ISSN 2450-6869

Volume 4, No. 7-8, 2019

DEFENCE SCIENCE REVIEW

http://www.journalssystem.com/pno/

DOI: 10.37055/pno/125474

UNMANNED AERIAL VEHICLES - APPLICATION, LEGAL REGULATIONS AND CHALLENGES

Original article

Jacek Krawczyk, PhD Eng, Marek Tomaszycki, Lt Gen (ret.), PhD

Military University of Land Forces in Wrocław

Peer review:

Double blind

Keywords:

UAV, NBR, UAVO, legal regulations, airspace, air traffic control

Abstract

The advantages of unmanned systems, such as cheaper operation, greater safety, better performance in flight duration or their minimal impact on the natural environment, result in a systematic increase in their significance and development, compared to manned aircraft. Even today the UAVs (Unmanned Aerial Vehicles) and UASs (Unmanned Aerial Systems) play a significant role both in civil, and in military environments, and they are expected to play a growing role in the world air transport and numerous other fields of human activity. At the end of 2018, the European Commission introduced the NBR (New Basic Regulations), regulating issues related to UAVs at a supranational level. This was a significant step towards the integration of manned and unmanned aviation, enabling international UAV flights, subjected to the same regulations of the member states on route of the Unmanned Aerial Vehicle. When introduction of UAVs to the common airspace is considered, the particularly relevant elements include: maintaining the seamless air traffic control, safety, capacity and efficiency of airspace management, and securing environmental protection. The purpose of the present article is to demonstrate the potential UAV applications, present changes in legal regulations, and the challenges faced by the Air Traffic Services and the elements of aviation command. The article presents solutions ensuring an adequate level of safety and smoothness of air traffic in the common airspace for operations carried out by both manned and unmanned aircraft. The article used the following methods: monographic, expert, participant observation, inductive and deductive, analysis, synthesis and comparison. Research sources were available literature and magazines, press articles, interviews, reports and authors' own experience as well as documents sourced from websites, most of which were written in English.

Applications of UAVs

The advantages of UAV flights compared to manned aircraft flights are that they are and will remain more cost effective, safer, and will have minimum impact on the natural environment. Furthermore UAV fligts can be carried out in war-affected areas, inaccessible terrain and in harmful or dangerous conditions (e.g. in contaminated environment, volcanic ash emissions, high temperatures), and - what seems particularly important, UAVs can perform operational tasks much longer than manned aircraft. A UAV never "gets tired", doesn't stress and still performs air operations with the same accuracy, always applying the maximum operational capabilities of the aircraft for the task.

What we know from practice and scientific research is that the presence of a pilot on board results in restrictions on the use of the full capabilities of the aircraft. It seems that the most important challenge for the pilots is to perform long-lasting air operations, often in difficult weather conditions, with the switch of several, and sometimes a dozen or so time zones. The mental and physical loads resulting from such flights have a significant negative impact on the successful performance of the task.

This issue is completely different in case of unmanned aviation, where the rotating crew is located in a GCS (Ground Control Station), and can perform aerial operations for several hours or even several days, a performance that is practically unattainable for aircraft personnel.

The practical application of UAVs for the needs of the Armed Forces is far from a novelty, and dates back to the 1950s. What we witness recently is the increasing use of UAVs in the civilian environment. They are used, among others, in agritourism, monitoring the natural environment, observing dangerous events on the ground, measuring traffic intensity, patrolling pipelines and other transmission lines, during natural disasters, but also in journalism or for recording extreme sports. They are also applied in science, including the monitoring of polar areas, e.g. to monitor the ozone layer thickness, freshwater tanks, thickness and melting of ice caps, and atmospheric pollution. They were also recently applied to monitor industrial heaps, landfills, smog control, thermal insulation measurements, in construction and during emergency events in medicine, in maritime and mountain rescue.

Furthermore the application of new technologies, i.e. installation of photovoltaic panels on wings and fuselage, enables these vehicles to perform long-haul flights, further extending their flight time. During these flights, they can perform the functions of telecommunications relays including Internet service provision in places, where it can not be provided in the traditional way.

They are increasingly used in search and rescue projects as well as in the exploratory forensics and observation of various types of objects, both stationary and mobile. This is enabled by equipping them with specialized cameras, that make them capable of manual or automatic tracking of an object or objects. The tracked "targets" can be exposed and enlarged, and the image can be transmitted to any destination.

They are also used in advertisements, celebrations and in the real estate industry for profile shots, recording movies and taking photos in places that are otherwise poorly accessible. Broadcasting of sporting events such as football matches, ski jumping, marathons would be practically impossible today without the use of cameras from UAVs.

There are experiments to apply them in the transport of courier parcels to inaccessible or remote locations, which are difficult and time consuming to reach with traditional, manned transport.

Unfortunately, with such wide possibilities, criminal groups are also interested in using the potential of UAVs. They use them for smuggling, to make photographs or record state owned and private property, and to track people.

We also have examples of the use of UAVs in kinetic activities. The military, as indicated earlier, has extensive experience in the application and use of UAVs, that dates back years into the past. UAVs are used, among others, for reconnaissance and espionage activities (video recordings, photos, direct image transmission), highlighting and marking targets for aviation and artillery strikes, or as radio signal retranslators, as well as for other kinetic and non-kinetic tasks.

They are practically invisible and inaudible to a person, who is not equipped with appropriate optical and recon measures. Images from cameras or other sensors can be recorded onboard the UAV or transmitted to the indicated places, often using satellite communication. In order to provide full imaging, it is possible to use several cameras at the same time, which can be used to observe several separate targets with automatic or manual tracking option. The image in the selected configuration is transmitted directly and live to the recipients and can be subjected to immediate technical processing or used to make an immediate decision to act.

The diversity of contemporary armed conflicts creates a great demand for services that can be implemented by unmanned aerial vehicles. Depending on the objective, type and nature of the aerial operation, different types of UAVs can be used. Depending on the type of air mission, modern armies use unmanned aerial vehicles of various classes, and thus of different sizes and configurations. UAVs can be portable, as those from the initial mini category (Dragon Eye, Desert Hawk, RQ-7/11 Raven) through the *MALE* - Medium Altitude Long Endurance (Predator) and *HALE* - High Altitude Long Endurance (Global Hawk) categories, and ending with orbital ones (X-37B Orbital).

Each UAV category is assigned to an appropriate level of command (of course this is not normative, and can complement each other at different levels), starting from the tactical level (platoon, company, battalion, brigade, division) through the operational one (armies, fronts or entire forces), and ending at the strategic level.

The aforementioned possibility of performing an air operation both at low as well as at high altitudes, with a wide possibility of equipment configurations, small structure and small radar cross section and the use of appropriate optical and electronic equipment, without exposing the crew (at it is not onboard) to loss of health or lives all give UAVs a clear advantage over manned platforms.

Legal framework

Based on the Convention on International Civil Aviation done at Chicago on the 7th day of December 1944 (ICAO[1] Convention. 1944, p. 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 undertakes 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" (ICAO Convention. 1944, p.4).

In addition, it is indicated (Annex 2 to the Convention on International Civil Aviation. 2012, p. 71) that:

".... a remotely piloted aircraft system (RPAS) operating in international air navigation cannot be used without the appropriate authorization of the state from which the remotely piloted aircraft (RPA) takes off,... and will not fly over the territory of another state, without special authorization issued by the state(s) over which the flight is to be performed. The authorization may take the form of agreements between the states concerned. RPA may not fly

[1]ICAO - International Civil Aviation Organization.

over the open sea (open sea - as defined by the Convention on the High Seas of 1958, p. 1) *without prior agreement with the appropriate ATS* (Air Traffic Service). "

Such flights may be carried out after obtaining (prior to take-off) the appropriate authorization and conditions for the performance of the flight operation. The air operation must be carried out in accordance with the instructions specified by the State of Registration of the Aircraft or the State of Registration of the Operator or the State(s), where the flight is performed (Krawczyk, 2019, p. 4).

The above regulations constituted the basis for introducing relevant provisions in Polish law by the Act of 3 July 2002 "Aviation Law" (the Aviation Law Act. 2002, pp. 76 and 89) which allows flights with use of UAVs in Polish airspace. However, for this to be possible, detailed national regulations in form of ordinance of the Minister competent for transport in consultation with the Minister of National Defense, for UAV flights and procedures for cooperation of operators of these aircraft with air traffic service providers, taking into account the principles of safe use of airspace must be first issued (Aviation Law Act. 2002, p. 168). Such a regulation was not issued.

The performance of UAV flights in the airspaces listed by ICAO must be carried out according to specific rules and principles. ICAO, EU (*European Union),* EASA (European Aviation Safety Agency) have not issued such guidelines, which means that the respective state have not introduced specific regulations for UAV flights with a MTOW (Maximum Take-Off Weight or MTOM - Maximum Take-Off Mass) in excess of 150 kg. Therefore, in order to ensure the safety of air navigation, such flights are performed in separate airspace structures, in which UAVs are separated from manned flights. They are mostly based on a FPL (Flight Plan) and must meet the requirements for airworthiness and equipment specified for the airspace in which the flight is to be performed, in accordance with the provisions of Annex 11 to the Convention on International Civil Aviation, Air Traffic Service, Appendix 4.

Until 2016, the EU did not deal with regulations for unmanned aircraft with a MTOW of 150 kg or less. Aircraft of that weight category were subject to national laws and regulations only .

In 2016, the European Commission took the initiative and presented a proposal to integrate all UAV weight categories, regardless of their size and purpose. The main objective was to ensure that the design, production, maintenance and operation of Unmanned Aircraft comply with the essential requirements of manned aircraft, as set out in EU-developed regulations. This approach was to form the basis for the integration of manned and unmanned aviation in a common airspace, ensuring full air traffic safety and the ability to ensure smooth air navigation by the Air Traffic Services.

In 2018, to meet the needs of users, manufacturers, and persons and institutions involved in the area of Unmanned Aerial Vehicles, the European Commission introduced the *Regulation (EU) 2018/1139 of the European Parliament and of the Council on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations (EC) No 2111/2005, (EC) No 1008/2008, (EU) No 996/2010, (EU) No 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No 552/2004 and (EC) No 216/2008 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91.*

The introduced regulation is also known as the NBR (New Basic Regulation *)*. The document regulates UAV issues at the supranational level. Its complete implementation will result in enabling a UAVO (Unmanned Aerial Vehicle Operator) to perform international air navigation in the airspace of the member states on the route of the Unmanned Aerial Vehicle.

In NBR, the UAV breakdown is the consequence of aviation risk analysis that takes into account the weight of the UAV, its speed, noise level and equipment configuration.
The NBR introduces the following Implementing Regulations:

- Commission Delegated Regulation (EU) 2019/945 of 12 March 2019 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, and
- Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft.

According to the above implementing act, drone flights will be carried out in three categories, as described below:

- **Open.**

  There will be five classes in the open category (marked with symbols from C0 to C4). Qualification to the respective class will depend, among others from the drone's weight, its speed, maximum flight altitude, safety technologies applied (e.g. follow-me, geo-awareness, e-ID), applied voltage, noise level, adequate lighting for day or night flight operations and the very appearance of the drone (e.g. presence of sharp edges).

  The classes will be as follows:

  - C0, with MTOW, including payload, of 250 g or less.
  - C1, MTOW, including payload, below 900 g.
  - C2, MTOW, including payload, below 4 kg

- C3, MTOW, including payload, below 25 kg, and maximum typical dimension of less than 3 m.
- C4, MTOW, including payload, above 25 kg.

In this category, flights according to VLOS (*Visual Line of* Sight) up to the ceiling of 120 m AGL (Above ground level) will be allowed. The manufacturer will be responsible for compiling the technical documentation and providing all necessary means for the production process to guarantee product compliance (conformity assessment) with the technical documentation.

- **Specific.**

This category includes UAVs with a dimension of at least 3 m or where flight operations are performed using specialized aircraft using flight scenarios previously defined and approved by air traffic supervisory body. Such air operations can be performed according to VLOS and BVLOS (*Visual Line of* Sight and Beyond *Visual Line of* Sight) procedures.

- **Certified.**

This category includes UAVSs with dimensions in excess of 3 m intended for operation over assemblies of persons, for the transport of persons or designed for the transport of dangerous goods, with risk analysis taken into account. The regulator decided that to be able to operate UAVs in this category it is necessary to carry out the certification process. Similar to the specific category, air operations can be carried out according to VLOS and BVLOS procedures.

Covering all UAV weight categories with NBR regulations will have a positive impact on the certification process of aircraft and their operators, as well as on the standardization of UAV flight operation procedures in EU member states. It will also translate into ensuring safety in the integrated international airspace as part of the air traffic management system[2] for manned and unmanned aviation.

Challenges in the single airspace

The technological development of UAVs, the increase in the capabilities of air traffic management systems (both civil and military), as well as the increase in awareness of

[2]The Air Traffic Management System covers all projects related to airspace management, maintenance of orderly and optimal air traffic flow and management of air traffic services, including procedures, personnel, operating methods as well as measures and devices that are required to ensure the safety of aircraft operating in airspace and at airports, taking into account the needs of airspace users and equal access to airspace. (Annex 2 to the Convention on International Civil Aviation. 2012).

potential drone users, is and will remain inextricably linked to the development of science, technology and the use of conclusions and experience from their practical applications. These are the factors that will determine new trends in the use of drones. Another factor, no less important than previously indicated, affecting UAV development directions will be the "market demand" and the definition of new task areas for unmanned aerial vehicles. There is currently no doubt that the near future will bring us a common airspace for manned and unmanned aviation, and the airspace integration becomes a priority.

One of the major obstacles to the process of integration of manned and unmanned aviation is the potential occurrence of different cruising speeds and different flight parameters of UAVs as well as other modes of communication in the ATS-UAVO relation. In this context, it is necessary to determine the amount of UAVs in the ATS sector, which will directly affect the capacity[3] of the sector under the responsibility of ATC (Air Traffic Control), and thus air traffic safety. The number of UAVs should also be predetermined to ensure proper air traffic flow in CA (Control Area) and secure sufficient airport capacity. They have a direct impact on the load on air traffic controllers and ensuring air traffic safety and minimizing delays in the ATC liability sector in CA, TMA (Terminal *Control Area*/ Terminal Maneuvering *Area)* and CTR (Control Zone) .

Taking into account sector capacities, we take into account the following values and structures of the airspace: capacities of aitports, TMA, CTR, ground space and capacity of the ATC sector, in which navigation safety must be ensured by appropriate ATCs. Therefore, the number of operations should not exceed permissible and accepted values. Exceeding the assumed values will result in the aircraft crews performing additional maneuvers or the ATC putting aircraft on hold or extending the landing procedure, which has a significant impact on the level of air traffic safety and timeliness of aircraft operations. An additional difficulty for the ATC operation may be the fact that the UAV is flying at a different speed and that there may be a different mode of communication in the ATC - UAVO relation (electronic information transmission).

In order to remove threats to the flow of air navigation and eliminate the need to introduce the so-called restrictions on sector capacity it is reasonable to divide the sector into two ATC sectors to which ATCs should be allocated. However, these *"makeshift"* sectors

[3]Sector capacity should be understood as the number of aircraft that can receive air traffic service in the designated sector of responsibility of the relevant ATS without exceeding a preset number of air operations. This indicator allows aircraft to perform operations safely, taking into account air traffic safety at the respective intensity of flight operations, including delays. (Marek MALARSKI Journal of Aeronautica Integra /007).

must not constitute an obstacle to air navigation. They must be sufficiently large for the pilots of manned and unmanned aircraft to establish air communication with ATC when changing the air traffic sector. It is estimated that there should be no more than 2 UAVs in each of the aforelisted airspace structures. A larger number of UAVs in one sector of responsibility will significantly absorb ATC's attention, making it less focused on performing their previous duties.

In the context of the problems mentioned above, the priority should be given to ATC training, who apart from specialist knowledge should also be acquainted in detail with the specifics of UAV operations, and able to make perfect use of the configuration of their sector.

Another challenge will be to increase the level of flight safety in the context of the likelihood of intersection or failure to maintain proper separation between manned and unmanned aircraft. Problems to be solved in this regard include the high probability of adverse events caused, among others, by the complicated and unpredictable flow of aircraft with intersecting aircraft routes that ascent or descent from their flight altitude due to hazardous weather conditions on the flight route, optimization of air routes, delays in timely execution of air operations or for other operational reasons. In practice, these dangers are unpredictable because they do not depend directly on a human or a technical factor. They are the consequence of not always completely predictable weather conditions, or the consequence of aviation activities performed according to such regulations, the application or interpretation freedom of which may lead to diverse misunderstandings, and in consequence, to threats in air traffic management.

Another issue that will hamper the work of ATC and may have an impact on the safety of air navigation in the common airspace is connected with UAVs that perform flight operations with different cruising speeds or along an unusual flight path. The solution is to change the UAV route or flight profile. If such a maneuver proves to be too dangerous or impracticable, it may also be justified to change the route or flight profile of the manned aircraft.

The rule should be to give priority in use of airspace to the manned aviation. However, if a change in UAV flight parameters results in the requirement to introduce changes for other aircraft, the ATC must perform a quick analysis, determining which of the aircraft should change the flight parameters. It is reasonable for the new air route to be directed through these airspace sectors, which are not threatened with reaching their full capacities. The above solutions will result in longer flight times of aircraft, the possibility of delays and higher fuel consumption, which will have a negative impact on the natural environment, but on the other hand will ensure smooth and safe navigation in the airspace.

Even with the adopted restrictions and slot allocation[4], the formation of traffic bottlenecks seems inevitable. This results in delays in air navigation and a possible increase in danger to its users.

In order to optimize the use of airspace, an analysis should be made, so as to perform part of the UAV's flights at night or at such times, when manned air traffic is minimal. UAV flights performed with use of modern technology allow for observation of terrain and completion of tasks both during the day and at night, including difficult weather conditions (fog, clouds, precipitation, winds, lightnings and other). Performing UAV flights at different times of the day will be extremely important from the point of view of air traffic management, and will enable the UAV operators to perform air operations in these airspaces, where the UAVO would not be able to perform flights in the preferred time frame, due to manned air operations.

Allocating slots on the basis of complex FPL (Flight Plans) does not give ATC certainty as to the number of aircraft in a given unit of time in the respective sector, since aircraft may circumnavigate difficult weather conditions, take off a few minutes earlier or later, or fail to take off at all.

Therefore, it is important for controllers to track and analyze airspace on an ongoing basis in order to maintain sector capacity in terms of UAV flight capability in the respective sector. It is important for the ATC to use optimal shortcuts in air routes for manned aircraft, while also analyzing the possibility of UAVs using this airspace. ATCs must be aware that UAVs carrying out flights as well as operational tasks have a large flight altitude range, the eventual change of which does not adversely affect the performance of the operational task, and exploit this characteristic in the more challenging moments.

In order for an aircraft to land at an airport, it must receive, from the airport management service, a PPR [5] (*Prior Permission Required)*, which specifies the time of flight

---

[4]Slots - time intervals for individual aircraft in which they can take off or land. The slot interval is 15 minutes, and the variation of its actual time may be from -5 min to +10 min from the time specified in the information provided to the crew. Shall it prove impossible to perform takeoff or landing in the given time interval the crew should ask the air traffic controller or handling agent to delay the current (whenever possible) or allocate a new slot. It should be taken into account that the new slot can be allocated even hours later than the one that was originally allocated.

[5]Permission granted by the appropriate authority prior to the commencement of a flight or a series of flights landi ng in orflying over the territory of the nation concerned. (Dictionary of Military and Associated Terms. US Department of Defense 2005.)

operations and airport stay. Airport managers have current information regarding the planned landing time of an aircraft at the airport. Information regarding the arrival of an aircraft to the airport should be used by the ATC to manage sector capacity and it can be used to allocate UAV slots accordingly. Information for ATC regarding take-off and landing times from destination airports and stopovers is extremely important as it will have a direct impact on the capacity of the sector.

HALE (High Altitude Long Endurance) class UAVs can perform air operations in an airspace distant from the place of their take-off. They are able to take off e.g. from airports in the United States, as well as from other places and perform air operations on other continents. UAV covering long routes may encounter various factors that will affect the time of their arrival, e.g. in the European airspace.

Therefore, it is necessary to exchange operational data between air traffic services of various parts of the world, including the military operational services responsible for commanding air operations. These services have up-to-date location information and detailed arrival times at specific points in the airspace. Enabling the ATCs access to this information will have a positive impact on the flow of air navigation.

Manned aircraft performing international air operations in European airspace fly at a cruising altitude[6] that is optimal for them. This depends on numerous factors, including the flight distance, size and parameters of the aircraft, atmospheric conditions, airspace structures and classes, or the operational situation in the airspace. However, it should be assumed that most flights take place at an altitude of 9,000 - 13,000 m AMSL (Above Mean Sea Level).

The optimum cruising altitude for the operational tasks of HALE class UAVs is 12,000 - 16,000 m AMSL. Change of UAV flight altitude by e.g. 1000 m will not have a significant impact on the quality and safety of the implementation of its operational task at this stage of the flight. However, it will be of substantial significance for critical sector capacity values.

Both ATCs and UAVOs must be aware that the arrival route can be modified both before take-off as well as when the aircraft is already in the airspace. However, such changes should be excluded in the *"operating space"* due to the fact that the sensors, devices and equipment on board the UAV have the optimal height of combat application and in case of

[6]Cruising altitude - the optimum altitude at which the aircraft reaches its proper cruising speed following the climb. For an aircraft, this altitude is closely related to its flight level. The flight level is a level with a constant atmospheric pressure, referred to a specific value of atmospheric pressure of1013.2 hectopascals (hPa) and separated from other such levels by predefined pressure differences. (Annex 2 to the Convention on International Civil Aviation. 2012, p.18).

changing the altitude or location of the UAV they may not be effective in use. In addition, the selection of the altitude and location of the operation by the UAV depends on the anti-aircraft defenses measures of the opponent, the date of the task, striking measures, parameters and type of target, and others.

Priorities in access to airspace are thus clear. The carriers have developed them over the years of cooperation with air traffic management service providers and international, regional and national aviation organizations.

One of the requirements for air carriers is the requirement of timely execution of the air operation. Manned aircraft are often carrying passengers, whose punctual arrival to a specific place forms the precondition for their subsequent meetings or celebrations that are important for specific groups of society, or organizations. Therefore, untimely completion of an air operation can be troublesome, expensive and even dangerous for air carriers.

Given the above, ATS faces the challenge of applying the right priorities in the use of airspace. ATS must consider both the economic factors and the factors affecting the security of the state, countries or military and political organizations. Priorities based on flight status, e.g. STS HEAD, LPR or SAR are transparent and indisputably mandatory to apply. On the other hand, flights without priority can always be discussed and implemented through planning and ongoing coordination of interested Parties. Therefore, there is a justified concern regarding the process of integration of manned and unmanned aviation in relation to the priority of access to airspace. The introduced regulations state that priority will belong to manned aircraft, however, it should already be assumed that the highest priority will be safety and it is on its basis that ATS will assign priorities in the use of the airspace.

Conclusion

The process of performing UAV air operations has already begun and it is expected that unmanned aviation will play an increasingly important role in air transport. The main advantage of UAV-performed flights in comparison to manned aircraft is that the former are more cost effective, safer, can perform longer air tasks, and have a minimal negative impact on the natural environment. In addition, UAV flights can be carried out in war-affected areas and in hazardous and harmful atmospheric conditions. We notice a steady growth in the use of UAVs, inter alia, due to the use of new technologies that are systematically introduced to unmanned aerial vehicle systems.

The application of UAVs gives the opportunity to transmit the image to any location, while the UAVO remains in the transmission vehicle in a remote place. What is also extremely important, is that the tasks are performed by the UAVO team that performs its activities in a shift pattern and is not directly exposed to risk of loss of health in consequence of being in the centre of the implementation of the flight operation. The team can execute the entrusted flight task *"cool"* and without emotions, without tiredness or fatigue triggered by a long lasting flight.

The NBR, introduced by the European Commission, regulates UAV issues at a supranational level. This forms a significant step towards integrating manned and unmanned aviation. The entry into force of detailed implementing acts will enable the performance of international air navigation by UAVs in the airspace of the states located on the flight route in accordance with transparent and harmonized regulations. The new base regulation differs from the existing legal acts introduced by the EC and EASA. According to the new regulation, the UAV breakdown is the result of an aviation risk analysis that takes into account the weight of the UAV, its speed, noise level and equipment configuration.

The introduction of UAVs into a common airspace must not negatively impact the air traffic flow, safety, capacity, airspace management efficiency and the natural environment. Common airspace cannot bring about the involvement of a significant amount of new technical measures, technical infrastructure and changes in aviation regulations that would revolutionize the work of ATS, ranging from Air Traffic Flow Management, Airspace Management to the Air Navigation Service. The safety and fluidity of the air traffic management system must be guaranteed in flight and in the maneuvering area. The tasks must be properly performed by area control services, airport control areas and airport control, providing control service for manned and unmanned aircraft, which, along with the development of technology, experience, equipment and entry into force of new regulations will ensure unmanned aviation access to all classes of airspace without negatively affecting the safety of its users.

Missions carried out with the use of UAVs are becoming more effective, safer, cheaper and more environmentally friendly, when compared to air operations carried out by manned aviation. Among many experts, both civilian and military, there is a widespread belief that manned aviation will be systematically reduced, and replaced by its unmanned counterpart. This process has certainly already begun and will continue. However, for it to continue, it is necessary that unmanned aviation has unrestricted access to all[7] airspace classes (Annex 11 to the Convention on International Civil Aviation of the Air Traffic Service, 2001. Appendix 4. Airspace classes).

This will require full integration of manned and unmanned aviation in the common airspace, proper cooperation of the Air Traffic Services and aviation management, implementation of legal regulations and appropriate equipment of UAVs.

[7]Airspace classification. There are 7 basic airspace classes, named after the first letters of the Latin alphabet. These Classes are A, B, C, D, E, F and G. Classes A–E are referred to as controlled airspace. Classes F and G are uncontrolled airspace. (AIP Polska. 2017, ENR 1.4-1).