Department of the Navy SBIR/STTR Transition Program

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Topic # N153-131

Non-Invasive Measurement of Fluid/Gas Characteristics in Harsh Environments

Innoveering LLC

WHO

SYSCOM: SSP

Sponsoring Program: Strategic Systems Programs

Transition Target: Strategic Systems Programs

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Other transition opportunities: The ability to sense and measure fluid or particle interactions with surfaces for airborne high speed system is a current need for the Navy. In support of flight testing such platforms, there is a need to improve mission assurance and data capture through the incorporation of sensors that can report on the environmental conditions external to high speed systems (erosion effects). In-situ, real-time measurements of recession rate of heat shield ablative materials is still of interest, both for NASA and AF high speed applications.

WHAT

Operational Need and Improvement: The AMPS system is developed for a specific Strategic Systems Program (SSP) office need. This involves providing test data on fluid dynamic properties during an underwater launch event. The data will support modeling and simulation (M&S) efforts for SSP. The AMPS system will be used during various test campaigns for experimental data to enhance M&S routine performance assessments of Navy hardware systems.

Specifications Required: The system in question creates a high-pressure, high temperature water/gas/steam mixture during a launch event. Time from beginning of the event to the end of the event lasts about one second. The flow within the system is multi-phase (i.e., water, steam, gas), compressible, non-homogeneous, turbulent, and highly transient with the potential of shock waves.

Technology Developed: Data is collected by non-invasively instrumenting the system. The sensor suite provides spatially resolved, time-dependent flow data to understand the underlying flow physics phenomena, and support flow performance assessments with CFD M&S tools. The ultrasound-based sensor probes through a 2-inch thick metal structure to yield flow properties from the internal surface of the system. The acoustic multi-property sensor (AMPS) system uses multiple sensor heads on the external surface, with power, control and data acquisition electronics. Key properties will be fluid flow velocity and internal pressure, while attempting to resolve temperature and relative density.

Warfighter Value: The AMPS system will be used with other sensors to yield experimental data during field tests for SSP.

WHEN

Contract Number: N00030-17-C-0025 **Ending on:** June 27, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Systems/Subsystems Specifications	N/A	Submission and Review	3	TBD
Preliminary Design Review (PDR)	Med	Validation of acquisition/control architecture	3	TBD
Critical Design Review (CDR)	High	Detailed design validated against requirements	4	TBD
Prototype Hardware Delivery	Med	Detailed design validated against requirements	5	TBD

HOW

Projected Business Model: Innoveering business model for the acoustic multiple property sensing (AMPS) system is to fabricate and assemble a prototype unit for use by the Navy during field trials in support of their validation activities. We will be available to support additional enhancements as needed as part of our engineering services strategy. Additionally, we will pursue transition opportunities of the technology within the DoD and NASA to address critical needs for in-situ, real-time measurement of vehicle protection system erosion and ablation, leveraging the IP generated.

Company Objectives: Innoveering is focused on providing innovative sensing and control solutions for high pressure and high temperature applications, within the aerospace, defense, power and energy markets. We specialize in formulating practical solutions that can transition on-board vehicle platforms and are interested in expanding our role as a go-to organization through custom solutions and niche product offerings.

Potential Commercial Applications: The AMPS technology offers additional opportunities within the DOD, specifically for the Air Force and/or the Test Resources Management Center (TRMC). The ability to sense and measure fluid or particle interactions with surfaces for airborne high speed systems is a current need. In support of flight testing such platforms, there is a need to improve mission assurance and data capture through the incorporation of sensors that can report on external environmental conditions. Erosion effects due to rain or other particulates in the air become significantly important at high speeds, and thus test technologies are needed for accurate assessment, in ground test facilities and in flight, of the thermo-mechanical responses of high speed system thermal protection system materials, support structures and aerodynamic control surfaces in natural environments to include rain, snow, ice, dust, and volcanic ash.

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