Array Configured of Remote Network Sensors (ACoRNS)

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Abstract

The ACoRNS concept was initially developed to provide a modular solution for CBRN detection and sample collection. The form factor, based on the 5.25” diameter Bomb Unit (BLU) 189A submunition, enables the use of support and sensor modules of varying heights to provide situational awareness, communications, intelligence surveillance and reconnaissance (ISR), and environmental hazard warning. Individual modules can be selected to meet mission requirements and stacked together, providing a multi-use sensor. Readings in detection and data handling have enabled automated warning and reporting when the information is transferred to systems and networks.

Employment Abstract

The modular nature of this sensor system allows operators to leverage CBRN detection, identification, and sample collection capabilities to improve situational awareness and threat warning. The small standardized form factor utilizes common mechanical, electrical, and software interfaces. These common interfaces enable flexible employment options: sensors can be affixed at fixed sites for continuous operation, mounted on unmanned aerial or ground mobile platforms for detection and sample collection at a distance, or dropped off at address specific areas of interest.

Unmanned Aircraft & Other Vehicles

The Detection Enhanced Experimental Platform (Deep Purple) unmanned aircraft (UAS) previously developed by CCDC Chemical Biological Center was leveraged to provide an aerial capability for the CBNM modules. The DEEP Purple 5 (DP5) provides a 25-32 minute flight time with payloads weighing up to 5 pounds. The common sensor interface provides every plug-and-play connectors of sensor modules to the aircraft platform. Power, Communications, and Geo-Location information from the aircraft platform are available to the connected modules. The unmanned aircraft is designed to autonomously operate, either from a pre-programmed location waypoint or dynamically from continuously updated navigation instructions. Precision landing capabilities allow for accurate drop-off placement of sensor modules. Numerous flights and hours of operation have demonstrated the reliability and capability of this unmanned aircraft platform, including launch from manned and unmanned ground vehicles.

Background

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Future Direction

An updated version of the ACoRNS Chemical Detection, Identification, Collection (CDIC) module is being prepared for JPEO-CBRN to be used with the Deep Purple unmanned aircraft. With this system, point detection can be conducted at a distance using point and click input on a tablet computer. Demonstrations of inserting unmanned aircraft (UAS) systems flying a coordinated CBRN detection mission are planned for Fiscal Year 2020. Through Cooperative Research and Development Agreements (CRADAs), we expect to build new ACoRNS modules including prototypes for surface contamination detection.

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Parallel Efforts

Development, integration and evaluation of this modular CBRN sensor system benefit from the ability to leverage complementary efforts including the precision employment capability, development of a quad-copter unmanned aircraft with the necessary payload capacity, and development of smaller sensors and collectors.

Key Capabilities

- Chemical Warfare Agent (CWA) Detection, identification, sample collection
- Biological Warfare Agent (BWA) Detection, sample collection
- Aerosol Detection
- Sample collection
- Solid Powder
- Sample collection
- Sample Collection methods
- Sorbent tube, dry filter, PaperSpray
- Carbon Derived Carbon, variable flow rate
- GPS Location
- Information, networking
- Communications
- Encrypted, mesh, point-to-point, IP based
- Power
- Battery, external sources