



Volume 97

2017

p-ISSN: 0209-3324

e-ISSN: 2450-1549

DOI: <https://doi.org/10.20858/sjsutst.2017.97.15>



Journal homepage: <http://sjsutst.polsl.pl>

Article citation information:

Tobór, D., Barcik, J., Czech, P. Legal aspects of air transport safety and the use of drones. *Scientific Journal of Silesian University of Technology. Series Transport*. 2017, **97**, 167-179. ISSN: 0209-3324. DOI: <https://doi.org/10.20858/sjsutst.2017.97.15>.

Damian TOBÓR¹, Jacek BARCIK², Piotr CZECH³

LEGAL ASPECTS OF AIR TRANSPORT SAFETY AND THE USE OF DRONES

Summary. Over the past few years, interest in the use of unmanned aerial vehicles (commonly referred to as drones) has increased. Uncontrolled drone flights poses a threat to air navigation, including air transport. The aim of this article is to identify potential sources of this threat, together with the identification of Polish legal regulations that respond to them. Conclusions will be based on proposals *de lege ferenda*, i.e., related to the postulated change of legal regulations, in order to limit the risk of incidents. The object of the article is subordinate to its structure, consisting of five parts. In the first part, the concept of unmanned aerial vehicles used by the Polish legislature will be defined, which is necessary because of the inaccuracies surrounding it. The second part will present ways to use drones for civilian purposes. The next part of the article will describe the cases of accident and aerial incidents involving drones. The fourth part focuses on the indication of Polish legal regulations related to the exploitation of drones. The article closes with concise conclusions.

Keywords: drones; air transport safety; legal aspects

¹ Faculty of Law and Administration, University of Silesia, Bankowa 11b Street, 40-001 Katowice, Poland. E-mail: damian.tobor@gmail.com.

² Faculty of Law and Administration, University of Silesia, Bankowa 11b Street, 40-001 Katowice, Poland. E-mail: jbar@poczta.onet.pl.

³ Faculty of Transport, Silesian University of Technology, Krasińskiego 8 Street, 40-019 Katowice, Poland. E-mail: piotr.czech@polsl.pl.

1. CONCEPT OF “UNMANNED AERIAL VEHICLES”

Article 126 of the Act of 3 July 2002 on Aviation Law⁴ introduces the concept of an unmanned aerial vehicle (hereinafter referred to as UAV), which the legislator describes in Paragraph 2 of the article using the UAV acronym. However, the act does not introduce a definition of a UAV. This term also appears in the Ordinance of the Minister of Infrastructure and Construction of 8 August 2016, amending the regulation on the exemption of certain provisions of the Aviation Law Act for certain types of aircraft and determining the conditions and requirements for the use of these vehicles⁵. As in the case of the act, the regulation does not introduce a definition of UAV. It should be noted, however, that, in Appendix 2 to this regulation, we find that the concept of UAVs is reserved by the Polish legislature for determining the legal provisions for UAVs with a maximum take-off mass (hereinafter, MTOM) of no more than 150 kg, used solely for visual line of sight (VLOS) operations for non-recreational or sports purposes⁶. For the regulation of UAVs with a take-off mass of no more than 150 kg, used exclusively for VLOS operations for recreational or sports purposes, the legislator uses the term “flying model”⁷. Drone is the name most often used in the context of the use of unmanned machinery in military operations. This context is referred to in the definition of the term “drone” in the *New Standard Encyclopedia*, which describes drones as “unmanned aircraft used for purposes such as reconnaissance or target elimination exercise, or as a lure to attract anti-aircraft fire”⁸. This concept has its roots in terms used by NATO. According to NATO sources, drones should be called unmanned vehicles, which carry out their mission, without interfering with the external source⁹. In Polish literature, we find the term “drone” refers to “an object with or without controls or interference from the operator”. When using the term “flying model” or “remotely controlled aircraft”, one should refer to an aircraft without a pilot on board, but permanently driven by an operator having a permanent impact on all activities performed by the facility¹⁰. It is emphasized that “flying models” should also qualify as UAVs, even though they are for recreational or sports flights¹¹. The concept of UAVs appears in the Polish legislation in the context of non-recreational or sports flights (e.g., flights related to running a business). The distinction between UAVs and flying models, i.e., the purpose of the flight, is derived from the previously mentioned Regulation of the Minister of Infrastructure and Construction of 8 August 2016, although it originally appeared in the Regulation of 26 March 2013¹². These regulations do not, however, contain definitions of the above-mentioned objects. Attention should be drawn to the fact that, although commonly used in everyday language, “drone” does

⁴ The Act of July 3, 2002, Aviation Law (Journal of Laws No. 130, Item 1112, As Amended), Article 2, Part 1.

⁵ Regulation of the Minister of Infrastructure and Construction of 8 August 2016 Amending the Regulation on the Exclusion of the Application of Certain Provisions of the Aviation Law Act to Certain Types of Aircraft and Determining the Conditions and Requirements for the Use of These Aircraft (Journal of Laws of 2016, Item 1317).

⁶ *Ibid.*, Annex 2, Chapter 1, Point 1.

⁷ *Ibid.*, Annex 1, Chapter 1, point 1.1.

⁸ D. W. Downey. 1998. *New Standard Encyclopedia* (Vol. 6): 286 Chicago: Ferguson Publishing Company.

⁹ The Official NATO Terminology Database, Record 9267 (<https://nso.nato.int/natoterm/Web.mvc>).

¹⁰ M. Moj. Dron: statek czy model latający, Rzeczpospolita, PCD.2015.7.24, Thesis No. 2 to Article 126, Aviation Law

¹¹ *Ibid.*, Thesis No. 1 to Article 126, Aviation Law Act.

¹² Regulation of the Minister of Transport, Construction and Maritime Economy of 26 March 2013 on Exemption from Application of Certain Provisions of the Aviation Law to Certain Types of Aircraft and to Specify the Conditions and Requirements for the Use of These Vessels (OJ of 2013, 440), Annexes 6 and 6a.

not occur in Polish regulations. In turn, the Polish Air Navigation Services Agency (hereinafter referred to as PAŻP), in accordance with the ICAO, uses the term remotely piloted aircraft (RPA) on its website¹³. The ICAO defines RPA as “an aircraft whose pilot is not present on board”¹⁴.

Many countries are moving away from the UAV concept, referring collectively to UAVs. The concept of a remote-controlled aircraft (RPA) draws attention to the fact that so-called drones are under the constant control of the operator. Constant influence on the flight and the operator’s supervision of the machine contradict the “unmanned” aspect of which the term UAV speaks. The ICAO thus defines the UAV term as obsolete¹⁵.

The terms VLOS and beyond visual line of sight (BVLOS) should also be distinguished. They appear in the context of UAV operator (UAVO) status, which, in Polish law, refers to the certificate of qualifications of operators, authorizing them to use drones for purposes other than sports and recreational flights, e.g., for commercial flights (not necessarily for profit)¹⁶. Under the UAVO status, VLOS (i.e., drone flights within sight of an operator) or BVLOS permissions to make drone flights out of sight (including flights within drones’ coverage) can be obtained. It is also worth mentioning first-person view (FPV) flights here, which are made using models with a specially mounted on-board video camera. With video transmitters, the video is sent to the operator on the ground. This involves a special eyeglass on which is displayed the image from the camera mounted on a drone. With the gyroscope mounted in goggles, the operator’s head moves the camera, giving a realistic effect in the cockpit of the aircraft and thus its piloting. Thanks to the used electronics, it is already possible to fly outside the visible area of the operator on the ground. This gives a great opportunity to observe objects located a few kilometres from the model’s starting point. FPV equipment is also used by hobbyists to drone races and organize events in this field, even international ones¹⁷.

2. THE USE OF DRONES FOR CIVILIAN PURPOSES

Recently, there has been an increase in the use of drones for civilian purposes. The value of the drones market in Poland was estimated at PLN 201.31 million for 2016, which means an increase of 22.75% compared to 2015 (PLN 164 million), despite a decline in the military market. Most of the revenue was generated by the sale of recreational equipment for professional photography and film and other services, including training for licensed unmanned operators.¹⁸ The popularization of drones is primarily due to the fact that they have

¹³ See the website of the Strategic Planning Unit within the PAŻP:

http://www.pansa.pl/index.php?menu_lewe=ops&lang=_pl&opis=OPS/ops_rpa.

¹⁴ ICAO Circular 328, Unmanned Aerial Systems (UAS), 2011, ISBN 978-92-9231-751-5, Glossary: Explanation of Terms (www.icao.int/Meetings/UAS/Documents/Circular%20328_en.pdf).

¹⁵ See the website: www.swiatdronow.pl/slownik (accessed: 11 April 2017), Abbreviations/Acronyms.

¹⁶ Regulation of the Minister of Infrastructure and Construction Amending the Regulation on Qualification Certificates of 19 September 2016 (Journal of Laws of 2016, Item 1630), Appendix No. 1.

¹⁷ See the website of European Rotor Sports Association: www.ersa.eu.com; Petrus J. van V. Coetzee, Pieter A. Swanepoel. 2017. „Spatial relationships and movement patterns of the air cargo industry in airport regions”. Journal of Transport and Supply Chain Management 11: 1-10; Pogačnik B, J. Duhovnik, J. Tavčar. “Aircraft fault forecasting at maintenance service on the basis of historic data and aircraft parameters”. *Eksplotacja i Niezawodność – Maintenance and Reliability* 19 (4): 624-633.

¹⁸ K. Juszczak, S. Kosieliński, P. Rutkowski. 2016. “Where we are, where we are going?”. In S. Kosieliński (ed.) *Drones Market in Poland (2017 Edition). Dawn in the Valley of Death*: 10, Warsaw.

become more accessible. Drones with varying degrees of sophistication, different functions and utility parameters are available on a mass sale, depending on the customers' needs. By the end of 2016, the price of the simplest UAVs (mostly rotors), based on low-cost components, ranged from a few dozen to several hundred zlotys. Drones have become a commodity found on shelves of not just speciality shops, but also supermarkets and discount stores. Due to the lower prices, drones have become a popular form of gift, often aimed at children. In the interest of civil aviation safety, the Civil Aviation Office (hereinafter ULC) launched a "Fly with the Head" information campaign in mid-2015. As part of the campaign, the ULC prepared a television spot and a website¹⁹, which is designed to attract the attention of drone owners on the most important principles of the safe flying of UAVs. The campaign promoters point out that drones that look like toys are subject to aviation law for which serious damage is likely to occur, and that unintended use can cause danger to people and property. The President of the ULC also issued guidelines on informing users of UAVs on the principles of safe flight²⁰. In this document, a recommendation has been made for entities marketing UAVs within the territory of the Republic of Poland to include those accompanying the UCL leaflet as set out in the Annex to the Guidelines. Most drones are used by photographers and filmmakers. Drones give their operators the ability to take pictures and record aerial footage, which was previously reserved for expensive photo shoots a few years ago, because it was necessary to rent avionics or a helicopter. The most popular among photographers and hobbyists is the French Parrot and the Chinese DJI, whose flagship and most popular products are quadcopter drones (i.e., floating with four parallel rotors) from the Phantom series²¹. Besides photography, drones can serve many other purposes, such as commercial purposes, e.g., marketing or mailing. American online trading giant, Amazon, is working on "Prime Air", where drones will deliver courier services²². The first shipment was delivered by drone to a customer in England on 7 December 2016²³. The fact is that the flight was autonomous and one man was only needed to pack the package. A project that would revolutionize the delivery of mail to addressees, however, still requires a lot of work from the investor to solve the numerous problems involved. The obstacles that must be overcome by investors include weather factors, the issue of safe handling of consignments, and restrictions for the safe use of airspace. Similar to Amazon, Google is also working on its "Wing" project, as part of the research and development of the "X" company²⁴. Facebook, on the other hand, focuses its research on developing a drone called Aquila, powered by solar energy. This energy source would allow for a continuous uninterrupted flight of the machine, lasting for up to several months. The world leader in social media wants to use this technology to deliver the Internet to places in the world that it is not reaching today. On 28 June 2016, Aquila made its first successful flight²⁵. Among the various uses of drones, there are also studies on areas

¹⁹ See the "Fly with the Head" campaign website: www.latajzglowa.pl.

²⁰ Guideline No. 7 of the President of the Civil Aviation Office on Informing Users of Unmanned Aerial Vehicles on the Principles of Safe Flight, Warsaw, 6 August 2015.

²¹ L. Sun. 2016. "Drones in 2016: 4 numbers everyone should know". *The Motley Fool*, 29 February. Available at: <https://www.fool.com/investing/general/2016/02/29/drones-in-2016-4-numbers-everyone-shouldknow.aspx>.

²² See the website of the "Prime Air" project: www.amazon.com/Amazon-PrimeAir/b?ie=UTF8&node=8037720011.

²³ Ibid.

²⁴ C. Metz. 2014. "Google reveals 'Project Wing' its two-year effort to build delivery drones". *Wired.com*, 28 August. Available at: www.wired.com/2014/08/google-reveals-project-wing-its-two-year-effort-to-build-delivery-drones/.

²⁵ See the press release from the Facebook founder and CEO, Mark Zuckerberg: "The technology behind Aquila", issued on 21 July 2016 via the author's personal profile on [facebook.com](https://www.facebook.com).

inaccessible to humans, spraying of fertilizers in crop fields, fire extinguishing, fish baiting, border control etc. To patrol the borders of our country, the Border Guard uses, as does the Polish Army, Fleye drones manufactured by the Polish arms company, WB Electronics. They help to catch people breaking the law on the border, e.g., smugglers. However, there are no reliable data on their actual effectiveness and information on the principles of storing and sharing the data collected²⁶. In the performance of duties, drones also help the Polish Police. They can be used for missing persons searches, operational work, traffic monitoring, and managing safety at major events²⁷. PKP Cargo uses drones to protect its trains from theft. The presence of drones on the train discourages criminals from stealing (e.g., dumping coal from wagons). This device works preventively, while discouraging people from trespassing on railway tracks near the trains. The careful choice of colour scheme for these devices and their high observation height make them virtually impossible to detect by thieves. Drones record the image in the vicinity of warehouses and send it in real time to the headquarters of the Hazard Prevention Team. Among the drones used by PKP Cargo are “Eagle” machines with an arm span of about 1 m. They are used primarily to patrol large areas from high altitude. These drones are equipped with two cameras, where the first has a large optical zoom, which allows the face of the thief to be recorded in very good quality, even from a few hundred metres away. The second camera, which uses thermal imaging, makes it easy to work under night-time conditions. Thanks to this, drones are able to recognize the silhouette of a human from a distance of up to 2 km. According to data presented by the carrier, largely due to the use of drones, from January to October 2014, the value of stolen consignments and goods from trains dropped by nearly 65% compared to the same period in 2013²⁸. Drones are also employed to check the status of wagons used by the company’s customers, as drones allow for quick inspection of dozens of wagons²⁹. Drones can also be used by the Forest Service, and even in the fight against low emissions. In the autumn of 2016 in Bytom, the Central Mining Institute conducted tests using drones, which checked what was being burned in the furnaces in the city. The institute has developed a mobile platform for monitoring selected low-emission parameters using drones. It has its own solution: laser meters for dust, carbon dioxide and carbon monoxide. Its “Flying Laboratory” is characterized by high measurement accuracy, which allows for determining the source and amount of pollutant emissions³⁰.

3. SELECTED OCCURRENCE AND AVIATION INCIDENTS INVOLVING DRONES

Drones are becoming increasingly visible in the sky³¹. On the Polish market for these machines, the majority of revenue generated relates to the sale of recreational equipment and

²⁶ W. Cieśla. 2016. “The strange history of robots for refugee catching”. *Newsweek* No. 51/2016, Index no. 36679X.

²⁷ A. Kowalczyk. 2016. “Drones in the Police/Drones in the Polish Army”. *Policja 997 Monthly* No. 131/02.2016.

²⁸ See the press release from PKP Cargo: “PKP CARGO drones have flown hundreds of hours, good carrier experience presented in London”, Warsaw, 8 December 2015.

²⁹ *Ibid.*

³⁰ See the article: “In Bytom drones will check what we burn in the furnace”, 20 October 2016. Available at: www.portalsamorzadowy.pl/ochrona-srodowiska/w-bytomiu-drony-sprawdza-czym-palimy-w-piecu,85947.html.

³¹ K. Juszczak, S. Kosieliński, P. Rutkowski. 2016. “Where we are, where we are going?”. In S. Kosieliński (ed.) *Drones Market in Poland (2017 Edition)*. *Dawn in the Valley of Death*: 10, n. Warsaw.

that intended for professional photography and film³², so it can be seen that most used machines are already used for civil purposes. The increasing presence of UAVs in the sky and the increase in the number of drone owners carry the risk of more frequent incidents and aviation hazards, and pose a great challenge to security and the protection of human rights and freedom. Security is the overarching goal of EU aviation policy. In the Communication of the European Parliament and the Council, entitled A New Era in Aviation History, the European Commission clearly pointed out that only the RPA System (RPAS) should be based on the principle of zero safety concessions. RPAS operations should have an equivalent level of safety compared to manned flights³³. According to the Commission, the legislative framework designed in the EU should reflect the diversity of aircraft and operations, preserve the proportionality of regulations with regard to potential risks, and reduce administrative burdens for industry and regulators. The legal framework should first focus on those areas where technology is advanced and sufficiently tested.

Drones can be a threat if they are used as weapons, for example, in terrorist attacks. Mostly, however, unintentionally piloted aircraft is a threat to air traffic and to people and property on the ground. In March 2014, the ULC President issued a communication on the violation of flight rules and UAVs³⁴. It mentioned the basic principles of safe flight of drones in Polish airspace and called for the dissemination of this information in the broader aviation and modelling environment, for the common good and for the safety of all airspace users. However, this appeal did not reach all drone operators, confirmed by the fact that several incidents of relevance took place in Poland. During the NATO summit in Warsaw in July 2016, there were, according to information from the Minister of National Defence, four incidents involving drones³⁵. At the time of the summit, a no-fly zone was introduced in Warsaw and its surrounding areas³⁶. The incident took place in the vicinity of Frederic Chopin Airport in Warsaw in July 2015. During the approach to landing at Chopin Airport, the pilots of a Lufthansa aircraft informed the flight control tower that a drone flew, during the landing approach on Runway 33, at about 100 m, from the machine. The incident occurred at an altitude of 762 m³⁷. In the above situation, there was a violation of the control zone of Chopin Airport. This incident drew the public's attention to the threat to flight safety posed by the growing number of UAVs. As flight controllers have pointed out, drones are becoming increasingly commonplace; because of their low mass and small size, they cannot be seen from the tower and are often are not visible to radar³⁸. At that time, Dr. Maciej Lasek, Chairman of the State Commission for Aircraft Accidents Investigation, pointed out that the collision of a drone weighing several kilos with a passenger plane could cause serious

³² Ibid.

³³ Communication from the Commission to the European Parliament and the Council, A New Era in Aviation History. Launch of the Aviation Market for Civilian Use of Remote Piloted Systems for Aircraft in a Safe and Sustainable Manner, Brussels, 8 April 2014. COM (2014) 207 Final, 3.1.

³⁴ Announcement of the President of the Civil Aviation Office on the Violation of Regulations Concerning the Rules of Flying Flights and Unmanned Aerial Vehicles, Warsaw, 25 March 2014.

³⁵ Press release: "Antoni Macierewicz: four drones incidents at the NATO summit", 9 July 2016. Available from: <https://wiadomosci.wp.pl/antoni-macierewicz-cztery-incydenty-zudzialem-dronow-w-czasie-szczytu-nato-6027384393036417a>.

³⁶ Ministry of National Defence, Air Traffic Restrictions during the NATO Summit, 6 June 2016: <http://www.mon.gov.pl/aktualnosci/arttykul/najnowsze/ograniczenia-dla-ruchu-powietrznego-podczaszczytu-nato-h2016-07-06/>.

³⁷ S. Hradecky. 2015. "Incident: Lufthansa E195 at Warsaw on July 20th 2015, near collision with drone". *The Aviation Herald*, 20 July. Available from: <http://avherald.com/h?article=48996163>.

³⁸ "Police arrested probable owner of drone from Warsaw Okęcie", 21 July 2015. Available from: <http://www.tvp.info/20918354/policja-zlapala-prawdopodobnegowlasciciela-drona-znad-warszawskiego-okecia>.

trouble³⁹. By comparison, the suction of a bird, due to its soft substance, by a jet engine of a passenger plane usually ends with a replacement of the propulsion and its general refurbishment. Equally dangerous is when the cockpit or fuselage is hit. The collision of a plane with a drone made of hard plastic can have serious consequences⁴⁰.

4. POLISH LEGAL REGULATIONS

According to Polish law, civil aviation is subject to the minister responsible for transport (since 16 November 2015, this has been the Minister of Infrastructure and Construction), who issues implementing regulations to the Act of 3 July 2002 on Aviation Law (Journal of Laws No. 130, Item 1112), which is the basic legal act regulating the legal relations in the field of civil aviation. The minister supervises the ULC, which is the state budget unit serving the President of the Civil Aviation Authority and the central civilian government administration body responsible for civil aviation, and the PAŻP. The Shipping Agency provides safe, continuous, smooth and efficient air navigation in Polish airspace by performing the functions of air navigation service providers, airspace management and air traffic flow management⁴¹. An independent and permanent State Commission for Aircraft Accident Investigation (hereinafter referred to as PKBWL) operates alongside the minister responsible for transport, and conducts or supervises investigations into aviation incidents. The commission conducts research on the basis of the EU Civil and Commercial Code and acts on civil aviation accidents and incidents, taking into account the standards and recommended practices set out in Annex 13⁴² to the Convention on International Civil Aviation, signed in Chicago on 7 December 1944, known as the Chicago Convention⁴³. In addition, as a member of the EU, Poland applies the findings of the European Aviation Safety Agency (hereinafter the EASA), which deals with air traffic safety issues in Europe. According to Article 126, Paragraph 1, the Aviation Law Act states: “Unmanned aerial vehicles may be operated in the Polish airspace.” Drone operators, however, also have additional regulations that abolish the obligation to comply with certain rights and principles, which apply to other flight crew members, such as pilots or paratroopers. Rules for drones may vary depending on the nature of the flight, which is also determined by the requirement to have a qualification certificate. UAVO certification, issued by the ULC, authorizes the use of drones for purposes other than sports and recreational flights. This means that all non-recreational or sports flights, for example, providing services related to photographs, video, photogrammetry, various types of measurements, air monitoring, research flights etc. require a pilot to hold a qualification certificate.

In addition, a UAV/flying model operator should exercise extreme caution and avoid any act or omission that could cause a safety hazard, including a threat to air safety, obstruct air traffic, disturb public order, and expose anyone to harm. The operator is also required to control the drones in such a way as to avoid collisions with other aircraft and to ensure that

³⁹ “Police: the owner of a drone from Okęcie released”, 22 July 2015. Available from: <http://www.polskieradio.pl/5/3/Artykul/1478497,Policja-wlasciciel-drona-znad-Okecia-zwolniony>.

⁴⁰ Ibid.

⁴¹ Act on the Polish Air Navigation Services Agency Dated 8 December 2006 (Journal of Laws No. 249, Item 1829, As Amended), Article 3, Paragraph 1.

⁴² ICAO, Annex 13 to the Convention on International Civil Aviation: Investigation of Accidents and Incidents of Aircraft, 10th Edition, July 2010.

⁴³ Convention on International Civil Aviation, Signed in Chicago on 7 December 1944 - Chicago Convention (Journal of Laws of 1959, No. 35, Item 212, As Amended).

the drones performing the flight give priority to the manned aircraft, as well as being responsible for the flight decisions and for the correctness of the flight⁴⁴. Failure to comply with these requirements increases the risk of incidents, which, upon receipt of the necessary reports, are qualified by the Chairman of the PKBWL as either an aviation accident, a serious aviation incident, an aviation incident or other occurrence (e.g., breakdown, aircraft damage)⁴⁵. An aviation incident is an occurrence other than an accident involving the operation of an aircraft, which has an impact or could affect its safety. A serious incident is an incident whose circumstances indicate that an accident has almost occurred⁴⁶. On the other hand, an aviation accident is an occurrence where any person has suffered at least serious bodily injury or the aircraft has been damaged or destroyed, or the aircraft is missing or located in a location where access is impossible⁴⁷. The above-described aviation occurrence involving a drone, which took place in the control zone of Chopin Airport, was classified as a serious aviation incident⁴⁸. In civil aviation cases, ULC personnel have extensive control responsibilities related to maintenance of safety. The authority is authorized to check the qualifications of the flight crew and the airworthiness of the aircraft. Representatives of the ULC have the right (after presenting the relevant ID) to secure an UAV, which is in poor technical condition, to prevent it from flying. In addition, they can secure an UAV used by unauthorized persons to continue flying or in violation of its use, and demand access to the documents and materials necessary for inspection⁴⁹. Police officers may rebuke a drone operator if they consider that the drone's flights pose a risk to persons or property. In unequivocal situations, for example, in the case of causing nuisance noise using a drone, officers can punish a UAV operator with a criminal penalty for disturbing the peace⁵⁰. Police (or another public authority or service providing assistance) must also be notified of the occurrence of an aviation accident⁵¹. It is worth pointing out that there are penalties applicable to air accidents. Chapter XII of the Criminal Code (Journal of Laws of 2016, Item 1137) describes crimes against security in communication. Article 173, Paragraph 1, states that: "Whoever brings a catastrophe in land, water or air traffic which threatens the life or health of many persons or property in great proportions, shall be subject to the penalty of deprivation of liberty for a term of between one and ten years." For the above-mentioned incident, Article 174, Paragraph 1, is applicable, which reads: "Whoever directs the immediate danger of a catastrophe in land, water or air traffic shall be liable to imprisonment for a term of imprisonment from 6 months to 8 years." On the other hand, the provision of Article 177, Paragraph 1, states that: "Whoever, inadvertently, inadvertently, the rules of safety in land, water or air traffic, unintentionally causes an accident in which another person has suffered

⁴⁴ Regulation of the Minister of Infrastructure and Construction of 8 August 2016 Amending the Regulation on the Exclusion of the Application of Certain Provisions of the Aviation Law Act to Certain Types of Aircraft and Determining the Conditions and Requirements for the Use of These Aircraft (OJ of 2016, Pos. 1317), Chapter 3 "Responsibility".

⁴⁵ Aviation Law (Journal of Laws No. 130, Item 1112, As amended), Article 135, Paragraph 1, in conjunction with Article 135a.

⁴⁶ *Ibid.*, Article 134, Paragraphs 5 and 6.

⁴⁷ *Ibid.*, Article 134, Paragraph 2.

⁴⁸ See the Register of the State Commission for Aircraft Accident Investigation, 2015 (1201-1600), Registration No. 1425/15. Available from: <http://mib.gov.pl/2-Rejestr201512011600.htm>.

⁴⁹ Decree No. 136 of the Prime Minister of the Republic of Poland on Granting the Statute of the Civil Aviation Authority of 14 November 2002 (MP No. 55, Item 754), i.e., 9 June 2014 (MP of 2014, Item 583); Aviation Law Act, *op. cit.*, Article 27, Paragraph 3 and Paragraph 3a.

⁵⁰ Code of Misdemeanours of May 20, 1971 (Journal of Laws No. 12, Item 114, As Amended), Article 51, Paragraph 1.

⁵¹ Aviation Law Act (Journal of Laws No. 130, Item 1112, As Amended), Article 137, Paragraph 4.

injuries as referred to in art. 157 § 1 (i.e., a violation of a body organ function or a disorder of health other than serious injury) shall be subject to the penalty of deprivation of liberty for up to 3 years.” According to Paragraph 2, if the result of an accident is the death of another person or a serious injury, the perpetrator is subject to imprisonment from six months to eight years⁵². Section XII of the Air Law Act describes, in turn, air traffic offences. In the context of the division of Polish airspace into zones, UAV operators should be aware of the provision of Article 212, which states, in Paragraph 1, that anyone performing an airplane flight, which violates the rules governing air traffic in the area in which the flight takes place, shall be punishable by the deprivation of freedom for up to five years. In order to reduce any possible dangers in air traffic and to people and property on the ground, drones are often equipped with rescue and emergency systems. The basic rescue procedure is “return to home” (RTH), i.e., an automatic return to the starting point. Before the flight and after calibrating the compass, the starting point coordinates are stored in the memory. Low-battery RTH is an automatic return system, which starts when the battery is discharged to a level that ensures safe return to the “base.” The FailSafe RTH system works in such a way that the drone automatically returns to the starting point after the transmitter loses signal, usually after few seconds of no contact⁵³. Since 7 September 2016, the condition for using UAVs with a take-off mass of no more than 150 kg, only in operations within VLOS visibility for purposes other than recreational or sporting purposes, is equipping them with the FailSafe system.⁵⁴ It is also appropriate to require drones to be equipped with a geofencing function, which allows the aircraft to independently detect areas of the no-fly zone, thus preventing flights in control zones or restricted zones.

Legal regulations also apply to flight rules and responsibility for potential damage. In spite of the existence of legal regulations, it does not seem possible to completely avoid the dangers of air transport caused by the use of drones. It is important, however, that, where a drone poses any threat to human life or health and to property, it can be effectively eliminated prior to the occurrence of injury or terror. Shooting drones does not seem to be the best idea, as it involves the risk that a shotgun falls on something or someone, causing additional damage. The creators of hardware called DroneGun were inspired by how to deal with this problem. This device, which resembles a futuristic weapon, allows users, after targeting a specific machine, to disrupt communication in the 2.4- and 5.8-GHz bands used by most common communication drones. DroneGun also interferes with the GPS signal and allows it to take control of the intruder and, as a result, safely land it⁵⁵. Devices of this type can be identified as security equipment. Dangers caused by drones prompt a wider need for specialist anti-unmanned equipment. Among the devices that allow for the capture threatening drones, it is worth mentioning yet another British invention called SkyWall, which is an intelligent launcher that allows users to catch drones in the net and safely bring it to the ground using a small parachute. Bringing the whole drone to the ground not only provides security for people

⁵² Criminal Code of June 6, 1997 (Journal of Laws No. 88, Item 553), i.e., 5 July 2016 (Journal of Laws of 2016, Item 1137). Article 173 and n.

⁵³ W. Wyszzywacz. 2016. *Drones*: 53. Brzezia Łąka: Poligraf.

⁵⁴ Regulation of the Minister of Infrastructure and Construction of 8 August 2016 Amending the Regulation on the Exclusion of the Application of Certain Provisions of the Aviation Law Act to Certain Types of Aircraft and Determining the Conditions and Requirements for the Use of These Aircraft (Journal of Laws of 2016 item 1317).

⁵⁵ See the DroneShield brochure:

https://www.droneshield.com/sites/default/files/DRO_Products_Information_Brochure.pdf.

and property, but also facilitates the identification of an intruder⁵⁶. Elimination of drones is permitted in Poland in the circumstances and by the services referred to in Article 126a of the Aviation Law Act. According to its content, a UAV, including a flying model, may be destroyed, immobilized or, during its flight, may be subject to control where the flight or its operation endangers the life or health of the person, poses a threat to protected objects, facilities or areas, or creates a reasonable suspicion that it may be used as a means of terrorist attack.

5. CONCLUSIONS

The drones market has grown tremendously in recent years. There is also a growing number of drone applications for civil purposes. At the same time, more and more technologically advanced versions of these machines are being developed. The use of drones raises an increasing threat to air traffic safety, including transport. There is a need for new legal solutions in this regard, but it should be stressed that the legal response to the long-term nature of the legislative process is delayed in relation to needs. However, it should be noted that Polish law is relatively well suited to the emerging threats. The amendment of 2016, i.e., the Ordinance of the Minister of Infrastructure and Construction of 8 August 2016, Amending the Regulation on Exclusion of Certain Provisions of the Aviation Law Act from Certain Types of Aircraft, and the Conditions and Requirements for the Use of These Aircraft (Journal of Laws of 2016, Item 1317). This regulation came into force on 7 September 2016 and requires UAV operators to include a nameplate on the side with the name of the entity to which the UAV belongs, as well as the need to have night-time warning lights and a properly programmed FailSafe function. Introducing the above requirements not only enhances the security of commercial operations, but also identifies the potential offender, while indicating that the Polish legislators are watching over the drones market and responding to emerging needs. A positive reception also met the appointment, in May 2017, of a separate Airborne Unmanned Aerospace Division within the framework of the ULC. One of its tasks is to supervise and coordinate matters related to the integration of unmanned aircraft within civil airspace⁵⁷. Polish legislation duly regulates issues such as civil liability insurance and separation of airspace, and rightly requires the training of certified training centres to obtain the right to operate commercial flights. One drawback of Polish regulations is the existing distinction between flying models and UAVs. There is some opacity here, because this terminology may be unintuitive for drone operators, and produces certain legal consequences. It should also be noted that, in the next few years, it may be necessary to regulate access to drones, so that the airspace is not overfilled. In addition, it may be necessary to cover recreational drones with the same requirements as commercial flyers (for example, the need to have a qualification certificate), so that the level of security is not reduced.

⁵⁶ See Open Works Engineering brochure:

<https://openworksenineering.com/images/skywall/SkyWall%20Brochure.pdf>.

⁵⁷ “Announcement: New ULC Unmanned Aerial Vehicle Division”, 18 May 2017. Available at: www.ulc.gov.pl/pl/publikacje/wiadomosci/4197-nowy-departament-w-ulc-ds-bezzalogowych-statkowpowietrznych.

References

1. Act of July 3, 2002, Aviation Law (Journal of Laws No. 130, item 1112, As Amended).
2. Regulation of the Minister of Infrastructure and Construction of 8 August 2016 amending the Regulation on exclusion of the application of certain provisions of the Aviation Law Act to certain types of aircraft and determining the conditions and requirements for the use of these vessels (Journal of Laws of 2016, item 1317).
3. Downey D. W. 1998. *New Standard Encyclopedia*. Vol. 6. Chicago: Ferguson Publishing Company.
4. The Official NATO Terminology Database. Record 9267. Available at: <https://nso.nato.int/natoterm/Web.mvc>.
5. Mój M. 2015. "Dron: statek czy model latający?". [In Polish: "Drone: a ship or a flying model?"]. *Rzeczpospolita*. PCD.2015.7.24.
6. Regulation of the Minister of Transport, Construction and Maritime Economy of 26 March 2013 on Exemption from Application of Certain Provisions of the Aviation Law to Certain Types of Aircraft and to Specify the Conditions and Requirements for the Use of These Vessels (OJ of 2013, 440).
7. Strategic Planning Unit within the PAŻP. Available at: http://www.pansa.pl/index.php?menu_lewe=ops&lang=_pl&opis=OPS/ops_rpa.
8. ICAO Cir. 328. Unmanned Aerial Systems (UAS). 2011. ISBN: 978-92-9231-751-5. Glossary: Explanation of Terms. Available at: http://www.icao.int/Meetings/UAS/Documents/Circular%20328_en.pdf.
9. Abbreviations/Acronyms. Available at: <http://www.swiatdronow.pl/slownik>.
10. Regulation of the Minister of Infrastructure and Construction Amending the Regulation on Qualification Certificates of 19 September 2016 (Journal of Laws of 2016, Item 1630).
11. European Rotor Sports Association. Available at: <http://www.ersa.eu.com>.
12. Juszczak K., S. Kosieliński, P. Rutkowski. 2016. "Where we are, where we are going". In S. Kosieliński (ed.) *Drones Market in Poland (2017 Edition)*. *Dawn in the Valley of Death*. Warsaw.
13. "Fly with the Head" campaign website. Available at: <http://www.latajzglowa.pl>.
14. President of the Civil Aviation Office on Informing Users of Unmanned Aerial Vehicles on the Principles of Safe Flight. Warsaw, 6 August 2015.
15. Sun L. 2016. "Drones in 2016: 4 numbers everyone should know". *The Motley Fool*, 29 February 2016. Available at: <https://www.fool.com/investing/general/2016/02/29/drones-in-2016-4-numbers-everyone-shouldknow.aspx>.
16. Amazon Prime Air. Available at: <http://www.amazon.com/Amazon-Prime-Air/b>.
17. Metz C. 2014. "Google reveals 'Project Wing' its two-year effort to build delivery drones". *Wired.com*, 28 August. Available at: <http://www.wired.com/2014/08/google-reveals-project-wing-its-two-year-effort-to-build-delivery-drones/>.
18. "The Facebook founder and CEO, Mark Zuckerberg: The technology behind Aquila". Available on 21 July 2016 at the author's personal profile on [facebook.com](https://www.facebook.com).
19. Cieśla W. 2016. "The strange history of robots for refugee catching". *Newsweek* No. 51. Index no. 36679X.
20. Kowalczyk A. 2016. "Drones in the Police/Drones in the Polish Army". *Policja 997*. No 131/02.2016.

21. PKP Cargo, 2015. "PKP CARGO drones have flown hundreds of hours, good carrier experience presented in London". Warsaw, 8 December.
22. "In Bytom drones will check what we burn in the furnace", 20 October 2016. Available at: <http://www.portalsamorzadowy.pl/ochrona-srodowiska/w-bytomiu-drony-sprawdzaczym-palimy-w-piecu,85947.html>.
23. Juszczyk K., S. Kosieliński, P. Rutkowski. 2016. In S. Kosieliński (ed.) *Drones Market in Poland (2017 Edition). Dawn in the Valley of Death*. Warsaw.
24. Communication from the Commission to the European Parliament and the Council. A New Era in Aviation History. Launch of the Aviation Market for Civilian Use of Remote Piloted Systems for Aircraft in a Safe and Sustainable Manner, Brussels, 8 April 2014. COM (2014) 207 Dinal, 3.1.
25. Announcement of the President of the Civil Aviation Office on the Violation of Regulations Concerning the Rules of Flying Flights and Unmanned Aerial Vehicles. Warsaw, 25 March 2014.
26. Macierewicz A. 2016 "Four drones incidents at the NATO summit", 9 July. Available at: <http://wiadomosci.wp.pl/antoni-macierewicz-cztery-incydenty-zudzialem-dronow-w-czasie-szczytu-nato-6027384393036417a>.
27. Ministry of National Defence. 2016. "Air traffic restrictions during the NATO Summit", 6 June. Available at: [http://www.mon.gov.pl/aktualnosci/artykul/najnowsze/ograniczenia-dla-ruchupowietrznego-podczaszczytu-nato-h2016-07-06/](http://www.mon.gov.pl/aktualnosci/artykul/najnowsze/ograniczenia-dla-ruchu-powietrznego-podczaszczytu-nato-h2016-07-06/).
28. Hradecky S. 2015. "Incident: Lufthansa E195 at Warsaw on July 20th 2015, near collision with drone". *The Aviation Herald*, 20 July. Available at: <http://avherald.com/h?article=48996163>.
29. "Police arrested probable owner of drone from Warsaw Okęcie", 21 July 2015. Available at: <http://www.tvp.info/20918354/policja-zlapala-prawdopodobnegowlasciciela-drona-znad-warszawskiego-okecia>.
30. "Police: the owner of a drone from Okęcie released", 22 July 2015. Available at: <http://www.polskieradio.pl/5/3/Artykul/1478497,Policja-wlasciciel-drona-znad-Okecia-zwolniony>.
31. Act on the Polish Air Navigation Services Agency Dated 8 December 2006 (Journal of Laws No. 249, Item 1829, As Amended).
32. ICAO, Annex 13 to the Convention on International Civil Aviation: Investigation of Accidents and Incidents of Aircraft, Tenth Edition, July 2010.
33. Convention on International Civil Aviation, Signed in Chicago on 7 December 1944 - Chicago Convention (Journal of Laws of 1959, No. 35, Item 212, As Amended).
34. Regulation of the Minister of Infrastructure and Construction of 8 August 2016 Amending the Regulation on Exemption from Application of Certain Provisions of the Aviation Law to Certain Types of Aircraft and to Specify the Conditions and Requirements for the Use of These Vessels (OJ of 2016, Pos. 1317).
35. Aviation Law (Journal of Laws No. 130, Item 1112, As Amended).
36. Register of the State Commission for Aircraft Accident Investigation, 2015 (1201-1600), Registration No. 1425/15. Available at: <http://mib.gov.pl/2-Rejestr201512011600.htm>.
37. Decree No. 136 of the Prime Minister of the Republic of Poland on Granting the Statute of the Civil Aviation Authority of 14 November 2002 (MP No. 55, Item 754), i.e., 9 June 2014 (MP of 2014, Item 583).

38. Code of Misdemeanours of 20 May 1971 (Journal of Laws No. 12, Item 114, As Amended).
39. Criminal Code of 6 June 1997 (Journal of Laws No. 88, Item 553), i.e., 5 July 2016 (Journal of Laws of 2016, Item 1137).
40. Wszywacz W. 2016. *Drones*. Brzezia Łąka: Poligraf.
41. Regulation of the Minister of Infrastructure and Construction of 8 August 2016 Amending the Regulation on Exemption of Certain Provisions of the Aviation Law Act for Certain Types of Aircraft and Determining the Conditions and Requirements for the Use of These Vessels (Journal of Laws of 2016, Item 1317).
42. The DroneShield brochure. Available at: https://www.droneshield.com/sites/default/files/DRO_Products_Information_Brochure.pdf.
43. The Open Works Engineering brochure. Available at: <https://openworksen지니어ing.com/images/skywall/SkyWall%20Brochure.pdf>.
44. “Announcement: New ULC Unmanned Aerial Vehicle Division”, 18 May 2017. Available at: <http://www.ulc.gov.pl/pl/publikacje/wiadomosci/4197-nowy-departament-w-ulc-ds-bezzalogowych-statkowpowietrznych>.
45. Petrus J. van V. Coetzee, Pieter A. Swanepoel. 2017. „Spatial relationships and movement patterns of the air cargo industry in airport regions”. *Journal of Transport and Supply Chain Management* 11: 1-10. DOI: 10.4102/jtscm.v11i0.297.
46. Pogačnik B, J. Duhovnik, J. Tavčar. “Aircraft fault forecasting at maintenance service on the basis of historic data and aircraft parameters”. *Eksploatacja i Niezawodność – Maintenance and Reliability* 19 (4): 624-633. DOI: <http://dx.doi.org/10.17531/ein.2017.4.17>.

Received 15.08.2017; accepted in revised form 28.10.2017



Scientific Journal of Silesian University of Technology. Series Transport is licensed under a Creative Commons Attribution 4.0 International License