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|  | *International CBRNE Institute*  ***Rue de sart-Dames-Avelines, 8A***  ***B6210 Les Bons Villers***  ***Belgium***  [***www.ici-belgium.be***](http://www.ici-belgium.be)  [***www.ismcr.org***](http://www.ismcr.org) |

**Workshop VRISE2022 – June 7 2022**

**Risky Interventions and Environmental Surveillance**

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| 10.00H | The European Defense as consequence of the Ukrainian Crisis | Lieutenant General e. r. Guy Buchsenschmidt Vice-president of the Society for European Defense |
| 10.30H | The Pandemic COVID: lessons and prospective | Dr F.Van Trimpont, Head of European College for Disaster Medicine) |
| 11.00H | How to face CBRNE threats | M.Yves Dubucq, Director of the CBRN Institute |
| 11.30H | How to face National CBRNE Crisis situations | B.Troisième, [Direction générale de la police judiciaire | Police Fédérale](https://www.police.be/5998/fr/a-propos/police-judiciaire-federale/direction-generale-de-la-police-judiciaire)-DSU/Intervention Unit |
| 12.00H | Standing Lunch/QR ICI-CRISTANINI Exhibition | |
| 13.00H | Introduction and Demo mini-UAV  SKY-TOOLS ([www.sky-tools.com](http://www.sky-tools.com)) | |
| 14.00H | **AIDED**: Robotics & Artificial Intelligence for Explosive Ordnance Disposal | Enzo Ghisoni, Geert De Cubber, Royal Military Academy  Enzo Ghisoni, Geert De Cubber  [enzo.ghisoni@mil.be](mailto:enzo.ghisoni@mil.be); [geert.decubber@mil.be](mailto:geert.decubber@mil.be) |
| 14.30H | **INTREPID** , Intelligent Toolkit for Reconnaissance and assessment in Perilous Incidents | Ana María Cintora Sanz  Servicio de Urgencias Medicas de Madrid  [anamaria.cintora@salud.madrid.org](mailto:anamaria.cintora@salud.madrid.org) |
| 14.50H | **RESCUER**: New Technologies that improve the work of responder first responders in hostile environments.  **RESCUER** New technologies that improve the work of first responders in hostile environments: cognitive load assessment | María Redondo Lozano. Médico de Emergencias del SUMMA 112 – Madrid  [maria.redondo@salud.madrid.org](mailto:maria.redondo@salud.madrid.org)  Marta Alvarez Calderon  SALUD Madrid  [marta.alvarez@salud.madrid.org](mailto:marta.alvarez@salud.madrid.org) |
| 15.10H | **HUNTER:** Consideration of hybrid propulsion of heavy unmanned ground platform applied to Robotics for Risky Interventions and Environmental Surveillance | Łukasiewicz Research Network – Industrial Research Institute for Automation and Measurements PIAP  [mikolaj.zarzycki@piap.lukasiewicz.gov.pl](mailto:mikolaj.zarzycki@piap.lukasiewicz.gov.pl) |
| 15.30H | **TEAMAWARE** – TeamAware: Integrated and cost-efficient situational awareness system for first responders | Carrer de Mallorca 221, 2n, 2a  08008, Barcelona  [www.enide.com](http://www.enide.com)  [jvicent.pastor@enide.com](mailto:jvicent.pastor@enide.com) |
| 16.00H | **Work-meeting on European DRS CALL :** | CL3-2022-DRS 01-07 : Improved International Cooperation addressing first responder capability gaps (Type RIA, DL 23 November 2022) |

**ABSTRACTS**

**AIDED : Robotics & Artificial Intelligence for Explosive Ordnance Disposal**

Enzo Ghisoni, Geert De Cubber

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*Recent armed conflicts (Ukraine, Afghanistan, Iraq, Syria) have seen a dramatic rise in the use of EOs (Explosive Ordnance), specifically IEDs (Improvised Explosive Devices) and landmines by adversaries, often resulting in casualties from EU and NATO member states. In modern warfare operations, consistently 50% of all soldier deaths in action are related to IEDs.*

*Therefore, the Royal Military Academy is working on a research project, called AIDED, on the development of Artificial Intelligence (AI) for the detection of explosive devices. AIDED will use a set of state of the art Artificial Intelligence algorithms able to identify unconventional (IEDs) and conventional (buried mines) explosive devices, and autonomously plan offline and run-time missions plans. AI-Machine Learning techniques such as deep learning will be designed & trained using simulated & outdoor data sets for the detection of EOs using sensor data from Ground Penetrating Radar, Electromagnetic Arrays, infrared and thermal cameras and Laser Induced Breakdown Spectroscopy. Sensor data will be fused to improve the confidence of detection and classification of EOs by removing outliers and false detection. AI techniques will ensure robustness to changing environments & composition of EOs.*

*AIDED will also develop AI based Centralized & decentralized mission planning to coordinate a swarm of small and medium heterogeneous robots (land and aerial) that are capable of working cooperatively towards the goal of detecting EOs that are on the surface, buried or hidden. The Positioning Navigation and Mapping will also be based on AI-machine learning techniques for robustness and standalone operation in GNSS denied environments.*

*The AIDED project is financed by the European Commission and managed by the European Defence Agency in the framework of the Preparatory Action on Defence Research.*

**DRaGON:** Drone for Radiation surveillanceLucio Pancheri∗‡, Daniele Fontanelli∗, Felix Pino†, Matteo Polo§, Jessica Delgado†,  
Sandra Moretto†¶, and Davide Brunelli∗‡

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§INFN, Laboratori Nazionali di Legnaro, Viale dell’Universit`a 2, 35020 Legnaro, Italy  
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This paper will not be presented during the WS, due to the unexpected unavailability of the author. But fruitful contact may be organized with him: [daniele.fontanelli@unitn.it](mailto:daniele.fontanelli@unitn.it)

*Nuclear materials may compose a threat to public health and homeland security in the form of terrorism threats, lost orphan sources, nuclear accidents, or radioactive contamination. The goal of the Drone for RAdiation detection of Gammas and Neutrons - DRAGoN project is to design, develop, and characterize a mobile sensing system comprising an Unmanned Aerial Vehicle (UAV). The UAV is equipped with a detection system able to identify radioactive contamination spread over an area of a few to tens of square meters. The type of radioactive sources that are detected are gamma emitters and special nuclear materials (SNM). UAVs are mainly used in accident scenarios where the doses are too high for a manned survey or in areas of difficult access.*

*An ideal detector configuration would use a very high-density material for a high counting rate and a large volume. Such configuration guarantees a high stopping power of the radiation, in other words, a high chance of stopping and detecting radiation. The Dragon solution can distinguish between neutrons and gamma radiation types, making it suitable to picture the surrounding environment and detect radiation contaminants.*

**RESCUER :** NEWS TECHNOLOGIES THAT IMPROVE THE WORK OF FIRST RESPONDER IN HOSTILE ENVIRONMENTS

**AuthorsMaría Redondo Lozano. Médico de Emergencias del SUMMA 112. E-mail:** [**maria.redondo@salud.madrid.org**](mailto:maria.redondo@salud.madrid.org)**Patricia Blanco Hermo. Médico de Emergencias del SUMMA 112. E-mail:** [**pblanco@salud.madrid.org**](mailto:pblanco@salud.madrid.org) **Marta Álvarez Calderón. Psicóloga de Emergencias del SUMMA 112. E-mail:** [**marta.alvarez@salud.madrid.org**](mailto:marta.alvarez@salud.madrid.org)**Sara Navarro Santos. Enfermera de Emergencias del SUMMA 112. E-mail:** [**snavarros@salud.madrid.org**](mailto:snavarros@salud.madrid.org)**Gemma Izquierdo González. Médico de Emergencias del SUMMA 112. E-mail: gemma.izquierdo**[**@salud.madrid.org**](mailto:Javier.alvarez@salud.madrid.org)**Ana María Cintora Sanz. Enfermera de Emergencias del SUMMA 112. E-mail:** [**anamaria.cintora@salud.madrid.org**](mailto:anamaria.cintora@salud.madrid.org)**Beatriz Merino Regio. Enfermera de Emergencias del SUMMA 112. E-mail:** [**bmerino@salud.madrid.org**](mailto:bmerino@salud.madrid.org)

***Keywords:***

* *First responders*
* *Improve skills*
* *New technologies*

***1- Introduction***

*Companies financed by the European Community (EC) develop RESCUER (first RESponer-Centered support toolkit for operating in adverse and infrastrUcture-less EnviRonments) to create new technologies and advance in this field.*

***2- Objective***

*Develop and validate technologies that help improve the response in catastrophes, facilitating a safe and efficient performance of FR and validate tools to improve the protection of FR against unexpected risks and situations of vulnerability.*

***3- Method***

*RESCUER is a project financed by the European Union (EU), developed within the framework of the European Agenda H2020, which has the participation of 6 countries, 20 companies.*

***4- Results***

*The risks run by FR and casualties, in disaster care, are an indisputable fact, especially in hostile environments and with reduced visibility. Improving hearing and visual abilities, detecting environmental toxins, and improving FR communications helps to improve their work and contribute to a faster and more effective rescue of casualties.*

***6- Conclusions***

*The development and implementation of new tools that demonstrate the HERO concept, enhanced nEw eRa first respOnder.*

**RESCUER News technologies that improve the work of first responders in hostile environments: Cognitive load assessment**

**M. Álvarez Calderón, P. Blanco Hermo, S. Navarro Santos, G. Izquierdo González, M. Redondo Lozano, A. María Cintora Sanz, B. Merino Regio.**

**Background:** Safety is a recurring concern for first responders (FR). Additional competencies complementing the ones needed to execute the job need to be acquired to operate safely. RESCUER is a project financed by the European Union (EU), developed within the framework of the European Agenda H2020 that aims to improve FR security through new technologies as augmented reality to increase sensations, auto-positioning and robust communications. Cognitive load (CL) will be measured so that RESCUER improves the work of the FR without overloading them.

**Method:** A literary review is carried out using MEDLINE (PubMed), to know how to assess CL and thus be able to select the appropriate measures.

**Results:** CL has been measured by assessing in real time objective or physiological aspects. Heart rate is the most used and good established measure of CL. Other measures are: eye tracking, electroencephalography, skin conductance response, electromyography or heat flux. CL is also widely measured through subjective rating scales.

**Conclusions:** RESCUER will assess CL using heart rate variability, an adapted eye tracking measure, masseter tone and facial temperature. The NASA Task Load Index (NASA-TLX) will be used as a subjective measurement.

**Keywords**: cognitive load, first responders, New technologies

**HUNTER** Consideration of hybrid propulsion of heavy unmanned ground platform applied to Robotics for Risky Interventions and Environmental Surveillance *Authors: Mikołaj ZARZYCKI1, Rafał CZUPRYNIAK1, Tomasz KRAKÓWKA1, Magdalena DUDEK2, Andrzej MASŁOWSKI1*

*1 Łukasiewicz Research Network – Industrial Research Institute for Automation and Measurements PIAP, Al. Jerozolimskie 202, 02-486 Warszawa, Poland*

*2 AGH University of Science and Technology, Faculty of Energy and Fuels,   
al. A. Mickiewicza 30, 30-059 Kraków, Poland*

*Surveillance, reconnaissance, CBRNE approach are still carried out mostly by human resources. Existing real threat for them should be minimalize, using advance and novel technology. In order to prevent or immediate the direct threat, specialized robots equipped with various detectors, actuators and remote control are sent in place of people. This approach is made possible by the implementation of remote control or even autonomous work.*

*Depending of usage scenarios energy autonomy is one of the most important feature of UGV. Density of storaged energy in fuel influence directly on capabilities entire vehicle. Using conventional fuel allows perform long operations, while implementing electric propulsion unit significantly simplifies the design and allows to operate in silence.*

*This article will present concept of hybrid propulsion unit of heavy unmanned ground platform called HUNTER designed in Łukasiewicz Research Network – Industrial Research Institute for Automation and Measurements PIAP. The existing design based on conventional fuel will be confronted with a new approach based on implementation additional fuel cells. The considerations are conducted for an existing modular, unmanned mobile platform weighing 3500kg with extended mobility.*

**TEAMAWARE** – TeamAware: Integrated and cost-efficient situational awareness system for first responders

Vicent Pastor, ENIDE Spain

*First responders are the first to arrive and provide assistance at the scene of an emergency that requires rescue operations and crisis management. However, despite their heroic services, first responders often struggle with inefficient and old technologies. Advanced technology like smart sensor systems, wearables, data processing, data fusion, data analytics, communication infrastructure and AI can dramatically improve performance. The EU-funded TeamAware project will develop an integrated and cost-efficient situational awareness system with heterogeneous and interoperable sensor units. It will include drone-mounted, wearable and external sensor systems, existing first responder services and operational centres. Highly standardised augmented reality and mobile human–machine interfaces will increase the flexibility and reaction ability of first responders.*