WORKSHOP REPORT

COLLARIS workshop on UAS operations in civil protection and first response

Revinge, Sweden, 30 May 2023

Background

The COLLARIS project is financed by the European Commission through the DG ECHO Union Civil Protection Knowledge Network. The COLLARIS project will establish a multidisciplinary network focused on Unmanned Aerial Systems (UAS) to connect, share, and grow knowledge among European actors.

Approximately 20 public stakeholders were welcomed to the MSB Revinge College (Sweden) on 30 May to interact in discussions on current and upcoming perspectives on Unmanned Aerial Systems (UAS) and Air Traffic Management (ATM) for crisis management and first response. Invited speakers presented different perspectives on opportunities and challenges while an open session also offered participants to make presentations. The workshop was moderated to introduce and discuss the participants' forecast of possibilities, challenges, and vision within UAS operations in civil protection and first response.

Core partners
CBK PAN (PL), Entente Valabre (FR), MSB (SE), DCNA (AT), KIOS (CY)

Project duration
01/2023 – 12/2024

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The COLLARIS project team

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1 Welcome and Introduction

The participants were welcomed by European commission representative Teresa Capula and MSB workshop organizer Tanja Ståhle. Dr Jakub Ryzenko of the COLLARIS project introduced and moderated the workshop. The workshop would provide the first opportunity to have a discussion on issues related to safe use of drones. It would also touch a few other aspects. He invited the participants to offer their opinions, thoughts, and suggestions by active participation in discussions pertaining to each of the 8 presentations.

The workshop is a small beginning of networking on perspectives of UAS and ATM.
➔ *What should be done, what needs to be done, what could be done/organised?*

The focus of discussion should be on the implementation of truly operational work. We are indeed quite rightly identifying ATM as an enabler for UAS. There are of course other opportunities, but ATM is a key enabler right now. We need to make sure we can fly safely.

The workshop output would be a starting point for further exchanges on these issues, aiming also at supporting the COLLARIS project to play a role in the Knowledge Network. There is a need for a hub, a presence, in the development of regulations, logistics and the concept of blue light stakeholders needs to be highlighted to optimise not only safety but also the effectiveness and development of new areas of effective use.

The future of drones is discussed and developed now in multiple fora, but there is a wide variety of different stakeholders with weak coordination, sometimes even insufficient information exchange.

Our vision is for COLLARIS to help the community here and the EU Commission to really make the needs of the civil protection rescue services visible in the European context. For instance, the different blue light services seem to need a special recognised status for priority treatment by ATM. It ought to be of great interest today to develop regulations for UAS above humanly managed aircraft.

The participants and other interested stakeholders were encouraged to offer ideas and thoughts during and after this workshop, also on trials upcoming in 2023-2024. How could these trials serve your purposes and contribute to your work? There will be a trial on ATM, but also probably on automatic systems.

Dr Jakub Ryzenko also summarised the COLLARIS project itself. Simply put, the project is not about how to fly UAS, but how to fly in a safe and effective way, i.e., to focus on the prerequisites for efficient and effective air traffic management and operational use of drones for crisis management purposes. The project will collect and share data, practical experiences, and best practices. Within the project there will be trials and simulations as well as trainings. The first field trial will be in Poland in late August 2023.

The COLLARIS project vision for 2024:
1. For the COLLARIS Network to become the natural first point of contact and source of information about UAS issues
2. For the COLLARIS Network to become a key stakeholder in European discussions about the future of UAS
3. For the COLLARIS Network to become a natural partner for the development of new capabilities.

2 Summary of the Workshop Presentations

2.1 Fair Fleet

Online presentation on the introduction of Copernicus drone mapping operations – Unmanned operations for CEMS Pilot Network

"Drone component" of Copernicus Emergency Management Service – Mapping provides unmanned aerial services as an alternative source of post-event imagery of satellites in emergency situations or as real-time follow up of events (e.g. earthquakes, urban flooding) whenever satellite images are not available or when the satellite's resolution is not sufficient. The 4-year framework contract with Copernicus aims at establishment of EU-wide drone operators' network, with a dedicated GIS-Tool for quick deployment, able to collect drone data after activation and provide processed data within 48 hours. The network offers special training and preparations for pilots coordinated with national authorities and using specialised equipment. Approximately 135 local CEMS pilots participate in the project from 23 EU member states.

Six activations have been done so far and the positive outcomes are: great acceptance among member states, fast and accurate data collection for analysis or actions.

The challenges identified are linked to administration, weak coordination, and ATM:
- slow process of receiving permission approval or authority coordination
- lack of local helicopter route communication (ATM)
- slow NOTAM process for avoidance of illegal operations by other UAS pilots.

The host nation support system (HNS) is not aligned with the project and not all 3000 certified drone pilots are on board of the project. Only around 30 drones currently participate in the initiative.
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2.2 Thematic area 1 – Air traffic management (ATM) during emergencies

2.2.1 Dr Jakub Ryzenko – The Space Research Centre of the Polish Academy of Sciences, CBK PAN (PL)

In connection to the previous presentation, Dr Ryzenko posed a question whether it might be the role of the COLLARIS network to facilitate the alignment with HNS? Until the management of drones is harmonised with ATM, all states will work on a national level for quite some time. That is why we need this COLLARIS network for experience sharing.

The short-term challenges we are now facing are related to ensuring the safety of flights during crisis operations (with the use of multiple UAS' and with the use of UAS' in parallel with human-operated aviation) and also increasing efficiency of coordination of UAS operations with multiple UAS' from different organisations.

However, there are longer-term issues that should be taken into consideration, such as for instance ensuring priority for emergency and emergency-related flights in U-space (important side notice about terminology – for air traffic management services emergency means a situation when an aircraft/drone is in trouble, whereas for blue light services on the ground emergency means an incident like traffic accident of fire during which an aircraft/drone might be used to help).

Dr Ryzenko presented two innovative concepts related to ATM:

1. "Emergency participant" status for UAS participating in crisis operations
2. Standard procedure of UAS operations above human-operated aviation during crisis

In the long-term perspective U-space is the future air traffic management system. We are talking about the future already being here, not theory but practice. Drones add real value to rescue services for situation awareness, monitoring, and coordination of missions.

There is an urgent need to provide information to U-space about the changing situation on the ground by crisis management institutions, as it might have a serious impact on the risk of U-space flights. In a few years we will see drones in the air regularly. This means there is also a need for provisions of information from overflying vehicles to emergency services (support to 112). We need operational procedures for airport operations coordinators and safety officers, rules, and procedures for establishment of ad hoc no-fly zones, etc.

The COLLARIS project and network can be the platform where we share experiences. The COLLARIS trial in Poland later this year will be devoted to this way of thinking. There are many questions: how do manned aircraft feel having unmanned aircraft around? How should communication between ground and air pilots be coordinated?

Dr Ryzenko briefly presented the background of the "Search and Help" ATM system, currently under development in Poland (large wildfire in Biebrza National Park in April 2019, with limited use of drones due to safety constraints, Forest 2021 exercise validating the concept of addressing the systemic gap identified), as well as its basic components (IT system, procedures, personnel), planned key functionalities and lessons learnt from already conducted activities. It should be a good basis for further discussions and exchanges of different national experiences during the trial in Poland and later on in other COLLARIS activities.

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2.2.2 Ronan de Saint Germain – Entente Valabre (FR)

Ronan gave a brief overview of the current training activities in France and presented a vision of UAS European training of the future.

UAS have been used in France for many years and are considered one useful tool among many, for instance for situational assessment during forest fires. Civil security is very interested in them due to their low costs, ease of use and possibility of immediate intervention.

However, many surrounding questions of both operational and ethical character continue to appear, such as the fact that the drones could crash on people monitored or the issues of integrity and the right to privacy.

There is a national training system for drone pilots, and it is clear which officer acts as contact between the team and the pilot. The aim is, during the simulation exercises, to be confronted with several types of scenarios in order to understand all the operational expectations per risk typology. Certain activities foreseen within the COLLARIS project could lead to new training for UAS pilots to integrate the UAS module of the UCPM voluntary pool whereas the elaborated guidelines might facilitate potential definition of common operational procedures to be accepted by UCPM. It would have three distinct purposes:

1. A technological watch (sharing of innovations)
2. Operational procedure training using simulation (within COLLARIS)
    a. OLAT liaison officer
3. Development of interoperability between all users, national and European:
    a. Working together by joint trainings and exercises within the UCPM
    b. Different handbooks and guidelines to be developed

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2.2.3 Magnus Kristiansson and Patrik Segerfelt – Region Västra Götaland (SE)
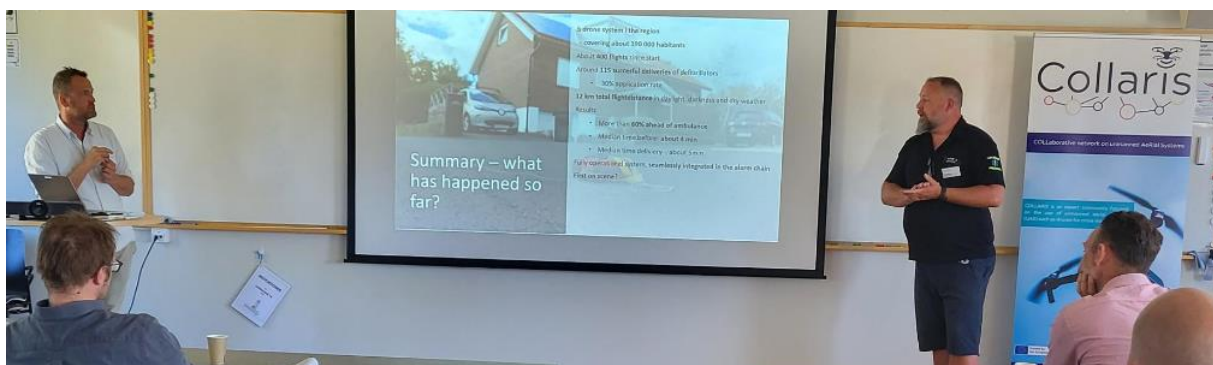
The Region Västra Götaland (the Region) is mainly responsible for health care services and public transportation services in the South Western part of Sweden (Gothenburg is the largest city). The Region is the largest public employer in the country and has a long history of pilot trainings in a simulated way.

MSB trains incident commanders (IC) for Police and rescue services. The Region aligns the training of IC. The Coast Guard educates pilots internally. So, there are different levels of training in Sweden.

The project presented describes how drones in the Region are used to deliver defibrillators to save lives. The drone hovers 30 meters above ground, drops the defibrillator with a wire, and then flies home. The project has also been set up in Denmark and England.

A study trip to the United States (Tulavista in California) was carried out. There the regulations have been developed and the drones are very much present in everyday operations by police, fire fighters and other stakeholders. The US drones only work during daytime but are very much the first responders.

With the help of drones, a defibrillator can reach the victim of an accident at a specific address before the arrival of ambulance/rescue services. They are ahead of ambulances in 60% of the time. The drones also have the capacity to be "first at scene" to get situational awareness, monitor traffic, help handle detection of fires, drowning situations etc. The camera can be switched on before you reach the exact address which helps in planning an activation and in decision making.

The drone has now become a tool that needs to be on standby all the time. The Region has 5 drones that serve 190 000 inhabitants, and the goal is to have autonomous drones. For this there is a need to work together with the rescue services. Coordination and cooperation are key to make the system work. The possibilities in emergency management are huge. For instance, it could be used to send out blood bags to emergency areas instead of with helicopters, as it is done today.

In terms of need for coordinated development of ATM regulations, the first lesson of the project was that there is a need for an exact address. Without it, for instance a traffic accident in remote areas, the regulations needed to be changed for the drone to get permission to work. It took 14 months for approval of the changes because of surveillance concerns and integrations. Now there is a permission. One has to remember that these are unchartered grounds.

For sea accidents, there has been developed a drone that can work in bad weather.

The frustrations that are experienced by both the Region and private companies relate to problems with regulations. The worst-case scenario is that the drone would fall down and kill a person on the ground, but at the same time the drones should be helping victims and saving lives. However, there is a good cooperation with the national agencies to find a solution. Everyone wants the best, after all, so there will be a change. There are many emergency pilots listening in on the development too. Another problem is time for permissions in division in air space.

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2.3 Thematic area 2 – Today's solutions and the challenges of tomorrow

2.3.1 Rickard Henningsson – Swedish Police (SE)

"Whatever you do, do not fall down!"

Swedish Police have had zero serious accidents, but they do crash with the drones sometimes. When they fail, they fall. 90% of the time it is the fault of the pilot.
For the Swedish Police, UAS is important for public safety. They have state aircraft approved (with special status and rules) and operations manual to be strictly followed, including safety management system. They have extended flight rules beyond visual line of sight (BVLOS), which is essential for risk management systems.

They often work together with a helicopter. UAS are used by the armed forces, coast guard, rescue services and the collaboration works well.

Objectives are to:
- Save lives
- Lead operational activities
- Prevent and investigate crimes
- Reduce risks for police employees
- Apprehend and prosecute criminals

The quality level is guaranteed by the many actors by standardised and regulated cooperation. They train each other and there will soon probably be joint trainings too.

The fire department of Stockholm was trained by the Police and now they train other rescue services to get the "trickle down" effect. So, the Police way of working with UAS has become normative!
There is an idea of doing a joint main training and then specialised trainings (an entire joint training programme), but this is not even in the planning yet.

Every organisation has identified the same challenges: all weather operations, air space availability, Mixed manned / unmanned operations, airtime, BVLOS regulations, Artificial Intelligence (AI), technology development.

There is also "The new technologies dilemma" covering the issues of:
- Control (What level of autonomy do we want? Everything always or something sometime?)
- Effect (How do we ensure the desired effects? AI?)
- Responsibility (Who is responsible for a fully autonomous intelligence system?)

For now, these are the main questions that are asked, but we have more open questions than acceptable answers: What kind of society do we want and what is it worth? What democratic values is the fight against crime allowed to challenge?

The answers to these questions will be important because they affect the role of the police in the democratic society. They will define the difference between general surveillance and specific monitoring activities.

The Swedish Police is currently focused on developing UAS towards more automatic features (not autonomous), with limited autonomy and effects of AI.
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2.3.2 Constantinos Heracleous, PhD – The KIOS Research and Innovation Centre of Excellence at University of Cyprus (CY)

The topic of the presentation was artificial intelligence (AI) and UAS for disaster management.
AI and UAS play critical roles in disaster management and response. These technologies can significantly improve the effectiveness, efficiency, and safety of disaster relief efforts.

AI is the simulation of human intelligence (ability to understand, discover, learn, solve problems, and act rationally) by machines. In the disaster management cycle, AI can provide help with forecasting events to take action before disaster strikes, decision support systems, decision making systems, and help with AI-powered automated robotic devices.

First-line responders, rescue teams, emergency management officers, tirage officers and administrative officers would potentially have a great deal of help from AI powered tools.

The main conclusion is that there is a bright potential for the future use of AI in UAS to develop the effectiveness of disaster management.

2.3.3 Jasmina Schmidt – Disaster Competence Network Austria, DCNA (AT)

In her presentation, DCNA expert Jasmina Schmidt underlined that drones can offer much more than cameras to map an emergency. There is a wide variety of auxiliary support systems, such as sensors, smart platforms/payloads, permanent energy supply etc. According to a research review, 2/3 of the 52 studies on auxiliary support systems focused on the use of cameras and situation pictures only. 5 looked at UAS for transport in medical emergencies and 6 looked at multiple systems for multiple purposes. UAS are mostly used for reconnaissance flights to get situational awareness. The current challenges consist of privacy and data protection concerns, public trust issues vs. new technologies, lack of consensus on operational concepts and how to assess collected data, additional resources needed such as speed of internet connection, costs of logistics and staff, flight times and battery run time.

2.3.4 Lars-Göran "Ellge" Emanuelsson – Swedish Contingencies Agency (MSB)

Lars-Göran Emanuelsson, head of MSB's unit Critical Information Infrastructure Protection Section, presented a number of aspects within cyber security relevant to the efficient use of UAS.

Cyber-physical systems are existing units within both drones and satellites. All kinds of IT systems are vulnerable and possible to attack, including cyber-physical systems within drones and satellites. Therefore, information security protection is necessary regardless of these systems being on ground, in air or in space. One possible example is how electromagnetic threats can disrupt information systems by affecting the electronics used to run the systems, and/or the wireless communications they often depend on.

Within cyber security, MSB's mission is to support the society with guidelines, guidance and education giving courses and holding exercises for technicians, administrators and management. In direct relation to UAS, MSB has supported a number of projects involving training of pilots and sensor

operators in emergency services and the police; common methods for data collection and information linked to accidents and other societal disturbances and experience from flights and deviation reporting. In 2021 national guidance called Unmanned aircraft in municipal rescue services was published. The guidance's aim is to support the establishment of an aviation organization linked to the permission needed (special conditions) and how this can be organized in a municipal rescue service. The guidance is primarily based on the needs that emerged from the municipal rescue service but also as an adaptation for the EU legislation (EASA). Moreover, the purpose of the guidance is to facilitate the introduction of UAS as a capability-enhancing tool in operations, which, if used correctly, can contribute to a more efficient management of the rescue effort.

Summing up his presentation, Lars-Göran drew the audience's attention to the existing challenges, both social and legal (GDPR) when implementing UAS in the organisation. In addition to challenges within cyber and information security also overarching challenges such as robustness and supply chains needs to be catered for.

However, he underlined that "once we have solved the problems, we have a bright future when using all these systems, satellites, and drones together with AI analysis in crisis, we will have a more effective and correct situational picture or overview. Early-warnings will make the crisis management more cost effective and help to shortening the response-time and will save life."
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2.4 Open Session Presentations

2.4.1 Vendelin Clicques – International Emergency Drone Organization

He presented a brief overview of his organization and its activities, underlying possible synergies and complementarities with the COLLARIS Network. IEDO is a worldwide non-profit association of drone pilots from among the first responders (firefighters, police, paramedics, doctors, SAR volunteers, coast guards etc. – individual persons, not institutions, no companies to preserve neutrality). It was founded in 2018 and now has about 800 members from 55 states.

The goals of the IEDO are:
- Promotion of the use of UAS by public safety agencies in all countries
- Sharing experiences, feedback and information between emergency drone teams
- Improvement of emergency UAS pilot training level and safety
- Research and development, the testing of new technologies about drones
- Collaboration with international or European organizations about using drones during disasters

IEDO organizes annual seminars, conferences (last one in Paris in 2022) and other events like national drone challenges. In 2020 they published the first International Best Practice Report on the operational use of drones for fire and rescue missions, based on experiences from 13 countries, updated in 2022. They are open for different forms of exchanges and collaboration.

2.4.2 Åke Sivertun – Research Institutes of Sweden (RISE)

RISE is an international private research and innovation partner working on sustainable development. It coordinates a project on UAS in search and rescue and firefighting. The use of UAS for several purposes with new technology is developed and tested at their test bed in southeastern Sweden.

One possibility currently under development is to use Lidar and nRTK for measuring height of trees, their crown width and ground conditions. There is a potential with sophisticated sensors to predict trafficability in road-less terrain for instance, indicating go and no-go zones and suggestions to defend the roads. With gamma and radar hydrocultural plants can be found. Drones can carry thousands of litres of water much cheaper than helicopters. Test flying is done through the mobile network, and it is very safe, but drones are "tricky", so cyber security is an issue.

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2.4.3 Henrik Kruse – Danish Emergency Management Agency (DEMA)

DEMA started using UAS in 2014 for fire incidents. A UAS in SAR project was started in 2021 to find out how effective UAS is at search mission, how to tactically approach a search mission, how to technically carry out a mission and to identify search methods. 18 field tests with four different scenarios have been carried out. Also, the project has undertaken a study trip to the USA and conducted a thorough desk research on the issue.

Preliminary findings reveal 16 methods with six variations, a probability of detection of 42% across all methods and scenarios. Targets of value are risk search (places that are dangerous for the person) and probability search (along natural walking paths of hide outs). Image processing after mapping resulted in 30% additional finds. Also, an instruction is being formulated on how to technically carry out a search mission with UAS in different terrains (flat, hilly, wet area and built-up area).

The conclusions of the project will be published later during 2023.
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3 Closing of the Workshop

The COLLARIS project team closed the workshop with gratitude to the participants. Upcoming options for collaboration will be a large scale UAS trial in Poland (flood response scenario) on 30-31 August 2023, combined with an international workshop on 1 September. Proposals to improve ATM provisions and tasking during crisis events for continued efficient use of UAS capabilities in crisis situations will be discussed there. Interested institutions are encouraged to contact Collaris-network@cbk.waw.pl.