Adopting AI in defence organisations requires further focus on ethical, legal and societal aspects

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ICUAS MAGAZINE

State-of-the-art and recent developments in unmanned aviation

In This Issue

EDITORIAL

Dear Readers:

In this 2nd Issue of the eMagazine, we first provide the latest details concerning the upcoming ICUAS 2023. This conference update allows you to plan around the June 6-9 conference dates, whether you decide to attend physically or virtually – our very strong recommendation is to attend physically, and to enjoy what Warsaw has to offer.

This 2nd issue includes three very important and different articles:

- The first article with title "Adopting AI in Defence Organisations Requires Further Focus on Ethical, Legal and Societal Aspects", emphasizes the need for a legal and regulatory framework under which drones will operate. In addition, it raises and makes valid points about AI ethics – note that robot ethics in general is a center stage discussion topic.
- The second article with title "A Novel Remote Water Inspection System based on an Amphibious Drone", centers around the utilization of drones to specific public domain applications.
- The third article with title "Introducing Noise for AirSim 3D LiDAR Sensor to Reduce the Sim2real Gap in Simulated Multi-rotor Operations" centers on the importance of modeling accurately sensor noise, as it may affect the accuracy and reliability of an aerial robot's perception of the surrounding environment.

The issue concludes with recent news and reports on unmanned aviation.

UPDATES ON ICUAS 2023, JUNE 6-9

With respect to this year's conference, the paper review process has been completed and results have been announced. We received a healthy number of 250 contributed, invited session, and poster papers, and, following a very thorough and in-depth peer review process, the committee accepted for presentation and inclusion in the conference proceedings 189 papers, the distribution of which is presented next.

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ACCEPTED PAPERS PER COUNTRY

COUNTRY	SUBMITTED	ACCEPTED	COUNTRY	SUBMITTED	ACCEPTED	COUNTRY	SUBMITTED	ACCEPTED
Algeria	3	2	Germany	9	7	Netherlands	7	7
Argentina	3	2	Greece	4	3	New Zealand	3	0
Australia	2	1	Hungary 3	2		Norway	2	1
Austria	2	1	India	15	9	Poland	10	7
Brasil	19	13	Ireland	1	1	Portugal 1	1	
Canada	12	8	Israel	2	2	Russia	1	0
China	14	12	Italy	17	15	Singapore	5	4
Colombia	1	1	Japan	3	1	Spain	13	13
Croatia	3	3	Kazakhstan	1	1	Sweden	4	4
Cyprus	6	6	Kenya	2	1	Switzerland	4	4
Czech Republic	5	2	Korea, South	5	5	Turkey	3	3
Denmark	6	3	Luxembourg	3	3	United Kingdom	4	4
Finland	2	1	Malta	1	0	USA	34	23
France	9	7	Mexico	6	6			
						Totals	250	189

ICUAS'23 includes the UAV Competition, which is student-focused, offering unique opportunities for students to test and compare their skills with those of their peers, worldwide.

ICUAS'23 offers three pre-conference Workshops/Tutorials that will take place on Tuesday, June 6, and three Keynote/Plenary Talks.

TUTORIALS / WORKSHOPS - TUESDAY, JUNE 6, 2023		
LOCATION	TIME	TITLE
ROOM 464	FULL-DAY 9:00 - 18:00	New Developments on Sense-And-Avoid (S&A), Distributed Fault Detection and Diagnosis (DFDD), Fault-Tolerant Control (FTC) and Fault-Tolerant Cooperative Control (FTCC) Techniques Unmanned Systems.
ROOM 465	HALF-DAY 9:00 - 13:00	Review of State-Of-The-Art Deep Learning Approaches for Visual Object Recognition and Tracking: Applications to Unmanned Aircraft Systems.
ROOM 466	HALF-DAY 9:00 - 13:00	Current and Future Surveillance Technologies for Airspace Integration of UAS in Controlled and Uncontrolled Airspace.

KEYNOTE / PLENARY TALKS		
DAY	TIME	AULA 58
WEDNESDAY JUNE 7	09:30 - 10:30	**Increasingly Autonomous Perception and Decision Systems for Advanced Air Mobility,** Prof. Ella Atkins, Virginia Tech, USA
	14:00 - 15:00	**Soft Aerial Robots,** Prof. Bego a Chiquinquira Arrue Ullés, University of Seville, Spain
FRIDAY JUNE 9	09:00 - 10:00	**From Competition to U-Space Certification and Implementation - a Story about "What If....?** Panel Korzec, Droneradar Sp. Z. O. O., Poland

All details and logistics about the conference may be found at **www.uasconferences.com.**

ADOPTING AI IN DEFENCE ORGANISATIONS REQUIRES FURTHER FOCUS ON ETHICAL, LEGAL AND SOCIETAL ASPECTS

BENJAMYN I. SCOTT, HENNING LAHMANN, BART CUSTERS

1. INTRODUCTION

On 14 March 2023, two Russian Su-27 jets attempted to intercept a United States MQ-9 Reaper unmanned aircraft in international airspace over the Black Sea, whereby the Su-27 aircraft intentionally flew in front of the Reaper and dumped fuel. Eventually, one of the Russian jets collided with the rear propeller of the Reaper, resulting in the total loss of the Reaper. This recent incident raises questions regarding the legality of the use of both manned and unmanned military aircraft in international airspace, and the right of interception.

International Law makes it explicitly clear, as recognised in Article 1 of the Convention on International Civil Aviation of 1944, that "every State has complete and exclusive sovereignty over the airspace above its territory." As the incident took place in international airspace rather than over the "land areas and territorial waters" (Article 2) of a State, all involved aircraft were lawfully permitted to be in that part of the airspace.

The international airspace is not, as phrased by Prof. Bin Cheng, an "oasis of lawlessness"; international law applies. For example, military aircraft may choose to follow or deviate from civil air law. However, per Article 3 of the 1944 Convention, military aircraft must be flown with 'Due Regard' for the safety of civil aircraft. In addition, each State will have its own rules on the military use of aircraft, which will include procedures on the interaction with other airspace users, including interception of (unmanned) aircraft.

As unmanned aircraft operations fall within the international legal regime, the fact that the US aircraft was unmanned did not pose any specific legal issues in this case. As a result, the use of military unmanned aircraft has produced significant literature on their place in the international legal order. For example, the use of unmanned aircraft for defence purposes by a State must conform to Article 2(4) of the Charter of the United Nations, which declares that "All Members shall refrain in their international relations from the threat or use of force [...]." This obligation must then be balanced against Article 51 of the UN Charter, which codifies a State's "inherent right of individual or collective self-defence" against an armed attack, as well as the rules for international humanitarian law in times of war found in the Geneva Conventions. The fourth Geneva Convention pertains to the Protection of Civilian Persons in Time of War. Thus, public international law dictates how combatants must treat civilians, which also extends to the use of unmanned aircraft. Further, Protocol 1 to the Geneva Convention also covers Methods and Means of Warfare. Nothing in this Protocol precludes the use of unmanned aircraft.

This incident is an example of how applicable legal frameworks generally govern the fielding of unmanned aircraft, but it also illustrates that the current legal frameworks do not provide satisfying solutions and provide only limited guidance. The increasing use of artificial intelligence (AI) in these military systems will further complicate the regulatory picture considerably due to the complexities of human-machine interaction the use of such technologies entails. The development of adequate legal frameworks requires a deeper examination of the issues these military AI raise.

2. THE ETHICAL, LEGAL SOCIETAL ASPECTS LAB

For the armed forces to operate efficiently and effectively in a secure way during both peacekeeping and combat activities, AI technology is becoming increasingly critical. However, while new technological advancements in AI present opportunities for defence stakeholders, they

also carry challenges and risks in relation to ethical, legal, or societal aspects (ELSA). To ensure the successful and responsible use of AI technology by the defence stakeholders, ELSA issues need to be evaluated and all concerns must be addressed. This is a continuous and holistic approach, whereby such considerations must take place at the design, manufacturing and maintenance of AI-based systems, as well as its utilisation via appropriate military doctrine and training.

In response to this task, the Dutch Government has established the National Growth Fund (NGF), which is tasked with investing €20 billion between 2021 and 2025 in projects targeting knowledge development as well as research, development, and innovation. Funding is allocated to projects with the highest potential of contributing to durable economic growth, which will bring benefits to Dutch society as a whole. In the first year, around €10 million was dedicated to the so-called ELSA Labs, with more to come.

These ELSA Labs focus on the development and deployment of 'human-centric AI' in a way that aligns with the European focus on AI applications that respect fundamental rights and public values. To support and oversee the development of ELSA Labs, the Netherlands Organisation for Scientific Research (NWO) and the Netherlands AI Coalition launched a call for 'Human-Centric AI for an Inclusive Society: Towards an Ecosystem of Trust'. As a result, five projects were approved at the end of January 2022. One of these was the ELSA Lab Defence (see https://elsalabdefence.nl/).

As ELSA issues are continuously evolving with new developments in technology, this calls into question how defence organisations can maintain strategic competitiveness and be at the forefront of military innovation, while also upholding the values of the citizens they are tasked to protect. In response to this question, the ELSA Lab Defence was established to assess this in an inter-institutional and interdisciplinary setting. The ELSA Lab follows the 'Quadruple Helix' model consisting of four actors in innovation: academia, government, industry, and society. The ELSA Lab is focused on giving context-dependent methodology that focuses on the 'analysis', 'design' and 'evaluation' of ELSA issues that arise from AI-based applications within the military context. This necessitates applying the theory to real-world case studies.

3. CASE-STUDY: UNMANNED AIRCRAFT AS NON-LETHAL AUTONOMOUS ROBOTS

There is already considerable literature on autonomous weapon systems, which identify and engage remote targets. However, this is not the totality of AI systems in defensive applications. The use of unmanned aircraft as Non-Lethal Autonomous Robots and as tools for earth observation data collection are highly relevant as well, which makes them an appropriate case study for the ELSA Lab Defence.

Among other possible scenarios, non-lethal unmanned aircraft increasingly play an important role in providing situational awareness, collecting intelligence and fulfilling logistical tasks (e.g., for dirty, difficult or dangerous operations). These types of operations pose ELSA concerns as, for example, human operators hand over a degree of control and responsibility to the AI systems, which in turn impacts human agency and human dignity in warfare. Typical other issues concern security (for people, objects, data or other aircraft), privacy (sensitive data, hindrance, annoyance, data collection, function creep), chilling effects, PlayStation mentality, and PTSD.

Without sufficient consideration of the ethical, legal and societal aspects of the use of AI in the defence domain, risks like losing control, biased decision-making, and decreasing humanity in warfare may result in losing public support. Such detrimental consequences should therefore be avoided.

4. WIDER LEGAL CONCERNS

When discussing the use of AI for defence purposes, concepts like accountability, explainability, governability, reliability, responsibility and traceability are often cited. Furthermore, the AI solutions must be accurate, resilient, robust and trusted. The law plays a central role in guaranteeing and reinforcing these aspects. This takes the discussion beyond the above-addressed international law conversations that dominate aviation law and humanitarian law in the context of the use of unmanned aircraft for defence purposes, and demands that legal questions concerning AI must be considered as well. Here only a few relevant issues are mentioned.

First, privacy is a fundamental right, which is guaranteed, for example, in the United Nations Universal Declaration of Human Rights and the European Union Charter for Fundamental Rights. While the right to privacy initially focused on private and family life, this has evolved as informational privacy has gained importance. Informational privacy is closely related to the protection of personal data and this relates to the developments in AI as violations of privacy may occur (1) when processing personal data and (2) when AI tools disclose privacy-sensitive patterns.

Second, human dignity is inherently and inseparably linked

to all the basic human rights (e.g., non-discrimination, freedom of expression, freedom of religion, privacy) and the core values of ethics (e.g., autonomy, non-maleficence, justice). Dignity is the underlying value, whereby interference with basic human rights impacts human dignity.

Third, unmanned aircraft, as well as the systems used to operate them, must be safe. The level of safety is set through strict certification, maintenance, training and operational rules. This must also extend to AI solutions. To promote safety, industry standards, such as those developed by the North Atlantic Treaty Organization (NATO), will also play a key role, whereby interoperability will also be achieved.

Finally, many different stakeholders are involved in designing, manufacturing, putting on the market, and deploying AI systems. This can raise issues of responsibility and liability for damage caused to contractual and third parties. To ensure that injured parties are appropriately compensated, legal clarity is required that takes into consideration the complexity of unmanned aircraft operations that utilise AI solutions.

5. CONCLUSION

It is currently unclear which AI-enabled systems are acceptable from an ELSA perspective, as well as, under which circumstances. This could lead to 'over-use', such as using too many AI systems in too many situations, with a lack of consideration of the consequences, or to 'under-use', such as not using AI, due to a lack of knowledge or fear of consequences. Both reactions could hamper innovation, as over-use could lead to a backlash and under-use to being too cautious. This raises concerns about protecting the freedom, safety and security of society, whereby the suboptimal adoption of AI in the defence organisation carries risks for these values. Here, the law should both facilitate the creation of innovative solutions and contribute to reducing the ELSA risks.

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