Best Practices | Co-Creation | Research

ENLETS Countering Unmanned Aircraft Systems

Final Report
February 2022

European Network of Law Enforcement Technology Services
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1. Purpose of this document

The ENLETS Countering Unmanned Aircraft Systems Final Report is intended to provide a comprehensive summary of its activity which was started in December 2020.

This Final Report sets out:

- Summary of the C-UAS Technology Interest Group activities;
- Summary of the C-UAS Technology Interest Group Subgroups activities.

2. Introduction about ENLETS

The European Network of Law Enforcement Technologies Services (ENLETS) was founded in 2008 during the French Presidency following council conclusions and is a subgroup of the Law Enforcement Working Party (LEWP) reporting to the Standing Committee of Operational Coordination and Internal Security (COSI). The ambition was to establish a stronger connection between law enforcement agencies (LEAs) and innovative technologies.

ENLETS' main goal is to operationally strengthen Law Enforcement (Police) with the use of modern Technology and Development by exchanging information, experience and knowledge on a practical communication level. In 2012 new vigour was brought into the group by the establishment of a Core Group (CG) and a Core Group Leader, to lead the network on a daily basis and by refreshing the vision and mission of ENLETS.

Since 2014, the ENLETS network has received direct grants from the European Commission's DG HOME. These are:

- 2014 – 2016 ENLETS Disseminates Best-Practices;
- 2016 – 2018 ENLETS Security, Technology and Procurement;
- 2018 – 2021 ENLETS Technology Program.

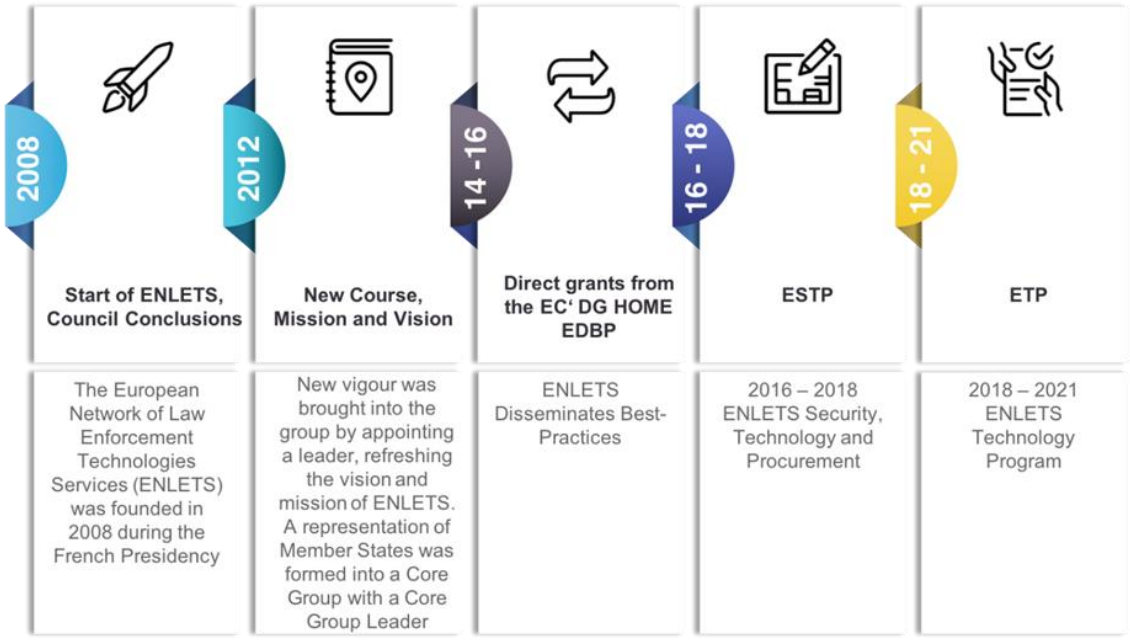

Figure 1 ENLETS Network (timeline)

1.1. ENLETS Technology Program approach

Figure 2 ENLETS approach

ENLETS' focus will be to professionalize the ENLETS community, build strong coalitions with academia, (security) agencies and other networks and create sustainability. A part of professionalizing the ENLETS community is to standardize work principles of the Technology Interest Groups (TIG). The previous outcomes of the programs have shown that there are mainly capability gaps, issues and/or needs within the following elements of LEAs' (operational) work and/or European collaboration:

- Legal framework (incl. ethics);
- Process (incl. techniques, work methods);
- Training and education (incl. culture aspects);
- Technology;
- Standards and/or automation;

→ BUSINESS CHANGE

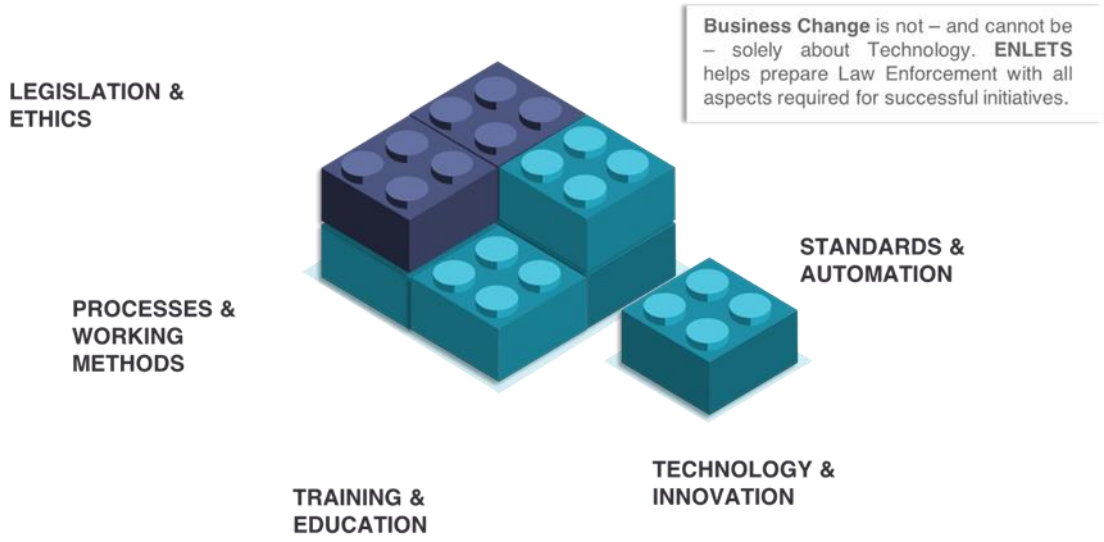

Figure 3 ENLETS Building Blocks

The above mentioned elements will be the building blocks in the ENLETS Technology Program TIGs. Each building block will have certain expected effects on the business. Furthermore, it will provide a structure and guidance throughout the program and gives a clear criterions view in the end.

3. C-UAS Technology Interest Group (TIG) overview

The C-UAS TIG Group is a continuation of the previous Drone Technology Interest Group. The experience gathered in the Drone TIG appeared crucial to understanding the operational concepts and potential threats caused by UAS's. The group is supported by an Advisory Board made up of representatives of DG HOME of the European Commission (Unit D.2 Counter-Terrorism).

The Leader of C-UAS TIG is **Dr. Jarmo Puustinen**, Ministry of the Interior (Finland).

Jarmo Puustinen
Ministry of the Interior, Finland

Superintendent Jarmo Puustinen began in ENLETS as an NCP and Core Group Representative Finland in 2016. In 2013, Jarmo became acquainted with ENLETS in the ANPR working group, where the ANPR development was produced as a roadmap. Jarmo found ENLETS to be very interesting to develop national technological activities, to compare best practices and also to save money and development resources for national development activities: "Reference and different experiences from a technological point of view also keep us nationally aware of the aspects of law and human rights, which are often highlighted in development activities. Wide-ranging knowledge is of the utmost importance today and LEA is increasingly forced to combine academic expertise and practical experience".

Jarmo began as a police officer in 1992 and has gone through the entire education system for the management of the Finnish police. He then continued at the University of Tampere, studying security management and graduated in 2017 as a doctor of administrative science. This has been very helpful in the current work.

Between 2020 and 2021, Jarmo has been chairing the activities of the ENLETS C-UAS Group and, before that, the ENLETS Drone Group: "It is very important to be central to and engage the activities in common EU view. By being involved, we will develop the skills capacity and the knowledge gained through experience. It is of great value in today's different activities."

Jarmo says that he understood at a relatively early stage the important role of technology in assisting LEA's activities. The ENLETS network has, above all, provided a platform for common operational challenges, needs and development prospects.

Jarmo is currently working for half of his working time for the Ministry of the Interior and the National Police Board on the other side. At the same time, he supports the activities of the Police University College, by being activity manager in CEPOL Future Leader course and lecturing international affairs for senior police students. "With the current job image, I can find the best possible expertise from different part of the internal security organization and combine it where necessary with international cooperation. “This work is very rewarding and I always feel a good feeling when I can help our national and international experts in various areas."

In 2020, The Polish Platform for Homeland Security (PPHS) was appointed as the designated ENLETS Secretariat and TIGs Support. In that case, Edyta and Klaudia support Jarmo with organising the meetings connected to the group as well as in the daily tasks within the group and subgroups.

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Special thank you are due to the Advisory Board consisting of the representatives of the Directorate-General for Migration and Home Affairs from the European Commission - **Mr Lars Huybrechts** and **Mr Marc Leoutre**. Their great contribution to the activities of C-UAS TIG allowed the implementation of many activities smoothly. Their openness, knowledge, and experience from the EC perspective completed the discussion and showed a broad picture of the C-UAS matters in Europe.

The ENLETS Core Group decided that the C-UAS TIG should:

- build upon the earlier work in the Drone TIG;
- not overlap with other activities such as the European Commission DG Home initiatives and funded projects;
- add value by connecting the members to the existing initiatives;
- cross-fertilise between other LEWP groups, other LEA initiatives by inviting them to participate;

- pay additional attention to Drone Forensics as well as the new regulatory framework “U-Space” to position LEAs.

Many European nations have been searching for proper way to control the UAS threat in their countries. The major challenge is to have the proper technology to protect urban environments. The first findings from C-UAS TIG were that most of the **detection** and **neutralisation** technology solutions are working well in open areas. In a city and build up environment (high buildings etc.) the systems are not working well and the LEA are facing more challenges than benefits.

There are several different action steps in Counter Action procedure from the LEA perspective. In the C-UAS operational process, actions and terminology overall are categorised for three main areas (please see Figure 4 below).

1. **Detection and tracking** of overall flying UAS system.
2. **Identification and verification** of the UAS that is causing the reason to clarify the purpose of the flying because of the flying direction or other abnormal behaviour in the outer/external safety/security zone.

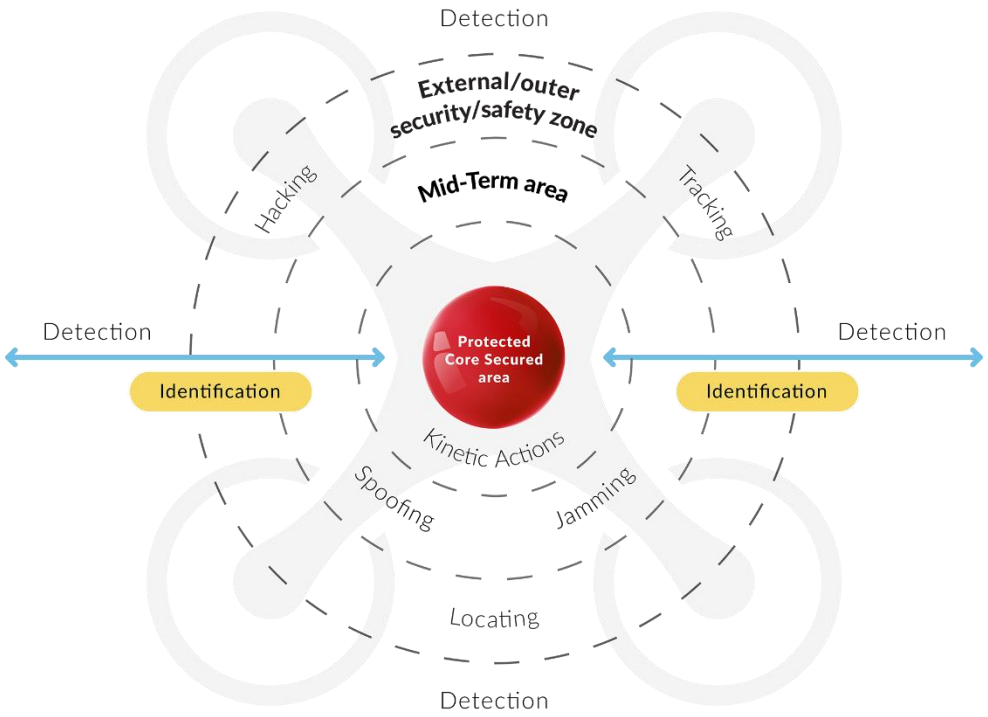


Figure 4 C-UAS from LEA’s perspective

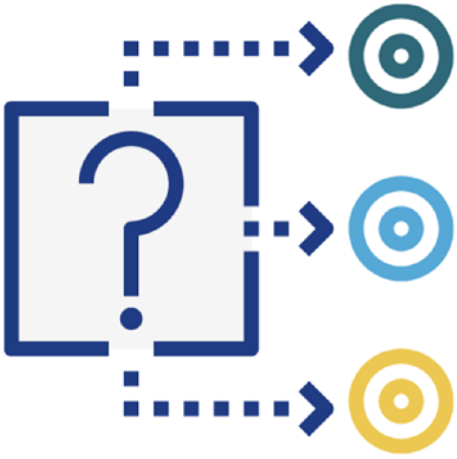
3. **Description of different actions** related to the estimations of the safety/security zones. To estimate safety/security zones for different actions and assess the size of the safety/security zone for the external, mid-term and protected core areas.

It is relevant to benchmark the most suitable intervention systems and find out the system gaps in different safety/security zones. It is necessary for ENLETS C-UAS TIG to have an entire picture of the available systems to produce TIG’s activities. This activity was done in cooperation for instance with COURAGEOUS and other projects/networks. The intervention abilities should be assessed from the perspective of safety/security zones.

A. To benchmark and estimate the best available solutions to intervene the flying UAS in mid-term safety/security zone protecting the core area.
B. To benchmark the best available solutions for redeployment and fixed detection systems and estimate the difference in security/safety zones between the systems.
C. To validate the best possible technology solutions for intervening in the flying UAS (jamming, spoofing, shooting and use of counter UAS against the UAS threat).

3.1. Objectives

Like the other ENLETS TIGs, the principal objectives of the group are to help share best practices, ideas, and insights across the EU, supporting continuous improvement across Europe. The C-UAS TIG defined two main objectives:



A. To share knowledge about innovative technology for counteraction purposes as well as forensics: Detection (A1), Tracking and identification (A2), safe zone and neutralisation (A3) and forensics (A4).

B. To share knowledge and collaborate on less technical topics: standardisation, U-Space development (B1), EU funded C-UAS projects (B2) and regulations (C3)

Because of the many specific topics, six Subgroups were established to handle the various topics. Each subgroup set its objectives in cooperation with C-UAS TIG.

- **Detection** cooperates with other EU projects, support Industry Days and connects C-UAS topics from previous experience. The threat assessment is an important aspect of detection to share best practices and create different scenarios in different environments as well as common training. More information can be found in Detection Sub Group leaflet attached as **ANNEX 1**.
- **Neutralisation** is working in close cooperation with the Detection Sub Group. The functions: detection, monitoring, identification and decision making are making a continuous chain ending at neutralisation. Moreover, the aim is to learn new solutions, new technologies, and new equipment, and try to define innovative testing solutions. More information can be found in Neutralisation Sub Group leaflet attached as **ANNEX 2**.
- **Regulation** is concentrate on getting an overview of the specific police regulation in countering UAS, aggregating and evaluating the results to suggest further fields of exploration and extracting possible fields of activity to present to EUCOM. More information can be found in Regulation Sub Group leaflet attached as **ANNEX 3.**
- **U-Space** is connecting LEA for U-Space discussion at the EU Commission level (profits and consequences of developing U-Space, the LEAs expectations on U-Space, actors and their competence/ responsibility, the information they would like to get to manage public safety and EU Member State U-Space tools and airspace management for LEA's purpose).

- **Drone Forensic** harmonize the forensics procedures for the UAS by cooperating with INTERPOL and previous ENLETS Forensics TIGs as well as the available expertise in the EU. More information can be found in Forensics Sub Group leaflet attached as **ANNEX 4.**
- **EU-Projects** is connecting current and previous EU projects concerning C-UAS topic as well relevant EU Law Enforcement Working Party (LEWP) networks with help of DG HOME also to the other relevant network.

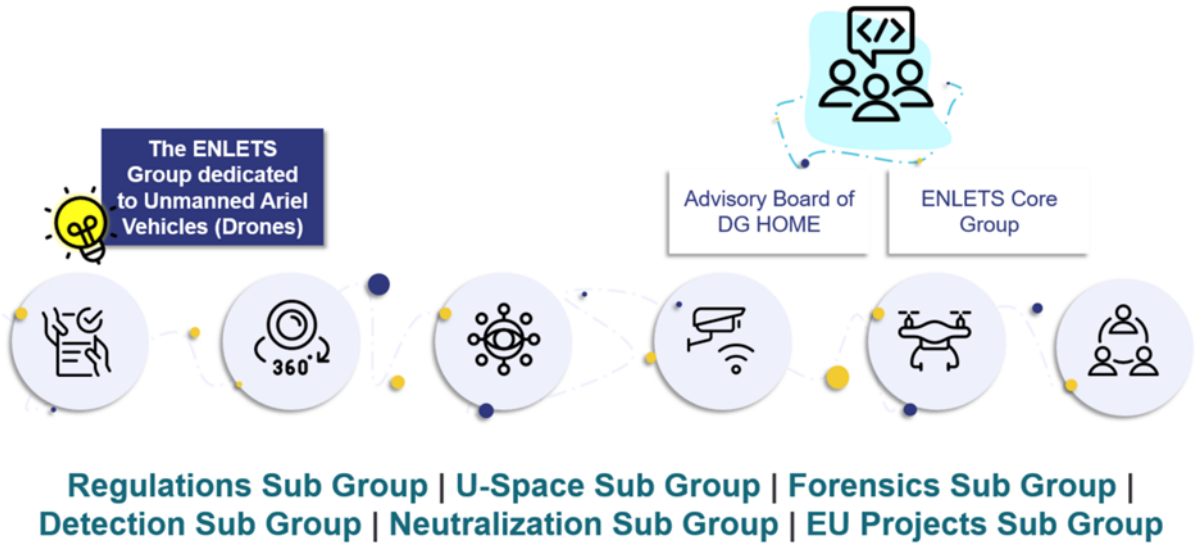


Figure 5 C-UAS TIG structure

The activities of Subgroups are reported in Chapter 4.2 of this report.

3.2. Defined tasks

Tasks are defined within the C-UAS TIG:

T1. Conducting a survey to analyse the gaps and needs of LEAs regarding technological solutions and law regulation.

T2. Defining the innovative C-UAS's solutions regarding the detection, tracking and identification and safe zones and neutralisation. The Industry Day in June 2021 and the second one at the same time as I-LEAD Industry Day.

T3. The collection of Industry Day findings and the best practices of C-UAS's solutions.

T4. The collection of the relevant testing results in the field by following other EU projects (COURAGEOUS and Skyfall) (together with Interpol to see the system interoperability in real environmental circumstances).

T5. Identifying the best technical solutions (needed technology), including findings of European projects for effective C-UAS work, with input to SME's, Industry and Academia.

T6. Discussing and describing the operational process of C-UAS from detection to possible neutralisation.

T7. Standardise the common steps and procedure for drone forensics and compare the best practices with INTERPOL and previous ENLETS Forensics related TIG.

T8. To know LEA's point of view on the U-Space discussion with the support of DG HOME.

T9. To provide recommendations for the next steps in C-UAS's area.

3.3. Deliverables

A number of deliverables were expected for the C-UAS TIG, which are detailed in the table below with expected delivery dates.

Deliverable no.	Deliverable	Delivery Date
DEL 1	Survey of the overall situation on Member countries; Surveys of Sub Groups;	April 2021 November - December 2021
DEL 2	Report summarising the C-UAS Industry Day 2021	June 2021
DEL 3	Recommendations outcomes to national and European policy makers about using counter UAS technologies mainly based to the Sub Group work (Regulations and U-Space)	February 2022
DEL 4	Final Report of findings on the activities carried out by Technology Interest Group, as well findings from Sub Groups	February 2022

3.4. Members

The following countries have made their contribution by working for the C-UAS TIG: Belgium, Bulgaria, Czech Republic, Cyprus, Denmark, Estonia, Finland, Germany, Greece, Ireland, Italy, Lithuania, Netherlands, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Switzerland, United Kingdom, and representatives of INTERPOL and EUROPOL.

4. Summary of C-UAS TIG activities

4.1. C-UAS TIG activities

4.1.1. Questionnaire to analyse the gaps and needs of LEAs

To map the current situation across the European Law Enforcement, the C-UAS Team implemented a **questionnaire to analyse the gaps and needs of LEAs regarding C-UAS technological solutions and law regulations**. The main purpose of this questionnaire was to understand the current state of drone countermeasures from the European Law Enforcement point of view, as well as the needs and current challenges. Moreover, the results of the survey contributed to the proper planning and organisation of the C-UAS TIG activities, as well as to the organisation of ENLETS C-UAS Industry Days in 2021.

The questionnaire was conducted in the period from 25th March till 9th April 2021 among C-UAS TIG members. The Team used a 'reusable template', that, with minimum alterations, can be leveraged to capture and highlight similar information from other countries. EUSurvey[1] is the European Commission's official multilingual online survey management tool that can also be used free of charge by all European citizens. It facilitates the creation and publication of globally accessible forms, such as user satisfaction surveys, public consultations or registration forms.

The questionnaire included open-ended questions within four thematic blocks:

1) The Current situation of C-UAV in your country;
2) Law regulations regarding C-UAV;
3) Challenges regarding C-UAV in your country;
4) Needs regarding C-UAV from your point of view.

The current situation of C-UAS in countries

In general terms, the various European member states are seeking effective solutions to the counter challenges. There are also major differences between countries in the ability of some to develop systems and some of them have been left waiting for the new generation of instruments to come out of the market.

DJI is the largest producer of RPAS in terms of volume and the Aeroscope they produce is a fairly commonly used solution for detection and localization.

RF- observation appears to be the most common way to detect RPAS and some countries also have experience of radar use.

Neutralisation seems rather challenging and often resorts to jamming at standard UAS frequencies (2.4 MHz- 5.8GHz). Spoofing and autonomous counter-measures for police officers in member states are not yet in place. Kinetic actions are based for shooting or net launchers like Skywall 100.

Law regulations

U-Space is also the main development point for the development of national legislation. As a result of the survey, we found that only individual countries are involved in the debates from LEA side. This is partly due to the fact that U-Space debate and development prospects have been dealt with by another national authority related to the aviation responsibilities.

The general situation with regard to national laws seems to be that member states do not have separate legislation for counter-measures.

Challenges regarding C-UAS in your country

There are number of challenges in counter measurements.

1. To have a good operative situation picture of the airspace extending at least five kilometers

[1] https://ec.europa.eu/eusurvey/

2. The biggest technological challenge in the field of neutralisation is the possibility of identification and disruption of a particular “enemy” drone, or taking control of this aircraft without disrupting other permitted UAS operations.
3. Counter UAS technology is expensive technology and because of that some of the countries are without the special counter technology.
4. Small covering area of C-UAS technology
5. The national law and tight frequency limitations for jamming technology
6. Testing standardization of C-UAS devices. Testing is time consuming. The manufacture testing presentations are usually in open environment. The challenge is urban city environment, where often protected sites are also.
7. Small and fast noncooperative UAS devices.
8. How to take-over of command-link of UAS?
9. Electronic fencing technology without disturbing GNSS-Signals
10. UAS based on 4G, 5G (and next gen) communication
11. Standardization/certification of C-UAV technologies. Nowadays, all C-UAS technologies need to be tested before LEA can evaluate their efficiency
12. Material capability to do counter measurement actions. Military cooperation is good, but when there is need for military own use, you may not rely too much for military support.

Needs regarding C-UAS from your point of view

In general, the LEA needs the fixed and mobile counter-activity technology. The fixed technology should to be able to operate 24/7 in certain important infrastructure locations and separately mobile technology for different situations. There is a reliable need for detection and identification technology over extended ranges to ensure enough reaction time, at least over 5km, but even more against fast flying objects. There is a need for a platform that is able to independently identify UAS and remote pilots, need for spoofing technology for UAS, need for capturing the C2-link and need for neutralisation technology with minimum risks for third persons. As a common observation, the development of legislation on counter-measurement activity.

The questionnaire can be found as **ANNEX 5.**

4.1.2. ENLETS C-UAS Industry Day

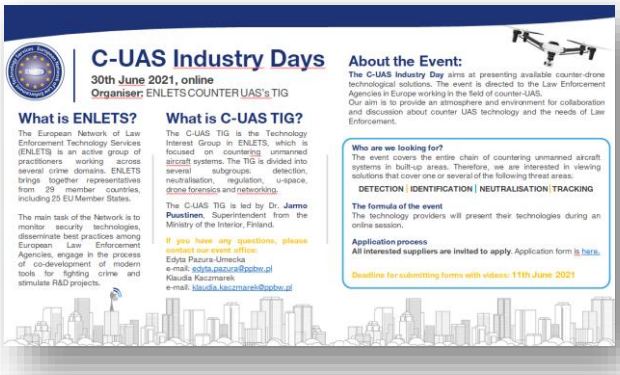
The C-UAS Industry Day was organised by the Counter-Unmanned Aerial Systems Technology Interest Group (C-UAS TIG) on 30th June 2021. Due to the COVID restrictions, the C-UAS Industry Day was organised in an online formula. The goal of C-UAS Industry Day was to present available counter-drone technological solutions for Law Enforcement Agencies. Moreover, the aim was to provide an atmosphere and environment for collaboration and discussion about counter UAS technology and the needs of Law Enforcement. Together with LEAs and Industry, we strive to forge mutually beneficial relations between industry experts and law enforcement specialists in counter drones matters.

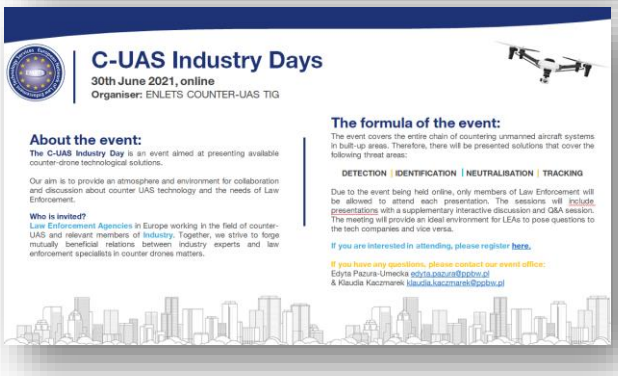
The event covers the entire chain of countering unmanned aircraft systems in **built-up areas**. Therefore, the solutions that cover the following threat areas were presented:

DETECTION | IDENTIFICATION | NEUTRALISATION | TRACKING

During the event was presented providers as follows:

- GRADIANT
- Rinicom Intelligent Solutions Ltd
- ROBIN RADAR SYSTEMS BV
- DroneShield
- OpenWorks Engineering Ltd
- Delft Dynamics B.V
- Blighter Surveillance Systems Ltd
- H.P. Wuest GmbH
- Droptec GmbH
- TELEFONICA
- ELETTRONICA SPA
- AEORUM





Given the interaction limitations of online events, the overall result of the Industry Day was highly satisfying. The significant number of participants who attended and actively took part in the question and answers sessions, and the engagement of the technology presenters were the highlights of the event. The presentations were very interesting and practical for LEAs, and the presenters used their time efficiently.

The public report summarized this event is attached in **ANNEX 6.**

4.1.3. ENLETS C-UAS TIG Meetings

The COVID pandemic made the ENLETS activities challenging as the model for meetings was most often physically sessions. In 2020, the increased capacity and experience of PPHS, ENLETS Secretariat, allowed triggering an online model for regular meetings and renewed energy to counter the loss of momentum caused by the pandemic.

Since December 2020, twelve C-UAS TIG monthly meetings took place online during which members could establish relations and discuss topics related to counter drones matters as well as share knowledge about innovative technology for counter action purposes. The schedule of particular meetings along with a short summary can be found below:

- **Meeting on 8th December 2020; 13 participants present**

It was the first C-UAS TIG meeting during which Jarmo, as a TIG Leader, briefly reported the activities that have currently taken place within ENLETS. Moreover, Jarmo highlighted the importance of cooperation with the operative counter drones experts and discussion about challenges within the area of C-UAS technology. The main objectives of UAS TIG were pointed out and discussed as well.

- **Meeting on 21st January 2021; 18 participants present**

This time Patrick Padding, Core Group Leader of ENLETS, opened the meeting and welcomed all C-UAS TIG members present at the meeting. Patrick summarised the recent meeting with the European Commission by highlighting the importance of cooperation with operative counter experts and discussion about challenges within the area of C-UAS technology. During the meeting, the German Federal Police as well as the Spanish C-UAS experience were presented by Dirk-Heinrich Bothe and Verónica Ortiz Leal.

- **Meeting on 4th March 2021; 17 participants present**

Adrian Slowikowski presented the activity of the Polish National Contact Point - National Police HQ in Warsaw in the field of UAS technology. Then there was a discussion on the C-UAS TIG Project Initiation Document (PID) and future activities. Because of the many specific topics, the particular Subgroups were initiated: Regulations, U-Space, Forensics, Detection, Neutralisation, EU Projects. At the end of the meeting, the representative of the European Commission briefly presented a policy perspective on counter-UAS from DG HOME, focused on 6 pillars: Community building, Information collection and sharing, European Programme for C-UAS systems testing, Practical guidance/support, Research and innovation and Legislative engagement. Moreover, the ongoing DG HOME actions and EU's UAS regulatory framework present and in the near-term future were presented.

- **Meeting on 21st April 2021; 20 participants present**

The chair of TIG informed about the finalisation of work on the Project Initiation Document. The document was reviewed by an Advisory Board composed of representatives of DG HOME of the European Commission (Unit D.2 Counter-Terrorism). The current Group activity was to collect the gaps and needs in the field of counteracting drones in member countries. The results of the questionnaire contributed to the proper planning and organisation of the ENLETS C-UAS Technology Interest Group activities, as well as to the organisation of C-UAS Industry Days in June. Moreover, the Chairs of Subgroups highlighted the main assumptions and ideas of particular Groups as well. In the end, the overall background of the Network for Police and Border Guard Units at EU airports (AIRPOL) was presented. AIRPOL is the Law Enforcement

Network created to build synergies for Police and Border Guard units working in the fight against crime in the European aviation sector.

- **Meeting on 27th May 2021; 16 participants present**

Christopher Church presented INTERPOL experience of counter actions and drone forensics, including global operational procedures and guidelines related to counter-drone matters such as tools, threats, and evidence. Then he presented the drone threat matrix from compliant to terrorist and pointed out the drones evaluation. He presented some examples of using drones in big mass events and some example solutions of C-UAS as well. Moreover, Christopher presented a Courageous project, its objectives, and a general overview as well as a CFID solution from https://www.scgcanada.com/. Then, the current Subgroups activities were pointed out by Chairmen.

- **Meeting on 16th June 2021; 12 participants present**

The chair of TIG opened the meeting, welcomed all participants present at the session and briefly summarised the last C-UAS TIG meeting. Representative of the Joint Research Center presented the main assumptions of the EU JRC Drone Project and "Living Lab" experience of counter-drone matters. In accordance with the current practice, the Subgroups Chairmen summarised the recent activities of each Subgroup.

- **Meeting on 15th September 2021; 16 participants present**

After the holiday period, the Group met again to listen to the presentation of the Skyfall and DroneWise project aims, activities and practical outcomes. Both projects are funded by the EC Internal Security Fund-Police Program. The goal of this project is to give an appropriate response to the misuse of drones as well as to significantly improve the security of public spaces by enhancing the cooperation and coordination between first responder agencies to effectively plan against and manage the aftermath of a terrorist attack by use of UAVs.

- **Meeting on 26th October 2021; 16 participants present**

The main point of this meeting was the presentation of the ATLAS Forum Innovation project within EKO Cobra as a part of the Austria Ministry of Interior. Tested solutions (outdoor and indoor) and their results were shortly presented. Moreover, Veronica Ortiz Leal summarised the INTERPOL event in Oslo as very impressive and well organised. After the tour through the table, other actions points were pointed. Klaudia informed attendees about a dedicated repository for exchanging knowledge and documents among C-UAS Members based on the EU-Lisa repository and Lars informed about two becoming events which are organised by DG Home as well as about the DG Home repository related to C-UAS.

- **Meeting on 1st December 2021; 16 participants present**

Among the topics discussed during this meeting was a SIGLO-CD Global Network of C-UAS Systems presentation, prepared by Veronica Ortiz Leal and Antonio Gutiérrez from the Ministry of the Interior, Spain. They informed about the mission of the SGSICS, the SIGLO-CD project phases (zero, one, two and three) along with the timeline and data obtainment process as well as about the drones' typology and automatic change of drones' typology. A Q&A session followed the presentation. Next, Lars from DG HOME D.2 Counter-Terrorism informed about the latest UAS news since March 2021 and summarised the virtual counter-UAS workshop which took place online on 30 November 2021. He also mentioned the current DG HOME's Counter-UAS activities (e.g. EU Handbook) and highlighted the possibility of involving the ENLETS C-UAS TIG members.

- **Meeting on 5th January 2022; 18 participants present**

Lars Huybrechts from DG HOME D.2 Counter-Terrorism informed the Group members on how to join the Counter-UAS Interest Group on CIRCABC. This portal offers access to consolidated open-source counter-UAS information as well as an avenue for exchange between policymakers and practitioners involved in this topic. The C-UAS TIG members were invited to provide content (e.g. publicly available reports, updates on relevant national legislation, information about recent incidents) to the platform as they deem appropriate. Moreover, Dirk-Heinrich Borthe, the Leader of the Regulation Subgroup, presented a very interesting analysis of the survey on the legal situation concerning counter UAS-Technology employed by Law Enforcement Agencies (LEA). At the end of the meeting the U.K.'s Approach to Drone Intelligence was presented by representative of NPCC Counter Drones, Counter Terrorism Policing Headquarters (CTPHQ). The Chairmen of the Subgroups informed about the current stage of their surveys.

- **Meeting on 18th February 2022; 23 participants present**

During the meeting, Detection, Neutralisation and U-Space Subgroups Chairs presented their analysis of the surveys conducted on November 21 on the illegal use of drones, the use of neutralisation equipment by LEA and related legal issues as well as the use of the U-Space concept for C-UAS. The multidimensional analysis within the subgroups provides a solid base to plan future TIG activities, and the recommendations and plans also provided discussion points among attendees. Moreover, the outcomes of EU project ALADDIN - Advanced hoListic Adverse Drone Detection, Identification Neutralisation were presented.

- **Meeting on 24th February 2022; 67 participants present**

On 23rd and 24th February 2022 the ENLETS ETP Final Conference was held online to provide the Community with a comprehensive overview and progress made throughout the duration of ENLETS ETP. During the dedicated session, the practical presentations about the C-UAS TIG overview were made by Jarmo Puustinen as well as by C-UAS Subgroup Chairs. During the event special focus was led on U-Space issues and drone forensics. The event provided general information about Unmanned Aircraft Systems (UAS) and Drones, including the state of play on Counter-UAS in Europe.

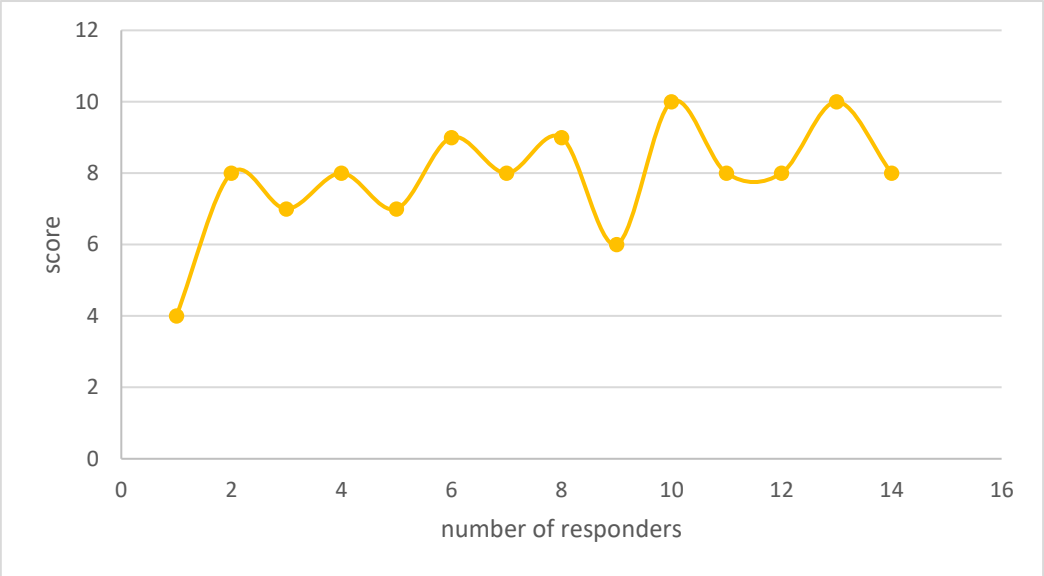
4.1.4. ENLETS C-UAS TIG Meeting Evaluation Form

In order to improve the quality and standard of the upcoming C-UAS TIG online meetings, the Team launched in January 2022 the Meeting Evaluation Form. The form was anonymous and included 7 closed and open-ended questions and we received 14 answers from the Group Members.

The results are as follows[2]:

1. **How interesting were the C-UAS TIG meetings for you?**

[2] The charts show how many points in a given question were awarded by each of the respondents



Most of the TIG Members rated the meetings as very good and interesting, giving 8 points or more. In their opinion, the meetings were very valuable, mainly because of the opportunity to share experience and ideas as well as to meet other colleagues within C-UAS and be informed about other projects. The TIG Members liked the chance to get an overview of the state of play on C-UAS in Europe.

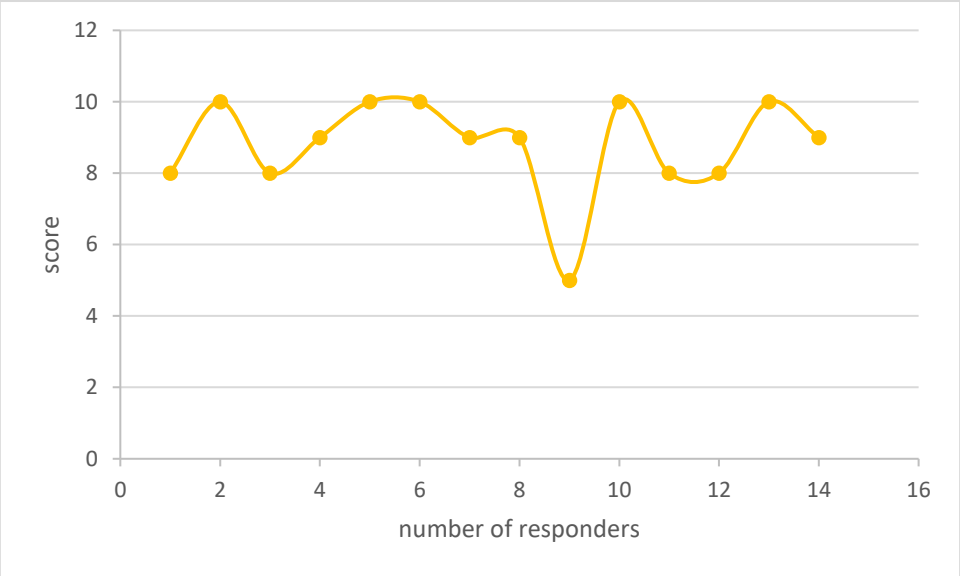
Moreover, the meetings were a very good occasion to get to know all the issues of interest to the Group. They were carried out in an agile way allowing participants to provide their own ideas and proposals to try to improve the results of the Group. In general, we offered an accurate state of the art of the international situation and allowed the participant to improve their network of knowledge. More so, adding Subgroups was a very good renewal as after that things were better structured and thus more informative.

2. What part of the C-UAS TIG meetings was most valuable for you?

The most valuable part of the C-UAS TIG meetings according to our Members was the possibility to get general information about drones and contact with other police units in Europe as well as exchange of the experience within Subgroups. Every aspect, external input as well as discussions with all the participants and international presentations of other members were added value, especially the speech of Lars Huybrechts, the presentation about SIGLO-CD, the integral network of C-UAS Systems of the Spanish Ministry of Interior as well as presentation of INTERPOL experience of counter actions and drone forensic.

Moreover, it was highlighted that the solutions adopted at the national level are very interesting; their adoption in other countries can bring great benefits. There was an opinion to provide more discussion over the C-UAS subjects presented during the meeting, just to share the different points of view and to know about the different initiatives. Using user experience and testing C-UAS could be very valuable.

3. How do you value the organisation of the C-UAS TIG meetings?



The organisation of C-UAS TIG meetings itself was rated around 8 points as well. So far, most of the meetings have been well organised. The only setback was organising the Industry Day during the summer holiday season. In general, from a technical and organisational point of view, everything went smoothly. The model of the meetings is very efficient and allows an agile performance of the activities. The Team that organises the meetings has been assessed to be highly qualified and very friendly specialists. Schedules come in good advance and the meetings were well planned and hosted. The feedback with the necessary documents is timely and sufficient as well.

It would be worth considering early planning of the next meetings so that the participants can organise their presence.

4. **Do you have any suggestions or recommendations for future C-UAS TIG online meetings? (e.g. organisational/technical improvements, the way of conducting the meeting, topics discussed, others?)**

Among the suggestions or recommendations for future C-UAS TIG meetings was that of potentially meeting in person once the COVID pandemic subsides. Most of the topics in this area of Law Enforcement are mainly sensitive in nature, therefore the F2F meetings could be an option again. A wish was expressed for a more secure, non-commercial platform, as online meetings may anyway be more common in the future.

Moreover, it would be worth engaging with other EU groups for the definition, development and implementation of joint technology solutions and the presentation of systems and technological solutions that are being applied in the different countries represented in ENLETS. Also the proposition was to research platforms for exchange of information among the participants (besides Stashcat). Otherwise, there were not any technical improvements.

5. **What topics/projects/networks would you like to see on the agenda at future C-UAS TIG meetings?**

The following topics were mentioned as worth discussing at future C-UAS TIG meetings:

- technology, networking, legislation topics;
- effectiveness of the different technology solutions as well as technical equipment;

- experience gained from the adoption of solutions the contrast to malicious drones;
- development of a process to provide the industry with relevant information, without hindering competition and acquisition;
- feasibility study to assess the decision to incorporate the ENLETS TIG C-UAS Group into a European initiative to define, develop and implement a network of C-UAS systems in different police organisations in EU countries;
- policy development for member states on the employment and use of C-UAS technologies in different scenarios and theatre's of operation;
- presentations from academics about C-UAS;
- soft kill effectors and mobile C-UAS systems;
- detection: getting an overview of the systems that are currently operational in EU member states;
- regulation: continuation of the current survey; integration of C-UAS systems seems to be very relevant for the future;
- continuation of ENLETS C-UAS Industry Day.

6. Are you interested in presenting national projects/activities in the area of C-UAS during future meetings?

Several C-UAS TIG Members expressed interest in presenting national projects/activities in the area of C-UAS during future meetings. They were asked to contact ENLETS C-UAS TIG Support directly.

7. Additional comments.

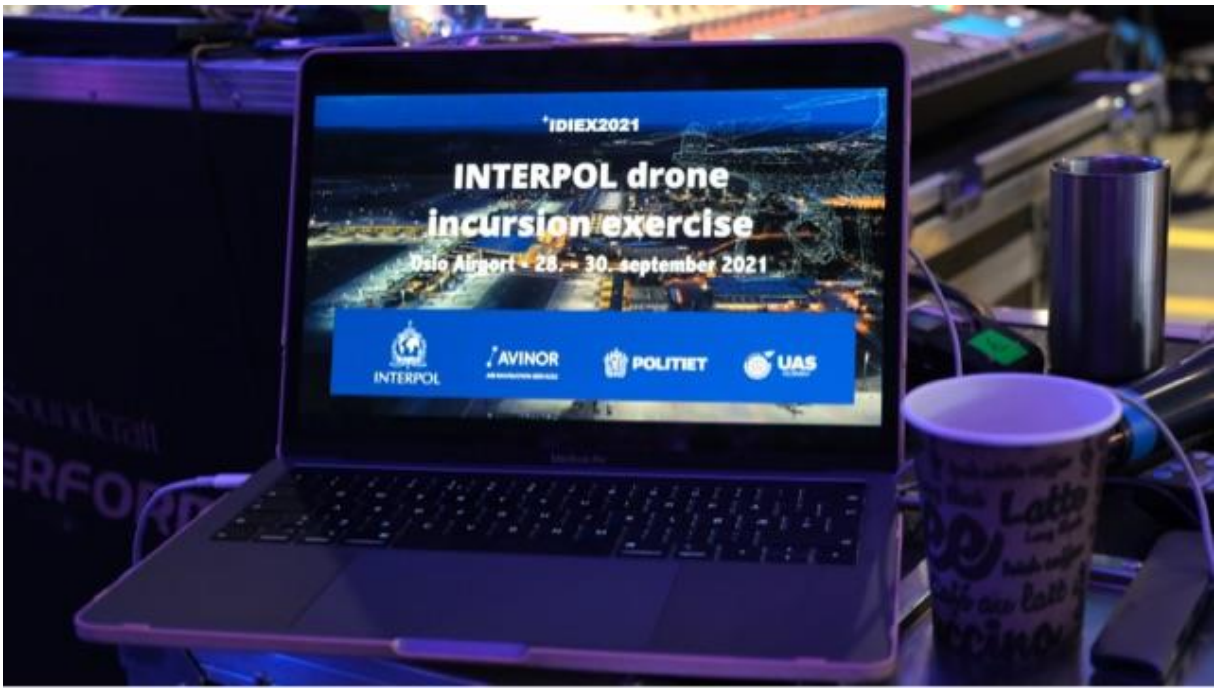
There was some additional comments as thanks to the chair, C-UAS TIG Leader, as well as Edyta and Klaudia, C-UAS TIG Support, for their phenomenal work, without which the results of the C-UAS TIG would be minimal.

4.1.5. INTERPOL tests counter-drone systems at Oslo Airport

INTERPOL, in coordination with UAS NORWAY, the Norwegian Police and AVENUR carried out a three-day exercise to evaluate and test drone countermeasures in a secure airspace environment.

Attendees to the event included the Leader of the C-UAS TIG, Jarmo Puustinen and three other members of the Group who actively participate in the TIG activities. The real-life exercise was held in Oslo from 28 to 30 September 2021 with the presence of law enforcement, academia and industry experts from Europe testing and assessing drone countermeasures to ensure the safety of an airport environment through the detection, tracking, and identification of drones and their pilots.

In addition to the exercise, workshops and presentations were held to address drone incursions with a view to evidence retention. The systems presented at this event are emerging as essential elements in ensuring the security of airports and, airspaces, and protecting no-fly zones above cities, prisons, and critical infrastructure. The sessions were, therefore, invaluable as participants shared the best practices and discussed possible future solutions for drone incursions.



4.2. C-UAS Subgroup activities

4.2.1. Regulation Subgroup

The subgroup forms a forum to find and evaluate regulative ideas, regulative approaches, and active regulations to determine the scope of necessary support by ENLETS. For this purpose, systematic and analytic skills are employed to assess the situation and suggest future steps.

The Leader of the Regulation Subgroup is **Dirk-Heinrich Bothe** (Germany).

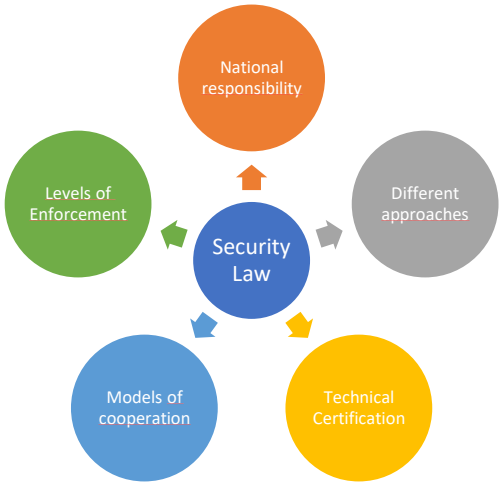
Dirk-Heinrich Bothe
German Federal Police Headquarters

Senior Chief Superintendent Dirk-Heinrich Bothe M. A. is a former police helicopter pilot, who works currently as deputy head of Section 21 - Command and Operation, Special Forces - at German Federal Police Headquarters in Potsdam.

His operational experience extends from commanding ground police forces to leading and flying numerous different domestic and international missions compromising the full scope of the service from various police missions day and night, visual and on instruments, helicopter emergency medical service, mountain rescue, cargo transport, disaster relief and fire-fighting. After 25 years of service as a commanding officer and helicopter pilot with the air support group, he is now providing expertise on operational aspects of GSG 9, air support, maritime assignments and close protection.

In his capacity as consultant, he formulates the operational requirements for the application of UAS and cUAS in the scope of tasks of the German Federal Police and coordinates UAS-related questions within Headquarters.

4.2.1.1. Regulation Subgroup background and challenges



Air law is an EU-delegated policy issue and is already well elaborated concerning UAS. Therefore, the options for influencing regulations in favour of LEA are very scarce. On the other hand, security is a policy-field, which falls under national responsibility. The EU can only suggest recommendations to harmonise the partly very different national regulations. Despite that, it is necessary to focus on regulations that allow the use of technology e.g. in the city area and make sure that every LEA has the same options.

Different member states have different approaches and limitations. For example, there are already regulative ideas to transfer responsibility for the negative effects of neutralisation on drone operators. Operationally it is more difficult to detect and arrest the operators/pilots of drones - as the originator of a drone-threat - than neutralise drones themselves.

Regulation should take into account the formulation of appropriate warrants as well as measured approaches to prevent risks of harming third parties during the neutralisation of drones.

The main challenge is to find best practices for regulative approaches, mainly those, which are already set to law or even better proven by court decisions.

4.2.1.2. Regulation Subgroup objectives and tasks

The Regulation Subgroup operates in the difficult and contested EU delegated and nationally retained policy fields of air traffic law and security law. To acquire results, a staged approach into security law is envisioned:

- to get an overview of the specific police regulation in countering UAS;
- to develop a short survey to find out where to concentrate on;
- to aggregate and evaluate the results to suggest further fields of exploration;
- to extract possible fields of activity to present to EUCOM.

4.2.1.3. Regulation Subgroup Members

The following countries have made their contribution by working for the subgroup: Greece, Romania, Italy and representatives of INTERPOL and EUROPOL.

4.2.1.4. Description of work conducted within Regulation Subgroup including meetings, survey and other activities

Due to pandemic restrictions as well as operative prerogatives of other police work the subgroup choose to discuss the relevant questions and formulate an initial survey via email. The final version of the survey was evaluated then within the ENLETS panel by video conference. The scope of the survey compromised the legal situation on assignments, prevention, prosecution and technical regulation. ENLETS C-UAS TIG steering group accepted the result, placed the survey on an EU-platform and encouraged the member states to send in their answers.

23 LEA did provide answers, whereas in two countries two LEA provided separate answers. The UK was represented with one LEA. The Data provides good coverage of the situation in the EU (and the UK). In total 19 member states of the EU and the UK have provided their contributions to date.

The analysis was developed by the already well established process of email discussion. It took on the challenge to generate a median out of a scale between -2 and 2 (from strong/slight disagreement to slight/strong confirmation) as a general indicator to the situation out of a set of answers with respect to the relevant questions without disregarding the individual situation in the member states.

4.2.1.5. Recommendation for future activities

Constitutional aspects are beyond the scope of the EU as well as ENLETS. For this reason, there should be no interference concerning assignments to C-UAS in the member states.

ENLETS concentrates on harmonising the police codes, technical standards and certification. ENLETS recommends to (re)form C-UAS regulation in three aspects:

- implementation of harmonised and standardised aeronautical regulation on UAS and thus standardised definition of offensive behaviour and their respective fines,
- integrate standardised C-UAS measures/warrants into local/national police codes and
- provide for similar sanctioning of UAS-offenses in every member state, including supranational prosecution in the EU.

Furthermore, ENLETS aspires to have EU-wide regulation with the perspective of interoperability on:

- technical standards through certification and
- standardised warrants on employment of C-UAS-equipment for assigned LEAs.

4.2.2. U-Space Subgroup

The U-Space Subgroup connect LEA for U-Space discussion at the EU Commission level (including profits and consequences of developing U-Space, the LEAs expectations on U-Space, actors and their competence/responsibility as well as information they would like to get to manage public safety and EU Member State U-Space tools and airspace management for LEA's purpose).

The Leader of the U-Space Subgroup is **Adrian Slowikowski** (Poland).

Adrian Slowikowski
Polish National Police

Senior Chief Master of Science in Electrical Engineering. In service in the Police since 2005. From very beginning associated with the special technology area. Police and Civil UAV Pilot/ Instructor. Since 2019 National Coordinator for UAV Matters in the Police, in Crisis Management and Defense Preparation Unit of Operations and Crisis Management Command structures of the Police.

4.2.2.1. U-Space Subgroup background and challenges

U-space is a set of specific services and procedures designed to ensure safe and efficient access to airspace for a large number of drones, and which are based on high levels of

digitalisation and automation. The purpose of U-space is therefore to achieve automated UAS management and integration, allowing for a large series of operations, many of them even simultaneous, and all of this in harmonious coexistence with the current ATM system. U-space airspace designation is supported by an airspace risk assessment, to determine the necessary services and performance requirements.

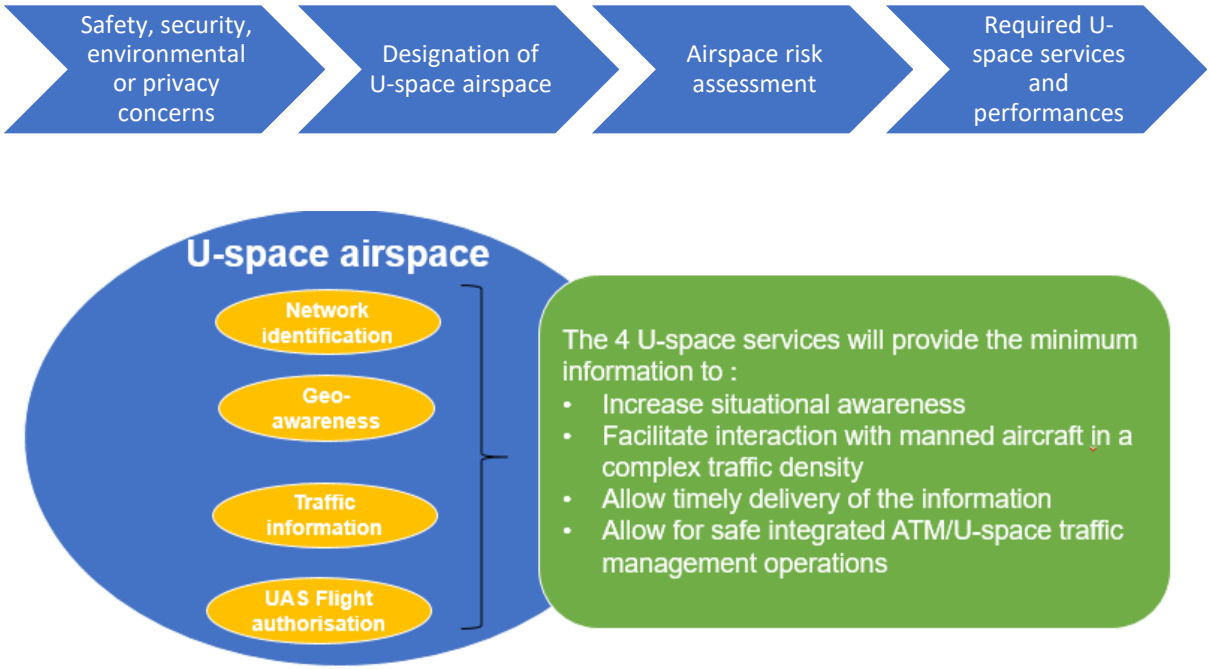


Figure 6 Minimum set of U-Space services

The designated competent authorities shall establish a mechanism to coordinate with other authorities and entities, including at the local level, the designation of U-space airspace, the establishment of airspace restrictions for UAS within that U-space airspace and the determination of the U-space services to be provided in the U-space airspace.

In order to support the deployment and implementation of U-space, it is essential to have the appropriate regulations in place to adopt the necessary requirements as well as for the safe integration of drones with manned aviation.

With the participation of Member States and following a long process of several meetings and discussions at the European level, the U-space regulatory package was approved by the European Union Aviation Safety Agency (EASA) Committee in February 2021. Subsequently, in April 2021 the European Commission adopted and published the policy package regulating U-space, which is made up of three implementing regulations whose new provisions will be applicable as of 26 January 2023.

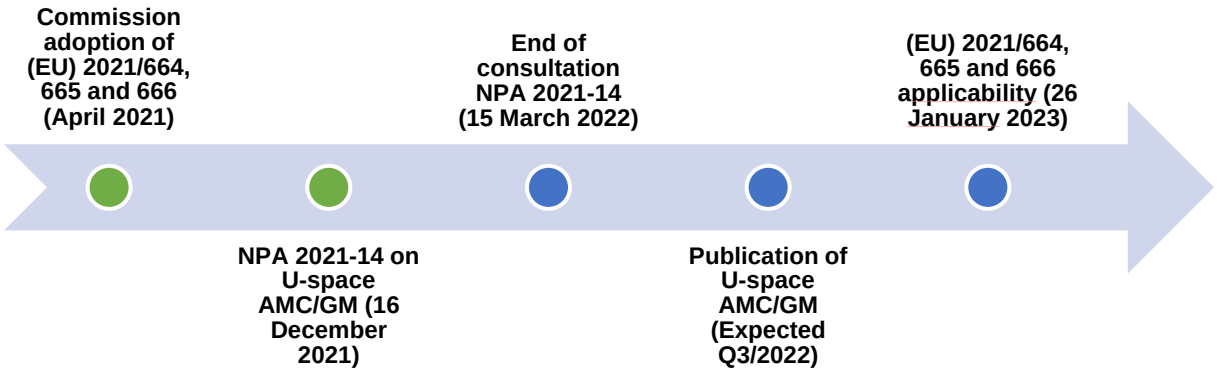


Figure 7 U-Space applicability timeline

4.2.2.2. U-Space Subgroup objectives and tasks

The main objectives of the U-Space Subgroup are:

- to connect LEAs to u-Space Discussion;
- to find out what the U-Space is and how it works and affects C-UASs;
- to connect with others networks and authorisation to understand how the system works.

4.2.2.3. U-Space Subgroup members

The following countries have made their contribution by working for the subgroup: Greece, Slovenia, Spain, Romania, Cyprus, Italy and representatives of INTERPOL.

4.2.2.4. Description of work conducted within U-Space Subgroup including meetings, survey and other activities

The survey on the U-SPACE concept concerning counter UAS employed by Law Enforcement Agencies (LEA) in the EU was disseminated through ENLETS UAS TIG members and NCPs. The aim was to analyse the state of play regarding counter-drone matters in MS to get a complete picture of the situation.

4.2.2.5. Recommendation for future activities

We can see, that the C-UAS area will evolve in the long term perspective. The active participation of LEAs in this process is very important to ensure public safety at the appropriate level. That's why we plan to be involved in of EU legislation process in UAS and C-UAS area. We want to strengthen cooperation between EU member states and build the experts network for exchange of good practices. We also want to share our experience and show to others that using of aerial space management tools and other information provided by U-Space, can improve public safety.

4.2.3. Forensics Subgroup

The subgroup forms a forum to share ideas, best practices, and investigational approaches to allow member countries to create and utilise drone forensics as part of an investigational response to a drone incident. Bring together law enforcement, industry, and academia to create a collaborative approach to drone forensics.

ENLETS create a collaborative platform and hosts virtual/physical meetings to advance drone forensics and engage with partners and projects that focus on this area to create a unified methodology and best practice in drone forensics.

The Leader of the Forensics Subgroup is **Christopher Church** (INTERPOL).

Christopher Church
INTERPOL

Christopher Church is a Senior Mobile Forensics Specialist within the Digital Forensic Laboratory at the INTERPOL Innovation Centre which is suited within the Global Cyber Complex for Innovation based in Singapore. Christopher's role involves supporting law enforcement in 190 member countries in the challenges they face undertaking digital forensics and tackling cybercrime.

He has been involved in digital forensics for 16 years and has diversified his expertise into looking at emerging technology and its implications for law enforcement. One of these areas has been drones, where he has been instrumental in helping INTERPOL and member countries understand the Threat, Tool and Evidence elements of drones. In June 2020, INTERPOL published the Framework for Responding to a Drone Incident, and this was published and distributed to all INTERPOL 194 member countries. In 2021 INTERPOL hosted the first Drone Countermeasure Exercise at Oslo International airport, where INTERPOL, Norwegian Police, Avinor and UASNorway tested twenty cUAS systems within an operating civilian international airport. INTERPOL is also part of Project Courageous, which is developing a framework for cUAS testing for law enforcement within Europe, and they currently head the ENLETS Drone Forensics TIG. Chris has gained considerable experience in drones and the associated issues in the last five years and is discussing and exploring the issue within member countries and within regional and international initiatives.

INTERPOL Innovation Centre provides a global view of emerging and technologically innovative solutions that law enforcement can utilise to enhance member countries capability in fighting, detecting and investigating crime.

4.2.3.1. Forensics Subgroup background and challenges

Digital forensics is used as evidence/intelligence in many criminal investigations, but with innovative technology such as drones, there is a knowledge gap between theoretical and operational capability.

INTERPOL Innovation Centre has published the Drone Framework for Responding to a Drone Incident for First Responders and Digital Forensic Examiners in 2020. Since then, there has been a considerable increase in drone threats faced by member states. However, using digital forensics in a drone incident is still limited. We hope that by producing an updated framework, we can increase the awareness and utilisation of drone forensics. ENLETS wishes to improve this and use the ENLETS and associated networks to further this work and assist member states in drone and associated device forensics. The new framework will be created by collaborating with industry, law enforcement and academia to promote and develop specific digital forensics capabilities that member states can utilise.

4.2.3.2. Forensics Subgroup objectives and tasks

Drones are proven to be valuable sources of information in most drone incident investigations. Therefore, the drone forensics subgroup wishes:

1. Establish an overview of member states' use of drone forensics and find experts to collaborate in this area.
2. Develop a forensic framework to share best practices and enable member states to use drone forensics in an investigation.
3. Aggregate and evaluate forensic solutions supporting drone forensic and related work.
4. Promote and share knowledge and expertise through appropriate mediums and forums.

4.2.3.3. Forensics Subgroup Members

The following countries have been identified for the Subgroup: Romania, Belgium, UK, Italy, Estonia and representatives of EUROPOL.

4.2.3.4. Description of work conducted within Forensics Subgroup including meetings, survey, and other activities

In 2021 INTERPOL shared the INTERPOL Framework for Responding to a Drone Incident for First Responders and Digital Forensics Specialists published in June 2020 and published globally. This publication intended to notify member countries of the threat from drones and an appropriate response created at the INTERPOL Drone Forensics Meeting held in Denver, Colorado, in 2018.

Since the publication of the Framework, it has been referenced by member countries/states in many published documents and mentioned in various meetings regarding drones since.

INTERPOL results

INTERPOL Innovation Centre (IC) has engaged with experts during 2021 to understand what areas could be improved and identify any areas that the framework should include. A majority of the feedback was very positive regarding the publication. In exploring this, specialists identified that the document covered the first responder area sufficiently, but as drone forensics has matured, this area needs to be updated. The papers should also mention and introduce some more information on techniques used to recover and analyse data from drones and provide sample forensic workflows for drones. INTERPOL has contacted several member states/countries that already utilise drone forensics to understand the training and content supplied to forensic examiners within these states/countries.

4.2.3.5. Recommendation for future activities

INTERPOL IC intends on starting introductory meetings for ENLETS Drone Forensics in the 1st Qtr. of 2022. The initial meeting will present an overview of the TIG and conclusions of the discussions held with drone forensic experts and establish the content for the ENLETS/INTERPOL Drone Framework for Digital Forensics Specialists (EIDFDFS). INTERPOL has received 144 applications from 47 countries to participate in the ENLETS Drone Forensics TIG. The participants are from industry, academia, and law enforcement, and they are all interested in understanding more about the program and how they can contribute.

INTERPOL IC has already received two submissions for consideration regarding how forensics tools work and an introduction to JTAG and chip off. Experts from academia and industry have written these documents to help share knowledge and expertise around digital forensics and its applications to drones.

INTERPOL IC is currently reviewing these documents to see if they are suitable for the EIDFDFS publication.

The work of ENLETS compliments the work of INTERPOL in drones ranging from C-UAS, regulation to forensics, and INTERPOL are looking forward to contributing to the group in 2022.

INTERPOL IC will host bi-monthly meetings to create the EIDFDFS and publish the framework in the 4th Qtr. 2022 or 1st Qtr. 2023.INTERPOL is engaged in various areas related to drones, from hosting an annual Drone Expert Group to being a partner in the European Funded Project Courageous, developing a selection, testing, and assessment criteria for C-UAS use by Law Enforcement.

INTERPOL Innovation Centre provides a global context to the drone threat and the associated technology challenges and solutions currently present in the drone sector. The Innovation Centre looks at the current and future threats, tools and evidence potential of any new or emerging technology and provides current and future foresight into this area.

4.2.4. Detection Subgroup

The detection subgroup cooperates with other ENLETS subgroups, supports Industry Days and follows the C-UAS topic to share best practices in the different involved field environments.

The Leader of the Detection Subgroup is **Alessandro Carini** (Italy).

Alessandro Carini
National Police

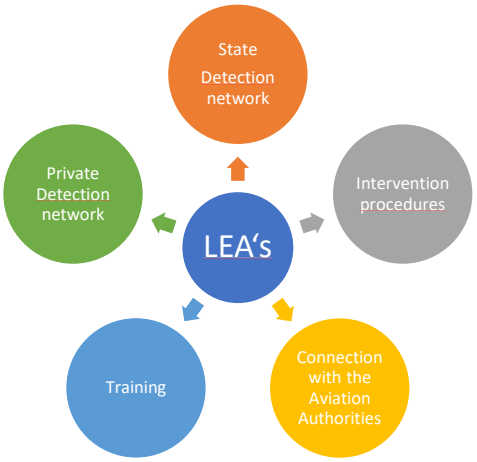
He works as deputy head of First Division of Territory Control Service of the Anti-Crime Directorate of Italian State Police in Rome. His operational experience extends from territory control techniques to antiterrorism investigation and include, from 2017, many police services related to mass gathering events with the specific duty to enforce law through the use of drones.

In his capacity as supervisor of the national framework, coordinating 106 field offices, he formulates the operational instruction for the Italian police control rooms in case of intervention for illegal drones.

4.2.4.1. Detection Subgroup background and challenges

There is a huge need for detection solutions to counter the malicious use of drones at or around critical infrastructures (such as airports, electric and nuclear plants) and mass gathering

events. Is commonly agreed to find common procedures in order to give the different involved parties the required level of awareness in order to respond appropriately.



As drone technology has not yet been fully proven or standardised, the industry would help LEA to find trusted common patterns. Under this point of view, a detection network has to be developed to the maximum possible extent making also use of private networks.

The involvement of aeronautical bodies must be carried out at the highest levels in order to ensure shared procedures for intervention and the exchange of data within their respective competencies. The level of awareness of LEAs must be increased in terms of operator training, including through the use of codified intervention procedures.

4.2.4.2. Detection Subgroup objectives and tasks

The main objectives of this Subgroup are:

1. to define the extent of the threat;
2. to focus on information sharing with operational police forces;
3. to establish collaboration paths with the private sector;
4. to improve operational procedures;
5. to contribute to training processes.

4.2.4.3. Detection Subgroup Members

The following countries have been identified for the Subgroup: Portugal, Cyprus, The Netherlands, Czech Republic, Finland, Slovenia, Slovenia, Spain, Belgium, Romania, UK, Estonia and representative of INTERPOL.

4.2.4.4. Description of work conducted within Detection Subgroup including meetings, survey and other activities

Due to pandemic restrictions as well as operative prerogatives of other police work the subgroup choose to discuss the relevant questions and formulate an initial survey via email. The final version of the survey was evaluated then within the ENLETS panel by video conference. The scope of the survey focus on the level of the threats, detection infrastructure, operative procedures, collaboration with other institutions and private industry and related training. ENLETS C-UAS TIG steering group accepted the result, placed the survey on an EU-platform and encouraged the member states to send in their answers.

22 LEA did provide answers, whereas in two countries two LEA provided separate answers. The UK was represented with one LEA. The Data provides good coverage of the situation in the EU (and the UK). In total 20 member states of the EU and the UK have provided their contributions yet.

The analysis was developed through a scalars analisys in order to definite a level of confirmation to every question:

- strongly agree - slightly agree - slightly disagree - strongly disagree
- for interpretation each scalar has been assigned a numeric value between 2 and -2

It took on the challenge do generate scalar statistics between -2 and 2 (for strong/slight disagreement to slight/strong confirmation) as general indicator to the situation out of a set of answers in respect to the relevant questions without disregarding the individual situation in the member states.

4.2.4.5. Recommendation for future activities

The threat is increasingly registered, and the sector requires additional resources, even more significant. To overcome the financial limits, ENLETS should recommend supporting an integrated policy in order to:

- enhance the sensor network dedicated to the detection of airspace violations.
- involve the private sector in order to facilitate the establishment of a national network through the interconnection of technological infrastructure in use (for the protection of strategic sites such as airports and energy production facilities)
- interconnect police operations rooms with detection systems.
- codify intervention procedures.
- involve aviation authorities in order to share, in real-time, information under their domain.
- increase first responder program for training.

4.2.5. Neutralisation Subgroup

The neutralisation subgroup within the ENLETS C-UAS TIG is committed to obtaining solutions to counter the big problem posed by the drone threat. It involves technological and police operations specialists, with the objective of defining the needs, gaps and current effective solutions available to facilitate police action that may occur in the phase of addressing the threat, once it has been detected. Neutralisation is possibly the main police action to take in many cases.

The Leader of the Neutralisation Subgroup is **Manuel Izquierdo Colmenero** (Spain).

Manuel Izquierdo Colmenero
Ministry of the Interior

He has been a civil servant in the Central State Administration since March 1980. He is a Technician (specialized in IT) in the National Police Corps, where he joined in June, 1987.

From June of 1987 to March of 2007, for almost twenty years, he was stationed at the Headquarters of the Directorate General of Police, holding the position of Analyst to the Director General of Police and Head of the Technological Support Service

From March, 2007 to September, 2018, he has held, without interruption, the position of Technical Director of the System for the Integral Monitoring of Gender Violence Cases (VioGen), in the Area of Training and Cooperation of the Secretary of State of the Ministry of the Interior.

His current position is as Head of Computer Projects at the Technological Centre for Security (CETSE) of the Secretary of State for Security, within the Ministry of the Interior.

Since September of 2018 he has held, uninterruptedly, the functions of Head of the Drones and C-UAS SES Department as well as Director of the Global Counter-Drone System Project

of the Secretary of State for Security (SIGLO-CD). This is the position he is currently occupying.

4.2.5.1. Neutralisation Subgroup background and challenges

Determining the police actions includes decision-making of the threat, and its consequent mitigation or neutralisation, based on information obtained and the specific situation. In addition, every police action must be reported, and the decision taken must be justified. Also, It is important to understand that the police action will be chosen after determining what will be the least damage caused by the operation.

The goal is to know the current situation in the ENLETS countries regarding drone neutralisation, both from an operational activities perspective and from the currently available equipment. All in all, we expect to exchange knowledge, lessons learned and best practices in this area, as well as identify current gaps that must be assessed from both national and international perspectives.

In short, we need to determine what is needed to bring us to an effective police action regarding neutralisation, and the precise possible police actions that can be implemented accordingly.

4.2.5.2. Neutralisation Subgroup objectives and tasks

The Neutralisation Subgroup objectives are:

1. To know the level of knowledge of the assistants - and of the personnel, they direct in their C-UAS office - about Jamming and Hacking technologies.
2. To know what studies have been carried out on the electromagnetic effect on other equipment of the Jamming equipment by each assisting country.
3. Edition of a document that gathers the different neutralisation solutions used by each attendee.
4. Gather the limitations of the solutions currently used by each assisting country.
5. Determine the neutralisation needs of each assistant, from the point of view of Public Safety.
6. To know the alternatives considered by each attendee and the work carried out in this regard at present by each attending country.
7. To know how the training of the operatives has been carried out, on the use of the acquired C-UAS equipment.
8. Determine the training that would be necessary to use a counter-UAS system in each participating country.

4.2.5.3. Neutralisation Subgroup Members

The following countries have been identified for the Subgroup: Portugal, Cyprus, The Netherlands, Czech Republic, Finland, Greece, Slovenia, Spain, Belgium, Romania, UK, Estonia and representatives of INTERPOL and EUROPOL.

4.2.5.4. Description of work conducted within Neutralisation Subgroup including meetings, survey and other activities

During the year 2021, different meetings have been held, within the Neutralisation subgroup, which has consisted of:

- debate on different technological and legal aspects of the use of neutralisation equipment;

- summary of actions taken by each Member State and
- presentations on specific topics, such as the test carried out by the Dutch National Police.

In short, each attendee with relevant information or willingness to make it known to the rest of the components of the subgroup, has communicated their point of view and actions carried out within their unit. All this, is in order to cover the objectives set at the beginning, and ultimately, to know what is necessary for effective police action on neutralisation and specify the possible policy actions that can be implemented.

The exchange of knowledge and experiences, within the subgroup, has made it possible to know:

- different points of view on the subject;
- solutions that could work;
- activities that are being carried out, in some countries, and that could be transferred to any other;
- common strengths and weaknesses, which must be addressed and
- possibilities of technological cooperation at the European level within the ENLETS C-UAS group.

Based on the information obtained, during these meetings, a questionnaire has been created that has been answered by all the attendees of the subgroup, among others – in total 18 representatives of member countries.

4.2.5.5. Recommendation for future activities

The activities carried out by this subgroup have made it possible to know the approaches, experiences and knowledge of each unit of member states. This enables the interchange of information, in order to address the drone threat in an efficient and prompt manner. The following activities have been identified, which, at a minimum, are necessary to carry out as a continuation.

It has been noted that some Member States have a great deal of experience in C-UAS systems, but that, on the contrary, other countries are at a very early stage of addressing the problem. That is, there are great differences between police units from different countries in the current state of drones threats that they are facing. For this reason, the exchange of information is crucial to shorten the learning and planning period, as well as joint action at the European level to address the problem.

Likewise, responses have been obtained in the questionnaire that notify the need **to determine the minimum level of technology necessary** to face the threat. For example and for this reason, the suitability or not of:

- fixed neutralisation units in front of portable;
- the activation of the neutralisation units by SW, interconnected with detection units.

Finally, police operations are conditioned by a technology that is not yet in a mature state of development, and it is of the utmost importance to reduce this dependence. In this line, at the operational level, it would be convenient to determine at the European level, (i) what information is considered crucial to be able to activate the neutralisation units, (ii) if this information could really be available through detection units or not, (iii) if the information obtained by other sources would be necessary, (iv) how it could be integrated to obtain a diagnosis of the threat in real-time to support the police operation, and (v) what feasible solutions could be proposed and implemented in this line.

4.2.6. EU-Projects Subgroup

The EU Projects Subgroup connects current and previous EU projects concerning C-UAS topics as well relevant EU Law Enforcement Working Party (LEWP) networks with help of DG HOME.

The Leader of the EU-Projects Subgroup is **Dr. Jarmo Puustinen** (Finland).

The following presentations took place during the regular C-UAS TIG meetings where projects and networks presented their activities:

- **Presentation of Skyfall project aims, activities and practical outcomes - Eelco Hottenga**

Project Skyfall is funded by the EU Internal Security Fund-Police program. As the overall use of drones becomes more common, authorities have to give a correct response to this upcoming trend. The goal of project Skyfall is to give an appropriate response to the misuse of drones.

Currently there are several C-UAV systems available on the market, but there is still no 'one size fits all' solution. Skyfall will study the different C-UAV systems and integrate the best systems on the market in a training for law enforcement organisations.

Within project Skyfall, a C-UAV training will be developed to respond to drone-related incidents. This training will be open to law enforcement organisations of all EU member states.

More information can be found here.

- **Presentation of DroneWise project aims, activities and practical outcomes - Jeroen van der Burgt**

DroneWISE develop a holistic first-responder agency command, control and coordination strategy, underpinned by evidence-based training for the counter-terrorism protection of public spaces. DroneWISE serves to increase the preparedness of first-responder agencies to better coordinate their efforts, significantly improving the protection of public spaces and coordinated response to a terrorist attack using UAVs.

The strategic aim of the project is to significantly improve the security of public spaces by enhancing the cooperation and coordination between first responder agencies to effectively plan against and manage the aftermath of a terrorist attack by the use of UAVs.

DroneWISE is constituted of 6 partners representing 5 member states including Bulgaria, Croatia, Estonia, Germany and Greece, bringing forward a broad European perspective.

More information can be found here.

- **EU JRC Drone Project; Counter UAS for Critical Infrastructure and public spaces. "Living lab" experiences – Paul Hansen, Project Manager, Joint Research Center**

The Joint Research Centre is the Commission's science and knowledge service. The JRC employs scientists to carry out research in order to provide independent scientific advice and support to EU policy.

The DRONE project reviews passive and active Counter UAS technologies, and the application of these technologies to ensure the security of citizens and Critical Infrastructure. The aim is to provide expert advice to the Commission, supporting initiatives to counter non-cooperative UAS.

JRC DRONE Project

Counter UAS for Critical Infrastructure and public spaces

- **AIRPOL introduction and drone activities - Peter Nilsson, Head of Airpol, Police Commissioner**

AIRPOL is the Law Enforcement Network created to build synergies for police and border guard units working in the fight against crime in the European aviation sector.

The mission of AIRPOL is to enhance, through its activities, the overall security in EU airports and the civil aviation domain by optimising the effectiveness and efficiency of airport and aviation-related law enforcement and border guard issues, and by contributing to a more harmonised approach of enforcement in this domain.

Through the activities of the AIRPOL project and network, a significant and lasting added value is to be generated in the prevention of and the fight against criminal activities in the European aviation sector. Airpol's mission is to actively increase the safety and security within Airport Policing, Aviation Security and Air Border Security.

More information can be found here.

- **Presentation of the ATLAS Forum Innovation overview – Thomas Vahrner**

ATLAS
ARC TRAINING CENTRE
LIGHTWEIGHT AUTOMOTIVE STRUCTURES

In close collaboration with domestic and international university and commercial partners, ATLAS train a new cohort of industry-ready researchers through an integrated program of projects spanning lightweight materials, functional multi-material structures, design and advanced manufacturing as well as a whole of life assessment.

The creation and transfer of cutting edge knowledge and skills in light weighting will assist the industry to innovate and create new product offerings and design solutions aimed at reducing transportation-related CO^2 emissions. Whilst projects are aimed at improving the competitiveness of the automotive sector in the first instance, longer-term, the research skills

and technologies developed will undoubtedly assist related industry segments like defence and construction.

More information can be found here.

- **Interpol experience of counter actions and drone forensics – Christopher Church, Digital Forensics Lab Interpol Global Complex for Innovation**

The International Criminal Police Organization, commonly known as Interpol is an international organisation that facilitates worldwide police cooperation and crime control. Headquartered in Lyon, France, it is the world's largest international police organisation, with seven regional bureaus worldwide and a National Central Bureau in all 195 member states.

Interpol provides investigative support, expertise, and training to law enforcement worldwide, focusing on three major areas of transnational crime: terrorism, cybercrime, and organised crime. Its broad mandate covers virtually every kind of crime, including crimes against humanity, child pornography, drug trafficking and production, political corruption, intellectual property infringement, and white-collar crime. The agency also facilitates cooperation among national law enforcement institutions through criminal databases and communications networks. Contrary to popular belief, Interpol is itself not a law enforcement agency.

More information can be found here.

- **Presentation of EU funded project ALADDIN - Jehan-Christophe Charles**

The overall concept of the ALADDIN project is the development of a seamless, tightly integrated system for countering malicious drones. Therefore, the project study and assess existing relevant technologies, regulations and SoEL implications in order to design, implement, integrate, and demonstrate a scalable platform extending state-of-the-art capacity for the detection, localisation, and neutralisation of UAVs with unprecedented accuracy and effectiveness. Technical developments are constantly guided by the advice on operational aspects provided by the end-user component of the ALADDIN consortium.

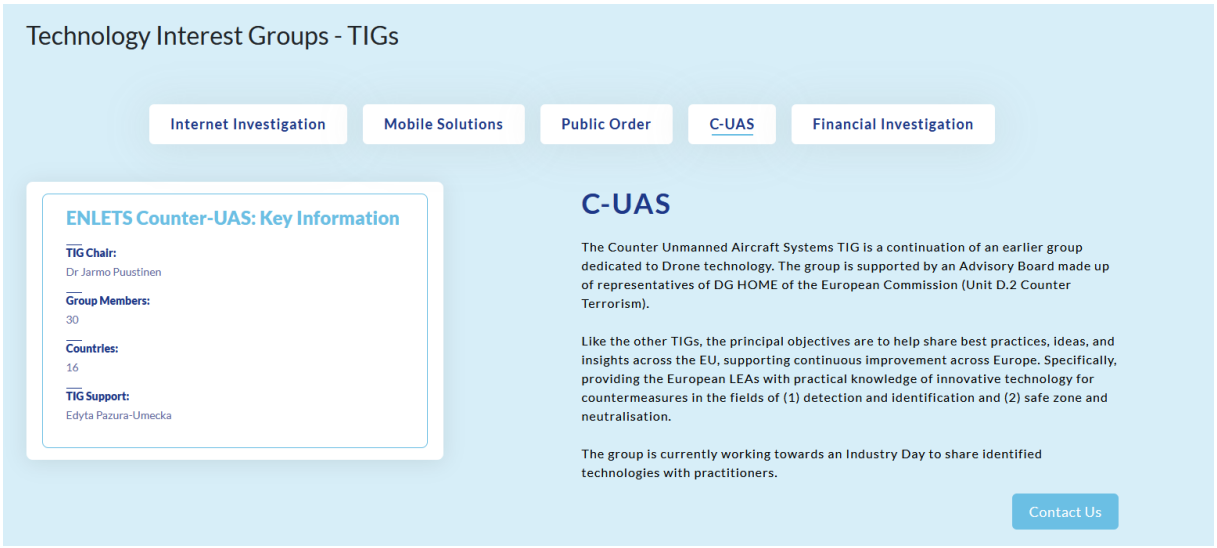
More information can be found here.

4.3. Communication, Dissemination & Exploitation activities

The ENLETS C&D strategy provides an overview of both internal and external actions necessary to unite the various spokes of ENLETS, sharing targeted and consistent information coherently and professionally. The following communication and dissemination methods and channels were used for the C-UAS TIG communication, dissemination & exploitation activities:

4.3.1. ENLETS website

The ENLETS website[3] is a central hub of information and typically the first touchpoint for interested parties. There we can find key information about the C-UAS TIG itself, news and events as well.



[3] https://enlets.eu/

4.3.2. ENLETS newsletter

The ENLETS newsletter includes regular content to update the ENLETS community with the progress of the various TIGs and general developments. So far, eight ENLETS newsletters (#1; #2; #3; #4; #5; #6; #7; #8) containing information in a concise and attractive manner about the C-UAS TIG current and future activities have been distributed. The assumption is to encourage the readers and engage further with other activities.

4.3.3. Stashcat application

Participating in discussion and ongoing dialogue is fundamental to the success of ENLETS, particularly the TIGs. The C-UAS TIG uses a dedicated channel on the Stashcat[4] platform. Stashcat provides a space where our TIG members can chat and collaborate on their work topics and continue conversations between meetings. The application offers encrypted messaging, and PPHS, ENLETS Secretariat, administer the spaces dedicated to ENLETS. It can provide a safe, secure area that provides C-UAS TIG members with the freedom to discuss topics related to their work and establish relations with likeminded individuals working across Europe. The #Drone and C-UAS Technology Interest Group channel currently have 37 active members.

4.3.4. EU-LISA repository

Due to the Group members' need, a repository for the C-UAS TIG that is part of the ENLETS space on the EU-LISA[5] server was launched. EU-LISA is the EU agency that operationally

[4] https://stashcat.com/en/
[5] https://www.eulisa.europa.eu/

manages the largest IT systems in the Union. The purpose of having a repository is to store documents related to the current activity of TIG and to avoid sending often heavy attachments (e.g. from TIG meetings) in favour of sending a link with access to them. A access to the repository will require double authorisation: email and phone number.

5. Summary and next steps

After the first phase of work, we can see that the work is ongoing and that still requires a great deal of cooperation from industry, research, law enforcement, networks and projects. At the moment, we have different pieces of response from different stages, but a whole chain that starts with the observation of the target and ends with the choice of the target being able to be taken down safely is still in progress. Likewise, our strong assumption is that at present the various detection systems need a comparative observation system alongside each other to support each other in order to obtain the best possible situation in the environment. This will ensure a better perception of the sites around.

The need for law enforcement is twofold; find solutions that can be built in place and quickly move. The key objective is that the law enforcement authority has the equipment to be able to extract dangerous-behaving items from other safe-flying destinations.

Together, we can say that the built urban environment is a challenge for counter-action. Presentation of equipment to law enforcement authorities often takes place in open locations where there are no other blind spots than the city in the environment. One important development, therefore, would be to define for industrial operators certain requirements and standards needed by law enforcement authorities to ensure that the equipment is operational. In this way, law enforcement authorities will be able to save a lot of resources and time when they have access to up-to-date information on equipment that meets the basic requirements of the operating environment. In addition, from the point of view of the law enforcement authority, the equipment to be transferred should be so automated with regard to the calibration of parameters that separate engineering skills would be unnecessary for the installation of the equipment in a new operating environment.

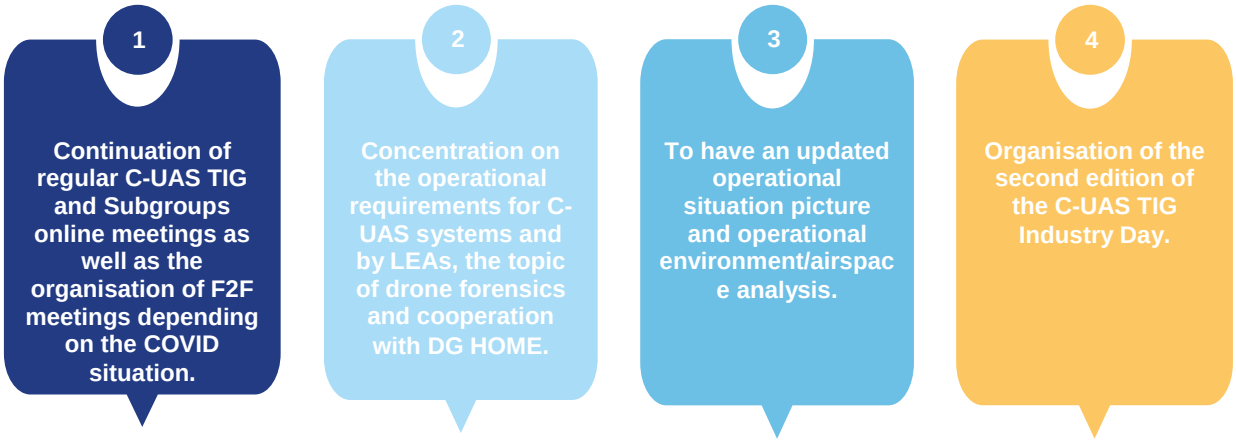
During the programming period, the ETP has also increased its understanding of the "U-Space" package and has also looked at the authorities that are contributing to the issue. It is important for the law enforcement authority to be involved in understanding the entities it should also prepare for. This provision is made effectively in advance, thus saving financial resources, and the measures are well-targeted.

The starting point from the LEA perspective is that legislation and advanced guidance will reduce unnecessary countermeasures, thereby saving the response resources of the authorities.

It has been noted that some Member States have a great deal of experience in C-UAS systems, but that, on the contrary, other countries are at a very early stage of addressing the problem. This implies a significant difference in the current state of police units from different countries in combatting the drone threat.. For this reason, the exchange of information is crucial to shorten the learning and planning period, as well as joint action at the European level to address the problem.

During the next Trio Program, our plan is to focus mainly on operational requirements. We have also recognised the importance of an up-to-date situation picture and the importance of the air space observations, as an analysis of the situation of what is happening in our lower airspace.

Priorities for the next program:



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DETECTION SUBGROUP

The ENLETS Group dedicated to Unmanned Aircraft Systems (Drones)

Description of tasks/objectives

The subgroup will:

- define the extent of the threat;
- focus on information sharing with operational police forces ;
- establish collaboration paths with the private sector;
- improve operational procedures ;
- contribute to training processes.

What is the Sub Group?

There is a huge need for detection solutions to counter malicious use of drones at or around airports and critical infrastructures.

Is commonly agreed to find common procedures in order to gives the different involved parties more warning to respond appropriately.

Drone technology has not yet been fully proven or standardized and industry would help LEA to find trusted common patterns.

The strategy will support the plan to mitigate the malicious and criminal use of drones that threatens airports, government establishments, critical infrastructure and public safety.

If you would like to join this Sub Group, please contact:

SUBGROUP LEADER:

Alessandro Carini, Italy
Alessandro. carini@poliziadistato.it

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Remotely Piloted Aircraft Systems (RPAS) are a growing subsector of civil aviation.

Growing numbers of commercial drone units in use in Europe

Growing numbers of pilot certificates issued

Number of drones in Europe expected to reach 200.000 by 2025

Industry is evolving quickly, from smaller platforms to Next Generation cargo and passenger-capable RPAS

Increase of mini and micro drones (less than 250g)

With growth presents safety and security issues;

Careless, Clueless and Criminal

Airport incursions, risk to aircraft/infrastructure/general public

BVLOS

Homemade drones

Free comment field.

Airports have reported an increase in the number of RPAS sightings in and around their vicinity as well as at various critical infrastructure facilities

The Gatwick incident, and other incidents around the world as well as growing concerns over future challenges associated with RPAS risk and the emerging trend of ‘disruption’ led to the creation of a specific observatory

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NEUTRALIZATION SUBGROUP

The ENLETS Group dedicated to Unmanned Aircraft Systems (Drones)

What is the Sub Group?

The neutralization subgroup within the ENLETS C-UAS group is committed to obtaining solutions to counter the big problem posed by the drone threat. It involves technological and police operations specialists, with the objective of defining the needs, gaps and current effective solutions available to facilitate police action that may occur in the phase of addressing the threat, once it has been detected. Neutralization is possibly the main police action to take in many cases.

The goal is to know current situation in the ENLETS countries regarding drone neutralisation, both from operational activities perspective and from the current available equipment. All in all, we expect to exchange knowledge, lessons learned and best practices in this area, as well as identifying current gaps that must be assessed from both national and international perspectives.

In short, we need to determine what is needed to bring us to an effective police action regarding neutralization, and also precise the possible police actions that can be implemented accordingly.

Free comment field.

By working together, we can unite the effort already performed by each member state, avoid making the same work and falling down on the same mistakes, and expedite the process of exploring neutralization solutions.

If you would like to join this Sub Group, please contact:

SUBGROUP LEADER:

Manuel Izquierdo Colmenero, Spain
mic@interior.es

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Description of tasks/objectives:

Objective No. 1. To know the level of knowledge of the assistants - and of the personnel they direct in their C-UAS office - about Jamming and Hacking technologies.

Objective No. 2. To know what studies have been carried out on the electromagnetic effect on other equipment of the Jamming equipment by each assisting country.

Objective No. 3. Edition of a document that gathers the different neutralization solutions used by each attendee.

Objective No. 4. Gather the limitations of the solutions currently used by each assisting country.

Objective No. 5. Determine the neutralization needs of each assistant, from the point of view of Public Safety.

Objective No. 6. To know the alternatives considered by each attendee and the work carried out in this regard at present by each attending country.

Objective No. 7. To know how the training of the operatives has been carried out, on the use of the acquired C-UAS equipment.

Objective Nº 8. Determine the training that would be necessary to use a counter-UAS system in each participating country.

Free comment field.

Determining the police actions includes decision-making of the threat, and its consequent mitigation or neutralization, based on information obtained and the specific situation. In addition, every police action must be reported, and the decision taken must be justified. Also, It is important to outstand that the police action will be chosen after determining what will be the least damage caused by the operation.

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REGULATIONS SUBGROUP

The ENLETS Group dedicated to Unmanned Aircraft Systems (Drones)

Description of tasks/objectives

The regulation subgroup operates in the difficult and contested EU delegated and nationally retained policy fields of air traffic law and security law.

Therefore a staged approach into security law is envisioned:

1st get an overview of the specific police regulation in countering UAS

2nd develop a short survey to find out where to concentrate on

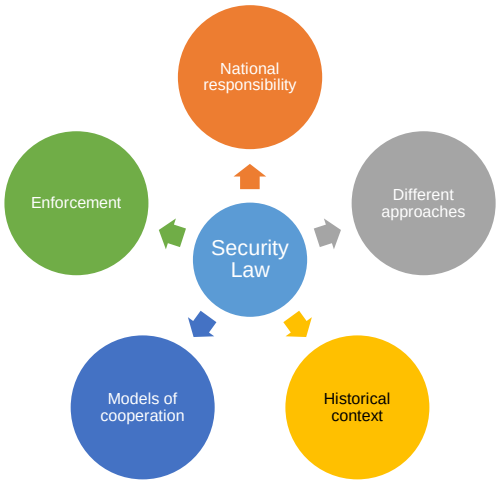
3rd aggregate and evaluate the results to suggest further fields of exploration

4th extract possible fields of activity to present to EUCOM

What is the Sub Group?

The subgroup will form as a forum to find and evaluate regulative ideas, regulative approaches and active regulations to determine the scope of necessary support by ENLETS.

For this purpose systematic and analytic skills as well as eloquence are most welcome.



If you would like to join this Sub Group, please contact:

SUBGROUP LEADER:

Dirk-Heinrich Bothe, Germany
Dirk-Heinrich.Bothe@polizei.bund.de

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Background information

Air law is an EU-delegated policy-issue and already well elaborated concerning UAS. Therefore the options for influencing regulations in favour of LEA are very scarse.

On the other hand security is a policy-field which falls in the national responsibility. The EU can only suggest recommendations to harmonize the partly very different national regulations. Despite of that it is necessary to focus on regulations which allow the use of technology e.g. in the city area and make sure that every LEA has the same options.

Different member states have different approaches and limitations. For example there are already regulative ideas to transfer the responsibility for the negative effects of the neutralization on drone operators.

Challenges

Operationally it is more difficult to detect and arrest the operators/pilots of drones - as the originator of a drone-threat - than neutralizing drones themselves.

Regulation should take into account the formulation of appropriate warrants as well as measured approaches to prevent risks of harming third parties during the neutralization of drones.

The main challenge is to find best practices to regulative approaches, mainly those which are already set into law or even better proven by court decisions.

Finish Line

The subgroup will aim on suggesting possible recommendations to be made by EUCOM for the purpose of harmonizing and foster interoperability of cUAS LEA units.

The most satisfying experience should be to find the recommendations depicted as EU-Regulation in the Law Gazette.

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DRONE FORENSICS SUBGROUP

The ENLETS Group dedicated to Unmanned Aircraft Systems (Drones)

Description of tasks/objectives

Drones are proven to be valuable sources of information in the majority of drone incident investigations.

Therefore, the drone forensics subgroup wishes to:

1st - Establish an overview of member states use of drone forensics and find experts to collaborate in this area.

2nd - Develop a forensic framework to share best practices and enable member states to use drone forensics in an investigation.

3rd - Aggregate and evaluate forensics solutions that support drone forensic and related work.

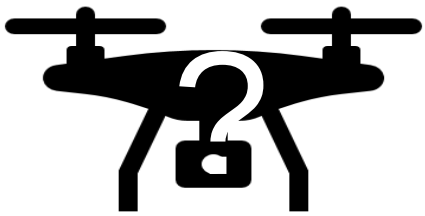
4th - Promote and share knowledge and expertise through appropriate mediums and forums

Scope of Work

The group aims to share best practices and challenges to enable member state collaboration and expertise.

- Forensic Recovery of Drone data and Associated Devices
- SOPs and Guidelines
- Data Processing and Analysis

To aid member countries in the recovery of data and identifiers from drones and associated equipment



If you would like to join this Sub Group, please contact:

SUBGROUP LEADER:

Chris Church, INTERPOL
c.church@interpol.int

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Background Information

Digital forensics is used in many criminal investigations but with new technology such as drones there is a knowledge gap between theoretical and operation capability.

INTERPOL published the Drone Framework for Responding to a Drone Incident for First Responders and Digital Forensic Examiners in 2020 and since then there has been a huge increase in drone threats faced by member states but the ability to use digital forensics in a drone incident is still limited. ENLETS wishes to improve this and use the ENLETS and associated networks to further this work and assist member states in drone and associated device forensics. This will be accomplished by collaborating with industry, law enforcement and academia to promote and develop specific digital forensics capabilities that can be used by member states.

What is the Sub Group?

The subgroup will form as a forum to share ideas, best practices and investigational approaches to allow member countries to create and utilise drone forensics as part of an investigational response to a drone incident. Bring together law enforcement, industry and academia to create a collaborative approach to drone forensics.

ENLETS will create a collaborative platform and host virtual/physical meetings to advance drone forensics and engage with partners and projects that focus in this area to create a unified methodology and best practice in drone forensics.

INTERPOL DRONE FRAMEWORK

SCAN ME

Finish Line

The subgroup will aim to publish an updated digital forensics framework and associated work packages to ensure member states can apply drone forensics to a drone incident to help identify the drone, pilot and flight data to aid an investigation.

The Sub Groups operate as part of European Network Of Law Enforcement Technology Services financed by ENLETS Technology Programme for years 2018-2021.

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Date: 22/03/2022 06:29:32

ENLETS C-UAVs TIG

Questionnaire to analyzing the gaps and needs of LEAs regarding to C-UAVs technological solutions and law regulations

Fields marked with * are mandatory.

Dear ENLETS C-UAV TIG Members,

Below we present you with a survey questionnaire with open-ended questions which we kindly ask you to fill in. The questionnaire consists of four thematic blocks:

1) The Current situation of C-UAV in your country;
2) Law regulations regarding C-UAV;
3) Challenges regarding C-UAV in your country;
4) Needs regarding C-UAV from your point of view.

The survey results will contribute to understanding the current state of drone countermeasures from the European Law Enforcement point of view, as well as the needs and current challenges. Moreover, the results of the survey will contribute to the proper planning and organization of the ENLETS C-UAV Technology Interest Group activities, as well as to the organization of C-UAV Industry Days this year.

The fulfilling of the questionnaire should take you approximately 30-45 minutes. We kindly ask you to fill it in diligently **until 9th April 2021.**

If you have any substantive questions, please contact the TIG Group Leader Mr Jarmo Puustinen (e-mail: Jarmo.Puustinen@poliisi.fi).
If you have technical or organizational questions, please contact the TIG secretariat: Edyta Pazura-Umecka

(e-mail: edyta.pazura@ppbw.pl), Klaudia Kaczmarek (e-mail: klaudia.kaczmarek@ppbw.pl).

Thank you for completing the survey!

Yours sincerely,
Jarmo, Edyta, Klaudia

GENERAL INFORMATION

Please provide the following informations:

* Name and surname

* Institution

* Country

1. CURRENT SITUATION OF C-UAV IN YOUR COUNTRY

1. What are the key C-UAVs technological solutions presently used by your institution/Law Enforcement Agencies regarding:

* **a) detection and identification?**

* **b) ensuring safe zone and neutralization?**

* **c) autonomous systems 24/7 detection/identification/neutralization ensuring security of critical infrastructure and mass events etc.?**

* **2. Are drone-jamming technologies available in your country/ Police agency? If yes please briefly describe these technologies.**

* **3. Are drone-spoofing technologies available in your country/ Police agency? If yes please briefly describe these technologies.**

* **4. Are kinetic action technologies for C-UAV available in your country? If yes please describe these technologies.**

* **5. Are drone forensics developed in your country?**

* **6. Are LEA involved for the U-Space discussion in your country in national level or EU level?**

2. LAW REGULATIONS REGARDING C-UAV

* **7. What is the key counter-drone law regulation in your country?**

* **8. Do you have valid law or regulation policy of drone use in your country?** *Please list and briefly describe.*

* **9. Are there U-SPACE law regulations in your country and procedures directed to LEAs?**

* **10. Do you think that the standardization of EU law for drone use and Counter drone measurement would be helpful in your daily job?** *Please shortly describe your opinion.*

3. CHALLENGES REGARDING C-UAV

* **11. What are the biggest challenges in your country in regards to C-UAVs technological solutions (regarding to detection, identification, safe zone, neutralization)?**

* **12. What are the biggest challenges in your country regarding to C-UAVs law regulation, taking into account European and national law?**

4. NEEDS REGARDING C-UAV

* **13. What are the needs in your country regarding to C-UAVs technological solutions in the area of detection and identification, as well as safe zone and neutralization?**

* **14. What are the most important priorities in your country regarding C-UAVs technological solutions in the area of detection and identification?**

* **15. What are the most important priorities in your country regarding C-UAVs technological solutions in the area of ensuring safe zone and neutralization?**

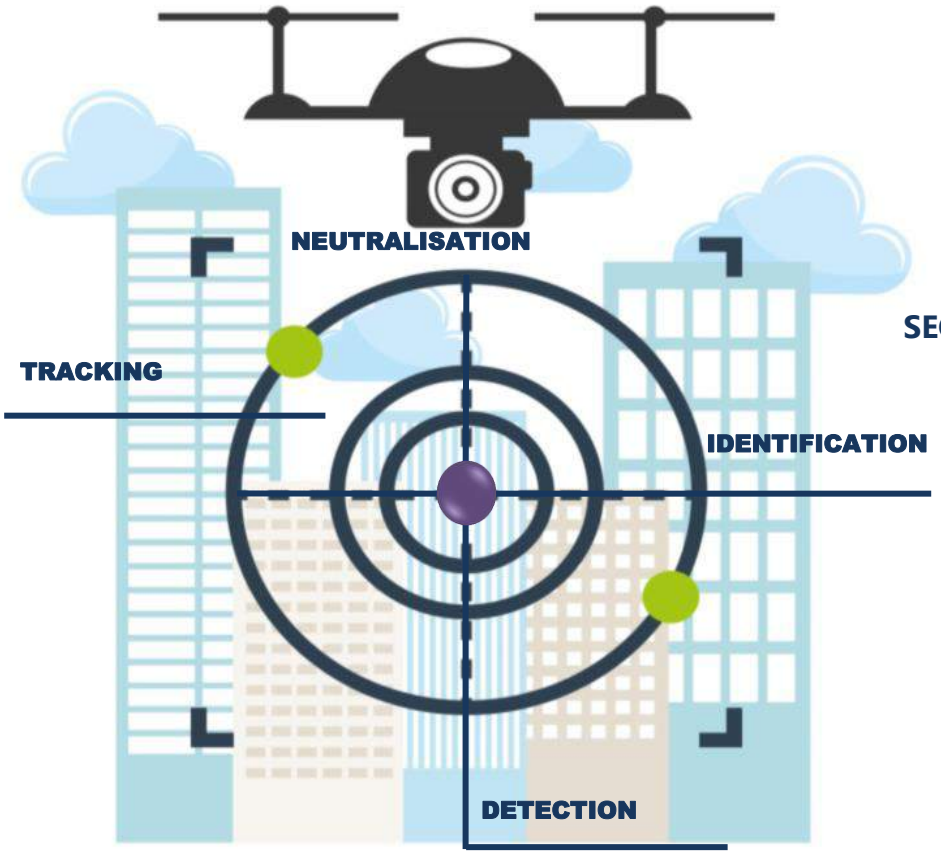
Contact

Contact Form

C-UAS Industry Day

30th June 2021, online

PUBLIC REPORT



INDUSTRY

SECURITY PRACTITIONERS

EU REGULATIONS

DETECTION | IDENTIFICATION | NEUTRALISATION | TRACKING

Table of content

1. Event overview

The C-UAS Industry Day was organised by the Counter-Unmanned Aircraft Systems Technology Interest Group (C-UAS TIG), which is part of the European Network of Law Enforcement Technology Services (ENLETS). ENLETS' main goal is to operationally strengthen Law Enforcement (Police) with the use of modern Technology and Development by exchanging information, experience and knowledge on a practical communication level. Find more about ENLETS here.

Due to the COVID restrictions, the C-UAS Industry Day was organised in an online formula.

C-UAS Industry Day in numbers

50 participants attending the event

LEA representatives from **19** European countries

12 C-UAS technologies presented

The goal of the C-UAS INDUSTRY DAY was to present available counter-drone technological solutions to Law Enforcement Agencies. Moreover, the aim was to provide an atmosphere and environment for collaboration and discussion about counter UAS technology and the needs of Law Enforcement. Together with LEAs and Industry, we strive to forge mutually beneficial relations between industry experts and law enforcement specialists in counter drone matters.

Focus areas

The event covers the entire chain of countering unmanned aircraft systems in **built-up areas**. Therefore, the solutions that cover the following threat areas were presented:

- **DETECTION**
- **IDENTIFICATION**
- **TRACKING**
- **NEUTRALISATION**

Hosts and presenters

The C-UAS Industry Day was hosted by:

Steven Ormston
Polish Platform
for Homeland Security

Dr. Jarmo Puustinen
Ministry of the Interior, Finland
C-UAS TIG Leader

During the event, there were two accompanying presentations - one on the ENLETS network and another on counteracting drones from the perspective of the European Commission. These were presented by:

- **Patrick Padding -** ENLETS Core Group Leader
- **Lars Huybrechts -** DG HOME D.2 Counter-Terrorism

2. Technology presenters

Within the one-day event, the organisers decided to schedule 20 minutes time slots for presenters – maximising the number of presenters. The timeslot consisted of 15 minutes presentation and 5 minutes Q&A session. The breaks between presentations were limited and the activity time was maximised.

The agenda of the event looked as follows:

C-UAS Industry Day

30th June 2021, time: 9:30 – 15:30 CET, online
Organiser: ENLETS COUNTER UAS's TIG
Target Group: LEA's (registration needed in advance)

AGENDA*

9:30 – 9:40	Opening the meeting, welcome speech		
9:40 – 9:55	ENLETS network	12:16 – 12:36	DroneCatcher
9:55 – 10:05	C-UAS in European Commission perspective	12:39 – 12:59	Blighter A800 3d Drone Detection Radar
Presentation of the technology		12:59 – 13:30	LUNCH BREAK
10:08 – 10:28	Gradiant	13:30 – 13:50	H.P. Wuest GmbH Jamming Solution
10:31 – 10:51	SkyPatriot	13:53 – 14:13	Dropster C-UAS net-pistol
10:54 – 11:14	Robin Radar sensors ELVIRA®, IRIS®	14:16 – 14:36	TELEFONICA
11:14 – 11:30	COFFEE BREAK	14:39 – 14:59	ADRIAN
11:30 – 11:50	DroneShield	15:02 – 15:22	AEORUM
11:53 – 12:13	SkyWall	15:22 – 15:30	Summarising and closing

*Between the presentations of the technology 3 minutes to switch presenters are planned.

DETECTION

TRACKING

NEUTRALISATION

GRADIANT

Galician Research and Development Center for Advanced Telecommunications

COMPANY DESCRIPTION

Gradiant is an ITC provider with a highly-skilled task force of over a hundred people located in Spain. It incorporates its vision and knowledge of telecommunication technologies into the processes and products that companies develop. Gradiant brings its expertise from the point of view of connectivity, intelligence, and security to work hand in hand with the industry from its surroundings.

TECHNOLOGY SOLUTION PRESENTED

Counter UAS by Gradiant can automatically detect, classify, track and neutralise drones within a security perimeter, thus guaranteeing infrastructure and people protection. Its system is modular, scalable and decentralised and can operate 24/7, either autonomously or commanded by an operator. Gradiant's Counter UAS integrates complementary detection, analysis and neutralisation technologies in 4 independent modules and has been deployed in real scenarios.

GRADIANT's system is specially conceived for security and defence at airports, prisons or correctional facilities, government buildings, for the security of recreational or sporting events; and to be used by armies or security forces. Counter UAS by Gradiant guarantees protection against drone attacks in a security perimeter, avoiding potential damage to critical infrastructures or civilians.

Presented solutions:

SMARTEAR+	SMARTEYE+	REPULSE
Drone detection, identification and tracking module based on radiofrequency.	Module for identification and tracking based on computer vision.	Protection system against drones that operates creating an invisible shield with a radius of over 1km (vertically and horizontally) where drones cannot operate.

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DETECTION

IDENTIFICATION

TRACKING

Rinicom Intelligent Solutions Ltd

COMPANY DESCRIPTION

Rinicom Intelligent Solutions Ltd (RIS) is a spin-out from Rinicom Ltd, aiming to utilise unique experience and experience in developing AI and video analytics solutions for security applications. In a short time since their incorporation, Rinicom's C-UAV products, with embedded AI solutions, have gained recognition on the market and Rinicom has a number of worldwide real-life installations with high-profile customers.

TECHNOLOGY SOLUTION PRESENTED

SkyPatriot is a versatile AI-enhanced optical drone detection system capable of operating standalone or integrated with radar or RF sensors. It detects, tracks and classifies drones, birds, aircrafts, vehicles and humans and recent addition to the system allows it to estimate the weight of a drone payload. Rinicom's AI algorithm is camera-agnostic and can operate with third party cameras, making SkyPatriot scalable for various operational scenarios.

SkyPatriot is very versatile. It can operate standalone or as a part of the bigger C-UAV system. Numerous installations include large international airports, Remote Towers, Military bases, Prisons, Critical Infrastructure (governmental buildings, power stations). It works both in urban and rural environments.

To optimise return on C-UAV investment, Rinicom - together with OSL - are developing algorithms that could expand the capabilities of C-UAV system in the detection and classification of other targets (such as humans, vehicles) in the predefined areas.

Classification

- InSight

Detection, Classification and Tracking

- Sector 180/360
- Sector30
- Hunter

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DETECTION

ROBIN RADAR SYSTEMS BV

COMPANY DESCRIPTION

A Netherlands-based technology leader in tracking and classification of small objects. Robin's mission is to provide actionable information that increases safety and security. They do that by combining affordable sensors with smart software. The demand for high-performing drone detection and intervention methods continues to increase - therefore Robin's purpose-built drone detection radars, ELVIRA® and IRIS®, can automatically distinguish birds from drones.

TECHNOLOGY SOLUTION PRESENTED

ELVIRA® radar delivers the capability and price level that meets the needs of the professional security market, on a global scale. It is the primary choice of Governments, Police, Airports, Prisons and other critical infrastructures for the protection against drone intrusions.

IRIS® adds 60-degree target elevation coverage, increases performance and comes in a small and lightweight package. It is well-placed in both the global security and defence market.

Both IRIS® and ELVIRA® cover a full 360-degrees and come with a standard instrumented range of five kilometres.

Both solutions offered by Robin are suited to prevent: near misses and collisions between planes and drones at airports, disturbance at public events, weapon and drug smuggling into prisons, espionage or damage to critical infrastructures, cybersecurity breach, espionage and disruption of government employees and VIP's, damage to harbours and ports as well as ensure privacy and safety on superyachts. Both radars can be easily integrated into a sensor network.

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DroneShield

COMPANY DESCRIPTION

DETECTION

IDENTIFICATION

TRACKING

NEUTRALISATION

DroneShield (ASX:DRO) is an Australian publicly listed company with its head office in Sydney and teams in the US and UK. It is specialising in C-UAS, Electronic Warfare, RF sensing, Artificial Intelligence and Machine Learning, Sensor Fusion, rapid prototyping and MIL-SPEC manufacturing. DroneShield's capabilities are used to protect law enforcement, military, Government, critical infrastructure, commercial and VIPs throughout the world.

TECHNOLOGY SOLUTION PRESENTED

DroneShield provides a complete range of patrol, vehicle-based and fixed site C-UAS solutions. RfPatrol and DroneGun are patrol products, DroneSentry-X is the vehicle product, and DroneSentry is the fixed site product.

The typical setting ranges across patrol, convoy, forward deployment and fixed site security C-UAS solutions. For example, the Australian Federal Police uses DroneShield's products for event security, airport security, and other temporary and permanent applications.

BODY-WORN & HANDHELD SOLUTIONS

Effective detection and mitigation solutions for Counter-Drone and the threat smart doorbells pose to agents.

- **RF PATROL** – used to detect the presence and protocol of smart doorbells
- **DRONEGUN** – used to disable drones and smart doorbells

VEHICLE MOUNTED SOLUTIONS

Vehicle / convoy protection

- **DRONESENTRY-X** – can be installed on a vehicle, maritime vessel, aerial platform, temporary or fixed site system.

FIXED SOLUTIONS

Permanent / semi-permanent: geo-location, identification and countermeasures

- **OPTICAL** – deep learning visual detections
- **RFONE** – long-range RF sensing
- **DRONECANNON** – multi-band intelligent jammer

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OpenWorks Engineering Ltd

IDENTIFICATION

TRACKING

NEUTRALISATIO

COMPANY DESCRIPTION

OpenWorks develops technology and products for security and counter terrorism authorities. SkyWall drone capture systems and autonomous optical detection and tracking technology are deployed as part of integrated systems. The SkyWall systems are already in use with law enforcement and military organisations, deployed at nuclear sites, airports and critical infrastructure, including the Pentagon.

TECHNOLOGY SOLUTION PRESENTED

SkyWall Net Capture systems are operationally-deployed and provide the ability to physically capture a drone in a net, they are completely unique. The SkyWall Autonomous Optics products make use of the latest developments in deep-learning neural network classification to quickly and reliably classify, track and ID a target. They achieve industry leading tracking performance by controlling the camera motion using AI.

SkyWall physical capture is deployed in conjunction with electronic counter-measures for a layered defence, or in environments where electronic attack cannot be deployed. The SkyWall systems are already deployed at sites such as international airports, nuclear sites and other critical infrastructure, such as the Pentagon and Heathrow Airport. They have been deployed in close protection at events such as the G7 and with the US President events.

Clicking on the link below you can see SkyAI and SkyTrack detection and tracking functions: https://www.youtube.com/watch?v=_8UVsFXdbCY

Under this link you can see SkyWall net capture functions:
https://www.youtube.com/watch?v=eOpZDv3BztE&feature=youtu.be

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DETECTION

IDENTIFICATION

TRACKING

NEUTRALISATION

Delft Dynamics B.V.

COMPANY DESCRIPTION

Delft Dynamics B.V. is an innovative, high-tech company founded in The Netherlands in February 2006. The company is specialising in developing and building drones: small unmanned helicopters and multicopters that can be used as stable, easy to control sensor platforms. This is accomplished by smartly combining computer and sensor technology. Delft Dynamics is involved in many national and international RD&T projects.

TECHNOLOGY SOLUTION PRESENTED

After detection, by e.g. a radar, RF-scanner, vision or an acoustic system, DroneCatcher is able to quickly approach hovering or moving threats. With the use of multiple on board sensors, the net gun can be locked on the target. Due to DroneCatcher's automatic tracking capabilities, the drone will be swiftly caught by shooting a net. After the catch, DroneCatcher can carry the captured drone on a cable to a harmless place and release it there. If the caught drone is too heavy to be carried, it can be dropped with a parachute to ensure low impact on the ground. Therefore the DroneCatcher system is ideal in built-up areas because there is no collateral damage at all.

Innovations DroneCatcher 2.0

- **DroneBox** (standalone or vehicle integrated system)
- **Releasable Tether** (infinite detection, safe and immediate response)
- **Further optimized AI** (faster detection and tracking)
- **Autonomous deployment** (fully automated chase & catch)
- **Integration with other systems** (radar, RF, vision, acoustics, etc.)
- **Extra on-board sensors** (cameras, radar, RF scanner / jammer, etc.)

Under the following link you can see the DroneCatcher's functions and way of operating:
https://www.youtube.com/watch?v=h3aJ4KKxpWs

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Blighter Surveillance Systems Ltd

DETECTION

TRACKING

COMPANY DESCRIPTION

Blighter Surveillance Systems is a world leading designer and manufacturer of electronic-scanning radars and surveillance solutions. Its solid state radars are deployed in 35 countries to deliver round the clock protection along borders, for coastal facilities, at military bases, and to guard critical national infrastructure such as airports, oil and gas facilities and palaces. Blighter specialises in radar as part of Counter-UAS systems.

TECHNOLOGY SOLUTION PRESENTED

A400 Series Air Security Radars are medium-range air security radars for detection of covert air targets . They detect and report micro, mini or standard drone types as well as ground and coastline targets.

AUDS (Anti-UAV Defence System) is a strategic C-UAS system, designed to disrupt and neutralise UAVs engaged in hostile airborne surveillance or other malicious activities. AUDS combines e-scan radar target detection, electro-optical tracking/classification and directional RF inhibition capability.

Blighter's A800 3D drone detection radar is a tri-mode e-scan radar, based on the latest monopulse antenna technology. It has the unique ability to use its optimised air security modes to search for small drones. At the same time, it can use its ground/sea surveillance modes to search for surface targets over land/water. The A800 performs its air, ground and sea detect functions all at once, allowing tri-mode operation with a simple user setup.

The A800 radar acts as the key long-range detect element in C-UAS integrated systems. The 3D detection capability allows such systems to cue long range camera systems and electronic countermeasures systems onto the detected targets much more quickly than has previously been possible. Blighter radars are very easily integrated into C-UAS systems using Blighter's SDK, and have previously been integrated with the most popular VMS/PSIM products.

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H.P. Wuest GmbH

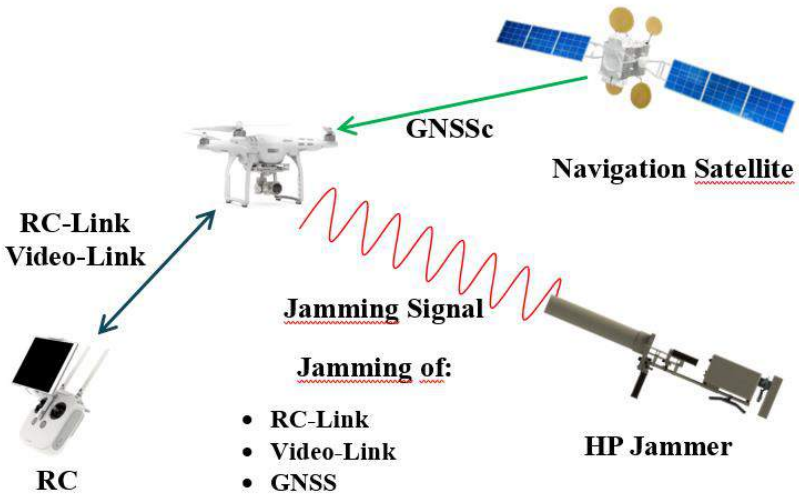
COMPANY DESCRIPTION

HP Marketing & Consulting Wüst GmbH, Germany was founded in 1982 and is a privately owned company based close to Hamburg. It is specialising in developing, manufacturing and marketing jamming solutions all over the world for 39 years. H.P. Wuest GmbH owns Nato Stock number for its convoy jammers, self-protection jammers, Counter Drone jammers and EOD jammers.

TECHNOLOGY SOLUTION PRESENTED

H.P. Wuest GmbH offers different kinds of field proven C-UAS jammers: HP 47 Series owns a unique helical antenna with several drone frequencies in one antenna. The advantage of this solution is horizontal and vertical polarization and high gain, which means less weight and long jamming range. The solution does not pose any harm to the operator. H.P. Wuest GmbH also owns modular C-UAS jammer with open interface to communicate with command and control system. The solution is directional with pan & tilt or omni antennas.

H.P. Wuest GmbH offers stand-alone solution (e.g. HP 47 drone gun) or integrated in system solution: HP 1107 with directional antenna or HP 3050 T omni directional antenna. The company also offers portable case or trolley versions (HP 3055T+ or HP 3962h) with LAN functionality and directional or omni directional solution. Additional separate battery packs are available. The technical solutions offered by H.P. Wuest GmbH were used during G7 and G20 Summits, World Economic Forum in Davos and many more.



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NEUTRALISATION

Droptec GmbH

COMPANY DESCRIPTION

Droptec is a Swiss company located in the centre of Europe and it is the manufacturer of the counter-UAV net pistol Dropster - a quick and reliable to use last resort defence solution against rogue UAV's.

TECHNOLOGY SOLUTION PRESENTED

The Dropster Net Pistol uses gas pressure, produced from Blank cartridges, to shoot off a resistant net onto UAV's in order to entangle with the rotors of the UAV and block its thrust. Currently the system covers a guaranteed range of 30m, but Droptec is working on a 50m-cartridge variant, which will be ready to sell by the end of 2021.

Law enforcement and security officers can respond directly to a threat with the Dropster in a reasonable way and up to 30m guaranteed. The 30m-cartridge is ideal for correctional facilities to prevent contraband, spying or sabotage acts from UAV's, ideally in combination with a detection system or even a jammer where possible. Typical application areas of the solution offered by Droptec are: property, personal and event protection.

The Dropster counter drone system is classified as a firearm of Category B in Switzerland and can be sold only with a weapon transmission contract.

Droptec offers training in handling the Dropster and shooting training for standing and moving targets. The courses are mainly addressed to security staff. During the training the participants receive basic information and skills to safely deploy the Dropster in an emergency as part of their protective role. The training also includes the general safety rules in dealing with weapons and manipulation drills and target practice.

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TELEFONICA

Telefónica Ingeniería de Seguridad

DETECTION

IDENTIFICATION

TRACKING

COMPANY DESCRIPTION

Telefónica is a company that is aware of the new challenges posed by today's society. This is why it offers the means to facilitate communication between people, providing them with the most secure and state of the art technology so they can live better, and - achieve whatever they resolve.

TECHNOLOGY SOLUTION PRESENTED

The SENDES ecosystem is, for the moment, unique in Spain and consists of a radiofrequency system for inhibition and a detection system. This autonomous system is specially designed for the negligent use of drones; neutralizing the detected threats. It allows detecting a multitude of drones through the radio electric spectrum and neutralizing them, without affecting other electronic devices.

The SENDES ecosystem is made up by the following elements:

- **DAU technology**: Detection systems
- **SJ technology**: Neutralization systems
- **SENDES Gate**: User interface
- **SENDES Core**: System intelligence
- **Servers** in either client's or ASDT's infrastructure

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ELETTRONICA GROUP

DETECTION

IDENTIFICATION

TRACKING

NEUTRALISATION

ELETTRONICA SPA

COMPANY DESCRIPTION

Established in 1951, ELETTRONICA is a World Leader in Electronic Warfare with a complete portfolio of state-of-the-art solutions to satisfy the most challenging requirements of modern operational scenarios. The solutions designed and manufactured by ELETTRONICA cover a wide range of applications and missions: ELINT, COMINT (SIGINT), ISR, INFRARED, SELF PROTECTION, ELECTRONIC ATTACK.

TECHNOLOGY SOLUTION PRESENTED

ADRIAN is a field proven, military-grade system, already operated by security authorities and Armed Forces. Its mission is to provide an effective response against LSS (Low-Small-Slow) unauthorized/hostile Mini and Micro UAV. It offers surveillance, recognition and jamming capabilities. ADRIAN can be used for the protection of bases, HQ, FOB, convoy and vessels. Today, ADRIAN leverages the benefits of many years of improvements, field trials and feedback from the End User Community.

ADRIAN is built upon a flexible system architecture which makes it tailorable against different operational applications and configurations (fixed, mobile, naval) and can be easily integrated with external systems such as higher level C2 Centres. GROUND VERSION: Protection of Critical Infrastructures MOBILE VERSION: Protection of Special Events.

CONCEPT OF OPERATION

SURVEILLANCE WITH MULTI-SPECTRAL SENSORS SUITE

- detection
- tracking
- classification
- identification

THREAT EVALUATION

- alarms
- threat libraries

NEUTRALIZATION

- soft kill

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DETECTION

IDENTIFICATION

TRACKING

NEUTRALISATION

AEORUM

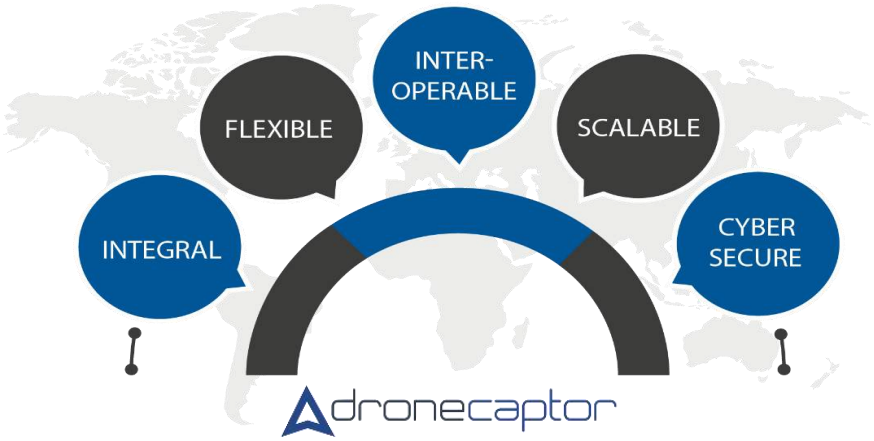
COMPANY DESCRIPTION

Located in the Technology Park of Andalusia, Aeorum is a Spanish company specialised in technological developments with a solid path in the sector, started in 2009. From the first moment, all Aeorum's efforts have been aimed at a common goal: contribute to the making reliable, fast and accurate decisions in complex situations through new preventive surveillance tools. The objective? Managing the security in a more efficient way.

TECHNOLOGY SOLUTION PRESENTED

Aeorum offers a scalable, flexible and automated solutions, commanded from remote locations. Dronecaptor reliably detects and neutralizes unauthorized drones (UAVs) combining multiple sensors, automatically analysing all the information received from each of them. It permits actions coordinated against multiple threats and multiple sites. Dronecaptor is tailored for complex environments.

Dronecaptor enables one or several command centres, to access the real-time information generated by the sensors deployed in different facilities. All the data is analysed in real-time and, in case a rogue drone is detected, the system proposes the best way to neutralize the threat taking into account the counter-drone devices deployed. It can also operate autonomously in especially sensitive areas in which a drone must not be allowed to fly over.



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3. Conclusions and next steps

Given the interaction limitations of online events, the overall result of the Industry Day was highly satisfying.

The significant number of participants who attended and actively took part in the question and answers sessions, and the engagement of the technology presenters were the highlights of the event. The presentations were very interesting and practical for LEAs, and the presenters used their time efficiently.

The modest amount of feedback received following the event was reassuringly positive. The participants expressed the need for such events, addressed to LEAs, to be cyclical.

Special thanks are due to the ENLETS C-UAS TIG Leader for overseeing the organisation of the event and the Polish Platform for Homeland Security, which organised and hosted the event. Also, we would like to thank Mr. Lars Huybrechts, who represented EC DG HOME D.2 Counter-Terrorism Unit and presented C-UAS matters from EC's perspective. Moreover, we would like to thank the ENLETS Core Group Leader, Mr. Patrick Padding, who presented the ENLETS network. Finally, a warm thank you to everyone who took part and supported the event in some way.

The next session for the C-UAS Industry Day is planned for Q4 2021. The goal of the next event will be to deepen the knowledge about selected technology solutions.