

EMERGING LEGAL ISSUES REGARDING CIVILIAN DRONE USAGE

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Abstract

Unmanned vehicles are becoming a common sighting in our day-to-day life and are soon going to become an important economic drive in creating workspaces and help achieve new milestones in human activities. As such, the technology revolving around the unmanned vehicles will push itself as much as it's needed but with each achievement in the field of robotics a legal issue arises around how to use the newly acquired piece of technology in a public or private space and whether or not should such a technology be placed under a strict governmental control.

As the saying by Prof. Henry W. Haynes (1879) goes "The possession of great powers and capacity for good implies equally great responsibilities in their employment. Where so much has been given much is required." so does an unmanned vehicle and its operator must follow a degree of legal guidelines on how to properly use the gadget and to also to understand the legal limitations when interacting with other entities.

This paper will focus on identifying and answering some legal issues regarding what is required for a drone to fly over an identifiable space, but also if the operator must have a document that was conferred by a state to acknowledge the skills of the pilot or should a software limitation be in place for national security safeguards. The paper will also tackle the issue of identifying legal documents from different states that can be applied to drone flight operations and also if different states have adopted sanctions to persons who did not abide to said legal norms.

Keywords: *uav, pilot license, air laws, examination, drones.*

1. Facts and legal issues regarding unmanned vehicles.

1.1. Introduction and facts regarding the legality of unmanned vehicles.

The progress of robotics and communications technology has drawn a point in which the average consumer now has the possibility to acquire unmanned drones and use them in their day-to-day life. This progress however brings forth new social and legal issues such as operator liability, privacy violations, certification requirements and new mulct or crimes to be classified.

Even at this stage of the technology, lawmakers must be ready to tackle future modes of transportation of passengers and cargo by unmanned vehicles, as such a new phenomenon of remote controlled devices will bring forth new social services that must be covered by laws.

Current drone technology only allows the drone to be handled by a remote pilot, who can either be a lone operator or comprised of a team operators, who operators the unmanned vehicle based on the data that is being gathered from its camera, sensors and satellite connection. A second type of unmanned vehicle is

based on self-management and self-guidance, on the basis of pre-programmed instructions, machine learning or even artificial intelligence¹. The later type of unmanned vehicles is a newly formed category that is based on automation and as such can only accomplish tasks within programmed limits.

The focus of this paper will be mainly on unmanned aerial vehicles and their legal status and situation based on current aircraft regulatory regime. While aircraft regulations may seem well established, drones offer a different approach to a traditional legal branch and bring a plethora of new situations which require either a new understanding of the older legal provisions or must be accompanied with new legal regulations based on their current and short-term future prospects.

The first time the concept of unmanned aerial vehicles was handled by the Protocol amending the Paris Convention (1929)² in the context of unmanned balloons that were developed and used both scientifically and military. Later, small planes were remote controlled and used with the same objectives in mind, but had shortcomings when range and fuel autonomy was taken into consideration.

As such, the Chicago Convention on International Civil Aviation³ recognizes unmanned aerial vehicles under article 8⁴ and establishes a positive obligation

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¹ Kristian Bernauw, Drones: The emerging era of unmanned aviation, University of Ghent, Belgium, UDK: 347.823.37(497.5) 341.24:347.823.3 Prethodno znanstveno priopćenje Primijeno: kolovoz 2015, pg. 227-228.

² Convention relating to the Regulation of Air Navigation (1919), article 15 was amended in 1933 with the following provision: "No aircraft of a contracting State capable of being flown without a pilot shall, except by special authorization, fly without a pilot over the territory of another contracting State".

³ 4.04.1947, International Civil Aviation Organization.

⁴ No aircraft capable of being flown without a pilot shall be flown without a pilot over the territory of a contracting State without special authorization by that State and in accordance with the terms of such authorization. Each contracting State undertake to insure that the flight of such aircraft without a pilot in regions open to civil aircraft shall be so controlled as to obviate danger to civil aircraft

towards states to ensure that such flights will be conducted without endangering other civilian aircraft. The requirement for drones in this case should be to at least be registered to an individual, a legal entity or even to a governmental body, but just this condition has proven that it can be difficult to achieve or lackluster when accidents happen, this being taken under consideration as Annex 7 to the Chicago Convention established the requirement for states to have a national aircraft register⁵. For civilian aircraft accidents to even be considered a registry must exist and drones have been considered being registered to said registry to benefit from compensation clauses, as article 1 of the Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface⁶ dictates.

To ensure that drones are flying in such a manner that allows for compensation in case of accidents and discourage unmorally conduct is by introducing a legal obligation for operators to be licensed, registered and have a minimal understanding of safety laws and procedures, similarly to how a person acquires a driving license for a car or a plane.

The only drawback of the Chicago Convention is that of not being able to foresee the rise of autonomous drones and semi-intelligent software, as such the convention only covers drones that are piloted by a human operator and not guided by one through a software interface. However, the International Civil Aviation Organization (henceforth will be abbreviated I.C.A.O.) has been active as of 2006 in recognizing the impact of unmanned vehicles and started developing legal guidelines for members to integrate in their national legal system.

I.C.A.O. had two informal meetings in 2006 and 2007 in order to develop standards regarding drone operations and started a collaboration with the European Organization for Civil Aviation Equipment and the Radio Technical Commission for Aeronautics in order to fully grasp how drones operate and to have a larger vision on how the technology might evolve later on⁷.

The most important regulatory work is the inclusion of fully autonomous drones under the definition of article 8 of the Chicago Convention, as it was endorsed in the 35th Session of the I.C.A.O. Assembly⁸ and as such ensuring that states will have to tackle this issue in their own national legislation. With this inclusion, a proper definition of the concept can be understood as „*An unmanned aerial vehicle is a pilotless aircraft, in the sense of Article 8 of the*

Convention on International Civil Aviation, which is flown without a pilot-in-command on-board and is either remotely and fully controlled from another place (ground, another aircraft, space) or programmed and fully autonomous”⁹.

Despite having guidelines on how drones should operate and how air space should be segregated to accommodate the new devices, states still have issues in implementing these principles and standards and sometimes require trial-and-error to grasp the real issues that drones bring forth.

However, the European Union acknowledges the ongoing need to regulate drones, this being a common strategy as the Riga Declaration¹⁰ claims in the opening statement regarding principles: „*Drones need to be treated as new types of aircraft with proportionate rules based on the risk of each operation*” with rules being simple and performance based. As such, the European Union launched on the 7th of December 2015 the Aviation Strategy which will gather amendments from anyone interested and have a formal debate in the European Parliament on how the final regulatory document should handle drones. The current agenda supports a spring 2018 deadline for amendments and proposals followed by the formal debate¹¹.

This is however lackluster since by 2014 there were 87 states from around the world that were developing drones or were already owning civilian and military drones and doing operations on a regulatory basis¹² and as such not everyone was ready to discuss and adopt an international legal binding document on how unmanned vehicles should operate.

1.2. Standards and practices for unmanned vehicles.

To help states integrate unmanned aerial vehicles in non-segregated airspace I.C.A.O. developed guidelines that were integrated into the Manual on Remotely Piloted Aircraft Systems¹³ which reinstates that “*Each contracting State undertakes to adopt measures to insure that every aircraft flying over or maneuvering within its territory and that every aircraft carrying its nationality mark, wherever such aircraft may be, shall comply with the rules and regulations relating to the flight and maneuver of aircraft there in force. Each contracting State undertakes to keep its own regulations in these respects uniform, to the greatest possible extent, with those established from time to time under this Convention. Over the high seas, the rules in force shall be those established under this*

⁵ Tabel 1 of Annex 7 to the Chicago Convention.

⁶ Rome, 7.10.1952.

⁷ ICAO, Unmanned aircraft systems, Cir 328 AN/190, pg. 1-2, ISBN 978-92-9231-751-5.

⁸ Global Air Traffic Management Operational Concept (Doc 9854), First Ed., I.C.A.O, Appendix B.

⁹ See note 8, pg. 42.

¹⁰ Riga Declaration on Remotely Piloted Aircraft (drones) "FRAMING THE FUTURE OF AVIATION" Riga - 6 March 2015, European Council.

¹¹ Information was gathered from <http://www.consilium.europa.eu/en/press/press-releases/2017/12/22/updated-aviation-safety-rules-and-new-rules-on-drones-approved-by-the-council/>.

¹² Michael Shank and Elizabeth Beavers, Sign a drone treaty before everyone does as we do, USNews, 04.02.2014.

¹³ ICAO Document nr. 10019 AN/507, First Ed. 2015.

Convention. Each contracting State undertakes to insure the prosecution of all persons violating the regulations applicable."¹⁴ As such article 12 requires states to adopt legal provisions to ensure that unmanned aerial vehicles are being flown under principles that govern public safety and transparent liability.

Furthermore, the manual offers an insight to what drones should require to be air ready based on what documentation is required for a civilian airplane, that being: a certificate of registration, certificate of airworthiness, a license for each member of the crew, a log book, a radio, and other requirements that are based on its capability (if it can carry passengers or goods)¹⁵. Regarding the certificate of airworthiness, this is a requirement that is only required if the device is capable of doing international flights and as such is not a requirement for internal drone flights and also the manual states that the license to fly a drone is not needed.

However, the problem of the drones is exactly the lack of a license to fly, since a lot of drones can easily be acquired from the market and be used right out of the box without any prior knowledge or safety checks. The lack of a proper course in air safety can be a decisive moment between a fatal accident and a safe conduct.

Furthermore, drones do not abide to the general type of operation that the Chicago Convention regulates, meaning that it does not follow a general commercial air transport operation paradigm or even that of the general aviation operation (corporate or aerial work).

Articles 8, 12 and 20¹⁶ from the Chicago Convention establish the need for drone registration to be done similarly to an identification plate on a car, this being a sign of the drones nationality and that it is under the supervision of a state or more states. The obligation requires that the license plate (markings) to be placed in a prominent position or affixed conspicuously to the exterior. The markings are to be obtained after registration in a national database and be fixed, preferably, by the registrar.

The manual also covers the need for a certification for operators, but the requirement is only limited to commercial operators or to those who can conduct operations as services and must be contracted in this manner. Furthermore, the operator must ensure that all employees are familiar with the laws, regulations and procedures applicable to the performance of their duties, prescribed for the areas to be traversed, the aerodromes to be used and the air navigation facilities relating thereto, and operations must be conducted only under safe conditions and

under operational control of the operator. The manual also recommends that responsibility for operational control should only be delegated to the remote pilot-in-command (PIC) and to a flight operations officer/flight dispatcher if an operator's approved method of control and supervision of flight operations requires the use of flight operations officer/flight dispatcher personnel¹⁷.

The certification should contain the name of the state of the operator, a number and an expiration date, the name of the operator, contact details and signature of the governmental or private body that has provided certification, types of operations that are authorized, models of unmanned vehicles that can be operated and airspace categories that can be used accordingly. According to I.C.A.O. Assembly Resolution A38-12¹⁸ certifications that are remitted according to international requirements are also recognized by other states without further need towards obtaining a new certification of the same class or category.

Furthermore, the Manual requires that licensed (certified) operators must hold a series of documents in order to conduct safe operations, these are represented by the present manual are not limited to the following¹⁹: the certificate of operations, operations specifics to the vehicle model, operations manual, flight manual, maintenance control manual, insurance, the registry certification, air worthiness certification (if its conducting international operations), certification for special components, radio license, noise certification, special loads certification and cargo manifest.

After the operator has launched an operation, he must have a certified copy of the license on him, a certified copy of registry paper, a certified copy of the air worthiness certification, license for each pilot/operator in certified copy, a log book, operation specifics, cargo manifest and special documentation for dangerous goods, noise certification and radio license, and also the operation must be accompanied with a flight manual in order to help during situations.

The operator is also responsible²⁰ for the maintenance of the vehicle and its components and also have on hand emergency equipment for servicing the flight or emergency situations. The manual recommends that commercial flights should only be allowed after a maintenance organization approves the flight and should be done as accordingly to a maintenance control manual that the state of registry has provided. Besides such a manual, a maintenance log book should be kept by the operator and also the operator must record modifications and repairs done to the vehicle.

Also, human resource management must be kept in check and encouraged since the remote flight crew

¹⁴ Article 12 of the Chicago Convention,

¹⁵ Pg. 6 of the Manual on Remotely Piloted Aircraft Systems.

¹⁶ Every aircraft engaged in international air navigation shall bear its appropriate nationality and registration marks.

¹⁷ Pg. 55-56 of the Manual on Remotely Piloted Aircraft Systems.

¹⁸ Consolidated statement of continuing ICAO policies and associated practices related specifically to air navigation, 24.09-04.10.2013.

¹⁹ Chapter 6.6, pg. 60-62 of the Manual on Remotely Piloted Aircraft Systems.

²⁰ Chapter 6.8, pg. 65-68 of the Manual on Remotely Piloted Aircraft Systems.

must be prepared with ongoing courses for knowledge and skills on operational procedures, coordination and handover procedures, abnormal and emergency situations, situational awareness and human performance indicators for threats and errors that may occur during flight. Also, the human resource management must be able to cope with fatigue and must grasp the risks and mitigation techniques for fatigue.

In addition²¹, Chapter 8 of the Manual addresses one of the main issues regarding drone pilots, an issue in which they have to follow the same responsibilities and guiding principles as regular pilots meaning that they must abide to national and international air law. The manual opens up with a theory that in the future a single license will be able to cover all types of scenarios but will feature ratings, limitations and endorsements. Also, the manual does not apply to people who own and use drones as sports or recreational devices, however national legislation will have to include a degree of control on flight patterns and areas and also the category of drones that can be used in said areas.

The license will be issued or rendered valid by a legally based authority within the registrar state. The I.C.A.O. Manual addresses a key issue regarding the pilot license that can be obtained, meaning that he must have a medical assessment, an observer competency proof (if its needed), proof regarding experience and a special licenses for international flights. Also a minimum age is considered for obtaining a drone pilot license, as such it is considered that the age of 18 is appropriate.

Additionally, the guidelines offer the registrar state the possibility to organize examinations in order to award the pilot license and also a courses for safety operations and air safety, conducted by authorized instructors. The examination should have a theoretical knowledge examination and a practical skill test. The theoretical exam should at least cover subjects such as air law, general knowledge regarding drones, flight management, human performance, meteorology, navigation, radiotelephony and the principles of flight, while the practical test should focus on threat and error management, maneuvers, airmanship, drone controls.

Since the aforementioned manual is not legally binding member states to I.C.A.O. are not obliged to follow these guidelines, but they can implement some aspects in order to deter unlawful conduct and to prevent fatal accidents.

However, not all states have adopted a licensing procedure for pilots beyond that of doing a simple registration of the device and applying the markings on the drone. For the most part, the United States of America and European Union offer a small

informational brochure regarding *dos and don'ts* in drone operations for civilians²². The informative material has common elements, even thou there are two distinct systems, and focuses mainly on what is prohibited with civilian drone operations.

Both administrative and legal systems consider as guiding principles for drone operations the following: safety checks before operations, applying and obtaining drone insurance, respecting private property and privacy laws, no operations near airports or crowded areas, always have the drone in sight and do not operate changes to the drone. While the I.C.A.O. Manual recommends the starting age for drone pilots should be 18, both the European Union and the United States of America offer the possibility for drone operators to obtain their license at the earliest of age 16.

This is however tied to drone tiers that are based on the weight of the device, manufacturer specifications and risk involved²³ and so it includes an open category that can be used by anyone without any certification, but requires the user to be at least 14 years old, and also a specific and certified category that requires prior certification depending on the type of drone that will be operated. The drones are to be registered if they pass the 250 grams mark and require special registration and certification if they pass the 55 kilogram mark²⁴, a similar approach is also available in the European Union²⁵. If a drone is under the 250 grams mark, it will not be subject to any registration requirements or pilot licensing, the only rule is that of following the core principles of flight as established by the aviation administration authority.

2. Solutions and proposals in deterring unlawful drone operations.

2.1. Certifications and flight approvals approved by aviation authorities.

Starting with 2016 the Federal Aviation Administration in the U.S.A. introduced the Remote Pilot Knowledge Test that focuses on aspects such as regulations, airspace and requirements, weather, performance and operations, and is organized as a 2 hour written exam with a 60 question paper with only one possible answer and can require that the participant to have maps or charts on hand, while having a minimum of 70% of the questions needed to pass (42

²¹ Chapter 8 of the Manual, pg. 73-76.

²² Brochure for the European Union available at the following link: https://www.easa.europa.eu/sites/default/files/dfu/213888_EASA_DRONE_POSTER_v5.pdf and information for flying a drone in the U.S.A. can be read at the following website: https://www.faa.gov/uas/getting_started/.

²³ European Aviation Safety Agency Opinion 01/2018 – can be accessed at the following address: <https://www.easa.europa.eu/document-library/opinions/opinion-012018>.

²⁴ Section 336 from the Federal Aviation Administration.

²⁵ Julia Fioretti, EU agrees registration for drones, downloads of flight recordings, Reuters, 30.11.2017.

out of 60 questions must be answered correctly)²⁶. The test must be repeated once every 24 months and must also be accompanied by a vetting by the security administration on transports.

The only exception to the examination is considered those who fly model aircraft and those who have drones under the 250 grams mark. Persons who are already licensed pilots for manned aircraft can also receive the drone certification without the need to pass the test but have to get their accreditation validated by a drone instructor beforehand.

In Romania, the Civil Aviation Agency published an informative brochure²⁷ regarding drone flight requirements and it's based on the Navigation Directive D.N. 14-02-001²⁸. The document states that a certification of identification, a national permit to fly for drones with a mass of over 15 kilograms, insurance, approval for operations for general flights and a very special approval if the flight is done over the Danube Delta.

Regarding the aforementioned approval, Romania has an interesting approach in limiting drones over its skies, meaning that operators must reserve a portion of the airspace and must be requested with at least 45 days before the operation. Furthermore, if the drone is equipped with a camera, then the operator must request a special authorization from the Ministry of Defense of Romania that can be obtained anywhere from 1-30 days after submission. The only exceptions from these specifics are similar to other legal systems, meaning that model aircraft are exempted and also any other drone under 1 kilogram in mass if it only operates in no populated areas and contains no filming or data transmission devices. Currently there are no exams needed in order to fly a drone but there are some authorized flight instructors.

The European Air Safety Agency does not issue pilot licenses, this is reserved to member states that can issue such documents, but must be done under the guidelines established by the agency²⁹. For example, the United Kingdom implements the I.C.A.O. Manual and the European Air Safety Agency Regulation³⁰ in order to restrict unlawful drone flights by requiring permits for operators. These permits are valid for 12 months and applies to both indoor and outdoor operations.

Under current guidelines, drone operators in the United Kingdom must comply with a series of requirements in order to operate, as such if the drone is under 20 kilograms then the operator must have an operating permission and a pilot qualification, but only if the operator is doing aerial work³¹, if not, then the casual operator is exempted from this rule. If the total weight of the devices is more than 20 kilograms, then the operator will require a registration and airworthiness certificate³². A permission only addresses the flight safety aspects of the flight operation and does not constitute permission to disregard the legitimate interests of other statutory bodies such as the Police and Emergency Services, the Highway Agency, Data Commission or other authorities.

However, all drone operators must comply with the Regulation (EC) 785/2004 on Insurance Requirements for Air Carriers and Aircraft Operators³³ and as such must acquire a minimum insurance based on the device in question. The Regulation exempts from this requirement the following unmanned aircraft: model aircraft and drones that are under 500 kilograms that have no commercial purpose or are being used in local flight instruction. Also, the operators must abide to the visual line of sight principle, meaning that they can only operate at a distance of 500 horizontally and 400 feet vertically, but these ranges can be extended if the owner is a holder of special certifications or the aviation authority has approved an exempt for a situation.

In the United Kingdom a license exam has not been introduced officially as it is awaiting for a proper regulation by the European agency, however users who partake in aerial work must have a small unmanned aerial vehicle permission that can be obtained only after a course organized by a drone instructor has been undergone and a certificate was given to them.

Other European Union member states have adopted internal regulations as placeholders till a proper legal document is adopted, as such France is considered a pioneer³⁴ with the Creation and Use Orders that came into force in early 2016, both orders aiming at limiting the numbers of drones in the sky and also the number of drones being manufactured and their development. French laws also introduce a category that the current European legislation does not provide a

²⁶ Part 107 of the Federal Aviation Regulations is the written drone knowledge exam introduced in order to limit the number of commercial and civilian drones in the sky, information can be accessed at the following website: https://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=20516.

²⁷ Material can be read at the following link: http://www.caa.ro/media/docs/Guidance_material_Unmanned_Aerial_Vehicles.pdf.

²⁸ Which can be accessed at the following link: <http://www.caa.ro/pdf/Directiva%20identificare%20UAV.pdf>.

²⁹ E.A.S.A. informational document: <https://www.easa.europa.eu/easa-and-you/general-aviation/licensing-general-aviation>.

³⁰ As implemented by the United Kingdom in Cap 722 - Unmanned Aircraft System Operations in UK Airspace – Guidance published by the Safety and Airspace Regulation Group of the Civil Aviation Authority, 31.03.2015.

³¹ Details that a flight is for the purpose of aerial work if valuable consideration is given or promised in respect of the flight or the purpose of the flight.

³² See note 30, pg. 34-35.

³³ Official Journal of the European Union L 138/1, 30.04.2004.

³⁴ As stated by the legal blog lexology.com with information that can be read at the following website: <https://www.lexology.com/library/detail.aspx?g=7257ad71-6f12-4c2c-bfde-ed40088fb961> and also the Library of Congress, U.S.A. has an online article that gets updated regularly: <https://www.loc.gov/law/help/regulation-of-drones/france.php> that was prepared by Nicolas Boring, Foreign Law Specialist, April 2016.

legal oversight and that being the *particular activities* situation, which is defined as something that is not hobby, competitive, commercial or experimentation. Also, to fly drones in public spaces is possible only with prefecture's approval.

The particular activities, flight testing and competitive drone operators must also have pass a theoretical examination and must finish a practical training course (and may require up to 20 hours of drone flight), while commercial operators could also be obliged to possess additional license for a manned aircraft and at least one hundred hours of flying a manned vehicle.

Flying a drone without permission or without a license can lead to jail time to up to six months a fine of 15 000 euros (if done out of negligence) and can also lead to 1 year of jail time and a fine of 45 000 euros if the user intentionally flies the drone without permission and in a no-fly zone. The law also criminalizes drone video and photography that was done without respecting property, intellectual property and private laws, meaning that in doing so a person can face a jail time of at least one year in jail and a fine 75 000 euros.

Furthermore, the laws also require for a registration at the civil air authority and adding a license plate to the drone showing owner details and drone registration number. Manufactures must also include the force of impact from maximum height for all drones sold in France. Current legal drafts point towards electronic registrations and safety features pre-installed in drones.

2.2. Possible solutions in deterring unlawful flights.

Al-Jazeera reporters were fined and jailed for flying a drone over Paris in 2015³⁵ after two days of unlicensed operations and being caught by the Police without having the required documentation (license plate and registration documents) and without an approval to fly in public areas. French authorities also stated that at least 13 unauthorized drones' flights near nuclear plants were documented but nobody was found after the investigation in order to be accountable for the unauthorized flights.

Romania has started criminal investigations for at least 4 persons on the usage of drones during the February 2017 protests³⁶ as the drones were not registered and were flying in a crowded and public space, without special authorization. Romania has also

fined unauthorized usage of drones³⁷ and users could also face jail time depending on the severity of their deed, as one person found after filming a local church and was fined for 5000 lei (over 1000 euros) for not registering the drone to the civil air authority and obtaining a license plate for it.

Currently, Italy and Germany have also started drone training programs aimed at limiting drones in the sky to only those who own operators flight licenses and only to those who have a minimum insurance. Germany has even introduced a take-off weight limitation and fireproof identification based on their weight as a requirement³⁸. These two states are also implementing the I.C.A.O. guidelines and current European Air Safety Agency regulations in order to deter unlawful flights that can cause accidents. Without these legal requirements, accidents similar to the ones over Canada in autumn 2017³⁹ or early 2017 in China⁴⁰ could lead to potential catastrophic incidents in which a drone that flies in the cockpit of a much larger manned aircraft could lead to its crash and cause an unimaginable aftermath. As such, the case in China was also accompanied by the arrest of the operator, but in both cases the international agreed limit of 450 meters altitude was breached.

As a solution to these situations, states have adopted different measures of protecting no-fly zones from drones. As such United Arab Emirates⁴¹, Japan⁴² and South Korea⁴³ have adopted hunter drones to spot and take-out drones that are flying in protected areas and to try and identify and prosecute the owners for these situations. Other states have introduced specially trained police eagles in order to fight unlawful drone flights, but the results are mixed⁴⁴ and may require future usage and training to determine the impact in combating unauthorized flights.

Another possible solution is by introducing a theoretical examination before take-off and introduced in the drone application that comes with drone for the mobile phone camera/controller⁴⁵. This has been implemented so far in the United States of America and United Kingdom by one of the leading drone manufactures and developers, DJI, and it forces operators to take an 8 question exam on its GO4app and based on the common-sense flight rules exam it will allow the user to either start the drone or attempt to pass the exam after the operator gained some more knowledge regarding flying under United Kingdom national legislation.

³⁵ BBC, Paris drones: Al Jazeera journalist fined 1000 euros, 3.03.2015.

³⁶ ProTV, Dosar penal pentru folosirea ilegala a unor drone in timpul protestelor din Piata Victoriei. 4 persoane chemate la Politie, 17.02.2017.

³⁷ Alin Cordos, 5000 lei amenda pentru drona folosita ilegal, ProPolitica, 22.05.2017.

³⁸ See note 34 for a brief mention of the laws that are referenced.

³⁹ Sherrise Pham, Drone hits passenger plane in Canada, CNN, 16.10.2017.

⁴⁰ Euan McKirdy, Drone's operator detained for flying near Chinese airplane, CNN, 17.01.2017.

⁴¹ Zahraa Alkhalisi, Dubai develops a drone hunter to keep its airport open, CNN, 4.11.2016.

⁴² Udi Tirosh, Japan introduces a drone hunting drone – nets rogue drones midair, Diyphotography.com, 15.12.2015.

⁴³ Jeff Daniels, Around 60,000 security forces, interceptors drones deployed to protect Pyeongcham Olympics, CNBC, 05.02.2018.

⁴⁴ Tyler Essary, These drone-hunting eagles aren't messing around, Time, 17.02.2017; Thuy Ong, Dutch police will stop using drone-hunting eagles since they weren't doing what they're told, TheVerge, 12.12.2017.

⁴⁵ Nick Summers, DJI forces UK pilots to sit a 'knowledge quiz' before takeoff, Engadget, 21.12.2017.

Currently, the only limitation for drones is that of a geofencing system that has been implemented in order to force drones and their operators from straying in protected areas such as airports, high density urban areas or other areas, but this limitation has been hacked a number of times because of faulty security around the application that comes with the drone⁴⁶ and as such users could circumvent their way and be able to fly over the imposed limit.

3. Conclusions

Combating unlawful flights has proven a continued focus for most states, however people have adopted a stance against drones that fly over their private property and for situations where authorities failed to properly intervene.

For example, in the United States of America persons have adopted the stand-your-ground principle⁴⁷, a principle that derives from a law that designates a person's abode (or, in some states, any place legally occupied, such as a car or place of work) as a place in which the person has certain protections and immunities and allows such a person in certain circumstances, to attack an intruder instead of retreating. Typically, deadly force is considered justified homicide only in cases when the actor reasonably feared imminent peril of death or serious bodily harm to oneself or another.

This was an issue raised in front of a national court where a person shot a drone that was hovering his home, dubbing him the "*Drone Slayer*"⁴⁸. Afterwards the pilot demanded a reparatory decision, but the county judge ruled that drone cases are under the competence of federal courts and as such the pilot must file another lawsuit. However, the court provided some light regarding private property limits by referring to the Supreme Court Case from 1946, *Causby v. United States*⁴⁹, in which the Supreme Court established that

83 feet (or 25 meters) is the maximum height limit for private property.

Some solutions to these types of privacy invaders have been considered and deployed, one of these being the DroneShield, a detector based on acoustic technology that notifies the local monitoring service if a drone comes close to the target in proximity. This device was a crowd funded gadget that soon came under military contracting and is now a piece of technology that can only be sold under the International Traffic in Arms Regulations (ITAR)⁵⁰ due to its functionality. This device was also used during the Boston Marathon in 2015, as the entire area was declared by local authorities as a no-fly zone⁵¹.

Currently, there are lots of applications for mobile phones that showcase no-fly zones for drone users⁵², but this technology has to be implemented into the drone themselves, while operators must follow training courses and eventually pass a theoretical and practical examination in order to operate drones, regardless of classification and/or weight. The I.C.A.O. Manual was published in 2015 but soon afterwards most states have started implementing it in various degrees and will implement most of its rules as they were laid out by technicians and legal practitioners around the world, being considered an international standard.

Sadly, most drone manufacturers will not implement a software based limitations to drones as it does require additional costs for software development and so will have to defer to states developing national solutions in order to deter unlawful flights. However, the automobile industry started in 1886 when Karl Benz built the first horseless carriage (the car)⁵³ and it was driven by people without a permit, but afterwards local authorities required people prove they can drive the car for their own safety and the safety of others and so certification was required⁵⁴ in order to drive the machine. So will drones follow suite and will abide to the I.C.A.O. regulations in order to be able to fly legally and will also require a proper insurance in case of responsibility.

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