



SBIR

**Small Business
Innovation
Research
Program**

**ABSTRACTS OF
AWARDS FOR
FISCAL YEAR 2006**

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 17 Phase I contracts for FY 2006. These awards of up to \$95,000 each, and totaling approximately \$1.6 million, are for a six-month effort to demonstrate the feasibility of innovative approaches to the research topics identified in the "DOC/NOAA SBIR Program Solicitation for FY 2006 (NOAA 2006-1)." Abstracts of the successful Phase I proposals submitted under this solicitation, and brief comments on their potential commercial applications are provided in this publication.

In Phase II, funding is provided for projects that are most promising after Phase I is completed. These awards can be for up to \$300,000 each and for two years. The DOC/NOAA awarded a total of 11 Phase II contracts in FY 2006 for a total of approximately \$3.1 million. Abstracts of successful Phase II proposals and comments on their commercial applications are also provided in this publication.

The SBIR program is highly competitive. A total of 104 proposals were received by DOC/NOAA in response to its FY 2006 solicitation. DOC/NOAA scientists and/or engineers independently reviewed the proposals. With the funds available, only 17 were selected for an award. 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 2006 PHASE I AWARD WINNER

FIRM: Nekton Research, LLC
4625 Industry Lane
Durham, North Carolina 27713

AWARD: \$95,000

PHONE: 919-405-3993 x140
FAX: 919-405-3994
E-MAIL: rvosburgh@nektonresearch.com

PRINCIPAL INVESTIGATOR: Frederick Vosburgh, President

TITLE OF PROJECT: User-Friendly 3D Environmental Profiler AUV

SUBTOPIC NUMBER: 8.1.3N

TECHNICAL ABSTRACT:

We propose Ranger ES, a low cost, autonomous underwater vehicle (AUV) for three-dimensional profiling and water samplings of chemical, physical, and biological parameters of oceanic and fresh waters. The AUV will be programmable by point and click to analyze a volume of water continuously for the selected parameters. After returning for pickup after a day's run, it will download its data into an intuitive graphical user interface and visual profiling tool, which will permit the user to draw inferences while still in the field, as well as storing the run's data for further analysis. The system's continuous, granular profile volumes captured with reduced cost of personnel and ship- time imposed by existing technology will enable new insights into aquatic systems for research, management, or regulatory purposes. Specific capabilities of the initial design will be derived from interviews of potential end users both before and after a live technology demonstration.

SUMMARY OF ANTICIPATED RESULTS:

Results in Phase I will be: 1) a summary of guidance from representative users regarding sampling capabilities of the proposed Ranger system, 2) demonstration of data capture at sea, 3) summary of input from representative users following demonstration, 4) final report. In Phase II, we will implement a low cost vehicle and data analysis and presentation system suitable for unattended use in ocean and fresh water survey in research or management applications.

FY 2006 PHASE I AWARD WINNER

FIRM: Onomea Scientific, LLC
27-470 Old Mamalahoa Highway
Papaikou, Hawaii 96781-0434

AWARD: \$95,000

PHONE: 808-936-6287
FAX: 808-964-8646
E-MAIL: danoc@interpac.net

PRINCIPAL INVESTIGATOR: Daniel O'Connor, Ph.D., Chief Scientist

TITLE OF PROJECT: A Prototype Net Cleaning System for Open-Ocean Aquaculture Nets

SUBTOPIC NUMBER: 8.1.10SG

TECHNICAL ABSTRACT:

Open-Ocean Aquaculture businesses are proving commercially successful. There are several technical refinements the industry must undergo in order to maximize productivity and future expansion. We address a problem common to all off-shore open-ocean aquaculture cage systems, marine biofouling of the net mesh used for the enclosure. Significant amounts of biofouling leads to increased pollutant levels within the cage, increased population stress due to that pollution, and increased probability of disease for the stock population. We propose to build and evaluate a novel, environmentally friendly, remotely operated, net cleaning system capable of cleaning present day off-shore aquaculture cages. This innovation will significantly lower offshore labor overhead costs for off-shore aquaculture cages.

SUMMARY OF ANTICIPATED RESULTS:

- (1) Demonstration of feasibility for not-as-yet optimized technology in field test.
- (2) Measurement of relevant system parameters and energetics for producing roadmap to Phase II prototype.

FY 2006 PHASE I AWARD WINNER

FIRM: ProFishent, Inc.
17806 NE 26th Street
Redmond, Washington 98052-5848

AWARD: \$88,534

PHONE: 425-883-9896
FAX: 425-869-5364
E-MAIL: davidp@profishent.com

PRINCIPAL INVESTIGATOR: David B. Powell, Ph.D., Vice President, R & D

TITLE OF PROJECT: Nanotechnology Systems to Prevent Disease and Improve Healing of Aquatic Animals

SUBTOPIC NUMBER: 8.1.11SG

TECHNICAL ABSTRACT:

Netting, tagging, and/or vaccination of shrimp or fish often result in increased stress and infections caused by opportunistic pathogens. Damaged epidermis or cuticle provides a portal of entry to potentially deadly infective agents that bind preferentially to injured cells. Recent advances in nanotechnology and computer-assisted scanning instrumentation now make it possible to quantify progress toward developing economical, nanoparticle-based systems that effectively treat handling-associated skin lesions.

SUMMARY OF ANTICIPATED RESULTS:

Commercialization of this research in Phases II and III will result in a new platform technology using non-toxic nanoparticle products that will be registered through regulatory authorities and applicable to both fresh-water and marine aquatic species. Unlike antibiotic feed additives, the particles will be compatible with biological recirculation filter systems and environmentally benign. It should be possible to handle and raise a variety of aquatic species previously thought to be too susceptible to pathogens. This family of products will have documented efficacy against obligate and opportunistic pathogens affecting the aquaculture.

FY 2006 PHASE I AWARD WINNER

FIRM: Maine BioTek, Inc.
P.O. Box 408
259 Main Street
Winterport, Maine 04496

AWARD: \$95,000

PHONE: 207-223-4662
FAX: 207-223-4909
E-MAIL: sclouthier@hotmail.com

PRINCIPAL INVESTIGATOR: Sharon Clouthier, President

TITLE OF PROJECT: A Multivalent Bacterial Vaccine for Atlantic Cod

SUBTOPIC NUMBER: 8.1.11SG

TECHNICAL ABSTRACT:

The goal of this project (Phase I – III) is to develop a vaccine for the control of diseases in Atlantic cod caused by *L. anguillarum* and *A. salmonicida*. To accomplish this we have established the following sequential technical Phase I objectives: (1) identify bacterial growth conditions suitable for small-scale vaccine production, (2) determine the conditions for inactivation that result in the retention of immunoprotective properties and abolish infectivity of the bacteria, (3) standardize the content of a single dose of vaccine, (4) formulate the vaccine with or without adjuvant and (5) measure the safety and efficacy of the vaccine in Atlantic cod. The Phase II and III research efforts will include scale-up of vaccine production, determination of optimal vaccine dose, optimal adjuvant and vaccine formulation, duration and kinetics of the protective immune response elicited by the vaccine, vaccine safety and efficacy of the vaccine against heterologous bacteria.

SUMMARY OF ANTICIPATED RESULTS:

The ultimate success of the project will be the construction of a safe, efficacious *L. anguillarum* and *A. salmonicida* vaccine for farmed Atlantic cod. Maine BioTek, Inc. anticipated that the Phase I investigation will result in a prototype vaccine. By the end of Phase II, the vaccines will be ready for regulatory approval testing. The product will initially be marketed to the North American aquaculture industry for administration of farmed Atlantic cod. An efficacious *L. anguillarum* and *A. salmonicida* vaccine would provide a disease management tool that in combination with good fish health practices would ensure the growth and sustainability of the emerging Atlantic cod aquaculture industry in North America.

FY 2006 PHASE I AWARD WINNER

FIRM: System Science Applications, Inc.
3 Trovita
Irvine, California 92620

AWARD: \$95,000

PHONE: 714-730-6858
FAX: 213-740-8123
E-MAIL: fjobrien@cox.net
jackrensel@worldnet.att.net

PRINCIPAL INVESTIGATOR: Frank, O'Brien, Systems Engineer & Treasurer, and
Jack Rensel, Senior Scientist

TITLE OF PROJECT: Modeling Offshore Aquaculture: Comprehensive
Planning and Permitting Software

SUBTOPIC NUMBER: 8.1.15F

TECHNICAL ABSTRACT:

We will develop a fish farm simulation model to assess the operations and impact of a diverse range of fish farms installed in offshore waters of the U.S. and as a means to expedite planning and permitting. The information system is needed by administrators to establish regulations, operators to obtain permits, and investors to assess risks and opportunities. We have already begun development and partial validation of a virtual salmon farm model. It provides a three dimensional simulation of growth and metabolic activity of penned salmon as well as associated flow and transformation of nutrients, oxygen, and particulate wastes in adjacent waters and sediments. During Phase I we will create the only fully comprehensive modeling system of operations and impacts for fish farms growing different species of fish under diverse environmental conditions. Importantly, we will develop, tune, and validate the model to assure accuracy beginning in Phase I and at several varying locations nationwide in Phase II.

SUMMARY OF ANTICIPATED RESULTS:

- (1) The first and only comprehensive and verified fish farm simulation model for candidate fishes to be grown in the U.S. offshore waters.
- (2) User-friendly flexible modeling of fish farm operations and environmental impacts of dissolved and particulate waste produced by the farm.
- (3) An objective and scientifically based means to expedite planning and permitting for investors, operators, and regulators who presently have no such tool.

FY 2006 PHASE I AWARD WINNER

FIRM: Troutlodge, Inc.
P.O. Box 1290
Sumner, Washington 98390-0260

AWARD: \$75,495

PHONE: 253-863-9463
FAX: 253-863-4715
E-MAIL: parsons@troutlodge.com

PRINCIPAL INVESTIGATOR: James Parsons, Senior Vice President

TITLE OF PROJECT: Induction and Utilization of Tetraploidy in Atlantic Salmon (*Salmo salar*) as a Reliable Method for Producing Sterile Autotriploid Stocks

SUBTOPIC NUMBER: 8.1.17F

TECHNICAL ABSTRACT:

The use of sterile, triploid Atlantic salmon (*Salmo salar*) has been suggested by many to be a means of mitigating the perceived genetic impacts of escaped animals on their wild counterparts. The US Atlantic salmon industry has been slow to adopt this technology, apparently due to reduced performance under stress of conventionally made (*de novo*) triploids. We propose to develop techniques to produce tetraploid Atlantic salmon (individuals with four sets of chromosomes). These individuals can then be reared to maturity and crossed with diploid salmon to reliably produce all triploid offspring. In recent research programs using similar methods in rainbow trout, these autotriploids have performed better than their diploid counterparts. A consistently reliable method of producing sterile triploid salmon will have both political and economic benefits for salmon aquaculture.

SUMMARY OF ANTICIPATED RESULTS:

Sterile, autotriploid Atlantic salmon will potentially reduce the pressure from Non-Government Organizations (NGO's) regarding the consequences of escapes from marine farms, and could also improve farm economics through improved growth and yield.

FY 2006 PHASE I AWARD WINNER

FIRM: Scientific Fishery Systems, Inc.
P.O. Box 242065
Anchorage, Alaska 99524-2065

AWARD: \$95,000

PHONE: 907-563-3474
FAX: 907-563-3442
E-MAIL: jae-byung@scifish.com

PRINCIPAL INVESTIGATOR: Jae-Byung Jung, Ph.D., Senior Engineer II

TITLE OF PROJECT: Web-Crawler: A Paired Robotic System for
Cleaning Offshore Aquaculture Nets

SUBTOPIC NUMBER: 8.1.18F

TECHNICAL ABSTRACT:

Scientific Fishery Systems, Inc. (SciFish) proposes the development of a paired robotic Web-Crawler system for automatically cleaning offshore aquaculture nets. The Web-Crawler concept places paired wheeled robotic vehicles on either side of the cage, connected by magnets. Only one of the two vehicles will be powered, the other will be passive and be pulled along by its active partner. The vehicle will follow a predetermined path defined by a wire wove into the net. It is our initial hypothesis that the repeated movement over the net will be sufficient to eliminate biofouling. However, if necessary, water jets can be added to the system to provide additional cleaning capability. Power delivery to the vehicle will be provided to the vehicle on the outside of the pen. Phase I will address specific design issues such as sizing, coverage rates, power, and reliability.

SUMMARY OF ANTICIPATED RESULTS:

The Web-Crawler Team will design and build a dry-land prototype paired robotic system and perform a series of lab tests to confirm system performance.

FY 2006 PHASE I AWARD WINNER

FIRM: Sunburst Sensors, LLC
1121 E. Broadway, Suite 114
Missoula, Montana 59802

AWARD: \$94,998

PHONE: 406-532-3246
FAX: 406-543-2304
E-MAIL: jim@sunburstsensors.com

PRINCIPAL INVESTIGATOR: James C. Beck, President

TITLE OF PROJECT: A Multi-Parameter Inorganic Carbon Measurement System

SUBTOPIC NUMBER: 8.2.2G

TECHNICAL ABSTRACT:

NOAA requests proposals to develop a system for the measurement of pCO₂, dissolved inorganic carbon (DIC) and total alkalinity (A_T) for shipboard use. In response, Sunburst Sensors proposed integration of a novel approach for analysis of A_T developed at the University of Montana (UM) with existing DIC and pCO₂ analyzers developed by Burke Hales (OSU) and pH and pCO₂ sensors developed at UM.

In Phase I, Sunburst will demonstrate the feasibility of a commercial rapid response, low volume design for an A_T analyzer based on UM's tracer monitored titration (TMT) methodology and reducing the sample size and response times for the pCO₂ and pH systems. With these optimizations in place, Phase II will then focus on integrating them into a single system capable of sampling from either a ship seawater line or discrete samples. The end product will be a valuable tool that can be sold to oceanographers and limnologists.

SUMMARY OF ANTICIPATED RESULTS:

- (1) Demonstration of feasibility of rapid response, low volume analyzer for total alkalinity.
- (2) Improvements to volume requirements and accuracy of pH and pCO₂ analyzers.

FY 2006 PHASE I AWARD WINNER

FIRM: 3TIER Environmental Forecast Group, Inc.
2001 6th Avenue, Suite 2100
Seattle, Washington 98121-2534

AWARD: \$95,000

PHONE: 206-325-1573 x121
FAX: 206-325-1618
E-MAIL: bnijssen@3tiergroup.com

PRINCIPAL INVESTIGATOR: Bart Nijssen, Ph.D., Director of R & D

TITLE OF PROJECT: A Web-Based, Interactive, Long-Range Hydrologic Forecast Tool for the Western U.S.

SUBTOPIC NUMBER: 8.2.5G

TECHNICAL ABSTRACT:

Water resource managers must translate uncertain information about the future into operational decisions that can have large public safety, economic and ecological impacts. Seasonal forecasts of climate and hydrology can be an important tool in assisting managers in their decision making process. However, studies evaluating the utility of seasonal forecasts have repeatedly identified the lack of additional interpretation and the lack of verification information as barriers to more widespread use of seasonal forecasts in the water resources sector. The focus of this Phase I proposal is the development of a web-based query and visualization tool for the Columbia River Basin that will enable the user to visualize past, current and future hydrologic conditions and to create place and time specific, long range hydrologic forecasts, including verification information. This provides a level of customization, interactivity, and accountability that is currently not offered by any web-based long-range forecasting tool.

SUMMARY OF ANTICIPATED RESULTS:

The web-tool will allow visualization of past and current basin conditions. In addition, it will enable customers to make their own forecasts by interactively querying a forecast database. Verification measures will then be provided based on automatically generated queries in a hindcast database. Thus, customers can tailor the forecast to their specific need and will receive information on the performance of similar forecasts in the past.

FY 2006 PHASE I AWARD WINNER

FIRM: Broad Reach Engineering
1113 Washington Avenue, Suite 200
Golden, Colorado 80401

AWARD: \$95,000

PHONE: 480-377-0400 x39
FAX: 480-968-4597
E-MAIL: brian@broad-reach.net

PRINCIPAL INVESTIGATOR: Brian Giesinger, Senior Avionics Engineer

TITLE OF PROJECT: Improving Radio Occultation Technologies Through
Next Generation GPS Receiver Design

SUBTOPIC NUMBER: 8.2.8E

TECHNICAL ABSTRACT:

The weather research community is utilizing a proven RO technique for climate modeling and numerical weather prediction; however, the current space hardware does not provide the optimum science data. This proposal will focus on proposed enhancements to the Integrated GPS Occultation Receiver (IGOR™) L1/L2 GPS flight receivers.

- Improvement in real time Navigation Solution from <3 meter RMS navigation solution accuracies to <10cm RMS accuracies;
- Addition of new GPS L5 frequency & L2C Signal processing
- Addition of proposed Galileo frequencies and correlators
- Addition of capability for real-time corrections via TDRSS or equivalent
- Upgrade of hardware to improve radiation tolerance
- Provision of extensible GPS science mission capability
- Improvements in precision orbit determination capability

The upgrade technology will result in improving the global weather and climate data set by increasing the number of global soundings (including tropospheric) with improved resolutions and higher spatial concentrations.

SUMMARY OF ANTICIPATED RESULTS:

Results from Phase I will lead to decisions of which functionality should be added to our existing RO receiver hardware including L2C, L5 frequency utility, and Galileo and GLONASS frequencies. The significance of the successful Phase I results in relation to Phase II is that the prototype GPS avionics receiver functionality will be demonstrated through an engineering model. After successful verification of technical objectives, flight receiver builds can be considered for Phase II space or commercial applications. This process will reduce the on-recurring costs for basic avionics as well as simplifying the Integration and Test phases of spacecraft development and manufacturing.

FY 2006 PHASE I AWARD WINNER

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

AWARD: \$95,000

PHONE: 413-863-0200 x7201
FAX: 413-863-0255
E-MAIL: mcb@yesinc.com

PRINCIPAL INVESTIGATOR: Mark C. Beaubien, Senior Engineer

TITLE OF PROJECT: Buoy Atmospheric Precipitation Sampler

SUBTOPIC NUMBER: 8.2.12R

TECHNICAL ABSTRACT:

Reliable automated collection and measurement of precipitation from moored buoys has been an elusive goal. Operation of open aperture collectors on ocean platforms is problematic, requiring constant human attention and intervention to prevent sea spray from contaminating the collected samples, and for dealing with freezing conditions in colder climates. Approaches are described that have the potential to automate these measurements over a six week period are proposed that extend the current state-of-the-art. We investigate sample segmentation and quality control screening for detection of sea salt, bird interference or other errors. The proposed system will provide continuous unattended collection and measurement of precipitation in all weather conditions, but will probably have to shut down during higher sea states. A low cost commercial system suitable for buoy deployment worldwide would be the result of this effort.

SUMMARY OF ANTICIPATED RESULTS:

While three quarters of the earth is covered by water, near shore regions remain largely unmeasured because automated unattended precipitation samplers for buoys don't exist. Subsequently the impact of manmade pollution on coastal areas and fisheries is poorly understood. Historically, acid rain research has focused on land masses and sampling over the oceans has been largely non-existent. The potential market for the sampling technology described is scientific research, funded by governments. If the technology was low cost, we believe a sizable market would arise to serve hundreds of buoys operating around the globe. Based on our experience in the commercial precipitation collector market, we envision several models selling for between \$1000 and \$5000 each, representing a market between perhaps \$1 - \$5 million/year. Atmospheric deposition research programs driven by NOAA, USDA, USFS, DOC as well as domestic Universities and overseas labs studying mercury in the environment would benefit.

FY 2006 PHASE I AWARD WINNER

FIRM: Brechtel Manufacturing, Inc.
1789 Addison Way
Hayward, California 94544

AWARD: \$95,000

PHONE: 510-732-9723
FAX: 510-732-9153
E-MAIL: fredj@brechtel.com

PRINCIPAL INVESTIGATOR: Fred J. Brechtel, Vice President

TITLE OF PROJECT: Development of a Compact Aerosol Instrumentation Suite for Unmanned Aerial Vehicles

SUBTOPIC NUMBER: 8.2.13R

TECHNICAL ABSTRACT:

To assess the climate impacts of atmospheric aerosols, global datasets of aerosol properties including the number size distribution, chemical composition, and absorption coefficient are needed yet generally unavailable. Knowledge of the vertical distributions of these key properties is also required to properly model column extinction. We propose to develop a new aerosol measurement system, the Aerosol Counting Composition Absorption and Sizing System (ACCASS), capable of simultaneous observations of ambient total number concentrations, aerodynamic number size distributions, and chemical composition over the 0.1 to 10 micron diameter range. A model of instrument response will be created to guide the design of a new mixing particle counter, virtual impactor, and light absorption system. Prototypes of key ACCASS sub-systems will be bench-tested to assess their technical feasibility.

SUMMARY OF ANTICIPATED RESULTS:

The Aerosol Counting Composition Absorption and Sizing System (ACCASS) will provide a new compact and low power suite of aerosol measurements at significantly reduced cost and complexity over currently available techniques. The ACCASS will find use in unmanned airborne missions, ground-based air quality monitoring studies, in medical applications and in detection of bio-warfare agents.

FY 2006 PHASE I AWARD WINNER

FIRM: Boulder Environmental Sciences and
Technology, LLC
4425 Hastings Drive
Boulder, Colorado 80305

AWARD: \$95,000

PHONE: 303-827-6420
FAX: 303-554-1452
E-MAIL: ma4leo@yahoo.com

PRINCIPAL INVESTIGATOR: Marian Klein, Ph.D.

TITLE OF PROJECT: All Weather Temperature and Water Vapor Profiling
Radiometer for Marine Environment

SUBTOPIC NUMBER: 8.3.5W

TECHNICAL ABSTRACT:

The detailed design and development of an operational radiometer for regular use in sounding temperature and humidity in the marine boundary layer on NDBC buoys is proposed. The design follows that of a well demonstrated unit pioneered by the PI and Co-Is that has been used successfully in the field on ships, aircraft, and ground based sites. It relies on full (360 degree) scanning of the sky above and sea below the radiometer, along with optimal profile inversion to obtain ~15 minute soundings. A Phase I effort is proposed to transition the design of the existing 60 GHz temperature-only system to an environmentally hardened and optimized temperature and humidity sounding system suitable for implementation and extended testing on a buoy in Phase II. The PI and Co-Is have unique experience in scanning radiometry and hardened instrument development for this task.

SUMMARY OF ANTICIPATED RESULTS:

A detailed design complete with extensive simulation results is expected for the Phase I study. In successive phases it is expected that a number of the operations buoy units would be required to outfit NDBC buoys with the MBL THP capability. The potential market is ~5-15 units annually for the first several years of production.

FY 2006 PHASE I AWARD WINNER

FIRM: HY-TEK, Ltd.
6502 Micro Drive
Dayton, Maryland 21036-1100

AWARD: \$94,775

PHONE: 410-531-5111
FAX: 410-531-2605
E-MAIL: bob@hytekltd.com

PRINCIPAL INVESTIGATOR: Robert M. Mroz, President & CEO

TITLE OF PROJECT: NOAA Weather Radio (NWR) "Smart Receiver"

SUBTOPIC NUMBER: 8.3.7W

TECHNICAL ABSTRACT:

There is a critical need for a high performance receiver that knows where it is, knows where the NWR transmitting stations are, tunes itself to the local NWR station (especially in a mobile environment), provides weather and warnings in both audio and text, requires little-to-no setup and can communicate with other devices such as external alarms and network systems that can better warn its owner of impending disaster wherever they may be. This SBIR Phase I project covers the research directed toward designing, prototyping, and establishing the feasibility of such as receiver or family of receivers to establish proof-of-principle. In Phase II, a fully engineered receiver will be built and delivered to NOAA and potential commercialization partners.

SUMMARY OF ANTICIPATED RESULTS:

It is anticipated that in Phase I we will be able to determine the feasibility of integrating existing and yet-to-be developed technologies into a prototype that will demonstrate a receiver that not only knows where it is and where its local NWR station is with respect to location and frequency, but will produce weather and All-Hazard warnings for both hearing and hearing impaired as well as be able to broadcast its warning alerts to external devices using industry standard protocols so that 3rd party hardware and appliance manufacturers can easily interface to the device.

FY 2006 PHASE I AWARD WINNER

FIRM: LBI, Inc.
973 North Road
Groton, Connecticut 06340

AWARD: \$95,000

PHONE: 860-446-8058
FAX: 860-446-8132
E-MAIL: plegnos@legnosboat.com

PRINCIPAL INVESTIGATOR: Peter J. Legnos, President

TITLE OF PROJECT: Inexpensive Airborne Expendable Ice Buoys (AXIB)
Suitable for Marginal Ice Zone Deployment

SUBTOPIC NUMBER: 8.3.8E

TECHNICAL ABSTRACT:

The proposed solution provides a low-cost practical air-droppable package for existing polar ice meteorological sensor systems. The buoy package will be configured for deployment from a fixed wing aircraft. Descent is stabilized and slowed by a parachute deployed after launch, and designed for a descent rate of 20 ft/s or less. When deployed on the ice, the buoy will erect to the vertical for operation. The erection and anchoring system consists of four erector legs and an anchoring screw. An integrated commercially available sensor and communication package utilizing a commercial Argos platform transmitter terminal will interface with a GPS receiver, barometric pressure, air temperature and an ice/water thermistor using NMEA standard interfaces. The PPT will provide hourly data transmission through the Argos satellite network. LBI, Inc. provides complete development and production capabilities thereby ensuring a least-cost solution.

SUMMARY OF ANTICIPATED RESULTS:

This system will enable lower installations costs and thereby promote more extensive programs to measure the effects of global change. This enables more, well-spaced in-situ observations throughout the Arctic area due to the increased accessibility of fixed-wing aircraft. The effects of animal tampering can be countered by lower cost re-seeding of the buoy field. Commercial interests such as weather forecasting and polar tourism can utilize these systems to ensure more accurate environmental monitoring. The IIP and fisheries programs can remotely track pack and drift ice without the necessity of continuous over-flights.

FY 2006 PHASE I AWARD WINNER

FIRM: Sutron Corporation
21300 Ridgetop Circle
Sterling, Virginia 20166-6520

AWARD: \$94,479

PHONE: 703-406-2800
FAX: 703-406-2801
E-MAIL: dan@sutron.com

PRINCIPAL INVESTIGATOR: Daniel W. Farrell, Vice President

TITLE OF PROJECT: Improved Water Level Measurement System

SUBTOPIC NUMBER: 8.3.11N

TECHNICAL ABSTRACT:

This project provides a preliminary design and specifications for a Data Collection Platform with Interrogate (DCPI) capability using DS-CDMA RF transmission techniques. Sutron shall develop a sample link budget for the DCPI link and model its performance. A protocol will then be designed that will allow maximum flexibility in the communications with the DCP. A prototype will be developed to explore techniques to implement the DCP side of the link for a product that is both low in power consumption and low cost. The resultant specifications for the DCPI can be proposed to NESDIS as the new standards for the DCPI link.

SUMMARY OF ANTICIPATED RESULTS:

Develop specifications for DCPI that overcome the problems of the prior system. Provide a preliminary design based on the specifications that can be carried into Phase II without major risks.

FY 2006 PHASE I AWARD WINNER

FIRM: Sutron Corporation
21300 Ridgetop Circle
Sterling, Virginia 20166-6520

AWARD: \$94,380

PHONE: 703-406-2800
FAX: 703-406-2801
E-MAIL: dan@sutron.com

PRINCIPAL INVESTIGATOR: Daniel W. Farrell, Vice President

TITLE OF PROJECT: Improved Water Level Measurement System

SUBTOPIC NUMBER: 8.4.2N

TECHNICAL ABSTRACT:

This project provides an improved design for the dual-orifice bubble gauge for water level observations in cold regions. The improvements consist of using optimized true-differential sensors and specialized processing to improve the accuracy, particularly in the presence of water waves. The prototype will be designed based on a numerical model of the dual-orifice gauge that includes the time-dependent effects of waves - - both the instantaneous pressure and the mean dynamic wave pressure. The model will be provided in Matlab. The prototype unit will be constructed and evaluated in a wave tank to verify the overall improvements, provide data for the development of algorithms for pressure corrections, and the operational characteristics of the prototype. The resultant sensor design should work well for NOS in the cold regions, non-cold regions, and have a wide market for the many other groups making bubble gauge measurements

SUMMARY OF ANTICIPATED RESULTS:

Reduce the errors caused by waves on the average water level. Reduce the cost of the overall system by using sensors optimized for the measurement. Create a preliminary design that can be carried into Phase II without major risks.

FY 2006 PHASE II AWARD WINNER

FIRM: Troutlodge, Inc.
P.O. Box 1290
Sumner, Washington 98390

AWARD: \$194,855

PHONE: 253-863-9463
FAX: 253-863-4715
E-MAIL: parsons@troutlodge.com

PRINCIPAL INVESTIGATOR: James E. Parsons, Senior Vice President

TITLE OF PROJECT: Improved Spawning, Fertilization, Rearing, and Grow-Out Methodologies for the Culture of the Sablefish (*Anoplopoma fimbria*)

SUBTOPIC NUMBER: 8.1.5SG

TECHNICAL ABSTRACT:

Metabolism and physiology research on the sablefish (*Anoplopoma fimbria*) conducted in Phase I of this research established that this fish is highly suited to culture conditions typically found in the Puget Sound or Straight of Juan de Fuca waterways of the state of Washington. In this research, we will examine techniques to improve spawning of captive brood fish, increase fertilization success, enhance incubation and hatching results, and define early feeding requirements. Additionally, we will further examine the particular physiological and metabolic issues important to grow-out in net pen aquaculture settings (particularly fecal settling rates and C/N ratios), and incorporate data generated into a modeling system developed to assess aquaculture dynamics.

POTENTIAL COMMERCIAL APPLICATIONS:

The development infrastructure already existing in the Pacific Northwest as salmon net-pen sites represents a unique opportunity since the grow-out side of the industry is already in place. The salmon net-pen industry in Washington is in great need of a higher value fish, such as sablefish, that they can grow in order to diversify and compete with lower cost growers in Chile, Canada and Norway. Success in Phase II of this project will enable a reliable supply of US grown juveniles from locally adapted stocks to be made available to the industry.

FY 2006 PHASE II AWARD WINNER

FIRM: Montana Microbial Products, LLC
510 East Kent Avenue
Missoula, Montana 59801

AWARD: \$199,032

PHONE: 496-544-1176
FAX: 406-721-4266
E-MAIL: cbradley@montana.com

PRINCIPAL INVESTIGATOR: Clifford Bradley, Founding Member

TITLE OF PROJECT: Microbial Enhancement of Flax Seed to Replace Fish Oil in Salmonid Diets

SUBTOPIC NUMBER: 8.1.10SG

TECHNICAL ABSTRACT:

In Phase I, MMP combined strain selection with the company's innovative technology for solid substrate culture of fungi to develop a process for treating whole flax seed; creating bioenhanced flax seed nutritionally suitable for direct use as a replacement for fish oil in aquaculture feeds. This process reduced fiber content of flax seed by up to 80%, increased protein concentration from 20 to 26% and increased total content oil from 25% up to as much as 45%. Of the total oil, 55% to 57% is the omega 3 fatty acid, linolenic acid. The process also eliminated the mucilage that causes the feeding deterrent effects of flax.

In Phase II, MMP will advance commercialization by completing a work plan with three principal components, pilot scale up of the solid substrate culture process, trout feeding trials and selection of a fungus to enhance flax oil with EPA and DHA, long chain C20 and C22 polyunsaturated fatty acids. Objectives are to generate manufacturing design and cost estimates, establish value of bioEnhanced flax seed in trout feeds and develop the basis for nutritionally complete plant derived oil to replace fish oil in trout feeds.

POTENTIAL COMMERCIAL APPLICATIONS:

Bioenhanced flax seed will replace fish oil in aquaculture feeds. Initial target market is feed for farmed trout, to be followed by salmon feeds. MMP plans to manufacture and sell bioenhanced flax seed to companies that manufacture finished aquaculture feeds.

FY 2006 PHASE II AWARD WINNER

FIRM: Atmospheric Observing Systems, Inc.
1930 Central Avenue, Suite A
Boulder, Colorado 80301

AWARD: \$300,000

PHONE: 303-443-3389
FAX: 303-317-5594
E-MAIL: jim@aosinc.net

PRINCIPAL INVESTIGATOR: Dr. James R. Smith, President

TITLE OF PROJECT: The Oceanic CO₂ Monitor

SUBTOPIC NUMBER: 8.2.2G

TECHNICAL ABSTRACT:

During Phase I, AOS produced a prototype, equilibrator-based p(CO₂) monitor and performed extensive research in the laboratory and in the field to verify its operation. It is compact, has minimal environmental loading and is suitable for autonomous deployments from research vessels and oceanic platforms of opportunity. We deployed it three times on day cruises from Monterey Bay, CA; agreement was acceptable between the AOS system and the platform's working system constructed and maintained by the Monterey Bay Aquarium Research Institute. Laboratory testing showed that the AOS analyzer operates with negligible systematic bias and system noise is 0.2 ppm/sec. We demonstrated that the same system provides good waterside and airside measurements. During Phase II, AOS proposes to deploy oceanic p(CO₂) monitors in two different oceanic environments. The first will be repeated shipboard deployments with the goal of developing expert protocols to facilitate oceanic CO₂ measurements, particularly in the dynamic coastal regions. The second will be a system running constantly at a fixed point to determine and solve problems involved with environmental loading on extended deployments. The information obtained from these platforms will be used to produce a robust, turn-key product that can be deployed by unskilled personnel on oceanic platforms worldwide.

POTENTIAL COMMERCIAL APPLICATIONS:

1. Turn-key, equilibrator-based detection systems for autonomous observations of p(CO₂) of the ocean's surface from ships.
2. Verification of p(CO₂) observations from a distributed observatory of floater buoys for global mapping of p(CO₂) of the ocean's surface.
3. Management of data streams from global monitoring of the ocean's surface.

FY 2006 PHASE II AWARD WINNER

FIRM: Ceilings Unlimited, Inc.
1074 Cold Springs Road
Santa Barbara, California 93108-1011

AWARD: \$300,000

PHONE: 805-705-8651
FAX: 805-456-0613
E-MAIL: Patrick@ceilingsunlimited.tv

PRINCIPAL INVESTIGATOR: Patrick Gregston, Producer

TITLE OF PROJECT: NOAA Premium TV Program

SUBTOPIC NUMBER: 8.2.4G

TECHNICAL ABSTRACT:

Ceilings Unlimited proposes to develop a popular entertainment television show ("The Program") for climate education and outreach. The Program will present tales of the human impact of climate and climate science, highlighting the role NOAA's climate services play in our nation's engagement on issues of climate and climate change.

In Phase II, Ceilings Unlimited will distill the results of the Phase I feasibility efforts and produce a Pilot Documentary for an ongoing series that ties the civil service work of NOAA's climate services to the real, personal, human impact of our climate. This series will be targeted for a three to thirteen episode run, depending on the distribution partner; each episode will also work as a stand alone program.

The proposed research is to find the right combination of the communications goals, scientific expertise, and climate services of NOAA, with the actors, writers, concept, and distribution channel for a successful, prime-time television program on a major cable or television network.

POTENTIAL COMMERCIAL APPLICATIONS:

Prime-time broadcast or cable television show.

FY 2006 PHASE II AWARD WINNER

FIRM: Lynntech, Inc.
7607 Eastmark Drive, Suite 102
College Station, TX 77840

AWARD: \$300,000

PHONE: 979-693-0017
FAX: 979-764-5794
E-MAIL: season.wong@lynntech.com

PRINCIPAL INVESTIGATOR: Season Wong, Research Scientist

TITLE OF PROJECT: In-Field Device for the Autonomous Detection of Harmful Algal Bloom Toxigenic Species and Toxins

SUBTOPIC NUMBER: 8.3.3N

TECHNICAL ABSTRACT:

Harmful algal blooms (HABs) are a serious threat to coastal resources, causing impacts ranging from the contamination of seafood products with potent toxins to mortalities of wild and farmed fish and other marine animals. HABs cost the U.S. economy over \$50 million annually due to the closure of fisheries and beaches and the treatment of human illness from toxin exposures. NOAA is interested in technologies that will allow timely HAB species and toxins detection as they represent critical components of HAB management plans in which rapid response by resource managers are the most effective way to mitigate HAB impacts. Also, when integrated into coastal observing systems, the technologies will yield enormous advancements in monitoring temporal-spatial progression of HABs and forecasting their threats. Current HAB detection methods are laborious, time-consuming and costly. To overcome these problems, Lynntech proposes to develop an automated dual-function field instrument for detecting both HAB nucleic acid and toxins. The platform technology will be innovative, cost-effective, rapid, accurate, and quantitative. The system can potentially be installed on moored buoy or ship-deployed vehicles for automated monitoring with real-time data access capability. Phase I results using the automated procedures were similar to those generated using labor-intensity microtiter procedures.

POTENTIAL COMMERCIAL APPLICATIONS:

The proposed nucleic acid and biotoxin detection device platform would be a significant benefit to state and federal resource managers who are often required to make quick decisions to safeguard public health, local economies, and fisheries with limited HAB data. Related markets would include seafood safety testing and a broad range of marine, estuary, and freshwater environmental applications such as disease detection and rapid recognition of unwanted "invader" species. The platform technology can also be adapted into marketable devices for both government and civilian uses such as biosensors for countering biological warfare and biological terrorism, and point-of-care medical diagnostics.

FY 2006 PHASE II AWARD WINNER

FIRM: Marill Enterprises (dba Woodley Weather Consultants)
11 White Fir Court
Littleton, Colorado 80127-2600

AWARD: \$299,322

PHONE: 303-979-7946
FAX: 303-973-3446
E-MAIL: williamlwoodley@cs.com

PRINCIPAL INVESTIGATOR: William L. Woodley, Research Scientist

TITLE OF PROJECT: Short-Term Forecasting of Severe Convective Storms
Using Quantitative Multi-Spectral Satellite Imagery

SUBTOPIC NUMBER: 8.3.9E

TECHNICAL ABSTRACT:

The results of SBIR Phase I suggest that it will be possible to make much improved short-term severe weather forecasts ("nowcasts") for severe convective storms and especially for tornadoes by using GOES multi-spectral satellite imagery in conjunction with more traditional tornado-forecasting parameters. When the clouds in a region have a strong linear profile of satellite-retrieved effective radius over virtually their entire depths and when glaciation occurs in these clouds at the temperature of homogenous freezing (i.e., $\sim -38^{\circ}\text{C}$), there is a much increased risk of tornadoes, especially when CAPE, helicity and wind shear are concurrently large.

The next step under SBIR Phase II will be the development of an operational system that will lead to improved severe storm watches and warnings. Phase I did not provide nearly enough time for full method development. Consequently, Phase II must involve the development and use of an automated algorithm, adapted to real-time imagery, which will quantify the tornado risk of the clouds in each image. Analysis of the much larger sample will be made in order to quantify the probability of severe weather in each cloud system as a function of time. Logistic regression will again be used for this quantification.

The third task of SBIR Phase II will involve an operational real-time test of the methodology during the tornado season of 2008 in conjunction with personnel with the Storm Prediction Center (SPC) and the National Severe Storms Laboratory (NSSL). The real-time data stream for this effort will be provided by NASA Langley's Cloud and Radiation Research Program. Maps of tornado probability will be generated in real time using the specialized methodology to quantify cloud properties, the logistic regression coefficients and the probability of tornadoes. An objective assessment of the value of the products will be sought on a continuing basis from their users. The tasks of SBIR Phase II will be accomplished under the umbrella of Woodley Weather Consultants through the efforts of the talented research team that participated in Phase I.

POTENTIAL COMMERCIAL APPLICATIONS:

After completion of Phase II, the specialized, real-time, severe-weather, forecast products will be generated in the private sector and marketed to private and governmental entities having severe storm interest and forecast responsibility such as the Storm Prediction Center. This will be the commercialization phase (i.e., Phase III) of the SBIR effort.

FY 2006 PHASE II AWARD WINNER

FIRM: Synkera Technologies, Inc.
2021 Miller Drive, Suite B
Longmont, Colorado 80501-6787

AWARD: \$300,000

PHONE: 720-494-8401 x105
FAX: 720-494-8402
E-MAIL: ddeininger@synkera.com

PRINCIPAL INVESTIGATOR: Debra J. Deininger, Senior Scientist/Product Manager

TITLE OF PROJECT: Acoustic Sensors for Detection of Persistent Organic Contaminants in Water

SUBTOPIC NUMBER: 8.3.10R

TECHNICAL ABSTRACT:

This SBIR Phase II project is for the development of an innovative, advanced microsensor for the detection of persistent organic pollutants in natural waters. The proposed sensor is a type of acoustic wave sensor fabricated via micromachining of anodic aluminum oxide, followed by coating with piezoelectric zinc oxide and analyte specific polymers. The sensor design (a flexural plate wave device) offers significant advantages for detection of very low levels of chemical species in liquids compared to surface and bulk acoustic wave devices.

Phase I demonstrated the feasibility of detecting low levels of persistent organic contaminants in water using the proposed acoustic sensor. A subsequent Phase II will optimize the sensor design, and extend the flexural plate wave design from a single sensor to multiple sensors in an array. A custom interface for off the shelf instrumentation will be designed and developed in order to fabricate a low cost, field portable instrument for the detection and quantification of chemical compounds in a marine environment.

POTENTIAL COMMERCIAL APPLICATIONS:

Significant commercial applications exist for the proposed sensor technology in homeland security, environmental research and water quality monitoring and drinking water assessments.

FY 2006 PHASE II AWARD WINNER

FIRM: Remote Sensing Solutions, Inc.
P.O. Box 1092
3179 Main Street, Unit 3
Barnstable, Massachusetts 02630-1105

AWARD: \$299,700

PHONE: 508-362-9400
FAX: 508-413-2372
E-MAIL: Carswell@rmss.us

PRINCIPAL INVESTIGATOR: James R. Carswell, President

TITLE OF PROJECT: A High Resolution Airborne Atmospheric Boundary Layer and Surface Wind Field Imager for the NOAA WP-3D Aircraft

SUBTOPIC NUMBER: 8.3.16R

TECHNICAL ABSTRACT:

Accurate, high resolution, continuous monitoring of the lower atmospheric boundary layer (ABL) and ocean surface wind fields within tropical cyclones is required to improve intensity forecasting. This proposed Phase II effort will build on the Phase I project successes to realize an operational airborne imaging Doppler radar (AWRAP) capable of providing these winds with up to 15-meter vertical resolution from a minimum of 5000 feet to, and including, the ocean surface. Specifically, the Phase II effort shall develop an advanced, real-time digital receiver processing system capable of removing ocean surface contamination of the low altitude Doppler measurements in order to map the ABL winds to the surface and a novel transceiver that will significantly reduce costs and improve accuracy and sensitivity. Leveraging support from NOAA NESDIS and HRD, and operational AWRAP system will be constructed for deployment on the NOAA WP-3D aircraft. In addition to serving the tropical cyclone forecasting and research communities, this system and innovations developed can service the homeland defense and weather industries. Finally this Phase II effort will provide an archive of the 2005 and 2006 ABL and ocean surface wind fields. This unique data set has significant importance to NOAA researchers studying tropical cyclones.

POTENTIAL COMMERCIAL APPLICATIONS:

Coastal surveillance, low cost weather radars, advanced radar receiver and processor, atmospheric boundary layer profiling, target identification in search and rescue missions.

FY 2006 PHASE II AWARD WINNER

FIRM: ProSensing, Inc.
107 Sunderland Road
Amherst, Massachusetts 01002

AWARD: \$300,000

PHONE: 413-549-4402 x15
FAX: 413-549-5203
E-MAIL: popstefanija@prosensing.com

PRINCIPAL INVESTIGATOR: Dr. Ivan Popstefanija, Vice President

TITLE OF PROJECT: Operational Scanning Radar Altimeter for Real-Time Reporting of Directional Ocean Wave Spectra

SUBTOPIC NUMBER: 8.3.17R

TECHNICAL ABSTRACT:

This Phase II SBIR project focuses on the development of an operational Scanning Radar Altimeter (SRA) intended for airborne measurement of directional ocean wave spectra. The proposed innovation is a novel solid-state digital beamforming radar, designed to replace the aging prototype SRA currently operated by NOAA. The proposed SRA will employ a 10 W solid-state transmitter and a pulse compression waveform with a compression gain of up to 38 dB. The proposed design is highly sensitive, allowing operation to altitudes as high as 6 km. Furthermore, the design frequency of 16 GHz will permit the system to operate without loss of signal through heavy hurricane rainfall. Successful completion of Phase II will result in construction of a COTS-based operational SRA and data system designed to be deployed on NOAA-AOC's P-3 hurricane research aircraft.

POTENTIAL COMMERCIAL APPLICATIONS:

Hurricane reconnaissance is the primary application for the proposed SRA. The Air Force Reserve's Fleet of hurricane hunter C-130s are a potential platform which could result in sales of up to 11 units in Phase III. In addition, the proposed technology could be applied to a variety of nadir-pointing imaging altimeter applications, such as mapping the topography of the Arctic ice shelf.

FY 2006 PHASE II AWARD WINNER

FIRM: Toyon Research Corporation
75 Aero Camino, Suite A
Goleta, California 93117

AWARD: \$300,000

PHONE: 805-968-6787
FAX: 805-685-8089
E-MAIL: gvanblaricum@toyon.com

PRINCIPAL INVESTIGATOR: Glenn F. Van Blaricum, Jr., Principal Investigator

TITLE OF PROJECT: Multipath Mitigation GPS Antenna/Receiver System
For Geodetic Applications

SUBTOPIC NUMBER: 8.4.1N

TECHNICAL ABSTRACT:

Toyon Research Corporation proposes to develop and demonstrate a multipath mitigating antenna/receiver system for GPS geodetic applications. Our proposed system consists of a dual-channel antenna that provides spatial discrimination between the direct satellite signal and multipath signals, coupled with enhancements to the receiver architecture including multiple correlators to estimate multipath offset and pseudorange error filtering. We will evaluate and field-test these techniques in a software-defined GPS receiver testbed. The predicted net effect of the proposed antenna and receiver-based techniques is a reduction in the root-mean-square-error (RMSE) of the satellite pseudorange by a factor of eight (8).

POTENTIAL COMMERCIAL APPLICATIONS:

The differential GPS system provides significantly enhanced positioning accuracy over standalone GPS units, allowing for such critical applications as GPS-based surveying and automated landing systems for aircraft. At present, the dominant source of error in differential GPS is multipath. The proposed multipath mitigating system and algorithms will have direct application in both CORS sites and mobile end users.

FY 2006 PHASE II AWARD WINNER

FIRM: Nanohmics, Inc.
6201 East Oltorf Street, #400
Austin, Texas 78741-7511

AWARD: \$299,935
PHONE: 512-389-9990
FAX: 512-389-9850
E-MAIL: dpatterson@nanohmics.com

PRINCIPAL INVESTIGATOR: Donald E. Patterson, Senior Scientist

TITLE OF PROJECT: Environmentally-Friendly Anti-Fouling Coverglass
For Bio-Optical Sensors and Solar Panels

SUBTOPIC NUMBER: 8.4.5R

TECHNICAL ABSTRACT:

During a successful Phase I feasibility study, Nanohmics' scientists were able to incorporate environmentally-friendly algaecides into hard, optical quality polymers for use as coverglass materials. These transparent coverglass materials stopped all marine algae growth on the glass for well over a month. The Phase II development will further this research by incorporating natural product and/or environmentally-friendly algaecides and pesticides into a novel optical quality polymer. This newly developed polymer has the optical qualities of polycarbonate and yet exhibits nearly a 40% increase over polycarbonate's impact resistance and enhanced resistance to UV aging. The advanced coverglass material will be fully developed for commercial production and tested in laboratory and actual marine environments for optical, physical, and anti-biofouling properties as well as for their impact on the environment.

POTENTIAL COMMERCIAL APPLICATIONS:

Protective coverglass materials are essential to the long-lived performance of both freshwater and marine bio-optical sensors and solar panels. Coverglass materials that inhibit the growth of aquatic life on the glass greatly enhance and prolong the performance of the underlying active device. Other potential users for anti-fouling, impact resistant, inexpensive, transparent polymers include: greenhouse windows, underwater shipboard windows, aquariums, instrument viewports that are subject to biological fouling, and terrestrial solar panels.