COLLaborative network on unmanned **A**e**RI**al **S**ystems

D3.2 – Recommendations towards standardisation / interoperability for operational practices

WP 3 – AIR TRAFFIC MANAGEMENT CHALLENGES AND EXPECTED NEW DEVELOPMENTS OF UAS CAPABILITIES

Deliverable type: Report

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Date: 16.12.2024

COLLARIS partner organizations:

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Executive Summary

Drones are becoming a typical equipment for more and more different crisis management services across European states. However, the internal operational practices related to the use of drones depend on the characteristics of individual institutional actors. They result from their habits, current legislation, types of missions performed, activity of ATM structures, etc. and therefore may vary not only among different countries, but also among different public services in the same state.

In order to ensure as smooth and as efficient as possible cooperation among different services dealing with a crisis situation when international aid is involved – be it in a form of bilateral assistance between Member States, cross-border problem or Union Civil Protection Mechanism activation – it is necessary to aim for interoperability of these practices.

There are usually the same basic steps that have to be followed in such a case. The incoming drone team has to confirm its formal ability to carry out legitimate flights. They have to establish communication with the relevant decision-making centre (the cell coordinating air missions of a scale compatible with the capabilities of incoming support). And last but not least, there is a need for tactical arrangements with the cell commanding the implementation of operations and with the cell aggregating information (e.g., the team responsible for updating GIS services). Then and only then the "incoming" drones will be used in a safe and coordinated manner and the data and information they gather will be provided to the relevant services and resources involved in the crisis operation.
In this report we are aiming at offering some practical suggestions that might facilitate the operational cooperation among different stakeholders in such situations and indicate areas which have the most impact on ensuring safe and efficient use of drones. There are four key thematic areas we have identified during discussions with various drone experts during the trials in Valabre, Poznan and Solina: procedures for cooperation and coordination, legal considerations, specific aspects of ATC, data and GIS information sharing. For each of these areas we have defined more detailed issues that should be addressed and we present them in a form of a questionnaire/check list for both sides involved, i.e. the drone team coming to a different country (so-called Assisting Force Questionnaire) and the state receiving the aid (so-called Host Nation Support Questionnaire). There are also detailed instructions/suggestions how the questionnaires should be filled in and what practical information would need to be provided by both sides.

As already mentioned, the key thematic areas for interoperability have been identified on the basis of inputs from COLLARIS Network members and drone specialists from several other states who participated in the UCPM Exchange of Experts Programme in Valabre and Poznan and in the exercises in Solina, for which COLLARIS project team would like to express its profound gratitude. Therefore we hope that they represent a foundation for future broader consensus and as such might serve as a good start for further reflections on the topic both on national and European levels.

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About COLLARIS

Scientific advances as well as fast-evolving drone technology and its applications have today become indispensable in all phases of the disaster risk management cycle. COLLARIS is a capacity-building initiative to develop a sustainable European network of scientific, engineering, and end-user expertise related to unmanned aerial systems (UAS) in civil protection and disaster response. COLLARIS covers the following thematic focus areas:

- identification and sharing of operational procedures, lessons learnt, and best practices using UAS
- elaboration of air traffic management challenges, solutions, and operational practices
- acquisition of solutions for data analysis and data sharing, as well as auxiliary support systems (e.g. simulators)
- development of methods for increasing end-user competences
- foresight of new developments and future use case scenarios to identify tomorrow's needs and gaps, technological capabilities, and their potential applications

The general concept of COLLARIS is based on two assumptions: That the technical capabilities related to UAS will continue to develop rapidly, as will the scope of their application for civil protection and crisis management purposes; and that the gap between these recently created technical capabilities and the practical needs and operational practices of civil protection not utilising them yet will remain a permanent challenge. Therefore, there is a clear need for establishing a stable long-term mechanism to continuously support the civil protection community in gradual implementing innovations enabled by UAS developments. The COLLARIS-based community will make an important contribution to achieve that.

COLLARIS will offer a networking platform as part of the Union Civil Protection Knowledge Network for information exchange and experimentation with advanced concepts of UAS for disaster response and crisis management. These activities are accompanied by thematic workshops, webinars, and moderated discussions as well as trials and embedded first responder trainings, aimed at increasing the efficiency of UAS operations by bringing knowledge closer to operational use.

Representatives of civil protection authorities at all levels, first responders, crisis management practitioners, and researchers interested in issues related to further development and operational use of UAS in their activities are cordially invited to join the COLLARIS Network initiatives.

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List of Abbreviations

ATM	Air Traffic Management
ATC	Air Traffic Control
GIS	Geoinformation systems
HNS	Host Nation Support
GA	General Aviation
HEMS	Helicopter Emergency Medical Service
LEMA	Local Emergency Management Authority
AUP / UUP	Airspace Use Plan/ Updated Airspace Use Plan
UAS/UAV	Unmanned Aerial System/ Unmanned Aerial Vehicle
UCPM	Union Civil Protection Mechanism

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1. INTRODUCTION: Why there is a need to explore the topic of standardization / interoperability for operational practices using UAVs?

Internal operational practices related to the use of drones depend on the characteristics of individual institutional actors. They result from their habits, current legislation, types of missions performed, activity of ATM structures, etc. and therefore may vary not only among different countries, but also among different public services in the same state.

COLLARIS Trial and UCPM Exchange of Experts Program in Valabre in November 2023 and in Poznań in October 2024 allowed to gather a lot of knowledge on the required qualifications for pilots, training programs, methods of organizing drone units and their deployment mechanisms and using drones in crisis management operations in Austria, Croatia, Cyprus, Denmark, Finland, France, Italy, the Netherlands, Poland, Portugal and Sweden), with additional inputs from Norway during the Trial in Podkarpacie in November 2024. The discussions during these trials, as well as other exchanges throughout the COLLARIS activities, led to the conclusion that in order to correctly answer the question from the title, it is first necessary to inquire where and when the need for interoperability exists. In this report, we present the idea that this need arises in particular in situations where we have to deal with the activities of actors coming from one environment (understood as a state) in another environment: bilateral assistance, cross-border crisis situations and Union Civil Protection Mechanism activations. We are aiming at providing some practical suggestions (in the form of a questionnaire/check list) that might facilitate the operational cooperation among different stakeholders in such situations and indicate areas which have the most impact on ensuring safe and efficient use of drones.

Fig. 1 Photos from the trial in Poznan (left) and field exercise in Solina.

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2. Aiming for mutual understanding between assistance providers and recipients

In the course of various meetings with experts in the COLLARIS network, we have repeatedly observed the process of formulating certain questions that seem fundamental to the ability of external actors to cooperate effectively and in line with all applicable legal requirements. Based on this observation, we have elaborated the following logical cycle that becomes apparent in such cases:

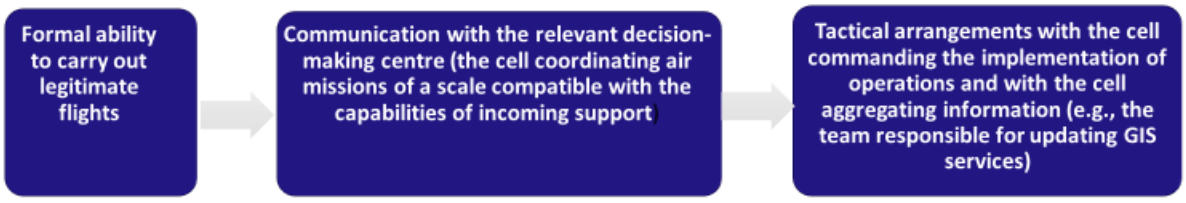

Fig. 2.

This entire process is supported by the ability to communicate effectively with other assets operating in the area, especially other drone operators (co-executing the same task or working independently) and those who may either provide relevant information or be interested in receiving it.

2.1 Host Nation Support

Our report is prepared in line with the general approach of the EU Host Nation Support Guidelines [1] from 2012 and recent discussions in the UCPM framework aimed at making HNSG more accessible and more consistent.

Let us recall the overall picture as described on UCPM website: when a disaster strikes and a country triggers the Union Civil Protection Mechanism or asks their neighbours for help, getting support on the ground as soon as possible is the priority. Host Nation Support means removing (as much as possible) any obstacle to international assistance to ensure that disaster response operations proceed smoothly. One of the challenges of HNS is that countries have their own ways of working in a crisis situation. This means that each country's approach to receiving and integrating international assistance in their national system can also vary considerably. There are no guarantees that a HNS Cell or national HNS liaison officer is available in a crisis situation, for example.

The Host Nation Support Guidelines (approved in Jan 2012 by the EU Civil Protection Committee) are intended to support and assist affected states in receiving international assistance during disaster response, and are a key preparedness element to ensure the effectiveness of UCPM operations. They are a non-binding tool aimed at providing guidance and support for the delivery of effective and efficient international assistance in a major emergency. They highlight the key actions to be taken in relation to emergency planning, emergency management and coordination, logistics, transport and legal and financial issues.

[1] Brussels, 1.6.2012, SWD (2012) 169 final, COMMISSION STAFF WORKING DOCUMENT: EU HOST NATION SUPPORT GUIDELINES.

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The goal of any Member State hosting aid from external sources – drone units included – is to use it effectively. To achieve this, command cells need to learn both its capabilities and limitations. While the capabilities are usually clear (as evidenced by participation in a number of joint R&D project activities, participation in thematic webinars, or meetings at conferences and expert networks), the biggest diagnosed limiter is the ability to conduct operations in accordance with legal constraints and procedures (e.g., flight execution safety, coordination rules, knowledge of local flight recording methods).

The first step is the recognition of the type of capabilities possessed and the detailed information on the specific features of equipment providing support turns out to be relevant only at the final stage (e.g., a paraglider drone operating effectively at altitudes above 150m, providing a strategic view of the crisis, hierarchically may be classified differently from tactical multirotors that operate in a limited area).

2.2 Pre-mission briefing

The drone team incoming for assisting a nation during an emergency, should be appointed with a liaison officer. This officer should have experience in UAS operations and be consulted before the team's departure. Although provision of a properly completed questionnaire should cover most of the necessary knowledge, some key points should be highlighted and discussed before the mission.

The team should receive a "spokesman" – a contact officer, preferably an UAV pilot who, even if not performing field operations during the specific event, is familiar with their characteristics. The default point of contact here seems to be the cell responsible for overseeing the aviation of the service coordinating operations.

In addition, before the mission, it is a good idea to consult equipment – air transportation can be a limiting factor, so the various types of specialized equipment should be agreed upon before the mission. For achieving correct understanding, however, it will be necessary to consult not only the point of contact, but also the commander implementing the action in the field and familiar with the specifics of the event the team is being deployed to assist in. It seems beneficial to give the incoming team guidance on the type of event and allow them to use the equipment they feel comfortable and can provide useful results with.

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3. Main areas identified for standardization recommendations – Assisting Force questionnaire

	Thematic area	Detailed issues
1	**Procedures for cooperation and coordination**	a. General information: team size, means of communication, means of transportation and overall autonomy (related to conducting UAV operation's only) b. Additional capabilities (on-device processing, image detection, cargo transport, live stream, onboard transponder-style systems) c. Aircraft radio ownership and type of license
2	**Legal considerations**	a. Personal liability insurance requirements b. State aviation status (having the status of "state aviation", or following civilian rules?) c. Operational Risk Assessment in use – what rules do you follow? do you need any additional input data for that?
3	**Specific aspects of ATC**	a. Ability to conduct operations – overview (explanation, overview) b. List of aircraft (EU class, weight, type, API key for drones GPS) c. List of remote controllers (incl. certification)
4	**Data and GIS information sharing**	a. Integration of UAV mapping – ability to and format of provided outputs, assessed operational time of processing b. Internet access autonomy

Table 1 Assisting Force Questionnaire

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4. Instructions for completing the Assisting Force questionnaire

Ref 1.Procedures for cooperation and coordination

a. General information: team size, means of communication, means of transportation and overall autonomy (related to conducting UAV operation's only)

Explain your group - its resources, capabilities, experience and details of its methods of operation, communication, mobility.

b. Additional capabilities (on-device processing, image detection, cargo transport, live stream, onboard transponder-style systems)

Add an explanation for all above-mentioned basic capabilities, focusing specifically on activities that the group can undertake which go beyond basic UAV capacities (streaming video, generating images, and manually searching for an object on the controller screen). In addition, provide the interface by which these additional effects can be consumed.
Describe also the group's experience in conducting long range or BVLOS flights, and if such flights are permitted to them. This can be aggregated to give the operational range of a single mission and the disposition (e.g. requirements) to perform missions outside this range.

c. Aircraft radio ownership and type of license

Comment on having the ability to listen and transmit on airborne radios, indicating whether the team is authorized and experienced in conducting communications on airborne channels.

Ref 2.Legal considerations

a. Personal liability insurance

State whether the group has adequate insurance for flying in the host nation, and what is the financial scope of the aforementioned insurance.

b. State aviation status (having the status of "state aviation", or following civilian rules?)

Is the group authorized to fly under State Aviation rules in the country from which it is coming? Does it have experience in conducting such flights? What are the significant differences in conducting such flights.

c. Operational Risk Assessment in use – what rules do you follow? do you need any additional input data for that?

What tools are used to perform risk analysis and what data should be fed to the group in this context (i.e. population density maps, other geographical information).

Ref 3.Specific aspects of ATC

a. Ability to conduct operations – overview (explanation, overview)

General information about capabilities and preferences for conducting operations – a background description of the group's experience, particularly in the context of typical

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activation and out-of-country assistance experience, as well as group members' experience in other types of international activations, such as related to UCPM activations or other types of missions.
Air operations resources and experience – additional equipment affecting safety, mission management systems, related tools etc., with particular emphasis on active detection systems and positioning systems.

b. List of aircraft (EU class, weight, type, API key for drones GPS)
c. List of remote controllers (incl. certification credentials)

Ref 4.Data and GIS information sharing

a. Integration of UAV mapping – ability to and format of provided outputs, assessed operational time of processing

Ability to generate products that can then be shared with spatial geo-information systems, e.g., for use in operations headquarters. With additional indication of processing time and how the group can share these products (and in what data formats).

b. Internet access autonomy

Ability to operate outside the transmission network, dependence on access to resources (mobile network, LTE internet, electricity supply).

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5. Main areas identified for standardization recommendations – Host Nation questionnaire

	Thematic area	Detailed issues
1	**Procedures for cooperation and coordination**	a) Incident Command and Coordination i) Structure, subordination, means of communication b) Access to geographic data on the country c) Coordination with relevant parties' details: air operations command (military), Civil Aviation Authority, Air Traffic Control, Flight Information Service d) Host Nation manned (air) traffic characteristics (structure, role of governing agencies, overview) e) Host Nation current organisation of drone flights f) Description of the actual integration with manned aviation: GA, State aviation (military and rescue, others) g) Tactical airspace coordination i) Overview – air traffic management for UAS / emergency manned aviation ii) Current procedures and systems in place to support the operation of the UAV remote controller (required and supporting) iii) Airspace Manager, Air Liaison officer roles description iv) Flight Level limits, separation: standard buffer zones (horizontal, vertical, other), v) Radio channel(s) and frequencies available vi) No-fly zone activation method h) Procedures for coordination with other rescue drone users i) Flight registration procedure ii) Communicators (apps) for coordination between participants in activities
2	**Legal considerations**	a) Legal basis for general aviation operations, UAS flights, state aviation and other applicable regulations b) Local legislation on the participation of foreign parties in rescue operations c) Personal liability insurance d) Operational Risk Assessment e) GDPR laws and procedures, regulations towards using different sensors f) Regulations related to usage of aircraft radio and any radio

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		g) UAV remote controller – requirements (registration, certification, liability insurance, flight registration (check-in) procedure, access to existing rescue web-based services)
3	**Specific aspects of ATC**	a) Flight Authorisation and Registration mechanism in hosting country (overview) b) Specific aspects: i) General use of airspace information in relevant area of interest, points of contact (incl. military) ii) Airspace Usage Plan – access details, temporary restrictions communication methods iii) Rescue reservation airspace procedure, integration with National ATM, digital ID iv) UAS restriction zones – means for procedural and real time airspace monitoring (incl. geofencing, safety alerts and no-fly zones registry) v) Flight registration procedure for current event c) Critical Communication d) Procedures and means for addressing non-cooperative aircrafts
4	**Data and GIS information sharing**	a) The ability to receive and digest geospatial information – overview (video, image, map, point cloud) [an effective representation of the developing situation] i) Overview of data systems in use ii) Desirable data formats and topics of interest iii) The way to access data repositories and GIS systems in use

Table 2 Host Nation Questionnaire

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6. Instructions for completing the Host Nation questionnaire

Ref 1.Procedures for cooperation and coordination

a. Incident Command and Coordination

i) Structure, subordination, means of communication (general)

The incoming drone team should be presented with the overall dependencies in the target country, the matrix of responsibilities of the services, the command structure (indicating their location in the above structure), as well as the methods of navigating the structure (how to communicate during and outside operations). The goal is **to present the incoming team with a manageable in extent, but complete picture** of the interdependence between host nation institutions with regard to the type of activities in which they will participate.
If there is a risk of a language barrier driven miscommunication, this should be taken into account, while not overloading the liaison officer (who may be responsible for more groups / tasks). It is worth distinguishing two topics of communication here: communication concerning the **execution of UAS flights** (obtaining approvals, coordination of pilots) and communication concerning directly the **rescue operations** (informing incident commanders, alerting services to detected threats).

b. Access to geographic data on the country

Map repositories and other geographic data that will help participants become more familiar with the region of operations. The section should include access to sources that may not be obvious to incoming forces, such as forest databases, map layers with information about the type and ownership of structures, power grids, and maps of air obstacles.

c. Coordination with relevant parties' details: air operations command (military), Civil Aviation Authority, Air Traffic Control, Flight Information Service

A separate section should, e.g. in tabular form, **enumerate the services responsible for supervision and support of aviation activities**, together with their working hours (if other than 24/7), expected response time and an indication of the method of contact available to English speakers.

d. Host Nation manned and unmanned air traffic characteristics (structure, role of governing agencies, overview)

Describing the **customs, interdependencies and forms of operation in the host country's airspace** will allow the arriving party to prepare themselves accordingly and build a proper picture of the situation.
After initial overview, follow this section by expanding on the list from the previous point, the **responsibilities of the various institutions and their role in the context of rescue flights** in a situation of ongoing rescue operations.

e. Host Nation current organisation of drone flights

This section should describe the **organization of drone flights**, with a particular focus on any deviations from EASA rules. Then describe licence obligation, drone registration obligation, flight registration methods (if any).

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Lastly, discuss the access to aeronautical information (e.g. NOTAM messages) and overall view on the frequency of encountering unaware (of existing laws / airspace organisation) pilots to create a general understanding of the **level of awareness** of the usual professional / unprofessional drone remote controller.

f. Description of the general integration of UAS with manned aviation: GA, State aviation (military and rescue, others)

Air traffic for "blue light" operators may **interact with other airspace users**. Therefore, it should be clarified whether the country has any methods of information exchange and interaction, and explained to what extent they are binding for emergency operations. It is necessary to present the situation “as is” as of today.

g. Airspace coordination (tactical view, specific for the current emergency)

The following section, unlike the previous ones, describes the **air traffic organization** that will be **applied for a given mission / activities** of the incoming team. It should include references to specific individuals / staff positions appointed for the current emergency.

i) Overview – air traffic management for UAS / emergency-response manned aviation

Description of the total air activities carried out in the current emergency, indicating the affiliation, type and approximated number of airspace users, the current organization of the airspace, active or foreseen Air Operation Coordinator / Air Marshalls. Description should be concise and indicate the scale of air operations and likely scenarios for escalation of the air effort.
It should include also information on **potential for appearance of airships not directly engaged in rescue operation** (e.g. media drones), organisations known to not communicate their flights (e.g. police covert flights, volunteers flying without access to emergency communication hubs), typical uncooperative aircraft – and link to practical procedures to be applied should any of these mentioned cases materialize.

ii) Current procedures and systems in place to support the operation of the UAV pilot (required and supporting)

Listing of all UAS procedures, that should either be explained or attached, together with any apps, databases and other tools that are being used by other UAS remote controllers. This should include check in for flight (flight registration) procedure.

iii) Air Operation Coordinator / Air Marshall / Air Liaison officer roles description

If **Air Operation Coordinator** (or any derivatives thereof) are deployed, **explain their role**, authority, subordination, and method of work.

iv) Flight Level limits, separation: standard buffer zones (horizontal, vertical, other)

Generally applied standards and limits. This should also include (if relevant) any exemptions to them.

v) Predefined radiochannel(s)

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Listing of **radio communication channels** that are being utilised for the airspace coordination in relevant area.

vi) No-fly zone activation method

Some institutions are authorized to either request or directly activate an **air traffic restriction zone**. Such a zone may have different types of features - allow (or not) entry of third parties after appropriate application, apply to all flights or only UAS flights, oblige to a certain form of communication, introduce additional requirements, etc.
If host nation has a relevant procedure, please explain who, how, where and for how long can run it. As well as who is obliged to comply with it and who is subject to exceptions. Lastly, advise on where the zone is published and updated.

h. Procedures for coordination with other rescue / GA drone users

If no other type of coordination has been activated in the area, how is **bilateral coordination between airspace users** organised – whether bilateral flight realignment is allowed and how it can take place. What are the units (and their reference) for flight level, speed, prevailing writing coordinates method etc.

i) Flight registration procedure

Is there any procedure for **flight registration** / **alteration of planned flights** (that alters to what has been explained before)?

ii) Communicators (apps) for coordination between participants in activities

Are there any other apps / social groups / websites to coordinate with other drones in the area?

Ref 2.Legal considerations

The section should provide information and sources of knowledge about the **applicable regulations** (in the form of a summary with further references), if possible with direct links to repositories of the above regulations and whether they are available in English. <u>If specific national regulations do not follow the line of EASA regulations, this should be explicitly pointed out</u>.

a. Legal basis for general aviation operations, UAS flights, state aviation and other applicable regulations

An enumeration, with links to the version translated into English or allowing machine translation, of the legislation.

b. Local legislation on the participation of foreign parties in rescue operations

The legal basis for allowing such participation, and a summary of the rules contained therein.

c. Personal liability insurance

Obligation of participants to have insurance and insurance coverage required in the host country (if none – include information about it).

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d. Operational Risk Assessment

Description of risk analysis requirements -–scope, acceptable methods, cases where it is required. Along with a contact to the body that performs such analyses for flights of emergency response actors.

e. GDPR laws and procedures, regulations towards using different sensors.

Regulations, procedures and guidelines applicable to data protection, data storage and sharing, recording with the use of various sensors, as well as special regulations which regulate the use of typical sensors / techniques (e.g. ML/AI tools; use of IR sensors).

f. Regulations related to usage of aircraft radio and any radio

Regulations on the passive AND active use of radio frequencies, along with the bodies that oversee their use.

g. UAV remote controller – requirements (registration, certification, liability insurance, flight registration (check-in) procedure, access to existing rescue-related web-based services)

The totality of regulations specific to UAV flight in the country, if possible, along with the current manual / direct access to a trainer.

Ref 3.Specific aspects of ATC

a. Flight Authorisation and Registration mechanism in hosting country (overview)

Summary of the total actions necessary to **plan, authorize and register (check-in) the flight**, if there are variants (different procedure for airspace class G, for ATZ, emergency-R, others), with a separate breakdown. This section should be organised as, or linked to, a step-by-step guide.
It should also inform whether the applicant must have an account / be registered in some external database, whether the operator or pilot is applying, etc.
Even when the participation of an external team is limited to specific forms (e.g. only in emergency R zone coordinated by an AOC), other forms should also be shortly presented, for giving the context of the aviation situation in a hosting country.

b. Aspects specific to:

i) Sources of airspace information in relevant area of interest, points of contact (incl. military)

Any information directly related to the **area where flights will be performed** – including joining information services / airspace organization management, information on active / planned airspace organizations, contacts to airspace managers and other relevant sources of information – nearby HEMS stations, nearby airstrips, managers of neighbouring zones.

ii) Airspace Usage Plan – access details, temporary restrictions communication methods

Repetition: address of access to the visualization of the current AUP / UUP, information on whether temporary restrictions are visualized there and with what delay (whether updates are applied 24/7), contact to CAA (national Civil Aviation Authority) cell that governs AUP and UUP. Integration with National ATM, digital ID etc.

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iii) Ad-hoc R-zone reservation procedure

How can an incoming drone team ask to designate a zone for their flights, who is the point of contact for them (e.g. CAA / AOC / LEMA / other), how the procedure is carried out and what data needs to be supplied.
Experience teaches that if a third party (e.g., LEMA) is acting as an intermediary in the application, it can be effective to include a direct contact to the group requesting the flights – if changes are required, this will simplify the process and flight supervision organizations usually speak English.

iv) UAS restriction zones -–means for procedural and real time airspace monitoring (incl. geofencing, safety alerts and no-fly zones registry)

Access to the registry of UAS geographical zones (in line with (UE) 2019/947/UE). Information on any means of airspace monitoring: geofencing, digital ID requirement, active monitoring systems, active communications jamming systems and the organizations that control them.

v) Flight registration procedure for current event

Step-by-step procedure (incl. contact information) for reporting flight execution and maintaining communications.

c. Critical Communication

- Communication procedure for air-emergency situations (as defined by Emergency Procedures – abnormal and emergency situations that may occur in flight) for the target flight area.
- Communication procedure in case of outage of means of communication to be used.
- Communication procedure for direct endangerment of a team member / other emergency responder.

d. Procedures and means for addressing non-cooperative aircrafts

Procedure for dealing with flight of a non-responsive aircraft or UAS (if different). With an indication of the direct point of contact (it is worth noting that even if there will be police officers in the area, they may not have the knowledge or means to find / make contact with the aforementioned aircraft).

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7. Additional comments and suggestions for potential way forward[2]

The presented questionnaires effectively highlight many of the key elements to be considered in facilitating the exchange of UAS capacities between different nations. They provide a good starting point for organizing the operational, legal and logistical aspects of such exchanges. However, there are areas where additional detail and specificity would enhance their usefulness:

Implementation and procedures – the document outlines considerations and a broad framework but does not delve deeply into how these elements should be operationalized**:**

- What specific procedures should be followed for airspace coordination and risk analysis?
- Are there standard methods or protocols that all parties should adhere to?

Making recommendations more specific – generally accepted guidelines on common standards and "best practices" are being sought for key aspects, such as:

- Compliance with EASA regulations and how they align with national requirements.
- Risk assessment methodologies and tools.
- State aviation considerations and coordination with manned and unmanned systems.

Including the recommendations for standard operating procedures (SOPs), equipment compatibility, and communication protocols would make the presented questionnaires more actionable.

Operational examples – the document broadly covers the legal and logistical elements well, but it would benefit from being supplemented with practical aspects of deployment and coordination during emergencies, such as:

- Examples of effective "best practices" in similar scenarios.
- Handling non-cooperative aircraft in restricted airspace.

The answers to the questions posed in this way are not yet available, but the very formulation of such indicates the expected direction of the future work, to be carried by the COLLARIS Network, MODEX exercises and other similar initiatives addressing interoperability challenges in international drone operations.

8. CONCLUSION

The key thematic areas for interoperability described in detail in the report – procedures for cooperation and coordination, legal considerations, specific aspects of ATC, data and GIS information sharing – have been identified on the basis of inputs from COLLARIS Network members and drone specialists from several other states who participated in the UCPM Exchange of Experts Programme in Valabre and Poznan. We hope that they reflect the practical experiences and knowledge of all the experts involved in the discussions and as such may be useful during a crisis situation when international aid is involved, not only for the drone teams coming to a different country but for the crisis management services from the state receiving the aid as well. Nevertheless, they are only the first step for further reflections on the topic both on national and European levels.

[2] This section is based on comments and suggestions provided by the external reviewers of the questionnaires (from NO and AT).

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