Humanities and Social Sciences **2023**
Research Journal 30, No. 3 (2023), pp 117-126 **July-September**

Received: March 2023
Accepted: September 2023
DOI: 10.7862/rz.2023.hss.31

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A DESCRIPTION OF MILITARY THREATS TO POLAND'S AIR SAFETY

The events of the past year have made many experts aware that the contemporary international security environment is increasingly uncertain, complex and difficult to predict. It is, therefore, reasonable to present current issues related to air safety, which, in the author's opinion, are crucial for the functioning of the Polish state in the area of medium- and long-term national and international policy. The aim of this article is to describe the contemporary air safety environment, which is characterized by a dynamic process of transformation of the types of threats; these include the ambitions of some countries to dominate in this dimension.

The study concerns the military dimension of Poland's air security. The author's analysis proves that air threats are not a new phenomenon, but currently they have an extremely wide range of application in armed conflict. The research method adopted is qualitative analysis supported by the technique of real-meaning definition.

Keywords: air security, air threats, armed conflict

1. INTRODUCTION

The sense of security is inextricably linked to the development of new areas by man, which are a derivative of the implementation of new technological solutions. This also applies to the rapidly growing exploration of the airspace, which expands and separates the catalog of types of security, taking into account the spatial criterion. In this context, it should be emphasized that we are witnessing the development of various forms of human air activity, which on the one hand force the continuous development of science and technology, and on the other generate new threats. The aforementioned human air activity contributes not only to the implementation and dissemination of new technological achievements, it is also the main factor in the civilizational development of humanity and a source of threats that may disrupt this development (Rosłan, 2018).

The contemporary air safety environment is characterized by a dynamic process of transformation of the types of threats, which include, among others, ambitions of some countries to dominate in this dimension. Moreover, threats and risks in the area of air safety have or may have a negative impact on Poland's security. Therefore, efforts in the field of

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air security in Poland require constant monitoring of opportunities and threats that airspace exploration brings (Rajchel, 2015).

Considering the above, it is reasonable to present current issues related to air safety, which, in the author's opinion, are crucial for the functioning of the Polish state in the area of medium and long-term national and international policy. Due to the complexity of the issue, the military dimension of Poland's air security was treated in a special way.

2. THE CONCEPT OF A THREAT TO STATE AIR SAFETY

A threat to the air security of the state should be understood as a state that would threaten its proper functioning in a specific situation. According to J. Gotowała, "an air threat is a possibility of an attack using an aircraft (object) on military facilities or civilian facilities important for the functioning of the state" (Gotowała, 2002). In other words, it is a situation in which there is a probability of a dangerous state threatening the functioning of the state, implemented with the use of e.g. aircraft (objects), hereinafter referred to as means of air attack. In the definition cited above, the probability, i.e. the eventuality (possibility) of the occurrence of an air threat, is clearly emphasized in the first place. J. Gotowała notes that when forecasting threats in the air, it is assumed that all air objects approaching the airspace of a given state for an unknown purpose or violating this space and changing the prescribed flight conditions for no reason should be treated as objects that can take destabilizing actions and cause certain type of threat. This means that one of the causes of a threat to the territory of a state (alliance) from the airspace may be intentional or accidental impact of airborne objects (*air attack means* – AAM).

An air threat is a situation in which there may be a varied, as to the means of air attack, impact from the third dimension, aimed at achieving specific (measurable) effects affecting the functioning of specific forces and means, adequate to the scale and intensity of a given conflict (Rosłan, 2014). The threat from the air has become an inseparable element of modern military operations, and the scale of the use of AAM largely depends on the combat potential of a possible adversary in a specific situation. A threat to the durability of the state's defense system, as a result of air impact, may occur in virtually any state of internal and external political relations; in a state of peace, in a state of internal or external anarchy or in a state of local armed conflict conducted with the participation of e.g. Polish armed forces outside the country (Rosłan, 2012).

3. THE MILITARY DIMENSION OF THE THREAT TO STATE AIR SAFETY

The analysis of military air threats allows us to conclude that the development of means of combat, including aviation, which has strengthened its position of the main implementer of neutralizing the physical resistance of a potential enemy, has made the airspace the primary arena of war struggles in the first decade of the 21st century. The implication of this situation is the wide spectrum of tasks performed by aviation in solving various crisis situations, from the moment they occur. On the other hand, it should be remembered that aviation (including, above all, military) will be treated by many countries as a significant element of threat to air safety. Therefore, it will be a military air threat that should be treated very seriously, especially since in recent years analyzes of air threats related to broadly understood air terrorism have dominated. In other words, to asymmetric threats occurring in the air environment, apart from classic military threats (Olszewski, 2002). In the context presented above, the use of aviation, identified with an air threat, should be viewed through the prism of means of air attack (Jałoszyński, 2008; Krawczyk, 2008).

Taking into account the above statements, according to J. Rajchel, air threats can be divided into four groups. The first is cases related to unintentional violations of airspace and air traffic rules in times of peace or crisis. Another group consists of the use of aircraft for criminal purposes, the most dangerous of which is widely understood air terrorism. Next, cases related to the intentional (deliberate) violation of the airspace of the state (alliance) in peacetime or crisis for the purpose of reconnaissance. The last group consists of actions aimed at an intentional (deliberate) threat from the air as part of military aggression against a given country (alliance) (Rajchel, 2012).

Also according to A. Radomyski,

> it seems advisable to divide air threats into those that may occur in peacetime and those that may occur in an armed conflict. It can therefore be assumed that an air threat, i.e. a threat related to the possibility of using means of air attack, can be considered due to its military or non-military nature, including through the prism of the means used (Radomyski, 2015).

And so, the area of military air threat, which from the perspective of this study is crucial, is primarily war, including military operations. As part of these activities, the air opponent may carry out: aerial reconnaissance (provocation) of the air defense system (AD), shallow incursions into the country's airspace with limited forces and in a limited time, planned attacks on specific objects, devices, institutions in order to force specific actions or behaviors; retaliatory strikes against one of the parties to the conflict (where Poland may be a participant) and subsequent strikes on objects located in the border zone or in the interior of the country, depending on the stage of the armed conflict.

An interesting voice in the discussion on the issues raised, related to the military dimension of air security, are the statements of K. Dymanowski. In his opinion, threats from the air must be considered using three division criteria. According to the first, direct and indirect threats are distinguished (Dymanowski, 2011). Direct threats are identified with an attack by means of air attack. Indirect ones, on the other hand, relate to the violation of the air border of the state (alliance) and conducting reconnaissance activities. In turn, according to the next two criteria, the determinant of air threats is: the operational criterion describing the nature of the use of the enemy's means of air attack and the technical criterion describing the technologies used (Dymanowski, 2011).

The analysis of possible variants of the enemy's actions in a local conflict allows for the identification of specific types of incidents (Zdrodowski, 1998). These include, above all, strikes by single groups of aircraft in limited space, most often where our (allied) armed forces operate, as well as strikes by single groups of aircraft and destruction of selected objects (both military and specific civil infrastructure). In addition, simultaneous strikes from several directions on the grouping of our (allied) troops and massed strikes, spatially extensive, combined with an increase in the intensity of operations, e.g. of land forces. In addition, a mass air attack with other air means, e.g. unmanned aerial vehicles, and the possibility of using other means of air attack apart from aviation are mentioned. Such actions of the air enemy will be supplemented by the use of various airborne electronic warfare (EW) means and the performance of demonstration and reconnaissance flights with the use of EW means (Rosłan, 2017).

It is worth emphasizing that a characteristic feature of a military threat to the air security of the state is the relatively short duration of the impact itself, in the order of several minutes. The location of the attacks will most often be selected with a very good

recognition of the stationary dislocation and spatial combat capabilities of the state's air defense forces and means. At the same time, the planner, organizer and operator will strive to impede the detection, recognition and tracking of the air target. Therefore, the potential adversary's aerial interaction will probably be carried out using means with a small effective reflection surface, flying at low and very low altitudes, at relatively high permissible cruising speeds. This means that today the issue of air threats should not be identified only with airplanes and helicopters, but the categories of air impact should be viewed in a broader spectrum (Radomyski, 2003). And so, air objects that may threaten the air safety of the state should be understood as all aircraft and other flying devices detected and observed in the national airspace.

In considering the issue of military threats to Poland's air security, reference can be made to the provisions of the 1971 "Instruction for the preparation and transmission of reports on the air situation". This document contains a provision that "all aircraft and other flying devices detected and observed in the air by radio engineering units are divided into air targets and own aircraft" (Szt. Gen. 604/71). Moreover, according to the provisions contained in the aforementioned Instruction, air targets include planes and other means of air attack of the enemy in the air, planes (flying devices) violating state borders and planes (flying devices) observed outside state borders. In addition, air targets include aircraft (flying devices) and radiolocation echoes reflected on the circle observation indicators, whose assignment has not been determined, and aircraft (flying devices) violating the established flight regime. The last group of air targets are planes (flying devices) simulating air opponents during manoeuvres, exercises and trainings, and planes performing control flights (Szt. Gen. 604/71).

Also interesting in this regard is the classification of means of air attack proposed by A. Radomyski, resulting from the division of air threats. Generally, the means of air attack can be divided into two groups, respectively corresponding to the division of threats into the so-called traditional (classic) and new - asymmetric, identified with air terrorism (Radomyski, 2013). It should be noted, however, that some military AAMs can also be used by terrorist groups, i.e. not only and exclusively during a military conflict (military operations). It is worth emphasizing that among the military means of air attack A. Radomyski mentions primarily ballistic missiles, aerostatic and aerodynamic flying devices and military space devices (Radomyski, 2015). These tools may pose serious threats to Poland's air safety.

The typology presented by K. Dobija also has an important cognitive value of the discussed issues. It presents a division taking into account the possible threat scenarios in contemporary and future warfare identified in allied documents and the National Security Strategy of the Republic of Poland and the Defense Strategy of the Republic of Poland. And so, the most probable is the use of manned aircraft, which include planes and helicopters of the air, land, sea and special forces. In addition, it mentions the possibility of using unmanned aerial systems and cruise missiles and tactical ballistic missiles, which are still in the arsenals of countries aspiring to be military powers (Dobija, 2013).

In the context of military threats to the air security of the state, one should also refer to the NATO document "Ground Based Air Defense Operations" (2020), which describes the activities for which the air defense systems of the alliance countries must be prepared in the future. Thus, among the potential air threats, apart from the above-mentioned threats, there are also threats created by: rockets, artillery and mortar shells; precision-guided munitions and various-purpose platforms that are lighter than air (Radomyski, 2015).

In general, the assessment of air threats in the military dimension made by experts indicate that the challenge for Poland's air defense in the near future may be primarily manned aircraft with increased tactical and technical capabilities in the field of reconnaissance and combating ground, surface and air objects. In addition, tactical ballistic missiles and surface-to-surface missile fire support systems; winged missiles and unmanned aerial vehicles and civil aviation aircraft used as an air attack tool (Standing Defence Plan SDP 10901 D).

4. ARSENAL OF CHALLENGES FOR STATE AIR SAFETY

In the arsenals of the countries of the Euro-Atlantic area there is a large fleet of combat aircraft prepared for use in the event of a high-intensity armed conflict. With regard to Poland's air security, a potential adversary may have third-generation (e.g. Su-25, Su-24M, Tu-22M3) and fourth-generation aircraft (e.g. Su-30, Su-32, Su-34) with reduced detecting and performing tasks in all weather conditions. Some of these aircraft are adapted to carry weapons with a range of up to 300 km (e.g. Kh-59ME) (The Military Balance, 2018). It is worth noting that long-range airborne means are expensive weapons, so they are expected to be used to attack heavily defended civilian and military objects of strategic and operational importance. Since Western and Russian solutions are used in the production of analogous agents by China, India and Iran, it cannot be ruled out that the availability of these agents will be much greater in the next decade (Kopp, 2015).

The above situation has certain consequences for Poland's air safety. Moreover, the evolution of military threats to air security forces fundamental changes in the organization and methods of counteracting such threats. The implications of this state of affairs for air defense have been noticed in many countries with significant military potential. Along with the increase in the range of air means of destruction, the range of anti-aircraft systems was increased to destroy carrier aircraft before the long-range means of destruction was launched. Such action turned out to be only partially effective, mainly due to the ratio of the cost of anti-aircraft systems to the price of means of destruction, as well as the limited mobility of anti-aircraft systems in relation to combat aircraft. At the same time, the countries that decided on such a solution equipped themselves with anti-aircraft systems with a range of about 300 km, thus moving the carrier aircraft beyond the scope of the task. In the case of countries with more limited military potentials and smaller territory, medium-range sets deployed as far as possible from the shield objects are used for this purpose. Both solutions take into account the need for additional object shielding using short-range and short-range kits (Rosłan, 2018).

The assessment of Poland's air security should also take into account the ongoing proliferation of satellite-guided aerial weapons, which means that in the event of a high-intensity armed conflict in the Euro-Atlantic area, gliding bombs with a range of up to 100 km and a precision of less than 3 m can be used en masse. is less than $20,000. For comparison, a dozen or so years ago a guided air-to-surface missile with similar parameters cost over PLN 250,000 USD (Hładij, 2018). The low unit cost and relatively high precision will imply the use of these means to attack communication facilities (airports and seaports, road and railway junctions). Apart from the USA, satellite-guided aviation weapons are now also produced by Russia, Israel, France and China, and in the near future an increase in the number of producers and users should be taken into account (Cliff, 2010), which in consequence has no impact on Poland's air safety.

In the context of military threats to Poland's air security, a noticeable trend is also the development of aerial means of destruction capable of long-term duty over the battlefield and attacking mobile objects with sub-missiles carried by homing to a source of thermal energy or guided by radar. An example of such a solution is the LOCAAS container that uses a laser radar to observe the battlefield and homing on objects with predefined characteristics. The proliferation of similar solutions may result in Poland's air defense measures being forced to fight the specialized means of destruction in the air.

When analyzing the factors influencing the creation of a threat to Poland's air security, one should also take into account the fact that the ever-longer list of countries in the Euro-Atlantic area with tactical ballistic missiles adapted to carry weapons of mass destruction requires treating this means of destruction as a real air threat. Some experts are of the opinion that this type of threat will only be dangerous for Poland in the event of a high-intensity armed conflict. Others say that also in peacetime, suggesting intensification of work under the so-called anti-missile shield. One of the concepts assumes the implementation of the ground-based theater air defense system – THAAD (*Terminal High Altitude Area Defense*). The system is intended to increase the ability to protect large urban agglomerations and large military formations by destroying missiles at distances of up to 200 km and at altitudes of up to 160 km (Zajas, 2018). The response of rocket manufacturers is to increase the resistance of warheads by armoring them and introducing maneuvering warheads after entering the atmosphere. The use of such a solution in the Russian ISKANDER missiles makes them a difficult target to destroy for current anti-aircraft defenses (Radomyski, 2010).

The experience of the recent wars in Iraq and Afghanistan, as well as in Lebanon in 2006, also brings added value to the assessment of military threats to the state's air security. And so, experience shows the massive use of unguided missiles as a means of influencing military and civilian objects. More than 4,000 unguided rocket attacks by the Hezbollah organization have disorganized Israel's functioning in a large part of its territory, directly threatening more than a million of its inhabitants. After Israel was unable to effectively defend its territory against Hezbollah attacks, the IRON DOME (Israeli air defense system developed by Rafael Advanced Defense Systems) system was developed and implemented. It seems that this system can be a point of reference for analyzing the needs related to the national air defense's ability to fight unguided missiles. Similar analyzes should be made in the case of eliminating the threat posed by multi-launch missile systems with capabilities similar to those of SMERCZ (up to 70 km) or MLRS (with ATACMS missiles up to 300 km). Undoubtedly, the above experiences should be taken into account in counteracting threats to Poland's air safety.

In addition, taking into account the changes in the military threats to the air security of the state, a significant increase in the number of cruise missiles themselves and the countries that will have them should also be taken into account. This threat is also noticed in Poland. The latest generation of winged missiles is characterized by a reduced effective radar reflection surface, a range of up to 1,500 km, a flight altitude of less than 50 m and a hit accuracy of several meters. Due to the high unit price, the winged missiles will be used mainly to attack civilian and military objects of strategic and operational importance. The introduction into the arsenals of the Euro-Atlantic area of less expensive winged missiles with a shorter range and reduced precision of destruction will expand the number and scope of the attacked objects (Jackson, 2008). The proliferation of winged missiles will undoubtedly force the acquisition of an appropriate number of anti-aircraft systems adapted to combat targets with a small effective reflective surface and flying at low altitudes.

Looking for some analogies with the protection of warship groupings against water-to-water guided missiles, the short-range systems seem to be the most effective in the fight against cruise missiles (Jackson, Frelinger, Lostumbo, Button, 2008).

Bearing in mind the military threats to the air security of the state, one should also take into account the continuous adaptation of unmanned aerial vehicles to carry out missions similar to those of combat aircraft. Based on the experience of other countries, it can be assumed that large unmanned aerial vehicles flying at an altitude of 5,000 to 10,000 m will be fought by medium-range sets, and smaller ones flying lower by short-range and short-range sets. The challenge for air defense will be hypersonic unmanned aerial vehicles moving at a speed of 4.5-6.5 Ma and flying at an altitude of 30,000 m (Unmanned Aircraft Systems Roadmap 200S-2030).

Equally significant threats to Poland's air safety may be generated by activities using small commercial unmanned aerial vehicles available immediately. The experience of the conflict in eastern Ukraine clearly shows that this kind of danger cannot be underestimated.

It should be noted that with regard to potential air security threats, the relatively attractive purchase price, low operating costs (compared to combat aircraft), long service life and high reliability mean that the use of unmanned aerial vehicles for terrorist attacks on civilian population centers cannot be ruled out. to blackmail state authorities. Such a threat materialized in 2006, when the Hezbollah organization used Iranian-made unmanned aerial vehicles to attack the Israeli capital from Lebanese territory. This forced the Israeli authorities to strengthen their air defense, which contributed to the multiplication of expenditures on the system of detecting air targets with a small effective radar reflection surface, flying at low altitudes (Fabian, 2022; Israel Intercept Two Attack UAV Launched by Hezbollah, 2018).

It should also be emphasized that in the literature on the subject there is a typology that takes into account new threats identified with the asymmetric air threat to the state. It mainly concerns terrorist attacks with the use of various types of aircraft structures (Fabian, 2022). On the other hand, many experts on the subject maintain unequivocally that military means of air attack are not intended only for operations in times of conflict, and vice versa. We can deal with asymmetric threats in the air environment not only in times of peace.

Making some generalizations, it can be concluded that military aviation in the future will operate planes and helicopters characterized, on the one hand, by high survivability on the battlefield, thanks to such features as difficult detectability, the ability to neutralize most air and anti-aircraft defense systems, the ability to identifying threats and having the means to eliminate them, and on the other hand having a technological advantage over the air opponent, based on highly effective means of detection, long-range weapons and resistance to possible interference.

In addition, aviation will undoubtedly be based on aerial robots performing reconnaissance and strike tasks in the enemy's territory, in an environment harmful to humans, and difficult detectability will remain an important feature of future aircraft and helicopters. Moreover, in tactics, technological surprise will probably be more important than plans and variants of use developed in the headquarters of the Air Force (Jeler, Roman, 2016). The implementation of air tasks will be accompanied by the principle of eliminating losses by reducing the risk of being shot down by ground-based air defense systems. The trend of raising the ceiling of aviation operations above the height marking the fire zone of short-range missile and artillery defense means impossible to eliminate will probably become permanent.

There are many indications that the aviation capabilities in cooperation with support systems (AWACS) will be developed in parallel, as well as the capabilities of independent operations using on-board systems for detecting, identifying and attacking targets in the air and on the ground. These systems will be characterized by high efficiency on the one hand, and discreet operation on the other. The basic requirement for both the aircraft and the weapons carried by them will be the ability to operate at any time of the year and 24 hours a day, at any latitude and with extremely high precision, regardless of weather conditions.

5. CONCLUSION

To sum up, the military air security environment of the state is an important area of national security identified with counteracting air threats, including, above all, means of air attack by the enemy. It should also be clearly articulated that air safety is not a static phenomenon, it is subject to constant evolution, both under the influence of changes taking place in the regional, national and international environment. Air security is becoming more and more interdisciplinary and multidimensional, its perception and understanding are changing, and the source of threats may be hostile military activities of states (alliances), terrorist groups or criminal elements. In addition, despite the visible link between air security in the military and civil spheres, especially in relation to threats, in practice this means the functioning of two separate subsystems of this security. In the military sphere, the air force plays a fundamental role in ensuring air security.

Threats to the air security of the state are a combination of destructive events that disrupt the established law and order of the state. Taking into account the changes in the political and military environment of Poland, air security threats to our country should be perceived in a dichotomous manner. One should be aware of the existence of conventional threats to Poland's air safety. Such threats may be caused by civil and military aircraft that may recognize and violate Polish airspace in times of peace and crisis. Among the classic threats to Poland's air security, one should also take into account the means of air attack, such as airplanes, unmanned aerial vehicles or winged missiles, which can affect specific objects in the territory of our country during an armed conflict. In assessing the state of Poland's air security, it is also necessary to take into account more extensively than before, asymmetric air threats identified with broadly understood air terrorism. A potential threat may also be the increasing access to unmanned aerial vehicle technologies and their illegal use.

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