SBIR

Small Business Innovation Research Program

ABSTRACTS OF AWARDS FOR FISCAL YEAR 2004

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 21 Phase I contracts for FY 2004. These awards of up to $75,000 each, and totaling approximately $1.5 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 2004 (NOAA 2004-1)." 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 12 Phase II contracts in FY 2004 for a total of approximately $2.9 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 99 proposals were received by DOC/NOAA in response to its FY 2004 solicitation. DOC/NOAA scientists and/or engineers independently reviewed the proposals. With the funds available, only 21 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 2004 PHASE I AWARD WINNER

FIRM:	GSSL, Inc. P.O. Box 909 Tillamook. OR 97141-0909
AWARD:	$74,931
PHONE: FAX: E-MAIL:	503-842-1990 503-842-1923 koh@gsslinc.com
PRINCIPAL INVESTIGATOR:	Koh Murai, Engineering Manager

TITLE OF PROJECT:	Low-Cost Atmospheric Turbulence Measurement Platform
SUBTOPIC NUMBER:	8.1.1R

TECHNICAL ABSTRACT:

Current turbulence measurements are limited to pilot reports and measurements along a specific vertical or horizontal trajectory. Aside from the high cost, these methods do not provide information on turbulence patches, their size or persistence. This proposal combines emerging sensor instrumentation with new balloon technology to produce a balloon-borne, low cost Atmospheric Turbulence Measurement Platform. This system can economically facilitate data gathering in the scale of 1 – 50 km, which is important to flight operations as well as numerical weather prediction models. The project objectives include definition of a feasibility study of inferring turbulence from balloon motions and evaluation of different types of balloon construction and sensor combinations. In Phase I, the feasibility study parameters and candidates for balloons and sensors will be identified. In Phase II the study would be completed and a prototype system built. Application for this ATBF would be to current FAA efforts, large disaster models, dispersion and plume studies, and Homeland Security planning efforts.

POTENTIAL COMMERCIAL APPLICATIONS:

AFF turbulence model input and development, forecast model improvements, chemical/biological weapons plume trajectory and dispersion prediction modeling, pollution plume and dispersion modeling, atmospheric chemistry studies.

FY 2004 PHASE I AWARD WINNER

FIRM:	MetroLaser, Inc. 2572 White Road Irvine, CA 92614-6236
AWARD:	$74,950
PHONE:	949-553-0688
FAX:	949-553-0495
E-MAIL:	vdoushkina@metrolaserinc.com
PRINCIPAL INVESTIGATOR:	Valentina V. Doushkina, Senior Scientist

TITLE OF PROJECT:	An Innovative Raster-Mirror Optical Detection System for CCD Camera Bistatic Lidar
SUBTOPIC NUMBER:	8.1.2R

TECHNICAL ABSTRACT:

An innovative optical system with 500X higher étendu and spatial resolution will be designed for CCD-based bistatic lidar. A 100º vertical field of view is required to image the laser beam from the ground through the boundary layer, but only a few degrees are required in the horizontal direction. The proposed design is based on dividing the vertical field of view into N sectors, using 1D rastering of flat mirrors, and parallel imaging of laser scattered light from each sector onto one CCD-matrix utilizing a single objective with narrow angle of view. By employing an off-the-shelf, off-axis, parabolic mirror as an objective, chromatic aberration can be eliminated, i.e., this system can be used in a broad spectral area from IR to UV. Phase I will consist of modeling, design, and proof-of-concept breadboard experiments.

POTENTIAL COMMERCIAL APPLICATIONS:

For decades, optical instruments have provided the means by which aeronomers have studied the complex processes that take place in the atmosphere. The increased sophistication of optical remote sensing techniques has rapidly advanced our knowledge about the atmosphere and brings new demands for advanced but simple optical devices. A ground-based bistatic lidar that incorporates the proposed innovative optics can find a broad application in (1) monitoring boundary layer aerosols to access the impact of anthropogenic and natural aerosols on climate; (2) monitoring spatial and temporal atmospheric aerosol profiles, which is essential for air quality and health effect studies; (3) monitoring the tropospheric ozone density and transport, as well as the chemicals that form it; (4) monitoring the water vapor density and transport, since the water vapor provides an important clue about the atmospheric dynamics; (5) understanding the physics, chemistry, radiation, and dynamics of the atmosphere by measuring and monitoring the aerosols in the boundary layer; and (6) studying and monitoring the green house global warming effect. A network of ground based bistatic lidars can be very beneficial for understanding the dynamics of the atmosphere.

FY 2004 PHASE I AWARD WINNER

FIRM:	ADA Technologies, Inc. 8100 Shaffer Parkway, Suite 130 Littleton, CO 80127-4107
AWARD:	$74,999.71
PHONE:	303-792-5615
FAX:	303-792-5633
E-Mail:	pat.french@adatech.com
PRINCIPAL INVESTIGATOR:	Patrick D. French, Instruments Program Mgr.

TITLE OF PROJECT:	Modular Micro-Weather Station for Use in Open and Coastal Marine Environments
SUBTOPIC NUMBER:	8.1.3R

TECHNICAL ABSTRACT:

NOAA collects meteorological measurements in open ocean and coastal marine environments from research vessels, data buoys and commercial ships for use in numerical weather prediction, global climate change research, and severe storm identification. The current system cost for robust marine automated meteorological stations is too high to allow ubiquitous use on all the available platforms.

Through this SBIR award ADA Technologies will develop a cost effective, modular micro-weather station for use in marine environments. ADA will leverage an existing miniature self-networking sensor pod developed for military applications. The final modular system will weigh a few pounds and 1) measure meteorological parameters, 2) measure GPS location and spatial orientation to correct for platform motions, 3) contain integral communications to transfer data on a routine basis, 4) use a plug-and-play port for additional sensors. In Phase II, other sensors such as cloud cover, cloud height and horizontal visibility will be added.

POTENTIAL COMMERCIAL APPLICATIONS:

The commercial potential for the modular marine weather station includes the existing applications of use in 1) the VOS fleet [currently around 4,000 participate], and 2) the NDBC buoys [roughly 100]. Additional markets include the creation of marine meso-nets for harbors and estuaries for improved resources management, incident meteorology and homeland security. ADA's weather stations will also be suitable for use on channel markers, buoys, navigation aides, and day markers. Outside of marine applications, this modular sensor platform has applications in the DOD and various scientific sectors.

FY 2004 PHASE I AWARD WINNER

FIRM:	Vista Photonics, Inc. 67 Condesa Road Santa Fe, NM 87508-8136
AWARD:	$75,000
PHONE:	505-466-3953
FAX:	505-466-3953
E-MAIL:	jpilgrim@vistaphotonics.com
PRINCIPAL INVESTIGATOR:	Jeffrey S. Pilgrim, President

TITLE OF PROJECT: Rugged Optical Carbon Monoxide Field Analyzer

SUBTOPIC NUMBER: 8.1.4R

TECHNCIAL ABSTRACT:

Detection of carbon monoxide (CO) is an essential element of the North American Carbon Program. CO detection is challenging because of the low, 100 parts-per-billion (ppb), concentrations in the atmosphere and the required 10 ppb precision. Vista Photonics proposes to develop novel optical sensing technology that will provide unambiguous carbon monoxide detection with better than 10 ppb precision in less than one minute. The analyzer will be about the size and weight of a can of soda, with integrated optics and electronics, and will operate long-term unattended (without cryogenic fluids). The analyzer will run at a reduced pressure for selectivity to carbon monoxide in the presence of atmospheric contaminants in wet or dry air. The sensor will require no more than 0.1 liter (NTP) of reference gas per day to provide 1 ppb CO measurement accuracy. In quantity, the sensors will retail for less than $6,000, excluding vacuum requirements.

POTENTIAL COMMERCIAL APPLICATIONS:

The proposed technology represents a significant advancement in the performance-to-price ratio for optical detection techniques. The approach will allow laser diode based photoacoustic sensors to outperform traditional tunable diode laser absorption spectroscopy (TDLAS) across multiple markets. The technology developed on this SBIR project will be an across-the-board solution for many trace gas detection opportunities.

FY 2004 PHASE I AWARD WINNER

FIRM:	Sonoma Technology, Inc. 1360 Redwood Way, Suite C Petaluma, CA 94954
AWARD:	$74,964
PHONE:	303-279-4499
FAX:	707-665-9800
E-MAIL:	Marty@sonomatech.com
PRINCIPAL INVESTIGATOR:	Dr. Martin Buhr, Senior Scientist

TITLE OF PROJECT: Measurement of Greenhouse Gases in Airborne An Autonomous Gas Chromatograph for Applications

SUBTOPIC NUMBER: 8.1.5R

TECHNICAL ABSTRACT:

An automated, high precision, lightweight gas chromatograph, capable of measuring hydrogen (H_2), methane (CH_4), carbon monoxide (CO) and carbon dioxide (CO_2) with a fast duty cycle (1 sample per two minutes) will be designed and built. The detector used for the chromatograph will be an electron capture detector with sensitivity enhanced by addition of nitrous oxide (N_2O) reagent gas. The instrument will be designed for minimum power consumption, weight and size to best facilitate deployment on small research aircraft. The instrument components will b selected to maximize commercial viability in both system performance and reliability.

POTENTIAL COMMERCIAL APPLICATIONS:

Commercial applications for this instrument include a variety of US and foreign research organizations that require a small, automatic instrument for precise determination of the principal greenhouse gases. Extension of the instrument to measure other important atmospheric trace species will further enhance the commercial viability of the system.

FY 2004 PHASE I AWARD WINNER

FIRM:	International Radiation Detectors, Inc. 2527 W. 237th Street, Unit A Torrance, CA 90505-5243
AWARD:	$75,000
PHONE:	310-534-3661
FAX:	310-534-3665
E-MAIL:	rajkorde@ird-inc.com
PRINCIPAL INVESTIGATOR:	Dr. Raj Korde, President

TITLE OF PROJECT:	Silicon Photodiode Detectors with Integrated Filters for VUV Solar Observations
SUBTOPIC NUMBER:	8.1.6R Measurement of Greenhouse Gases in Airborne An Autonomous Gas Chromatograph for

TECHNICAL ABSTRACT:

Fabrication of stable, nearly 100% internal carrier collection efficiency silicon photodiodes (AXUV diodes) for 1 nm to 600 nm photons was successfully demonstrated by us several years ago. Owing to their excellent characteristics, these devices are being used by NIST as transfer standards in 5 nm to 250 nm range and aboard SOHO, SNOE and TIMED instruments for the EUV solar spectrum studies. Although, AXUV devices are being used in the present GOES EUV instrument, detectors for the 50 to 100 nm passband with stability and solar blindness required by GOES mission have not yet been demonstrated. Objective of this research is to realize AXUV diodes with Sn and In directly deposited filters for the 500 to 100 nm spectral region. In Phase I, fabrication of filtered diodes with five orders of magnitude visible light blocking will be demonstrated. In phase II, these devices with seven orders of magnitude visible light blocking and acceptable stability will be realized so that they will be useful with the transmission gratings to make the measurements desired by NOAA.

POTENTIAL COMMERCIAL APPLICATIONS:

Owing to their light weight and long term stability the proposed AXUV filtered diodes will be extremely useful in future EUV solar space instrumentation. Other applications of the proposed devices are plasma diagnostics, process control during reactive film sputtering and XUV spectroscopy in general.

FY 2004 PHASE I AWARD WINNER

FIRM:	FIRST RF Corporation 1200 28th Street, Suite 302 Boulder, CO 80303-1756
AWARD:	$74,993.10
PHONE:	303-449-5211
FAX:	303-449-5188
E-MAIL:	flalezari@firstrf.com
PRINCIPAL INVESTIGATOR:	Farzin Lalezari, Chief Executive Officer

TITLE OF PROJECT: ad Advanced Microwave Antenna for Airborne Soil Mnoisture Salinity Mapping

SUBTOPIC NUMBER: 8.1.10R

TECHNICAL ABSTRACT:

The NOAA Environmental Technology Laboratory seeks to perform advanced wide-area mapping of soil moisture and salinity. This requires a large scanning antenna with aerodynamic form, narrow beamwidth, high efficiency, and dual polarization. This antenna system must provide operation at L-band (1400-1427 MHz) and C-band (6.0-6.5 GHz). This large aperture must maintain stable performance independent of changes in environment. This is important, as the test conditions require high accuracy and a high degree of calibration for the sensitivity levels that are sought.

FIRST RF is proposing dual polarized microstrip antennas capable of meeting performance requirements. The design parameters and materials must be chosen carefully to achieve bandwidth, efficiency, and packaging constraints. FIRST RF is proposing separate apertures at L-band and C-band. This is due to the rigid performance requirements at each frequency. A combined frequency antenna would compromise the performance of either frequency and pose additional complexities in the radome.

POTENTIAL COMMERCIAL APPLICATIONS:

The most direct use of this technology will be for precision airborne mapping of soil moisture and salinity. This antenna can be used on airborne platforms to perform this mission. Many of the technology components, however, will have use in various other applications. The dual polarized C-band array with co-located orthogonal polarization beams can be scaled and applied to polarization diverse communications antenna applications of the US Government.

FY 2004 PHASE I AWARD WINNER

FIRM:	Research International, Inc. 17161 Beaton Road SE Monroe, WA 98072-1034
AWARD:	$74,850
PHONE:	360-805-4930
FAX:	360-863-0439
E-MAIL:	davidmccrae@resrchintl.com
PRINCIPAL INVESTIGATOR:	David Alan McCrae, VP, R&D Engineering

TITLE OF PROJECT:	A Low-Cost, Single or Multi-Point Oxygen Concentration Measurement Technique
SUBTOPIC NUMBER:	8.2.1Nb

TECHNICAL ABSTRACT:

Aquatic environments are poorly understood and this lack of understanding needs to change as population pressures affect all aqueous biomes, particularly those of the oceans. A major difficulty in gathering data from the oceans is the lack of appropriate instrumentation.

The principals of Research International have been developing sensors for physical, chemical and biological analysis for some 20 years with a prime focus on 'smaller, faster, and cheaper'. This program will develop a state-of-the-art optical oxygen sensing system that combines a novel oxygen sensitive polymer with a compact, low-power optoelectronic interrogation package. The micron-thick oxygen sensing film undergoes a reversible color change upon exposure to UV light, and returns to its initial colorless state at an oxygen-dependent rate. This program will create a high-resolution measurement system that is at the same time, significantly less expensive and smaller than present instruments.

POTENTIAL COMMERCIAL APPLICATIONS:

Oceanographic monitoring, environmental monitoring, intracranial oxygen measurements, fermentation monitoring.

FY 2004 PHASE I AWARD WINNER

FIRM:	Vescent Photonics, Inc. 2927 Welton Street Denver, Co 80205-3021
AWARD:	$75,000
PHONE:	303-296-6766
FAX:	303-296-6783
E-MAIL:	davis@vescentphotonics.com
PRINCIPAL INVESTIGATOR:	Dr. Scott Davis, VP Technology

TITLE OF PROJECT:	Miniaturized and Robust FTS Sensor for Marine Chemical Analysis
SUBTOPIC NUMBER:	8.2.2R

TECHNICAL ABSTRACT:

Vescent Photonics proposes to construct a miniaturized, robust, Fourier transform spectrometer (FTS) for rapid, in-situ marine chemical analysis. A t the heart of the proposed FTS sensor is our innovative, electro-optic technology, which provides a replacement for mechanical mirror translation. This technology enables a chip-scale, fully integrated FTS sensor with exceptional attributes: 1) small size, comparable to a book of matches; 2) low mass, only tens of grams; 3) small energy consumption, can be battery powered; 4) high sensitivity, can detect solvated species at the ppm to ppb level; 5) great versatility, is sensitive to essentially any chemical contaminant; 6) robust monolithic construction, no moving parts are needed; 7) rapid measurement time, only a few seconds; and 8) tremendous potential for economical construction. This FTS will directly sense, without the need for any chemical reagents, organic contaminants, phosphates, nitrogen, and silica compounds solvated in the marine environment.

POTENTIAL COMMERCIAL APPLICATIONS:

These devices will be suitable for either hand-held field-testing or continuous on-site monitoring. Widespread deployment of these devices will result in enhance marine monitoring, consistent with NOAA needs. Furthermore, applications exist in diverse fields such as: plastics sorting prior to recycling, vehicle emissions monitoring, airborne VOC detection, explosive and threat chemical detection, agricultural food screening, and pharmaceutical and medical monitoring.

FY 2004 PHASE I AWARD WINNER

FIRM:	Arete Associates 1725 Jefferson Davis Highway, Suite 703 Arlington, VA 22202-4130
AWARD:	$75,000
PHONE:	703-413-0290
FAX:	703-413-0295
E-MAIL:	farruggia@arete-dc.com
PRINCIPAL INVESTIGATOR:	Guy J. Farruggia, Senior Engineer

TITLE OF PROJECT:	nsorNon-Fouling Oceanographic Temperature and Conductivity Se
SUBTOPIC NUMBER:	8.2.3W

TECHNICAL ABSTRACT:

Arete will develop a non-fouling, robust, monolithic, sensor package that will yield accurate salinity calculations from temperature and conductivity measurements. The sensor comprises a unique conductivity cell, a thick-film thermistor, and an embedded ultrasonic cleaning device used to remove all incipient detritus from the sensor head. The temperature and conductivity measurements will be programmable for intervals varying from sparse to continuous measurements in order to conserve power and to suit applications requirements. The frequency and amplitude (and the resulting surface acceleration) of the ultrasonic oscillation in the integral cleaner will be selected to disrupt and dislodge the smallest unicellular organisms that are at the vanguard of biofouling. The cleaner will be activated for only a few short intervals each day to disrupt the early adhesions of fouling organisms. The clean sensor surface will ensure proper sensor accuracy before recalibration for at least one year.

POTENTIAL COMMERCIAL APPLICATIONS:

It is envisioned that, if the sensor development through Phase II is successful, Arete will have opened the door on a new generation of ocean temperature/conductivity sensors that will be useful in many scenarios from moored to towed applications. Commercial uses of alternative thick-film electrode systems that are self-cleaning would have uses not only in seawater, but also in fresh water, and in biological, medical, and food processing applications as well.

FY 2004 PHASE I AWARD WINNER

FIRM:	Optical Air Data Systems 10531 Terminal Road Manassas, VA 20110
AWARD:	$74,898
PHONE:	703-393-0754
FAX:	703-393-0745
E-MAIL:	progers@oads.com
PRINCIPAL INVESTIGATOR:	Philip Rogers, CEO

TITLE OF PROJECT: measurement from a Buoy in an Open Ocean Environment Velocity

SUBTOPIC NUMBER: 8.2.5R

TECHNICAL ABSTRACT:

Wind velocity is a critical parameter measured by ocean observing systems. Currently, wind velocity is measured from most buoys with mechanical or point acoustic anemometers that measure wind at the sensor location that is distorted by surface roughness and boundary layer effects. These sensors are also subject to vandalism as they are highly visible on the buoy platform. To replace these inadequate systems, Optical Air data Systems has developed a fiber-optic, laser wind sensor precisely for such meteorological and environmental measurements. Originally designed for use aboard Navy Landing Craft, this sensor is perfectly suited for application to buoy-based oceanic wind observation. The sensor employs an all-fiber-optic, eye-safe LIDAR to detect aerosol backscatter and remotely determine the three-dimensional wind vector at a point 100-150 feed from the sensor aperture.

POTENTIAL COMMERCIAL APPLICATIONS:

The technology developed will be incorporated into the laser sensor products that are already under development at OADS, L.P. for both the commercial and government markets. These sensors include laser based aircraft primary air data systems, compact laser wind sensing units for ballistic windage correction, laser vibrometers for aircraft structural inspection, and wind sensors for competition sailing.

FY 2004 PHASE I AWARD WINNER

FIRM:	Planning Systems, Inc. 12030 Sunrise Valley Drive, Suite 400 Reston, VA 20191-3453
AWARD:	$74,952
PHONE:	228-689-8458
FAX:	228-689-8499
E-MAIL:	wmcbride@psistennis.com
PRINCIPAL INVESTIGATOR:	Dr. Walton McBride, Senior Scientist

TITLE OF PROJECT:	Remote Sensing of Coastal Phenomena
SUBTOPIC NUMBER:	8.2.7E

TECHNICAL ABSTRACT:

Planning Systems, Inc. (PSI) proposes to demonstrate through modeling and simulation, that polarization technology can be exploited to enhance the remote detection of coastal phenomena relevant to NOAA's mission. PSI proposes to adapt an existing toolkit developed under Air Force research and refined for commercial applications, PSI's Polarization Toolkit (P2T). We will modify P2T to identify portions of spectral signature related to skylight and sunglint and develop a subtraction technique to eliminate these signatures from selected pixels within an image. Comparisons will be made to demonstrate the enhanced detection in either time or space from images processed using standard atmospheric correction techniques. Phase II will focus on the robustness of the new technique and the collection of polarized spectra from example phenomena for further study. Follow-on efforts proposed include investigation of the use of linear polarizers onboard satellite sensors to enhance remote detection.

POTENTIAL COMMERCIAL APPLICATIONS:

Initial commercialization efforts will focus on marketing PSI's newly developed subtraction technique as a step in the atmospheric correction process for existing imagery. Follow-on commercialization will focus on the use of linear polarizers to enhance the detection of coastal events.

FY 2004 PHASE I AWARD WINNER

FIRM:	JPS Industries, Inc. P.O. Box 500 Bristol, NH 03222
AWARD:	$74,796
PHONE:	603-744-6400
FAX:	603-744-3700
E-MAIL:	cwsanta@aol.com
PRINCIPAL INVESTIGATOR:	Joseph Santamaria, GM

TITLE OF PROJECT:	Development of a Submersible Fish Cage for Open Ocean Aquaculture
SUBTOPIC NUMBER:	8.3.1F

TECHNICAL ABSTRACT:

A need exists to develop cost effective and reliable submersible cage technology for exposed aquaculture. The team assembled as part of this SBIR incorporates JPS Industries, Great Bay Aquafarms and the University of New Hampshire. In Phase I, a design will be developed based on concepts known to work in the industry. Concepts to be investigated include a cage constructed around HDPE pipe, with an airlift so the system can move through the water column. Feeding, monitoring and control/telemetry will be performed with a surface buoy with a connection to the cage using a high-stretch hose. Analysis will include hydrostatics and development of hydrodynamic loads. Cage structural integrity will also be examined. Specification of components will be made in preparation for construction and deployment in Phase II where the cage will be tested in the first year stocked with cod in the second year, focusing in the live fish market and to develop harvesting techniques.

POTENTIAL COMMERCIAL APPLICATIONS:

Expansion of marine aquaculture to exposed, open ocean or offshore sites.

FY 2004 PHASE I AWARD WINNER

FIRM:	Advanced Design Consulting, Inc. 126 Ridge Road P.O. Box 187 Lansing, NY 14882-0187
AWARD:	$74,187.71
PHONE:	607-533-3531
FAX:	607-533-3618
E-MAIL:	eric@adc9001.com
PRINCIPAL INVESTIGATOR:	Dr. Eric Johnson, Vice President of Research

TITLE OF PROJECT:	Bottom Water Temperature and Pressure Sensor With Real-time Readout
SUBTOPIC NUMBER:	8.3.4F

TECHNICAL ABSTRACT:

Monitors that are currently used to periodically record bottom water temperatures cannot be read by the lobstermen who use them. In addition, current monitors make no provision for recording changes in depth if they are redeployed in a different location. The specific aim of this proposal is to develop a sensor that will measure water temperature and pressure hourly and will be readable by a radio frequency (RF) signal from a standard hand-held computer. Data will be immediately available for graphical display by the user. The sensor will be designed for minimal power consumption, to provide extended batter life, and will be recharged by RF induction, allowing the unit to be completely and permanently sealed.

POTENTIAL COMMERCIAL APPLICATIONS:

Temperature/pressure sensor with real-time readout for use in the lobster industry and in other areas of the fishing industry. Diverse uses generally in environmental monitoring of aquatic conditions in oceans, lakes, reservoirs, rivers and streams. Other potential commercial uses include temperature/pressure monitor for liquids during manufacturing (e.g., during fermentation) and as a swimming pool temperature monitor.

FY 2004 PHASE I AWARD WINNER

FIRM:	Analytical Instrument Systems, Inc. 118 Old York Road Ringoes, NJ 085511042
AWARD:	$75,000
PHONE:	908-788-7022
FAX:	908-788-5617
E-MAIL:	ais@aishome.com
PRINCIPAL INVESTIGATOR:	Dr. Donald B. Nuzzio, President

TITLE OF PROJECT: Rugged Electrodes for Mapping Sediment Habitat

SUBTOPIC NUMBER: 8.3.5F

TECHNICAL ABSTRACT:

Currently no commercially available voltammetric electrode system exists which can operate in the water column, water/sediment interface or sediment. These electrodes need to sense a variety of electroactive species in the marine environment, which are biogeochemical relevant to understanding the Essential Fish Habitat. More importantly, these electrodes must be able to take the punishment of multiple deployments into the sediment. It is the goal of this work to prove feasibility of a new type of electrode (sensor), which can be commercially available to the community.

AIS In-situ instruments coupled to these new electrodes could be used in the analysis of sediments in the oceans, bays, harbors (Tengberg, 1995) or planet surfaces.

From monitoring sediments for contamination, “Hot Spots” of heavy metal discharge from dry docs, effluent discharge to manufacturing facilities and electrical power plants, these electrodes would greatly simplify electrochemical procedures and make them accessible to more researchers.

POTENTIAL COMMERCIAL APPLICATIONS:

The ability to couple a rugged electrode system to out current in-situ electrochemical analyzers would allow researchers a tool to explore the biogeochemical processes in real time on a global basis. Many oceanographic and environmental researchers have contacted AIS for rugged electrodes. This is the right time for the development of such electrodes. The scientific community needs them!

FY 2004 PHASE I AWARD WINNER

FIRM:	YSI, Inc. 1725 Brannum Lane Yellow Springs, OH 45387-0279
AWARD:	$49,347.56
PHONE:	937-767-7241
FAX:	937-767-1058
E-MAIL:	rspokane@ysi.com
PRINCIPAL INVESTIGATOR:	Dr. Robert B. Spokane, Lead Scientist

TITLE OF PROJECT:	Applications
Development of Opto-Chemical CO_2	Sampling/Monitoring System Suitable for Aquaculture
SUBTOPIC NUMBER:	8.4.1SG

TECHNICAL ABSTRACT:

Aquaculture has become a critical component in the international quest to feed the world and protect the earth's natural food resources. Numerous research efforts have proven that controlling CO_2 in aquaculture is critical to the quality and quantity of the product produced. Though the importance of controlling CO_2 levels in all aquaculture environments (re-circulation systems, ponds, ocean settings, etc.) is well established, there are no suitable means for regularly monitoring dissolved CO_2 in these waters.

We propose to develop an opto-chemical CO_2 monitor which is sufficiently robust, sensitive and accurate to serve all aspects of the aquaculture market by providing fast, reliable dissolved CO_2 readings on demand with a view to optimizing aquaculture operations and increasing the quantity and quality of their end product.

Severinghaus described the principle for a CO_2 sensor. We propose to modify this approach by optimizing the sensor's chemistry making it suitable for aquaculture.

POTENTIAL COMMERCIAL APPLICATIONS:

Aquaculture, aquaculture sampling, monitoring, process control and research.

FY 2004 PHASE I AWARD WINNER

FIRM: Advanced BioNutrition Corporation
6430-C Dobbin Road
Columbia, MD 21045-4735

AWARD: $49,999

PHONE: 410-730-8600
FAX: 410-730-9311
E-MAIL: rbullis@advancedbionutrition.com

PRINCIPAL INVESTIGATOR: Robert A. Bullis, Director of Animal Health

TITLE OF PROJECT: Non-Marine-Based Fishmeal and Fish Oil Replacement Strategies for the Production of Aquaculture Feed

SUBTOPIC NUMBER: 8.4.1SG

TECHNICAL ABSTRACT:

If aquaculture is to become an increasing contributor to the food supply, it is critical that aquaculture feeds become less reliant on marine-derived fishmeal and fish oil as the preferred source of essential proteins and lipids. Not only is the wild fishery from which these products are extracted at maximum sustainable levels of harvest, but also there is increasing concern that these feedstocks may contain contaminants and pollutants that have accumulated in the fish from which the fishmeal and fish oil were derived. It is critical; therefore, that aquaculture feeds become less reliant on marine proteins and lipids. Technically, this means finding suitable terrestrial alternatives that are safe for human consumption. Our goal is to develop a strategy for the production of aquaculture feeds that replace marine fishmeal and fish oil with non-marine ingredients. We will demonstrate that the ingredients of prototypical diets currently being tested can perform economically in a standard production environment.

POTENTIAL COMMERCIAL APPLICATIONS:

A non-marine-based fishmeal replacement product.

FY 2004 PHASE I AWARD WINNER

FIRM:	Resodyne Corporation 1901 South Franklin Butte, MT 59701
AWARD:	$50,000
PHONE:	406-723-2222
FAX:	406-723-2225
E-MAIL:	jpierce@resodyne.com
PRINCIPAL INVESTIGATOR:	Joel Pierce, Chemical Engineer

TITLE OF PROJECT:	A Vibrationally-enhanced Aquaculture Treatment System (VEATS) for Water Reuse and Effluent Management
SUBTOPIC NUMBER:	8.4.2SG

TECHNICAL ABSTRACT:

Because of the severe impact of diseases on production and the environmental devastation created by many commercial aquaculture effluents, modern methods of intensive aquaculture are evolving which rely heavily on recirculating the water. This proposal addresses the need for a modular, integrated technology in closed-loop aquaculture operations by enhancing the performance of a fluidized ion exchange bed that removes ammonia by the addition of the low-frequency vibrational agitation, which also accelerates oxygenation and gas stripping, and ensures efficient use of ozone as a disinfectant. Additionally, the agitation will prevent fouling of the media with organic material, which compromises the ability of the media to adsorb ammonia. The vibrationally-enhanced aquaculture treatment system (VEATS) will provide an economical improvement that will enable a series of modular, integrated treatment units to function with the same efficiency as a much larger custom system designed specifically for cold water or warm water production.

POTENTIAL COMMERCIAL APPLICATIONS:

Aquaculture is growing faster than any other form of agriculture, creating worldwide demand for new technology that can make closed-loop, biosecure aquaculture operation affordable. The treatment technology will also have applications in treatment of wastewater and drinking water.

FY 2004 PHASE I AWARD WINNER

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

AWARD: $42,310

PHONE: 808-964-8646
FAX: 808-964-8646
E-MAIL: doconnor@onomeascientific.com

PRINCIPAL INVESTIGATOR: Daniel O'Connor, Chief Scientist

TITLE OF PROJECT: A Prototype Fish Metrology System for Open-Ocean Aquaculture

SUBTOPIC NUMBER: 8.4.5SG

TECHNICAL ABSTRACT:

Open-ocean aquaculture businesses are proving commercially successful. There are several refinements this technology must undergo in order to maximize productivity. One of the specific areas of refinement is in gathering detailed statistical knowledge of the captive fish stock population as a function of time. This knowledge will allow optimization of feed rates. Optimized feed rates will minimize feed costs, maximize fish yields, and minimize environmental impact. In addition, time series analysis of measured length-frequency distributions can be used to enhance fish harvesting strategies. We propose to build a novel, non-invasive, environmentally friendly, in-situ imaging system to provide fish length-frequency data on a routine basis. The prototype system is a low-cost, diver-activated, biometric imaging system with laser based absolute metrology.

POTENTIAL COMMERCIAL APPLICATIONS:

Optimization of feed rates for all mostly clear-water aquaculture cage systems worldwide. Aid in optimization of harvesting strategies.

FY 2004 PHASE I AWARD WINNER

FIRM:	Neptune Sciences, Inc. 40201 Highway 190 East Slidell, LA 70461-2443
AWARD:	$73,687
PHONE:	985-649-7252
FAX:	985-649-7252
E-MAIL:	jboyd@neptunesci.com
PRINCIPAL INVESTIGATOR:	Dr. Janice A. Boyd, Senior Scientist/Oceanographer

TITLE OF PROJECT:	Web-Based Tools and Databases for Multi-Hazard Contingency Plans and Tools for National Marine Sanctuaries
SUBTOPIC NUMBER:	8.4.7N

TECHNICAL ABSTRACT:

An on-line GIS-oriented management and planning system for four National Marine Sanctuaries will be designed. It will contain static databases of physical, chemical, biological, geological, cultural, historical and archeological information of value to Sanctuary managers. It will link with ongoing oceanographic and meteorological monitoring systems to allow near real time access to their data. It will allow creation of maps, charts and tables from databases selected by the user. It will provide software tools and data for Sanctuary managers and emergency responders and planners to devise Sanctuary specific contingency plans to respond to and mitigate hazardous spills that may occur in the marine environment in or near the Sanctuary. Comparisons of data collected after a spill with archived databases will also allow monitoring of recovery after such incidents. Archived databases and access to on-line data delivery systems will also aid Sanctuary managers in their day-to-day oversight and management of the Sanctuaries.

POTENTIAL COMMERIAL APPLICATIONS:

Customized systems could be prepared for other national Marine Sanctuaries and for other marine areas in the United States and other countries. The customer base would be any commercial, Federal, state, local or tribal entity that has responsibility for management and protection of marine natural resources.

FY 2004 PHASE I AWARD WINNER

FIRM:	GMA Industries, Inc. 20 Ridgely Avenue, Suite 301 Annapolis, MD 21401-1426
AWARD:	$75,000
PHONE:	410-267-6600
FAX:	410-267-6602
E-MAIL:	glenn@gmai.com
PRINCIPAL INVESTIGATOR:	R. Glenn Wright, President

TITLE OF PROJECT:	Heads-up Vessel Navigation Using Raster/Vector Data
SUBTOPIC NUMBER:	8.5.1N

TECHNICAL ABSTRACT:

This project entails a comprehensive approach to developing an innovative solution to heads-up display navigation for marine vessels that addresses the required hardware, the sources of raster and vector navigation and marine charting data, and the means to convey these data to watch standers on the bridge in a manner that enhances their performance. During Phase I we identify specific heads-up display system components suitable for use in the marine environment and capable of meeting the stringent operational requirements of vessel navigation. Raster and vector data sources for navigation, including radar contact information, and nautical charts are then considered by defining their scope, range, accuracy, and usefulness while minimizing clutter. We then create the software needed to integrate and display these data. A prototype demonstration system is developed during Phase I to illustrate our approach and validate our methods.

POTENTIAL COMMERCIAL APPLICATIONS:

Commercial applications for marine heads-up display navigation to river and coastal marine operations provided by tugs, barges, patrol craft, pilot boats, fishing vessels, and numerous other such craft. There is also significant commercial potential for the use of this technology in the recreational boating industry by luxury yachts.

FY 2004 PHASE II AWARD WINNER

FIRM:	Atmospheric Observing Systems 1930 Central Avenue, Suite A Boulder, CO 80301
AWARD:	$104,000
PHONE:	303-443-3389
FAX:	303-440-3328
E-MAIL:	jim@asoinc.net
PRINCIPAL INVESTIGATOR:	Dr. James R. Smith, President

TITLE OF PROJECT:	igh Precision Monitoring Instrumentation for BackgrounHd Methane
SUBTOPIC:	8.1.1R

TECHNICAL ABSTRACT:

Our Phase I effort was successful. We upgraded our baseline methane analyzer to meet or surpass the levels of performance posed by DOC solicitation subtopic 8.1.1R: sensitivity of 10 ppb (dry mole fraction), low maintenance for extended periods at remote field sites, less than one liter (NTP) of reference gas per day, and negligible response to platform motion. The analyzer is a novel application of the NonDispersive Infrared technique. It utilizes the narrow ($4cm^{-1}$) Q-Branch of methane at 3.315μm. The absorbing cell is single pass, compact ($15cm^3$, 20 cm long) and has no internal optics. For Phase II, we are proposing to: 1) upgrade the methane analyzer and associated detection system to become a commercial product of the proposing company, and 2) build two full methane detection systems, one to be deployed to a land-based site of NOAA's choice after the appropriate amount of laboratory development, the other to serve as a demonstration project to be deployed on a buoy for monitoring the background of atmospheric methane at sea.

POTENTAIL COMMERCIAL APPLICATIONS:

Full detection systems for atmospheric methane to monitor the important sinks and sources of the global carbon cycle.

FY 2004 PHASE II AWARD WINNER

FIRM:	Metatech APS Division 5 West First Street, Suite 301 Duluth, MN 55802-2070
AWARD:	$300,000
PHONE:	218-727-2666
FAX:	218-727-2728
E-MAIL:	jkappenma@aol.com
PRINCIPAL INVESTIGATOR:	John G. Kappenman, Division Manager

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

SUBTOPIC: 8.1.2R

TECHNICAL ABSTRACT:

Geomagnetic disturbances have caused widespread disruptions to power grids throughout North America. It is necessary to fully describe the complex physical manifestation of geomagnetic disturbance environments to model how and to what extent these disturbances impact modern ground-based critical infrastructures. The Ground Level Assimilative Model (GLAM) would provide the general public and operations of land-based infrastructures concerned about GIC impacts a set of geomagnetic storm climatology data in a context that can be made readily used in power network models or other infrastructure models. The development would provide a meso-scale resolution geomagnetic storm data. The aspects of the work proposed for Phase II can be summarized as follows: 1) develop, test, and select high-cadence nowcast assimilative model of geomagnetic storm conditions over local and north American continental regions; 2) validate nowcast model for various observatory array combinations; 3) develop graphical visualization and 2D gridded datafile capabilities for the GLAM model outputs; and 4) test and deliver beta version of nowcast models for the SEC and also to serve as platform for Metatech commercial application.

POTENTIAL COMMERCIAL APPLICATIONS:

Both Metatech and other space weather vendors would be able to utilize GLAM model outputs to develop commercially tailored forecast and nowcast services of geomagnetic storm conditions to end-users concerned about these impacts across the US.

FY 2004 PHASE II AWARD WINNER

FIRM:	Southwest Sciences, Inc. 1570 Pacheco Street, Suite E-11 Santa Fe, NM 87505-3993
AWARD:	$300,000
PHONE:	505-984-1322
FAX:	505-988-9230
E-MAIL:	mzondlo@swsciences.com
PRINCIPAL INVESTIGATOR:	Dr. mark A. Zondlo, Senior Research Scientist

TITLE OF PROJECT:	Miniature Chemical Ionization Mass Spectrometer for Tropospheric Ammonia
SUBTOPIC:	8.1.4OGP

TECHNICAL ABSTRACT:

Southwest Sciences proposes continuing development of an instrument for use on a lightweight aircraft capable of measuring tropospheric concentrations of ammonia. Gas phase ammonia plays important roles in determining the formation and composition of aerosol particles. Understanding the chemical and physical properties of aerosol particles is critical towards understanding global climate change, regional air pollution, and acid deposition. The instrument uses a state-of-the-art, miniature mass spectrometer that operates at higher pressures than conventional mass spectrometers, resulting in lower pumping, lighter weight, and consuming less power. In addition, the instrument uses chemical ionization mass spectrometry to obtain high selectivity, high sensitivity, and a low limit of detection (20 pptv). Phase I results have demonstrated excellent ion transmission from the chemical ionization source to the mass spectrometer. Phase II efforts will focus on optimizing the electrostatic lenses, inlet design, extensive calibration and background testing, data acquisition and analysis, and field-testing of the instrument. The expected prototype at the end of Phase II will measure ammonia at a frequency of 0.1-1 Hz and be the size of a computer monitor.

POTENTIAL COMMERCIAL APPLICATIONS:

Commercial applications of a sensitive and fast ammonia instrument include atmospheric chemistry field campaigns and laboratory experiments, air quality monitoring networks, and the semiconductor industry. Development of tropospheric ammonia instruments are among the highest priorities for numerous government agencies investigating climate change processes. Ammonia also plays an important role in unhealthy particle formation in the urban and agricultural interface. Finally, because ammonia poisons the surface in the doping process of semiconductor fabrication, more accurate and sensitive measurements of ammonia will help to increase yields in semiconductor production.

FY 2004 PHASE II AWARD WINNER

FIRM:	Fairfield Technologies, Inc. 1200 G Street NW, Suite 800 Washington DC 20005-6705
AWARD:	$300,000
PHONE:	703-277-7707
FAX:	703-277-7730
E-MAIL:	kfried@fairfieldtech.com
PRINCIPAL INVESTIGATOR:	Kenneth Fried, President

TITLE OF PROJECT:	Build a Prototype “Grid in a Box” Software Product for NOAA
SUBTOPIC:	8.1.7W

TECHNICAL ABSTRACT:

Brief Description of Problem: NOAA’s AWIPS is a cornerstone of NWS’ forecast mission. As advanced as AWIPS is, it still faces challenges similar to many systems, including: system capacity over-/under-utilization; data and analysis stovepiping; and complex data management needs.
Innovations: In Phase 1, FTI successfully demonstrated that grid computing and ontologies could enable communications between AWIPS computer systems. FTI will leverage this success to exploit the commercial potential of this innovation in Phase 2. FTI’s approach is innovative in that it: applies grid computing to mainstream government needs; employs an innovative open source software business model; and builds upon FTI’s standards-based software development “best practices.”
Project Objectives: FTI’s objective is to build a working prototype “Grid In A Box” product to address NOAA’s need for easier-to-use high performance computing options both within and outside of AWIPS. FTI will then refine this product for targeted marketing to government and commercial sectors.
Technical Approach: FTI’s working prototype will consist of the following components, built on open source/open architecture software: the core “Grid In a Box” product; a supporting proprietary toolkit for non-grid experts; and an online product sales and delivery portal. FTI will validate prototype performance in a “real world” NOAA environment.

POTENTIAL COMMERCIAL APPLICATIONS:

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

FY 2004 PHASE II AWARD WINNER

FIRM:	Yankee Environmental Systems, Inc. 101 Industrial Blvd. Turner Falls, MA 01376-1611
AWARD:	$300,000
PHONE:	413-863-0200
FAX:	413-863-0255
E-MAIL:	mcb@yesinc.com
PRINCIPAL INVESTIGATORS:	William Stein, Senior Design Engineer, and Mark Beaubien, General Manager

TITLE OF PROJECT:	An Innovative Low-Cost Dropsonde Using Integrated Flexible Circuit Design
SUBTOPIC:	8.1.9R

TECHNICAL ABSTRACT:

Upper atmospheric measurements of temperature, humidity, pressure and winds are required daily at hundreds of locations around the world to drive numerical weather prediction forecast models. In the US these critical measurements are made by Radiosondes carried aloft by balloons filled with helium and tracked by 104 NWS ground stations. However, data-sparse regions off the west coast can only be accessed via dropsondes. Today, radiosondes are commodities, manufactured using relatively old designs and production methods. Dropsondes measure 16"x2.25", weigh more than a pound, and support only one sounding at a time. Significant reductions in size/weight and support for multiple simultaneous soundings would permit Unmanned Aerial Vehicle (UAV) use in the Global Universal Profiling System (GUPS). In phase I, we developed a GPS dropsonde design using fewer than 15 active components, including sensors, and demonstrated its performance. In Phase II we will further reduce the parts count to four active integrated circuits. Our design can optionally incorporate in-situ chemical sensors, providing on line real time chemical analysis in support of homeland security initiatives, so in addition to meteorology, this technology is also important to evolving homeland defense requirements.

POTENTIAL COMMERCIAL APPLICATIONS:

Annual dropsonde sales are estimated to be about 7,000 per year at a sales price of about $575 each, so a market worth about $4 million per year. Our dropsonde can also be carried aloft by a balloon (a radiosonde), which is a market 100 times larger than dropsondes. YES believes the number of dropsondes used would increase if the sensor package were smaller, lighter, and cheaper. With GUPS' ER-2 or UAVs, lighter dropsondes permit carrying more per flight. The market includes the Federal Government (NOAA, Air Force, and Navy), research organizations such as the National Center for Atmospheric Research, and many overseas customers. Our dropsonde should also meet the requirements of the evolving global atmospheric sounder concept for high altitude balloons (such as GAINS). The balloons would be loaded with dropsondes and deployed from a height of 60,000 feet around the globe as they drift with winds in the upper troposphere.

FY 2004 PHASE II AWARD WINNER

FIRM:	Hydro-Optics, Biology, & Instrumentation Labs 8987 E. Tanque Verde, #309-366 Tucson, AZ 85749-9610
AWARD:	$299,980
PHONE:	520-299-2589
FAX:	520-299-2598
E-MAIL:	maffione@hobilabs.com
PRINCIPAL INVESTIGATOR:	Dr. Robert Maffione, President & Chief Scientist

TITLE OF PROJECT:	Full Spectrum Complete IOP Instrument Suite
SUBTOPIC:	8.2.1N(d)

TECHNICAL ABSTRACT:

In the Phase I effort, we developed conceptual designs and methods for novel oceanographic optical instruments that measure a complete set of water inherent optical properties across the full visible spectrum at high spectral resolution. One instrument is a new type of in-situ absorption meter that maintains high accuracy over a wide range of water optical properties, from the clearest waters to those of extremely high turbidity. Moreover, the design is superbly robust, allowing the instrument to be mounted on long-term moorings, AUV's and ROV's, drifters or deep profiling packages. The second instrument is a spectrometer-based, folded-path beam transmissometer. The third is a relatively compact instrument for measuring the volume scattering function at 11 equally spaced angles from 15 to 165 degrees. While currently there are commercial instruments for measuring absorption, beam attenuation and scattering, they all suffer from their own particular shortcomings and well-known limitations, in some cases severe limitations. The Phase II objectives are to build prototypes of each of these instruments, test them in the lab and then conduct an ocean deployment, and thoroughly characterize instrument accuracy. By the end of this effort, we expect to have complete schematics and shop drawings for commercial production models.

POTENTIAL COMMERCIAL APPLICATIONS:

With the emergence of ocean-color remote sensing in the past 20 years or so, understanding and characterizing the optical properties of ocean waters has gained intensive interest. While currently there are commercial instruments for measuring absorption, beam attenuation and scattering, they all suffer from their own particular shortcomings and well-known limitations, in some cases severe limitations. The suit of optical instruments developed on this SBIR will truly revolutionize the scientific investigation and characterization of the optical properties of natural waters and provide tools and capabilities that do not currently exist. The market is global and includes oceanographers and limnologists conducting basic and applied research, navies interested in underwater visibility, beam propagation and remote sensing, and government agencies as well as commercial companies involved with environmental monitoring and the characterization of oceans, lakes and rivers.

FY 2004 PHASE II AWARD WINNER

FIRM:	Polestar Technologies, Inc. 220 Reservoir Street, Suite 32 Needham Heights, MA 02494-3133
AWARD:	$299,738
PHONE:	781-449-2284
FAX:	781-449-1072
E-MAIL:	jkane@polestartech.com
PRINCIPAL INVESTIGATOR:	Dr. James A. Kane, Vice President Operations

TITLE OF PROJECT:	Inexpensive Submersible Long-Term Dissolved Oxygen Recorder
SUBTOPIC:	8.2.5F

TECHNICAL ABSTRACT:

Polestar Technologies, Inc. proposes a Phase II SBIR Project to complete the development of an inexpensive compact optical system for continuous dissolved oxygen monitoring in areas at risk of eutrophication induced by hypoxia and anoxia. The proposed monitor will facilitate the development of improved theoretical models by enabling better data collection with regard to spread and degree of oxygen reduction occurring in the suspect areas. This monitor will also significantly reduce maintenance costs and improve reliability of data. An innovative sensor design will incorporate a unique biostatic barrier that has been shown to inhibit biological encapsulation of the system's sensing membrane. The Phase II effort will result in the development of prototypes to be tested in the Chesapeake Bay.

POTENTIAL COMMERCIAL APPLICATIONS:

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

FY 2004 PHASE II AWARD WINNER

FIRM:	Physical Sciences, Inc. 20 New England Business Center Andover, MA 01810-1077
AWARD:	$299,208
PHONE:	978-689-0003
FAX:	978-689-3232
E-MAIL:	mazel@psicorp.com
PRINCIPAL INVESTIGATOR:	Charles H. Mazel, Principal Research Scientist
TITLE OF PROJECT:	e Imager for Rapid Estimates of the DistributionFluorescenc and Abundance of Coral Recruits (7284-350)
SUBTOPIC:	8.3.1F

TECHNICAL ABSTRACT:

New methods are needed to help marine scientists conduct studies of the processes limiting or promoting coral recruitment and survivorship. The small size and low visual contrast of coral recruits in natural settings make them difficult to impossible to locate efficiently. Many coral recruits contain strongly fluorescent pigments, and viewed in the proper way this fluorescence dramatically increases their contrast with their surroundings. Our Phase I efforts, complemented by work being carried out by other researchers, have demonstrated that fluorescence can be an enabling technology for locating coral recruits both in-situ and in the laboratory, and on both natural substrates and artificial settlement tiles. We propose to develop a suite of fluorescence-based tools and instruments that significantly expand on currently available technologies for locating, identifying, and documenting coral recruits. This suite will include specialized light sources and observation and photography techniques that increase the contrast of the recruits with their surroundings, and magnification tools that aid in the identification of the very small targets that are found. The technologies that we propose to develop will be applicable in the field and the laboratory and are intended for both researchers and resource managers.

POTENTAIL COMMERCIAL APPLICATIONS:

This research will result in a suite of products that address the application of fluorescence viewing and imaging to coral recruitment research, both in-situ and in the laboratory. The products will be of interest to coral researchers worldwide. The products are being developed specifically in regard to coral recruitment, but some are of general enough applicability that they will also be of benefit for addressing other research questions. The products will be commercialized through an existing small business that is already the world leader in the use of fluorescence for underwater research applications.

FY 2004 PHASE II AWARD WINNER

FIRM:	Snapperfarm, Inc. P.O. Box 685 Culebra, PR 00775
AWARD:	$200,000
PHONE:	787-742-0641
FAX:	787-742-0641
E-MAIL:	brian@snapperfarm.com
PRINCIPAL INVESTIGATOR:	Brian O'Hanlon, Vice President of Operations

TITLE OF PROJECT:	Refining Culture Technology for Growing Spiny Lobsters, *Panulirus argus*, from Pueruli to Market in Puerto Rico
SUBTOPIC:	8.4.1SG

TECHNICAL ABSTRACT:

Spiny lobster, *Panulirus argus*, aquaculture on a global scale is a small fraction of the total annual wild harvest. The ability to advance the culture of spiny lobsters will reduce the stress on the natural stock while providing a highly desired product. The culture cycle is dependent on the collection of lobster pueruli from the wild, due to the difficulty in rearing the larvae through the yearlong cycle. Snapperfarm, Inc. moored its first two offshore fish submerged sea cages in the Puerto Rico in 2002. These cages quickly became large settlement collectors for spiny lobster pueruli, which were drifting to nearshore for settlement. The collection of pueruli from offshore sea cages represents a novel technique, which differs from the traditional methods – small floating collectors and plankton nets. Building on the results in Phase I, Snapperfarm will address in Phase II the bottlenecks to commercial culture of spiny lobster. The objectives and approaches include refining pueruli collection techniques, developing feed for juveniles, using growout cages to raise lobsters to market, and finding value-added markets for cultured lobsters. As these refinements are realized, Snapperfarm, Inc. can expand their research lobster culture program to a successful and profitable business (Phase III).

POTENTIAL COMMERCIAL APPLICATIONS:

Snapperfarm, Inc. intends to refine spiny lobster culture technology during Phase II so that cultured lobsters are regularly available on the market. This technology will encourage other user groups to pursue spiny lobster culture in the Caribbean and Florida as a viable and economic business.

FY 2004 PHASE II AWARD WINNER

FIRM:	Net Systems, Inc. 7910 NE Day Road West Bainbridge Island, WA 98110-1254
AWARD:	$200,000
PHONE: FAX: E-MAIL:	206-842-5623 206-842-6832 kswanson@oceanspar.com
PRINCIPAL INVESTIGATOR:	Kurt Swanson, Design Engineer

TITLE OF PROJECT: Offshore Semi-autonomous Fish Feeding System

SUBTOPIC: 8.4.5SG

TECHNICAL ABSTRACT:

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

Based on the results of Phase1, Net Systems and co investigator the University of New Hampshire intend to demonstrate a fully functional semi-autonomous offshore feeder. This feeder will have the sea keeping characteristics necessary to survive the worst weather anticipated at the UNH Open Ocean Aquaculture (OOA) site. It will integrate an appropriate mooring system to be compatible with the existing offshore pens. The feeder will be automated and remotely controllable with capabilities to feed an entire farm of submerged fish pens. This major advancement should allow the offshore fish farming industry to move to the next level here in the US and around the world. Proving the feasibility of such a system would allow Net Systems to offer farm packages that would include the major components of a fully functional offshore fish farm.

POTENTIAL COMMERCIAL APPLICATIONS:

Annual dropsonde sales are estimated to be about 7,000 per year at a sales price of about $575 each, so a market worth about $4 million per year. Our dropsonde can also be carried aloft by a balloon (a radiosonde), which is a market 100 times larger than dropsondes. YES believes the number of dropsondes used would increase if the sensor package were smaller, lighter, and cheaper. With GUPS' ER-2 or UAVs, lighter dropsondes permit carrying more per flight. The market includes the Federal Government (NOAA, Air Force, and Navy), research organizations such as the National Center for Atmospheric Research, and many overseas customers. Our dropsonde should also meet the requirements of the evolving global atmospheric sounder concept for high altitude balloons (such as GAINS). The balloons would be loaded with dropsondes and deployed from a height of 60,000 feed around the globe as they drift with winds in the upper troposphere.

FY 2004 PHASE II AWARD WINNER

FIRM:	Cates International, Inc. P.O. Box 335 Kailua, HI 96734-0335
AWARD:	$97,762
PHONE: FAX: E-MAIL:	808-262-0267 808-262-0804 jrc@catesinternational.com
PRINCIPAL INVESTIGATOR:	John R. Cates, President
TITLE OF PROJECT:	Construction and Testing of a Spar Feeding System for an Offshore Aquaculture Farm
SUBTOPIC:	8.4.5SG

TECHNICAL ABSTRACT:

This SBIR Phase II project proposes to add telemetry and monitoring equipment to the spar designed and constructed under our Phase I contract. Furthermore, we propose to test and evaluate an automated spar feeding system suitable for use on an operating offshore fish farm. C Cates International, Inc. has developed a feeding system for it's underwater cages that functions from a small boat. But this requires the presence of men at the site. We propose to equip and operate and test a 3 meter by 13 meter spar buoy to serve as an automatic feeding station that will be able to feed up to four cages. The spar will contain feed storage hoppers, a diesel electric generator, various water and slurry pumps and automated equipment to maintain the spar's buoyancy as feed is removed.

POTENTIAL COMMERCIAL APPLICATIONS:

Several other farms in Hawaii alone are currently under development and undergoing permitting processes. This feeder is likely to be included in the initial start-up cost analysis, due to the cost benefit factor alone, as it would greatly reduce the manual labor involved in current technology. In contrasts to other feeders in the same competition, this plan is a streamlined for practical application and immediate operation making it the most cost competitive. If successful, CII will sub-contract fabrication of the exterior body (spar) and then outfit the inner assemblies and machinery to be sold as a fully operational system when completed.

FY 2004 PHASE II AWARD WINNER

FIRM:	ProFishent, Inc. 17306 NE 26th Street Redmond, WA 98052-5848
AWARD:	$197,855
PHONE:	425-883-9896
FAX:	425-869-5364
E-MAIL:	davidp@profishent.com
PRINCIPAL INVESTIGATOR:	Dr. David B. Powell, Vice President, R&D

TITLE OF PROJECT:	A New Generation of Anti-Viral Vaccines for Aquaculture Using Nanotechnology
SUBTOPIC:	8.4.6SG

TECHNICAL ABSTRACT:

Although companies based outside the U.S. have tested and, in some cases, sold basic anti-viral vaccines to aquaculture producers, practicing veterinarians and virologists have been unimpressed by their extremely limited effectiveness (J. Mullins, pers. comm. 2002; J. Winton, pers. comm. 2004). The consensus is that new approaches are urgently needed to develop viral vaccines that do not rely on DNA technology. ProFishent will apply advances in nanotechnology to the design and construction of efficacious immersion and injection vaccines to prevent mortalities from viruses and, potentially, other intracellular pathogens. Proprietary nanoparticles will be combined with model viruses (ISAV and IHNV) to create potent immunostimulatory complexes. Vaccine prototypes will be optimized and compared to traditional formulations for their ability to stimulate immunity and to protect rainbow trout and Atlantic salmon from laboratory challenges with live pathogens. Fluorescent, antigen-coated particles will also be used to observe the effect of size on uptake and transport by the immune system.

POTENTIAL COMMERCIAL APPLICATIONS:

Commercialization of this research in Phase 3 will result in a new platform technology using non-toxic nanoparticle products that will be applicable to both fresh-water and marine aquatic species. The vaccines will be compatible with biological recirculation filter systems. It should be possible to vaccinate and raise a variety of aquatic species previously thought to be too susceptible to pathogens. Unlike DNA vaccines, this family of products will not raise any objections from consumers concerned about genetically modified organisms, nor will it face formidable hurdles by regulatory authorities.