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

D2.2 – Report: Overview of current SotA practices of training: assessment and recommendations.

WP2B – Thematic line: Methods of increasing personnel competences

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Executive Summary

This initial report recognises and addresses an expanding need for collaborative and cooperative training for the use of UAS among European first response and civil protection stakeholders. It also recognises a growing need to strengthen training organisations to cater for collaboration and cooperation within and across different domains of civil protection in the EU in order to ensure the safe and effective use of UAS operations and to enhance social acceptance of state-based authorities' use of these technologies.

A survey questionnaire developed by the COLLARIS consortium and distributed by MSB in Sweden and to a number of European stakeholders yielded a low response rate that limits the scope of conclusive claims that can be drawn from the gathered data. The survey did however provide some basic findings that can help to build better understanding for the current status of UAS training in and across these countries. By employing the case of the Swedish police and their use of UAS as outlined in a recently published book chapter on the technology and capacity of drones and UAS in Sweden, the report provides a solid case of a first response authority that has advanced the employment and safe use of UAS in their everyday work as "blue light" authorities but more importantly, as a state approved flight operational organisation who conducts training within and beyond their own organisation. Other examples of training provided by consortium members and European experts (participating in the UCPM exchange of experts' program in Valabre) included here help build a broader picture of the current status of UAS training across the EU.

These training focused results from the COLLARIS developed survey that are presented here in this report, as well as the training examples provided from Sweden and those shared from other consortium partners will provide a foundational platform from which this knowledge building and collective learning process can progress.

Although we do not offer definitive answers here and now, the survey results do open up room for discussions and call for more advanced evaluations in upcoming project activities. More specifically, they can also be a basis for more in-depth discussion to encourage greater evaluation of training needs and training materials. As discussed in the case of Sweden (the ambitions of the police and MSB) and also in relation to the consortium partners it is an aim to provide joint solutions. However, we still think that further exploration is needed to determine the extent that formal and collaborative training matters and on what level. From the survey and examples provided here however we observe that context differs, and therefore that context matters. As such, qualitative-based research that can capture in-depth the contextual factors and domain-specific needs and limitations identified by sharp-end organisational stakeholders is needed. Although supranational policies and regulations are in place, each country and in the case of the EU - each Member State, is subject to national legislation, policies and not the least different operational first responder contexts and training systems. The COLLARIS project will therefore continue to collect, learn from and share examples like those presented here, to support collaborative learning whenever and wherever applicable.

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.

About this deliverable

This deliverable lays down an initial outline for providing an up-to-date and comprehensive overview of current training methods focused on the operational use of UAS in crisis management and first response.

Using the case of the Police in Sweden as a starting point for the discussion, the report includes overview of examples of training from a number of European stakeholders. These non-exhaustive examples build on a basic survey conducted by the project together with dialogues with individual stakeholders. They aim to open up for further dialogues within the consortium and between stakeholders alike to increase knowledge exchanges and deepen learning on the subject.

Training today is provided by a number of different stakeholders, for different purposes (data collection before, during and after an incident; provision of material; in-sight and out-of-sight operations to mention just a few) using both live and virtual simulation and in some cases relying on AI- solutions. Working from this initial report outline, the final report aims at identifying best practices and developments (preliminary version) and through network activities such as workshops and trainings, it will also establish a framework with suggestions for what and how to train to provide operational effect and greater collaborative capacity (final version).

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List of Abbreviations

AMC	Acceptable Means of Compliance
BVLOS	Beyond Visual Line of Sight
CONOPS	Concept of Operations
DEMA	Danish Emergency Management Agency
EASA	European Union Aviation Safety Agency
FOM	Flight Operations Manual
GM	Guidance Material
LUSA	Lund University School of Aviation
SORA	Specific Operation Risk Assessment
STA	Swedish Transport Agency
PANSA	Polish Air Navigation Services Agency
POLS	Polismyndighetens obemannade luftfartssystem
MSB	Myndigheten för samhällskydd och beredskap
UAS	Unmanned aircraft system
UAV	Unmanned aircraft vehicle

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1 Introduction

1.1 UAS in civil protection – the case of a first responder organization

The use of unmanned aerial vehicles has created new opportunities requiring enhanced capabilities for effectively carrying out operations within rescue and emergency services. An ever-increasing need for UAV/UAS in crisis management and first response therefore requires the establishment of new aviation organisations to manage UAS/UAV specific flight operations (see MSB 2020)[1]. Accordingly, there is a further need to establish specific training entities to ensure the safe and effective conduct of drone operations in a civil protection and first response context.

In the context of civil protection and disaster response in Sweden, the ever-developing domain of UAS operations sees an ever-expanding need for collaborative engagement with and cooperation between various crisis management and first response authorities[2]. These authorities include the police (*Polismyndigheten*), the rescue services (*Räddningstjänsterna*), the coast guard (*Kustbevakningen*), but can even involve other authorities such as the maritime authority (*Sjöfartsverket*) and the armed forces (*Försvarsmakten*) (see Henningsson 2023: 242; see MSB 2020).

Recently published literature suggests that the way the police use and work with UAS can be regarded as establishing a norm among many first response and emergency service operators in Sweden who are increasingly employing UAS in their operations (see Henningsson 2023; cf. Eftychidis et al. 2018:123-125, on community policing). And although there are no immediate plans in place to date, shared aspirations exist among civil protection and first response stakeholders in Sweden for establishing a common training platform for carrying out joint main (basic) training that can then be built upon to develop more specialised training schemes to accommodate specific and collaborative operative needs (part of an entire joint training programme) (see Henningsson 2023; also MSB 2020).

The COLLARIS project ultimately aims to collect and share data, practical experiences, and to establish best practices with the project's main focus on building a European network to establish common understandings and to learn from shared experiences in order to fly drones in a commonly acceptable safe and effective way that can assist and reinforce first response and crisis services in society. This further requires placing more focus on the prerequisites and specific requirements for developing efficient and effective air traffic management surrounding the operational use of UAS for crisis management and search and rescue purposes. It also requires the building of knowledge concerning safety and regulation for effective operation of UAS in civilian airspace.

The basic training focused results from the COLLARIS developed survey that are presented here in this report as well as the training examples provided from Sweden and those shared from other consortium partners will contribute to this aim and can provide a foundational platform from which this process of knowledge building and collective learning can progress.

[1] Vägledning 2.0 "Obemannade luftfartyg i kommunal räddningstjänst" (English transl. "Unmanned aircraft systems in municipal rescue services").

[2] Commonly referred to as "blåljusmyndigheter" in Sweden (English transl. "*blue light"* authorities).

1.2 Why operate UAS/drones in civil protection – the case of Swedish police

In this section, we begin our report by discussing the case of the Swedish police authority and how they have managed the challenges that surround the use of UAS in their work. A recently published book chapter (Henningsson 2023) in an edited volume addressing drone/UAS in a total defence perspective of Sweden outlines the process of development for how the police authority in Sweden employs the use of UAS within their organisation. It also addresses how, more broadly, collaboration and cooperation in the Swedish context of civil protection and first response are progressing. It is not our intention here to assign greater status to the Swedish policing case. Instead, we see that it provides us with a clear example of *a* first response authority that has come very far in its process of UAS usage and training, especially concerning aviation safety, regulation and procedural development through the establishment of a flight operation organisation[3]. In Chapter three of this report we include other examples provided from the consortium members and discuss these in relation to the example of the Swedish police.

As should be the case for all UAS operations in civil airspace, aviation safety and the management of aviation safety systems is paramount (see EASA 2023). As a central component in the Swedish police operations for UAS, current safety goals prioritise risk for third party persons, that is, the general public. The overarching goals for employing UAS within the police involve therefore building a flight organisation that is free from accidents and serious incidents by minimizing the risks to safety caused by the human factor and/or technical causes (Henningsson 2023: 238). According to Henningsson, to actualise police ambitions for the safe use of UAS while at the same time support and uphold national harmonisation within the police organisation concerning UAS, five national normative beneficial effects have been prescribed. These are:

- saving lives (e.g. search for missing persons)
- increasing capacity for intervention (e.g. directing police personnel to correct locations during mission)
- increasing capacity to prevent, investigate and process/prosecute crimes (e.g. with aerial photography of crime scenes
- minimising risks for police personnel (e.g. safe path of advance or advance warning of threatening situations)
- increasing police capacity for leading operational activities (e.g. provide true situational picture and awareness for an operational activity)

These national utility benefits are commonly further divided at the regional and organisational levels to provide for greater descriptive detail for determining what should be performed, where the activity shall be carried out, when it can be conducted and who in the region can and will execute the exercise (Henningsson 2023: 237-238).

To realise their ambitions for achieving the highest levels of safety and to ensure that the effective utility benefits can be achieved, the Swedish police have established their own internal flight organisation – *Polismyndighetens obemannade luftfartssystem (POLS)*[4]. As part of its core mission, POLS, as an operational flight organisation, must meet the flight safety requirements and conditions for operation drones laid down by the Swedish Transport Agency[5], who are both the approval and auditing authority (see STA 2023a). Accordingly, POLS has developed a flight-operations manual (FOM) which explicates the organisational standards and practices and all related parts therewith for the safe operation of UAS within police activities (see note 3). Contained within the FOM are the rules of the organisation and the flight safety rules. It also

[3] According to Henningsson (2023: 235), the formal decision to employ UAS within the framework for the crime prevention processes in Sweden is as recent as 2018, the same year that the police authority submitted their first version of their Flight Operations Manual (FOM) (for UAS) to the Swedish Transport Agency for approval.

[4] Police Authority's Unmanned Aircraft System

[5] Transportstyrelsen (Swedish)

includes educational descriptions and training procedures, operational procedures, actions for the handling of disruptions and accidents as well as other aspects specific to state-run flight organisations (Henningsson 2023: 238; cf. MSB 21-51).

The capacity for using UAS within the police recognises that as a flight operation within Swedish airspace, Swedish legislative requirements as well as internal organizational rules, including the regulatory requirements of the laws of the air must be observed (see Henningsson 2023: 237; STA 2023b, 2023c; also MSB 2020: 65)[6]. Ultimately, this means that police usage of UAS within POLS, also has to meet the various levels of legal requirements – national procedural rules, regional operations organisational regulations, appropriate integrity rules and as a regulated and approved flight safety organisation – provides the Swedish police with a distinct added value for delivering these services to act in society's best interests (Henningsson 2023: 237; MSB 2020:52-57; see also Bassi 2020).

1.3 Some reviewed literature

In this section, a short overview of reviewed relevant literature and previous scholarly research concerning UAS in civil protection, disaster management and first response contexts are discussed[7].

A policy paper (2012) from Germany identified and critically examined the potential for the various applications for the use of UAS in civilian missions (Skrzypietz 2012: 5). Amongst other civilian contexts, disaster prevention and management are identified and several critical areas using UAS in the area of disaster response outlined. By providing several relevant examples, this paper highlighted actual cases from the 2000's where the pioneering use of UAS played a pivotal role in managing a disaster[8]. The main limitation identified in this policy paper surrounding the use of UAS in civilian missions was an "absence of legislation and regulation for operation in non-segregated airspace". It further highlights how problems surrounding the operation of unmanned aircraft in the same "civil" airspace as manned aircraft in traditional aviation has been a longstanding concern and a controversial issue for stakeholders such as pilots, airline operators and aviation safety authorities (Skrzypietz 2012: 8). Another potential barrier to UAS usage in the civilian domain was identified as "political and societal acceptance". Societal opinion was reported as varying concerning the type of mission and was found to be embedded in two controversial lines of argument – problems surrounding "data protection and infringements on the right to privacy" and "the safety of the technology and its potential for accidents". Another disadvantage raised in the report was the high cost of "development and procurement" surrounding the use of UAS, which Skrzypietz suggests may correspond to an asymmetrical disjuncture between the costs surrounding complex UAS compared with development and procurement costs in manned aviation (Skrzypietz 2012: 8-10; cf. Henningsson 2023: 237[9]). It should be noted here that this analysis of costs, compiled in 2012, does not accurately reflect the current market situation, where the market is saturated with relatively low-cost UAS of increased equipment standards, robustness and overall technology maturity. Complex UAS are far less common in blue-light institutions where instead, off-the-shelf enterprise class UAS seems to be widespread. This means that the unit cost and cost per flight hour is prodigiously lower compared to development and procurement costs in manned aviation (see note 9).

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[6] For an overview of the legal framework affecting the use of UAS within rescue services in Sweden, see Table 7 (MSB 2020:65) (Swedish only).

[7] The content in this section can be construed as a work in progress and may be expanded on in the final report submission for 2024.

[8] Forest fires in California (2007), use of Incident Support Imaging System in the UK, including thermal imagery (2007/2008), data collection for assessing extent of earthquake damage in Haiti and for locating usable landing/take-off sites for helicopters (2010), high-resolution infra-red imaging and aerial photography over Fukashima Daiichi nuclear power plant to monitor changes in heat sources and measure radiation levels following the damage caused by the earthquake and tsunami (2011).

[9] In contrast, Henningsson discusses more accurately how, in the current context of the Swedish police, less costs are considered advantageous for police usage of UAS when compared to the considerably higher costs surrounding the use of helicopter systems.

In the context of UAS usage for disaster and first response in the US, Vincenzi et al. (2014) discussed how a decade ago, numerous challenges and issues continued to face the operation and employment of drones, concerns that could restrict the capacity of UAS to support first response and disaster recovery. Amongst the primary concerns identified by these authors were access to airspace, safeguarding privacy and security and improving data capture and analysis. These researchers posited then that failure to adequately address these concerns would limit the possibilities for building better understanding to develop methods to mitigate restrictions for ensuring the effective employment of UAS for disaster recovery and emergency response (Vincenzi et al. 2014: 767).

Eftychidis et al. (2018) explored the needs for civil protection operations in the context of Greece and Cyprus where the use of UAS was examined and developed within the framework of the so-called PREDICATE project. This exploratory project entailed engaging with sharp-end actors from various stakeholder entities such as emergency response organisations and law enforcement agencies. This was to best establish and facilitate the appropriate requirements to address common and specific relevant needs among these different stakeholders. By first carrying out an extensive review of relevant literature and then developing appropriate and subject relevant questionnaires as well as conducting meetings and interviews with experts and involved actors from public agencies in Greece and Cyprus, knowledge and important information was gained and learning deepened. Eftychidis et al.'s analysis of the feedback provided and the data gathered determined that the employment of UAS capabilities in the area of civil protection operations can be prescribed in four main groups – the Reconnaissance and Mapping group (RAM), the Monitoring and Tracking group (MAT), the Tertiary Utility Infrastructure group (TUI), the Delivery of Aid group (DOA)[10] (Eftychidis et al. 2018: 122-123).

Returning to Henningsson (2023), keeping up to date with the pace and complexity of technical development, challenges and changes surrounding law and regulatory issues, and access to airspace are identified as some of the self-evident factors that will increasingly affect state aviation actors' use of UAS in Sweden, and beyond. These, amongst others, are concerns that the police and other blue light authorities share (including the defence forces) and commonly monitor (Henningsson 2023: 242). With consideration of the beneficial effects identified and defined in Henningsson (2023: 237), it seems that these should also be situated and understood in relation to Eftychidis et al. (2018) who concluded that operating authorities must give pertinent consideration to preserving "procedural justice, transparency, and accountability" while also acknowledging that they are responsible for "balancing the benefits of such technologies with the preservation of the community, safety, and other concerns" (Eftychidis et al. 2018: 130). Indeed, this conclusion also speaks to the concerns raised by Skrzypietz regarding UAS usage by authorities in the civilian domain where upholding transparency and accountability and even procedural justice within and among authorities can help to improve "political and societal acceptance" for how and why state authorities use and should use UAS (see Skrzypietz 2012: 8-10). And whereas beneficial effects discussed above do provide for a transparent prescriptive basis for why UAS are used by an authority, new technologies and formally established systems of training can further improve social trust by enhancing police effectivity and are beneficial for ensuring legal certainty and improving civil protection (see Henningsson 2023: 236; see also Tyllström 2023[11]). Ultimately, these become questions of legitimacy and the obtainment and maintenance of public support for how and why authorities use UAS. In short, established collaborative training schemes between different actors from different domains in civil protection can contribute to greater societal acceptance for the use of UAS.

A brief summary of the reviewed literature to date identifies how a common problem that has prevailed over time and across geographical location is that legislative and regulatory concerns continue to pose challenges for the operation of UAS within the context of crisis management, law enforcement and first response. These

[10] These will not be expanded upon here but do provide an important example of how far the process of civil protection use of UAS in Greece and Cyprus has evolved and developed in relation to the PREDICATE project.

[11] Rikard Tyllström's (LUSA) chapter in Rydell and Olofsson's edited volume on Drones/UAS discussed above (see References) provides an informative basic overview of the development of civil education for UAS in Sweden, albeit not specific to training needs in a civil protection context.

regulatory concerns primarily center around the use of both manned and unmanned aircraft in the same airspace. On the one hand, these issues recognize the disruptive potential that UAS technology brings to aviation more generally, but on the other hand, identifies a need for regulatory clarity and improved guidance, not least concerning training and education within this area of competence for civil protection use of drones. From a European perspective, the entry into force of directly applicable regulatory frameworks for civilian use of UAS have, in the European Union, established a platform for ensuring regulatory uniformity across the EU and sought-after harmonization of compliance to these EU rules within and beyond the national legal systems of Member States (see EASA 2023a; also Bassi 2020).

In the context of training but mainly directed towards UAV piloting, in a working document relevant for regulatory development and change in the EU, a general need for skill development to ensure "the requisite level of knowledge and skills in line with continuous advancing technological development", is highlighted. Making a reference to the "Blueprint for sectoral cooperation on skills"[12], it suggests cross-sectoral partnerships, mapping key occupation needs, defining occupational profiles and developing training programmes.[13] Within the sector of first response and civil protection, similar partnerships for skills development, also beyond piloting could be a useful tool to strengthen the efficiency of UAS in operational use.

1.4 European Union regulatory framework for civil UAS – civil defense context in focus

A brief overview of the current European regulations for the use of civilian drones in Europe is provided in this section.

In the European Union (EU), the European Union Aviation Safety Agency is the EU agency for civil aviation and as such, is the competent authority in Europe for aviation safety (see EASA 2023; also Ratajczyk 2015). The primary regulation governing EASA and EU civil aviation activities, including unmanned aviation, in all Member States (and so-called EASA member States) is the so-called "The Basic Regulation":

- Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations (EC) No 2111/2005, (EC) No 1008/2008, (EU) No 996/2010, (EU) No 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No 552/2004 and (EC) No 216/2008 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91 (OJ L212, 22.8.2018:1-122)[14].

The framework of rules that more specifically define and describe the safe operation of civil drones is laid down in two main regulations that became directly applicable in EU/EASA Member States. These are:

- Commission Implementing Regulation (EU) No 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft (OJ L152/45, 11.6.2019:45-71)[15].
- Commission Delegated Regulation (EU) No 2019/945 on unmanned aircraft systems and on third country operators of unmanned aircraft systems (OJ L152/1, 11.6.2019: 1-40)[16].

[12] https://ec.europa.eu/social/main.jsp?catId=1415&langId=en

[13] Commission staff working document, EU drone sector state of play, COM (2022) 625 final, p.40

[14] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32018R1139&qid=1647347211590

[15] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R0947

[16] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R0945

These regulations adopt a risk-based approach to regulating unmanned aircraft and therefore do not distinguish between the commercial or leisurely usage of civil drone activities. However, they do give consideration to such features as weight, civil drone specifications and the intended type of operations to be conducted. Both Regulation (EU) No 2019/945 and Regulation (EU) 2019/947 entered into force in 2020, and are directly applicable in all EU Member States but also in Norway and Lichtenstein, with Iceland and Switzerland pending direct applicability. Regulation (EU) 2019/947 covers most types of civil drone operations and their levels of risk. In respecting Opinion 01/2018, this regulation follows EASA's suggested distinctions that define technical and legal requirements to ultimately describe three categories of civil drone operations: "open", "specific" and "certified"[17]. The "**open**" category adopts the lower-risk civil drone operations and as such, does not require an operational authorization prior to starting a flight. For this category[18], compliance with the applicable regulatory requirements for the intended operation and by the civil drone operator is considered to ensure safety. The "**specific**" category addresses civil drone operations that involve greater risk. Accordingly, this category requires that for a drone operator to ensure safety, they must acquire an operational authorisation from the national competent authority in their country before commencing a flight operation. In turn, and prior to obtaining their drone operational authorization, the drone operator must first carry out a risk assessment in order to establish and fulfil the necessary requirements for ensuring the safe operation of the civil drone and/or drones. For the "**certified**" category, the risk to safety is highest and such, this category requires that, to ensure safety, the drone operator and its drone are certified. Moreover, the remote pilot(s) must be licensed to fly this category of civil drone (EASA 2020; see Bassi 2019: 495; see also Tyllström 2023: 225-229).

EASA consequently published the Acceptable Means of Compliance (AMC) and Guidance Material (GM) for both these regulations, also in 2019. The AMC also provides the guidance for conducting the SORA (Specific operation risk assessment) requirements that must be met for a UAS operation and contingent with the particular category of UAS in question (EASA 2023a; see Tyllström 2023: 225-229).

[17] https://www.easa.europa.eu/en/domains/drones-air-mobility/rules-standards

[18] Further broken down into three subcategories – A1, A2, and A3 (see Table 3 in Chapter 3).

2 How is the efficient use of UAS/drones trained within civil protection and first response organisations in Europe?

In this chapter, we present the basic results of a survey examining the efficient use of UAS within the context of civil protection and first response. The survey was conducted by MSB during the latter part of 2023.

2.1 Overview of training survey

A survey questionnaire made up of 13 questions was distributed in distinct two rounds among various crisis management and first response stakeholders in EU member states (see Annex 1). The survey was primarily designed to gather basic descriptive data in order to provide a starting point for building a broader understanding of the efficient use of UAS in crisis management and first response as currently employed in European countries. The survey was developed by the COLLARIS consortium during the first half of 2023 by engaging with and building on expert knowledge from within the consortium and with key actors already involved in UAS training. Formulated from a practitioner's perspective, the aim was to get a broad overview of current training practices among first responders regarding roles, content areas and collaboration from a quantitative and qualitative point of view.

Initially, the survey was distributed to Swedish and Nordic stakeholders (≈ 70 stakeholders) of which the majority in this population were Swedish rescue services and governmental authorities (≈ 60 rescue services and 10 agencies).[19]In a second round, the same survey questionnaire was further distributed to a number of European civil protection and firefighting training schools (≈ 45 respondents)[20].

The same survey software that was used to construct the survey questionnaire was used to analyse the gathered data[21]. For both rounds of distribution, there was a total of 22 responses – 14 responses received in the first round and 8 responses in the second round. Of the population of crisis management and first response stakeholders that received the survey questionnaire, this corresponds approximately to a 19 per cent response rate, which is considered very low. Since the survey yielded such a low response rate, no advanced statistical methods were applied to the gathered data and as such, no statistical significance is claimed for the data coming from such a small sample. However, basic descriptive data is presented here. The survey response results included in this report are be understood with regard to the COLLARIS WP 2 D2.2 and as only providing for a basic and broad overview of training and collaborative capacities for supporting crisis management and first response. In addition, the overview developed from the collection and the basic descriptive analysis of the survey data presented here should establish a basis for supporting the development of other activities and reports within the COLLARIS project.

In the survey, all respondents had the choice to remain anonymous. However, background data such as the country covered, the name of the respondent's organisation and their professional role was collected. As

[19] The survey was sent out to three Swedish practitioner networks, covering the Sensor Council, the Committee for Methods and Technology for Swedish Rescue Services, a training network affiliated to Stockholm Greater Area Rescue Services, and representatives of the Nordic Fire and Rescue Schools.

[20] The survey was distributed in December 2023 to the participants of the second meeting of Directors of Civil Protection and Firefighting Schools being held May 31st-June 1st 2023 at MSB College in Revinge, Lund (SE) covering about half of the number of schools involved in the European network of schools invited by DG ECHO.

[21] The survey distribution process was conducted and all data collected was handled by MSB. LUSA was not involved in the development, distribution, data management or data analysis of this survey but assisted MSB in interpreting basic survey results and writing up the draft report for delivery on December 31st, 2023.

discussed below (see Section 2.2.1), the data presented in this report does not explicitly connect any respondent answers with a specific order of response concerning respondents' employing organisations and professional roles. This is to best ensure anonymity for the survey participants. Notwithstanding, all survey respondents were provided with the possibility to contribute with written responses to compliment and develop upon the close-ended questions answered in the questionnaire. These written responses provided valuable qualitative data that is included and discussed in this report, with some respondents making the identity of their organization known in this regard.

2.2 Stakeholder respondents – Round 1

In this section, the survey data that was collected in the first round is discussed and presented. The survey distribution to Swedish crisis management and first response stakeholder respondents is primarily in focus. However, responses from one Finnish and one Danish training organisation are also included.

Table 1. List of stakeholder survey respondents in round 1

Organisation	Country	English translation
Bergslagens Räddningstjänst	Sweden	Rescue Services Bergslagen
Räddningstjänsten Vimmerby	Sweden	Rescue Services Vimmerby
Kustbevakningen	Sweden	Coastguard
Jämtlands Räddningstjänstsförbund	Sweden	Rescue Services Association of Jämtland
Räddningstjänsten Östra Blekinge	Sweden	Rescue Services of Eastern Blekinge
Södertörns brandförsvarsförbund	Sweden	Södertörns Fire Protection Association
Södra Älvsborgs Räddningstjänstsförbund	Sweden	South Älvsborg Rescue Services Association
Myndighet för samhällssydd och beredskap (MSB)	Sweden	Swedish Civil Contingencies Agency
Emergency Services Academy Finland	Finland	Emergency Services Academy Finland
DEMA	Denmark	Danish Emergency Management Agency
Luleå brandförsvar	Sweden	Luleå Fire Protection (Rescue Services)
Umeåregionens brandförsvar	Sweden	Umeå Regional Fire Protection Service
Räddningstjänsten Kalix	Sweden	Rescue Services Kalix
Räddningstjänsten Syd	Sweden	Rescue Services South

2.2.1 Professional roles within the responding organisations

The survey respondents held various roles within the different organisations. To ensure that respondent anonymity is not compromised in any way, the respondents' roles outlined below are not presented to correspond with any order of responses provided above. The roles of the respondents were the following:

- FSA/Pilot
- Division chief
- Drone chief pilot
- Flight Systems Manager
- Leader, Educator and Fire inspector
- UAS flight chief and fire operations manager
- Accountable Manager Flight Unit
- Planning Officer
- FSA (Flight Systems Manager)
- Incident Commander
- Technician/Flight System Responsible Manager
- Flight Systems Coordinator and Responsible Manager for UAV pilot training
- Flight Coordinator UAS officer
- Operations manager, officer in command, and FSA.

2.3 UAS/UAV Training Survey Results from Round 1

In the survey, four questions were included to address UAS/UAV training and to gather data from these crisis management and first responder participants to construct an overview of training capacities, needs and developments in this area of interest. A first survey question sought to establish an overview of current status regarding the provision of UAS training within the responding organisations. Respondents were asked:

In your organisation, do you provide training in using UAVs in crisis management and first response? If the answer is yes there will be follow-up questions in the following sections.

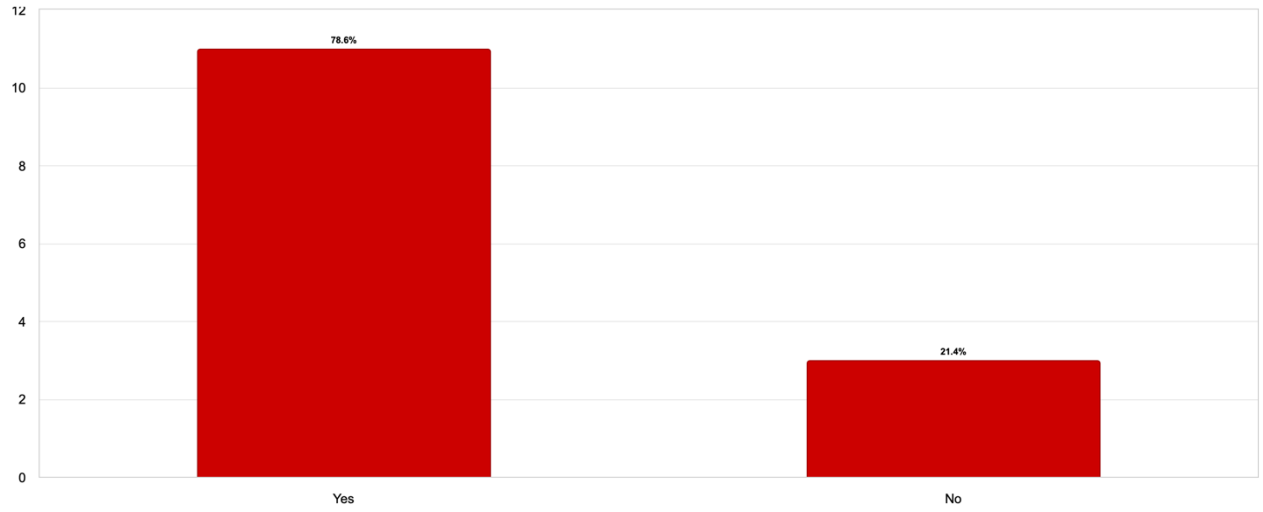

Figure 1: Training provision for UAS usage

At 79 %, it seems apparent that most of the responding organisations actively provide some form of training for using UAV in crisis management and first response. Notwithstanding, it is noteworthy that about one fifth of the respondents indicated that their organization currently lacks this capacity. To better understand the types of organizational training involved, respondents were further asked to answer the following question:

What kind of training do you provide in your organisation and for whom? If possible, provide examples of training types and scopes in the free text below.

Respondents were given three options defining specific types of training provided with a fourth option to give other examples of training provided:

- Practical training for UAV piloting
- Practical training for efficient utilization of UAV data gathered via UAV's data user
- Theoretical training on safe and lawful use of UAS
- Other examples – please specify in text box

Respondents were given six options regarding who is trained and an option to name other target groups:

- Internal personnel
- External personnel
- Onsite commanders
- Other command levels
- Data users (postprocessing)*
- Flight coordinators/airspace managers
- Other target groups – please specify in text box*

*No responses were submitted for the options “Data users (postprocessing)” or “Other target groups”.

Responses to five response options yielded basic data that indicates which areas of training are directed towards specific (and non-specific) areas of competence and professional roles.

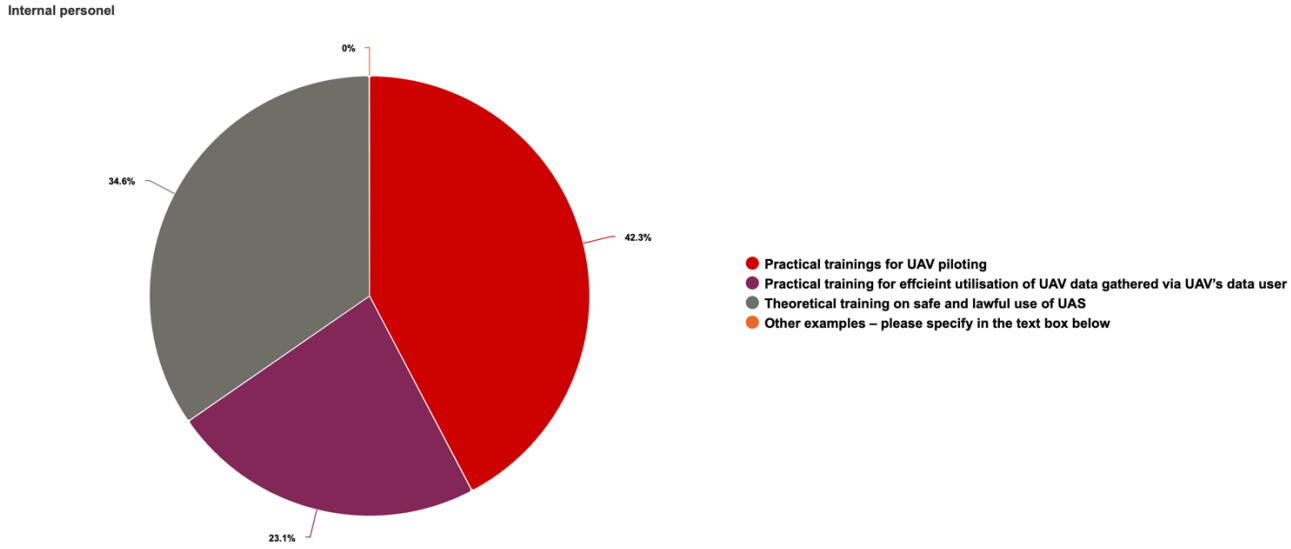

Figure 2.1

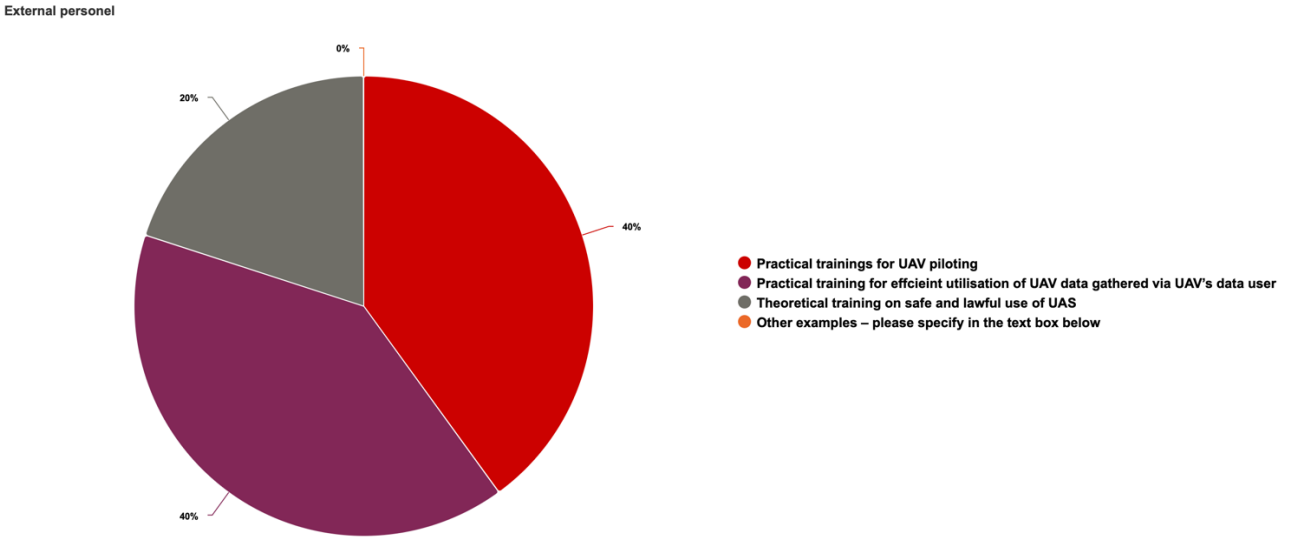

Figure 2.2

Although it is unclear which professional roles fall under the category of internal personnel (Figure 2.1) in the survey responses, it emerged from the survey data that practical training for UAV piloting is experienced as the most commonly provided type of UAS training offered within these stakeholder organisations with eleven positive responses. This compares with nine respondents answering that they provide theoretical training on the safe and lawful use of UAS to their internal personnel. Although only six responses were received that internal personnel are provided with practical training for efficient use of UAV data gathered through UAV data user, this differed noticeably on the provision of this area of training for external personnel (Figure 2.2) with only two respondents answering that their organisation offers this training. In that only two respondents also indicated that their organisation provides theoretical training on the safe and lawful use of UAS for external personnel, it is somewhat noteworthy that the pattern of answering for training provided to external personnel is less than that for internal staff. And although the response rate is very low, it is noteworthy that

practical training (whether for UAV piloting or efficient use of UAV data) seems to be the more common type of training provided for external personnel.

For the more specifically defined category of onsite commanders (Figure 2.3), with only one respondent answering, practical training for UAV piloting is the area of training seems to be the least provided area of training to this professional group. This is not surprising given that it seems self-evident that practical training for efficient use of UAV data gathered through UAV data user and theoretical training on the safe and lawful use of UAS (4 respondents for both options) are more relevant areas of training needed for this coordinating professional role.

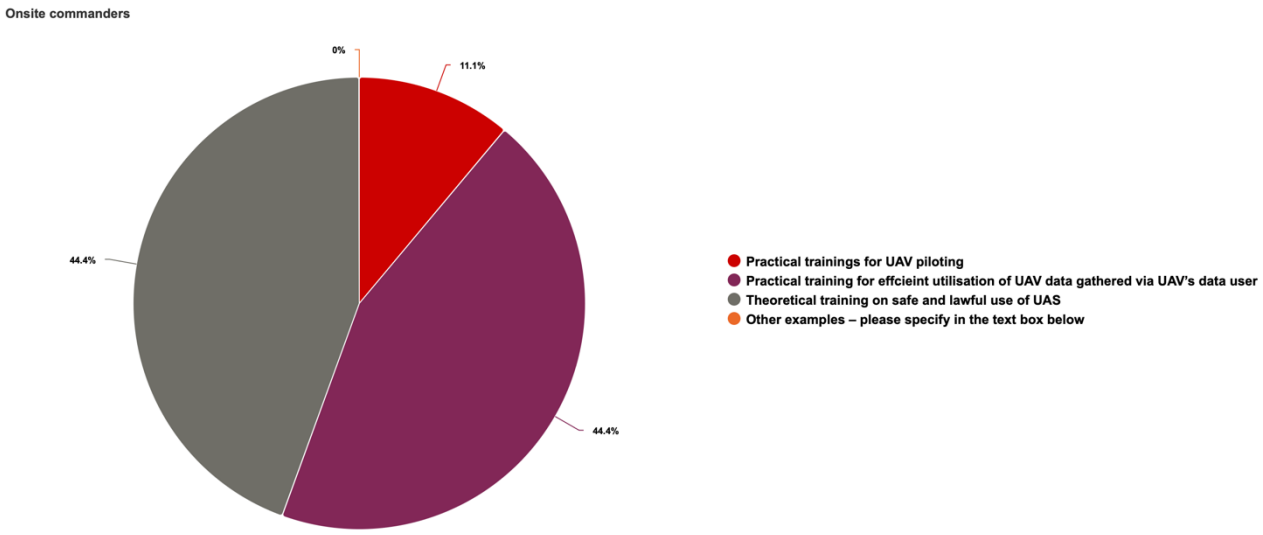

Figure 2.3

However, for other command roles (Figure 2.4), three positive responses suggest that theoretical training on the safe and lawful use of UAS is more commonly provided to this group of professionals. The two responses for efficient use of UAV data gathered through UAV data user suggests that slightly less practical training is being provided to these professionals than for site commanders. However, the low response rate requires that more data would be needed to explore if this is a common trend at a European level. Despite the low frequency in responses, the data seems to show that for all command level professional roles, practical training for UAV piloting is not commonly provided as a type of training for UAS usage in civil defense context.

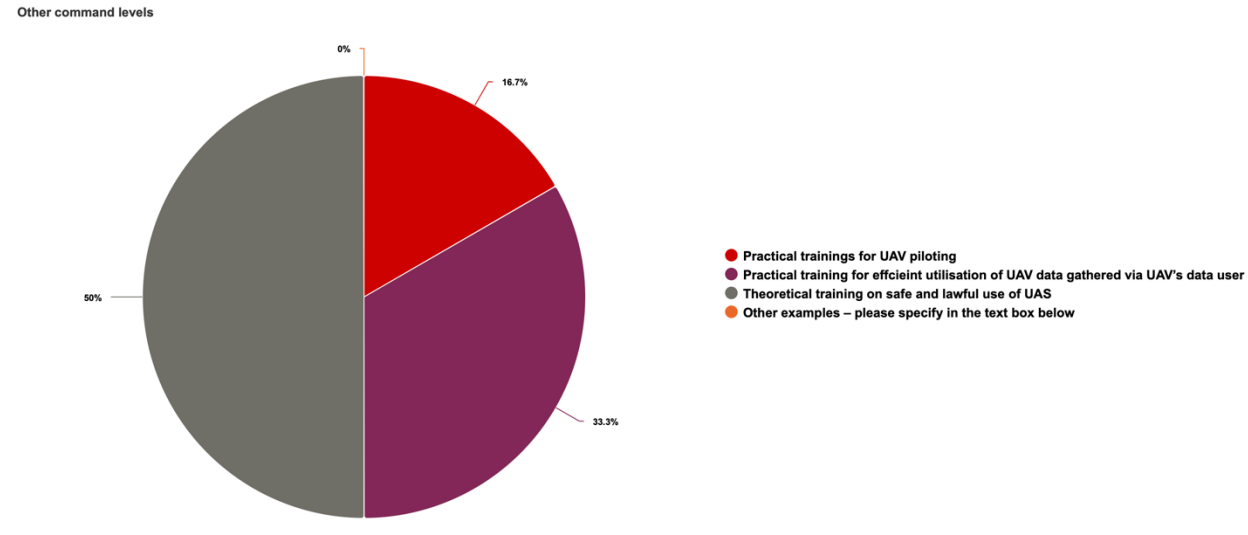

Figure 2.4

Only one response was received for each the three types of training options provided for the category flight coordinator/airspace manager, a response rate that is too low to make any sense of the training provided (more data is needed). However, the even distribution across all three options suggests that both practical and theoretical competence in all three areas of training is provided for this professional role in the responding organisations.

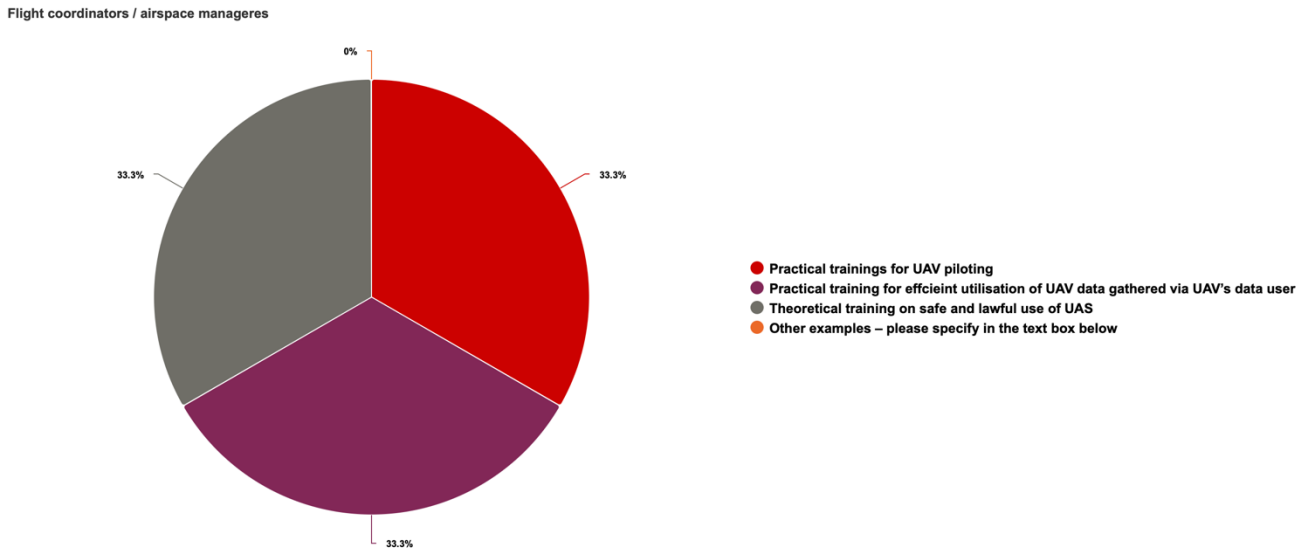

Figure 2.5

The qualitative data in the written responses further revealed that one organisation provides internal training for pilots and observers. At least one organization provides basic training only for first responders, but also provides advanced training for first responders in the areas of BVLOS, thermal camera usage, and coordination of UAS. They also indicated that within their organization, they offer specific course-based training to onsite/incident commanders that includes education on general knowledge, laws and regulations, operational environment and use of UAS, leading UAS on mission and roles, data management (logging and imaging), and training examples for onsite commanders. Another organization answered that they provide training to police, fire and rescue service and pre-hospital sector personnel who participate in their incident commander course where drone usage and limitations are in focus (external personnel). This organisation also indicated that it provides a three-day course – "Tactical Use of Drones" – available to drone pilots and incident commanders on how to use and cooperate with drones. However, the course requires that participants already have a drone pilots license (it is not a basic course for teaching how to fly drones or focusing on the regulations for standard UAS flights). This basic requirement is noticed for other stakeholder examples as well, as described below in Chapter 3.

The survey respondents were then asked:

Do you develop your own training material (handbooks, scenarios, training goals)?

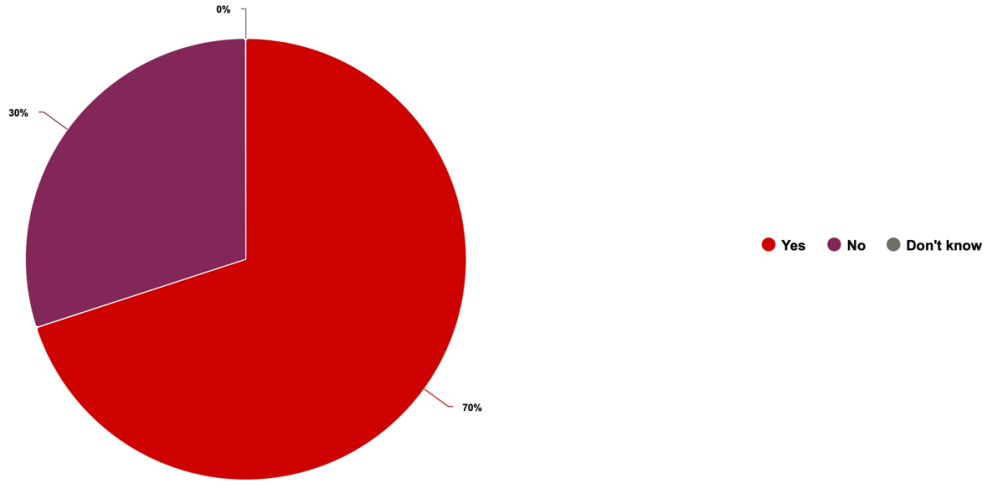

Figure 3

Seven respondents positively indicated that they do develop their own training materials with only three answering negatively to this. The survey questionnaire followed up the with the question:

In your training material, what theoretical contents are included?

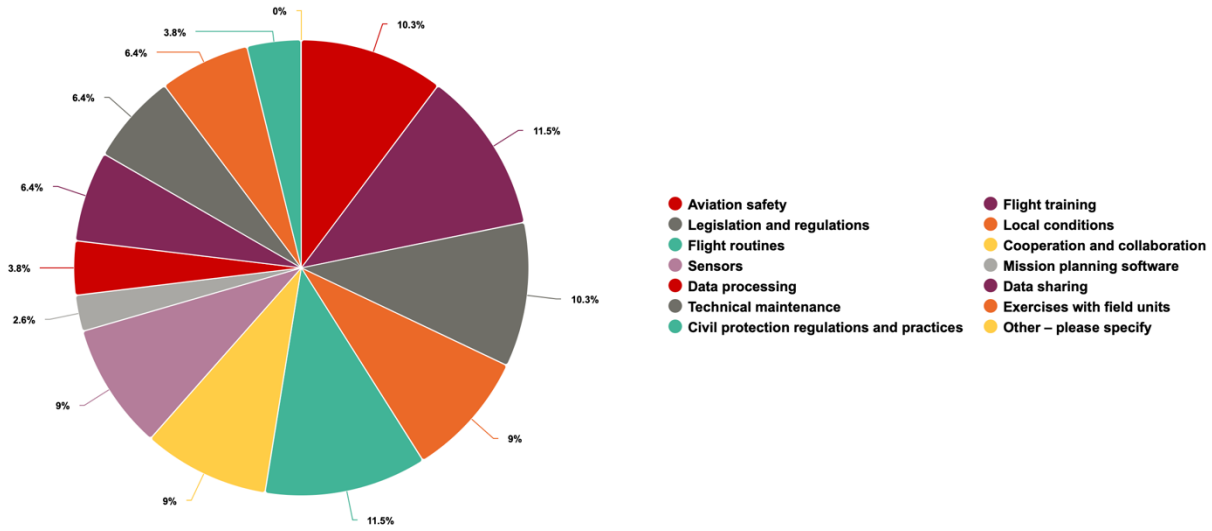

Figure 4

Figure 4 shows that the theoretical contents of training material vary across the responses and suggests that the surveyed organisations have, for the most part, similar and common needs. The survey responses also showed that the different responding organisations have specific training needs. With 9 responses for each of the options “flight routines” and “flight training”, this seems to suggest that these two topics make up the most commonly included theoretical contents in training material. This is followed by “aviation safety” (8 respondents) and “legislation and regulations” (8 respondents). Least commonly included contents in training material, with only two respondents answering, was theoretical contents for “mission planning software”. Somewhat surprisingly, for the option theoretical contents covering “civil protection regulations and practices”, only three respondents answered that their training material includes content for this topic, a similar response rate as for content on “data processing” (3 respondents). An interesting finding, given the

COLLARIS project scope and goals, was that seven respondents answered that their training material includes theoretical content for “cooperation and collaboration”. Both “local conditions” and “sensors” also received seven positive responses that their training material covers these areas in its current content. Five respondents also answered that their training material includes content for “technical maintenance” with five respondents indicating that content for “exercises with field units” is included in their training material. Training material content addressing “data sharing” also yielded five responses.

2.4 Stakeholder respondents – Round 2

In this section we present the basic results of the survey which was distributed in the second round. The targeted population in this second round was European firefighting and civil protection schools of which a number (≈ 45 respondents) were sent the survey questionnaire (see note 20).

Table 2. List of stakeholder survey respondents in round 2

Country	Responding training organisation
Denmark	Danish Emergency Management Agency*
Albania	National Civil Protection Agency
United Kingdom	Lancashire Fire & Rescue Services
Italy	Italian Fire Brigade (Corpo Nazionale Vigili del Fuoco)
Portugal	Portuguese National Firefighter School
Croatia	Ministry of Interior
Slovenia	Training Centre for Civil Protection and Disaster Relief**

*Two respondents from DEMA
** Republic of Slovenia, Ministry of Defence, Administration for Civil Protection and Disaster Relief, Prevention, and International Cooperation Office.

2.4.1 Professional role in organisation

- Head of operations and analytics
- Director
- Manager, pilot, and teacher
- Course manager of tactical use of drones
- Director for education, training and information technology

2.5 UAS/UAV Training Survey Results from Round 2

In the second round, the same four questions addressing UAS/UAV training were posed to gather data from firefighting and civil protection training schools. In relation to UAS/UAV, these various stakeholder respondents were first asked to indicate (Figure 5) if their organisation provides certification (1), guidelines (4), competence (4), knowledge and research (3), operations (6), innovations (2) and most relevant for the current deliverable, training (5). Written responses suggest that one organization has future aspirations to use UAV/UAS, to provide training and certification as well as develop guidelines and competence. Another organization responded that it will provide training on operational use of drones in crisis areas (flooding, wildland fires).

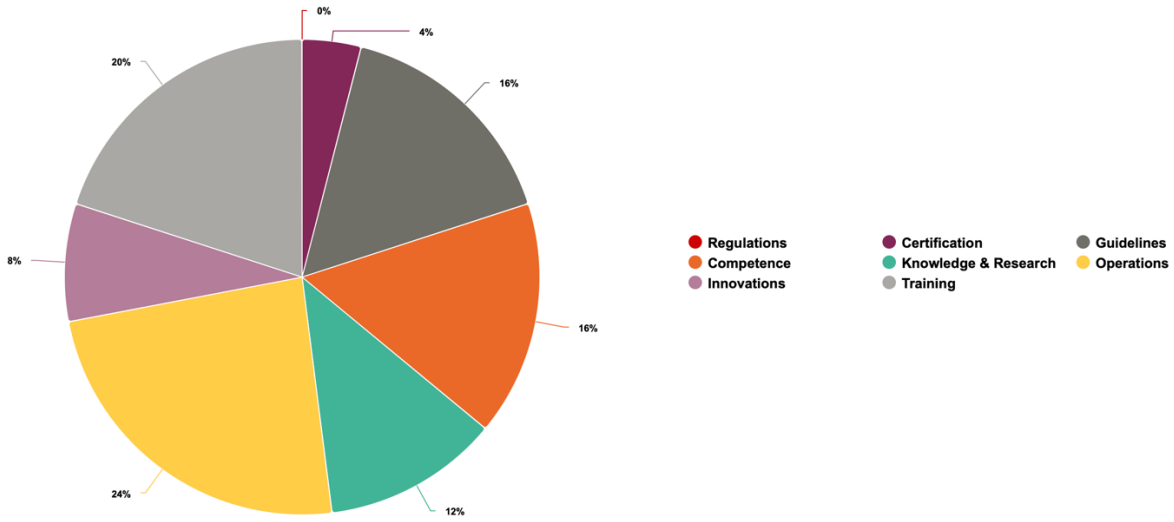

Figure 5. Organisational provisions

As in the first round of distribution, the following survey question was to provide an overview of the provision of UAS training within the training organisations. Survey participants were asked:

In your organisation, do you provide training in using UAVs in crisis management and first response? If the answer is yes there will be follow-up questions in the following sections.

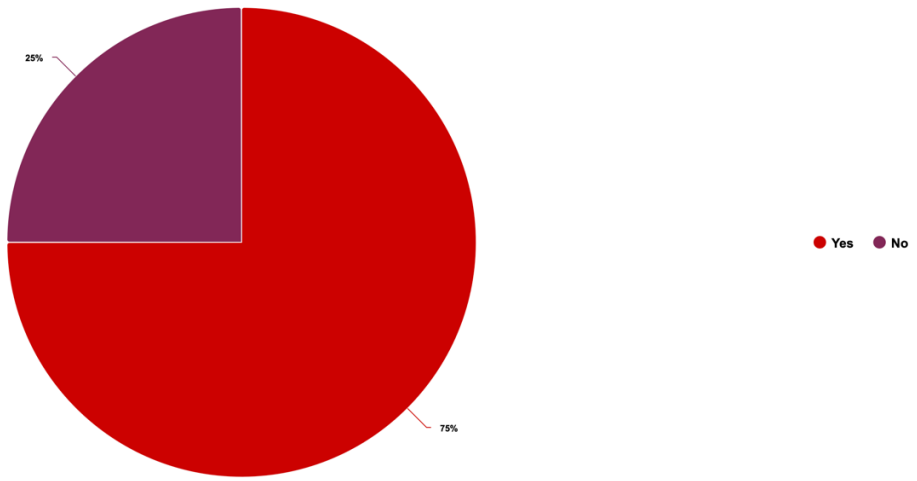

Figure 6. Provision of UAS/UAV training in training schools

Six respondents answered that their organisation provides training in the usage of UAVs in crisis management and first response. One organisation further responded in text that they previously provided nationally

accredited pilot training for emergency services but now only provide in-house training to pilots, a consequence of the consolidation of GVC certificates. Another answered that in their organisation they provide specific UAS training for UAS operators (unclear if they mean pilots). With the possibility to choose multiple alternatives and also to provide other examples in written text respondents were then asked:

What kind of training do you provide in your organization and for whom? If possible, provide examples of training types and scopes in the free text below.

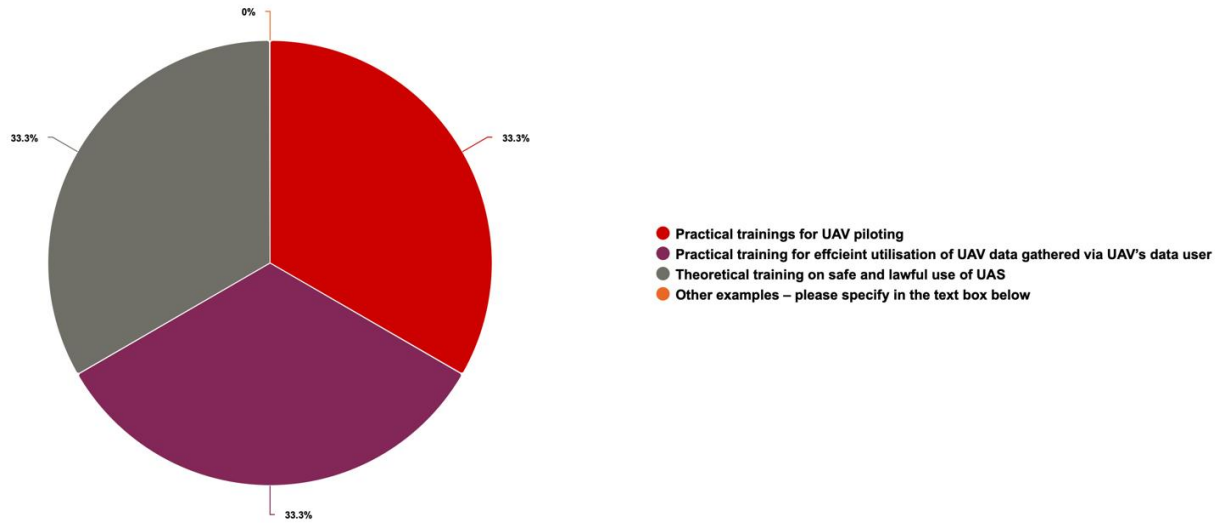

Figure 7.1. Internal personnel – training schools

Five respondents answered that their organisation provides UAV pilot training for internal personnel (Figure 7.1) with four respondents answering that external personnel can receive training on this option (Figure 7.2). For theoretical training on the safe and lawful use of UAS, five responses indicated that their organisations offer this type of training for internal personnel but again, only four providing this training option for external personnel.

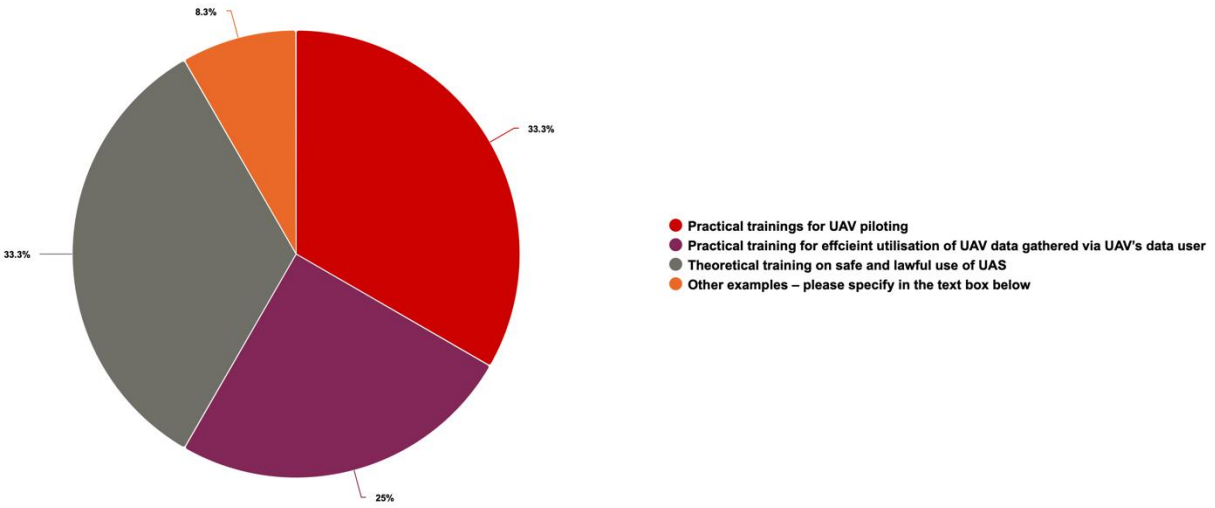

Figure 7.2. External personnel – training schools

Five respondents answered that training for the efficient use of UAV data gathered via UAV's data user is provided for internal personnel in their organisation, but only three respondents indicating that this same provision is offered for external personnel. Only one response was received for the option that an organisation provides other examples of training than the options provided.

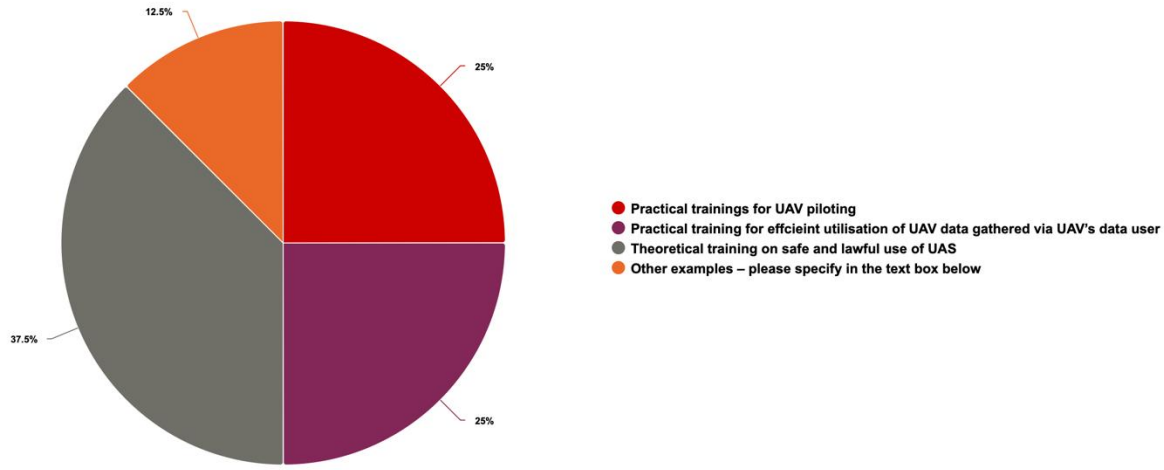

Figure 7.3. Onsite commanders – training schools

For onsite commanders, theoretical training on the safe and lawful use of UAS was most commonly provided training for these professional roles with three respondents answering that such training is available in their organization (Figure 7.3). Although only one respondent indicated that their organisations can provide other examples of training, two respondents also indicated that onsite commanders in their organisation receive training on efficient use of UAV data gathered via UAV's data user. Two respondents shared that their organisation provides training for UAV piloting. For other command levels, one respondent indicated that other examples of training are provided (no pie chart here).

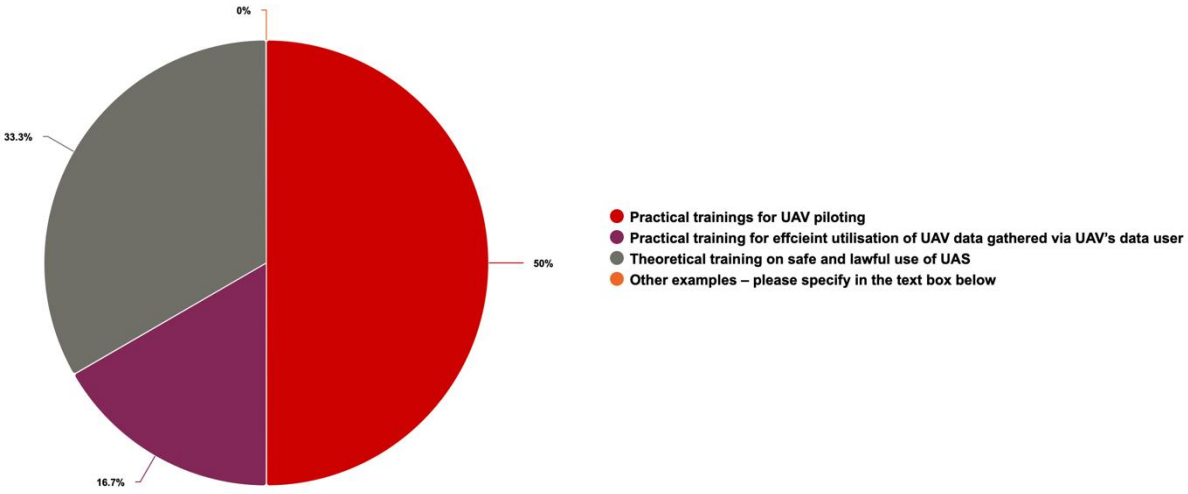

Figure 7.4. Data users (postprocessing) – training schools

For flight coordinators/airspace managers (no pie chart needed here), one respondent shared that these professionals receive training on the safe and lawful use of UAS. Only one respondent also answered that practical training for the efficient utilisation of UAV data gathered via UAV's data user is provided for this professional group(s). However, three responses were received for organisations providing this specific training for the professional category of data users (postprocessing) and only one response indicating that their organisation provides training for the efficient utilisation of UAV data gathered via UAV's data user. Two respondents answered that training on the safe and lawful use of UAS is provided for these professionals in their organisations. In the written responses, a respondent offered that in that organisation basic training and certificates are obtained through a joint defense school whereas at the civil defense training college, 3-day

specific course on tactical training of drone pilots and incident commanders is the main area of training provided. The same respondent further added that incident commanders from fire services, ambulance and police are trained in effective drone usage as a tool for leaders at a site. Another respondent answered that an example of other forms of training provided covers capability overview and use of products, such as orthomosaics.

When asked if they develop their own training materials such as handbooks, scenarios or train goals within their organisations, six respondents answered positively that they do. A respondent further replied in text that they have developed their first textbook on the use of drones, a book that is currently awaiting update in the context of an ongoing project[22]. Moreover, they have developed a set of action cards (also developed in English) for drone usage when searching for missing persons, which is not yet available online. One respondent also wrote that data is protected by copyright. Respondents were also asked to indicate what theoretical contents are included in the training material (Figure 7.5). The responses to the categories below show that the various organisations include different focus areas within their training materials:

- flight training (6)
- legislation and rules (6)
- flight routines (6)
- cooperation and collaboration (6)
- sensors (6)
- data sharing (6)
- aviation safety (5)
- local conditions (5)
- data processing (5)
- exercises with field units (5)
- mission planning software (4)
- civil protection regulations and practices (4)
- technical maintenance (2)

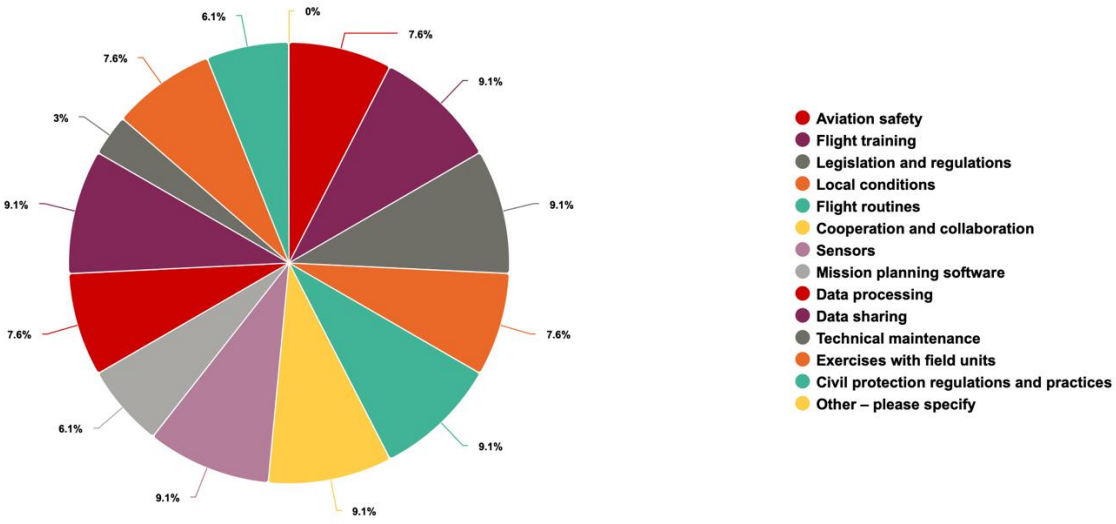

Figure 7.5. Included content of training materials

[22] https://www.brs.dk/link/2b04e47ae379474f909386d1cd4b97d3.aspx

For UAS training, respondents were asked to choose between listed scenarios examples. This allowed for building a broad picture on scenario-based training for the use of drones in emergency and disaster management (Figure 7.6).

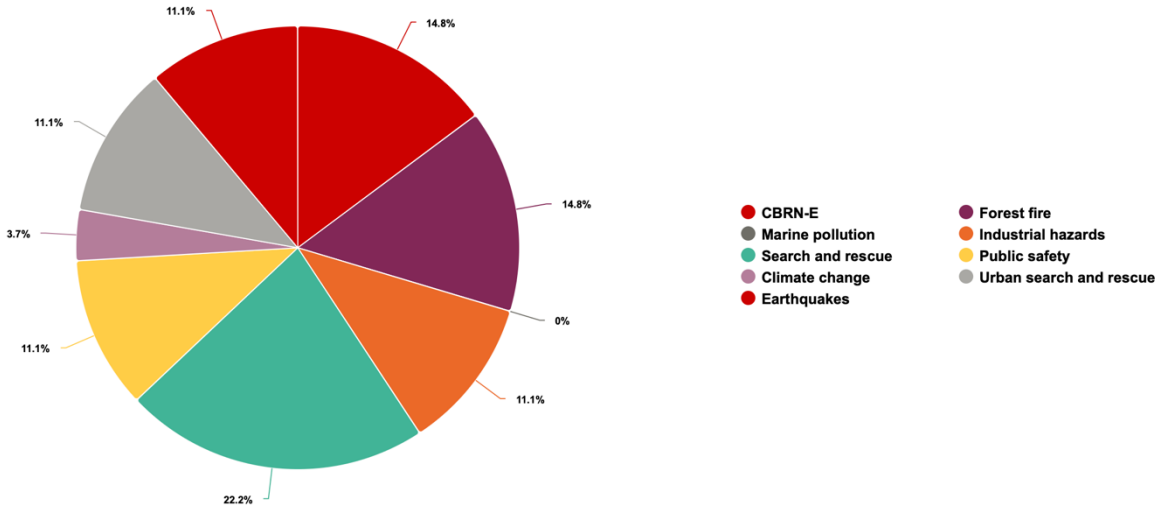

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Figure 7.6. Scenario-based training

3 Training for the efficient use of UAV/UAS in civil protection and first response in Europe

The following examples are extracted from dialogues during project workshops in Sweden, Poland and France together with information gathered from the questionnaire. The aim is not to provide a full picture for each sample but to present examples of how training may be operationalized in various contexts.

3.1 Drones for first responders – specific roles and objectives demand specialized training

As we have seen above, the professional role places demands on both pilot and flight organization. These requirements can be about where and how one needs to fly, how collected data needs to be gathered, stored and shared, as well as adaptations to the operational rhythm of a mission. This, in turn, requires training and practice. UAV operators in civil protection and first response have to meet the specific needs of the actual response mission.

As shown earlier (D2.1), among civil protection practitioners, two approaches to the implementation of UAV use in first response are leading the way:

Drone as a tool in the toolbox – the first approach is to saturate first responding units with relatively inexpensive drones that nevertheless have good enough performance and payload to comprehensively support operations. Then such a drone is one of many tools in the possession of rescuers, and although they have qualified pilots, flying the drone is not their exclusive task. In this approach, drones perform operations when needed and when risk analysis allows.

Specialised drone group – remote pilots serve a very specific role and as such intervene after the first responders. They fly heavier and more expensive machines, and their professionalism allows them to fly in higher risk scenarios, on lover segregation buffers and communicating with manned pilots in their own jargon. This means that they must perfectly master the operational procedures of the different risks and the organization of emergency services to be perfectly integrated into the system.

Following the REGULATION (EU) 2018/1139 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on common rules in the field of civil aviation (Artikel 2, § 3a)[23] and national regulations for state aircraft in each member state, differences in how roles and responsibilities are distributed among civil protection and first response stakeholders, various organisational approaches like the ones above creates fundamentally different context for increasing and sustaining personnel competences – not only on the organizational level but also for the response system as such.

The overall picture drawn from the survey and workshop discussions is however that training is often being conducted for each separate organization. Training is sometimes supported by scenarios with more scenario-based training to come. Collaborative multi-stakeholder training is mainly made possible during CM exercises, project funding or partnerships.

[23] https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32018R1139#share

3.2 Training in Austria

Background

Concerning the training of UAS pilots in emergency services in Austria, A1/A3 and A2 drone licenses are mandatory before the pilots advance to specific emergency services trainings. The A1/A3 license preparation consist of online courses with video tutorials, exercises, and an online multiple-choice exam for A1 as well as A3. For A2, the training is done either via self-study (books, electronic content, etc.) or with the help of external training providers (online training, face-to-face courses). At the end stands a multiple-choice exam at AustroControl, the Austrian air navigation services provider that controls Austrian airspace.

Framework

The emergency service specific training consists of two levels, level 1 mainly aimed at all drone pilots in operational organisations, while level 2 addresses topics for experts and managers who set up or lead drone teams as well as those who are involved in the authorisation and the operation of drones in the "Specific" category. In 2022, ten level I courses took place, which are recommended for all drone pilots in operational organisations and are organized as a 1-day course. The courses are not only aimed at fire brigades but at various emergency service organisations: e.g., Red Cross, mountain rescue services, and water rescue. In 2023, the first level II course took place which takes 2 days to complete. Therefore, the training procedures are quite new.

Training providers

At the moment, there is no set out curriculum and the “learning-by-doing” approach is favored. The training is put together by experienced UAS pilots and incident commanders of various emergency services themselves. Above all, their own experiences are incorporated in the training which allows for flexibility and the integration of innovation and recent events.

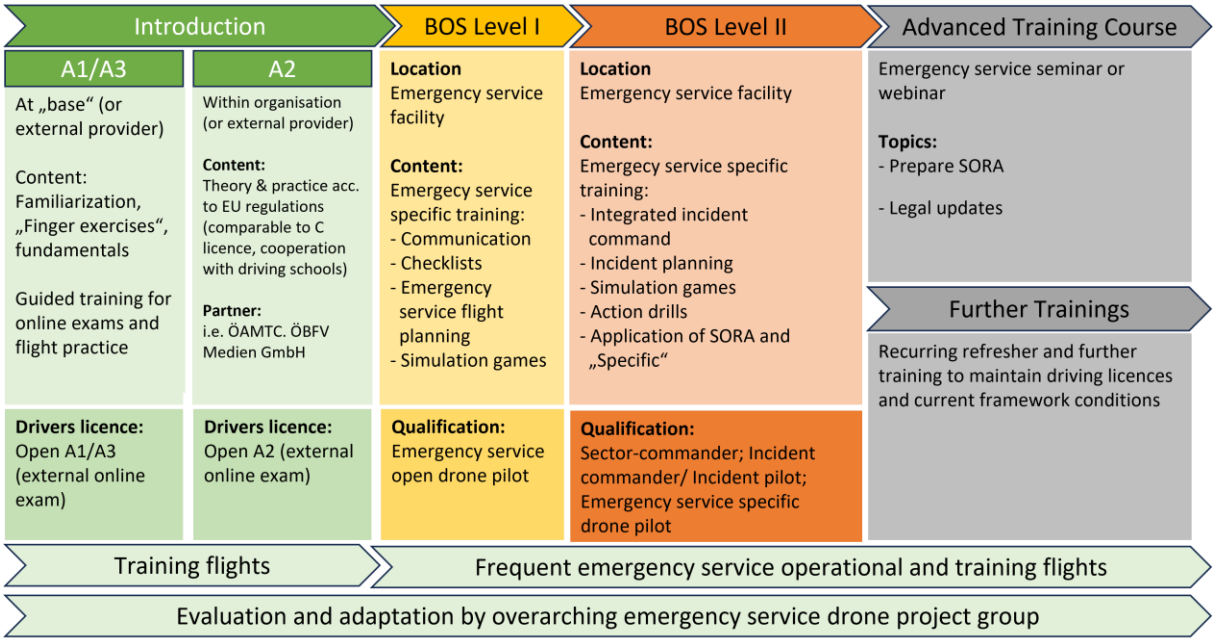

Figure 8. An overview of the training framework in Austria (translated from the original)

3.3 Training in Cyprus

Background
In Cyprus, the Department of Civil Aviation (DCA) is responsible for providing information on UAS and required training. Also in this case, the remote UAS pilot candidates should initially study the A1/A3 license theoretical training lectures that are available from the UAS Civil Aviation Website[24]. To get an A2 license, theoretical and practical training needs to be carried usually by a recognised UAS training academy. Finally, to get the Specific license, Theoretical Training and Practical Training need to be carried out by a recognized UAS training academy. To the date of this report there are two such academies in Cyprus.

Framework
The theoretical framework for first responders includes three main areas:
- Meteorology
- UAS Flight Performance
- Technical and Operational Mitigations for ground risk

For an A1/A3 license, the training can be carried out online through available training material or by a recognized UAS training academy. For A2 and Specific licenses, all training is carried out by a recognized UAS training academy. Anyone can become a UAS pilot; however, in the case of first responders/civil protection, the personnel is usually chosen out of a group of people initially identified as possible candidates.
Cyprus has a dedicated UAS team that can be requested by the fire department or police. The UAS team is 24/7 with a deployment time of one hour. It consists of minimum one pilot, one observer, one liaison person and one person for technical support but all team members are trained in all roles. Team members train a minimum of six hours per month and training include scenario-based training. Yearly training exercises are also conducted.

Training providers
As mentioned above, basic pilot training is done using the open resources from the Department of Civil Aviation supplemented by training conducted by recognized UAS training academies. Continuous training for first responders is provided inhouse. Some training for data post-processing (lidar) is included.

3.4 Training in Denmark

Background
In Denmark, the Danish Civil Aviation and Railway Authority supervises licensing and regulations within UAV/UAS also providing online training for the open category in the same way as described above for Austria and Cyprus.

Framework
The Danish Emergency Management Agency (DEMA) and its training centres for first responders are part of the Danish national drone strategy, in place since 2016. DEMA developed their own drone strategy already in 2014.[25] Following this, DEMA has been leading the way in the development of training frameworks for first responders in Denmark. A training framework and resources such as a main textbook[26] has been prepared in a joint project with the country's rescue services, all contributing to different extents. The training framework emphasizes the tactical use of drones, including incident command – pilot communication, situation assessment and organizational and legal aspects. Today DEMA has two drone-units covering Denmark on a 5-

[24] https://drones.gov.cy/

[25] https://www.brs.dk/da/nyheder/2016/beredskabsstyrelsen-del-af-ny-dronestrategi/

[26] https://www.brs.dk/globalassets/brs---beredskabsstyrelsen/dokumenter/uddannelse---metodehafter-m.v/2021/-larebog---taktisk-anvendelse-af-droner-i-redningsberedskabet-.pdf (Danish only)

minute response and two additional units that can support on one-hour response and three-hour response thus opting for the specialised drone unit approach.

Training providers
As mentioned, DEMA has developed a dedicated three-day course "Tactical use of drones" for incident commanders on how to use a drone and what the limitations are. In this course, participants can be the police, rescue services and the pre-hospital sector including both pilots and incident commanders. It is not a basic course where the pilot learns how to fly their drone or about regulations regarding standard flights. Having a basic license is a requirement to attend the course. Teaching stakeholders from multiple first responder organisations simultaneously open up to possibilities to include collaborative perspectives from an early stage in building organisational UAS competence.

3.5 Training in Poland

Background
As in the other examples presented here, it is only possible to perform UAV flights in Poland after acquiring the relevant qualifications and completing courses. In the open category, the European A1/A3 drone pilot certificate of competency is acquired through an online test, A2 through self-study and an exam at a certified centre. Thematically, it covers elementary drone safety, ground risk management, applicable elements of aeronautical law and other basics. The knowledge base for acquiring competence certification is widely available (e.g. e-learning shared via the Polish Air Navigation Services Agency, PANSA) which is why The State Fire Service (PSP) does not run basic courses.

Framework
The State Fire Service (PSP) has its own education and training system. It consists of two subsystems, one of which is responsible for raising general qualifications preparing young people for the profession of firefighter, fire technician or fire engineer, while the other is related to raising professional qualifications within the structures of the fire service.

The former includes the Fire University of Warsaw (form. The Main School of Fire Service), whose curriculum does not include classes dedicated to UAS. However, within the course of Techniques and Technologies in Environmental Engineering, there are topics such as: New measurement, observation, rescue, firefighting techniques using drones and the use of IR sensors. It should be assumed that, despite the lack of a dedicated course on UAS operations, drone use will be embedded within more general courses covering other operational tactics. However, it should not be assumed that there will be content covering more advanced topics, such as photogrammetry or Air Traffic Management[27]. With regard to student profile, some schools can only address the subject in basic terms – using light aircrafts directly under the Incident Commanders' supervision. The latter (raising professional qualifications within the structures of PSP) is organised in bottom-up approach, on the initiative of individuals, unit commanders or regional commanders. The workshops, drills and trainings are done in-house (by internal personnel) or with participation of volunteers (individuals, companies or organisations). Each unit is responsible for conducting training within its own resources. That drill should cover 100% of firefighters' competences, so proportional amount of time should be dedicated to UAS training.

No common training framework has yet been developed with some relevant works started in December 2023.

Training providers
PSP has certification centres and is currently training staff (instructors and examiners) to conduct A2 examinations and to certify to Standard Scenarios (STS) (and National Scenarios (NSTS) in the interim period).

[27] All progress on ATM and Air Coordination Managers activities is being developed jointly with the COLLARIS project and will be presented in the project's public deliverables

Ultimately, each (of 16) regional command must have a minimum of one person trained for this purpose. The PSP is also planning to convert the informal drone groups into UAV Special Rescue Groups in 2024 (tentatively 16 groups are planned based on existing equipment and personnel and the creation of 16 new ones). Then a dedicated course will have to be set up in aspirant schools and Fire University.

An informal group of experts, drawn from the Commander-in-Chief's Team set up to develop the drone concept of operations (CONOPS), regularly conducts meetings in the form of refresher workshops, carrying out around 12 informal meetings per year. The focus is set on transferring newly acquired lessons learned from real incidents and exercises, and training together on the new software.

3.6 Training in Sweden

Background
In Sweden, it is the Swedish Transport Agency (STA, our abbreviation) that, through the Aviation Ordinance, supervises aviation and has the right to issue regulations for other aviation for state purposes rather than military. The STA regulations on unmanned vehicles aircraft do not apply to the rescue service, but the operation must instead be conducted according to special conditions issued by the agency. These terms are largely based on the rules in the STA's regulations on unmanned vehicles aircraft, but there are opportunities to adjust the basic requirements to better fit the activity to be conducted (see MSB 2020).

Framework
During recent years, a joint normative framework for training and increased competence has been developed by stakeholders such as the Swedish Police Authority, the Swedish Coast Guard, MSB, municipal rescue services and relevant national agencies such as the Swedish Transport Agency and the Swedish Civil Aviation Authority (Luftfartsverket). In 2020 (updated in 2022), the Swedish Civil Contingencies Agency (MSB) developed and published UAS Guidance manual for municipal rescue services[28]. The framework contains common topics such as areas of use, aviation safety and cooperation and collaboration but is largely operationalised into training curriculums by and for the individual organisations themselves. This said, multi-stakeholder cooperation in developing the actual training material is common with the Swedish Police Authority at the forefront involving large rescue service organisations such as Greater Stockholm Fire Brigade[29]. Before becoming an UAV pilot or a drone operator, most first responder organizations demand that the trainee complete the requirements for holding the license for the open category training provided by the STA. The MSB manual especially outlines how in Sweden:
"In order for the staff's actual competence to meet the competence requirements that may arise from the use of an unmanned aircraft in connection with a rescue operation, the various forms of skills development (training, training and exercise) should be combined" (MSB 2020).

The same guidance material also stated that a "development-oriented (organizational) learning" may now be required "*where the organization through various combinations of seminar exercises and exercises with field units combined with reflection develop their own routines and its own organization so that this best meets the needs that exist the scene of the accident" (MSB 2020).*

Training providers
In the case of Sweden, first responder pilot training is mainly organized internally, or conducted by the Police for organizations like the Coast Guard. A cluster of rescue services being trained by Storstockholms brandförsvar has evolved but many rescue services run their own concepts. The Swedish Civil Contingencies Agency does not provide training as of today, but their colleges and training fields are used by external public

[28] See note 1.

[29] Storstockholms brandförsvar (in Swedish).

stakeholders. Training is theoretical *and* practical, scenario-based with an emerging focus on analytics for the higher command levels.

Table 3. Examples of content areas in a program for education, training and practice of rescue service personnel (MSB 2020).

Block	Contents
Areas of use	Develop the knowledge of how the system is intended to be used (from the outside the results of the analysis of "A" in the ALTURIS model).
Aviation safety *	Regulations and measures for aviation safety, airspace coordination, risk assessment when flying at the scene of an accident: Safety Management System.
Flight training *	Use and operation of the aircraft in a correct and safe manner in the airspace. Takeoff and landing procedures. Navigation, planning and implementation of flight in a real flight environment that simulates the different possible uses.
Legislation and regulations	Legislation and regulations for: flying with unmanned aircraft camera surveillance and GDPR, dissemination of footage.
Local conditions *	Develop knowledge of what the local airspace looks like both in the case of uncontrolled and controlled air Routines for collaboration with local air traffic control. Objects or areas with prohibition of photography and / or imaging.
Flight routines *	The organization's flight routines in both uncontrolled and in controlled air. Internal routines for how aviation operations are focused and is coordinated with other activities at the scene of the accident. Communication and connections, as well as routines for image management and archiving.
Cooperation and collaboration *	Development of the ability to collaborate and / or collaborate with the rescue service's task force or other actors at a social disturbance. Collaboration with air traffic control. Sharing of situation with regard to the regulations on the protection of geographical information.
Sensors *	Development of the ability to use and interpret data from the system different sensors.
Technical maintenance	Systematic flight technical quality work, troubleshooting and repair common errors in an operational environment.
Exercises with field units *	Torque and effort exercises to consolidate and develop the ability to use the unmanned aerial vehicle system in connection with rescue efforts.

* In these blocks, there may be a special need for development-oriented learning to develop the organization's working methods, routines, structure, organization or collaboration.

3.7 Summary of discussion with representatives to the UCPM Exchange of Experts programme at the COLLARIS trial in Valabre, France, November 2023

In November 2023 a COLLARIS trial focusing on training first responders UAV skills with the aid of virtual simulation was organised in France. During the trial, participants[30] in the affiliated UCPM Exchange of Experts programme[31] were asked to share some of their perspectives on training.

Discussions confirm differences in administrative boundaries, division of roles and responsibilities in-between organisations in operational first response together with variations in the actual organisation of incident command and set-up of operational UAV support. Without discussing the narrower details of how the different organizations operate, it should be noted that first response stakeholders can be organised at municipal, regional and state levels – providing different contexts. Likewise, UAV support is organised in different ways. A majority of the countries represented in the programme provided examples of UAV support by specialised drone teams organised on the provincial or regional level that can be called upon by the actual response unit. For two of the participants (SE, FI) UAV resources are mainly integrated as a tool for the actual first response unit being called upon, with cases in between such as Austria, representing different solutions depending on the federal state. The estimated number of pilots also varies to a large extent, not only reflecting the organization of UAV support but also the size of the country.

The overall picture is that conditions like these affects when, where and how to train (notwithstanding financial and political aspects that are consciously left out this discussion). However, most of the first responder organisations represented at the workshop claimed that the national training scheme building on EASA standards is a prerequisite to train as a first responder pilot, with professional training mainly being provided by first responder training centres or by the (in one case) fire services themselves. For most of the organisations represented, combined training with the incident command is offered, with some examples (IT, PL) stating that the UAV team leader can also be appointed as operational command. Scenario-based training is adopted in a majority of the cases, with ambitions to increase this type of training. Both the amount of time allocated for training with the incident command and the number of scenarios vary. About a third of the representatives claimed data post-processing to be included in the training, exemplified by Cyprus including lidar training.

Together with the more in-depth examples above, these examples from the workshop provide a first step towards mapping the landscape of specialized training for and by first responder organisations. With much general support being accessible for the role of the UAV pilot, it indicates that other skills and competences, here exemplified by analytics (data post-processing) and collaborative training including incident command, must be developed accordingly.

[30] One participant from each of the following Member States took part in the exchange: Austria, Croatia, Cyprus, Finland, France, Italy, Poland, Portugal and Sweden.

[31] https://www.exchangeofexperts.eu/

CONCLUDING DISCUSSION

By considering the low response rate and that no advanced statistical analysis has been carried out, the results of the survey presented here are limited in their scope (reliability and validity) and do not allow us to draw overarching conclusions based on the findings. However, when analysed in relation to reviewed literature and the current training status in various countries, the basic survey results together with the written answers in the questionnaire allow us to identify **areas of interest concerning needs and capacities for enhancing collaborative training.**

For example, it seems that multi-stakeholder collaborative training provisions are currently less common than training provisions specific to individual stakeholder organisations. As the Swedish police case discussed above exemplifies, although there are no immediate plans in place to date, shared aspirations do exist among civil protection and first response stakeholders for establishing a common training platform for carrying out joint main (basic) training that can then be built upon to develop more specialised training schemes to accommodate specific and collaborative operative needs (part of an entire joint training programme) (see Henningsson 2023). From the broader perspective of the COLLARIS project scope and goals, the survey results revealed that several organisations currently use training material that includes theoretical content for "cooperation and collaboration". However, another finding showed that training material is commonly developed internally in the organisations and used within specific contexts, where it was also found that common training material is hard to source. Moreover, it would also seem that the open availability of training material that can be shared is very different across countries (and even organisationally within countries). A main conclusion that can be therefore drawn from this report is that there is a need to give more focus to, and create a more formal platform for, embedding a strong sharing culture with regards to collaborative training and training materials with a greater goal of enhancing training effectivity across the EU. In this regard however, public procurement concerns and limitations may well present a barrier to the achievement of such goals (different budgets and bureaucratic limitations and even secrecy requirements at national, regional and organisational levels, for example). As such, we would recommend that future policy development and other evaluations exploring possibilities to facilitate collaboration and cooperation must present accurate and up-to-date assessments of these factors and not least the costs involved and must accurately reflect the availability of resources needed for UAS in first response and civil protection. This is in in line with and strengthens what is already proposed in the EU drone strategy 2.0.

That the survey results show that practical training, for UAV/UAS piloting or for the efficient use of UAV data, emerged as the most common type of training provided for personnel is interesting but given the low response rate, such findings merit further in-depth investigation to explore if and why this is the case for UAS training in civil protection across the EU. We conclude here that a more qualitative approach to examine these questions and concerns may well yield more fruitful data to better explain and make accurate recommendations that best reflect the needs and expertise of sharp-end practitioners and organisational stakeholders in civil protection and first response.

By taking into consideration the basic survey results in Chapter 2 and the training examples provided by the consortium members that are discussed in Chapter 3, but also the reviewed literature and cases presented, the following questions are raised here that we also conclude merit further attention and should be qualitatively explored and investigated:

- Do the different approaches to collaborative training in different countries affect operational efficiency, and if so how?
- What tools and/or methods can be used and developed to best facilitate collaborative training?
- Does the differentiation of training for internal personnel and training for (or by) externals create gaps and/or negative effects on operational efficiency? If so, to what extent can legislation, collaborative training and common SOP's or even an enhanced sharing culture alleviate such effects?

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APPENDIX

This appendix contains the survey as it was presented to respondents. The survey was distributed digitally using Artologik Survey&Report licensed to MSB.

The purpose of this survey of (maximum) 14 questions is to support an **overview of training** supporting the efficient use of UAS in crisis management and first response among European member states. The overview will support the development of activities and reports within the COLLARIS project – COLLaborative network on unmanned AeRIal Systems. The project is funded by the Union Civil Protection Knowledge Network Partnership (UCPM-2022-KN) Please visit the Union Civil Protection Knowledge Network project website for more information and contact details.

The survey does not collect any personal data but at the end there is an opportunity to voluntarily share your contact details. In case you choose to share your contact details, all personal data is processed in accordance with Regulation (EU) 2018/1725 on the protection of natural persons with regard to the processing of personal data by the Union institutions, bodies, offices and agencies and on the free movement of such data.

BACKGROUND INFORMATION

The background information in this section helps us to better understand the answers. No personal information is included. At the end of the questionnaire you will be asked whether you accept to be contacted for follow-up questions and to voluntarily share your personal contact information.

Which country and (if applicable) region do your answers apply to? (Mandatory question)

Please share the name of your organisation. (Mandatory question)

What is your role in your organisation?

In relation to UAS/UAV your organisation provides

- [ ] Regulations
- [ ] Certification
- [ ] Guidelines
- [ ] Competence
- [ ] Knowledge & Research
- [ ] Operations
- [ ] Innovations
- [ ] Training

Other, please specify

GENERAL INFORMATION OF PREVIOUS ENGAGEMENT IN UAS PROJECTS AND COLLABORATIONS

This section maps past and current engagements to better understand the flows of interaction across the EU

In the past, have your organisation coordinated or participated in any projects or collaborations related to UAV/UAS?

- ☐ Yes
- ☐ No
- ☐ Do not know

If yes, feel free to give examples

Is your organisation currently coordinating or participating in any projects or collaborations related to UAV/UAS?

- ☐ Yes
- ☐ No
- ☐ Do not know

If yes, feel free to give examples

UAV/UAS TRAINING

The following questions apply to your own organisation.

In your organisation, do you provide training in using UAV:s in crisis management and first response? If the answer is yes there will be follow-up questions in the following sections.

- ☐ Yes
- ☐ No

Comment:

What kind of training do you provide in your organisation and for whom? if possible, please name specific training types and scopes.

	Practical trainings for UAV piloting	Practical training for effcieint utilisation of UAV data gathered via UAV's data user	Theoretical training on safe and lawful use of UAS	Other example – please specify
Internal personel Ex-	☐	☐	☐	☐
ternal personel Onsite	☐	☐	☐	☐
commanders Other	☐	☐	☐	☐
command levels	☐	☐	☐	☐
Data users (postpro-cessing)	☐	☐	☐	☐
Flight coordinators / airspace manageres	☐	☐	☐	☐
Other – please specify	☐	☐	☐	☐

Comment:

Do you develop your own training material (handbooks, scenarios, training goals)? If the answer is Yes, please move on to the next question. If the answer is No please name / link to what external materials are being used:

- ☐ Yes
- ☐ No
- ☐ Don't know

Comment:

In your training material, what theoretical contents are included?

- [ ] Aviation safety
- [ ] Flight training
- [ ] Legislation and regulations
- [ ] Local conditions
- [ ] Flight routines
- [ ] Cooperation and collaboration
- [ ] Sensors
- [ ] Mission planning software
- [ ] Data processing
- [ ] Data sharing
- [ ] Technical maintenance Exer-
- [ ] cises with field units
- [ ] Civil protection regulations and practices
- [ ] Other – please specify

Comment:

In UAS training, what are your main scenarios? The listed scenarios should be seen as unexhaustive examples.

- [ ] CBRN-E
- [ ] Forest fire Ma-
- [ ] rine pollution
- [ ] Industrial hazards
- [ ] Search and rescue
- [ ] Public safety Cli-
- [ ] mate change
- [ ] Urban search and rescue
- [ ] Earthquakes

Other, please feel free to share below

In your organisation, do you also provide operational support of UAVs in crisis management and first response?

- [ ] Yes
- [ ] No

If the answer is yes, please share how:

If needed, may the project contact you for follow-up questions or clarifications needed? (Mandatory question)

- ☐ Yes
- ☐ No

If the answer is yes, please share your contact details below. Your information will not be shared outside the scope of this survey or used for any other purposes.

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