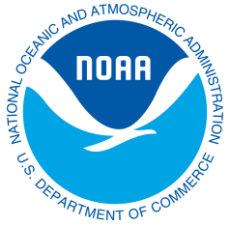
SBIR



Small Business Innovation Research Program

ABSTRACTS OF PHASE I AWARDS FOR FISCAL YEAR 2013

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 10 Phase I contracts for FY 2013. These awards are up to $95,000 each, and totaling approximately $950,000. 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 2013 (NOAA 2013-1)." 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 6 Phase II contracts in FY 2013 for a total of approximately $2.4 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 112 proposals were received by DOC/NOAA in response to its FY 2013 solicitation. Internal and external scientists and/or engineers independently reviewed the proposals. With the funds available, only 10 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 2013 PHASE I AWARD WINNER

FIRM:	Areté Associates P.O Box 2607 Winnetka, CA 91396
AWARD:	$94,569.91
PHONE:	703-413-0290
FAX:	703-413-0295
E-MAIL:	spanderson@arete.com
PRINCIPAL INVESTIGATOR:	Steven P. Anderson, Principal Scientist

TITLE OF PROJECT:	An Advanced Algorithm for Radar Derived Bathymetry
SUBTOPIC NUMBER:	9.3.1N

TECHNICAL ABSTRACT:

NOAA can reduce costs and improve efficiency by remotely monitoring harbors, navigation channels, and coastlines for bathymetric changes. This will aid NOAA in its mission to maintain waterways and assure maritime safety. This remote sensing can be accomplished by implementing a new radar derived bathymetry capability.

Areté Associates proposes to demonstrate an advanced algorithm to derive bathymetry from times-series wave imagery obtained from shore based navigation radars. NOAA will benefit directly from our experience developing and transitioning other remote bathymetry solutions. Our proposed approach includes the following benefits:

- A low risk approach that exploits linear wave dispersion and Fourier analysis
- High spatial resolution and accuracy retrievals using new variational assimilation approach.
- Algorithm demonstrations and validation using radar data from an operationally relevant site.
- A flexible and adaptive solution that can be used the NOAA's existing radar systems.

The success of Phase I will lead to prototyping and demonstrating a real-time, shore based radar bathymetry capability. These are the first steps toward reaching NOAA long term goal of an operational remote bathymetric measurement system suitable for both land and ship based radar systems.

SUMMARY OF ANTICIPATED RESULTS:

The anticipated results include the collection of radar data and demonstrations of radar derived bathymetry using two algorithms: a wave dispersion and Fourier Analysis approach and a variational assimilation approach. We expect the variational assimilation methodology will provide higher spatial resolution and accuracy bathymetry that has previously been possible.

FY 2013 PHASE I AWARD WINNER

FIRM:	Intelligent Automation, Inc. 15400 Calhoun Drive Suite 400 Rockville, MD 20855
AWARD:	$95,000
PHONE:	301-294-4253
FAX:	301-294-5201
E-MAIL:	jhenriksson@i-a-i.com
PRINCIPAL INVESTIGATOR:	Jakob Henriksson

TITLE OF PROJECT:	Climate Impact Visualization Tools using 3D City for Community based Panning and Outreach
SUBTOPIC NUMBER:	9.3.1R,C

TECHNICAL ABSTRACT:

Intelligent Automation, Inc. proposes an innovative visualization tool that transforms online GIS mappers into a climate impact assessment and planning tool that allows planners to visualize the impact of storm surges with sea level rise and coastal erosion using a 3D virtual city. The goal is to assist planners and emergency services to adapt to climate change at three tiers: i) Tier 3 (Long-term Planning & Near-term Mitigation): facilitate city planning, zoning, and building code decisions, and mitigation plans such as levees and barriers for existing structures, ii) Tier 2 (Readiness): facilitate in developing mitigations actions to minimize the extent of material damage from a forecast weather even within 120 hours of landfall, and iii) Tier 1 (Response): establish a community-based tiered communication mechanism (built on the top Commercial Mobiles Alert System (CMAS)/Wireless Emergency Alerts (WEA) systems) to plan for efficient use of limited emergency service resources within 48 hours of storm landfall. Key features are: the use of Unity 3D Game Engine based visualization, integration with SLOSH generated storm surge data, coastal inundation model, and community based outreach tool.

SUMMARY OF ANTICIPATED RESULTS:

Coastal planners can use the online tool to perform what-if planning analysis and decisions to prepare for sea level rise, erosion and weather events. The surge data generated from storm models using historical, hypothetical, and predicted storm tracks are used to by planning and emergency services to make long-term decisions (building codes, zoning), near-term mitigation decisions (barriers), readiness (debris removal), and response actions. The storm-preparedness data collection app will allow resource and budget constrained small towns to plan for effect response to an eminent storm system. The benefactors of the proposed systems, other than government and coastal residents, are insurance industry. The commercial potential web-based 3D visualization and smartphone based outreach extends to training & education applications, and health education by US government agencies.

FY 2013 PHASE I AWARD WINNER

FIRM:	McQ Inc. 1551 Forbes Street Fredericksburg, VA 22405
AWARD:	$95,000
PHONE:	540-373-2374
FAX:	540-371-1358
E-MAIL:	karmstrong@mcqinc.com
PRINCIPAL INVESTIGATOR:	Mark Winston, Senior Engineer

TITLE OF PROJECT: Buoy Guard System

SUBTOPIC NUMBER: 9.3.2W

TECHNICAL ABSTRACT:

McQ will develop a complete conceptual design for a Buoy Guard System (BGS). This system will detect the presence of intruders at and on the buoy. It will initiate deterrent actions to persuade and force the intruders away from the buoy. It will also collect imagery and other data about the intruders and about their activities associated with the buoy. This data, along with the basic warning will be immediately sent via satellite communications to the buoy operators so that action may be taken when appropriate. Our research during Phase I will investigate a variety of basic detection modalities and select those that provide the optimal performance. These will be built upon high performance, ultra-low power systems previously developed by McQ for similar applications. We will also use advanced image processing technology developed by McQ for similar applications to capture imagery of the vandals and their activity. The information will be relayed by sitcom to buoy operators immediate for action in addition to being stored on the buoy for later retrieval. The system will be developed as a kit that can be readily installed on a variety of buoy configurations and will be completely self-contained and self-powered.

SUMMARY OF ANTICIPATED RESULTS:

McQ's BGS will be effective at stemming the losses to climate buoys due to vandalism. The system will be effective at detecting intruders and capturing evidence used to prosecute willful violations. It will also be effective at warning more innocent intruders not to interfere with the buoy. Once widespread deployments of BGS have been made, their effectiveness at detecting and reporting the vandalism and providing prosecutorial quality evidence will garner a reputation within the community and the vandals will shy away from and buoy on which BGS is installed.

FY 2013 PHASE I AWARD WINNER

FIRM:	NorthWest Research Associates, Inc. CoRA Office 3380 Mitchell Lane
AWARD:	$94,994
PHONE:	425-556-9055
FAX:	425-559-9099
E-MAIL:	leka@nwra.com
PRINCIPAL INVESTIGATOR:	KD Leka, Senior Research Scientist

TITLE OF PROJECT:	Delivering a Solar Flare Forecast Model that Improves Flare Forecast (Timing and Magnitude) Accuracy by 25%
SUBTOPIC NUMBER:	9.4.3W

TECHNICAL ABSTRACT:

Many activities and technological systems prevalent in today's society – air traffic control and air travel, the power grids, communications, deep-water drilling operations, human spaceflight – are vulnerable to the effects of sudden flares from our Sun. Because the propagation speed for flare emission is the speed of light, it is necessary to forecast these events in order to mitigate their effects. The objectives of this project are 1) to validate the performance of an automated flare forecasting technique that parameterizes observations of solar magnetic fields and subsurface flows determined from helioseismology, then uses Discriminant Analysis to make a prediction, and 2) to assess the feasibility of this technique as an operational model. The quantitative use of magnetic field observations, subsurface flows and Discriminant Analysis are all innovations not presently used by the NOAA/Space Weather Prediction Center.

SUMMARY OF ANTICIPATED RESULTS:

The proposed forecasting system us automated, computationally inexpensive, and is expected to significantly improve up the accuracy of the present solar flare forecast model by the Space Weather Prediction Center. It can be customized for end users with respect to lead-time, forecast windows, and with respect to the relative cost of false alarms and misses.

FY 2013 PHASE I AWARD WINNER

FIRM:	Phase Sensitive Innovations 51 East Main Street Suite 201 Newark, DE 19711
AWARD:	$94,961.98
PHONE:	302-456-9003
FAX:	302-456-9004
E-MAIL:	scheutz@phaseensitiveinc.com
PRINCIPAL INVESTIGATOR:	John Wilson, Senior Engineer

TITLE OF PROJECT: Dynamic Frequency Passive Millemeter-wave Radiometer Based on Optical Up-conversion

SUBTOPIC NUMBER: 9.4.1D

TECHNICAL ABSTRACT:

In the proposed effort, we will leverage this extensive experience and capabilities to realize a frequency agile mmW radiometer that can cover the range of DC-110 GHz and can be scaled to DC-200 GHz under Phase II. Ours is a photonic system that multiplies and up-coverts a low-frequency reference signal onto an optical carrier (laser) using EO modulation, then uses the modulation sidebands to injection lock a second laser to a frequency offset from the first by a selectable multiple (harmonic) of the reference. Because the EO modulation process is both (a) coherent, and (b) ultra-broadband, the second laser becomes coherent (phase-locked) to both the first laser and the reference, while oscillating at an offset from the first laser that can be quickly and easily turned over the entire mmW band. An antenna is used to collect the incident mmW energy onto another EO modulator which induces side bands onto the primary laser carrier frequency which are proportional in amplitude to the incident mmW energy. This signal is combined with the second laser on a photodiode which mixes the two signals in a homodyne detection approach. The second laser can be thermally turned to different harmonics which allows it to interrogate the primary laser signal which contains the mmW sidebands. The output at the photodiode is low pass filtered and the DC term is now proportional to the mmW energy at the frequency selected by the second laser.

SUMMARY OF ANTICIPATED RESULTS:

The work under this Phase I proposal would create an optically based wideband radiometer capable of dynamic frequency measurements. This approach relies on successfully integrating a recently developed tunable source with an existing radiometer design. The Phase I work will demonstrate the feasibility of this approach by combining these two devices into a rugged system able to be deployed to different locations. The Phase I effort will focus on proving that these two concepts can be combined into a working wideband radiometer while Phase II will make a new radiometer based on this concept which will be built specifically for the purpose described in the solicitation.

FY 2013 PHASE I AWARD WINNER

FIRM:	Toyon Research Corporation 6800 Cortona Drive Goleta, CA 931117
AWARD:	$95,000
PHONE:	805-968-6787
FAX:	805-685-8089
E-MAIL:	kezal@toyon.com
PRINCIPAL INVESTIGATOR:	Kenan O. Ezal, Senior Scientist

TITLE OF PROJECT: Mobile VHF Lightning Mapping System

SUBTOPIC NUMBER: 9.4.2R,D,W

TECHNICAL ABSTRACT:

Toyon Research Corporation proposes to develop a mobile VHF-based sensor suite for detecting and mapping lightning flashes. The proposes Lightning Mapping Unmanned Sensor (LUTMUS)™ System will meet small unmanned aerial system (UAS) cost, size, weight, and power (C-SWAP) constraints and should be capable of being placed on virtually any small UAS. The most critical component of the LITMUS system us the VHF sensor design, which will be developed during the Phase I program. Initial performance estimates indicate that the LITMUS system with four geometrically diverse agents will be capable of geolocating intra-cloud (IC) flashes to less than 10-m spherical error probably (SEP), and will be able to map the entire flash sequence from beginning to end. In addition to the VHF sensor, the LITMUS system will comprise a video camera, GPS antenna and receiver, a communication system, and a mission control unit (MCU) for cross-correlating signals from multiple UASs. At the conclusion of the Phase I effort, Toyon will be ready for fabricating the Phase II design in preparation for a Phase II demonstration.

SUMMARY OF ANTICIPATED RESULTS:

The proposed LITMUS system will reduce the amount of effort required to deploy Lightning Mapping Array (LMA) networks, and will lessen the need to deploy static LMA systems. When fully developed and fielded, the LITMUS system has the potential to save significant number of lives due to the fact that the system will have much better visibility into approaching storm system and will be able to provide earlier warnings of severe weather, thereby giving residents and utility companies more time to prepare for the storm. The electronics developed for this program can also be used for sferics-aided navigation when GPS is denied.

FY 2013 PHASE I AWARD WINNER

FIRM: Aurora Flight Sciences
4 Cambridge Center, Floor 11
Cambridge, MA 02142

AWARD: $94,979.10

PHONE: 617-500-3978
FAX: 617-500-4810
E-MAIL: jwissler@aurora.aero

PRINCIPAL INVESTIGATOR: John Wissler, Director, Systems Engineering

TITLE OF PROJECT: Surveying Earth's Gravity with Unmanned Aerial Vehicles

SUBTOPIC NUMBER: 9.1.2R,N

TECHNICAL ABSTRACT:

To assist with the National Geodetic Survey's federal mandate to provide accurate positioning—including heights—to all federal non-military mapping activities in the USA, Aurora Flight Sciences proposes to integrate a gravimetry payload on a unmanned aerial system (UAS). Potential options include using either an unmanned aerial vehicle (UAV) or an optionally piloted aircraft (OPA). An OPA is an unmanned aerial system (UAS) that is integrated into an aircraft combining the best of manned and unmanned surveillance aircraft capabilities and can be flown traditionally manned, completely unmanned as a UAS, and in a hybrid mode-pilot on-board, but the aircraft is controlled as a UAS by a ground station.

Flying a gravimeter on a OPA opens tremendous flexibility of operations for the user-flexibility that ultimately results in cost and time savings. One system satisfies both the manned and unmanned needs, so the user does not have to support two different aerial systems to perform the survey mission. And as current legislation limits UAV flights to specifically designated airspace, an OPA gives the NGS freedom to operate outside of currently available airspace, expanding the reach of the survey.

SUMMARY OF ANTICIPATED RESULTS:

- Trade study of available UAS systems
- Trade study of available gravimeter's (performed by University of Texas Institute of Geophysics)
- Design of gravimeter payload to aircraft interface (performed by University of Texas Institute of Geophysics)
- Design of payload support system and integration plans for the UAS
- Cost analysis for potential further development in Phase II

FY 2013 PHASE I AWARD WINNER

FIRM: SeaLandAire Technologies, Inc.
1510 Springport Road, Suite C
Jackson, MI 49202

AWARD: $94,996.90

PHONE: 517-784-8340
FAX:
E-MAIL: sziegenfuss@sealandaire.com

PRINCIPAL INVESTIGATOR: Stephen Ziegenfuss, Project Engineer

TITLE OF PROJECT: Offshore Wind Energy Resource Evaluation and Siting

SUBTOPIC NUMBER: 9.1.1SG

TECHNICAL ABSTRACT:

Over the last decade, it has been noted that offshore wind energy resource development could prove extensively valuable in many areas of our nation's growth, including continued diversification of our energy supply, more options for cost-competitive electricity in coastal and Great Lakes regions, and economical stimulation through new and lasting infrastructure development. The challenges associated with this growth are based around 3 facets of developing the wind energy resource: 1) the relatively high cost of energy, 2) technical challenges surrounding installation and grid interconnection, and 3) permitting challenges related to the lack of site data and lack of experience with permitting processes for projects in both federal and state waters. SeaLandAire Technologies Inc., together with its partner, the Lockheed Martin Corporation, will seek to mitigate each challenge through effective site evaluation and characterization. We will conduct a full trade study during the Phase I to develop an optimized wind measurement strategy that will likely include getting data from both land based Wind Tracers and mobile buoy platforms equipped with meteorological sensor technology. Through the Phase I, we will develop a strategy that optimizes the cost, risk / data fidelity tradeoff that exists in coast energy resource evaluation.

SUMMARY OF ANTICIPATED RESULTS:

During the Phase I effort, we anticipate developing a comprehensive plan for coastal energy resource evaluation and characterization. This will include not only developing a system to collect data, but also to disseminate said data to stakeholders.

FY 2013 PHASE I AWARD WINNER

FIRM:	Toyon Research Corporation 6800 Cortona Drive Goleta, CA 931117
AWARD:	$95,000
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E-MAIL:	ksullivan@toyon.com
PRINCIPAL INVESTIGATOR:	Kevin J. Sullivan, Vice-President, Senior Scientist

TITLE OF PROJECT: Automated Image Analysis for Fisheries Applications

SUBTOPIC NUMBER: 9.2.1F

TECHNICAL ABSTRACT:

We propose to develop software that is capable of automatically classifying and measuring the length of fish observed in video. We will focus initially on underwater video, but much of the software will also be applicable to fish onboard commercial fishing vessels as well. Our approach is to first segment fish based on their motion in the water. For this purpose, we will make use of existing automated detection and tracking software developed at Toyon for the purposes of detecting and tracking people in video. In order to get a size estimate of the fish, we need to know the range to the fish and in order to get this information we propose the use of two camera and stereoscopic algorithms. For classifying the fish, we need to get a snapshot as close to broadside as possible for comparison with a library of feature models and we intend to select this image by maximizing the area of the segmented fish at a given range. At the end of Phase I, we will demonstrate the ability to automatically detect and track fish in underwater video and we will classify fish using a set of snapshots selected in cooperation with NOAA staff. We will create a confusion matrix for the classifier which quantifies the performance of the classifier when using the datasheet selected in Phase I. Finally, we will compare length measurements of fish made by an imaging system to physical measurements of the fish.

SUMMARY OF ANTICIPATED RESULTS:

The successful completion of this research will result in a system that is able to rapidly process underwater video and extract the number, type, and length of the fish that enter the field of view. This will reduce the cost of fish surveys because it will replace the need to manually perform these functions. Additional longer-term results of this research could lead to improvements in enforcement of fishing regulations and improved fish populations for both commercial and recreational fishermen.

FY 2013 PHASE I AWARD WINNER

FIRM: Low Salinity, Inc.
Virginia Cobia Farms
108 Battleground Ave
Saltville, VA 24370

AWARD: $95,000

PHONE: 276-496-4372
FAX: 276-496-0268
E-MAIL: scraig@virginiacobiafarms.biz

PRINCIPAL INVESTIGATOR: Steven Craig, PhD Senior Research Scientist

TITLE OF PROJECT: Improving Commercial Fish Meal Free Aquaculture Diets

SUBTOPIC NUMBER: 9.2.2F

TECHNICAL ABSTRACT:

The current emphasis in fish nutrition is fish meal replacement with a variety of alternative protein sources including plant-based, terrestrial and marine proteins. We propose to focus specifically upon the protein quality of these alternate protein sources and its potential impacts on marine fish production. Animal byproduct meals created through the rendering industry are widely utilized as intact protein sources in the aquafeed and pet food industries. This process produces fairly consistent protein feedstuffs, but the rendering process exposes these proteins to high heat and other factors that can detrimentally impact the quality of the final product. We have data suggesting that fish meals and alternative animal protein meals, both of which undergo rendering, can detrimentally impact marine fish performance under laboratory conditions. Our work suggests that rendering of protein sources destroys or modifies essential micronutrients resulting in poorer growth performance under commercial aquaculture conditions. LSI will focus on characterizing the essential micronutrients in chicken and fish meals exposed to different rendering processes, formulating and manufacturing fish meal free production diets and conducting extensive feeding trials with cobia and Florida pompano, thereby correlating the presence of absence of these nutrients back to production performance in marine fish.

SUMMARY OF ANTICIPATED RESULTS:

The biochemical characterization of fish meal alternatives will yield valuable information on the bioavailability and importance of key micronutrients and their correlation to production efficiencies under commercial aquaculture conditions. We expect to develop an innovative gentle rendering process for chicken byproducts to provide a sustainable source of high quality alternative animal protein to be incorporated into fish meal free diets designed for high value marine carnivorous fish species. These new U.S. made aquafeeds will be used for the production of cobia and Florida pompano in our own facilities, and marketed globally.