



# SBIR

**Small Business  
Innovation  
Research  
Program**

**ABSTRACTS OF  
AWARDS FOR  
FISCAL YEAR 2010**

**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 18 Phase I contracts for FY 2010. These awards are up to \$95,000 each, and totaling approximately \$1.7 million. The awards 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 2010 (NOAA 2010-1)." Abstracts of the successful Phase I proposals submitted under this solicitation, and brief comments on their anticipated results 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 \$400,000 each and for two years. The DOC/NOAA awarded a total of 7 Phase II contracts in FY 2010 for a total of approximately \$2.7 million. Abstracts of successful Phase II proposals and comments on their anticipated results are also provided in this publication.

The SBIR program is highly competitive. A total of 116 proposals were received by DOC/NOAA in response to its FY 2010 solicitation. DOC/NOAA scientists and/or engineers independently reviewed the proposals. With the funds available, only 18 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 2010 PHASE I AWARD WINNER

FIRM: Lynntech, Inc.  
7610 Eastmark Drive  
College Station, TX 77840-4023

AWARD: \$95,000

PHONE: 979-693-0017  
FAX: 979-764-5794  
E-MAIL: Season.Wong@lynntech.com

PRINCIPAL INVESTIGATOR: Season Wong, Senior Research Scientist

TITLE OF PROJECT: An Integrated System for In-field Detection of  
Microbial Contaminants in Coastal Waters

SUBTOPIC NUMBER: 8.1.1R

### TECHNICAL ABSTRACT:

NOAA places a high priority in working with state and territory coastal resource managers to manage and conserve these vital resources. Microbial contamination adversely impacts coastal water quality, and poor water quality has negative economic, health and environmental effects. Therefore, the advancement and implementation of rapid and automated methods for monitoring and identifying microbial contamination in coastal waters is urgently needed. To this end, Lynntech proposes to develop and commercialize a field-deployable, integrated system capable of rapidly detecting microbial contaminants in coastal waters. The system will employ a unique automated concentrator to capture and consolidate microbes directly from coastal waters, followed by novel sample preparation and PCR steps to detect target pathogens. The system could be operated remotely or installed on the Integrated Ocean Observing System. Aside from coastal water monitoring, its applications may include ballast water quality assessments, biosecurity for water resources, and aquaculture monitoring.

### SUMMARY OF ANTICIPATED RESULTS:

At the end of Phase I, we expect that our modular components (concentrator, sample preparation module and thermal cycler) will demonstrate specific identification of microbes in coastal waters in less than two hours. The performance of the device in terms of speed, specificity, sensitivity, and ease-of-use will be verified by our expert subcontractor in marine biology. Lynntech expects the device's performance to meet or exceed the specifications required by field researchers and the Phase I results should merit Phase II NOAA funding consideration for further development and commercialization.

## FY 2010 PHASE I AWARD WINNER

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

AWARD: \$92,716

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: Natural Adjuvants to Enhance Efficacy of  
Anti-Viral Vaccines for Mariculture

SUBTOPIC NUMBER: 8.1.2F

### TECHNICAL ABSTRACT:

Viral diseases are a major impediment to the development and expansion of environmentally safe and sustainable aquaculture systems (NMFS 2007). Despite control measures, pathogenic viruses kill millions of fish and shellfish every year (ICES Mariculture Committee 2004). To date, vaccines against fish viruses have generally provided extremely poor protection or are too expensive (e.g. DNA vaccines). We will test the feasibility of binding natural marine and terrestrial biological structures to viruses to boost the immunogenicity of viral antigens delivered to the gills and mucosal surfaces of aquatic animals. A nanotechnology-based dynamic light scattering laser instrument will verify the attachment of the model virus particles. Groups of Atlantic Salmon (*Salmo salar*) will then undergo needle-less, immersion immunization with the most promising vaccine formulations to assess safety and efficacy. Antibody titers will be compared to identify candidate vaccine adjuvant systems for further investigations planned in Phase II research.

### SUMMARY OF ANTICIPATED RESULTS:

We anticipate that this new platform technology will provide an economical, non-toxic, "micro-attachment" vaccine delivery system for enhanced infectious disease prevention and control. If successful, these treatments will promote an increased choice of cultured species, greater predictability of production for investment, and the growth of environmentally sustainable aquaculture systems which will help the United States reduce seafood trade deficits (Nash 2004).

## FY 2010 PHASE I AWARD WINNER

FIRM: Zeigler Brothers, Inc.  
P.O. Box 95  
Gardners, PA 17324-0095

AWARD: \$94,281.73

PHONE: 717-677-6181  
FAX: 717-677-6826  
E-MAIL: tim.markey@zeiglerfeed.com

PRINCIPAL INVESTIGATOR: Tim Markey, Director of Nutrition and  
Technology

TITLE OF PROJECT: Live Feed Replacement with Nutritionally  
Complete Manufactured Diets for Emerging  
Marine Species

SUBTOPIC NUMBER: 8.1.2F

### TECHNICAL ABSTRACT:

The culture of emerging marine finfish species is expected to play a major role in the continued expansion of the aquaculture industry. Despite considerable advancements in aquaculture technologies, significant growth of this sector has yet to occur. A major reason for this has been the limited availability of juveniles from hatcheries. Rearing of marine finfish larvae has proven to be one of the biggest barriers to successful hatchery operations, largely due to the difficulties associated with providing adequate nutrition at the earliest stages of development. Live feeds have proven to be the only reliable feed source for newly hatched marine larvae, but using them introduces considerable challenges and inefficiencies that can impact the success of a hatchery. The purpose of this project is to develop complete hatchery diets that can effectively eliminate the required use of live feeds, enhance hatchery production and ultimately support successful growth of this industry sector.

### SUMMARY OF ANTICIPATED RESULTS:

A successful Phase I project will yield a set of novel hatchery microdiets from innovative process engineering techniques established during Phase I R&D. These diets which will be designed for specific emerging marine finfish species will represent a range of physical and nutritional qualities which investigative research from this project will have established as necessary for the complete replacement of live feeds. This will position ZBI to begin a second phase of research work to assess the efficacy of the various diets in actual hatchery settings, assuming receipt of a Phase II SBIR award.

## FY 2010 PHASE I AWARD WINNER

FIRM: Enigmatics, Inc.  
9215 51<sup>st</sup> Avenue, Unit 7  
College Park, MD 20730-1949

AWARD: \$95,000

PHONE: 301-486-1725  
FAX: 240-599-7657  
E-MAIL: Gauthier@enigmatics.com

PRINCIPAL INVESTIGATOR: Ben M. Gauthier, Senior Mech. Engineer

TITLE OF PROJECT: Efficient Processing Using New Cell  
Disruption Method

SUBTOPIC NUMBER: 8.1.5SG

### TECHNICAL ABSTRACT:

The proposed effort is aimed at the development of a new low-cost technique for extracting the fuel precursor components from marine alga cells. The effort is aimed at reducing the total production costs of alga-derived fuels, up to one-half of which may be attributed to the recovery/extraction process alone. Development of advanced processing technologies such as that proposed here is necessary in order to bring alga production costs into line with competing fossil fuels. The proposed effort will primarily consist of an experimental effort aimed at demonstrating the technology and assessing technology capabilities and limitations.

### SUMMARY OF ANTICIPATED RESULTS:

Over the course of the proposed Phase I effort we anticipate identifying process operating conditions suitable for economical disruption of the targeted marine algae, *Dunaliella* sp., and extraction of fuel-precursor materials from them. After determining the optimal processing conditions and parameter sensitivities, we will project process operating costs and scaling and incorporate those into a preliminary design for an industrial-scale system in order to assess the technology's suitability in various algal-fuel production scenarios.

## FY 2010 PHASE I AWARD WINNER

FIRM: TIAX, Inc.  
15 Acorn Park  
Cambridge, MA 02140-2301

AWARD: \$94,997

PHONE: 617-498-6125  
FAX: 617-498-6691  
E-MAIL: Sinha.Jayanti@TIAXLLC.com

PRINCIPAL INVESTIGATOR: Jayanti Sinha, Associate Principal

TITLE OF PROJECT: Efficient Extraction of Oil from Microalgae

SUBTOPIC NUMBER: 8.1.5SG

### TECHNICAL ABSTRACT:

Microalgae are a promising feedstock for biofuels because of their high oil content, excellent CO<sub>2</sub> capture, and ability to use brackish water and non-arable land. The extraction of oil from algae represents a challenging cost barrier to commercial biofuel production. Conventional technologies for algal oil extraction are energy-inefficient, cost-intensive, or non-scalable, leading to barriers for their commercial deployment. TIAX, LLC proposes to demonstrate an innovative extractor that can address the cost barrier for biofuels by efficiently and economically releasing oil from algae. The Phase I effort will establish the feasibility and initial design of a hydrodynamic algal oil extractor, and provide a foundation to reduce the risks for Phase II development. In Phase II, we will refine the extractor design, fabricate a prototype, and demonstrate the technical and economic benefits of the algal oil extractor. After successful technology development, we will engage manufacturing and commercialization partners for pilot-scale demonstration.

### SUMMARY OF ANTICIPATED RESULTS:

The successful completion of this project will result in important benefits to the public, to biofuel producers, and to state and Federal governments in meeting energy security goals. The anticipated result of our project is the development of an energy-efficient, cost-effective algal oil extractor, which can be integrated into existing refineries. TIAX's hydrodynamic algal oil extractor has the potential to be an economical, high-throughput alternate to existing extraction procedures. An estimate of energy efficiency for our hydrodynamic extractor indicates that less than 5% of the produced algal oil energy content will be spent in the extraction process.

## FY 2010 PHASE I AWARD WINNER

FIRM: HiFunda, LLC  
2150 South 1300 East, Suite 500  
Salt Lake City, UT 84106-4375

AWARD: \$94,950

PHONE: 801-897-1221  
FAX: 801-618-4289  
E-MAIL: bnair@hifundallc.com

PRINCIPAL INVESTIGATOR: Dr. Balakrishnan Nair, President

TITLE OF PROJECT: Cost Competitive Wave Energy Without Moving Parts

SUBTOPIC NUMBER: 8.1.5SG

### TECHNICAL ABSTRACT:

Conventional approaches to ocean energy are unlikely to make a material impact on global energy supply. HiFunda LLC and its affiliate Oscilla Power, Inc. are developing a utility-scale wave energy harvester enabled by low cost, domestically-and readily-available magnetostrictive alloys that requires no moving parts. This device has the potential to deliver baseload power to coastal utilities, industrial users, and remote facilities at costs competitive with coal or gas. Early prototypes could enable low cost battery charging for remote buoys. This project will demonstrate that the combination of (1) existing material compositions, (2) compressive stress biasing and (3) permanent magnet biasing are sufficient to deliver the required magnetic flux performance. In combination with privately funded demonstration of a wave tank prototype and building upon prior testing demonstrating the magnetic induction potential of these alloys under representative loads, this project will demonstrate substantial technology risk reduction on the path to commercialization.

### SUMMARY OF ANTICIPATED RESULTS:

In the Phase I Project, we will demonstrate that the enabling magnetic materials can deliver the required magnetic induction to achieve the required device cost targets. We will also demonstrate a component fabrication process that can be developed into a high-throughput manufacturing operation for magnetostrictive alloy components that have the requisite bias compressive stress and bias magnetic fields. Phase II will be focused on incorporating the Phase I technologies into a wave tank and/or field trial prototype. Achievement of these goals will make a substantial contribution towards commercialization of a wave energy device that can produce utility-scale baseload power at competitive costs.

## FY 2010 PHASE I AWARD WINNER

FIRM: Maine Blue Stream Power  
P.O. Box 146  
Blue Hill, Maine 04614-0146

AWARD: \$94,922

PHONE: 207-266-0688  
FAX: n/a  
E-MAIL: sbreus@mac.com

PRINCIPAL INVESTIGATOR: Sergei Breus, Owner, Principal Investigator

TITLE OF PROJECT: Construction and Tidal Current Testing of Field Scale Model of Breus Rotor

SUBTOPIC NUMBER: 8.1.5SG

### TECHNICAL ABSTRACT:

Maine Blue Stream Power proposes to construct a field scale (2m diameter) prototype of a hydrokinetic energy conversion device, the Breus Rotor (patent pending), and perform in-stream tidal testing. The problem that Main Blue Stream Power addresses in this proposal is the extraction of energy from a wide range of marine current speeds with low impact on the marine environment. In preliminary laboratory (tow tank) testing, the Breus turbine begins to produce power at .3m/s and reaches maximum efficiency at a tip-speed ration of .4. Low rotational speeds are much less likely to cause marine species mortality (fish-strike). Phase I testing will be done at the Tidal Energy Demonstration and Evaluation Center at Maine Maritime Academy, Castine Maine, in a .5m/s-2.5m/s tidal flow, collecting data on power generation and overall performance.

### SUMMARY OF ANTICIPATED RESULTS:

Anticipated Phase II work includes research into construction materials, installation options and commercial scale testing. The Phase III goal is to manufacture a turbine that can efficiently convert the energy of a wide range of tidal flows into marketable electricity with the lowest possible impact on marine species.

## FY 2010 PHASE I AWARD WINNER

FIRM: Electro Standards Laboratories  
36 Western Industrial Drive  
Cranston, RI 02921-3403

AWARD: \$94,972.50

PHONE: 401-943-1164  
FAX: 401-946-5790  
E-MAIL: rsepe@electrostandards.com

PRINCIPAL INVESTIGATOR: Dr. Raymond B. Sepe, Jr.  
Vice President Research and Engineering

TITLE OF PROJECT: Optimum Control of Induction Generators for  
Water Current Energy Harnessing

SUBTOPIC NUMBER: 8.1.5SG

### TECHNICAL ABSTRACT:

Optimization of generator performance and maximization of output power are difficult to attain in the generation of hydro-power. This is due to the changing water conditions and corresponding changes in the form of available energy. ESL proposes to use self-tuning controls in combination with a suitably chosen and optimized generator driven by hydro-energy and condition it for distribution to then power grid. The proposed approach is to use control to maximize power generation while maintaining generator efficiency, despite changes in water conditions and electrical load demands.

### SUMMARY OF ANTICIPATED RESULTS:

The anticipated results are the development of compact and efficient energy harvesting nodes, at suitable power level, that generate power from ocean water currents. These devices can be nodes in distributed grids, similarly to wind generators on wind farms.

## FY 2010 PHASE I AWARD WINNER

FIRM: Hydroacoustic Technology, Inc.  
715 NE Northlake Way  
Seattle, WA 98105-6429

AWARD: \$91,940.43

PHONE: 206-633-3383  
FAX: 206-633-5912  
E-MAIL: jehrenberg@htisonar.com

PRINCIPAL INVESTIGATOR: Dr. John E. Ehrenberg, President

TITLE OF PROJECT: Development of an Extended Range, High Precision 3-D Acoustic Tag Underwater Positioning System for Monitoring Animals in the Marine Environment

SUBTOPIC NUMBER: 8.1.6SG

### TECHNICAL ABSTRACT:

Ecosystem-based marine research would benefit from an improved ability to investigate the ecology of marine animal populations on both large and small spatial scales. Acoustic tag monitoring systems are a preferred technology for monitoring animal movement and behavior in the marine environment. However, the marine acoustic tagging systems currently available generally lack precise positioning capabilities, or are limited in the areas over which they can provide these estimates. This research will determine the feasibility of producing an acoustic tag system that can provide precise 2-D and 3-D positions over extended ranges in the marine environment. A wireless and autonomous hydrophone monitoring array approach will be developed, based on existing technology proven in a fresh water environment. A marine acoustic tag design and optimal operating frequency will be determined, based on detection range modeling and field validation experiments.

### SUMMARY OF ANTICIPATED RESULTS:

At the conclusion of the proposed Phase I effort, HTI plans to provide definition of the architecture and performance characteristics of a marine acoustic tag monitoring system capable of positioning fish and other marine animals in 2-D or 3-D space with high precision, suitable for proceeding to a Phase II development stage, if the Phase I results warrant.

## FY 2010 PHASE I AWARD WINNER

FIRM: Ocean Approved, LLC  
188 Presumpscot Street  
Portland, ME 04103-5206

AWARD: \$95,000

PHONE: 207-409-6485  
FAX: n/a  
E-MAIL: pdobbins@oceanapproved.com

PRINCIPAL INVESTIGATOR: Paul Dobbins, President/Project Director

TITLE OF PROJECT: Development of Native Kelp Culture System  
Technologies to Support Sea Vegetable  
Aquaculture in New England Coastal Waters

SUBTOPIC NUMBER: 8.1.7SG

### TECHNICAL ABSTRACT:

This Phase I research effort is to design and develop “seed” nursery methodologies for development of commercial-scale production of young kelp plants, specifically *Saccharina latissima* (Phase I), *Alaria esculenta* and *Laminaria digitata* (Phase II). The project objectives include: (1) Establishing unialgal cultures from wild-collected material, (2) Determining the key culture conditions that control and trigger progression through life history stages, (3) Designing a scalable modular culture system appropriate for commercial production of young kelp plants, and (4) Creating a detailed outline of the protocol for culture system operations as a foundation for a Phase II project objective of transferring the technology to the educational and commercial sectors. This project is a collaborative effort between Ocean Approved, The University of Connecticut and the Bridgeport Regional Aquaculture Science and Technology Education Center and supports the development of a new aquaculture sector, allowing the United States to participate in the \$7 billion dollar cultivated sea vegetable market

### SUMMARY OF ANTICIPATED RESULTS:

The anticipated results of the proposed research will be the development of nursery culture technologies and methodologies to aid in the creation of commercial-scale mass production system for cold water kelp species. Moving from wild harvesting to sustainable harvests from aquaculture operations is a critical commercialization step that allows Ocean Approved to meet the growing demand for its innovation fresh frozen kelp products and provides an important new sustainable vegetable source for customers.

## FY 2010 PHASE I AWARD WINNER

FIRM: Droplet Measurement Technologies  
2545 Central Avenue  
Boulder, CO 80301-2865

AWARD: \$94,970

PHONE: 303-440-5576  
FAX: 303-440-1965  
E-MAIL: glkok@dropletmeasurement.com

PRINCIPAL INVESTIGATOR: Gregory L. Kok, Director of R&D

TITLE OF PROJECT: Aerosol Particle Spectrometer with  
Depolarization and Fluorescence (APPDF)

SUBTOPIC NUMBER: 8.2.2C

### TECHNICAL ABSTRACT:

A prototype optical particle counter will be built and evaluated that measures the size and shape of aerosol particles with optically equivalent diameters from 0.1 to 10 $\mu$ m diameter. This instrument will distinguish dust from other types of aerosol particles, provide an estimate of the asymmetry factor and produce compositional information related to a particle's refractive index. Additional information can be extracted from the measurements on some types of biogenic and organic aerosols. The size, shape, refractive index and some compositional information of particles is derived from the measurement of light scattered in forward and backward directions, depolarization by aspherical particles, and the fluorescence by some species of biogenic and organic aerosols when interacting with photons of short wavelengths. The size, weight and power of the instrument will be optimized to facilitate operation on a wide variety of ground-based, airborne and ship-born measurement platforms, including unmanned aerial vehicles.

### SUMMARY OF ANTICIPATED RESULTS:

The Phase I activities will result in a proof-of-concept evaluation of a prototype aerosol particle size and shape analyzer whereby reference particles of known size, shape and composition will be used to demonstrate the sensitivity of the instrument to changes in shape and composition and the capability of differentiating dust particles from other types of aerosols in the size range from 0.1 to 10 $\mu$ m.

## FY 2010 PHASE I AWARD WINNER

FIRM: Riverside Technology, Inc.  
2950 East Harmony Road, Suite 390  
Fort Collins, CO 80528

AWARD: \$93,526

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FAX: 970-484-7593  
E-MAIL: [steve.malers@riverside.com](mailto:steve.malers@riverside.com)

PRINCIPAL INVESTIGATOR: Steve Malers, Principal Investigator

TITLE OF PROJECT: Climate Information Management (CIM)  
Toolkit

SUBTOPIC NUMBER: 8.2.3C

### TECHNICAL ABSTRACT:

State governors recognized the need for drought information, which resulted in the implementation of the National Integrated Drought Information System (NIDIS). Other government efforts provide climate services in order to monitor, forecast, and mitigate the impacts of climate. In response to the SBIR request for a "Robust Software Data Integration Tool in Support of the NIDIS and Climate Services Delivery", Riverside is proposing the development of a Climate Information Management (CIM) Toolkit. The CIM toolkit will perform data collection, processing, and data product generation functions in support of NIDIS and other climate web portals. The effort will be consistent with existing NIDIS technologies, utilize proven components and new technology, and be demonstrated via a prototype implementation for Colorado. Riverside's expertise with developing similar systems, and our working relationships with data providers and water suppliers, ensures that technical objectives and user needs will be met by the solution.

### SUMMARY OF ANTICIPATED RESULTS:

Produce a feasibility report and prototype assessing the ability to produce a data integration tool capable of meeting the needs of federal programs such as NIDIS.

## FY 2010 PHASE I AWARD WINNER

FIRM: Masstech, Inc.  
6992 Columbia Gateway Drive  
Suite 200  
Columbia, MD 21046-2985

AWARD: \$94,709

PHONE: 443-539-1736  
FAX: 443-539-1757  
E-MAIL: shi@sesi-md.com

PRINCIPAL INVESTIGATOR: Wenhui Shi, Optical Scientist

TITLE OF PROJECT: Photoacoustic Sensor for High-sensitivity  
Measurement of Water Vapor

SUBTOPIC NUMBER: 8.2.4W

### TECHNICAL ABSTRACT:

We propose to build a compact, rugged airborne laser photoacoustic spectrometric (LPAS) sensor based on a tunable mid-IR diode laser for continuous, real-time measurements of water vapor, and perform field tests to qualify it for dynamic airborne in situ monitoring of upper troposphere water vapor. An innovative diode laser frequency locking technique developed by us will be utilized for tunable diode laser wavelength stabilization. Our sensor will be based on our laboratory LPAS instrument (at technology readiness level TRL-4) that has already demonstrated successful detections of water vapor, chemicals, alcohols, and CWAs. It utilizes a tunable infrared laser (interband cascade or quantum cascade), a high sensitivity photoacoustic cell with an air sampler and an efficient algorithm to rapidly complete high sensitivity, selective multi-component measurements in under a minute. In Phase I we will carry out extensive laboratory tests of LPAS and a comprehensive analysis of the sensor performance to determine the limit of detection (LOD) and receiver operating characteristic (ROC) curves for the sensor and establish its feasibility. A rugged and portable prototype sensor (TRL-5) will be built in Phase II. It will be field tested in aircraft (TRL-6) and characterize the sensor.

### SUMMARY OF ANTICIPATED RESULTS:

From our preliminary analysis, the anticipated sensitivity will be <1 ppmv for measurement of water vapor.

## FY 2010 PHASE I AWARD WINNER

FIRM: Spectrasensors, Inc.  
11027 Arrow Route  
Rancho Cucamonga, CA 91730-4866

AWARD: \$95,000

PHONE: 909-948-4112  
FAX: 909-948-4146  
E-MAIL: mschrempel@spectrasensors.com

PRINCIPAL INVESTIGATOR: Mathias Schrempel, Director of Engineering

TITLE OF PROJECT: Upper Tropospheric Water Vapor Sensing System

SUBTOPIC NUMBER: 8.2.4W

### TECHNICAL ABSTRACT:

Concepts for in-situ measurement of moisture in the upper troposphere and lower stratosphere using Tunable Diode Laser Absorption Spectroscopy (TDLAS), a technology known to have potential in this application, will be developed. Known water vapor absorption bands in the wavelength range of available IR lasers ( $\lambda = 1$  to 3 micrometers) will be examined to find a suitable absorption line with an absorption strength/path length combination that would provide adequate sensitivity to concentrations of  $\sim 0.5$  to  $\sim 100$  ppmv moisture. A conceptual design of a compact, robust instrument capable of reliable measurements at altitude in commercial aircraft will be developed based on the results of the spectral survey. The combination of this new concept with the current Water Vapor Sensing System (WVSS-II), which then could provide data from  $\sim 0.5$  ppmv to  $\sim 40,000$  ppmv, will be explored.

### SUMMARY OF ANTICIPATED RESULTS:

Successful formulation of a suitable absorption spectroscopy scheme(s) for a TDLAS sensor capable of measuring  $\sim 0.5$  -  $\sim 100$  ppmv moisture in the upper troposphere and lower stratosphere is expected. Prototype(s) of the selected instrument concept will be developed in Phase II. A combination with the current WVSS-II would yield a instrument with a measurement range of  $\sim 0.5$  ppmv to  $\sim 40,000$  ppmv. These instruments would ultimately be placed in aircraft and provide meteorologists and climatologists critical moisture data in the upper troposphere and the lower stratosphere for improved weather and climate modeling.

## FY 2010 PHASE I AWARD WINNER

FIRM: WorldWinds, Inc.  
1010 Gause Blvd., Suite 48  
Slidell, LA 70458-2940

AWARD: \$94,940

PHONE: 985-641-8661  
FAX: 985-641-8662  
E-MAIL: evalenti@worldwindsinc.com

PRINCIPAL INVESTIGATOR: Elizabeth L. Valenti, President/CEO/Owner

TITLE OF PROJECT: New Satellite Data Products for the TV  
Broadcast Market

SUBTOPIC NUMBER: 8.3.2D

### TECHNICAL ABSTRACT:

Modern technology, particularly computers and weather satellites, and the availability of data provided by coordinated meteorological observing networks, has resulted in enormous improvements in the accuracy of weather forecasting. Satellites, in particular, have given forecasters routine access to observations and data from remote areas of the globe. However, graphical products produced for scientists are not usually suitable for on-air consumption by the general public. WorldWinds, Inc. has spent the last 10 years developing systems that transfer government collected satellite and ground based data into products intended for consumption by the general public. Through collaboration with Baron Services, Inc., this project will develop a solution regarding the lack of NOAA satellite-derived data products that are routinely available to the public through their local television weather broadcast. This solution will provide broadcast meteorologists delivery of many NOAA satellite-derived data products directly through their on-air broadcast systems.

### SUMMARY OF ANTICIPATED RESULTS:

The main objective for this work is to determine the necessary steps required to streamline the process for adding new data sets, particularly satellite-derived data, into the existing television broadcast data supply stream.

## FY 2010 PHASE I AWARD WINNER

FIRM: CODAR Ocean Sensors  
1914 Plymouth Street  
Mountain View, CA 94043-1796

AWARD: \$94,977.41

PHONE: 408-773-8240  
FAX: 408-773-0514  
E-MAIL: don@codar.com

PRINCIPAL INVESTIGATOR: Donald Barrick, President

TITLE OF PROJECT: HF Radar Calibration with Automatic  
Identification System Ships of Opportunity

SUBTOPIC NUMBER: 8.4.1N

### TECHNICAL ABSTRACT:

Of more than 100 HF Radars operating within the Integrated Ocean Observing System (IOOS), more than half run either without recommended receive antenna pattern calibrations or with out-of-date calibrations, despite potential compromises to data quality. Cost is the primary inhibitor of frequent calibration, which generally requires a technician to drive a small vessel with mounted transponder in arcs around the antenna. Large vessels now broadcast their positions and speed approximately every 10 seconds using the Automatic Identification System (AIS). Echo from these vessels also appear as signals in real-time HF Doppler spectra. We propose using AIS ship position and speed, along with corresponding HF Doppler ship echo, to determine receive antenna patterns in near real time. The methods proposed here will result in a software product which would both reduce the cost of calibration of IOOS HF radars and significantly improve IOOS surface current data quality.

### SUMMARY OF ANTICIPATED RESULTS:

The proposed study will demonstrate the effective use of backscatter from ships along with AIS position data to calibrate HF radars. We will assess the feasibility of deploying this method throughout the IOOS network, including the anticipated frequency of such independent estimates of the antenna pattern.

## FY 2010 PHASE I AWARD WINNER

FIRM: GeoOptics, LLC  
201 N. Orange Grove Ave.  
Suite 503  
Pasadena, CA 91103-4603

AWARD: \$89,331

PHONE: 626-449-1397  
FAX: 626-449-1397  
E-MAIL: tyunck@charter.net

PRINCIPAL INVESTIGATOR: Thomas P. Yunck, President & CTO

TITLE OF PROJECT: A Pilot Weather Data Linker

SUBTOPIC NUMBER: 8.4.2W

### TECHNICAL ABSTRACT:

NOAA requires a means of ready access to weather data across multiple repositories enabling seamless sharing of diverse parameters for all atmospheric layers and regions, to include data from satellites and other sources. We will deliver a pilot web application with all technical elements to achieve just that. It will be an open-source, open-architecture system employing common data standards and special features to enable the user community rapidly to extend the system to become a “comprehensive system of systems” integrating distributed global datasets for forecasting, decision support, and scientific research. The pilot WDL will feature automated processes for extracting and integrating standard weather parameters from data repositories at all available spatial and temporal resolutions. The system will accommodate data from spaceborne, airborne, and ground sensors, along with model and forecast data, and will enable users to locate, retrieve, integrate, visualize, and analyze atmospheric products for almost any application of investigation.

### SUMMARY OF ANTICIPATED RESULTS:

Phase I will deliver a functioning demonstration Weather Data Linker (WDL) that incorporates the National Digital Forecast Database’s Digital Weather markup Language and its native means of communication. The demo system will be able to access atmospheric and weather parameters from multiple sites, including the NDFD, several NASA DAACs, and a GPS-ROO repository at NCAR. This demo system will lay the groundwork for an operational pilot WDL, to be developed in Phase II, which will go far towards achieving the comprehensive weather data linking and sharing envisioned in the solicitation.

## FY 2010 PHASE I AWARD WINNER

FIRM: Ophir Corporation  
10184 West Belleview Avenue  
Suite 200  
Littleton, CO 80127-1762

AWARD: \$94,828.36

PHONE: 303-933-2200  
FAX: 303-933-1430  
E-MAIL: Caldwell@ophir.com

PRINCIPAL INVESTIGATOR: Dr. Loren M. Caldwell, Director, R&D

TITLE OF PROJECT: Low Cost, Compact, Direct Detection Wind and Temperature Lidar for Measurements in the Boundary Layer

SUBTOPIC NUMBER: 8.4.5R

### TECHNICAL ABSTRACT:

Monitoring and forecasting of atmospheric winds within the United States provides protection from severe weather conditions, enables the safe operations of airports, provides the ability to predict wildfire evolution, and the dispersion of hazardous material plumes. However, the current NOAA National Profiler Network (NPN) is limited in spatial extent and is temporally and spatially very sparse. Ophir proposes to design, develop and demonstrate a direct detection lidar that is sufficiently low cost to enable wide-spread deployment to provide a more thorough, and cost effective wind and temperature measurement capability nationwide. The innovation is to design a Rayleigh/Mie lidar that enables the use of a low cost, small, rugged, highly-reliable, diode laser capable of sufficient output power in conjunction with a vapor filter to measure vertical wind and temperature profiles, reliably.

### SUMMARY OF ANTICIPATED RESULTS:

The anticipated results of this project include the development, demonstration and resulting production of a low cost, atmospheric wind and temperature profiling lidar. Once this innovative lidar approach is demonstrated for accurate measurement of wind and temperature profiles, its use for atmospheric measurements will be widely adopted due to its measurement accuracy, reliability, small size and low cost. The potential commercial applications of the lidar development include the improvement in available weather forecasting for human safety, airport safety and for homeland security threats, and for the wind energy site assessment market.

## FY 2010 PHASE II AWARD WINNER

FIRM: Haereticus Environmental Laboratory  
106 S. Saratoga Drive  
Lynchburg, VA 24502-5439

AWARD: \$400,000

PHONE: 434-263-5740  
FAX: 540-301-2838  
E-MAIL: haereticus1@hughes.net

PRINCIPAL INVESTIGATOR: Craig A. Downs, Executive Director

TITLE OF PROJECT: Coral Tissue Engineering for Mass-production  
of Coral for the Recreational Marine Aquarium  
Trade and Conservation Industry

SUBTOPIC NUMBER: 8.1.2N

### TECHNICAL ABSTRACT:

Over 10 million coral species a year are traded in the +\$100 million/year ornamental-recreational aquaria industry. Over ninety percent of commercial coral specimens come from some form of mass harvesting of wild corals from coral reefs. This can have a detrimental impact to coral reefs. We invented a method of perpetual propagation of corals through tissue engineering. Hundreds to thousands of microscopic tissue explants are generated from a single coral polyp. These explants can be induced to regenerate and develop into primary coral polyps and undergo colonization. In Phase I, we evolved this technology for mass-production and to augment cryo-preservation methods to control production rates using a single coral species, *Heliofungia*. The method for *Heliofungia* is not optimal for other coral species, and often require radically different medias, as well as environmental conditions. In Phase II, we will develop and optimize methods for micropropagation and cryo-preservation for ten commercial species of coral, and two species of coral listed as “threatened” on the U.S. Endangered Species List. The ten commercial species will be necessary to demonstrate the commercial feasibility and competitiveness of this technology. The threatened species will be necessary to demonstrate the value of this technology to the conservation/restoration industry.

### SUMMARY OF ANTICIPATED RESULTS:

Micropropagation and aquaria-transition protocols developed for ten high-value commercial coral species will allow for the immediate commercialization of this technology, as well as ensure significant entry into the coral-trade industry.

## FY 2010 PHASE II AWARD WINNER

FIRM: Desert Star Systems LLC  
3261 Imjin Road  
Marina, CA 93933

AWARD: \$324,849

PHONE: 831-236-7750  
FAX: 831-384-8062  
E-MAIL: mf@desertstar.com

PRINCIPAL INVESTIGATOR: Marco Flagg, Chief Engineer and CEO

TITLE OF PROJECT: APA: Air Pressure Alert Device

SUBTOPIC NUMBER: 8.1.4R,F

### TECHNICAL ABSTRACT:

For divers, out of air situations present a particular hazard. They can result in a dangerous emergency ascent, or failure of a diver to reach the surface. A low air pressure alert (APA) device can provide a valuable margin of safety, but careful design is required. In order for the device to be adopted, it must not only be effective but it must offer ease of use and a streamlined, ergonomic design that does not get in the way. Phase I saw strong progress with the field testing of APA technologies and the design of a full form and function prototype. Phase II will start with thorough lab and ocean testing of the prototype. Following a refinement of the design and reengineering for higher-volume production purposes, a pilot production run of sufficient quantity for field testing and statistic reliability evaluation will be executed. The effort ends with a joint field test of the pilot production units by NOAA and Desert Star staff. Primarily yielding a new capability addressing a specific safety requirement of the NOAA diving program, the APA project will also result in a new device platform upon which Desert Star will base a family of small electronic devices for scientific, commercial, military and advanced recreational divers alike.

### SUMMARY OF ANTICIPATED RESULTS:

This proposal addresses the established NOAA diving program requirement for a new safety device to address a specific hazard, and the development and production of that device as specified in the solicitation. APA will also become the starting point for a new family of small and uncomplicated diver science and safety devices or capabilities. This Phase III commercialization effort may for example include a precision acoustic tape measure, an underwater remote control, and a dive safety computer that warns of approaching decompression limit for both a diver and a dive buddy.

## FY 2010 PHASE II AWARD WINNER

FIRM: Aerial Imaging Solutions  
5 Myrica Way  
Old Lyme, CT 06371-1874

AWARD: \$350,000

PHONE: 860-434-3637  
FAX: 860-434-0225  
E-MAIL: dleroi@aerialimagingsolutions.com

PRINCIPAL INVESTIGATOR: Donald J. LeRoi, Owner

TITLE OF PROJECT: Multiple Digital Camera Mount with FMC

SUBTOPIC NUMBER: 8.1.7F

### TECHNICAL ABSTRACT:

NOAA uses large-format aerial film cameras to collect data for monitoring marine mammal populations protected under the Marine Mammal Protection Act and the U.S. Endangered Species Act. Historically, the major users of these cameras have been the military and government agencies. As these users move to newer technology, manufacturers are ending the production of aerial films and camera parts. Consequently, NOAA requires a digital camera system that will deliver high resolution aerial imagery equivalent to the imagery they currently gather. In Phase I, Aerial Imaging Solutions designed a multiple digital camera, forward motions compensated mount and control system to fill NOAA's sampling needs. Additionally, we produced a prototype of the design. The prototype was approved for flight by NOAA's Aircraft Operations Center and test flown by both the National Marine Mammal Laboratory Steller Sea Lion group and the Southwest Fisheries Science Center Photogrammetry group. The results exceeded all expectations, confirming the feasibility of replacing NOAA's aerial film cameras with the proposed system. For Phase II, we propose to deliver two commercial-quality FMC mount systems to NOAA researchers.

### SUMMARY OF ANTICIPATED RESULTS:

Phase II will produce two fully-operational, commercially viable, forward motion compensated, three digital camera mount and control systems. Aerial Imaging Solutions will also market the mount system to other potential users and will continue to enhance it's capabilities to keep pace with advances in imaging technology.

## FY 2010 PHASE II AWARD WINNER

FIRM: Optechnology, Inc.  
5000 Allendale Drive  
Huntsville, Alabama 35811-8971

AWARD: \$299,994.33

PHONE: 256-508-2487  
FAX: n/a  
E-MAIL: andrea.barnes@optechnology.com

PRINCIPAL INVESTIGATOR: Andrea Barnes, Project Coordinator

TITLE OF PROJECT: Creating Resilient Structures with Polymer Coatings

SUBTOPIC NUMBER: 8.1.9SG

### TECHNICAL ABSTRACT:

The first goal of our team is to design and develop highly ductile cement mortar composites using novel patent applied for technology which has been shown to produce materials with high energy absorption, decreased modulus, higher tensile strength, and greater toughness than standard or ultra high performance concretes or fibercements. These materials will be used to produce NEMA Class 5 flood resistant building panels which are also capable of withstanding hurricane forces to comply with Florida and North Carolina State Building Codes, ASTM 1886E-05, and ultimately to meet FEMA 320/FEMA 361 standards. In order to achieve our design goals, we may further strengthen the panels by reinforcing them with interlayers and polymer coatings. Our second goal is to test the effectiveness of using field applied polymer coatings to solve issues of roof joist to wall framing attachment and foundation-rim joist wall framing to produce a continuous foundation to roof load pathway and to supplement standard hurricane and construction ties.

### SUMMARY OF ANTICIPATED RESULTS:

Our work will result in the optimization of mix and panel design for a NEMA Class 5 structural wall panel, and will provide standard testing of polymer strengthened framing ties. Analytical and empirical techniques will be developed to quantify the composite behavior and structural performance.

## FY 2010 PHASE II AWARD WINNER

FIRM: Argos Intelligence, LLC  
3417 Chartley Lane  
Roswell, GA 30075

AWARD: \$399,948.10

PHONE: 404-790-1850  
FAX: 770-649-0169  
E-MAIL: clayton.kerce@argosintel.com

PRINCIPAL INVESTIGATOR: J. Clayton Kerce, Co-Founder, Principal Scientist

TITLE OF PROJECT: A Stochastic Integration Toolkit for Comprehensive Global Weather and Climate Models

SUBTOPIC NUMBER: 8.2.3C

### TECHNICAL ABSTRACT:

Stochastic parameterization of large scale models is becoming an important tool for evaluating climate predictability and for enabling accurate representation of effects of micro-scale and short time physics on long time climate statistics. The models currently used to evaluate climate risk do not incorporate these stochastic effects, but represent multi-year development and collaboration between tens to hundreds of scientists spanning a number of disciplines in the atmospheric, physical and numerical sciences. Because of the significant time and resources that have been devoted to the development and validation of these models, there is a critical need to develop approaches to stochastic parameterization that are minimally invasive to the existing model structure. Argos Intelligence is addressing this issue by developing the Stochastic Parameterization Toolkit (SPT) to bridge the technology gap between the established stochastic integration techniques and operational numerical prediction models. SPT will provide a platform for introducing stochastic terms into existing code base using a simple, high-level, user-friendly language.

### SUMMARY OF ANTICIPATED RESULTS:

The result of this effort will be a software package and documentation to enable the introduction of stochastic parameterizations into large scale climate models.

## FY 2010 PHASE II AWARD WINNER

FIRM: Boulder Nonlinear Systems, Inc.  
450 Courtney Way  
Lafayette, CO 80026-8878

AWARD: \$397,089

PHONE: 303-604-0077  
FAX: 303-604-0066  
E-MAIL: jstockley@bnonlinear.com

PRINCIPAL INVESTIGATOR: Dr. Jay Stockley, Senior Research Scientist

TITLE OF PROJECT: Hyperspectral Image Projector Based on Liquid  
Crystal on Silicon Displays

SUBTOPIC NUMBER: 8.2.5D

### TECHNICAL ABSTRACT:

This proposal outlines the development of a precision instrument for calibrating satellite based imaging sensors – the Hyperspectral Image Projector. The HIP instrument is capable of producing realistic, standards-based satellite imagery simultaneously projecting spectral spatial scenes. This proposed effort will concentrate on the spectral engine of the HIP, with the goal of producing a long-wave infrared spectral source capable of replicating the fine structure of the atmospheric spectrum.

### SUMMARY OF ANTICIPATED RESULTS:

The recent availability of inexpensive liquid crystal on silicon (LCOS) displays has opened doors for many applications, but these devices have been limited to operation the visible and NIR. By the end of the Phase II effort, we will have characterized and implemented a large format LWIR compatible display device. A successful Phase II effort would not only provide an elegant solution to LWIR spectral/spatial scene generation, but, as a by-product, would lead to the development of IR spectral and spatial engines suitable for marketing to the optics community as a whole.

## **FY 2010 PHASE II AWARD WINNER**

**FIRM:** Bennett Aerospace, LLC  
2054 Kildaire Farm Road, #181  
Cary, NC 27518

**AWARD:** \$400,000

**PHONE:** 919-859-5454  
**FAX:** 919-859-5455  
**E-MAIL:** dbennett@bennettaerospace.com

**PRINCIPAL INVESTIGATOR:** Douglas Bennett, CEO & Principal Investigator

**TITLE OF PROJECT:** Ground-based Water Vapor Profiling Lidar

**SUBTOPIC NUMBER:** 8.3.2W

### **TECHNICAL ABSTRACT:**

The objective of Phase II is to continue our efforts from the Phase I project and perform in-depth testing of technologies critical to achieving the required level of measurement performance. The Phase II project will involve the design of the NOAA water vapor profiling lidar and testing of component parts, seeking external sources of funding for the systems (for Phase III) and further creating a cost and return-on-investment justification.

### **SUMMARY OF ANTICIPATED RESULTS:**

In Phase II, we will create and test an Initial Operating Capabilities (IOC) Prototype as part of our Phased development approach, seek external sources of funding for the Final Operating Capability (FOC) prototype system (for Phase III) and further create a cost and return-on-investment business portfolio for investment consideration by external sources.