



Small Business Innovation Research Program

ABSTRACTS OF
AWARDS FOR
FISCAL YEAR 2002

**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 15 Phase 1 contracts for FY 2002. These awards of up to \$75,000 each, and totaling approximately \$975,000, 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 2002 (NOAA 2002-1).” 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 8 Phase 2 contracts in FY 2001 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 78 proposals were received by DOC/NOAA in response to its FY 2002 solicitation. The proposals were independently reviewed by DOC/NOAA scientists and/or engineers. With the funds available, only 15 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 2002 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: 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. : 8.1.1R

TECHNICAL ABSTRACT:

This Phase I SBIR research project will investigate the feasibility of an ammonia sensor based on an antimonide laser and an advanced, low noise modulation spectroscopy method. The rapid response and high sensitivity will allow the use of the eddy correlation method to provide continuous measurement of ammonia flux. Minor adjustments to the laser operating point will allow the instrument to measure the flux of methane or nitrous oxide. Tasks in Phase I include modeling and measuring the spectrum of ammonia near 2300 nm, using a simulated annealing algorithm to solve the nonlinear equations optimizing the modulation function and validating the solution with experimental measurements, testing the time response of materials for the sample system, and estimating the performance of a fully engineered system.

SUMMARY OF ANTICIPATED RESULTS:

The Phase I research will determine the best operating wavelength, the best pressure, the best modulation waveform, and the best materials for constructing the Phase II instrument.

POTENTIAL COMMERCIAL APPLICATIONS :

Instrumentation for atmospheric research, improved instruments for pharmaceuticals, medical diagnostics, refineries, and analytical instrumentation.

FY 2002 PHASE 1 AWARD WINNER

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

AWARD: \$74,921

PHONE: (808) 531-3017

FAX: (808) 531-3177

E-MAIL: csullivan@oceanit.com

PRINCIPAL INVESTIGATOR: 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 will demonstrate the feasibility of a compact, lightweight, eye-safe lidar suitable for aerosol gradient detection. The system will be based on an erbium fiber laser operating at 1.55 μ m, currently being developed at Oceanit as part of 3D scanning ceilometer. The laser can operate at greater power than other systems using non-eye-safe wavelengths thus eliminating many of the problems associated with low power aerosol LIDAR systems. Phase I efforts will consist of analysis and modeling of a lidar based on this technology, optimized for high sensitivity aerosol detection. Additionally, efforts will include the development of the prototype design and estimation of final production costs.

SUMMARY OF ANTICIPATED RESULTS:

As a result of Phase I of this proposal, Oceanit will possess a fully detailed design for an aerosol gradient detection system, including projected resolutions and performance analysis.

POTENTIAL COMMERCIAL APPLICATIONS:

Potential commercial applications include pollution detection systems, dual use ceilometer, and aerosol detection devices to be used for ship borne cloud height measurement and CBW sensing.

FY 2002 PHASE 1 AWARD WINNER

FIRM: Science & Engineering Services, Inc
4032 Blackburn Lane
Burtonsville, MD 20866-1168

AWARD: \$74,976

PHONE: (301) 989-1896

E-MAIL: ih@sesi-md.com

PRINCIPAL INVESTIGATOR: I. H. Hwang, Commercial Director

TITLE OF PROJECT: Portable Aerosol Lidar

SUBTOPIC NO.: 8.1.2R

TECHNICAL ABSTRACT:

An inexpensive aerosol lidar is proposed by combining inexpensive fiber coupled diode laser and photon counting detection technology for air quality monitoring in metropolitan area. The combination of inexpensive light source and high sensitivity photon detection technology developed in the "Micro Pulse Lidar" project will result in a rugged and affordable lidar system for air pollution monitoring and atmospheric studies. A simulation was performed to identify the feasibility of a successful lidar system with currently available fiber coupled diode laser and optical components. The simulation assures the possibility of development of inexpensive aerosol lidar system within current technology bases.

SUMMARY OF ANTICIPATED RESULTS:

The main result of this project is the experimental verification of possibility of affordable aerosol lidar system with a fiber coupled diode laser and photon counting technology.

POTENTIAL COMMERCIAL APPLICATIONS:

When the project successfully lays out the inexpensive aerosol lidar, the lidar will be used in major weather stations and airports for accurate weather forecasting, in place of the ceilometer. Also the developed lidar can be extensively used for air pollution monitoring in urban area and industrial area.

FY 2002 PHASE 1 AWARD WINNER

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

AWARD: \$74,998

PHONE: (303) 792-5615

FAX: (303) 792-5633

E-MAIL: brad.veatch@adatech.com

PRINCIPAL INVESTIGATOR: Bradley D. Veatch, Research Engineer

TITLE OF PROJECT: A Distributed Platform Automated Balloonsonde Launcher

SUBTOPIC NO.: 8.1.3GP

TECHNICAL ABSTRACT:

Atmospheric researchers rely heavily on balloon-borne sondes to obtain altitude-dependent data called "vertical sounding profiles." Typically, trained personnel on land or sea vessels manually launch balloons, at substantial cost. A relatively low-cost, adaptable, and portable automated launcher suitable for land and marine applications is highly desired. Building upon earlier work, ADA Technologies proposes to create an expandable, automated launcher "base component" for ready use by others building sophisticated new research tools. ADA will further develop its distributed "launch-module" concept to permit balloon releases in cold temperatures, gusting and sustained winds, and precipitation. Sonde pre-launch conditioning and calibration requirements will also be addressed.

SUMMARY OF ANTICIPATED RESULTS:

ADA will complete the development of a prototype automated launch module, and in conjunction with existing hardware will prove its ability to release balloons reliably in severe weather conditions.

POTENTIAL COMMERCIAL APPLICATIONS:

ADA's automated launcher will ultimately allow balloonsonde launches, from both land- and sea-based sites, for a fraction of the cost of current launching methods. The system is expected to appeal widely to atmospheric researchers at universities, government agencies, and the military, and will be offered as an off-the-shelf component adaptable for use in new research tools and scientific explorations.

FY 2002 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: William H. Bauman III, Government Programs Manager

TITLE OF PROJECT: A Low-cost Mobile Automated Sonde Launching System

SUBTOPIC NO.: 8.1.3W

TECHNICAL ABSTRACT:

We describe a radiosonde launch system that is automatic, robust, fault-tolerant, and mobile. Once loaded, for each cycle the system will automatically: 1) Determine ambient conditions, 2) power up a radiosonde, 3) tune the receiver, 4) initialize sonde communication, 5) performs pre-launch calibration, 6) start data acquisition software, 7) inflate a balloon and verify inflation, 8) release the balloon and sonde, 9) continuously capture data for duration of flight, 10) stop data capture, 11) transfer data to a central data archive, and 12) return to an idle state and prepare for the next launch.

SUMMARY OF ANTICIPATED RESULTS:

Phase I will establish the desired specifications and produce a prototype of the proposed launcher. We will undertake modeling and prototyping of the key critical components. Once the model is complete and each of the components parameterized, we will construct a mechanical embodiment. Finally, we will test these components and write a final report.

POTENTIAL COMMERCIAL APPLICATIONS:

The new launcher would represent a significant improvement in the price vs. performance of launching radiosondes for the National Weather Service, Department of Defense, the National Center for Atmospheric Research, as well as the Department of Energy. It is fundamental to climate monitoring programs as well as climate change research. The worldwide market for such a system is nearly one thousand systems (roughly \$30-50 million).

FY 2002 PHASE 1 AWARD WINNER

FIRM: Luna Innovations Incorporated
PO Box 11704
Blacksburg, VA 24062-1704

AWARD: \$74,957.00

PHONE: (540) 953-4274

FAX: (540) 951-0760

E-MAIL: linkousg@lunainnovations.com

PRINCIPAL INVESTIGATOR: Robert Harman

TITLE OF PROJECT: Wireless Interconnects for Environmental Sensing Applications

SUBTOPC NO.: 8.1.4W

TECHNICAL ABSTRACT:

Data collection electronics used for monitoring meteorological and oceanographic sensors onboard remote vessels and/or at coastal facilities can be significantly enhanced by the development of wireless enabled monitoring systems, especially those with implementation costs and performance characteristics comparable to current 'wired' approaches. Furthermore, all situations where a reliable, low cost wireless link can be established in lieu of wires/cables could easily result in major savings to the NOAA. Eliminating sensor cables often eliminates the most common failure point in data acquisition / measurement systems. However, the benefits associated with wireless interconnects cannot be realized until the numerous technical challenges related to implementing wireless links are overcome. The proposed Phase I program will first focus on determining candidate cables for replacement and the overall system impact. This includes compatibility issues, power requirements, system bandwidth and range capabilities and the possible problems associated with RF transmissions. Requirements for those wireless links will be documented and used to evaluate the usefulness of COTS wireless technologies. Luna will draw conclusions about the feasibility of wireless links on typical NOAA stations, and will offer creative ideas and a plan for adapting COTS products and/or developing new technologies and methods to meet the special requirements.

SUMMARY OF ANTICIPATED RESULTS:

During the Phase I effort, Luna will identify the critical performance metrics, survey possible solution technologies, design and demonstrate a working prototype of the system, and then make contact with key industry partners to market the developed technologies. In addition, all characteristics of the proposed designs will be evaluated theoretically and/or experimentally with careful attention to cost, manufacturability, reliability, installation concerns, and operator interface. The anticipated result of the Phase I research is a well-defined development path for a marketable wireless interconnect system.

POTENTIAL COMMERCIAL APPLICATIONS:

Luna Innovations anticipates large non-defense related markets in wireless cable replacement arena utilizing currently available wireless technologies. Specific applications include remote networking, mobile computing, wireless computer peripherals, and industrial process control and sensor systems.

FY 2002 PHASE 1 AWARD WINNER

FIRM: Softronics Limited
6920 Bowman Lane NE
Cedar Rapids, IA 52402-1576

AWARD: \$60,335.00

PHONE: (319) 431-0314

E-MAIL: rhsterno@home.com

PRINCIPLE INVESTIGATOR: Robert H. Sternowski, President

TITLE OF PROJECT: Measuring Depth Profiles of Scattering in the Ocean

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 14-16 bit, 1 Gsample/second (Gs/s) analog-to-digital converter (ADC), which does not yet exist. Currently the program is using a 100 MHz logarithmic amplifier and a COTS 8 bit, 1 Gs/s ADC PC plug-in board. This study will validate the feasibility of employing a novel array of 12- 14 bit COTS ADCs to achieve the desired 500 MHz bandwidth with 1 Gs/s, and define a specification and detailed technical approach to Phase 2 implementation as a computer plug-in board.

SUMMARY OF ANTICIPATED RESULTS:

Phase 1: design, breadboard 1 Gs/s, 12 bit digitizer; Phase 2: Prototypes

POTENTIAL COMMERCIAL APPLICATIONS:

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

FY 2002 PHASE 1 AWARD WINNER

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

AWARD: \$74,999.88

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.: 8.2.10 O

TECHNICAL ABSTRACT:

IEM is an established sensors and instrumentation company with transportation measurement systems in 15 countries. Visibility is one of the most critical pieces of environmental information in promoting safe traffic operation and traffic management in all modes of transportation: ground, maritime, and air. Typical visibility sensors determine the scattering properties within a relatively small air volume, and then use a transfer algorithm to convert that observation into a distance measurement equivalent to that which a human observer would report. In this project, IEM proposes to develop a low cost, innovative video technology based visibility sensor design and preliminary prototype to conduct the Phase I feasibility. Using natural targets present within the scene, IEM's approach will focus on novel algorithms and imaging hardware to calculate reliable visibility data in all 'weather conditions day and night. In addition, IEM's design will be based on low power battery operated hardware suitable for remote operation for long periods. The proposed visibility sensor will be networkable to communicate with the infrastructure. This project will be carried out in cooperation with Climatronics, New York State MESONET Program, and New York State ITS Testbed. IEM has an excellent team of instrumentation and sensor engineers with prior successful weather sensor projects completed with the US-DOD.

SUMMARY OF ANTICIPATED RESULTS:

IEM anticipates proving the feasibility and designing the system components for the proposed Video Based Visibility Sensor System. These results will allow IEM to move on, during a Phase II project, to develop, test and demonstrate a completed V2S2.

POTENTIAL COMMERCIAL APPLICATIONS:

IEM has contacted several organizations interested in collaborating in this project: NY State Department of Transportation; NY State Energy Research and Development Authority; NY State MESONET Program; the US Coast Guard; and Climatronics, a manufacturer interested in joint marketing.

FY 2002 PHASE 1 AWARD WINNER

FIRM: DYNAFLOW. INC
10621-J Iron Bridge Road
Jessup, MD 20794

AWARD: \$50,000

PHONE: (301) 604-3688

FAX: (301) 604-3689

E-MAIL: glchahine@dynaflow-inc.com

PRINCIPAL INVESTIGATOR: Georges L. Chahine, President

TITLE OF PROJECT: Development of a PC-Based Multi-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 reduced reaction time in an unexpected situation. We propose to develop a PC-Windows based ship simulator, which will be able to simulate multi-ship dynamics in restricted water, in the presence of waves, wind, currents, and obstacles. General topography, channel configuration, and environmental conditions will be input by the user. The simulator will be able to generate multiple ship tracks and evaluate harbor safety from a system perspective. Such a simulator will be used to estimate the likelihood of collision for various types of vessels, traffic densities, navigation channels geometries and environmental conditions. It can also be used for continual training of masters and pilots to minimize human error, and by harbor designers and port managers for structures and waterway design, modification, improvement and implementation of safety measures.

SUMMARY OF ANTICIPATED RESULTS:

A Physics-based tool to study scenarios of multi-ship traffic within a harbor to analyze and improve safety measures.

POTENTIAL COMMERCIAL APPLICATIONS:

The developed simulator will be used as a design aid and a system evaluator in waterway design. It will assist in evaluating the safety of a waterway or harbor under simulated traffic and weather conditions. It can also be used to evaluate the impact of modification to channel depth, width, harbor and channel geometry, etc. on ship trajectory and waterway safety. Organizations such as the Maritime Administration, the Army Corps of Engineers, various port authorities, the Coast Guard, and private insurance companies could use it as an efficient tool for establishing ship-maneuvering standards and for conducting inquiries into ship collisions. Mariners could 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.

FY 2002 PHASE 1 AWARD WINNER

FIRM: Montec Research
1901 South Franklin
Butte, MT 59701

AWARD: \$50,000.00

PHONE: (406) 723-2222

FAX: (406) 723-2225

E-MAIL: smcgrath@montecresearch.com

PRINCIPAL INVESTIGATOR: Steven McGrath, Senior Research Scientist

TITLE OF PROJECT: The Resonant Sonic Fluidized Bed (RSFB) Biofilter for Closed Loop Aquaculture

SUBTOPIC NO.: 8.4.1SG

TECHNICAL ABSTRACT:

Because of the impact of diseases on production and the environmental devastation wrought by commercial aquaculture effluents, modern methods of intensive aquaculture are evolving which rely heavily on the re-use of water. This proposal addresses the need for modular technology in closed loop aquaculture operations by enhancing the performance of a fluidized bed biofilter with low-frequency acoustic agitation to accelerate mass transfer of dissolved oxygen and other components. The low shear agitation will enable biofilms of active organisms to thrive on the support media. Additionally, the agitation will prevent fouling of the media with organic material, which severely compromises the ability of the filter to reduce ammonia concentrations. The Resonant Sonic Fluidized Bed (RSFB) Biofilter will provide a low cost improvement that will enable a small modular treatment unit to function with the same efficiency as a much larger system.

SUMMARY OF ANTICIPATED RESULTS:

Successful completion of this research will demonstrate a new method of biofilter operation that increases productivity and reduces the size of filter required for an application.

POTENTIAL COMMERCIAL APPLICATIONS:

Aquaculture is growing faster than any other form of agriculture, creating worldwide demand for new technology that can make closed system, biosecure operation affordable. The technology will also have application in wastewater treatment.

FY 2002 PHASE 1 AWARD WINNER

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

AWARD: \$50,000

PHONE: (207) 733-5556

FAX: (207) 733-2034

E-MAIL: rpeacock@trufresh.com

PRINCIPAL INVESTIGATOR: CAPT Robert Peacock, President

TITLE OF PROJECT: Development of Growout Techniques for Juvenile Sea Urchins

SUBTOPIC NO.: 8.4.1SG

TECHNICAL ABSTRACT:

This SBIR Phase 1 project proposes to develop and refine the culture conditions to optimize the growth and survivorship of juvenile sea urchins (Strongylocentrotus droebachiensis), a commercial species not previously cultured. Sea urchin roe is a delicacy in Japan, that is the basis of a \$500 millions fishery worldwide. 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 two 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 1, we will determine the temperature and diet parameters to optimize growth and mortality of juvenile sea urchins. In Phase 2, we will concentrate on large-scale husbandry techniques, grow-out systems, and land- vs. ocean-based culture methods.

SUMMARY OF ANTICIPATED RESULTS:

We expect to determine the optimum temperature and diet to maximize growth and minimize mortality of juvenile sea urchins.

POTENTIAL COMMERCIAL APPLICATIONS:

With success of both Phase 1 and 2 of our pilot program, we will close the loop on an alternative source of green sea urchins. 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 is economically and socially depressed, particularly in Washington County, in which Lubec is located.

FY 2002 PHASE 1 AWARD WINNER

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

AWARD: \$49,950.48

PHONE: (508) 540-4412

FAX: (508) 495-3210

E-MAIL: alex@epaint.net

PRINCIPAL INVESTIGATOR: M. Alex Walsh, Director of Research

TITLE OF PROJECT: Chitosan-based Foul-release Coatings for Aquaculture

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 are proposed to overcome these problems. These coatings are formed from low-cost, non-toxic and waterborne materials. The objective of this research is to experimentally demonstrate that these coatings control fouling more effectively than the industry standard, PDMS. Foul-resistance of coatings will be assessed by exposing coated nets and panels at five different sites, and recording fouling mass and diversity of organisms as a function of time. Chemical and physical property tests are also planned.

SUMMARY OF ANTICIPATED RESULTS:

This research effort will result in an environmentally compliant and cost effective means to controlling fouling that will greatly improve aquaculture efficiencies, increasing profitability and making United States culturing operations more competitive in the global market.

POTENTIAL COMMERCIAL APPLICATIONS:

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 biomedical polymers, water intake ducts, and anti-graffiti coatings.

FY 2002 PHASE 1 AWARD WINNER

FIRM: OmniSite BioDiagnostics
101 West Sixth Street, Ste. 200
Austin, TX 78701

AWARD: \$49,989.00

PHONE: (512) 479-7732

FAX: (512) 494-0756

E-MAIL: bruno@spec.com

PRINCIPAL INVESTIGATOR: John G. Bruno, Chief Technical Officer

TITLE OF PROJECT: FP-Aptamer Reader for Algal Toxins

SUBTOPIC NO.: 8.4.7SG

TECHNICAL ABSTRACT:

OmniSite BioDiagnostics (OmniSite) proposes to develop artificial receptors composed of DNA oligomers (called "Aptamers") for binding and detecting algal toxins. DNA aptamers can be mass produced with relative ease compared to antibody production and purification. The aptamers will be 5'-Cy 5 fluorochrome labeled and used in simple one-step binding fluorescence polarization (FP) assays that do not require wash steps. In Phase 1, OmniSite proposes to generate a set of specific fluoresceinated DNA aptamers to bind and detect Brevetoxin and Saxitoxin. Detection of the aptamer bound toxins will be accomplished via an FP breadboard system to be designed and constructed by OmniSite. In Phase 2, OmniSite will produce a hand-held FP prototype detector with wireless Internet connectivity so that test results can be accessed remotely. In addition, OmniSite will clone and sequence the anti-toxin aptamers and optimize FP aptamer assays for field use by water and seafood inspectors.

SUMMARY OF ANTICIPATED RESULTS:

OmniSite BioDiagnostics, Inc. expects to generate a set of high affinity and highly selective DNA aptamers to brevetoxin and saxitoxin by the SELEX process and to incorporate these reagents into fluorescence polarization (FP) assays for its compact or handheld readers.

POTENTIAL COMMERCIAL APPLICATIONS:

Clearly, the aptamers and assays developed under this project would be commercially viable for use in the seafood industry. In addition, the biotechnology, engineering and other experiences gained would aid in marketing other aptamer-FP assays and FP readers for the environmental or pollution monitoring and clinical diagnostics markets.

FY 2002 PHASE 1 AWARD WINNER

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

AWARD: \$50,000

PHONE: (808) 531-3017

FAX: (808) 531-3177

E-MAIL: kcheung@oceanit.com

PRINCIPAL INVESTIGATOR: Ken Cheung, Senior Research Engineer

TITLE OF PROJECT: An Unstructured Mesh Adaptation Algorithm for Ship Interaction Simulations

SUBTOPIC NO.: 8.4.9SG

TECHNICAL ABSTRACT:

The dynamics of ships interacting with other ships and with harbor structures and boundaries is a difficult computational fluid dynamics (CFD) problem for several reasons: geometric complexity, modeling of the free surface, and large Reynolds numbers involved. The proposed research will employ several approaches and techniques to simplify the problem to a manageable level while maintaining modeling fidelity. Among these are to initially use a potential flow approximation (i.e., neglect the effects of viscosity), linearize the free surface and develop an unstructured deforming adaptive mesh algorithm for relative ship motion. Of these, the three-dimensional deforming mesh will be the greatest challenge, and Phase I will concentrate on developing this method and demonstrating the feasibility of using this method to accurately model multiple vessels in a harbor environment. Successful development will pave the way for a time-varying, unsteady, 3-D flow solver employing the mesh algorithm.

SUMMARY OF ANTICIPATED RESULTS:

Successful Phase I research will result in an unstructured deforming adaptive mesh in three dimensions which will be capable of modeling relative motions between vessels. This is considered to be the greatest challenge in developing a three-dimensional hydrodynamic model for multiple vessels.

POTENTIAL COMMERCIAL APPLICATIONS:

The proposed research and development will have substantial value to both civil and defense agencies in the areas of harbor and marina design and operation, boat-traffic safety, hydrodynamic effects on coastal structures, design of wave-mitigation measures, pollution/spill transport and mitigation, and the effects of boat movement on sedimentation and water quality. The fundamental advances in three-dimensional, unsteady mesh algorithms will also be valuable for general hydrodynamic modeling, especially for defense applications. Commercialization efforts will include both military and non-military markets.

FY 2002 PHASE 1 AWARD WINNER

FIRM: GMA Industries. Inc.
20 Ridgely Avenue, Suite 301
Annapolis, MD 21401

AWARD: \$75,000

PHONE: (410) 267-6600

FAX: (410) 267-6602

E-MAIL: glenn@gmai.com

PRINCIPLE INVESTIGATOR: R. Glenn Wright, President

TITLE OF PROJECT: Raster to Vector GIS Chart Conversion Through Lossless Compression

SUBTOPIC NO.: 8.5.1 O

TECHNICAL ABSTRACT:

The proposed effort utilizes the by-product of an existing lossless compression process for digitized raster GIS charts as the basis for vector conversion. This process uses multiple resolutions of the raster image to recognize and extract text, symbol, contour, and color data while preserving the original chart features. These data are stored as objects in an electronic database optimized for data compression. The proposed effort organizes this data representation into a format suitable for vector conversion, and development of the user interface appropriate for fully utilizing the resulting vector data. Prototype software development for raster to vector conversion of an existing digitized nautical chart is performed.

SUMMARY OF ANTICIPATED RESULTS:

Software to automate much of the raster to vector conversion process for GIS charts, with provisions for user intervention to complete vector products where automated methods are not possible.

POTENTIAL COMMERCIAL APPLICATIONS:

Significant commercial applications exist in existing marine chart applications, as well as aeronautical and other chart applications.

FY 2002 PHASE 2 AWARD WINNER

FIRM: GSSL, Inc.
P.O. Box 909
Tillamook, OR 97141-0909

AWARD: \$300,000.00

PHONE: (503) 842-1990

FAX: (503) 842-1923

E-MAIL: koh@gsslinc.com

PRINCIPAL INVESTIGATOR: Koh Murai, Engineering Manager

TITLE OF PROJECT: 3DR Superpressure Balloon for Development of In-Situ Environmental Sensors

SUBTOPIC NO.: 8.1.1R

TECHNICAL ABSTRACT:

In-situ measurement of meteorological, atmospheric chemistry, and oceanic parameters for regional models would aid greatly in the understanding of critical processes and provide the necessary data for national policy decisions on significant environmental issues. Three Dimensional Reinforced (3DR) membranes have the ability to offer a dramatic reduction in the required envelope mass for balloons designed for long duration platforms which will reduce the volume while significantly increasing both payload and duration capabilities. The application of this space technology provides an innovative method of using a combination of films and fibers for locally reinforcing a balloon envelope based on its specific design requirements. In Phase 1, 3DR was evaluated for its applicability to meeting the requirements of NOAA's GAINS program. Results showed that envelope volumes could be reduced by 25-33% resulting in a 33-43% reduction in envelope mass. The Phase 2 goal is to provide empirical validation to 3DR's potential for practical application and commercialization of terrestrial balloon platforms. The Phase 2 technical objectives include validating the 3DR design and material selection methods, and reducing the experimental fabrication procedures to acceptable production processes. This will be accomplished through the development and testing of a commercially viable wind tracer balloon.

KEYWORDS:

3DR, Long Duration Balloon Platform, Wind Tracer, In-situ Measurements.

POTENTIAL COMMERCIAL APPLICATIONS:

3DR tracer balloon technology will support a wide variety of applications ranging from scientific research to environmental monitoring, communications platforms, and remote sensing. Primary application is a platform for tracing wind patterns, but lightweight instruments can also provide crucial in-situ measurements for calibrating and correlating satellite and other remote sensing data.

FY 2002 PHASE 2 AWARD WINNER

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

AWARD: \$300,000

PHONE: (303) 817-6854

FAX: None

E-MAIL: jrs_aos@Hotmai1.COM

PRINCIPAL INVESTIGATOR: James R. Smith, President

TITLE OF PROJECT: High Precision Monitoring Instrumentation for the Earth's CO2 Background

SUBTOPIC NO.: 8.1.2R

TECHNICAL ABSTRACT:

The phase I research was successful. An analyzer was designed and built, and it meets all five criteria of the DOC solicitation subtopic. We are proposing to: (1) build and incorporate copies of the analyzer into three detection systems, each to be constructed and customized for a platform of opportunity (buoy, ship, mountain); (2) make rigorous observations from each platform, lasting approximately one year, of the Earth's CO2 background; and (3) thereby prove the systems' utility and economic viability to the scientific community.

KEYWORDS:

Carbon Dioxide, Analyzer, Detection Systems, Monitoring, Global Carbon Cycle.

POTENTIAL COMMERCIAL APPLICATIONS:

Detection Systems for continuous monitoring of the Earth's CO2 background from air, sea, ground. Inexpensive, accurate, precise analyzers of carbon dioxide.

FY 2002 PHASE 2 AWARD WINNER

FIRM: Mayur Technologies. Inc
238 Amberleigh Drive
Silver Spring, MD 20905

AWARD: \$299,996

PHONE: (301) 464-2542

FAX: (301) 464-4233

E-MAIL: Suresh@mayurtech.com

PRINCIPAL INVESTIGATOR: Ramachandran Suresh, President

TITLE OF PROJECT: Observing Station Metadata System

SUBTOPIC NO.: 8.1.6W

TECHNICAL ABSTRACT:

Mayur Tech demonstrated a prototype web based system for submitting and storing observational station metadata for NOAA NWS programs during phase 1. We propose to develop this prototype into a complete metadata operational system leading to the development of commercial tools in phase 2. Mayur Tech plans to enhance the current CSSA metadata system, and add new functionality to NWS and FAA sites. The proposed system will enable users to add/update metadata and digital camera imagery easily through the web interface. Mayur Tech intends to add new projects and users such as Climate Reference Network and Mesonets (mesoscale synoptic networks) in consultation with NOAA NWS staff.

Specifically we propose to complete and develop the following:

- Enhancement of Station metadata system to include new fields and features identified by users,
- Operational field testing of the system,
- Architecture and system to include new potential users such as CRN and Mesonets,
- Metadata standard that will work for multiple sources of metadata providers,
- Tools to improve the timeliness and quality of meta data,
- Portable Data Collection System (PDCS) for use in the field for data or metadata entry and communication, and
- Comprehensive multimedia user training/documentation materials.

KEYWORDS:

Weather Observation, Metadata, WWW, Oracle, XML, PDCS, Training.

POTENTIAL COMMERCIAL APPLICATIONS:

Portable Data Collection System (PDCS), PDA/Wireless web-based applications for remote data/metadata entry systems would have considerable utility for a number of commercial applications including inventory status and tracking, instrument calibration data, and other field-based reporting systems. The increased availability of Internet access to wireless applications recently will open many new areas of applications for the PDCS technologies. PDCS can also be used in other federal, state, and local agencies for field data collection and transmission.

FY 2002 PHASE 2 AWARD WINNER

FIRM: Southland Fisheries Corp.
600 Old Bluff Road
Hopkins, SC 29061

AWARD: \$200,000.00

PHONE: (803) 776-4923

FAX: (803) 776-4975

E-MAIL: sfcfish@aol.com

PRINCIPAL INVESTIGATOR: Jesse A. Chappell, President

TITLE OF PROJECT: Controlled Commercial Production of Cobia (Rachycentron canadum) Juveniles from Captured Wild Adults in Tanks and Ponds

SUBTOPIC NO.: 8.4.1SG

TECHNICAL ABSTRACT:

Larviculture of marine finfish to provide feed trained healthy seedstock is a major constraint to the merging marine aquaculture industry. Recent research (Phase 1) in the U.S. and some anecdotal information from Asian services have shown success in captive habituation, maturation and spawning wild adult cobia broodstocks and production of high quality eggs/larvae. Larviculture of cobia fry was shown to be technically and economically feasible in our Phase 1 project, where newly hatched fry were reared in intensively managed tanks and earthen ponds. Our Phase 2 objectives are to: 1) habituate, mature, and spawn adult cobia, extend their spawning season; 2) duplicate and improve to commercial scale larval rearing in indoor and outdoor systems; and 3) develop a detailed economic model describing juvenile cobia development in intensively managed tanks and earthen ponds.

KEYWORDS:

Cobia (Rachycentron canadum), Production, Fingerling, Seed Stock, Larval Rearing Technology, Indoor Larval Rearing.

POTENTIAL COMMERCIAL APPLICATIONS:

Development of an economically viable commercial technology, which allows the reliable controlled production of Cobia juveniles, will be a major breakthrough in the development of marine seedstock availability. Habituation of wild adults and conditioning for spawning indoors leads to potential opportunities for year-round spawning and production of cobia fingerlings. This accomplishment would be a major stride forward in US marine aquaculture development with a high value fish.

FY 2002 PHASE 2 AWARD WINNER

FIRM: Phycotransgenics, L.L.C.
3416 Ashwood Drive
Bloomington, IN 47401

AWARD: \$199,650

PHONE: (812) 339-3057

FAX: (773) 913-0934

E-MAIL: wagner@phycotransgenics.com

PRINCIPAL INVESTIGATOR: Richard E. Wagner

TITLE OF PROJECT: Development of Microalgal-Based Vaccines for Fish

SUBTOPIC NO.: 8.4.5SG

TECHNICAL ABSTRACT:

Phycotransgenics goal is to develop a vaccine delivery system using microalgae to reduce disease-associated costs for aquaculture. To accomplish this, we transformed *Chlamydomonas*, a single-cell algal species, with an antigen gene. Through our Phase 1 Program, we demonstrated that: 1) an antigen expressed in our algae can elicit an immune response in fish, and; 2) using our microalgal delivery system, vaccines can be delivered to fish in several forms, as a feed, beverage, or immersion product. In Phase 2 we will develop a commercial prototype of our microalgal-based antigen delivery system. We will express an antigen of the IHN virus in our algae and conduct vaccine efficacy studies on fish challenged by IHNV. Fish will be vaccinated in an immersion bath or by medicated feed (orally). The final objective of our research is to produce a mediated feed for oral vaccination that meets industry standards.

KEYWORDS:

Aquaculture, Algae, Antigen, *Chlamydomonas*, Fish, Vaccine, Disease, Immunity.

POTENTIAL COMMERCIAL APPLICATIONS:

One of the major constraints on productivity in any high-intensity agricultural system is disease. On average 10-30% of farmed finfish and up to 50% of farmed shrimp (> \$3 billion) are lost each year due to disease. Lacking is an economical and effective method of administering vaccines. We believe that our microalgal-based vaccine delivery system meet this industry need.

FY 2002 PHASE 2 AWARD WINNER

FIRM: DYNAFLOW, INC.
10621-J Iron Bridge Road
Jessup, MD 20794

AWARD: \$200,000.00

PHONE: (301) 604-3688

FAX: (301) 604-3689

E-MAIL: glchahine@dynaflow-inc.com

PRINCIPAL INVESTIGATOR: Georges L. Chahine, President

TITLE OF PROJECT: A Computational Tool for Simulating Hydrodynamic Behavior of Multiple Vessels in a Harbor

SUBTOPIC NO.: 8.4.8SG

TECHNICAL ABSTRACT:

The hydrodynamic characteristics of a vessel are affected in restricted waters by the proximity of nearby moving or moored vessels. Interactions can result in large motions, potential collisions and significant loads on nearby structures, banks, and sediments. In Phase 1, we developed and demonstrated feasibility of a PC-Based numerical code for the prediction of the hydrodynamics of multiple vessels. We propose to complete development of this computationally efficient code into a marketable tool to simulate wave-vessel-harbor-bank interactions. We will conduct more substantial R & D efforts and include generalized environmental input and boundary conditions. The performance of the code will be improved by implementing more efficient memory and CPU utilization methods and optimized discretization schemes. The code will be further validated with results from the literature and small-scale controlled experiments. This tool will enable users to predict transient loads of moving ships on one another, on moored ships, and on banks and coastal structures, and to derive hydrodynamic coefficients for real-time simulators. User-friendly interfaces will be developed to enhance marketability. Marketing efforts will benefit from our overall effort to market our 3DYNAFS © boundary element code.

KEYWORDS:

Ship Hydrodynamics. Ship-Ship Interaction, Wave Dynamics, Harbor, Waterway, Boundary Element Method.

POTENTIAL COMMERCIAL APPLICATIONS:

The software package will be developed to be a user-friendly computational simulation and analysis tool for coastal, harbor, and marine engineers and practitioners. The code will be useful for practitioners interested in the determination of the hydrodynamics of multiple-ship interactions, wave loads on banks and shores, near-shore waves for navigation, shipping control, vessel mooring and berthing and their response to storms, traffic scheduling, harbor tranquility and response to large waves, amphibious landing, harbor design and dredging, and tracking of free or loosely-tethered objects. This tool will assist in making safer and more efficient operations of vessels in harbors, inland waterways, and channels.

FY 2002 PHASE 2 AWARD WINNER

FIRM: GMA Industries, Inc.
20 Ridgely Avenue, Suite 301
Annapolis, MD 21401

AWARD: \$300,000.00

PHONE: (410) 267-6600

FAX: (410) 267-6602

E-MAIL: glenn@gmai.com

PRINCIPAL INVESTIGATOR: R. Glenn Wright, President

TITLE OF PROJECT: Multiresolution Raster Chart Image Digitization and Compression

SUBTOPIC NO.: 8.5.1 O

TECHNICAL ABSTRACT:

The proposed research focuses on achieving significant gains in the ability to compress the information contained within raster images of nautical charts in such a manner that aids the characterization and acquisition of metadata pertaining to individual chart features. Present NOAA electronic nautical charts, which consist of raster images that are inherently difficult to compress without loss of data, provide little opportunity for enhancement beyond the mere display of their information. Multiple resolution analysis and neural networks are used to recognize and extract text, symbol, contour, and color data while preserving the original chart features. Data stored as objects in an electronic database enable their future use directly for navigation and information, and lossless compression of the raster chart image is performed to achieve greater compression.

KEYWORDS:

Digital Charts, Raster Charts, Vector Charts, MRA, Neural Networks, Navigation.

POTENTIAL COMMERCIAL APPLICATIONS:

There is a large commercial market for electronic charts as evidenced by the proliferation of computer-based navigation programs at recreational boating and marine industry trade shows. The product of our research represents a new generation of electronic chart with true metadata query capability that would be highly useful to both the recreational boating and professional maritime industries.

FY 2002 PHASE 2 AWARD WINNER

FIRM: Neptune Sciences, Inc.
40201 Highway 190 East
Slidell, LA 70461-2443

AWARD: \$298,652

PHONE: (985) 649-7252

FAX: (985) 649-9679

E-MAIL: mearle@neptunesci.com

PRINCIPAL INVESTIGATOR: Marshall D. Earle, Sr. Oceanographer, VP

TITLE OF PROJECT: GPS-Tracked Buoy for Hydrographic Survey Applications

SUBTOPIC NO.: 8.5.4 O

TECHNICAL ABSTRACT:

A long standing problem in oceanography and hydrography is accurate real-time measurement of offshore water levels. The Phase 1 research involved investigating a wide range of recent techniques and technologies, and performing analyses and trade-off studies to evaluate, select, and integrate them into a GPS-tracked buoy system (buoy, shore reference station for differential GPS, and repeater stations to optionally increase radio ranges). A key Phase 1 result is a preliminary prototype system design. The system should provide cm level water level accuracies. The buoy can be deployed and recovered from small vessels. During Phase 2, the system will be designed in detail, built, laboratory and field tested, and evaluated. Research will include developing the system software including GPS analyses, buoy motion corrections, and water level analyses. An operational system will be designed for Phase 3 commercialization.

KEYWORDS:

Buoys, Global Positioning System (GPS), Hydrographic Surveys, Tides, Water Levels.

POTENTIAL COMMERCIAL APPLICATIONS:

Government organizations in many countries and numerous companies would use GPS- tracked buoys to support hydrographic surveys. For example, about 500,000 square nautical miles of the U.S. Exclusive Economic Zone is navigationally significant. Water level data are also important for many research areas. Research users would be a second customer base.

**U.S. DEPARTMENT OF COMMERCE/NOAA
PROPOSALS AND AWARDS
BY STATE FOR FY 2002**

| STATE | PROPOSALS | PH 1 AWARDS | PH 2 AWARDS* |
|--------------|------------------|--------------------|---------------------|
| AK | 0 | 0 | 0 |
| AL | 0 | 0 | 0 |
| AR | 0 | 0 | 0 |
| AZ | 0 | 0 | 0 |
| CA | 13 | 0 | 0 |
| CO | 4 | 1 | 1 |
| CT | 2 | 0 | 0 |
| DC | 0 | 0 | 0 |
| DE | 1 | 0 | 0 |
| FL | 4 | 0 | 0 |
| GA | 1 | 0 | 0 |
| HI | 3 | 2 | 0 |
| IA | 3 | 1 | 0 |
| ID | 0 | 0 | 0 |
| IL | 0 | 0 | 0 |
| IN | 0 | 0 | 1 |
| KS | 0 | 0 | 0 |
| | | | |
| KY | 0 | 0 | 0 |
| LA | 3 | 0 | 1 |
| MA | 8 | 2 | 0 |
| MD | 9 | 3 | 3 |
| ME | 2 | 1 | 0 |
| MI | 1 | 0 | 0 |
| MN | 0 | 0 | 0 |
| MO | 1 | 0 | 0 |
| MS | 0 | 0 | 0 |

| STATE | PROPOSALS | PH 1 AWARDS | PH 2 AWARDS* |
|---------------|-----------|-------------|--------------|
| MT | 2 | 1 | 0 |
| NC | 0 | 0 | 0 |
| ND | 0 | 0 | 0 |
| NE | 0 | 0 | 0 |
| NH | 1 | 0 | 0 |
| NJ | 1 | 0 | 0 |
| NM | 1 | 1 | 0 |
| NV | 1 | 0 | 0 |
| NY | 1 | 1 | 0 |
| OH | 1 | 0 | 0 |
| OK | 0 | 0 | 0 |
| OR | 0 | 0 | 1 |
| PA | 1 | 0 | 0 |
| PR | 0 | 0 | 0 |
| RI | 0 | 0 | 0 |
| SC | 0 | 0 | 1 |
| SD | 0 | 0 | 0 |
| TN | 1 | 0 | 0 |
| TX | 1 | 1 | 0 |
| UT | 1 | 0 | 0 |
| VA | 4 | 1 | 0 |
| VT | 0 | 0 | 0 |
| WA | 4 | 0 | 0 |
| WI | 2 | 0 | 0 |
| WV | 0 | 0 | 0 |
| WY | 1 | 0 | 0 |
| TOTALS | 78 | 15 | 8 |

* From FY 2001 Phase 1 awardees.