS' mission, provide greater access to local data, utilize existing system resources to the greatest extent possible, providing more results from the same budget, and provide NOAA with greatly expanded options for business continuity planning, supporting improved recovery from natural disasters or national security threats.

FTI will iteratively specify, architect, design, build, and test AWIPS grid and ontology prototypes. Taking maximum advantage of current, worldwide state-of-the-art grid architecture research efforts, open-source software projects, and its own AWIPS data knowledge, FTI will provide NOAA a fast, reliable, robust processing capability compatible with rapidly advancing technology and still-evolving standards.

### SUMMARY OF ANTICIPATED RESULTS:

Phase 1- Determine the technical feasibility of building an AWIPS-based grid for sharing data and computational resources, and of a weather-related ontology facilitating global information reuse and sharing. Phase 2 - Validation of working AWIPS grid and ontology prototypes. Phase 3 and beyond - An operational AWIPS-based grid that can be scaled to broad NOAA usage, plus a detailed ontology or knowledge model for organizing, analyzing, using, sharing, and presenting weather-related information.

### POTENTIAL COMMERCIAL APPLICATIONS:

Development of pre-packaged, "out-of-the-box" grid software, implementation and training support. Outsourced grid hosting, facilities management, or business continuity/disaster recovery services. Development of grid-specific applications for functions such as weather forecasting, financial analysis and forecasting, bioinformatics modeling for drug and vaccine development, and Homeland Security-focused bio-defense applications in the areas of genetic, genomic, and proteomic analysis.

## FY 2003 PHASE 1 AWARD WINNER

FIRM: Yankee Environmental Systems, Inc.  
101 Industrial Blvd  
Turners Falls, MA 01376

AWARD: \$75,000

PHONE: (413) 863-0200  
FAX: (413) 863-0255  
E-MAIL: whb@yesinc.com

PRINCIPAL INVESTIGATOR: Dr. William H. Bauman III, Government Programs Manager

TITLE OF PROJECT: An Innovative Low-cost Dropsonde Using Integrated Rolled Circuit Design

SUBTOPIC NO.: 8.1.9R

### TECHNICAL ABSTRACT:

Current dropsondes (and radiosondes for that matter) are manufactured, using process and materials nearly 20 years old. The standard dropsonde is 16 inches long by 2.25 inches in diameter, weighing about one pound. YES proposes to significantly reduce size and weight of the current sensor package through innovative design and manufacture techniques.

YES's ongoing research into chilled mirror dew point sensors for radiosonde deployment has given it opportunity to perform some of this research already. We believe we can manufacture a dropsonde (not including the GPS function, more on this later) with less than 15 components, including sensors, by careful selection of existing components.

We will demonstrate in this proposal via data sheets and a preliminary schematic the architecture of a dropsonde that fulfills the <15-component realization stated above.

### SUMMARY OF ANTICIPATED RESULTS:

The technical objectives are to minimize the size, weight, manual assembly, and ultimately cost of the dropsonde. This will be achieved through careful review of candidate COTS components and innovative construction. YES intends to construct five prototype dropsondes.

### POTENTIAL COMMERCIAL APPLICATIONS:

Annual dropsonde sales are estimated to be about 7,000 per year at a sales price of about \$575 each, so a market worth about \$4 million per year. YES believes the number of dropsonde sales would increase if the sensor package were smaller, lighter, and cheaper. Especially with the ever-increasing use of Unmanned Aerial Vehicles (UAV) that are so weight restricted that a lighter sensor would allow UAVs to carry (more) dropsondes.

The market includes the Federal Government (NOAA, Air Force, and Navy), research organizations such as the National Center for Atmospheric Research, and overseas customers.

## FY 2003 PHASE 1 AWARD WINNER

FIRM: KAITECH, Inc.  
5962 Camelback Lane  
Columbia, MD 21045

AWARD: \$75,000

PHONE: (410) 964-4997  
FAX: (410) 964-4998  
E-MAIL: tooque@earthlink.net

PRINCIPAL INVESTIGATOR: Richard Cox, President

TITLE OF PROJECT: Water Properties Sensor

SUBTOPC NO.: 8.2.1N

### TECHNICAL ABSTRACT:

This project is to provide an affordable, easy-to-use, hyperspectral water properties measuring instrument that is designed for universal marine use. It is an instrument that combines, in a single package, capabilities to accurately measure the apparent, inherent, fluorescent and the CTD properties of water. The sensor captures a complete record of all of the water's properties in a single cast. It is a self-calibrating instrument with near real time output signals that are processed as tabular data or as graphical images. A complete system consists of a sensor unit, a connecting cable and a laptop computer programmed with the operating software. The system has deployment applications from a dock, a ship or from a mooring.

### SUMMARY OF ANTICIPATED RESULTS:

The expected result is that the proposed Water Properties Sensor will become an essential and widely used component for the accurate measurement of the ocean's optical properties.

### POTENTIAL COMMERCIAL APPLICATIONS:

First applications are expected to be in support of specific projects to acquire wide area scientific water quality data, second applications are discriminations between sediments, COM, biota and contaminants, and third applications to identify and track short-term variability and long-term changes in the integrity and biodiversity of estuarine.

## FY 2003 PHASE 1 AWARD WINNER

FIRM: Hydro-Optics, Biology, & Instrumentation Laboratories, Inc.  
8987 E. Tanque Verde, #309-366  
Tucson, AZ 85749-9610

AWARD: \$74,989

PHONE: (520) 299-2589  
FAX: (520) 299-2598  
E-MAIL: maffione@hobilabs.com

PRINCIPLE INVESTIGATOR: Dr. Robert A. Maffione, President & Chief Scientist

TITLE OF PROJECT: Full Spectrum Complete IOP Instrument Suite

SUBTOPIC NO.: 8.2.1N(d)

### TECHNICAL ABSTRACT:

An ultimate goal of ocean-observing and ocean-color remote sensing programs is to determine the nature and concentrations of ocean-water constituents and, combined with models, infer the biological and physical processes occurring. To effectively achieve this goal, it is absolutely necessary to obtain direct measurements of the fundamental (i.e., inherent) optical absorption and scattering properties of these constituents. Accurate and complete data on these inherent optical properties (IOP's) will directly benefit NOAA's ocean-color, earth-observing, and global climate change programs. We propose to develop a suite of in-situ oceanographic instruments that together measure a complete set of the IOP's of ocean waters as well as the laboratory methods and technology necessary to accurately calibrate these instruments. Our design approach will make use of proven instrumentation methods combined with the latest technologies as well as new developments in water-optical property measurements. The suite of instruments will consist of a novel hyperspectral (350 - 850 nm) absorption meter, hyperspectral transmissiometer and a multi-wavelength volume scattering function instrument.

### SUMMARY OF ANTICIPATED RESULTS:

The successful completion of the Phase 2 would result in a suite of fully tested prototype IOP instruments that measure full-spectrum (hyperspectral from 350 - 850 nm) absorption and beam attenuation coefficients, and multi-wavelength, multi-angle volume scattering functions. The commercialization of these instruments will provide the ocean research community with an unprecedented set of optical research tools that will greatly advance our understanding of ocean-optical properties and ocean-color remote sensing.

### POTENTIAL COMMERCIAL APPLICATIONS:

The suite of spectral IOP instruments will undoubtedly support a wide range of applications, including all basic and applied research on the optical properties of natural waters, environmental water-quality monitoring, ocean-color remote sensing programs, sediment transport studies and so on. The instruments can also be used in the laboratory to study the optical properties of specific, isolated particles, both living and nonliving, and will therefore find markets in these applications as well.

## FY 2003 PHASE 1 AWARD WINNER

FIRM: Sensicore, Inc.  
755 Phoenix Drive  
Ann Arbor, MI 48108

AWARD: \$74,931

PHONE: (734) 528-6312  
FAX: (734) 528-6301  
E-MAIL: glennmartin@sensicore.com

PRINCIPAL INVESTIGATOR: Glenn B. Martin, Analytical Chemist

TITLE OF PROJECT: Chemical Sensor Arrays for Remote Sensing

SUBTOPIC NO.: 8.2.4R

### TECHNICAL ABSTRACT:

Continuous real-time monitoring is broadly applicable to marine environmental research, environmental monitoring, and assurance of drinking water quality. Currently, the common procedure is to collect samples in the field and return them to the laboratory for analysis, which cannot possibly capture chemical data in real-time. Photolithographically processed silicon is suitable for manufacturing integrated arrays that contain a large number of electrochemical sensors. These arrays, which include sensors for both physical and chemical measurements, can be produced at low cost and treated as disposables. The objective of this project is to utilize Sensicore's current silicon-based electrochemical sensor array platform to generate sensor arrays that can continuously monitor chloride (Cl<sup>-</sup>), ammonium-nitrogen (NH<sub>4</sub><sup>+</sup>) and oxygen (O<sub>2</sub>) in fresh and saltwater. Ion selective electrodes (ISEs) will be evaluated for the determination of chloride and ammonium-nitrogen whereas a voltammetric sensor will be evaluated for the determination of oxygen.

### SUMMARY OF ANTICIPATED RESULTS:

The results of this research project will be the demonstration of an integrated silicon based sensor array that is capable of quantifying chloride (Cl<sup>-</sup>), ammonium-nitrogen (NH<sub>4</sub><sup>+</sup>), and oxygen (O<sub>2</sub>) in fresh and saltwater. The arrays will also be able to measure other important water parameters: pH, temperature and conductivity.

### POTENTIAL COMMERCIAL APPLICATIONS:

The proposed technology has broad application in environmental monitoring, marine research, and the protection of drinking water, as well as in various biomedical and pharmaceutical markets. These applications include portable hand-held devices for in field testing of water, continuous surveillance of drinking water distribution systems, point-of-care medical diagnostics and quality assurance for potable water processing.

## FY 2003 PHASE 1 AWARD WINNER

FIRM: Polestar Technologies, Inc.  
220 Reservoir Street  
Suite 32  
Needham Heights, MA 02494-3133

AWARD: \$74,991.94

PHONE: (781) 449-2284  
FAX: (781) 449-1072  
E-MAIL: jkane@polestartech.com

PRINCIPAL INVESTIGATOR: Dr. James A. Kane, Vice President

TITLE OF PROJECT: Inexpensive Submersible Long-Term Dissolved Oxygen Recorder

SUBTOPIC NO: 8.2.5F

### TECHNICAL ABSTRACT:

Polestar Technologies, Inc. proposes a Phase I Small Business Innovation Research project to demonstrate the feasibility of a compact optical monitor for continuous dissolved oxygen monitoring in areas at risk of eutrophication induced hypoxia and anoxia. The proposed monitor will facilitate the development of improved theoretical models by enabling better data collection with regard to spread and degree of oxygen reduction occurring in the suspect areas. An innovative sensor design is presented which incorporates a unique biostatic barrier designed to inhibit biological encapsulation of the system's sensing membrane. The Phase I effort will demonstrate the effectiveness of the new biostatic barrier technology by monitoring the performance of prototype oxygen sensors in environments where algae proliferation is taking place.

### SUMMARY OF ANTICIPATED RESULTS:

The proposed Phase 1 effort will provide data to show the extent to which copper alloy mesh can be used to inhibit biological encapsulation. The effort will also yield the design of a compact DSP-based electronic package for oxygen measurements by phase-sensitive fluorescence lifetime detection

### POTENTIAL COMMERCIAL APPLICATIONS:

The proposed optical oxygen sensor would be particularly well suited to the task of unattended monitoring of groundwater, lakes, and streams. The digital signal processing electronics could also be used in stand-alone monitors for industrial and bioprocess monitoring.

## FY 2003 PHASE 1 AWARD WINNER

FIRM: Physical Sciences, Inc.  
20 New England Business Center  
Andover, MA 01810-1077

AWARD: \$74,969

PHONE: (978) 689-0003  
FAX: (978) 689-3232  
E-MAIL: mazel@psicorp.com

PRINCIPAL INVESTIGATOR: Dr. Charles H. Mazel, Principal Research Scientist

TITLE OF PROJECT: Fluorescence Imagery for Rapid Estimates of the  
Distribution and Abundance of Coral Recruits

SUBTOPIC NO.: 8.3.1F

### TECHNICAL ABSTRACT:

There is a need for improved techniques for investigation of coral recruitment and survivorship. Fluorescence has the potential to be an enabling technology to extend the study of recruitment to smaller (more recently settled) specimens in natural habitats. Our objectives are to: create a novel, more versatile underwater light source for stimulating fluorescence; determine the capabilities and limitations of fluorescence approaches under realistic field conditions; and investigate approaches to applying fluorescence investigation in the daytime and on three-dimensional surfaces. The new light source will be constructed from components that enable simple, rapid switching between excitation wavelengths. We will use the new prototype and existing lights to conduct a field investigation comparing fluorescence technologies with conventional approaches to coral recruitment studies. We will survey approaches to daytime fluorescence imaging and to imaging of three-dimensional surfaces to determine the best approaches to overcoming these significant challenges to practical application of fluorescence techniques.

### SUMMARY OF ANTICIPATED RESULTS:

We expect to produce a prototype of an improved light source for excitation of fluorescence. The improvements will comprise better power efficiency and greater wavelength selection versatility over existing lights. With this light and with existing equipment we expect to acquire an improved understanding of the true, practical capabilities and limitations of fluorescence approaches for the study of coral recruitment. The experience with the light and the field investigation will pave the way for refinements and possibly additional enhanced technologies in Phase 2.

### POTENTIAL COMMERCIAL APPLICATIONS:

Fluorescence imaging is of interest not only for the investigation of coral recruits, but also for other scientific studies in reefs and other marine habitats. In addition there is a demonstrated market in the sport diving community for equipment for viewing and photographing fluorescence. The novel light source developed in this effort will have immediate commercial potential in both the scientific and sport diving communities as a complement to existing products.

## FY 2003 PHASE 1 AWARD WINNER

FIRM: Taylor Resources, Inc.  
701 Broad Spit Road  
Quilcene, WA 98376

AWARD: \$49,988

PHONE: (360) 765-3566  
FAX: (360) 765-3028  
E-MAIL: jdavis32@mindspring.com

PRINCIPAL INVESTIGATOR: Jonathan P. Davis, Principal Investigator

TITLE OF PROJECT: Improvement of Culture Techniques for the Purple-Hinged Rock Scallop

SUBTOPIC NO.: 8.4.1SG

### TECHNICAL ABSTRACT:

Taylor Resources, Inc. is proposing Phase 1 experiments to assist in commercializing the culture of rock scallops (*Crassadoma giganteus*). The firm maintains a state-of-the-art hatchery and nursery complex to supply seed to over 3400 ha of intertidal and subtidal grow-out beds. The purple-hinged rock scallop has been identified as the premium valued product with high potential for aquaculture development because of its large size and culinary qualities. Significant impediments remain to commercialization of rock scallop aquaculture due mainly to high mortalities in the hatchery, especially during the early post-settlement period, and the tendency for juvenile and adult scallops to cement themselves to grow-out trays and structures, which hinder grow-out. Phase 1 studies are proposed for rock scallop aquaculture development in Puget Sound and will focus on improving broodstock development and larval rearing through algal diet development, development of triploidy and research on grow-out technologies.

### SUMMARY OF ANTICIPATED RESULTS:

The proposed Phase 1 studies will benefit commercial shellfish growers in the region by developing the capability to culture the rock scallop. We anticipate resolving impediments to larval survivorship through broodstock nutrition, developing triploidy and grow-out technologies.

### POTENTIAL COMMERCIAL APPLICATIONS:

Existing farm technologies are extremely limited for the grow-out of this species and the improvements in culture technologies proposed here involving broodstock, larval rearing and nursery and grow-out could produce significant economic returns and greater diversification for the U.S. West coast shellfish industry.

## FY 2003 PHASE 1 AWARD WINNER

FIRM: Snapperfarm, Inc.  
P.O. Box 685  
Culebra, PR 00775-0685

AWARD: \$50,000

PHONE: (787) 548-6134  
FAX: (787) 742-0641  
E-MAIL: brian@snapperfarm.com

PRINCIPAL INVESTIGATOR: Brian O'Hanlon, President

TITLE OF PROJECT: Recruitment of *Panulirus argus* Spiny Lobster to Submerged Sea Cages Off Puerto Rico, and Its Implications for the Development of a New, Sustainable and Profitable Aquaculture Operation

SUBTOPIC NO.: 8.4.1SG

### TECHNICAL ABSTRACT:

Spiny lobsters (*Panulirus argus*) have been successfully mated and spawned in captivity. However, researchers have had difficulty rearing large numbers of phyllosoma larvae through the many stages of the year long complex cycle. The alternative for mariculture is to bypass the larviculture stage and collect the pueruli from the wild as they drift to near shore habitats. The traditional methods used for collection of pueruli or post larvae will often vary markedly with location, season and lunar phase, and are not considered economically viable. Snapperfarm, Inc. has recently deployed two 3,000 cubic meter sea cages to culture marine fish off the coast of Culebra, Puerto Rico. Over the course of six months, the cages became covered in a fine layer of macroalgae and diatoms. This ideal habitat is continuously recruiting thousands of Spiny Lobster pueruli, of which many have developed to full size lobsters in the fish sea cages. Collecting pueruli from two offshore fish cages that have 2,230 sq. meters of surface area opens up tremendous opportunities for the commercial production of spiny lobsters. The potential of having a steady supply of pueruli will alleviate one of the major bottlenecks in moving spiny lobster aquaculture towards commercial production. Phase 1 of this project will evaluate the temporal recruitment of Spiny Lobster to the sea cages in Puerto Rico, with the goal of using these pueruli for developing commercial production of Spiny Lobster.

### SUMMARY OF ANTICIPATED RESULTS:

Phase 1 of this project will contribute valuable information that will help develop a strategy for full scale commercial production of Spiny Lobster. Phase 2 will establish full scale commercial production with a goal of consistent year round production that is both economically viable and environmentally sustainable

### POTENTIAL COMMERCIAL APPLICATIONS:

The ability to culture this species will greatly reduce the stress from commercial and recreational fishing on the natural stock, while providing a highly desired product to the large existing Spiny Lobster market.

## FY 2003 PHASE 1 AWARD WINNER

FIRM: Net Systems, Inc.  
7910 NE Day Road West  
Bainbridge Island, WA 98110-1254

AWARD: \$50,000

PHONE: (206) 842-5623  
FAX: (206) 842-6832  
E-MAIL: kswanson@oceanspar.com

PRINCIPAL INVESTIGATOR: Kurt Swanson, Design Engineer

TITLE OF PROJECT: Offshore Spar Based Fish Feeder

SUBTOPIC NO.: 8.4.5SG

### TECHNICAL ABSTRACT:

As fish farmers attempt to increase capacity, they are being forced to more exposed growing sites. The technology for rearing fish in this high-energy environment is dependent on robust fish pens and the infrastructure to support them. One very important technology that must be developed is an automated feeding system capable of operating in this difficult environment.

Using already proven "spar technology," Net Systems and co investigators, Environmental Technologies and the University of New Hampshire, intend to demonstrate the feasibility of a spar based semi-autonomous feeder. This feeder would have the sea keeping, mooring, automation and remote control capabilities to feed submerged fish pens and allow offshore fish farming to move to the next level.

Proving the feasibility of such a system would allow Net Systems and Environmental Technologies to pursue Phase 2 funding to produce a working prototype to be tested at the University of New Hampshire's offshore farm site.

### SUMMARY OF ANTICIPATED RESULTS:

This study will hopefully verify that a spar configured feed system will have the capability to carry an appropriate quantity of different types of fish feed in a vessel that will respond well in high wave energy sites, and be capable of supporting the equipment necessary to operate in a semi-autonomous and dependable fashion.

### POTENTIAL COMMERCIAL APPLICATIONS:

It is hoped that the findings of this study will be the basis of a prototype to be built and tested with SBIR Phase 2 funding. Regardless, the feasibility study will be very useful to Net Systems/Ocean Spar Technologies and Environmental Technologies in finding a solution to feeding submerged fish pens at exposed sites.

## FY 2003 PHASE 1 AWARD WINNER

FIRM: Cates International, Inc.  
780 Kapii Street  
Kailua, HI 96734

AWARD: \$49,970

PHONE: (808) 262-0267  
FAX: (808) 262-0804  
E-MAIL: randy@catesinternational.com

PRINCIPAL INVESTIGATOR: John R. Cates, President

TITLE OF PROJECT: Construction and Testing of a Spar Feeding System for an Offshore Aquaculture Farm

SUBTOPIC NO.: 8.4.5SG

### TECHNICAL ABSTRACT:

This SBIR Phase 1 project proposes to design, construct, and test and evaluate a spar feeding system suitable for use on an operating offshore fish farm. To minimize the labor costs for operations in a remote location, remote feeding systems are needed so that feeding of the fish can take place even if the farmer is unable to get to the site. Cates International, inc. has developed a feeding system for its underwater cages that functions from a small boat. But this requires the presence of men at the site. We propose to construct and test a 6 meter by 15 meter spar buoy to serve as an automatic feeding station that will be able to feed up to four cages. The spar will contain feed storage hoppers, a diesel electric generator, various water and slurry pumps, and automated equipment to maintain the spars buoyancy as feed is removed.

### SUMMARY OF ANTICIPATED RESULTS:

We expect to deploy a working full-scale practical feeding system suitable for use on an operating offshore fish farm.

### POTENTIAL COMMERCIAL APPLICATIONS:

All fish farms require feeding systems. Our Phase 1 and Phase 2 efforts should yield a remotely controlled feeding system that many offshore operators might find useful. We would expect to construct copies for other users in Hawaii, and to license the design to other manufacturers for use elsewhere in the world.

## FY 2003 PHASE 1 AWARD WINNER

FIRM: ProFishent, Inc.  
17806 NE 26<sup>th</sup> Street  
Redmond, WA 98052-5848

AWARD: \$49,820

PHONE: (425) 881-9244  
FAX: (425) 869-5364  
E-MAIL: davidp@profishent.com

PRINCIPLE INVESTIGATOR: Dr. David B. Powell, Vice President, R&D

TITLE OF PROJECT: A New Generation of Anti-viral Vaccines for Aquaculture Using Nanotechnology

SUBTOPIC NO.: 8.4.6SG

### TECHNICAL ABSTRACT:

This innovative Phase 1 project will test the feasibility of using the science of nanotechnology and emulsion chemistry to produce nanoparticles in a matrix to greatly enhance the immunogenicity of inactivated viruses. This new approach promises to have direct application to the development of potent cost-effective anti-viral vaccines for aquatic animals. These novel formulations should stimulate protective humoral and cellular immune responses by targeting antigen presenting cells. Infectious hematopoietic necrosis virus (IHNV) and infectious salmon anemia virus (ISAV) will be used as model organisms to assess the binding and initial potency of these complex viral carriers. Emphasis will be placed on creating nanoparticles with high affinities to viral particles, followed by a comparison of antibody response kinetics and possible side effects in rainbow trout.

### SUMMARY OF ANTICIPATED RESULTS:

We expect to initiate the development of a new wave of injectable killed vaccines for fish that elicit strong protective immune responses against intracellular pathogens. The anticipated result of Phase 1 is a highly stable vaccine emulsion system with successful binding of antigens to nano- or microparticles, while maintaining very low side effects in fish.

### POTENTIAL COMMERCIAL APPLICATIONS:

Phase 2 & 3 developments of this technology will result in a new generation of aquaculture vaccines that will substantially reduce losses to disease. The lack of adverse effects to biological re-circulation filters is an added benefit. It should be possible to vaccinate and raise a variety of aquatic species previously thought to be too susceptible to diseases.

## FY 2003 PHASE 1 AWARD WINNER

FIRM: Advanced Technologies, Inc.  
P.O. Box 850  
Starkville, MS 39760-0850

AWARD: \$75,000

PHONE: (662) 324-2800  
FAX: (662) 324-2823  
E-MAIL: GLOBAL941@aol.com

PRINCIPAL INVESTIGATOR: Michael R. Smith, Principal Investigator

TITLE OF PROJECT: Head-up Display for Mariners

SUBTOPIC NO.: 8.5.1N

### TECHNICAL ABSTRACT:

This proposed NOAA SBIR Project will demonstrate the feasibility of a low-cost Head-Up Display (HUD) for mariners, that will display 2 and 3-dimensional navigation and nautical chart data. The capabilities of the Phase 1 HUD system will be based on operational requirements determined during the NOAA SBIR research phase. The proposed HUD requirements of other classes of ships and marine craft will be investigated in Phase 2. The proposed HUD and data extraction system will permit operations during inclement/limited visibility conditions, day, or night that would normally limit or curtail operations. The proposed Low-Cost HUD (LCHUD) technology is based on the use of HUD technology that is used in several high-performance and luxury automobiles and in military vehicles. Leveraging such existing technology is critical to developing a low-cost HUD system that has significant commercialization potential. The Phase 1 LCHUD system will be capable of displaying 2-D images extracted from existing raster and vector nautical chart databases and situational data from navigation sensors. The proposed Phase 2 LCHUD system will project 3-D images that will be conformal to the real world and provide valuable information for navigation and collision avoidance.

### SUMMARY OF ANTICIPATED RESULTS:

Successful development of a low-cost HUD system will improve marine situational awareness and enhance safe navigation.

### POTENTIAL COMMERCIAL APPLICATIONS:

The HUD systems can be used by NOAA for precise navigation during R&D operations as well as on operational craft engaged in routing acquisition of water depth data, location of data buoys, and other oceanographic operations. The proposed LCHUD system will have great market potential for marine craft operating on rivers and the intercoastal waterways. There is significant market potential for both military and private large marine craft. As the price of the units decrease with increased volume production, the retail price will be reduced significantly, making the HUD system attractive to commercial fishing vessels and pleasure crafts.

## FY 2003 PHASE 2 AWARD WINNER

FIRM: Southwest Sciences, Inc.  
1570 Pacheco Street  
Suite E-11  
Santa Fe, NM 87505

AWARD: \$300,000

PHONE: (513) 272-1323  
FAX: (505) 988-1322  
E-MAIL: Dchovde@swsciences.com

PRINCIPAL INVESTIGATOR: David C. Hovde, Principal Research Scientist

TITLE OF PROJECT: Antimonide Laser Spectrometer for Measuring the Flux of Ammonia

SUBTOPIC NO.: 8.1.R

### TECHNICAL ABSTRACT:

This Phase II SBIR Research project will continue the development and testing of an innovative instrument for measuring fluxes of atmospheric ammonia to be delivered at the end of Phase II. The instrument will combine advances in diode laser technology with sophisticated laser modulation methods to quantify ammonia in a low pressure flow cell. The instrument's small size and light weight will allow it to be mounted close to the measurement point, eliminating the need for long sampling lines. Careful selection of materials and a rapid flow rate ensure rapid gas exchange. Custom electronics to operate the instrument will consume 1-5 W of electrical power.

### KEYWORDS:

Ammonia, flux, antimonide, diode laser, modulation.

### POTENTIAL COMMERCIAL APPLICATIONS:

Commercial applications include flux monitors for ammonia, methane, nitrous oxide, and isotopes of water and carbon dioxide; leak detectors for natural gas and industrial refrigeration facilities; and monitors for measuring ammonia in smokestack emissions.

## FY 2003 PHASE 2 AWARD WINNER

FIRM: Oceanit Laboratories, Inc.  
1001 Bishop Street  
Pacific Tower, Suite 2970  
Honolulu, HI 96813

AWARD: \$300,000

PHONE: (808) 531-3017  
FAX: (808) 531-3177  
E-MAIL: Csullivan@oceanit.com

PRINCIPAL INVESTIGATOR: Dr. Christopher J. Sullivan, Senior Aerospace Engineer

TITLE OF PROJECT: Low-cost Automated Aerosol Lidar for Air Quality  
Assessment and Prediction

SUBTOPIC NO.: 8.1.2R

### TECHNICAL ABSTRACT:

Oceanit showed the feasibility of a low-cost, compact, lightweight, eye-safe LIDAR suitable for aerosol gradient detection in a Phase 1 effort. The system is based on an eye-safe laser being developed at Oceanit as part of a 3D scanning ceilometer. The laser can operate at greater power than other systems using non-eye-safe wavelengths, thus it eliminates many of the problems associated with low power aerosol LIDAR systems. The system will be able to detect very low backscatter from aerosols in the planetary boundary layer, and will be useful in determining the mixed layer depth. Phase 2 efforts will consist of prototype construction, system testing, and field-testing.

### KEYWORDS:

Aerosol, LIDAR, Laser, Atmospheric, Monitoring.

### POTENTIAL COMMERCIAL APPLICATIONS:

Potential applications of this technology include atmospheric monitoring for weather and environmental monitoring. The system can be used to identify atmospheric conditions as they relate to pollution dispersion and identify sources of pollution. Additionally, military applications have been identified.

## FY 2003 PHASE 2 AWARD WINNER

FIRM: Yankee Environmental Systems, Inc.  
101 Industrial Blvd.  
Turner Falls, MA 01376-1611

AWARD: \$300,000

PHONE: (413) 863-0200  
FAX: (413) 863-0255  
E-MAIL: Whb@yesinc.com

PRINCIPAL INVESTIGATOR: Dr. William H. Bauman III, Government Programs Manager

TITLE OF PROJECT: Low-cost Mobile and Portable Automated Sonde  
Launching Systems

SUBTOPIC NO.: 8.1.3

### TECHNICAL ABSTRACT:

Upper atmospheric measurements of temperature, humidity and winds are required daily at hundreds of locations around the world. These critical measurements are primarily made by radiosondes carried aloft by balloons filled with helium and tracked by ground stations. Currently, the process of radiosonde setup and launch is performed manually by trained human operators, and no mechanism exists to auto-calibrate radiosondes just prior to launch. Typically, NWS radiosonde preparation facilities are "High Bay" inflation buildings approximately 6.7 meters (22 ft) high with a 4.3 meter (14 ft) length. While there is a commercially available automated radiosonde launch system (manufactured outside the U.S.) at \$400,000, this system is impractical for most programs, due to cost and size, and because it's only compatible with the vendor's proprietary radiosondes. We propose to produce two automated radiosonde launchers. The mobile version would have dimensions approximately 2.5 meters (8 ft) long, 2.0 meters (6.5 ft) wide, and 2.6 meters (8 ft) high and could be mounted on a trailer for mobility. The portable version would be small and light enough for two people to easily handle and transport in a small truck or SUV.

### KEYWORDS:

Radiosonde, automated, launcher, balloon, Sonde, Weather, Meteorology, Upper Air, Skew-T.

### POTENTIAL COMMERCIAL APPLICATIONS OF THE RESEARCH:

The new launchers would represent a significant improvement in the price vs. performance of launching radiosondes for the National Weather Service, research programs such as DOE's Atmospheric Radiation Measurement program, field programs conducted by the research community, and fixed-base & tactical Department of Defense applications. It is fundamental to reducing the cost of daily radiosonde observations for operational meteorology as well as climate monitoring programs and climate change research. If reasonably priced and designed to support several popular radiosonde types, the worldwide market is nearly one thousand systems (roughly \$30 - 50 million).

## FY 2003 PHASE 2 AWARD WINNER

FIRM: ADA Technologies, Inc.  
8100 Shaffer parkway, Suite 130  
Littleton, CO 80127-4107

AWARD: \$299,998

PHONE: (303) 792-5615  
FAX: (303) 792-5633  
E-MAIL: Patf@adatech.com

PRINCIPAL INVESTIGATOR: Patrick D. French, Instruments Program Manager

TITLE OF PROJECT: A Distributed Platform Automated Balloonsonde Launcher

SUBTOPIC NO.: 8.1.3GP

### TECHNICAL ABSTRACT:

Balloon-borne radiosondes are used extensively to collect meteorological data in atmospheric research programs funded by NOAA, WMO, DOD, DOE and others. The launch of radiosondes requires skilled personnel at each launch site to perform tasks such as balloon filling, sonde pre-conditioning and attachment, and physical release of the equipment. At present no low-cost, simple, lightweight, and robust launchers that automate the process are commercially available. Launching balloon sondes in high winds is particularly problematic.

In Phase I, ADA demonstrated the automated launch of balloon-borne radiosondes in high winds (30mph+) from a novel automated sonde launcher weighing roughly 100 lbs compared to multi-ton commercial alternatives. The ADA modular launcher is less expensive and more flexible than existing systems, incorporating numerous innovations and robust mechanisms that improve reliability.

In Phase II, ADA will complete the development and packaging of this system and field validate the design on a ship. The prototype unit will be designed with extensive input from users and configured for minimal service requirements by shipboard personnel.

### KEYWORDS:

Balloon, radiosonde, meteorology, automatic launch.

### POTENTIAL COMMERCIAL APPLICATIONS:

The lightweight, robust, low-cost, automated balloonsonde launching system under development is intended for use by NOAA and the international scientific community (WMO, JCOMM, etc.) for the collection of data above the seas in programs such as the Voluntary Observing Ships, which currently operates over 6,500 ships. As another shipboard application, the Navy has a need for launching balloonsondes to determine atmospheric refraction which affects radar.

This system would also be used by the university and research communities for short-term, intensive balloon sonde launching campaigns both on land and sea. Finally, this system could be used by the Army as part of the balloonsonde launching program to improve the aim of artillery.

## FY 2003 PHASE 2 AWARD WINNER

FIRM: International Electronic Machines Corporation (IEM)  
60 Fourth Avenue  
Albany, NY 12202-1924

AWARD: \$199,866

PHONE: (518) 449-5504  
FAX: (518) 449-5567  
E-MAIL: Zack786@nycap.rr.com

PRINCIPAL INVESTIGATOR: Zack Mian, President

TITLE OF PROJECT: IEM's Video-Based Visibility Sensor System (V2S2)

SUBTOPIC NO.: 8.2.10c

### TECHNICAL ABSTRACT:

Visibility is a crucial safety issue in all transportation fields, and current technology is inadequate for measuring visibility for a number of reasons including (but not limited to) limited area coverage, overgeneral categorization of visibility conditions, expense, need for direct operation and calibration, and lack of ruggedness. Having demonstrated the practicality of its video-based visibility measurement approach in Phase I, IEM Corp. proposes to continue the work begun and create a finalized, commercializable prototype of the Video-based Visibility Sensor System (V2S2). The final result of this research and development work would be a system which would be superior to any current-art or near-future contemplated system in the following areas: cheaper (by at least 60%), more accurate in both visibility distance measurements and in characterizing large areas of variable visibility, far more rugged, completely automatic in both calibration and operation, built-in networking and control features, long-term independent operation, 24-hour year-round operation with real-time measurement updating, unique and proprietary algorithms for visibility calculation, use of natural/current view features rather than custom installed targets, measurement over wide areas, efficient combination of multiple algorithms through neural net application, direct scene transmission with comparative images, and other innovations detailed in the text of the proposal.

### KEYWORDS:

Visibility, Video-Based, Transportation Safety.

### POTENTIAL COMMERCIAL APPLICATIONS OF THE RESEARCH:

Port/Maritime visibility monitoring, roadside visibility warning/monitoring, airport visibility monitors, pollution monitoring, wilderness/park visibility monitoring and wildfire detection, weather monitoring and research.

## FY 2003 PHASE 2 AWARD WINNER

FIRM: Softronics Ltd., Inc.  
6920 Bowman Lane NE  
Cedar Rapids, IA 52402-1576

AWARD: \$221,395.86

PHONE: (319) 431-0314  
FAX: (866) 422-4280  
E-MAIL: Rhsterno@mchsi.com

PRINCIPAL INVESTIGATOR: Robert H. Sternowski, Project Director

TITLE OF PROJECT: High Performance 1 Gsample/second LIDAR Digitizer

SUBTOPIC NO.: 8.2.2R

### TECHNICAL ABSTRACT:

LIDAR (laser radar) is used for oceanographic research, and emits a short light pulse whose return echoes are digitized and analyzed to determine the composition and location of underwater objects. This requires a digitizer with high sampling speed, wide bandwidth commensurate with the pulse width, and high dynamic range. What is needed in reality is a 14 bit, 1 Gsample/second (Gs/s) analog-to-digital converter (ADC), which does not yet exist due to shortcomings of the integrated circuit state-of-the-art. Currently the program is using a 100 MHz logarithmic amplifier and a COTS 8 bit, 1 Gs/s ADC PC plug-in board. Phase 1 proposed, and analytically and experimentally validated, the feasibility of employing a novel array of 12 bit COTS ADCs to achieve the desired dynamic range and bandwidth at a sampling speed of 1 Gs/s. The proposed Phase 2 effort will produce three (3) full proof-of-concept prototype PCI-64 digitizer cards for delivery and NOAA evaluation by implementing and refining the multi-ADC architecture validated in Phase 1.

### KEYWORDS:

Digitizer; analog-to-digital converter; ADC; adaptive; interleaved.

### POTENTIAL COMMERCIAL APPLICATIONS:

Scientific research instrumentation; LIDAR; test equipment; communications (digital radios, cell towers, etc.); government surveillance systems; sonar systems; general purpose signal processing digitizer.

## FY 2003 PHASE 2 AWARD WINNER

FIRM: The R.J. Peacock Canning Company  
72 Water Street  
Lubec, ME 04652

AWARD: \$160,000

PHONE: (207) 733-5556  
FAX: (207) 733-0936  
E-MAIL: Mdevin@maine.edu

PRINCIPAL INVESTIGATOR: Michael Devin, Marine Sciences Technical Expert

TITLE OF PROJECT: Development of Grow-out Techniques for Juvenile Green Sea Urchins

SUBTOPIC NO.: 8.4.1SG

### TECHNICAL ABSTRACT:

This SBIR Phase 2 project looks to develop and further refine the culture conditions to optimize the growth of juvenile green sea urchins (*Strongylocentrotus droebachiensis*), a commercial species not previously cultured as juveniles. We will develop an alternative technology for the New England fishery which now depends only on the harvest of wild urchins. Sea urchin roe is a delicacy in Japan that is the basis of a 250 million+ dollar fishery. Overfishing has devastated natural populations. To date, research and development of sea urchin aquaculture has had two foci: hatchery development, in which we at the Peacock hatchery have played a pivotal role, and roe enhancement of adults. These are certainly two very important stages of the life cycle of sea urchins. However, without bridging them through growout of juvenile sea urchins, sea urchin aquaculture will not become a reality. In Phase 2 of this project we will determine if diet affects the growth and mortality of grow-out of juvenile sea urchins to adult. We will also investigate if diet quality affects gonad development and roe quality in adults. We will also determine if land-based or near-shore grow-out of juvenile sea urchins is more cost-effective.

### KEYWORDS:

*Strongylocentrotus droebachiensis*, juvenile grow-out, green sea urchin

### POTENTIAL COMMERCIAL APPLICATIONS:

With success of both Phase 1 and Phase 2 of our pilot program, we will close the loop on an alternative source of green sea urchins. The fishery has dropped from second to the fifth largest in Maine, over the past three years. Aquaculture of this economically important marine resource will provide a sustainable source for sea urchins. This comes at a time when a significant portion of the Maine coastal areas are severely economically and socially depressed, particularly Washington County, in which Lubec is located.

## FY 2003 PHASE 2 AWARD WINNER

FIRM: E Paint Company  
25 Research Road  
E. Falmouth, MA 02536

AWARD: \$160,000

PHONE: (508) 540-4412  
FAX: (508) 495-3210  
E-MAIL: Mawalsh@capecod.net

PRINCIPAL INVESTIGATOR: M. Alex Walsh, Director of Research

TITLE OF PROJECT: Chitosan-based Foul-release Coatings

SUBTOPIC NO.: 8.4.6SG

### TECHNICAL ABSTRACT:

Rapid biofouling of aquaculture netting necessitates frequent cleaning. Cleaning by scrubbing or pressure washing can consume as much as 40% of total labor. Chemical methods of biofouling control are not approved for the aquaculture industry. Silicone elastomers that release biofouling have been developed. However, these "foul-release" coatings are often more expensive than the netting itself and have short service lives. Novel chitosan-based foul-release coatings were discovered during Phase 1 and are proposed for further development during Phase 2 to overcome these problems. These novel coatings are formed from low-cost, non-toxic and waterborne materials. The objective of this Phase 2 research is to experimentally demonstrate that these coatings control fouling more effectively than industry standards, PDMS and copper-based coatings. Foul-resistance of coatings will be assessed by exposing coated nets and panels at different sites, and recording fouling mass and diversity of organisms as a function of time. Chemical and physical property tests are also planned.

### KEYWORDS:

Antifouling, Biofouling, Aquaculture, Release Coating, Chitosan

### POTENTIAL COMMERCIAL APPLICATIONS:

This research effort will result in an environmentally compliant and cost effective means to controlling fouling. The proposed work will greatly improve aquaculture efficiencies, increasing profitability and making United States culturing operations more competitive in the global market. The market for a low cost, non-toxic solution to biofouling control is very large. Over 44,000 potential aquaculture sites exist worldwide where the technology could be applied. Worldwide use of antifouling coatings for boats and structures exceeds \$1 billion annually. Other possible applications include biochemical polymers, water intake ducts and anti-graffiti coatings.

## FY 2003 PHASE 2 AWARD WINNER

FIRM: Dynaflow, Inc.  
10621-J Iron Bridge Road  
Jessup, MD 20794-9381

AWARD: \$160,000

PHONE: (301) 604-3688  
FAX: (301) 604-3689  
E-MAIL: Glchahine@dynaflow-inc.com

PRINCIPAL INVESTIGATOR: Dr. Georges L. Chahine, President

TITLE OF PROJECT: Development of a PC-based Ship Maneuvering Simulator for Improving Navigation Traffic Within Ports and Harbors

SUBTOPIC NO.: 8.4.10SG

### TECHNICAL ABSTRACT:

The potential for accidents in harbors increases with traffic density. Collisions with other ships or natural obstacles are caused by incorrect controls manipulation by the master in response to some unexpected situation, especially when in a new environment. Continual training for various critical situations on simulators that include realistic topography and the presence of other maneuvering vehicles is an effective means to enhance the experience of masters and pilots and minimize human error. We propose to continue development of the PC based ship simulator DYNASIM<sup>®</sup>, which was shown in Phase I to be able to handle multi-ship dynamics in restricted water and in the presence of waves, wind, currents, and obstacles. Traffic configurations, ship routes, ship characteristics, general topography, bottom and channel configuration, and environmental conditions will be input by the user or read from traffic schedules. The simulator will generate multiple ship tracks and evaluate harbor safety from a systems perspective. The simulator will be used to estimate the likelihood of collision of vessels, traffic densities, and the influence of navigation channel geometry and environmental conditions. It could be used for training by shipmasters and port managers, and by designers for waterway design, improvement and implementation of safety measures.

### KEYWORDS:

Collision avoidance, ship trajectory, ship-ship interaction, ship-obstacle interaction, maneuvering simulation, harbor, traffic safety, traffic management.

### POTENTIAL COMMERCIAL APPLICATIONS:

The developed simulator would be used as a design aid in waterway design. It will assist in evaluating the safety of a waterway or harbor under simulated traffic and weather conditions. It could also be used to evaluate the impact of modifications to channel depth, width, harbor and channel geometry, etc. on ship trajectories and waterway safety. Organizations such as the Maritime Administration, the Army Corps of Engineers, various port authorities, the Coast Guard, and private insurance companies would use it as an efficient tool for establishing ship-maneuvering standards and for conducting inquiries into ship collisions. Mariners would use it for continual training, including on-board simulation and learning of evasive maneuvers. It could also be used for ship system identification and for autopilot control.

**U.S. DEPARTMENT OF COMMERCE/NOAA  
PROPOSALS AND AWARDS  
BY STATE FOR FY 2003**

<b>STATE</b>	<b>PROPOSALS</b>	<b>PH 1 AWARDS</b>	<b>PH 2 AWARDS*</b>
AK	0	0	0
AL	0	0	0
AR	0	0	0
AZ	6	1	0
CA	16	0	0
CO	8	1	1
CT	1	0	0
DC	0	0	0
DE	0	0	0
FL	6	0	0
GA	2	0	0
HI	4	1	1
IA	1	0	1
ID	0	0	0
IL	1	0	0
IN	1	0	0
KS	0	0	0
KY	0	0	0
LA	1	0	0
MA	14	3	2
MD	11	1	1
ME	6	0	1
MI	4	1	0
MN	1	1	0
MO	0	0	0
MS	1	1	0

STATE	PROPOSALS	PH 1 AWARDS	PH 2 AWARDS*
MT	3	0	0
NC	1	0	0
ND	0	0	0
NE	0	0	0
NH	0	0	0
NJ	1	0	0
NM	4	1	1
NV	0	0	0
NY	3	0	1
OH	3	0	0
OK	0	0	0
OR	3	0	0
PA	2	0	0
PR	1	1	0
RI	1	0	0
SC	0	0	0
SD	0	0	0
TN	1	0	0
TX	6	0	0
UT	0	0	0
VA	8	1	0
VT	0	0	0
WA	9	3	0
WI	2	0	0
WV	1	0	0
WY	0	0	0
<b>TOTALS</b>	<b>133</b>	<b>16</b>	<b>9</b>

\* From FY 2002 Phase 1 awardees.