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KEY ISSUES RELATED TO THE USE OF UNMANNED AERIAL SYSTEMS

An important feature that characterizes modern armed conflicts is the large-scale use of aviation. Combat activities of the air force became an integral part of fights, battles and operations conducted in various conditions and in many cases determined their development and final result. Currently, in the center of the media discourse, including political and military, there are e.g., issues regarding the use of Unmanned Aerial Systems (UAV) during an armed conflict. The use of military UAVs in operations in Iraq, Libya and Ukraine confirmed their high usefulness in operations (conflicts) of various intensity. Drawing on practical examples, the article discusses key problems related to the use and integration of UAV. This can be a starting point for a discussion on the challenges associated with their use.

The study used the document research method as well as quantitative and qualitative analysis. A review of the scientific literature on the complex problem of the use of UAVs in the conditions of armed conflict was made. Publicly available information provided by interested institutions was used.

Keywords: Unmanned Aerial System (UAV), military conflict, drone attack.

1. INTRODUCTION

An important feature that characterizes modern armed conflicts is the large-scale use of aviation. Combat activities of the air force became an integral part of fights, battles and operations conducted in various conditions and in many cases determined their development and final result.

At the same time, the analysis of the course of recent wars and armed conflicts allows us to conclude that success is often determined not only by quantitative and qualitative advantage, but above all - information advantage. Currently, in the era of dynamic technical progress and the air-land dimension of the battlefield, the use of Unmanned Aerial Systems (UAV) is gaining particular importance.

The aim of the article was to discuss the key issues related to the use and integration of UAV. It can be a starting point for a discussion on the challenges related to their use in the Polish Armed Forces.

Therefore, the decision to acquire unmanned aerial systems requires that all environments understand the full spectrum of challenges related to their development and use in Poland. It should be mentioned that ultimately these are to be unmanned aerial

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reconnaissance and reconnaissance and strike systems, the essential element of which will be manned strike platforms. In addition, in the future they will carry out tasks as part of joint forces. Their integration therefore requires the implementation of solutions directly related to the concept of their use in the Polish Armed Forces. This, in turn, forces the identification of areas necessary to consider in the context of future integration of unmanned aerial systems in joint forces operations (Chamola, Agarwal, Gupta, 2021).

2. TERMINOLOGY, DEFINITION AND CLASSIFICATION ISSUES

In the 1990s, the name Unmanned Aerial Vehicles (UAV) began to function in Western specialist literature, which gained a wide range of supporters and defines an unmanned aerial vehicle as: a reusable air apparatus (vehicle, object, drone) of any aerodynamic configuration, armament or other equipment that does not carry a pilot-operator and is capable of flight along a programmed route. There are many categories of dividing drones. Depending on their range, size, purpose and nature of use as well as the size of the cargo carried, altitude and duration of the flight.

Classifying them according to the propulsion system, they can be divided into those built in the form of: airplane, helicopter, powered-lift in a system different from the helicopter. On the other hand, the classification according to the aerodynamic system divides them into: fixed-wing aircraft, rotorcraft, as well as balloons and airships. Noteworthy is also the division depending on the method of take-off and landing. This classification divides them into those that can take off in a conventional (independent) way, with support (e.g. catapult) or a combination of both methods. Without going into presenting all possible categories of drone division, it is worth emphasizing that when it comes to unmanned aerial vehicles, we are dealing with a system of which it is a visible element.

It seems reasonable to rely on the standardization documents of the North Atlantic Alliance in terms of terminology. Thus, the term "unmanned aerial system" is understood as all the components of the system necessary to perform the tasks and the relationships between them (unmanned aerial vehicle, control station, payload, data transmission, personnel, supporting elements, system users (AAP-6, 2013). An unmanned aerial vehicle is assumed to be the basic executive element of an unmanned aerial system. The term "unmanned aerial vehicle" should be used for both military and civil applications. Thus, the terms "remotely piloted aircraft system" and "remotely piloted aircraft" adopted by the International Civil Aviation Organization (ICAO) and the European Union are considered at the current stage of technological development as synonymous with the terms "unmanned aerial systems" and "unmanned aerial vehicles" (ATP-3.3.7, 2014).

It is also reasonable to present the typology of unmanned aerial systems in force in NATO. As agreed in ATP-3.3.7. and UAS Tactical Pocket Guide, unmanned aerial vehicles are classified based on the criteria of maximum take-off weight and practical ceiling. Class I includes unmanned aerial vehicles with a take-off weight of less than 150 kg, among which the categories micro (with a kinetic energy of less than 66 J), mini (take-off weight up to 15 kg) and small (from 15 to 150 kg) are distinguished (ATP-3.3.7.1, 2014). This class does not require certification standards in NATO and includes unmanned aerial vehicles, usually "hand-launched", which are in the equipment of subunits and used for reconnaissance within a radius of several to several dozen kilometers. The equipment of unmanned aerial vehicles with a take-off weight below 150 kilograms usually includes optoelectronic

sensors. A characteristic feature of unmanned aerial vehicles of this class are relatively small logistic requirements. They operate at low altitudes not exceeding 1,500 meters and have a limited range and endurance. The typical tactical radius of tasks performed by unmanned aerial vehicles of this class is: up to 5 kilometers for the micro category, up to 25 kilometers for mini and up to 50 kilometers for small unmanned aerial vehicles.

Class II (maximum take-off weight in the range of 150 kg to 600 kg) includes medium-sized unmanned aerial vehicles, also referred to as tactical unmanned aerial vehicles. Aircraft of this class are typically used in brigade-level operations or below for reconnaissance, surveillance and identification of targets. They can perform tasks from unprepared infrastructural landing sites, they do not require large logistic support. They operate at altitudes of up to 5,500 meters, and the typical task radius is about 200 kilometers within the radio horizon. Their equipment includes optoelectronic sensors and laser rangefinders (ATP-3.3.7.1, 2014). In the classifications functioning in the Polish Armed Forces, class II includes two categories of unmanned aerial vehicles: short-range (up to 100 km), which will protect the operations of the brigade, and medium-range (up to 200 km), operating at the division level.

Class III includes unmanned aerial vehicles with a take-off weight of more than 600 kilograms, characterized by a long range and long-term performance of tasks. In the third class, three categories of unmanned aerial vehicles are distinguished: for long-term performance of tasks at medium heights (Medium Altitude Long Endurance – MALE), for long-term performance of tasks at high altitudes (High Altitude Long Endurance – HALE) and strike/combat unmanned aerial vehicles (Strike/Combat). The MALE category includes, in accordance with the typology contained in ATP-3.3.7.1, class three aircraft that can routinely perform tasks at altitudes up to approximately 14,000 meters (45,000 feet), while the HALE and Strike/Combat categories include unmanned aerial vehicles capable of performing tasks at altitudes up to about 20,000 meters (65,000 feet). Third-class unmanned aerial systems, as a rule, require properly prepared landing sites for take-offs and landings, as well as extensive logistic support. They are capable of performing a variety of missions thanks to specific equipment, which may include: radars, lasers, reconnaissance agents, as well as weapons. Thanks to satellite communication systems, unmanned class 3 aircraft can perform tasks beyond the range of the radio horizon (ATP-3.3.7.1, 2014). In the literature on the subject and in the public debate, you can also encounter other typologies, in which the criterion distinguishing features for separate groups of unmanned aerial systems are: flight range (short, short and medium range systems), or the command level of the main user (tactical, operational or strategic) (Ko, Song, 2021).

3. ASSUMPTIONS FOR THE USE OF UNMANNED AERIAL SYSTEMS

The creation of unmanned aerial vehicles has created completely new perspectives in the field of aerial reconnaissance. Considering the fact that native general military commanders chronically suffer from the lack of timely and reliable information about the enemy, terrain and weather conditions, the introduction of UAVs at the level of a tactical compound (unit) may provide an additional source of information (Witczak, Kawalec, Klembowski, 2013). The speed and range of aerial reconnaissance carried out by the UAV clearly proves the advantage of this type of apparatus in relation to the forces and means of ground reconnaissance and is its best showcase.

The purpose of reconnaissance activities at the level of a tactical unit (unit) is to acquire and provide the command, in the shortest possible time, as much data as possible about the current situation on the battlefield, especially about the strength, organization, grouping, movements and intentions of the enemy. The command at every level is concerned not only with the ability to correctly assess the situation, but above all with the proper and rational use of own forces, especially fire resources, and ensuring the continuity and efficiency of command.

The command of each unit and tactical compound has a variety of forces and means of reconnaissance. The use of a specific type of reconnaissance forces and means depends on the situation on the battlefield and the type of combat operations conducted. Reconnaissance helicopters are intended for air reconnaissance in the land forces.

None of the reconnaissance means used so far in the Polish land forces, in comparison with the UAV, provides reliable information about the enemy's movements and regrouping, about its fire assets and about profitable objects on which own strikes can be made. The reconnaissance means currently used by the land forces meet these requirements only to a limited extent. On the other hand, using helicopters for reconnaissance, only some data can be obtained in a relatively small area. This is mainly due to their inadequacy to carry out tasks over the enemy group and poor equipment. The main disadvantage of helicopters is also their relatively high sensitivity to the fire of most anti-aircraft ground assets.

Artillery reconnaissance, on the other hand, has a limited range in terms of depth and is usually aimed at a specific object or area, and is also time-consuming. With the help of artillery reconnaissance, it is possible to determine the location of targets only during fire. The results of this reconnaissance are basically used by the artillery and rarely form the basis for making more important decisions. The results of radio-electronic reconnaissance depend primarily on the chance and mistakes of the enemy. Data from this reconnaissance may also be deliberate disinformation of the opposing party.

With the increase in the mobility of troops, the possibility of masking, the ability to conduct combat operations at night and the range of fire means, the demand for air reconnaissance data has increased enormously. Unmanned aerial vehicles can ensure continuous and systematic tracking of the movement of enemy units and tactical units, which have modern combat technology and the ability to concentrate or transfer their potential in a relatively short time.

To sum up, it should be stated that air reconnaissance significantly complements ground reconnaissance and provides the necessary information to conduct combat operations and protect own forces against surprise from the enemy. On the other hand, skilful use of reconnaissance UAVs, in the case of unreliable data about the enemy, his strength, grouping, areas of reserve concentration, missile launching stations and artillery positions, may be the key to success on the modern battlefield.

Unmanned aerial vehicles – according to many specialists – are characterized by many advantages that sometimes make them superior to airplanes and helicopters in terms of capabilities, especially in the zone of direct contact between the fighting forces. UAVs, for example, can take off and land from any place (a forest clearing, a city street, a small sports field). This allows them to be used in all forms of military operations. This feature allows you to deliver the acquired information to any headquarters, practically without wasting time. They can also perform reconnaissance flights at much lower altitudes than airplanes or helicopters (even 1 m above land), maneuver more freely and freely change the flight course, and use the ground cover much better for camouflage purposes. All this makes it

difficult to detect and possibly destroy the unmanned aerial vehicle. Flight at low altitudes and at a relatively low speed also allows for accurate reconnaissance, while maintaining high reliability of information (Cieślak, Zieliński, 2017).

A very useful advantage of the UAV during reconnaissance is the ability to stay in the designated area for a longer time. This allows the cameras to be used to conduct reconnaissance at the entire tactical depth of operations. This feature makes it possible to use the BSP also to correct and control the fire of its own artillery. In addition, thanks to the UAV, it is possible to accurately (accurately) blow up sabotage or reconnaissance groups in the rear of the enemy.

In the event of destruction or damage to the unmanned aerial vehicle, the material loss is incomparably smaller than in the case of the loss of an aircraft or helicopter. In addition, unmanned aerial vehicles, compared to helicopters, have another feature that is extremely important on the modern battlefield – they consume much less fuel, are quieter and more difficult to locate and destroy by enemy air defense means.

According to military experts, the main UAV reconnaissance tasks may be as follows:

- reconnaissance of the composition and grouping of the enemy's forces, its most important fire assets (primarily means of delivery of nuclear weapons), the system of engineering barriers, as well as the command system in the tactical defense zone,
- detection of reserves and identification of troop movements (mainly tank units) and their continuous tracking,
- detection of drop zones and operation of enemy airborne troops and special groups,
- precise determination of the course of the front edge of the defence, rear and depot locations, checking the condition of roads and bridges and detecting possible contamination zones,
- observation (monitoring) of own wings, in order to prevent the break-in of reconnaissance groups and separate units of the enemy,
- supporting other own means of reconnaissance by indicating objects and newly detected areas of the deployment of enemy troops,
- correcting artillery fire and indicating newly detected targets for firing,
- recognition of the effects of own fire means,
- monitoring the correctness of camouflaging own troops,
- simulating the movement of part or all of a force in order to mislead the adversary as to his intentions.

Aerial reconnaissance using UAVs can now be carried out by: visual observation, photography and radio-electronic reconnaissance. The choice of method depends on the nature of the task being performed, reconnaissance equipment, the enemy's influence, the time of day and year, and the weather.

In conclusion, it is worth mentioning that the experience gained from the use of unmanned aerial vehicles in combat conditions shows the advantages that can be formulated as follows:

- great capabilities in the field of air reconnaissance, radio-electronic warfare, targeting, artillery fire correction, feign and demonstration activities,
- the ability to transfer data, including to lower levels of command in real time,
- long service life due to small radar reflection surface, small thermal footprint and low noise level,
- the ability to perform tasks in strong anti-aircraft defense zones,

- the ability to focus effort in designated areas and then transfer it elsewhere, to more threatened directions,
- high maneuverability of the ground system and simplicity of its operation,
- low operating costs compared to manned aircraft and helicopters.

4. CONCLUSION

Since the beginning of their existence, unmanned aerial vehicles have been designed mainly for reconnaissance and radio-electronic countermeasures, as well as for detecting and locating targets. The UAV equipment variant depends mainly on the tasks assigned to them by the user. As a rule, the set of equipment includes: radar, optoelectronic, infrared searching and recording devices, special video cameras adapted to low light, classic and panoramic cameras, and laser target illumination.

To sum up, with the development of microelectronics, the improvement of cameras and their miniaturization, the importance of unmanned aerial vehicles, used both for military and civilian purposes, is growing. The advantage of UAVs are small dimensions, and thus a reduction in the risk of being detected by enemy radars, high mobility, low cost and, most importantly, sending them does not involve risking the pilot's life. More and more often, such devices are used to perform observation, reconnaissance flights or flights related to the verification of compliance with international agreements. They are also increasingly used by the police to track drug smugglers or control traffic.

For many years, there has been a great interest in small and cheap, remotely controlled, unmanned aerial vehicles. In recent years, this interest has grown, mainly due to the needs of our armed forces, and in particular the land forces involved in Iraq for almost two years.

The demonstrated advantages of unmanned reconnaissance devices prove that they should be a permanent element of the armament of the Polish Armed Forces. Given the fact that Poland has a huge scientific and research potential (The Air Force Institute of Technology – AFIT and Military University of Technology – MUT) and extensive experience in constructing flying devices, it may be surprising that they are still not in service. At the same time, attempts to explain this fact with the lack of funds, in the author's opinion, seem to be passing the truth. What's more, in the conditions of a huge quantitative and qualitative development of means of combat, the introduction of Unmanned Aerial Systems should be one of the most important undertakings in the land forces in the coming years.

To sum up, one of the priorities of the technical modernization of the Polish Armed Forces for the coming years should be the acquisition of reconnaissance and reconnaissance and strike unmanned aerial systems. In this context, it is extremely important that the representatives of the political, military, scientific or industrial circles, as well as the media, understand the complexity of unmanned aerial systems, based on substantive premises. A comprehensive perception of all components is necessary to develop detailed conceptual, organizational and technical requirements related to the development and use of such systems in our country.

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