



Design and optimization of CBRN sensors for application to drones

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Abstract:

Introduction:

In recent years we witnessed an increasing in the occurrence of events, both accidental or intentional, connected with the release of chemical, biological, radiological (CBRN) agents. In case of industrial incidents, or in the event of voluntary releases of improvised devices and dirty bombs during asymmetric conflicts, deployed first responders has to be duly equipped to assess the nature of the contamination. In response to the growing threat, a large number of detection equipment has been developed, both in civil and military environments. In parallel, the last few years have also been characterized by the development of Unmanned Aerial Vehicles (UAV), remotely controlled aircraft, for military and civil applications. This research project is aimed to reduce or possibly eliminate the exposure of personnel to an unknown contamination, by developing an UAV for safe observation and sampling of different matrices. This objective could be reached by sending one or more multi-sensor UAV, equipped with CBRN sensors, geo-localized, able to collect samples and to detect real-time contamination with an early survey. Once the CBRN incident is confirmed, after the analysis of samples collected in field, is likely to determine which kind of CBRN agent is involved and the level of contamination.

To design and optimize new equipment or adapt existing tools for the application to drones, some basic principles has to be considered:

- low weight;
- low power consumption;
- low cost;
- affect the less possible the UAV aerodynamics;
- influence the less possible the contamination fluid dynamics.

Conclusions:

Preliminary tests have been conducted to investigate the possibility to adapt miniaturized sensors to an UAV. Results obtained shown that this route offers a wide range of possibilities, such as the design of specific and interchangeable features to be applied on modular payload, adaptable time by time to the objective of the mission.

Keywords: unmanned aerial vehicles (UAV); detection chemical agent; CBRN survey.

Biography:

Francesca Fumian holds a University Degree in Chemical Engineering. After 5 years of experience as a Chemical Engineer in a process design company, she joined the Italian Army in 2017 and is currently the Doctrine and Experimentation Officer at the Italian Joint NBC Defence School of Rieti. She is participating to a PhD research programme with the Industrial Engineering Department of the University of Rome "Tor Vergata" with the topic "Application of CBRN detection and identification systems to Unmanned Aerial Vehicles". Her background in CBRN started with the II Level International Master Course in Protection against CBRNe Events at the University of Rome "Tor Vergata". After that, in 2016 she became the technical consultant of Italian National Authority for the application of Chemical Weapon Convention, and participated, as Italian representative, to several technical and political meetings at the OPCW HQ, such as Industry Cluster and National Authority meeting.