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UAS (Unmanned Aircraft Systems)

NATO STABILITY POLICING CENTRE OF EXCELLENCE

NATO OTAN

UAS (Unmanned Aircraft Systems):

The Force Multiplier for Law Enforcement Agencies

and

the potential Contributor to Stability Policing

Captain (TUR GEND) Yuksel KUTUK

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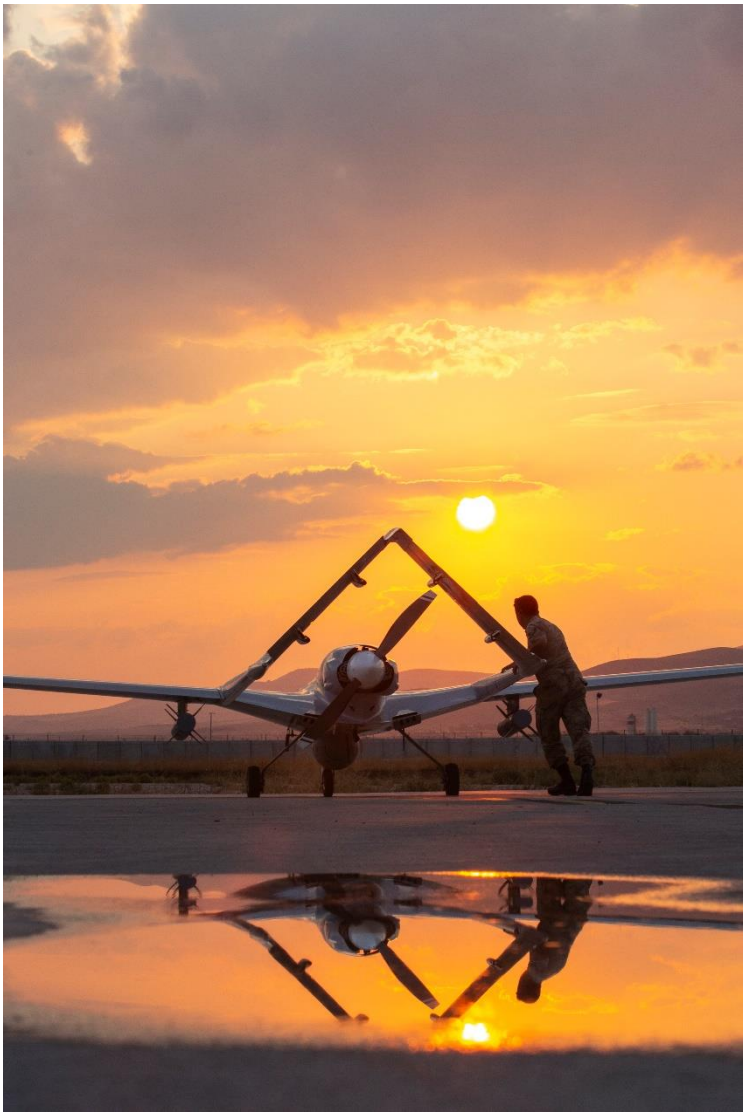
His uniformed career began in 2003 at Kuleli Military High School in Istanbul. Upon completion of his studies, he continued his education at the Turkish Military Academy in Ankara, graduating in 2011 as a Gendarmerie Second Lieutenant. Captain Kutuk has successfully completed a broad spectrum of law enforcement and operational training programs throughout his career, including Commando Training, for which he was awarded the Commando Badge.

Throughout his service, he has held several leadership positions, including team and company commander roles, and has conducted numerous internal security and law enforcement operations across various regions of Türkiye. Since 2018, he has been assigned to the Gendarmerie Aviation Command, contributing to a wide range of aviation and operational support missions.

In addition to his professional accomplishments, Captain Kutuk holds a Bachelor's degree in Systems Engineering (2011) and a Master's degree in Crisis Management (2022).

Table of Contents



Director's foreword

In 2024, the NATO Stability Policing Centre of Excellence published its inaugural volume on drone utilization. Titled "Stability Policing and the Drones' war: new challenges for NATO Countries' Law Enforcement Agencies and Internal Security Architectures", this work sought to identify and analyze potential policing gaps within the Alliance regarding emerging technologies—specifically in that grey area of traditionally segregated cognitive domains of collective defense and internal security.

The publication—representing the final report of a dedicated workshop organized in March 2024—identified necessary actions to bridge this divide, enabling two distinct security frameworks to communicate and operate effectively over the prevailing and sensitive issue of drone deployment for military action, both within and beyond combat scenarios.

This second study marks a significant advancement in the UAS - Unmanned Aerial Systems' approach (an alternative name for flying drones). While the previous perspective considered drone management as a slippery terrain where cognitive systems showed their limits, this volume presents an alternative viewpoint: the complexities of drone operations should now be embraced as an undeniable force multiplier for Law Enforcement Agencies.

Drawing from experiences across diverse operational and geographical contexts, the author— a well-recognized expert in the sector and a proficient Staff Officer in the Lessons Learned Branch of the NATO Stability Policing Centre of Excellence—guides readers through the multifaceted applications of UAS for Law Enforcement, highlighting improvements in effectiveness, cost and risk-effect management, as well as adaptation to the pace of rapidly evolving technologies.

Effective policing complexity lies in its adaptation to the specific society this given service or unit was designed for. In a fast-evolving technological landscape, where sophisticated systems are becoming increasingly accessible to the general public—including criminal groups or individuals— it is paramount that Law Enforcement Agencies surf the "innovation wave" to avoid the risk of unpreparedness, vulnerability, diminished effectiveness, and compromised credibility.

Stability Policing, as the sole NATO Civil Police expeditionary capability, is uniquely positioned to integrate lessons from both Law Enforcement and Military domains.

This volume thus represents the natural progression of efforts initiated a year ago to “catch the wave” and harness drone warfare capabilities from the perspective of enhancing Stability Policing mission effectiveness across all operational circumstances and contexts. Following Stability Policing doctrine, our previous volume identified a policing gap; now, this research aims to address that gap from an operational effectiveness standpoint.

Through its analysis of Law Enforcement Agency experiences, this publication demonstrates that a “UAS dimension” of operations represents the natural evolution of policing across all dimensions, including Stability Policing.

Consequently, future Stability Policing operations must incorporate this capability at its most advanced level, adaptable to the complexities of each operational environment, including the most violent and non-permissive scenarios.

Finally, this represents the logical evolution of both policing and warfighting. This work, alongside ongoing research at the Stability Policing Centre of Excellence, demonstrates how these two systems—these cognitive frameworks—must interconnect to enable harmonious evolution of NATO operations and more effective implementation of all NATO core tasks.

I praise this research as a significant milestone in Stability Policing evolution and recommend its reading as evidence that emerging technologies — even the most innovative and seemingly distant from daily operations — are already present in our operational reality, whether we like it or not.
Technological evolution advances inexorably. Our preparedness is imperative.

Luigi Bramati
Colonel, Italian Carabinieri
NATO SP COE DIRECTOR

EXECUTIVE SUMMARY

In field operations, visibility is inherently limited — vegetation, buildings, and terrain features restrict line-of-sight observation. In contrast, a bird's eye view overcomes these constrains beyond vegetation, hills and buildings. Based on perspective requirements, elevation can be adjusted and proximity controlled, the area can be monitored. **With Unmanned Aircraft Systems (UAS), law enforcement agencies gain wings.**

Time is often a crucial parameter in law enforcement missions. As first responder, Unmanned Aircraft Systems (UAS) can fly to the far reaches of a medium-sized city in just minutes, facilitating the immediate collection of current and instantaneous data and the display of evidence without contaminating the scene.

UAS integration represents a force-multiplier, an important piece of puzzle. Beyond standard daylight imaging capabilities, thermal and night-vision camera systems enable effective surveillance during low-visibility and nocturnal conditions when conventional observation is compromised. Beyond imaging, multifunctional payload options including loudspeakers, sample collector sensors, facial recognition systems, and audio recording — deliver versatile operational applications. **Therefore, decision makers can deploy UAS for crisis intervention or conflict management while maintaining strict legal compliance.**

UAS technology enhances a 360-degree law enforcement model by increasing traditional law enforcement capabilities with the aforementioned tactical advantages, thereby elevating service delivery quality. ***In countering increasingly complex contemporary threats and security challenges, UAS deployment provides significant contribution to law enforcement agencies. Evidence Based***

Policing can benefit from specialized payloads configuration for Evidence Handling. UAS implementation across operational domains such as Police Patrolling, Search and Rescue, Crowd and Riot Control, Disaster Response and Recovery, Traffic Monitoring and Border Security reinforces Problem-Solving Policing and Intelligence-driven Law Enforcement approach. Therefore, such integration yields a better understanding and awareness of the operational environment, as well as increased resilience. In addition, the visible presence of UAS serves as a potential crime deterrent through increased perception of monitoring.

Stability Policing is a specialized form of expeditionary law enforcement focused on maintaining public order and security in fragile or post-conflict environments. Units dedicated to Stability Policing, composed of specialized personnel from police, gendarmerie (or GTF – "gendarmerie-type forces") and military police units are crucial for filling security gaps. These units must be equipped according to the mission's requirements. Given the advantages discussed earlier, Stability Policing units should be equipped with the necessary UAS for their missions, and these systems should be used effectively.

While the phrase "boots on the ground" is common in law enforcement, the term "eyes in the air" serves as a force multiplier and can significantly enhance Stability Policing efforts. Using UAS allows for faster, more informed, and smarter decision-making, turning it into a possible breakthrough.

While the future cannot be precisely known, it is evident that as technology advances, UAS capabilities will expand. Installed payloads will diversify, performance will improve, and operational efficiency will grow. Accordingly, the contribution of UAS on law enforcement is expected to continue its upward trajectory.

Chapter 1 - Introduction

1.1 Background

Unmanned Aircraft Systems have become an increasing common presence in both the military and civilian sectors, becoming an integral component of daily operations. Today, law enforcement entities— including police, gendarmerie, and coast guard— are currently incorporating these systems in their activities.

The unprecedented rapid advance in technology fostered the development of a diverse array of unmanned aircraft systems. A wide range of new products was developed from micro UAS weighing just a few grams to heavy-duty models weighing several tons. Modular design allows for specific requirement, enabling the installation of a variety of payloads — such as various types of cameras, sampling collection systems, loudspeakers, facial recognition modules, radio relays, and air-to-ground missiles.

At the strategic level, contemporary security and public order are challenged by threats that are increasingly hybrid, irregular, adaptive and characterized by continuous diversification. In response, NATO - as a defensive political and military alliance - promotes an integrated and unified approach across five domains: land, maritime, air, cyberspace and space for collective defense objectives. NATO can achieve this goal through the law enforcement interoperability. These daily law enforcement activities directly contribute to NATO's core tasks. Within this all-out effort, UAS deployment offers unique opportunities, as a near-continuous 24/7 operational readiness.

1.2 Aim and Methodology

This paper's primary aim is to explore the contribution of various UAS, ranging from small to large platforms, in supporting law enforcement operations. The secondary purpose is to determine the potential support of UAS to Stability Policing (SP) when integrated to SP mission. To achieve these objectives, a comprehensive literature review was conducted to examine the UAS characteristics and capabilities with a particular focus on the deployment of UAS by law enforcement agencies across various countries and international organizations. This analysis identifies and categorizes the different types of law enforcement tasks, presenting case studies where UAS have been used to fulfil their mission.

The study concludes with **10 key findings and 10 recommendations under 3 main headings.**

1.3 Constraints and Limitations

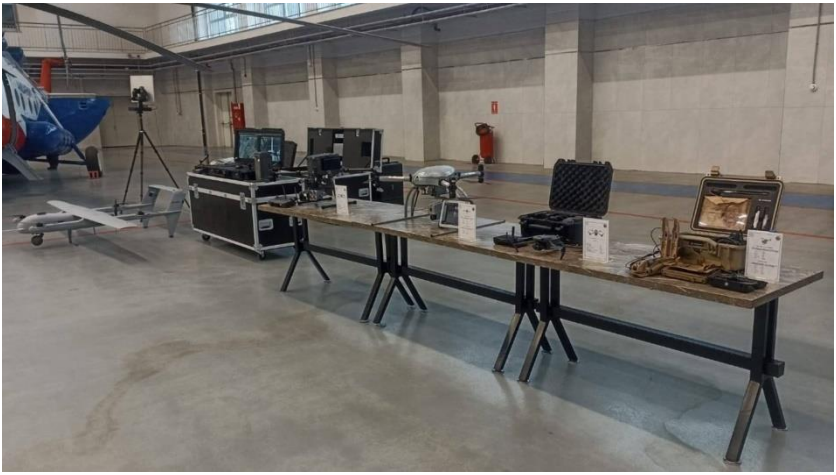
This paper is intended for a broad audience including law enforcement, military personnel and civilian stakeholders. All content is unclassified and shared in the purpose of maximizing public interest.

The case studies presented are specific to their individual contexts. Variation in UAS deployment may be due to differing law enforcement agencies and tasks. Consequently, agencies will deploy UAS in accordance with the applicable regulations.

The study is focused on the contribution of UAS to law enforcement services. Topics such as Counter-UAS measures and the legal framework fall outside its scope. While the legal analysis is not addressed in this paper, it is essential to note that all conclusions and recommendations regarding **UAS deployment must be understood in strict compliance with law**, consistent with all law enforcement activities.

1.4 Terminology and Definitions

The terms Unmanned Aircraft (UA), Unmanned Aircraft System (UAS), Unmanned Aerial Vehicle (UAV), drone, Remotely Piloted Aircraft (RPA) are interchangeably used in literature. At the same time, these systems are defined and classified with different names by their manufacturers. To ensure a consistent wording, the NATO Standardization Office UAS definition will be used in this study.



1.4.1 Unmanned Aircraft System (UAS)

A system whose components include unmanned aircraft, the supporting network and all equipment and personnel necessary to control the unmanned aircraft (NATO Term).[1]

1.4.2 UAS Characteristics

The UAS industry provides many different types of services for many different purposes. This difference provides flexibility for different purposes. In order to clarify some basic concepts, the table below reports the parameters to classify the smallest and the largest UAS.[2]

Type	Speed	Flight Time	Payload Weight	Range
The Smallest UAS (Minimum)	54 km/h	20-30 minutes with battery	a few grams	a few meters
The Largest UAS (Maximum)	360 km/h	up to 24 hours with fuel	hundreds of kilograms	hundreds of kilometers

[1] NATO, "Allied Tactical Publication (ATP) 3.3.8.1, Minimum Training Requirements for Unmanned Aircraft Systems (UAS) Operators and Pilots," Vols. Edition B, Version 1, 2019.

[2] S. A. H. Mohsan, M. A. Khan, F. Noor, I. Ullah and M. H. Alsharif, "Towards the Unmanned Aerial Vehicles (UAVs): A Comprehensive Review," Drones, vol. 6, no. 147, 2022. https://www.academia.edu/124641596/Towards_the_Unmanned_Aerial_Vehicles_UAVs_A_Comprehensive_Review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1.4.3 NATO UAS Classification

NATO break down of UAS in Class I, Class II and Class III - from the smallest to the largest - is given in the table below.[3]

NATO UAS Classification					
Class	**Category**	**Normal Employment**	**Normal Operating Altitude**	**Normal Mission Radius**	**Example Platform**
Class III (>600 kg)	Strike/Combat	Strategic/National	Up to 65,000 ft MSL	Unlimited (BLOS)	Reaper
	HALE	Strategic/National	Up to 65,000 ft MSL	Unlimited (BLOS)	Global Hawk
	MALE	Operational/Theatre	Up to 45,000 ft MSL	Unlimited (BLOS)	Heron
Class II (150 – 600 kg)	Tactical	Tactical Formation	Up to 18,000 ft AGL	200 km (LOS)	Watchkeeper
Class I (<150 kg)	Small (>15 kg)	Tactical Unit	Up to 5,000 ft AGL	50 km (LOS)	Scan Eagle

The term drone is commonly used to refer to Unmanned Aircraft Systems operated by law enforcement agencies, typically corresponding to Class I type UAS listed in the table above. In the

[3] NATO, "Allied Tactical Publication (ATP) 3.3.8.1, Minimum Training Requirements for Unmanned Aircraft Systems (UAS) Operators and Pilots," Vols. Edition B, Version 1, 2019.

following section, case studies illustrate the use of Class II and Class III types of UAS, in addition to Class I. ***The term "UAS" is used to designate these systems in NATO standardization, therefore - in order to maintain a consistent terminology - the term UAS will be used throughout the study to refer to all systems of different types.*** A single exception is made for the phrase "a project where the term drone is used". Here, the original terminology from the literature has been preserved.

1.4.4 Stability Policing (SP)

Police related activities aimed at supporting or temporarily replacing indigenous police forces, with the objective of contributing to restore and/or maintain public order and security, upholding the rule of law and the protection of human rights.[4]

[4] NATO, "Allied Joint Publication (AJP) 3.22, Allied Joint Doctrine for Stability Policing," Vols. Edition A, Version 1, 2019.

1.4.5 Stability Policing Tasks

Stability policing duties include but are not limited to the following:[5]

Crowd and riot control	Border control	Election security	Close protection	Searches and seizures
Criminal investigations	High risk arrest	Critical site security	Negotiation and mediation	Conduct forensic activities
Biometric	Surveillance	Counter-smuggling	Counter drug	Counter human trafficking
Police intelligence	Counter terrorism	Hostage rescue	Traffic circulation	Crime scene management
Support to weapon intelligence teams	Contribution to situational awareness	Counter-organized crime	Support to judicial and correction institutions	Community based policing (Patrolling)
Restoration of public security and public order	Protect people (especially vulnerable groups) and property	Rapport building (Population and authorities)	War crime investigations and assistance to international courts	Support to military and civilian activities

[5] Ibid.

1.4.6 UAS Capabilities Supported Law Enforcement

Below, a list of payloads and the relative data collected, in law enforcement missions:[6]

Mission	Operation	Payloads	Target	Data Collected
Law Enforcement and Surveillance of people	-Monitoring hotspots -Controlling crowds (during protests and riots or festivals) -Monitoring -Enforcing quarantine measures -Criminal investigations -Detection of abnormal or anti-social behavior -Early crime detection -Police response -Infrastructure protection against theft	-High-Resolution cameras -Thermal Cameras -Audio Recording -Facial Recognition Systems -Smart Surveillance Systems (Biometric and Behavior Identification Software) -Loudspeakers -Beacons -GPS Tracking Systems -Night Vision -Radio Frequency Equipment -Wi-Fi Sniffers	People	Personal and sensitive data -Image, audio, video, thermal, or geolocation data -Mobile phone signals, phone conversations, text messages, and internet activity -Identify or behavioral data
Civil Protection	-Emergency planning and response -Surveillance of critical infrastructure -Search and rescue missions -Firefighting -Monitoring environmental, biological and chemical hazards	-High-Resolution cameras -Thermal Cameras -GPS Tracking Systems -Loudspeakers -Radio Frequency Equipment (Mobile Phone Sensors) -Audio Recording -Sample Collector Sensors	Landscapes, People	Focus is mostly on landscapes, collection of personal or sensitive data is less likely Geolocation data (e.g., Mobile phone signals) -Image, audio, video, thermal
Regulatory Enforcement	-Enforcement of sector-specific rules and regulations -Monitoring pollution and illegal logging etc. Activities -Mapping and earth observation	-High-Resolution Cameras -Thermal cameras -GPS Tracking Systems -Sample Collector Sensors	Landscapes, People	Focus is mostly on landscapes, collection of personal or sensitive data is less likely -Image, audio, video, thermal or geolocation data

[6] R. L. Finn, D. Wright, L. Jacques and P. D. Hert, "Study on privacy, data protection and ethical risks in civil remotely piloted aircraft," European Commission, Directorate-General for Enterprise and Industry, 2014. https://op.europa.eu/en/publication-detail/-/publication/6b277634-4af3-48a7-b3e9-0ca31f7480ce/language-en

In addition to the aforementioned ammunitions, Smart Micro Munition missiles may also be integrated as mission-specific payload in compliance with applicable legal frameworks, particularly in counter-terrorism missions.

Chapter 2
Using UAS in Law Enforcement Tasks

Maintaining regional public order, building a peaceful and secure environment, and safeguarding human rights require the execution of regular law enforcement activities. For this purpose, law enforcement agencies integrate advancements in technology alongside conventional methods to fulfil their activities.

Among the most significant technological innovations in recent years are Unmanned Aircraft Systems (UAS). Law enforcement agencies integrated these advancements and rapidly adopted UAS in different types of missions. A key driver of this integration is enhanced environmental assessment capabilities, a precise threat identification and, as a result, the creation of a more accurate action plan. Actually, real-time and accurate information directly correlates to improved decision-making

UAS serve as crime deterrents through the continuous aerial monitoring by day and night. In the event of a crime, they support detection, identification and evidence collection through reconnaissance and surveillance. UAS target identification from altitudes ranging between 150–250 meters and above, together with speeds of approximately 100 km/h provides visibility up to ten times greater than conventional ground patrols.[7] The collected footage - whether videos or images - can be shared in real time with the relevant departments and decision-making centres.

The next section presents an overview of the relevant literature on UAS deployment followed by case studies selected from the NATO, EU, UN

[7] S.G. Constantinescu and F. Nedelcuţ, "Uav Systems in Support of Law Enforcement Forces," in International Conference of Scientific Paper AFASES, Brasov, 2011. https://www.afahc.ro/ro/afases/2011/uav/Constantinescu_Nedelcut.pdf

and Police, Gendarmerie Type Forces (GTF) law enforcement agencies known for performing Stability Policing tasks.

2.1 Police Patrolling

Patrolling constitutes a fundamental police function to maintain visible presence and foster police force community-engagement.[8] Patrolling activities support the implementation of intelligence-led and community-oriented policing. They enable long-term observation of potential security threats as well as accident prevention. Being proactive instead of being reactive increases the effectiveness of law enforcement agencies. Preventive law enforcement activities contribute to ensuring stability.

[8] J. Yesberg, I. Brunton-Smith and B. Bradford, "Police visibility, trust in police fairness, and collective efficacy: A multilevel Structural Equation Model," *European Journal of Criminology*, vol. 20, no. 2, pp. 712-737, 2023. https://journals.sagepub.com/doi/full/10.1177/14773708211035306

Major law enforcement organizations utilize aircrafts and helicopters for their operations. However, these aircrafts involve significant operational costs. Compared to conventional aircrafts, UAS can perform a cost-effective and manpower-efficient reconnaissance and surveillance activities without the casualty risks associated with manned flight. UAS can operate with the principle of secrecy compared to other aircrafts.[9] In addition, operational effectiveness can be improved through interoperability between UAS and Manned Aircraft Systems combined in appropriate mission profiles.

UAS have proven effective in detecting and collecting evidence for various types of crime, including:

-Robbery;
-Murder;
-Taking of hostages;
-Illegal business activities;
-Public disturbance etc.;[10]
-Poaching;
-Illegal mining;
-Illegal logging;
-Illegal cultivation of narcotic plants etc.;[11]
-Theft.

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[9] S.G. Constantinescu and F. Nedelcuţ, "Uav Systems in Support of Law Enforcement Forces," in International Conference of Scientific Paper AFASES, Brasov, 2011. https://www.afahc.ro/ro/afases/2011/uav/Constantinescu_Nedelcut.pdf

[10] Ibid.

[11] I. M. Yefimenko, "Modern possibilities of using unmanned aerial vehicles by Police authorities and units: Analysis of foreign and Ukrainian experience," Scientific Journal of the National Academy of Internal Affairs, vol. 27, no. 3, pp. 65-77, 2022. https://elar.naiau.kiev.ua/server/api/core/bitstreams/57fa3efa-9fe7-4dcc-a41f-23302a3f4743/content

NATO. The NATO Intelligence, Surveillance and Reconnaissance Force (NISRF) represents an international security force headquartered in Sigonella, Italy, providing operational support to NATO decision-makers and member states since 2015. NISRF operates with a UAS fleet of 5 NATO RQ-4D “Phoenix”. Its operational mandates include protection for ground forces and civilians, border control, maritime security, counterterrorism, crisis response and humanitarian assistance during natural disasters.[12]

UN. The United Nations Office on Drugs and Crime (UNODC) Program Office in the Kyrgyz Republic, in collaboration with the Counter-Narcotics Service of the Kyrgyz Republic's Ministry of Internal Affairs, has conducted combined tactical and specialized counter-narcotics exercises to enhance law enforcement personnel proficiency in the use UAS for counter-narcotic purposes as an integral part of the UNODC Regional Program for Central Asia 2022-2025. These exercises also demonstrated enhanced operational effectiveness of UAS when deployed in integration with other ground surveillance systems and technologies such as Unattended Ground Sensor systems.[13]

USA. In 2017, the Drone as First Responder (DFR) program was launched in Chula Vista, California, as the first of its kind in the country. The program's operational mandate was the provision of aerial support

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[12] “NATO Intelligence, Surveillance and Reconnaissance Force (NISRF),” [Online]. Available: https://www.nato.int/cps/en/natohq/topics_48892.htm [Accessed 29 11 2024].

[13] "United Nations Office on Drugs and Crime," [Online]. Available: https://www.unodc.org/roca/en/news/unodc-explains-the-combined-use-of-unmanned-aerial-vehicles-and-ground-surveillance-systems.html [Accessed 10 12 2024].

to enhance police operations safety, transparency and accountability while reducing response times and improving overall quality of life. The Program's objectives include aerial imaging of target areas, indoor area monitoring, detailed documentation of crime or accident scenes, and the search of lost or missing persons. It has been recognized as a milestone in cutting-edge innovation and the beginning of a new policing approach.[14]

The Netherlands. UAS are increasingly deployed by the Dutch police primarily for public order maintenance and traffic accidents investigation. UAS represent the emerging technology to enhance law enforcement personnel effectiveness in performing their duties. To help where needed, the National Police UAS units are mobilized across the entire nation. For instance, drones were deployed to get a reliable estimation of crowd sizes during public demonstrations and to assess compliance with socially distancing at the outbreak of the Covid-19 pandemic.[15]
During the Covid-19 pandemic, many local, regional and national police forces utilized UAS to conduct airborne patrols in order to reduce contact between individuals, prevent the spread of the virus and control compliance to curfews.[16]

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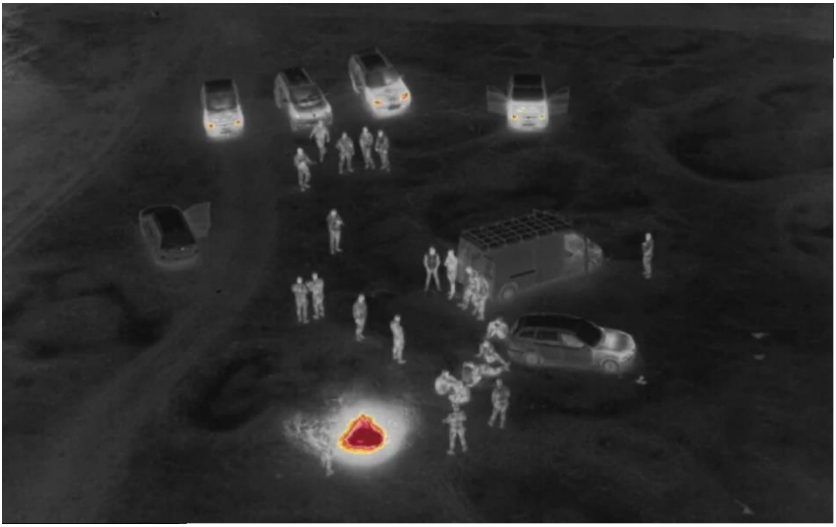
[14] "Chula Vista Police Department," [Online]. Available: https://www.chulavistaca.gov/departments/police-department/programs/uas-drone-program [Accessed 03 12 2024].
[15] "NL Times," 16 11 2020. [Online]. Available: https://nltimes.nl/2020/11/16/dutch-police-increasingly-using-drones [Accessed 10 12 2024].

[16] P. Royo, À. Asenjo, J. Trujillo, E. Çetin and C. Barrado, "Enhancing Drones for Law Enforcement and Capacity Monitoring at Open Large Events," Drones, vol. 6, no. 359, 2022.
https://www.semanticscholar.org/reader/277c486755f85b36b07e57ebefeca3b1884b2166

Spain. Following the Covid-19 pandemic imposition of lockdown measures on March 14, 2020, police began regular UAS deployment throughout the capital's urban environment. Thermal imaging systems facilitated the identification of individuals violating lockdown measures, while integrated loudspeakers systems delivered announcements and instructions.[17]



[17] J. M. Calatayud, "Algorithm Watch," [Online]. Available: https://algorithmwatch.org/en/tracers/the-spanish-police-watch-talk-to-and-count-people-through-drones-to-make-them-abide-by-covid-restrictions/. [Accessed 09 12 2024].

2.2 Evidence Handling

Evidence collection represents an essential responsibility of law enforcement agencies. A lawful gathering of evidence is essential for the integrity of judicial compliance. In such missions, prompt scene arrival is essential for correct and reliable investigation. UAS enable crime scene investigators to capture photographic and video documentation from multiple aerial angles. The integration of aerial imagery with ground-level investigations contributes to clarify elements in the crime scene.

Investigations are conducted to uncover the truth. Certain scenarios require access to remote or hazardous areas. In such environments, UAS deployment provides a timely arrival at the scene and evidence collection while preserving the integrity. This approach mitigates personnel and equipment transportation challenges. For instance, in the aftermath of an explosion, UAS deployment ahead of law enforcement personnel at a scene can assist in the initial assessment and in the detection of potential secondary explosives.[18]

Italy. Several devastating wildfires have occurred in rural Rome since July 2023. Thereupon, a local law enforcement began employing UAS equipped with high-resolution day and night vision cameras. This proactive approach led to the visual identification of a serial arsonist with photographic and video recordings confirming ignition activities.

[18] I. Bjelovuk, T. Kesić and M. Žarković, "The Possibilities Of Using Unmanned Aerial Vehicles – Drones In Crime Scene Investigation". https://eskup.kpu.edu.rs/dar/article/view/452/216

This individual was tracked by a UAS operator to his residence; a ground patrol was dispatched and took him into custody.[19]

2.3 Search and Rescue Missions

Standard search and rescue missions require significant personnel deployment and exploit traditional law enforcement techniques and tactics. In contrast, Unmanned Aircraft Systems (UAS) provide a critical contribution to search and rescue capabilities by enabling fast regional coverage and surveillance onto large areas. UAS equipped with specialized night vision and thermal imaging capabilities can detect individuals in areas that are otherwise difficult to access via ground transportation. In time-critical scenarios, UAS can be lifesaving.

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[19] C. Livesay, "CBS News," 27 7 2023. [Online]. Available: https://www.cbsnews.com/news/italy-fire-drone-arson-suspect-arrest-calabria-wildfires-europe-algeria/. [Accessed 09 12 2024].

Prior to physical access by search and rescue or medical personnel, priority supplies such as medical support, life-saving jackets and food supplies can be delivered to the victims.[20]
UAS deployment can make a significant contribution in search and rescue missions involving missing persons especially in densely vegetated areas, forests, mountainous or otherwise remote and high-risk environments.[21]

Türkiye. In 2022, a person who went hiking on Uludag Mountain in Bursa province went missing due to sudden fog. Upon notification, a Bayraktar Gendarmery UAS took off from the city of Aydin and located the person. Due to steep and rocky terrain, the villagers transported search and rescue, and medical teams using tractors. The missing person received first aid and was later transferred to a hospital. Subsequent medical assessment confirmed satisfactory health condition.[22]

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[20] S. A. H. Mohsan, M. A. Khan, F. Noor, I. Ullah and M. H. Alsharif, "Towards the Unmanned Aerial Vehicles (UAVs): A Comprehensive Review," Drones, vol. 6, no. 147, 2022.
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[21] I. M. Yefimenko, "Modern possibilities of using unmanned aerial vehicles by Police authorities and units: Analysis of foreign and Ukrainian experience," Scientific Journal of the National Academy of Internal Affairs, vol. 27, no. 3, pp. 65-77, 2022.
https://elar.naiau.kiev.ua/server/api/core/bitstreams/57fa3efa-9fe7-4dcc-a41f-23302a3f4743/content

[22] S. Balcikoca, "AA," 02 01 2022. [Online]. Available: https://www.aa.com.tr/en/turkey/turkish-made-drone-helps-rescue-lost-danish-national-at-ski-resort/2463007 [Accessed 12 12 2024].


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CARABINIER

2.4 Crowd and Riot Control

Public gatherings occur for different reasons such as celebrations, concerts, lawful demonstrations and marches. During this mass-attendance scenarios, crowd control is conducted by law enforcement in order to maintain public safety. In some cases, peaceful assemblies may escalate to violence and riots, turning initially peaceful events, as given in the examples above, into unlawful situations requiring riot control operations.

Law enforcement agencies deploy UAS in protests, riots, and large-scale gathering as sport events, concerts, and festival.[23] In addition to traditional ground-based reconnaissance and surveillance, aerial surveillance via-UAS enhances situational awareness for command-level decision-makers regarding crowd dynamics and the early detection of potential threats. Specialized payloads - such as loudspeakers - allow for public address and disseminate instructions to both law enforcement, authorities and civilians on the ground.
France. A 2023 decree published in the Official Journal authorized the French police to use camera-equipped UAS for a broad range of operations including crowd monitoring and border control. The decree permitted UAS deployment by police to prevent attacks against people or property, to ensure the safety of public gatherings and maintain or restore public order when such gatherings which pose a potential risk

[23] P. Royo, À. Asenjo, J. Trujillo, E. Çetin and C. Barrado, "Enhancing Drones for Law Enforcement and Capacity Monitoring at Open Large Events," Drones, vol. 6, no. 359, 2022.
https://www.semanticscholar.org/reader/277c486755f85b36b07e57ebefeca3b1884b2166

of serious disruption of public order.[24] Always in France, participants attending the 2023 Workers' Day celebrations may have had the sense of being watched - and rightly so - since the French police were using UAS to monitor rally sites and ensure security.[25]

Greece. The Hellenic Police enforced extensive security in Athens in preparation for the gatherings on December 6, 2024. About 5,000 were involved from various police branches. The police operations center received real-time video and imagery from UAS units conducting overhead surveillance.[26]

[24] "Reuters," 21 4 2023. [Online]. Available: https://www.reuters.com/world/europe/french-police-cleared-use-drones-crowd-monitoring-2023-04-21/ [Accessed 9 12 2024].

[25] S. Sitbon, "France24," 1 5 2023. [Online]. Available: https://www.france24.com/en/tv-shows/science/20230501-drones-used-to-monitor-french-may-day-rallies-for-first-time[Accessed 09 12 2024].

[26] C. Kowalenko, "Greek City Times," 06 12 2024. [Online]. Available: https://greekcitytimes.com/2024/12/06/security-athens-grigoropoulos/[Accessed 11 12 2024].

2.5 Disaster Response and Recovery

In natural disaster, response requires highly coordinated action and timely action to achieve effectiveness and efficiency. UAS have become a preferred tool in such scenarios due to their ability to support key aspects of disaster management particularly in the timely collection of critical information such as damage assessment.

Following natural disasters like tsunamis, earthquakes and floods, critical infrastructure - including telecommunications, road and railways networks and maritime transport, may sustain significant damage. UAS can fly directly to the affected areas and provide live aerial imagery to support rescue teams in determining situational awareness and planning their rescue operations. In wildfire scenarios, coordinated swarms of UAS equipped with fire-suppression payloads can detect and intervene without placing human lives at risk. Additionally, essential initial supplies, including medical first aid, can be delivered via UAS platforms.[27]

Türkiye. Following the 2020 Elazig and 2023 Kahramanmaras Earthquakes, Gendarmerie UAS assets were rapidly deployed to the affected areas. To maximize search and rescue effectiveness, real-time image transmission provided support to decision regarding building prioritization, damage assessment in rural areas, identification of access points for aid teams, coordination of debris clearance and road opening operations, as well as temporary/permanent shelter facilities.

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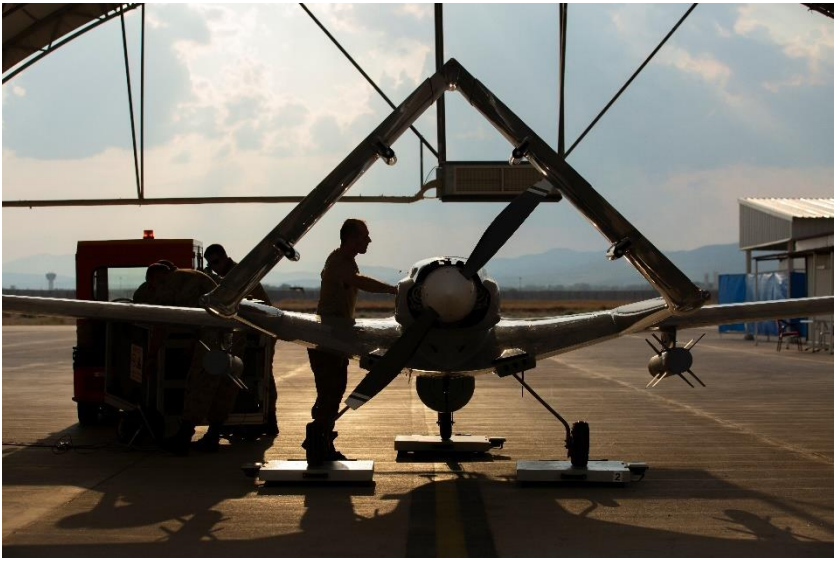
[27] S. A. H. Mohsan, M. A. Khan, F. Noor, I. Ullah and M. H. Alsharif, "Towards the Unmanned Aerial Vehicles (UAVs): A Comprehensive Review," Drones, vol. 6, no. 147, 2022.
https://www.academia.edu/124641596/Towards_the_Unmanned_Aerial_Vehicles_UAVs_A_Comprehensive_Review



2.6 Traffic Control

Law enforcement agencies perform several core functions related to traffic, broadly categorized as: traffic regulation, traffic inspection, as well as the management and procedures arising from traffic accidents.

Traditional traffic monitoring consists of roadside fixed-sensor networks. Each sensor generates localized data for specific road sections. Certain operations require physical teams to be deployed to the event scene. For comparable tasks, UAS are not affected by road congestion and can rapidly reach the scene via direct routing bypassing physical obstacles.[28]

[28] S.G. Constantinescu and F. Nedelcuţ, "Uav Systems in Support of Law Enforcement Forces," in International Conference of Scientific Paper AFASES, Brasov, 2011. https://www.afahc.ro/ro/afases/2011/uav/Constantinescu_Nedelcut.pdf

Traffic regulation constitutes a crucial law enforcement duty. UAS equipped with specialized payloads can perform the following tasks:
- Traffic flow monitoring and analysis;
- Vehicles of interest identification and tracking through license plate recognition until ground units intervention;
- Aerial reconnaissance of checkpoint and surroundings areas;
- Detection of vehicles involved in accidents attempting to flee the scene;
- Identification of illegally parked vehicles;
- Real-time monitoring of areas where physical checkpoints are not technically feasible.[29]

[29] I. M. Yefimenko, "Modern possibilities of using unmanned aerial vehicles by Police authorities and units: Analysis of foreign and Ukrainian experience," Scientific Journal of the National Academy of Internal Affairs, vol. 27, no. 3, pp. 65-77, 2022.

Czech Republic. Czech police continue to implement UAS-based traffic enforcement on selected roadways. Drivers who violate safe distance with other vehicles will eventually be fined. However, UAS operations are currently focused on data collection with the only purpose of monitoring road safety conditions. After reviewing UAS footage, authorities issue a traffic warning to the driver along with supporting photo or video evidence. Compared to helicopters previously deployed by the agency for traffic monitoring, UAS offer a lower-cost alternative and increased effectiveness especially in environments where helicopter deployment poses safety risks such as in cycling and pedestrian areas.[30]

[30] "Prague Morning," 10 6 2022. [Online]. Available: https://praguemorning.cz/czech-police-is-deploying-drones-to-monitor-traffic-violations/[Accessed 09 12 2024].

2.7 Border Control

In the context of border security, preventing, detecting, and catching smugglers, terrorists, and individuals attempting illegal crossings is of a critical importance. Traditional border protection methods are cost-intensive since they require significant personnel and operational expenditure. Therefore, the integration of emerging technologies has become essential. To this purpose, UAS deployment can provide a relevant contribution in this regard particularly in remote and high-risk border areas.[31]

[31] S.G. Constantinescu and F. Nedelcuţ, "Uav Systems in Support of Law Enforcement Forces," in International Conference of Scientific Paper AFASES, Brasov, 2011. https://www.afahc.ro/ro/afases/2011/uav/Constantinescu_Nedelcut.pdf

EU. The Border UAS Project, launched in 2020 and funded by the European Union, focuses on developing UAS capabilities to enhance border surveillance and prevent illegal crossing. The project outlines four primary aims:

1. Develop UAS components optimized for cost-effective and long-duration border surveillance operations;
2. Develop sensors and data-processing solutions to support detection and tracking in challenging terrain, extreme weather conditions and unstructured environments;
3. Perform validation and testing under realistic border surveillance conditions;
4. Conduct dissemination, communication and exploitation activities.

To date, multiple test flights have been made in Croatia, Romania, Moldova, Greece and Bulgaria, and development efforts are ongoing.[32]

Romania. In Romania, the Border Police has recently acquired two new UAS with vertical take-off and landing capability. These systems complement the UAS fleet already in use to provide extended surveillance over areas of up to 150 km², significantly reducing team response times through improved strategic planning. Especially in the current geostrategic context, border police officers need state-of-the-art equipment to prevent and combat all cross-border criminal activities, as well as maintain technological parity to counter increasingly sophisticated methodologies employed by transnational criminals.[33]

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[32] "BorderUAS," European Union, [Online]. Available: https://borderuas.eu/[Accessed 04 12 2024].

[33] 17 04 2024. [Online]. Availablehttps://www.politiadefrontiera.ro/en/main/i-two-airplanetype-drones-with-vertical-takeoff-entered-the-endowment-of-the-romanian-border-police-8761.html[Accessed 09 12 2024].

In 2023, migrants attempting unauthorized Romanian border crossing were detected by UAS. In one case,13 individuals from various Afro-Asian countries attempting to cross the border illegally were spotted, ground teams were informed, and an investigation was launched.[34]
In 2024, 19 foreign nationals who entered Romania illegally were detected by border police using UAS and detained by ground forces.[35]

[34] "Border Security Report," 8 6 2023. [Online]. Available: https://www.border-security-report.com/migrants-identified-with-the-drone-attempting-to-cross-the-romanian-border/[Accessed 09 12 2024].

[35] "Border Security Report," 26 1 2024. [Online]. Available: https://www.border-security-report.com/nineteen-foreign-citizens-illegally-entering-romania-detected-by-the-border-police-using-the-drones/[Accessed 09 12 2024].


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2.8 Contribution to Situational Awareness

Immediate and accurate information is critical in the execution of law enforcement operations, as it enhances situational awareness. Increased situational awareness enables command to execute a more precise and timely decision-making. The capacity of real-time and timely examination of events from multiple perspectives supports the accuracy of the decision to be made. UAS deployment facilitates the response operational questions such as: *What is the nature of the event? Where is it taking place? What resources are required to respond?*

USA. In 2023, The Chula Vista Police Department received reports regarding a vehicle fire along a freeway. However, initial reports did not indicate the exact location. Prior to the arrival of patrol units, the department's UAS identified the vehicle's exact coordinates enabling patrol to rescue the victim shortly before the vehicle was fully engulfed in flames.[36]

UAS platforms can be utilized to generate visual content to be released on law enforcement agency websites and social media profiles. In the contemporary digital era where visual communication maintains a special importance, such imagery can be used to build public trust in law enforcement operations while informing public opinion about tasks performed. Effective and efficient UAS deployment can also act as a deterrent for criminals and potential offenders.

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[36] "Chula Vista Police Department," [Online]. Available: https://www.chulavistaca.gov/departments/police-department/programs/uas-drone-program [Accessed 03 12 2024].

2.9 Support to Public Health

Specific law enforcement tasks include public health protection missions. In the event of incidents in nuclear facilities, whenever water resources are polluted, or illegal industrial waste disposal activities break environmental laws, the collection of environmental samples becomes critical in the prosecution and investigation process. In environmental-sensitive cases, UAS equipped with appropriate payload can be deployed to collect samples to minimize health-risks for law enforcement personnel and civilian population.

When outfitted with appropriate sensors, UAS can conduct precise, real-time measurements of emissions from sources as industrial chimneys, with expanded coverage. These technological applications can not only improve the effectiveness of anti-pollution measures but

also serve as a deterrent through a better public awareness of ongoing environmental monitoring.[37]

Poland. In preparation of the 2018 UN Climate Change Conference, Polish authorities implemented UAS platforms to get an early detection of environmental issues. Those ones were equipped with specific sensors for recording air quality variations in order to identify unauthorized pollutant release into the atmosphere. [38]

[37] M. Sieradzka, T. Balcerzak, K. Kostur and J. Rajchel, "Assessing the Legality and Impact of Anti-Smog Drones in Poland's Air Quality Management," Zeszyty Naukowe SGSP, vol. 89, no. 2, 2024. https://zeszytynaukowe-sgsp.pl/article/543099/en

[38] M. Margaritoff, "The Drive," 25 1 2018. [Online]. Available: https://www.thedrive.com/article/17965/the-polish-city-of-katowice-is-using-a-drone-to-combat-smog[Accessed 10 12 2024].

2.10 Contribution to Logistics

The growing integration of Artificial Intelligence (AI) and Machine Learning (ML) tools and techniques in UAS has accelerated UAS application in logistics and cargo transportation, as well as in other domains. The advancement of autonomous navigation systems enhances flexibility and efficiency in route optimization, particularly in dynamic operational environments.[39]

UN. Following Typhoon Yolanda in 2013, humanitarian actors deployed portable micro-UAS in Haiti and the Philippines to support mapping functions, enhance situational awareness, and conduct need assessment. While current applications primarily focus on data collection and monitoring, ongoing research is also exploring freight transportation - especially fragile items such as vaccines.[40]

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[39] D. Caballero-Martin, J. M. Lopez-Guede, J. Estevez and M. Graña, "Artificial Intelligence Applied to Drone Control: A State of the Art," Drones, vol. 8, no. 296, 2024. https://www.mdpi.com/2504-446X/8/7/296

[40] D. Gilman, "Unmanned Aerial Vehicles in Humanitarian Response," Office for the Coordination of Humanitarian Affairs, 2014. https://www.unocha.org/publications/report/world/unmanned-aerial-vehicles-humanitarian-response

2.11 Other Uses

Critical sites and infrastructures represent the backbone of modern society and support our daily existence. Due to high dependency on these systems, they are vulnerable to a range of threats. Cyber or physical attacks can impair partial, regional or national functionality of these systems.[41] Therefore, the protection of critical infrastructure and site areas - such as oil and natural gas pipelines, energy generation and distribution facilities, communication networks, institutional and large-organization buildings - is of paramount. UAS prove significant contribution to surveillance and protection of these areas.

Terrorism, in all its forms and manifestations, represents the most direct asymmetric threat to citizen security and to international peace and prosperity. [42] Terror organizations actively pursue technological advancement in order to sustain their existence. Correspondingly, law enforcement agencies are called to develop and use superior technologies. A key component of counterterrorism is intelligence activities. Knowledge of the movements, intentions and capabilities of terrorist organization members directly contributes to counter-terrorism activity. UAS can serve as force multiplier in this context providing effective reconnaissance and surveillance activities. Additionally, within established legal frameworks, UAS equipped with explosive payloads can execute terrorist neutralization operations.

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[41] United Nations, "The protection of critical infrastructures against terrorist attacks: Compendium of good practices," 2018. https://www.un.org/counterterrorism/sites/www.un.org.counterterrorism/files/eng_compendium-cip-final-version-120618.pdf

[42] "NATO 2022 Strategic Concept". https://www.nato.int/nato_static_fl2014/assets/pdf/2022/6/pdf/290622-strategic-concept.pdf

Across all previously enumerated operational categories, UAS can be fitted with specialized payloads as Radio Frequency Equipment and Wi-Fi Sniffers to support law enforcement and affiliated agency communications

The diverse Stability Policing functions described above can derive significant operational benefits from UAS integration.

While task categorization facilitates classification and explanation, in real-world multiple task types are often performed simultaneously or evolve dynamically in response to situational developments. Under both scenarios, UAS deployment can significantly support law enforcement.

2.12 Possible Future Uses

The integration of Artificial Intelligence (AI) and Machine Learning (ML) into the aviation sector continues to grow rapidly. One of the most notable advancements in recent years is the development of swarm UAS technology, which mimics through artificial intelligence applications the coordinated behavior of biological groups like birds or insects.
Powered by AI algorithms, this technology enables multiple UAS platforms to fly semi-independently while maintaining coordination to offer substantial operational advantages for law enforcement organizations.[43]

As Artificial Intelligence (AI) and Internet of Things (IoT) integration with UAS platforms intensifies, enhanced autonomous adaptation to new scenarios is also expected to improve. AI and IoT can unlock new UAS functional capabilities.
China. Researchers at Zhejiang University flew a swarm of ten UAS through a previously unexplored forest area unfamiliar to the system. The swarm successfully captured imagery of mobile human targets without colliding between them or against obstacles via integrated sensors while continuously exchanging information with the rest of the swarm. The swarm maintained effective visual tracking of their targets despite the presence of additional environmental obstacles and non-target humans during the flight.[44]

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[43] J. Rajajeyavel, S. Panneerselvam and S. Dinesh, "Air 100 UAV for Law and Enforcement Applications," in ITM Web of Conferences, 2021. https://www.semanticscholar.org/reader/8ae48930445f3bdfe0ce246221db365dabe2fdfd

[44] S. Knapton, "Drone swarms that can navigate dense forest burst out of science fiction into real world," The Telegraph, 5 5 2022. [Online]. Available: https://www.telegraph.co.uk/news/2022/05/05/drone-swarms-can-navigate-dense-

Chapter 3 Conclusions and Recommendations

3.1 Conclusions

1. Unmanned Aircraft Systems (UAS) represent effective and efficient Intelligence, Surveillance, Reconnaissance (ISR) and Targeting assets (with appropriate legal framework) tools.

2. Contemporary operational implementation demonstrates UAS functionality extends beyond military applications towards multi-functional systems actively deployed by law enforcement agencies. UAS are deployed both globally and regionally for tasks such as police patrolling, evidence collection, search and rescue missions, crowd and riot control, disaster response and recovery, traffic management and border control, with increasing relevance on a day-by-day basis.

3. UAS implementation allows law enforcement personnel to “see without being seen”. These versatile platforms offer diverse applications substantially enhancing law enforcement effectiveness and efficiency. UAS facilitates increased situational awareness through aerial reconnaissance and surveillance, with a comprehensive area assessment capability.

4. In an era marked by a daily technological advancement in digitalization and visualization technologies, UAS contribution is pivot in law enforcement activities.

5. UAS offer a cost-effective alternative to traditional law enforcement methods replacing functions previously requiring substantial personnel

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forest-burst-science-fiction/?msockid=274e595be436626628154dbce57d63db [Accessed 03 12 2024].

deployment and conventional assets like helicopters while maintaining traditional law enforcement tactics and techniques.

6. Resources (personnel, materials, time etc.) saved by integrating UAS into conventional methodologies can be reallocated to other tasks. In high-risk operational environments, UAS deployment minimizes personnel and civilian casualties, while reducing the potential for evidence contamination.

7. Compared to ground units, UAS demonstrate superior manoeuvrability across most operational scenarios. They enable rapid access to locations requiring extended transit times for personnel or ground vehicles.

8. Considering all the above-mentioned findings, the integration of UAS capability into Stability Policing mission supports NATO's core functions of Deterrence and Defense, Crisis Prevention and Management, and Cooperative Security.

9. UAS systems function as force multipliers for Law Enforcement Agencies and as substantial contributors to Stability Policing missions' deployment. With technological advances, their positive contribution is expected to grow in parallel with ongoing technological innovations.

10. **UAS presence enhances the deterrent effect of Stability Policing Units. Effective UAS deployment create a deterrent effect against criminals or potential offenders.**

3.2 Recommendations

UAS Capability Building in Law Enforcement Agencies:

1. Dedicated UAS departments should be created within law enforcement agencies. They should operate under clearly defined mandates and detailed operational plans.

2. UAS platform and payload systems procurement should be selected according to law enforcement mission-specific requirements. Selection criteria should prioritize flight range, payload capacity and camera features.

3. A comprehensive system covering organization, equipment and personnel should be implemented to cover UAS pre-flight preparation, flight safety protocols, mission execution and maintenance procedures.

4. Appropriate software and hardware solutions should be implemented to provide timely and accurate analysis of data collected by UAS during operations.

5. The UAS capabilities and operational areas should be communicated to relevant stakeholders on a need-to-know basis (high command, related colleagues, other organizations, general public, Ministry of Justice units, etc.), to enhance cooperation and coordination.

UAS Capability Building in Stability Policing:

6. Stability Policing units should receive mission-appropriate UAS capability and required training for such missions. Operations should be dynamically monitored in a lessons learned perspective.

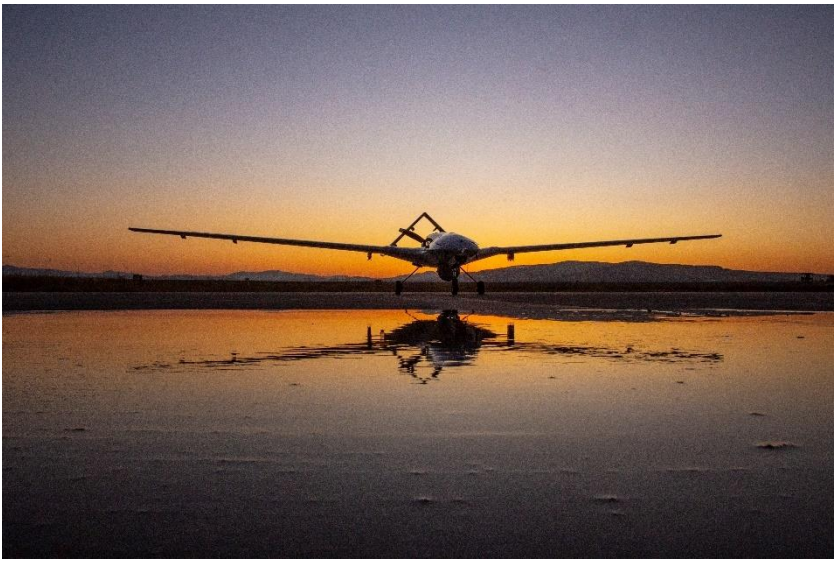
7. Host nation law enforcement forces should be assisted in building their UAS capabilities.

8. Protocols should be established to allow UAS platforms under NATO, UN or EU mandates normally assigned to alternative mission profiles, to provide Stability Policing operations when necessary

Emerging Opportunities:

9. UAS technology is advancing very fast driven by developments in Artificial Intelligence (AI), Machine Learning (ML), and the Internet of Things (IoT): continuous monitoring and adaptation to technological evolution remains essential.

10. Integrated operations involving UAS and other robotic systems such as Unmanned Ground Systems and Unmanned Surface Systems should be explored.



GLOSSARY OF ACRONYMS

AGL	: Above Ground Level
AI	: Artificial Intelligence
BLOS	: Beyond Line of Sight
DFR	: Drone as First Responder
EU	: European Union
GTF	: Gendarmerie Type Force
HALE	: High Altitude Long Endurance
IoT	: Internet of Things
ISR	: Intelligence Surveillance Reconnaissance
J	: Joule
kg	: kilogram
LOS	: Line of Sight
MALE	: Medium Altitude Long Endurance
MSL	: Mean Sea Level
NATO	: North Atlantic Treaty Organization
NISRF	:The NATO Intelligence, Surveillance and Reconnaissance Force
RPA	: Remotely Piloted Aircraft
SP	: Stability Policing
UA	: Unmanned Aircraft
UAS	: Unmanned Aircraft System
UAV	: Unmanned Aircraft Vehicle
UN	: United Nations
UNODC	: The United Nations Office on Drugs and Crime

REFERENCES

Border Security Report, 8 6 2023. [Online]. Available: https://www.border-security-report.com/migrants-identified-with-the-drone-attempting-to-cross-the-romanian-border/. [Accessed 9 12 2024].

Border Security Report, 26 1 2024. [Online]. Available: https://www.border-security-report.com/nineteen-foreign-citizens-illegally-entering-romania-detected-by-the-border-police-using-the-drones/. [Accessed 09 12 2024].

BorderUAS, European Union, [Online]. Available: https://borderuas.eu/. [Accessed 04 12 2024].

C. Kowalenko, "Greek City Times," 06 12 2024. [Online]. Available: https://greekcitytimes.com/2024/12/06/security-athens-grigoropoulos/. [Accessed 11 12 2024].

C. Livesay, "CBS News," 27 7 2023. [Online]. Available: https://www.cbsnews.com/news/italy-fire-drone-arson-suspect-arrest-calabria-wildfires-europe-algeria/. [Accessed 09 12 2024].

Chula Vista Police Department, [Online]. Available: https://www.chulavistaca.gov/departments/police-department/programs/uas-drone-program. [Accessed 03 12 2024].

D. Caballero-Martin, J. M. Lopez-Guede, J. Estevez and M. Graña, "Artificial Intelligence Applied to Drone Control: A State of the Art," Drones, vol. 8, no. 296, 2024.

D. Gilman, "Unmanned Aerial Vehicles in Humanitarian Response," Office for the Coordination of Humanitarian Affairs, 2014.

I. Bjelovuk, T. Kesić and M. Žarković, "The Possibilities Of Using Unmanned Aerial Vehicles – Drones In Crime Scene Investigation".

I. M. Yefimenko, "Modern possibilities of using unmanned aerial vehicles by Police authorities and units: Analysis of foreign and Ukrainian experience," Scientific Journal of the National Academy of Internal Affairs, vol. 27, no. 3, pp. 65-77, 2022.

J. M. Calatayud, "Algorithm Watch," [Online]. Available: https://algorithmwatch.org/en/tracers/the-spanish-police-watch-talk-to-and-count-people-through-drones-to-make-them-abide-by-covid-restrictions/. [Accessed 09 12 2024].

J. Rajajeyavel, S. Panneerselvam and S. Dinesh, "Air 100 UAV for Law and Enforcement Applications," in ITM Web of Conferences, 2021.

J. Yesberg, I. Brunton-Smith and B. Bradford, "Police visibility, trust in police fairness, and collective efficacy: A multilevel Structural Equation Model," European Journal of Criminology, vol. 20, no. 2, pp. 712-737, 2023.

M. Margaritoff, "The Drive," 25 1 2018. [Online]. Available: https://www.thedrive.com/article/17965/the-polish-city-of-katowice-is-using-a-drone-to-combat-smog. [Accessed 10 12 2024].

M. Sieradzka, T. Balcerzak, K. Kostur and J. Rajchel, "Assessing The Legality and Impact of Anti-Smog Drones in Poland's Air Quality Management," Zeszyty Naukowe SGSP, vol. 89, no. 2, 2024.

NATO 2022 Strategic Concept.

NATO, "Allied Joint Publication (AJP) 3.22, Allied Joint Doctrine for Stability Policing," Vols. Edition A, Version 1, 2019.

NATO, "Allied Tactical Publication (ATP) 3.3.8.1, Minimum Training Requirements for Unmanned Aircraft Systems (UAS) Operators and Pilots," Vols. Edition B, Version 1, 2019.

NL Times, 16 11 2020. [Online]. Available: https://nltimes.nl/2020/11/16/dutch-police-increasingly-using-drones. [Accessed 10 12 2024].

Online. Available: https://www.nato.int/cps/en/natohq/topics_48892.htm#what. [Accessed 29 11 2024].

Online. Available: https://www.politiadefrontiera.ro/en/main/i-two-airplanetype-drones-with-vertical-takeoff-entered-the-endowment-of-the-romanian-border-police-8761.html. [Accessed 09 12 2024].

P. Royo, À. Asenjo, J. Trujillo, E. Çetin and C. Barrado, "Enhancing Drones for Law Enforcement and Capacity Monitoring at Open Large Events," Drones, vol. 6, no. 359, 2022.

Prague Morning, 10 6 2022. [Online]. Available: https://praguemorning.cz/czech-police-is-deploying-drones-to-monitor-traffic-violations/. [Accessed 09 12 2024].

R. L. Finn, D. Wright, L. Jacques and P. D. Hert, "Study on privacy, data protection and ethical risks in civil remotely piloted aircraft," European Commission, Directorate-General for Enterprise and Industry, 2014.

Reuters, 21 4 2023. [Online]. Available: https://www.reuters.com/world/europe/french-police-cleared-use-drones-crowd-monitoring-2023-04-21/. [Accessed 9 12 2024].

S. A. H. Mohsan, M. A. Khan, F. Noor, I. Ullah and M. H. Alsharif, "Towards the Unmanned Aerial Vehicles (UAVs): A Comprehensive Review," Drones, vol. 6, no. 147, 2022.

S. Balcikoca, "AA," 02 01 2022. [Online]. Available: https://www.aa.com.tr/en/turkey/turkish-made-drone-helps-rescue-lost-danish-national-at-ski-resort/2463007. [Accessed 12 12 2024].

S. G. Constantinescu and F. Nedelcuţ, "Uav Systems in Support of Law Enforcement Forces," in International Conference of Scientific Paper AFASES, Brasov, 2011.

S. Knapton, "Drone swarms that can navigate dense forest burst out of science fiction into real world," The Telegraph, 5 5 2022. [Online]. Available: https://www.telegraph.co.uk/news/2022/05/05/drone-swarms-can-navigate-dense-forest-burst-science-fiction/. [Accessed 03 12 2024].

S. Sitbon, "France24," 1 5 2023. [Online]. Available: https://www.france24.com/en/tv-shows/science/20230501-drones-used-to-monitor-french-may-day-rallies-for-first-time. [Accessed 09 12 2024].

United Nations Office on Drugs and Crime, [Online]. Available: https://www.unodc.org/roca/en/news/unodc-explains-the-combined-use-of-unmanned-aerial-vehicles-and-ground-surveillance-systems.html. [Accessed 10 12 2024].

United Nations, "The protection of critical infrastructures against terrorist attacks: Compendium of good practices," 2018.

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