Topic: N142-101

Innovative Dynamics, Inc.

Atmospheric Icing Conditions Measurement System (AIMS) for UAV's

IDI developed an Atmospheric Icing Condition Measurement System that identifies hazardous icing clouds up to 10nm ahead of the aircraft in clear air and 100m into the cloud to enable enough time for the pilot to avoid and exit unsafe flight conditions. Pilots currently use aviation weather radar to avoid thunderstorms, but have trouble estimating ice crystal content or icing hazards within clouds, especially during low visibility or night operations. Our development is an innovative LIDAR used to scan cloud layers above, below and ahead of the aircraft to determine if an icing hazard exists, thus enabling pilots to avoid ice build-up on fixed and rotary flight control surfaces. IDI has conducted icing tunnel tests demonstrating system capability to identify cloud properties: liquid water content, droplet size and ice crystals using cost and weight efficient optical sensor and laser ranger finder techniques.

Technology Category Alignment:

EO/IR Components for sensing, transmission and communication
Fixed Wing Vehicles (includes UAS)
Information Collection/Management
Electro-Optical/Infrared (EO/IR)

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SYSCOM: NAVAIR
Contract: N68335-16-C-0091
Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-16-C-0091

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2016-852

Topic # N142-101
Atmospheric Icing Conditions Measurement System (AIMS) for UAV's
Innovative Dynamics, Inc.

WHO

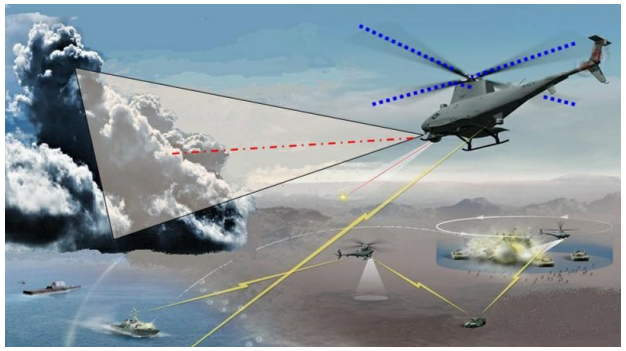
SYSCOM: NAVAIR

Sponsoring Program: PMA 266

Transition Target: MQ-8C

TPOC:
(301)757-1116

Other transition opportunities: Any air and ground vehicle without certified on-board ice protection equipment would benefit from this technology such as police, air ambulance, and search/rescue helicopters.



WHAT

Operational Need and Improvement: An operational requirement exists to improve the ability of pilots to see and avoid hazardous icing clouds. Pilots can use weather radar to avoid heavy rain and thunderstorms, but they have no way to gage the icing hazard and ice crystal in clouds, especially at night. Passive microwave systems used in meteorological satellite programs have met with some success in determining water composition and temperature in clouds. However, the current size of such systems is not compatible with aircraft use and would need to be miniaturized for low SWaP-C aircraft applications.

Specifications Required: System weight should be no more than 15 pounds to include antennas; power should be less than 100 watts, antenna size should not exceed 12 inch diameter with flush mounting, and avionics size should be less than 120 cubic inches. The system should not require external air cooling and should be capable of operating at sustained operating temperatures of 120F. It is critical that this new system be able perform this ice detection capability at a safe operating distance from the potential icing area and provide range and bearing to allow adequate time for pilot action to maneuver away from the inclement weather. Ice Detection/Avoidance system should be capable of measuring the amount of water in the atmosphere, temperature of liquid droplets in the atmosphere (including whether the water is super-cooled), and recognizing the difference between liquid droplets and frozen water to determine whether potential icing conditions along the route exist.

Technology Developed: IDI is developing an airborne atmospheric Icing LIDAR that uses a laser beam to scan clouds miles ahead of the aircraft and determine if an icing hazard exists. This information will enable pilots to make maneuvers or changes in altitude to avoid ice build-up on critical aircraft surfaces or rotorcraft blades.

Warfighter Value: The Icing LIDAR will provide increased mission readiness, allowing the UAS to be deployed in all weather conditions. The technology will save millions of dollars in replacement costs of UAS assets lost or destroyed due to operation in icing conditions.

WHEN

Contract Number: N68335-16-C-0091 **Ending on:** August 9, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstated Feasibility in Icing Tunnel environment.	N/A	Ability to measure in-situ cloud properties.	4	May 2015
Ground based cloud measurements with Prototype.	Med	Demonstrate sensor capability on the ground.	5	December 2016
Initial Airborne Cloud Range Test with Safety of Flight Unit.	Med	Demonstrate sensor capability in-flight.	6	March 2017
Perform full scale Flight Test into Clouds with Conforming Unit.	Med	Operational specs met in flight environment.	7	March 2018
Install Pre-production Units into Navy UAS.	Med	Deliver beta sets.	8	December 2018

HOW

Projected Business Model: IDI plans to work with a Prime such as Bell Helicopter to define system integration requirements for the MQ-8. The sensor will be qualified during Phase III to MIL specs. We plan to manufacture the product for the Navy with an ISO manufacturing partner.

Company Objectives: IDI's goal is to develop, manufacture and license intelligent sensor technologies for commercial and military applications. IDI is focused on an opportunity to deliver an order for 40-50 units to the MQ-8C program for winter weather operation. A large Aerospace OEM has also issued an RFP for 1000 units to comply with new FAA Part 25 Appendix O icing operations certification requirements.

Potential Commercial Applications: The Icing LIDAR addresses a currently unfulfilled need for timely in-situ cloud hazard information. The target commercial market includes: 1) aircraft safety research community; 2) unmanned aircraft (UAV's); 3) atmospheric research community; and 4) NOAA and other weather services. The sensor would have a unique and potential lucrative market niche because of its low weight and affordability.

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