SAVER TechNote

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The U.S. Department of Homeland Security (DHS) established the System Assessment and Validation for Emergency Responders (SAVER) program to inform emergency responder equipment selection and procurement decisions.

Under the Science and Technology Directorate, the National Urban Security Technology Laboratory (NUSTL) manages the SAVER program, which – with the participation of emergency responders – performs objective operational assessments of commercially available equipment.

SAVER knowledge products provide information about equipment that falls under the DHS Authorized Equipment List (AEL) categories and focus on two questions for the responder community: "What equipment is available?" and "How does it perform?"

To explore the full library, visit SAVER online at www.dhs.gov/science-and-technology/saver-documents-library.

For additional information on the SAVER program, email NUSTL at NUSTL@hq.dhs.gov.

Science and Technology

CBRNE SENSOR PAYLOADS ON UNMANNED AERIAL SYSTEMS

Emergency responders are deployed to various hazardous and contaminated areas with handheld sensors and traditional protection. The use of unmanned systems integrated with a sensor payload can provide a remote chemical, biological, radiological, nuclear, or explosives (CBRNE) detection capability in hard- to-reach or potentially hazardous environments. Unmanned aerial vehicles paired with appropriate sensors may be used to determine or characterize a hazard in prevention or response scenarios. This equipment falls under the AEL reference number 02EX-02RBTL, titled "Attachments/Tools, Robot."

Overview

Integrating CBRNE sensors and unmanned aerial systems (UAS) can provide the ability to remotely detect, identify, monitor, and provide important information on hazardous substances found in emergency scenarios. They can be used to survey areas for levels of radiation, enter burning buildings releasing hazardous gases, monitor toxic chemicals, and search for and locate a threat. Integrated CBRNE payloads on unmanned systems can transmit information in real-time or can collect air samples via probes for laboratory analysis [1]. The technology can be used in missions to discover a hazard before it becomes dangerous or to measure and monitor hazards after a dangerous event. Using unmanned systems limits first responder's exposure to toxic and harmful CBRNE agents; and provides a way to access hard-to-reach and unsafe areas.

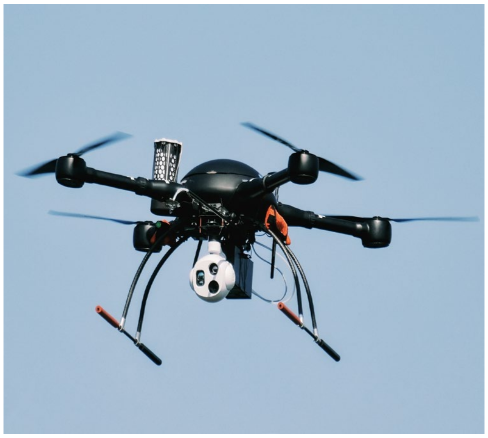

Figure 1. Air Monitoring Drone
Image credit: Andriy Sharpilo/Shutterstock.com

Mission and Payload Integration Considerations

The selection of payloads and UAS depends primarily on the mission and environment in which the UAS will operate. Extreme temperatures and weather conditions or GPS-denied locations, such as inside buildings or underground, will pose limitations on the UAS and the payloads that can be used. Missions that require a close and precise approach to a radiological source require a small UAS to navigate and maneuver in tight and confined spaces, like a nuclear facility. Search and payload delivery missions, that use larger payloads and more sensors, require a larger UAS or a UAS with larger lift and power capacity [2]. For a UAS, the size and the weight of the payload can impact the flight time, speed, and power consumption. Heavier payloads can lead to shorter flight times and affect the maneuverability and flight stability of a UAS. While heavier payloads also consume more power than lighter ones, they may collect more data in one pass than lighter payloads that consume less power. [3]

Sensor Integration

A further consideration for UAS selection is how sensors are integrated with the UAS in terms of attachment points, power, and communications. The clips, mounts, casings, wire harnessing, and cable chargers on the UAS must be compatible with the sensors used during the mission. The payloads and attachments should not interfere with any UAS function or block the view of any UAS component. [4] The sensor may also have its own independent power supply or rely on power from the UAS.

Some sensors and UAS are designed to be plug-and-play for easy integration. In this case, the sensor's data may be transmitted via the UAS' wireless communications link. For data collection and data analysis purposes, users should also determine if the sensors selected can be integrated with the software or user interface of the UAS. Plug and play options may allow users to quickly switch among compatible sensors based on the mission requirements. Such a solution would allow a UAS to be used for multiple purposes.

Cybersecurity Considerations

Special consideration needs to be taken for any software that requires active internet connection to function, share information, or receive necessary updates. When attaching payloads to unmanned systems, it is recommended to follow DHS Cybersecurity and Infrastructure Agency (CISA) cybersecurity best practices regarding commercial unmanned aircraft systems. [5]

Ensuring that any necessary software is implemented, maintained, and backed up in a secure manner is a key aspect of consideration when looking at various products. Following the Federal Bureau of Investigation's (FBI) Criminal Justice Information Services (CJIS) Security Policy for these areas of concern is recommended for any associated CBRN software. [6]

References

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