SBIR

Small Business Innovation Research Program

ABSTRACTS OF Phase II AWARDS FOR FISCAL YEAR 2018

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, plans to award 31 Phase I contracts for FY 2018. These awards are up to $120,000 each, and totaling approximately $3.7 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 2018 (NOAA 2018-1)." Abstracts of the successful Phase I proposals submitted under this solicitation, and brief comments on their anticipated results are provided in this publication.

The SBIR program is highly competitive. A total of 122 proposals were received by DOC/NOAA in response to its FY 2018 solicitation. Internal and external scientists and/or engineers independently reviewed the proposals. With the funds available, 31 were selected for an award. Final selection was based upon the results of the reviews, and the project's potential for commercialization.

In Phase II, funding is provided for projects that are most promising after Phase I is completed from the previous year. These awards can be for up to $400,000 each and for two years. The DOC/NOAA awarded a total of 18 Phase II contracts in FY 2018 for a total of approximately $7.2 million. Abstracts of successful Phase II proposals and comments on their anticipated results are also provided in this publication

FY2018 NOAA SBIR Phase II Awards

FY 2018
List of NOAA SBIR Phase II awardees

Proposal #	Company Name
17-2-016	Pisces Molecular
17-2-021	Space Environment Technologies
17-2-022	Creare LLC
17-2-032	Forever Oceans Corporation
17-2-044	Creare LLC
17-2-049	CODAR Ocean Sensors, Ltd.
17-2-060	Creare LLC
17-2-066	Aerodyne Research Inc.
17-2-067	Blue Storm Associates, Inc dba PEMDAS Technologies & Innovations
17-2-070	Remote Sensing Solutions, Inc.
17-2-071	Metron, Incorporated
17-2-072	Swift Engineering, Inc.
17-2-083	Actinix
17-2-086	Latitude Engineering, LLC
17-2-087	High Precision Devices, Inc.
17-2-091	Aerodyne Research Inc.
17-2-102	Atmospheric & Space Technology Research Associates, LLC (ASTRA)
17-2-108	Tridentis LLC.

FY 2018 PHASE II AWARD WINNER

FIRM:	Pisces Molecular LLC. 1600 Range Street, Suite 201 Boulder, CO 80301-2739
AWARD:	$399,601.95
PHONE:	303-546-9300
E-MAIL:	jwood@pisces-molecular.com
PRINCIPAL INVESTIGATOR:	John Wood

TITLE OF PROJECT:	Plasmid DNA positive control standards for molecular environmental assays
SUBTOPIC NUMBER:	8.4.3

TECHNICAL ABSTRACT:

We believe that employing current molecular biology techniques it is possible to develop plasmid DNA based positive control standard kits for a wide variety molecular assays for environmental organisms, and that this represents a significant commercial opportunity. In Phase I we demonstrated that plasmid DNA-based qPCR positive controls are stable, perform as well as genomic DNA positive controls and are technically feasible to produce at a commercially viable cost. In Phase II we intend to both improve the stability and ease of use of plasmid DNA based controls in laboratory PCR and qPCR assays as well as explore a wider variety of potential applications for such controls. Our objectives are to test methods to limit evaporation, determine minimum handling requirements and performance with & without background DNA of plasmid DNA controls. Additionally, we will test the utility of plasmids DNA controls to define the detection limits of multiple targets at different ratios in a multiplex qPCR, validate the detection sensitivity of new amplification technologies, and measure the stability and recovery efficiency of environmental DNA during collection, preservation and DNA extraction of environmental DNA samples..

SUMMARY OF ANTICIPATED RESULTS:

The anticipated results of this project will be readily available, accurately quantified positive control kits for molecular assays for environmental organisms that can provide more accurate and trustworthy results from testing that can have economic or public health impacts, better comparisons between results from different laboratories or procedures, or even different assays for the same organism.

FY 2018 PHASE II AWARD WINNER

FIRM:	Space Environment Technologies 1676 Palisades Dr. Pacific Palisades, CA 90272-2111
AWARD:	$400,000
PHONE:	310-573-4185
E-MAIL:	ktobiska@spacenvironment.net
PRINCIPAL INVESTIGATOR:	Dr. W. Kent Tobiska

TITLE OF PROJECT:	Space weather-based position error maps for TEC - On-Line (SpoT-On)
SUBTOPIC NUMBER:	8.3.1

TECHNICAL ABSTRACT:

The Space weather-based Position error maps for TEC - On-line (SpoT-On) project will use GPS-GNSS based TEC data, integrated into the Global Assimilation of Ionospheric Measurements (GAIM) operational system at the Utah State University Space Weather Center to produce an order of magnitude improved TEC position correction maps. These will be publicly and globally accessible. A significant result is that agencies, industry, and consumers will enjoy much higher accuracy position information than is currently available from single frequency GPS/GNSS receivers. In Phases 11-111, we will implement and demonstrate a prototype operational capability, construct a deployment and improvement plan, and deploy this system commercially on a test basis for first users. Implementation and demonstration tasks include using the existing GAIM Gauss-Markov (GM) model to produce global TEC correction maps and correction coefficients that can replace Klobuchar correction coefficients. These will be continuously updated and available from a server site at the end of Phase II. In Phase Ill will then extend the system to use the GAIM Full Physics (FP) model in an operational capability demonstration for even more accurate, reliable correction coefficients for TEC, including at high latitudes. The deployment of the system will consist of using an industrial version of the system to serve updated coefficients to the GPS system as a whole through telecommunications and agency providers.

SUMMARY OF ANTICIPATED RESULTS:

Improved GPS TEC correction maps are needed by consumer, agency, and industry positioning applications to enable lower-cost single frequency GPS devices to improve their accuracy. Agency (NOAA NWS) and DoD users would be able to support their customers with the system deployed on their operational servers.

FY 2018 PHASE II AWARD WINNER

FIRM:	Creare LLC 16 Great Hollow Road Hanover, New Hampshire 03755-3116
AWARD:	$399,920.38
PHONE:	603-643-3800
E-MAIL:	dbk@creare.com
PRINCIPAL INVESTIGATOR:	David B. Kynor

TITLE OF PROJECT: Open Water - A Citizen Science Monitoring Platform

SUBTOPIC NUMBER: 8.3.3

TECHNICAL ABSTRACT:

Ensuring the health of coastal marine ecosystems has emerged as one of the primary environmental concerns of this century. Frequent monitoring of water quality is required to establish baseline levels and enable early detection of problems. Citizen science programs have been shown to provide a highly effective method of monitoring water quality.

Creare is developing an open-source water quality monitoring system that is both easy to use and inexpensive. Our system incorporates a wireless sensor along with a cloud-based data repository. During Phase I we developed and demonstrated a prototype version of the system and demonstrated it to environmental researchers and water quality experts. During Phase II, we will finalize development and validation of the system and use the system in a pilot citizen science water quality monitoring study. Hardware designs and software developed during the project will be placed in the public domain.

SUMMARY OF ANTICIPATED RESULTS:

The project will provide citizen scientists with a cost-effective and reliable framework for monitoring water quality. In addition, the system will provide the scientific community with a set of powerful tools for data assurance, visualization, and analysis.

FY 2018 PHASE II AWARD WINNER

FIRM:	Forever Oceans Corporation 73-4460 Queen Kaahumanu Hwy #104 Kailua Kona, HI 96740-2637
AWARD:	$399,497
PHONE:	646-979-0066
E-MAIL:	mat@foreveroceans.com
PRINCIPAL INVESTIGATOR:	Matthew Goldsborough

TITLE OF PROJECT:	Camera-based Examination of Risk via Behavioral Evaluation with Remote Underwater Surveillance
SUBTOPIC NUMBER:	8.4.1

TECHNICAL ABSTRACT:

Commercial marine aquaculture operators face many operational hazards including disease, predators, husbandry operations, and environmental changes. Most of theses risks are only identified with constant surveillance and physical presence at a farm site. However, human observation of risk factors is expensive, slow, and sometimes ineffective. Sensors are available to monitor individual environmental parameters, but comprehensive monitoring of all operational risks is currently infeasible or cost-prohibitive. This project seeks to develop a single, inexpensive tool, CERBERUS (Camera-based Examination of Risk via Behavioral Evaluation with Remote Underwater Surveillance), to detect and alert operators to the presence of multiple types of operational hazards through the use of low-cost hardware and intelligent software processing. CERBERUS will enable fish farmers to remotely and automatically monitor their stock for responses to such hazards, helping them reduce reaction time in rectifying the causal issues, improve outcomes, and decrease overall operational risk.

SUMMARY OF ANTICIPATED RESULTS:

Phase II will build upon the advances made in Phase I and result in the development a cloud-based, computer vision framework which will facilitate the acquisition, segmentation, and classification of continuous, real-time video, rapid training and testing of neural network models, and the management of the entire process from a web-enabled dashboard.

FY 2018 PHASE II AWARD WINNER

FIRM: Creare LLC
16 Great Hollow Road
Hanover, NH 03755-3116

AWARD: $399,910.52

PHONE: 603-643-3800

E-MAIL: bhc@creare.com

PRINCIPAL INVESTIGATOR: Benjamin H. Cameron

TITLE OF PROJECT: A Compact and Agile Fixed-Wing UAS for VTOL Shipboard Operations

SUBTOPIC NUMBER: 8.3.2

TECHNICAL ABSTRACT:

Commercially available unmanned aircraft systems (UASs) are not well designed to meet requirements for many atmospheric measurement applications, including deployment from ships, long endurance, and low cost. Existing multi-rotor systems suffer from limited payload and endurance. Existing fixed wing systems offer improved endurance and payload, but require significant support hardware and high-risk recovery tactics for shipboard operations, such as catching the aircraft in a net or by a wingtip-mounted arrester hook. A compact UAS with vertical takeoff and landing (VTOL) capabilities is needed to meet NOAA requirements, including shipboard operations. To meet this need, Creare proposes a low cost VTOL UAS, the Quad-Biplane. The wings are configured as a biplane to reduce drag and increase endurance up to a factor of two compared to a monoplane with the same wingspan. The Quad-Biplane aircraft employs a novel control method that eliminates the added weight and complexity of traditional control surfaces (e.g., elevators and ailerons) and also reduces weight by using a single propulsion system for vertical and horizontal flight. In Phase I, we demonstrated the feasibility of our proposed approach through design, analysis, and flight testing. In Phase II, we will develop, build, and demonstrate system capabilities through flight testing and shipboard testing.

SUMMARY OF ANTICIPATED RESULTS:

Our proposed system will enable shipboard deployment of a low-cost, fixed-wing UAS for measurement of aerosols in the atmosphere. These measurements will support numerous NOAA programs related to climate and air quality studies. The proposed fixed-wing VTOL UAS platform will also improve adoption of long-endurance sensing platforms useful for collecting data in support of weather forecast and climate models in both civilian and DoD applications. The end benefits will be improved meteorological information with reduced deployment time and operational cost.

FY 2018 PHASE II AWARD WINNER

FIRM:	CODAR Ocean Sensors, Ltd. 1914 Plymouth Street Mountain View, CA 94043
AWARD:	$399,875.99
PHONE:	408-773-8240
E-MAIL:	chad@codar.com
PRINCIPAL INVESTIGATOR:	Chad Whelan
TITLE OF PROJECT:	Single-Mast Transmit-Receive Antenna for Long-Range 4-5.5 MHz Coastal HF Radars
SUBTOPIC NUMBER:	8.2.4

TECHNICAL ABSTRACT:

The U.S. High Frequency Radar (HFR) network contains more than 140 coastal stations that provide hourly two-dimensional coastal surface currents. Approximately one-third of these are Long Range (LR) systems that transmit in the 4–5.5 MHz frequency band with offshore ranges and resolutions of 160-220 km and 6 km, respectively. Currents provided by this network have numerous applications, most critically Coast Guard search & rescue and oil spill response. LR HFR stations presently require separate transmit and receive antennas, spaced approximately 60 m, which precludes mounting on most buildings or platforms and limits most to ground mounts in areas prone to storm surge. Hurricanes Irene (2011) and Sandy (2012) proved HFR to be a key observation tool, combined with others, to better predict hurricane intensity ahead of landfall. Sandy's storm surge destroyed part or all of many HFR stations in the Mid-Atlantic, costing tens of millions of dollars to replace and leaving operators to choose between losing hardware or making critical measurements during the next storm. CODAR proposes to build a LR HFR transmit/receive antenna for a single-mast installation on more resilient coastal structures. CODAR will demonstrate this antenna on a weather-hardened Sentinel water level monitoring station in Freeport, TX.

SUMMARY OF ANTICIPATED RESULTS:

Based on the results obtained in Phase I, CODAR will build a prototype combined transmit/receive antenna for operating in the 4-5.5 MHz band. Texas A&M University will build an autonomous power system and install it on the Freeport, TX Sentinel platform along with a Low Power SeaSonde connected to the new antenna. Performance of the new antenna on the Sentinel will be tested against performance on a ground mount as well as against the nearby Long Range SeaSonde installed at Surfside Beach, TX.

FY 2018 PHASE II AWARD WINNER

FIRM:	Creare LLC 16 Great Hollow Road Hanover, NH 03755-3116
AWARD:	$399,945.16
PHONE:	603-643-2445
E-MAIL:	jyb@creare.com
PRINCIPAL INVESTIGATOR:	Jerry Bieszczad

TITLE OF PROJECT:	Manual and Automated Marine Weather Observations Using Smartphones
SUBTOPIC NUMBER:	8.2.6

TECHNICAL ABSTRACT:

Accurate marine weather nowcasts and forecasts are critical requirements for mariners to maintain situational awareness and ensure safe navigation for vessels, passengers, crew, and cargo. To best achieve this, reliable observations of atmospheric and sea conditions must be available at high spatial and temporal coverage. Unfortunately, existing approaches for marine weather observations are inadequate. To address this need, Creare proposes to develop and commercialize the MarineCitizen software for collection and aggregation of marine observations using smartphones. MarineCitizen enables collection of crowd sourced marine observations through different modes of operation, including entry of manual observations (including text, audio, and images), automated polling of internal phone sensors (e.g., barometer), and Bluetooth connectivity to external weather stations. The observational data are uploaded to a central MarineCitizen server for dissemination via a web interface, as well as sharing on social media sites such as Twitter. Machine learning techniques will also be used for labeling of marine conditions from submitted images.

SUMMARY OF ANTICIPATED RESULTS:

MarineCitizen will enable aggregation of surface-level marine weather observations at high spatial and temporal coverage. This will provide mariners with improved situational awareness during current and planned navigational routes. These data will also be used by marine forecasters and weather researchers for improvement of maps of current and future conditions, data assimilation of numerical weather forecasts, and post-evaluations of forecast accuracy.

FY 2018 PHASE II AWARD WINNER

FIRM:	Aerodyne Research Inc. 45 Manning Road Billerica MA 01821-3976
AWARD:	$399,254.02
PHONE:	978-932-0220
E-MAIL:	blerner@aerodyne.com
PRINCIPAL INVESTIGATOR:	Dr. Brian Lerner

TITLE OF PROJECT: Automated peak fitting and analysis software for advanced gas chromatography and mass spectrometer systems

SUBTOPIC NUMBER: 8.2.7

TECHNICAL ABSTRACT:

Recent advances in gas chromatographic (GC) and mass spectrometric (MS) techniques for atmospheric measurements have led to highly complex data sets that have overwhelmed the capabilities of current data analysis software. We propose a new method for the automated reduction of chromatographic data using peak-fitting algorithms. By relying upon constrained peak-fit parameterization, accuracy of peak identification can be maintained or improved over standard manual integration methods. The proposed analysis software will be able to process large multi-dimensional data sets, including those produced with advanced time-of-flight high-resolution mass spectrometers and will address the current lack of suitable analysis tools for these instruments which are increasingly critical for atmospheric research. Scientists who use GC/MS instruments will be able to reduce their analysis time to a small fraction of what is currently required, with improved accuracy, access to new data, and efficient quality control. With this automated analysis software, NOAA researchers, and the atmospheric community at large, will be capable of fully and rapidly processing large complex data sets, and will be able to push the boundaries of our understanding of the atmosphere..

SUMMARY OF ANTICIPATED RESULTS:

The fast, automated data analysis software developed in this project will lead to new advances in atmospheric sciences, environmental monitoring, drug discovery and detection, chemical warfare agent detection, food and beverage analysis, medical research, and the petrochemical industry. This software will increase sales of Aerodyne’s commercially available advanced research instruments.

FY 2018 PHASE II AWARD WINNER

FIRM:	Blue Storm Associates, Inc dba PEMDAS Technologies & Innovations 5680 King Centre Dr Suite 600 Alexandria, VA 22315
AWARD:	$399,983.74
PHONE:	321-431-6408
E-MAIL:	michael.gauthier@pemdastech.com
PRINCIPAL INVESTIGATOR:	Michael Gauthier
TITLE OF PROJECT:	Development of the Low-Altitude Maritime Survey-Sampling (LAMSS) System
SUBTOPIC NUMBER:	8.2.8

TECHNICAL ABSTRACT:

In this Phase II effort, PEMDAS Technologies and Innovations (PEMDAS), in collaboration with subcontractor Aerovel, Inc., proposes to fully develop a prototype Low-Altitude Maritime Survey-Sampling (LAMSS) System using the technologies identified and knowledge gained during our Phase I effort. The proposed innovation will deliver the necessary capabilities for electro-optical and infrared (EO/IR) and full motion video (FMV) maritime surveys while leveraging an onboard Automatic Identification System (AIS); the LAMSS system will also simultaneously collect planetary boundary layer (PBL) observations, better enabling monitoring of the planet's air and water resources in remote maritime locations, and measurement of its boundary layer more safely and with greater effectiveness.

As outlined in the proposal, the technical challenges associated with this Phase II effort primarily surround: (1) the identification of a viable Air Quality (AQ) sensor capable of meeting the operational requirements detailed in the subtopic description; (2) formal evaluation and down-select of the final algorithm to be used for derivation of wind speed and direction; and (3) the integration of downselected technologies and algorithms into a single (LAMSS) system to deliver a multi-mission, transdisciplinary unmanned aerial prototype, capable of fulfilling NOAA's requirement to survey, map and collect on our nation's natural ecosystems.

SUMMARY OF ANTICIPATED RESULTS:

The outcome of this Phase II effort will be a functional prototype of the LAMSS System capable of meeting NOAA's operational requirements, and ready for commercialization (Phase III).

FY 2018 PHASE II AWARD WINNER

FIRM:	Remote Sensing Solutions 3179 Main Street, Unit 3 PO Box 1092 Barnstable, MA 02630-1105
AWARD:	$400,000
PHONE:	508-362-9400
E-MAIL:	ychao@remotesensingsolutions.com
PRINCIPAL INVESTIGATOR:	Dr. Yi Chao

TITLE OF PROJECT:	Development of a Portable 3-dimensional Variational (3DVAR) Data Assimilation Module for NOAA Operational Forecasting Systems
SUBTOPIC NUMBER:	8.1.4

TECHNICAL ABSTRACT:

We propose to continue the development of a generalized 3DVAR data assimilation module, in an open-source and non-proprietary programming language, which is compatible with FVCOM and incorporated into the Lake Erie Operational Forecast System (LEOFS). We will leverage our experience and expertise in using 3DVAR for a ROMS-based real-time forecast system for the California coastal ocean. 3DVAR has an ability to propagate observational information in both the horizontal and vertical directions while still keeping the computational overhead at a manageable level (e.g., 2X the forward model run time as compared to 20X or more for 4DVAR). Working closely with NOAA scientists, we will perform a hindcast experiment and demonstrate the ability of 3DVAR to 1) incorporate both in situ and satellite observational data sets into the existing LEOFS, 2) run efficiently from a computational perspective, and 3) improve over non-assimilating simulations. Our innovation is to include an Ensemble Kalman Filter (EnKF) module and develop a data assimilation roadmap towards a hybrid ensemble-variational (EnVar) data assimilation system

SUMMARY OF ANTICIPATED RESULTS:

Successful completion of the proposed work will demonstrate the positive impact of 3DVAR assimilation of both in situ and satellite observations on the performance of the Lake Erie Operational Forecast System (LEOFS). Through 3DVAR data assimilation, the impact of observational data on the operational forecast system will be quantified. Specific delivery includes an advanced 3DVAR data assimilation module, in an open-source and non-proprietary programming language, which is compatible with FVCOM and incorporated into the LEOFS. The EnKF data assimilation system will also be developed for the LEOFS with a goal to formulate a data assimilation roadmap that will guide future improvement of the 3DVAR data assimilation. The outlook for the commercial need and market penetration for the ocean data assimilation technology is very promising. Since this technology fits into our company's mission

statement, we will develop a more detailed business plan to expand the sales and marketing strategy for commercialization.

FY 2018 PHASE II AWARD WINNER

FIRM:	Metron, Incorporated 1818 Library Street, Suite 600 Reston, VA 20190
AWARD:	$399,981.17
PHONE:	703-787-8700
E-MAIL:	keller@ca.metsci.com
PRINCIPAL INVESTIGATOR:	Colleen Keller

TITLE OF PROJECT:	Mariner Report Application (MARApp): Crowdsourcing Maritime Weather Conditions
SUBTOPIC NUMBER:	8.2.6

TECHNICAL ABSTRACT:

During Phase I, Metron designed and implemented an efficient, scalable, end-to-end prototype system for collecting, storing, and viewing mariner weather observations: the Mariner Report App (MARApp). The MARApp Client is a mobile application that transforms smartphones and tablets at sea into forward geospatial/environmental sensors. It can take weather measurements from sensors built into a mobile device, external sensors connected via Bluetooth, or manual input by the user. The Client transmits time-stamped, geo-located weather reports in real time to the cloud-based MARApp Server, which stores the reports and provides an interface to view and export aggregated weather data from a browser on any web-enabled device. In Phase II, Metron will make significant additions and enhancements to the MARApp prototype to:

- Support the iOS operating system;
- Integrate with multiple external weather data sources via Bluetooth;
- Provide enhanced reporting, alerts, filtering, and visualization capabilities;
- Implement industry-standard security; and
- Integrate with social media.

In addition, Metron will develop and begin executing a comprehensive commercialization plan for continued enhancement and sustainment of MARApp in the years to come.

SUMMARY OF ANTICIPATED RESULTS:

At the end of Phase II, Metron will deliver a robust, intuitive, and secure end-to-end capability for marine weather reporting, data aggregation and fusion, customized alerts, and environmental model validation that will greatly improve mariner safety in coastal and inland water areas. Metron will release a fully functional version of MARApp to the maritime community for everyday use, accessible via a dedicated website and the Android and Apple App Stores.

FY 2018 PHASE II AWARD WINNER

FIRM:	Swift Engineering, Inc. 1141-A Via Callejon San Clemente, CA 92673-6230
AWARD:	$399,929.81
PHONE:	949-492-6608
E-MAIL:	jschloss@swiftengineering.com
PRINCIPAL INVESTIGATOR:	Jacob Schloss

TITLE OF PROJECT: Low Cost, High Precision Water Monitoring System

SUBTOPIC NUMBER: 8.3.3

TECHNICAL ABSTRACT:

This paper proposes development of a low-cost water monitoring system wirelessly networked to upload data to FieldKit for cloud based data visualization and validation. This will enable citizen scientists to collect a variety of parameters including conductivity, temperature, depth, and ocean noise measurements on an adhoc basis while contributing to a large data repository which will allow for deep analysis of data over a larger area than would be otherwise possible. There does not currently exist an online platform for exchange of scientific data between citizen scientists and professional researchers. The implementation of FieldKit combined with the water monitoring system with both industry, government, and public support will lower the barrier to entry and enable the implementation of data driven tools for local decision making.

SUMMARY OF ANTICIPATED RESULTS:

A water monitoring system with wireless connectivity will be produced as well as an application that will allow for data visualization and sharing via an open on-line platform that is being developed by National Geographic Fieldkit.

FY 2018 PHASE II AWARD WINNER

FIRM:	Actinix 1800 Green Hills Rd, Ste 105 Scotts Valley, CA 95066-4985
AWARD:	$400,000
PHONE:	831-252-5163
E-MAIL:	jimjacob@actinix.com
PRINCIPAL INVESTIGATOR:	James Jacob

TITLE OF PROJECT: Adaptive mask flow photometer

SUBTOPIC NUMBER: 8.2.2

TECHNICAL ABSTRACT:

A flow micro-photometer is proposed that can measure absorption and backscatter from single aquatic particles including phytoplankton, detritus and minerals. This instrument will make use of a novel adaptive diaphragm to define an analysis region of interest that exactly matches the size, shape and orientation of each particle being analyzed. A micro-fluidic chip will be used to convey the particles in a sequential fashion through the analysis region of the system.

The proposed instrument will be designed to be capable of measuring the transmitted and back-reflected light of particles from 0.5 microns to 100 microns in diameter. This tool will measure aquatic optical properties over the wavelength range from 400 nm to 700 nm. The instrument will also provide images of each particle, from which the identification of the type of particle being analyzed is possible, as well as provide morphology information.

SUMMARY OF ANTICIPATED RESULTS:

The anticipated results of this research are sets of imagery and photometric data from a variety of ocean particles that demonstrate the technical feasibility of the tool and a plan to go forward with a further Phase III commercialization.

FY 2018 PHASE II AWARD WINNER

FIRM:	Latitude Engineering 744 South Euclid Avenue Tucson, Arizona (AZ) 85719-6626
AWARD:	$400,000
PHONE:	520-792-2006
E-MAIL:	aaron.farber@latitudeengineering.com
PRINCIPAL INVESTIGATOR:	Aaron M.Farber

TITLE OF PROJECT: HQ-55 VTOL UAS for Ship Based Operation

SUBTOPIC NUMBER: 8.3.2

TECHNICAL ABSTRACT:

The Hybrid Quadrotor concept, developed by Latitude Engineering, combines the high power density of electric motors and propellers with the high energy density of a piston engine and liquid fuel. Together, each technology enables maximum performance in HQ's two regimes of flight: the electric system is responsible for lift while hovering (high power, short endurance), and the gas engine gives long endurance in fixed wing flight (low power, long endurance). Latitude proposes to address NOAA's requirement for a ship based UAS capable of carrying a 15lb payload and operating from ships, or confined land areas, by combining the lessons learned fron the development of the HQ-40 and HQ-90 aircraft. The resulting HQ-55 aircraft will have a higher useful load fraction than any previous HQ aircraft design, while staying under the 55lb limit to allow operations under the new Part 107 regulations. Phase I provide the feasibility of the HQ-55 by creating an initial design and a prototype airframe, which was successfully flown. Phase II will see the refinement and “productionization” of the airframe, the integration of NOAA’s aerosol sampling payload and flight tests conducted from a NOAA ship at sea.

SUMMARY OF ANTICIPATED RESULTS:

The outcome of the proposed project will be a high performance VTOL UAS capable of carrying a specified 15lb aerosol sampling payload while operating from a ship. The goal is to provide 10 hours of endurance and maintain flexibility for additional payload integrations. In Phase II, the airframe will be refined, including full integration of a fuel injected engine, transponder, and communication systems. Flight testing throughout the performance envelope will be conducted, including from a NOAA ship pending availability.

FY 2018 PHASE II AWARD WINNER

FIRM:	High Precision Devices, Inc. 1668 Valtec Ln, Ste. C Boulder, CO 80301
AWARD:	$399,999.74
PHONE:	303-447-2558
E-MAIL:	kmiller@hpd-online.com
PRINCIPAL INVESTIGATOR:	Kevin Miller
TITLE OF PROJECT:	Multichannel Commercial Cavity Ringdown Spectrometer for Oxides of Nitrogen and Ozone
SUBTOPIC NUMBER:	8.5.1

TECHNICAL ABSTRACT:

HPD, a small business focused on development and commercialization of advanced instruments, sensors and research equipment, proposes to partner with NAOA on technology transfer and commercialization of the NO(y) Cavity Ring-Down Spectrometer for atmospheric research. Since our founding in 1993, HPD has collaborated with researchers at NAOA and other government, commercial and academic institutions to translate instrument concepts and prototypes into robust, cost-effective commercially available products. We believe that NOAA's patented NO(y) CRDS technology offers outstanding potential for commercialization based on its excellent performance and robustness and stability of the optical cavities and cage system. Our team provides well over a century of collective experience in design and collaborative development of high performance instrument and atmospheric research. HPD offers the design and development expertise and processes as well as systems engineering and business acumen to achieve NOAA's objective to make the CRDS accessible to the research community.

SUMMARY OF ANTICIPATED RESULTS:

The Phase II effort will refine design requirements to support development of a research grade prototype for commercial markets, update and refine the commercialization plan to include all market segments, including research applications as well as other future markets , including detailed input regarding needs and priorities from prospective customers and users in the market segments beyond the research community, such as air quality and regulatory compliance, and advance the Phase I commercial design into an engineering hardware demonstration and initial prototype of the research instrument. Phase II efforts will include the stepwise development and validation of the key subassemblies and subsystems prior to development and test a fully integrated engineering instrument. The results of development and test of this instrument will be leveraged in the design, development and test of the multi-channel Commercial CRDS (C-CRDS). Development results will be included in ongoing commercialization interviews with atmospheric researchers and environmental monitoring

organizations. Interview results, market analyses and development and recurring unit cost analyses will be used to finalize the C-CRDS commercialization plan.

FY 2018 PHASE II AWARD WINNER

FIRM:	Aerodyne Research Inc. 45 Manning Road Billerica MA 01821-3976
AWARD:	$399,267.61
PHONE:	978-932-0266
E-MAIL:	herndon@aerodyne.com
PRINCIPAL INVESTIGATOR:	Dr. Scott Herndon

TITLE OF PROJECT:	Automated HCl laser monitor for long term and flight deployments
SUBTOPIC NUMBER:	8.1.3

TECHNICAL ABSTRACT:

Tropospheric oxidation capacity is dominated by HOx photochemistry, however halogen atoms and oxides significantly affect these chemical cycles. A sensitive and robust measurement of gaseous HCl is critically important to improve our understanding of halogen chemistry and its impacts on the spatial and temporal oxidation capacity of the atmosphere. In Phase I, we met all of our goals. We demonstrated a novel trace gas monitor that can sensitively (15 ppt noise at 1 Hz) and continuously monitor HCl without inlet artifacts. Our patented active passivation technique was extended from HNO3 to HCl, enabling HCl sampling with minimal surface interactions despite its stickiness. During Phase II we will improve the HCl monitor to provide more stable flight operation, develop an inlet switching system to measure reactive chlorine (ClNO2 and Cl2) and deploy the instrument for extended testing at a field site that is expected to show halogen photochemistry.

SUMMARY OF ANTICIPATED RESULTS:

The proposed instrument will be invaluable to the research market, governments agencies and academic institutions that research halogen cycling. Additional commercial opportunities exist in industrial fence line monitoring. The effort invested to make the instrument autonomous and flight ready will improve all of our trace gas monitors and will increase sales; almost all users would prefer an instrument that requires little or no user intervention and training.

FY 2018 PHASE II AWARD WINNER

FIRM:	Atmospheric & Space Technology Research Associates, LLC (ASTRA) 5777 Central Ave., Suite 221 Boulder, CO 80301
AWARD:	$399,969
PHONE:	303-993-8039
E-MAIL:	gcrowley@astraspace.net
PRINCIPAL INVESTIGATOR:	Geoffrey Crowley

TITLE OF PROJECT:	Position Error Maps for GPS/GNSS
SUBTOPIC NUMBER:	8.3.1

TECHNICAL ABSTRACT:

As our nation's dependence on reliable satellite navigation systems for precise Position, Navigation and Timing (PNT) applications increases, any errors/uncertainties or degradation of service will have significant life, safety, and economic impacts. Ionospheric 'space weather' is one of the largest sources of error in PNT applications that use the Global Navigation Satellite System (GNSS) satellite constellations, including the US government's Global Positioning Satellite (GPS) system. NOAA currently has no operational products or services to provide GPS users accurate information on the magnitude of the ionosphere-induced positioning errors, or to help them recognize conditions where degradation due to GPS scintillation may be a problem. Thus, specification and forecast products are needed to support the broad GPS user community. We propose to develop a software solution to process the existing publicly available GPS data at NOAA/SWPC to generate Precise Point Position (PPP) error maps for single- and dual-frequency GNSS receivers. The proposed Phase II research effort will develop a prototype software framework to provide now-casting and 1-3 day forecasting of GPS PPP and timing errors and for estimating ionospheric scintillations via Rate of TEC Index (ROTI) over the Continental United States (CONUS).

SUMMARY OF ANTICIPATED RESULTS:

At the end of Phase II, we will have demonstrated the performance and capabilities of the software framework system to create maps of PPP uncertainties as well as timing errors in now-casting and forecasting modes. These new data products will be produced in real-time at NOAA.

FY 2018 PHASE II AWARD WINNER

FIRM:	Tridentis LLC. 433 S. Lee Street Alexandria, VA 22314
AWARD:	$399.974.50
PHONE:	571-243-0870
E-MAIL:	william.latham@tridentis.com
PRINCIPAL INVESTIGATOR:	William Latham

TITLE OF PROJECT:	Design of an Autonomous, Green Powered, Mobile Coastal Monitor
SUBTOPIC NUMBER:	8.2.1

TECHNICAL ABSTRACT:

The mobile coastal monitor project is designed to prove out the research done in Phase I using a Proof of Concept demonstration craft. The Proof of Concept demonstrator will be a geometrically scaled version of the craft designed during Phase I. The Phase I craft, the Advanced Coastal Monitor (ACM) was designed to use state-of-the-art green power supplies and apply them as the propulsion and sensor power source for a highly efficient surface platform. The platform was equipped with a modular sensor bay that is capable of housing a wide variety of atmospheric, air/sea interface, and sub-surface sensors suitable for a wide range of sensing operations from benthic and flora/fauna surveying, to pollutant mapping, to calibration and validation of space borne optical sensors. The platform incorporated the latest unmanned vessel controls that conform to current Collision Regulations (COLREGS) and obstacle (surface and sub-surface) avoidance technology. The ACM was a clean sheet design as current autonomous surface vehicles either do not run on green power, or smaller battery, sail, or wave powered vehicles do not have the appropriate COLREGS / collision avoidance capability.

SUMMARY OF ANTICIPATED RESULTS:

Our anticipated results will include the successful testing of the Proof of Concept demonstration craft including the design of the modular sensor bay. The platform will be autonomous and powered by a green power supply(ies). This design will be suitable to take into contract and detail design cycles to commercialize in Phase III.