Casimir Pulaski Foundation

Si vis pacem, para bellum

Transformation of the Polish Armed Forces in Response to Emerging Threats

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Introduction

The full-scale Russian invasion of Ukraine, along with the attempted seizure of the Ukrainian capital Kyiv, is undeniably a turning point in recent European and Polish history. For more than 10 years, the Casimir Pulaski Foundation has been conducting research on the threats posed by the Kremlin's neo-imperial ambitions. Numerous studies and analyses published before 2022 have repeatedly pointed to the growing threat from Russia and the need to take decisive action to strengthen the potential of the Polish Armed Forces and the broader security of Poland. The Republic of Poland is a member of NATO – the largest defense alliance in the world – and the European Union, and these two organizations are one of the foundations of Poland's military and economic security. The changing situation in Europe, following the Russian invasion of Ukraine, proves that our country must have adequate capabilities to defend its borders and interests. Europe is currently not ready to wage a full-scale war against Russia on its own without the support of the United States, whose economic and political interests necessitate greater involvement outside Europe, particularly in the Asia-Pacific region. Given the threat of a much wider military conflict between the West and Russia, as demonstrated by the ongoing war in Ukraine, the Casimir Pulaski Foundation recognizes the need for a holistic review of Poland's security situation, the process of modernizing the Polish Armed Forces and other initiatives aimed at improving Poland's defensive capabilities. The purpose of this study is to evaluate currently running technical modernization programs and other key defense initiatives in the context of the ongoing war in Ukraine as well as projected future threats related to changes in Poland's security environment, as well as the use of new technologies, including unmanned platforms and other new means of air attack. The report is designed to identify key challenges and problems accompanying the transformation of the Polish Armed Forces until 2035, and, where possible, to identify potential solutions and areas requiring further analysis. The report is divided into three sections. Chapter one analyzes the evolution of Poland's and the region's security environment over the past two decades and the consequences of the Russian invasion of Ukraine. Chapter two is focused on Poland's response to the Russian invasion of Ukraine. This section considers both major technical modernization programs and other initiatives aimed at improving Poland's defense capabilities. The third chapter examines, among others, key challenges facing Poland in the context of Russian revisionism, possible implications of the use of modern combat systems in all domains based on the experience of both Russian and Ukrainian armed forces, as well as potential solutions to fill gaps in the Polish Armed Forces' current capabilities. The analysis also takes into account the experiences from the war in Ukraine and the conclusions of a wargame exercise conducted by the Casimir Pulaski Foundation and the RAND Corporation in June 2024. The main assumptions and limitations of the wargame are presented in the section describing the report's methodology. The report concludes with a series of recommendations which serve to identify the most important challenges standing in the way of the development and modernization of the Polish Armed Forces as well as propose possible solutions.

Methodology

This report is based on three types of data. The first of the approaches was to gather and analyze information from publicly available sources – including reports and articles on the war in Ukraine published by the Royal United Services Institute (RUSI), the Institute for the Study of War (ISW), United Nations agencies, the Center for Eastern Studies, Amnesty International, Human Rights Watch, the European Parliament and the World Bank. The authors also analyzed selected government documents, e.g., the Homeland Defense Act, as well as official reports, presentations and analyses prepared by, among others, the Office of Analysis, Documentation and Correspondence of the Senate of the Republic of Poland, the Ministry of National Defense, the General Staff of the Polish Armed Forces and other materials available on the websites of the aforementioned institutions. Articles and reports from the specialized press, academic journals, and studies from other research centers and think tanks were also extremely valuable sources. The second approach to data collection utilized interviews with retired military officers, security and defense experts, industry representatives and academics, which proved invaluable for the completion of this study. The third element contributing to the analysis was a research project carried out by the Casimir Pulaski Foundation and RAND Corporation, which included a wargame simulation, organized in accordance with Chatham House rules in June 2024. The purpose of the simulation was to test the impact of the transformation of the Polish Armed Forces on Poland's ability to defend itself against armed aggression in the 2030–2035 timeframe. The exercise took into account, among other things, the formation of two additional mechanized divisions, ongoing technical modernization programs and the construction of a system of border fortifications under the East Shield program. By design, the simulation was to focus on a national defense operation, taking into account limited NATO support. Due to time constraints and the complexity of the subject, it was necessary to simplify numerous assumptions. Given the aforementioned factors, the simulation focused on land forces and air and missile defense. Considerable NATO air support was also included. Among the most important limitations of the exercise were the absence of operations in the Baltic Sea and operations in cyberspace, as well as the omission of the importance of the logistics system and critical infrastructure defense. Given the need to generalize the above-mentioned issues, as well as the very optimistic scenarios for the pace of weapon systems' deliveries and the development of the Polish Armed Forces's structures, the results of the exercise were not intended to draw general conclusions on the issue of specific defense initiatives and technical modernization programs, but only to indicate the most important consequences of the assumptions made for the purposes of the simulation and to highlight areas requiring further research work. The discussions held during the exercise and the insights of its participants shed light on the problems and challenges that Poland and the countries of NATO's eastern flank may face in a 5–10 year perspective. Due to the aforementioned limitations of the project, the report includes selected, general conclusions, which, combined with the analysis of available documents and other studies, can provide added value for policy makers and the expert community in Poland.

1 The Evolution of the Security Situation of Poland and the Region

For the last three decades, Poland, along with the entire Western world, has been the beneficiary of a peaceful dividend initiated by a series of revolutions against communist regimes in Central and Eastern Europe and the collapse of the Soviet Union. From the point of view of most Central and Eastern European countries, it was a period of profound political, economic and systemic changes that contributed to the region's integration into the institutions of the Western world, particularly NATO and the European Union. These two parallel processes – strengthening transatlantic cooperation and joining the world's largest defense alliance, as well as political and economic integration within the European Union – contributed to the dynamic socio-economic development of the countries of the region. Peace on the European continent and the belief in the absence of potential conventional threats and the "end of history" influenced the thinking of European political elites, who over the past three decades have systematically reduced military numbers and cut defense budgets in favor of more priority – from the perspective of the time – expenditures, such as infrastructure projects and social policy. Because of their long-standing involvement in the conflicts in Afghanistan and Iraq, and the conviction of the impossibility of war in Europe, European states were reducing the size of their armed forces, while focusing on building easily-transportable expeditionary units. An extremely important factor that shaped the attitude of primarily European politicians was the belief in the possibility of building a common future and partner relations with the Russian Federation. Russia experienced a deep economic crisis in the 1990s and was at the time a mere shadow of the former power that was the Soviet Union, but it was still in possession of the world's largest nuclear arsenal. Vladimir Putin's first presidency (1999–2008) was marked by a continuation of the reforms initiated by former Russian President Boris Yeltsin and the rebuilding of Russia's economic and political clout. The Putin-led state at the time was heavily influenced by the oligarchs and faced many internal problems, including the war in Chechnya. The Russian economy grew rapidly between 1999 and 2008, thanks to both economic policies and a surge in hydrocarbon prices,[1] with positive economic trends accompanied by cooperation with the West between 2000 and 2004, such as support for the U.S. war on terrorism.[2] In a January 2002 article in the New York Times, Russian Foreign Minister Igor Ivanov argued that U.S.-Russian cooperation, based on democratic values, would enable the creation of a new security system capable of meeting the challenges of the 21st century.[3] The theses presented in the article not only emphasized Russia's willingness to cooperate with the West and NATO, but above all indicated the mindset of Russian politicians, according to which Russia was an equal partner for the Western world and a power to be reckoned with.[4] Occasional tensions between Moscow and Western partners did not have a significant impact on the shape of bilateral relations, although the Russian narrative began to change during Putin's second term in office after the success of Ukraine's Orange Revolution,[5] especially in the context of the expansion of the North Atlantic Alliance. The change in the mindset about the future of relations with the West was evident as early as 2005 in Putin's speech to the Federal Assembly, during which the Russian president uttered the famous words about the collapse of the Soviet Union being the greatest geopolitical tragedy of the 20th century.[6] In February 2007, at the Munich Security Conference, President Putin openly criticized the accession of the countries of Central and Eastern Europe to the North Atlantic Alliance and the policies of the United States, which, in his view, has led to the establishment of a unipolar world in which other major economies have little say. The Russian leader also denounced Western elites, asserting that Russia should not be lectured on democracy or accused of maintaining an allegedly passive stance in international affairs, stressed that Russia had almost always pursued an independent foreign policy during its more than 1,000-year history.[7] As the events of the past few years have proven, the use of this type of historical narrative has become a hallmark of the Russian president. The Russia Today television network, founded in 2005, was initially responsible for spreading the Russian point of view outside the Russian Federation, and then primarily Kremlin propaganda and disinformation. Despite the growing anti-Western narrative and propaganda in Russia, some Western politicians – particularly in Germany, such as Chancellor Angela Merkel – believed in the possibility of establishing stable political and economic relations with Moscow by engaging in joint initiatives, such as the construction of the Nord Stream and then Nord Stream 2 pipelines, which were to provide the Federal Republic of Germany with access to cheap raw materials from Russia. However, this was to come at the expense of the German economy's dependence on Russian gas. Close cooperation with Russia was supposed to create an interdependence between Russia and European states, which, according to some European political elites, would preclude the possibility of a major conflict between Moscow and Western capitals. However, Russia's economic successes were soon to be hindered by the financial crisis spreading around the world, which led to a nearly 8% decline in Russian GDP in 2009. At the same time, Russia was about to embark on a path of confrontation with the West for the first time since the Cold War. Relations between the West and Russia deteriorated after the Bucharest NATO summit in April 2008, where it was declared that Georgia and Ukraine would join the North Atlantic Alliance in the future. In August 2008, Russian troops launched an invasion of Georgia, embroiled since the early 1990s in a conflict with two rebellious territories, Abkhazia and South Ossetia. Since 2004, Georgia had been ruled by pro-Western politicians who sought to integrate the former Soviet republic into the European Union and NATO. The conflict with Russia, which lasted just 16 days, proved to have a key impact on Moscow's perception of the West, and thus on relations between Russia and Western democracies. Despite diplomatic support for Georgia from Central and Eastern European countries – including Polish President Lech Kaczynski, who traveled to Tbilisi during the Russian invasion – Georgia remained alone in its conflict with Moscow. Western countries, particularly France, limited their actions to supporting negotiations between Russia and Georgia. Both the United States and Western European countries did not share the perspective of the capitals of Central and Eastern Europe, for whom the events were a clear signal that Russia could pose a direct threat to peace in the region. In 2009, the Barack Obama administration initiated a so-called reset of relations with Moscow, and before that, back in 2008, France declared its willingness to sell two Mistral-class landing ships to Russia, which led to the signing of an export agreement between Paris and Moscow in 2011.

The vast majority of representatives of Western political elites did not consider the possibility of a full-scale armed conflict in Europe. The belief in the security of the continent – especially its western part – and in the possibility of building stable political and economic relations with Russia, especially on the economic plane, were a delusion. Voices pointing to Russia as a future military threat – especially from Poland and the Baltic states – were ignored or treated as a manifestation of an irrational approach to politics or even Russophobia. Nonetheless, the Kremlin's stance during the Ukrainian Euromaidan in 2013 and 2014 proved that it was the Central and Eastern European states that were right in this case. In February 2014, Russia invaded and subsequently annexed the Crimean peninsula and later in April 2014, Russian-backed separatists formed the Luhansk and Donetsk People's Republics in Donbas, permanently destabilizing the situation in eastern Ukraine. Russian aggression did not receive a proportionate response from the West even after the tragedy of Malaysia Airlines flight MH17, which killed 298 people, mostly European Union citizens. An international investigation confirmed that the destruction of the Boeing 777-200ER and the deaths of all passengers and crew was caused by a missile fired from a Russian BUK system of the 53rd Anti-Aircraft Missile Brigade from Kursk. Despite the outcry of politicians from Central and Eastern Europe, primarily Poland and the Baltic states, Russia was subjected to limited sectoral sanctions, and work on projects of great economic and geopolitical importance – such as the German-Russian Nord Stream 2 gas pipeline – continued.[8] The attitude of Western politicians has reinforced the Kremlin's belief that the Western world is incapable of rationally assessing Russia's policies and taking action that could halt its imperialist ambitions. Mistakes were also made by Poland, where virtually all major political forces agreed with the assessment of Russia as an immediate threat to Poland's security. These opinions were reflected in numerous analyses, as well as in strategic documents, such as Poland's 2020 National Security Strategy. However, this narrative was not accompanied by sufficient actions in the area of national security and defense. Many of the technical modernization programs planned a decade ago never lived to see implementation. Programs that are extremely important from the point of view of state security – such as the construction of an integrated, multilayered air and missile defense system; the modernization of mechanized and armored troops; the modernization of the Navy; or the large-scale introduction of unmanned systems – have seen years of delays and would most likely never have been implemented in the dimensions currently envisioned, were it not for the war currently taking place beyond Poland's eastern border and the imminent threat of Russian aggression.

The beginning of a full-scale Russian invasion of Ukraine in February 2022 is a turning point in recent European and Polish history. Faced with a growing threat to Poland's security, the Polish government has taken steps to transform the Polish Armed Forces into the largest land power in the region. The inability to implement multi-year modernization plans overnight has grown into the need to purchase huge quantities of various weapons systems, including advanced systems for missile and artillery forces, modern main battle tanks, combat aircraft and helicopters, unmanned systems and many other types of armaments. The scale of defense purchases to date and planned for the near future far exceeds the efforts of other European countries, including such economic powers as Germany, France, and the United Kingdom. In 2025, Poland plans to spend a total of about PLN 187 billion on defense, i.e. 4.7 percent of GDP.[9] A significant increase in defense spending is a chance to leapfrog the capabilities of the Polish Army within 5–10 years. It should be remembered, however, that such immense military spending should be coupled with adequate investment in the Polish economy and defense industry, so that in the long term the funds spent in the coming years will ensure the ability to operate, service and modernize the acquired equipment and hardware, as well as the ability to develop new weapon systems by the Polish defense industry.

1.1 The Security of Poland and the Region after the Russian Invasion of Ukraine

The Cold War rhetoric employed by Russia over the years did not motivate NATO's European members – including the countries of the Alliance's eastern flank – to strengthen their defense capabilities. There is no doubt that the moment Russian troops crossed Ukrainian borders in February 2022 came as a shock to many Western observers because of the costs involved in Moscow's invasion.[10] The attempt to seize Kyiv and, in all likelihood, overthrow Ukraine's legally elected authorities made Western politicians realize that any attempt to make a diplomatic deal with the Kremlin was doomed to failure, and that NATO countries must be ready for a possible war with Russia.

FIGURE 1 Defense spending of selected European NATO members in 2023

One of the most widely reported and emotionally charged events following the Russian attack on Ukraine was German Chancellor Olaf Scholz's famous speech at the Bundestag on February 27, 2022. At the time, the German leader stated that the Russian aggression against Ukraine constituted *Zeitenwende* – a turning point in history. At the same time, Chancellor Scholz announced a change in German policy and a rapid rearmament of the Bundeswehr, for which huge – as then believed – funds of €100 billion were to be allocated.[11] Although Chancellor Scholz's speech is sometimes seen as an unexpected turn in Berlin's policy and a move toward remilitarization of Germany, it should be emphasized that the changes and arms purchases announced at the time were aimed primarily at solving the problems the Bundeswehr now faces after many years of neglect. Berlin's approach to supporting Ukraine, which at first was limited to non-military assistance, symbolized by the delivery of 5,000 helmets despite Kyiv's appeals to provide the necessary armaments to stop the Russian invasion, has also changed. Over the past two years, Germany has become one of Ukraine's most important suppliers of military and financial assistance. It is worth noting that Berlin has also launched a number of new defense initiatives, such as the European Sky Shield Initiative, a joint European effort to build an integrated air defense system,[12] and has taken steps to strengthen the German armed forces – including the purchase of 5th generation F-35A multirole aircraft. Despite these developments, enhancing the capabilities of the Bundeswehr in all domains will require many years of work and significant funding. German plans for the coming years include keeping defense spending above 2 percent of the GDP, but it should be noted that German Defense Minister Boris Pistorius is already facing attempts to cut the German Defense Ministry's budget. The ruling coalition of the SPD, FDP, and the Greens has agreed to set aside only €53 billion for defense spending against the 58 billion expected by the defense ministry.[13]

The decision of Sweden and Finland to join NATO, driven by the threat from Russia, is undoubtedly a significant positive development for Poland's security.[14] In May 2022, representatives of Sweden and Finland officially submitted their applications for accession to NATO Secretary General Jens Stoltenberg.[15] Finland officially joined the Alliance in April 2023,[16] while Sweden had to wait until March 2024 to join due to Stockholm's dispute with Budapest and Ankara.[17] Both Nordic countries have been NATO partners since 1994, and their membership is seen as a significant enhancement of the Alliance's defense capabilities in the Baltic Sea region due to their relatively large, well-equipped, and trained armed forces and advanced defense industries.[18]

The Baltic States are among the NATO countries that have sharply increased their level of military spending in the wake of the Russian invasion of Ukraine. The current priorities of Lithuania, Latvia, and Estonia in developing defense capabilities are based on three pillars: 1) maintaining defense spending at a level of at least 3 percent of GDP, 2) ensuring greater involvement of allied troops on their territory, 3) accelerating technical modernization with the development of the capabilities of the armed forces and the expansion of defense infrastructure.[19] Land Forces are the most capable branch of the Baltic States' military, reflecting their critical importance in defending national borders when necessary. The priority approach to modernizing the ground troops is also due to limited financial capabilities and the costs associated with building modern air and naval forces, which the Baltic states cannot currently afford. Although Lithuania, Latvia, and Estonia allocate approximately 3 percent of GDP to defense, it should be stressed that these funds are relatively modest due to the limited economic potential of the Baltic countries. Filling the gaps in the capabilities of the professional military are the relatively well-developed territorial defense forces. The Baltic states, like Poland, are currently implementing a number of technical modernization programs, some of which were already initiated after Russia's annexation of Crimea in 2014. (Table 1.).

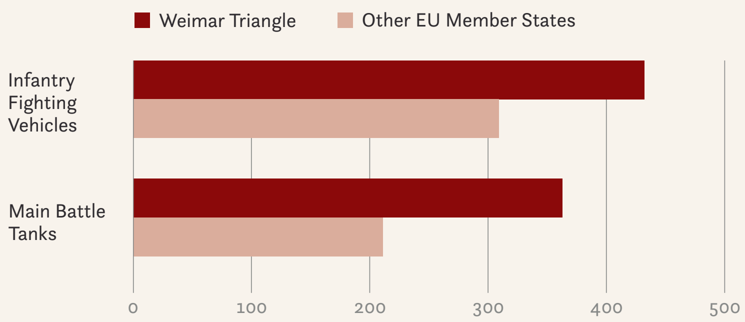
TABLE 1 Armament purchases made by the Baltic States after the Russian invasion of Ukraine in 2022.

COUNTRY	ARMAMENT	TYPE AND QUANTITY
Lithuania	Infantry Fighting Vehicles (Wheeled)	IFV BOXER (120) – Planned
	Short and Medium-range Air Defense Systems	NASAMS (1 battery)
	Self-propelled Artillery	CAESAR (18)
	Multiple Rocket Launchers	M142 HIMARS (8)
Latvia	Short and Medium-range Air Defense Systems	IRIS-T SLM (b.d.)
	Multiple Rocket Launchers	M142 HIMARS (6)
	Light Utility Helicopters	MD 530F (4) – Planned
	Anti-ship Cruise Missiles	Naval Strike Missile (NSM) (1 battery)
Estonia	Wheeled Armored Personnel Carriers 6×6	Otokar Arma (130)
	Light Armored Vehicles	Nurol Yörük NMS (100)
	Short and Medium-range Air Defense Systems	IRIS-T SLM (no data)
	Self-propelled Artillery	K9 (12) CAESAR (12) – Planned
	Multiple Rocket Launchers	M142 HIMARS (6)

Developed on the basis of B. Chmielewski, J. Tarocinski. On the warpath: the development and modernization of the Baltic states' armed forces. Center for Eastern Studies, 2024.

In January 2024, the governments of Lithuania, Latvia, and Estonia announced a joint plan to build a system of fortifications in response to the brutal occupation and war crimes committed by Russian troops in Ukraine. The purpose of the construction of the so-called Baltic Defense Line is to deter a potential attack by Russia and prevent a permanent occupation of the territory of the Baltic States, for which it would mean a significant reduction in population potential and difficulties in carrying out further defense operations.[20] It should be noted that this approach is justified by the lack of operational depth caused by the short distances between the eastern border of these states and their main urban centers. The Baltic defense infrastructure is also to be integrated with the so-called Shield East, the construction of which the Polish government announced in May 2024.[21]

FIGURE 2 Deliveries of Tanks and IFVs from EU Member States to Ukraine (2022–2024).



Based on Oryx estimates.

The reactions of NATO countries cited above, especially in Central and Eastern Europe, as well as the decision of Finland and Sweden to join the Alliance, could suggest that relations with Russia prior to 2022 were relatively stable, and there was no indication that tensions between the West and Russia would suddenly emerge. However, it should be noted that the security situation in the region began to rapidly deteriorate even before the Russian invasion of Ukraine. Russia, together with Belarus – which has effectively become a client state of Moscow – has already used various types of hybrid tactics, including spreading disinformation to destabilize the situation in European Union countries. The Kremlin has primarily used traditional media such as RT and Sputnik along with social media for this purpose. The latter became a target for Kremlin-controlled organizations, such as the Russian Internet Research Agency, one of the so-called Russian troll farms owned by the late Yevgeny Prigozhin, a former close associate of President Putin. The actions taken by Russia and Belarus in mid-2021 far exceeded the previously accepted framework of hybrid operations against Western countries. In July 2021, a few months after the anti-government protests in Belarus, Minsk and Moscow launched an operation to funnel illegal migrants to the borders with the Baltic States and Poland. The artificially created migration crisis was intended to destabilize the countries of NATO's eastern flank and the European Union. Attempts by thousands of people from different parts of the world to cross illegally from Belarus into Poland forced Warsaw to fence its border with Belarus and deploy thousands of soldiers to secure it. Lithuania quickly followed suit with similar measures. Although these events did not lead to a crisis on the eastern flank, they remain extremely problematic for the countries of the region to this day due to image problems, stemming from, among other things, limited access of journalists and NGO workers to the border areas and the difficult situation of migrants residing on the Belarusian side, who are often beaten and intimidated by Belarusian services.[22] Poland and the Baltics have been under migration pressure for more than three years now, and there is no sign that this situation is about to change. Although the Russian invasion in February 2022 led to the largest wave of refugees in Europe's postwar history,[23] EU countries – and Poland in particular – have passed the test by helping their eastern neighbors, often fleeing destroyed cities in eastern Ukraine. From the point of view of Central and Eastern Europe, a far greater challenge is to provide military and financial support to Ukraine.

1.2 The Significance of Ukraine in the Context of Poland's Security

Since the beginning of the Russian invasion, Poland has been one of the most active advocates of Western support for Ukraine, both in military and humanitarian terms. By August 2024, according to information disclosed by Polish President Andrzej Duda, the total value of aid to Ukraine amounted to about PLN 100 billion, including the supply of armaments and military equipment worth about PLN 12 billion.[24] Poland has supplied Ukraine with more than a thousand pieces of heavy equipment: 400 main battle tanks, primarily T-72S and PT-91S, and 14 Leopard 2A4S; BWP-1 infantry carriers; Rosomak Wheeled Armored Personnel Carrier (KTO); modern 155 mm Krab and Soviet-built 122 mm Goździk self-propelled howitzers; BM-21 multiple rocket launchers; MiG-29 fighter jets, and helicopters. The deliveries also included older generation anti-aircraft systems, Piorun MANPADS, and other types of armaments, such as self-propelled Rak mortars. Although a significant portion of the armaments transferred to Ukraine were systems of Soviet provenance, these deliveries were extremely important to the Ukrainian military due to the significant equipment losses and the ability of the Ukrainian military personnel to operate and maintain this type of weapon systems. According to the Oryx portal, by August 2024 Ukraine had lost, among others, nearly 900 tanks, which shows how important Poland's support was in terms of quantity and quality. Providing such significant aid to Ukraine meant that Poland had to undertake contingency purchases and accelerate the process of technical modernization, which will most likely allow the Polish Armed Forces to phase out all Soviet weapon systems within the next few years. There is no doubt that it is in Poland's interest to actively support the embattled Ukraine and advocate for greater involvement of allied countries in the continued supply of armaments and military equipment. It should also be emphasized that accelerated procurement and consistent implementation of the technical modernization process in Poland would enable further deliveries of post-Soviet equipment to Ukraine. These deliveries could include many systems that are obsolete or incompatible with NATO munitions, such as PT-91 tanks, BWP-1 tracked transporters, as well as Goździk and Dana howitzers. Polonization and serial production of weapon systems currently being introduced by Poland could also, in the perspective of a few years, enable the delivery of Leopard 2A5 and Leopard 2 PL tanks, 122 mm Langusta unguided rocket launchers and other systems, assuming they are considered non-perspective or generate too much maintenance costs in relation to the recently acquired equipment. The transfer of older types of armaments would allow for the standardization of the Armed Forces' equipment, which would simplify logistics. In the longer term, in the event of a continuation or temporary freezing of the conflict, Poland could become one of the suppliers of new equipment compliant with NATO standards. However, for this to happen, it will be necessary to work out a comprehensive strategy for the development of the Polish defense industry, which would facilitate the increase of domestic production and equipment supply for both Poland and potential export customers, such as Ukraine.

In the most pessimistic scenario, Russia's conquest or vassalization of Ukraine would mean extending the potential line of contact with Russian troops by 540 kilometers, forcing the Armed Forces and other services to stretch available means and resources by hundreds of kilometers to secure border areas in regions of strategic economic and industrial importance. These areas include, among others, plants established in the former Central Industrial District in the Lublin region, Podkarpacie, and eastern Małopolska, in particular the Huta Stalowa Wola and numerous enterprises in the Polish aviation industry, such as PZL Świdnik, PZL Mielec, and Pratt & Whitney Rzeszów. The need to defend additional hundreds of kilometers of Poland's eastern border would undoubtedly have an impact on defense planning and the process of modernizing the Armed Forces, which already requires huge financial outlays for equipment and armaments purchases, investments in the defense industry, and other matériel and personnel expenditures. Assuming that the current concept of increasing the size of the Armed Forces is related to the potential threat from the territory of the Kaliningrad region and Belarus, the sudden need to defend the Polish-Ukrainian border would most likely require the development of new operational plans and a change in the approach to the modernization of the Polish Army and the development of new structures. Defending the nearly 1,200-kilometer north-eastern and eastern border would therefore call for highly unorthodox and unpopular measures, such as the restoration of compulsory military service and even a further increase in defense spending, which already accounts for several percent of the state budget and more than 4 percent of GDP.

The subjugation of Ukraine would also enable Russia to exploit Ukraine's natural resources, agricultural areas, as well as infrastructure of strategic importance. Among the potential targets for Russian expansion, some experts point to Ukraine's hydrocarbon reserves, as well as rare raw materials needed for the energy transition. These resources include, among others, 500,000 tons of lithium, i.e. about 10 percent of the world's proven reserves of this raw material,[25] which is used primarily in the production of lithium-ion batteries. Lithium deposits are located in Kirovohrad region (Polochovskoye deposit), Donetsk region (Shevchenkovskoye) and Zaporizhzhia (Krutaya Balka).[26] It is worth noting that in July 2021, representatives of Ukraine and the European Union signed a protocol forming the basis of a strategic partnership on the integration of raw material supply chains and battery production,[27] which was to enable EU countries to diversify the supply of key raw materials, while reducing the EU's dependence on China. In addition, the territory of Ukraine has deposits of cobalt, zirconium, graphite, uranium, and titanium.[28] Some of these extremely valuable deposits are currently located in territories occupied by Russian troops – this is especially true for about 80 percent of Ukraine's coal reserves, including nearly 100 percent of anthracite coal deposits.[29] Analyses by the Canadian think-tank SecDev indicate that Russia controls territories with about $12 trillion worth of natural resources.[30] From Kyiv's point of view, regaining areas of significant economic importance, such as the aforementioned deposits and Black Sea ports, is crucial to the future reconstruction of the state and its economy – an objective that will be extremely difficult to achieve given Russian air and missile attacks, which typically focus on destroying Ukraine's critical infrastructure, energy sector, and industry.[31]

Russia's modus operandi stems from waging attrition warfare aimed at destroying Ukraine and forcing it to make territorial concessions to Russia or capitulate. These actions require special attention on the part of Polish policymakers, because in the event of a direct confrontation with Russia, the Kremlin could reach for similar methods of operation, which could set Poland's economy and infrastructure back by decades. Attacks on energy infrastructure could be particularly painful for Poland given that the majority of energy resources are now transported through the Baltic Sea, forcing Poland to secure not only the eastern part of the country, but also the major agglomerations on the coast, where key facilities are located, such as the LNG terminal in Świnoujście, the oil port in Gdańsk, and other elements of energy infrastructure, such as the Baltic Pipe undersea gas pipeline. Russian strikes on major industrial centers would most likely be intensified if the major strategic objectives could not be achieved. In the case of the Russian-Ukrainian war, this was marked by the defeat of the Russian offensive conducted between February and April 2022, aimed at seizing Kyiv.

Control of Ukraine would also allow Russia to gain dominance over the production of certain agricultural products, including grain, which can be used as a bargaining chip in international relations, especially with countries dependent on imports of Ukrainian and Russian crops, such as those in the Middle East and sub-Saharan Africa.[32] Already during the war, the Russians used agricultural products to exert political pressure on the West and Ukraine. Prior to the Russian invasion, Ukrainian agricultural products accounted for a significant portion of all food imports by the Global South, heavily contributing to the region's food security. However, Russian attacks on Ukrainian infrastructure and the occupation of key Black Sea ports – except for Odessa – have made it virtually impossible to export Ukrainian crops. According to 2022 data from the Food and Agriculture Organization of the United Nations, 50 countries in Asia and Africa imported 30 percent of wheat from Russia and Ukraine, and for 26 countries Russian and Ukrainian agricultural products accounted for 50 percent of all imports of such goods.[33] Similar problems occurred in the production and export of fertilizers, exacerbating the difficulties of ensuring food security in less developed countries.[34] Following Russia's withdrawal from the so-called grain agreement, which allowed temporary exports through Odessa, in November 2023, the Kremlin decided to start free deliveries to Burkina Faso, Somalia, Eritrea, Zimbabwe, Mali and the Central African Republic in order to strengthen Russia's international position and its influence over countries in the region.[35] Attempts to resolve this issue in early 2024 through the transit of Ukrainian agricultural products to European Union ports brought Kyiv into conflict with Warsaw and other Central and Eastern European countries, including Hungary, the Czech Republic, Slovakia, and Bulgaria. The EU's decision to allow unlimited grain imports from Ukraine quickly sparked a wave of farmers' protests across Central and Eastern Europe, opposing EU policies. The dispute was then used by Russian propaganda to undermine Western support for Kyiv.[36] The above examples demonstrate that in the event of a conflict, Russia is capable of using any means available to advance its interests and political goals.

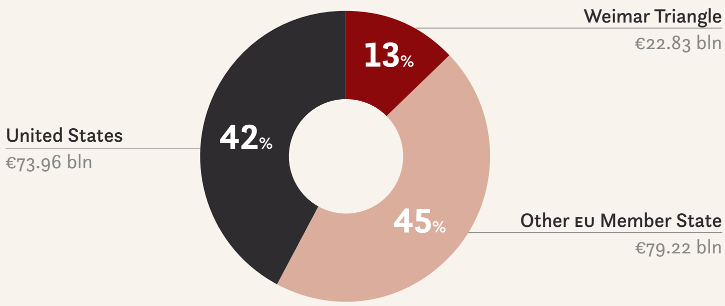
Support for Ukraine can be viewed and analyzed on many levels – such as ideological and geopolitical, as part of a broader struggle against Russia's neo-imperial policies. This war is also a test of the credibility and unity of Western states and their ability to defend the values, such as freedom and the right of nations to self-determination, that underpin the Western world. Europe's experiences in the 20th and 21st centuries prove that a policy of appeasement toward authoritarian states never works and actually encourages them to pursue further expansion and conquest. This threat applies particularly to states that were formerly in the Soviet sphere of influence or, like the Baltic states, were an integral part of the Soviet Union. Currently, the Baltic states have a significant Russian minority, the existence of which could be a pretext for Russian operations such as the one's conducted in Ukraine. **From the point of view of Poland's interests and security, providing further support to Ukraine is a non-negotiable issue, regardless of political preferences** or ideological inclinations. Poland should support all initiatives in the international arena aimed at strengthening Ukraine's defense capabilities. Deliveries of modern armaments from the United States and South Korea, among others, should allow Poland to transfer Soviet-era equipment to Ukraine. In the longer term, Poland should aim to export NATO-compliant armaments produced by the Polish defense industry – this will be extremely important in view of the increasingly limited access to parts and ammunition compatible with obsolete post-Soviet equipment that currently forms the bulk of Ukraine's arsenal.

1.3 The American Pivot to Asia and the Security of European NATO Members

Since Poland joined the North Atlantic Alliance, **the United States has remained Poland's most important partner and ally, as well as one of Poland's main arms suppliers.** The U.S. defense budget is twice the cumulative spending of all European NATO members, which translates into a significant disparity in military capabilities. American economic and military power remains one of the pillars of NATO's deterrence policy. However, there is no doubt that Europe's dependence on US military support and US foreign and security policy is negative in the long term. The main threat to Europe in this regard is the refocusing of US foreign policy on the Asia-Pacific area. The policy of the "Pivot to Asia" was initiated by the administration of Barack Obama,[37] but the real revolution took place a few years later during the first presidency of Donald Trump, and its main tenets were sustained under Joe Biden. American decoupling – or the policy of economic separation from China – and Beijing's response led to a trade war that actually continues to this day. The economic and political conflict between China and the U.S. is not limited to the use of tariffs and other barriers to destabilize trade. According to the official narrative, this policy aims to support the U.S. economy and reduce dependence on imports. President Joe Biden's administration has maintained Donald Trump's trade policies and then expanded the scope of a number of restrictions and sanctions, such as in the semiconductor manufacturing sector. The new sanctions included China's tech giant Huawei,[38] but the effectiveness of U.S. policy in this area is quite debatable given reports of the Chinese corporation's recent investments and technological successes.[39] In response, China is using various types of mechanisms, such as investment restrictions, to reduce the negative effects of U.S. policies. One of the measures China has adopted is the dual circulation strategy, which puts a greater emphasis on domestic market development and an attempt to reduce the Chinese economy's dependence on foreign trade.[40] At the same time, Beijing has intensified its expansive and confrontational policies in the South China Sea, both toward Taiwan as well as Southeast Asian countries, including Vietnam[41] and the Philippines.[42] The United States has been trying to counter China's policy – which has resulted in, e.g. the militarization of the Paracel Islands and the Spratly Islands – by strengthening cooperation with Vietnam and the Philippines, among others. Closer economic, political, and military cooperation between China and Russia is also not insignificant for U.S. policy, especially in the context of the Russian invasion of Ukraine and Moscow's resulting growing dependence on China, which is demonstrated by the dominance of the Chinese yuan in Russia's foreign exchange and the dependence on Chinese dual-use technologies, which now account for about 90 percent of Russia's imports of such products.[43] Geographic factors also work in China's favor in terms of importing Russian raw materials, particularly natural gas, which is transported to the People's Republic of China through pipelines currently under development, such as the Power of Siberia. The rise of China's economic and military clout will require the United States to become much more involved in the Far East in the future, which in the long run could lead to a permanent reduction in the presence of U.S. forces in Europe.

The second key concern from the point of view of European security is the potential outcome of the upcoming U.S. presidential election and its impact on U.S. involvement in European security structures. Washington is now a key ally of Kyiv, providing the Ukrainian army with essential military equipment, currently estimated to be worth €51.6 billion. In comparison, the value of military aid provided by all European countries is about €51.5 billion.[44] The United States has a key role in sustaining defense capabilities on the Alliance's eastern flank through U.S. military participation in NATO initiatives in the region, such as the Enhanced Forward Presence (EFP), for which a Battalion Battle Group stationed in Poland has been assigned. The U.S. Armed Forces are also involved in bilateral cooperation

FIGURE 3 Total aid provided to Ukraine by the US and EU countries from January 2022 to April 2024



Compiled from Kiel Institute for the World Economy data.

formulas; on this basis the U.S. Armed Forces deployed an Armored Brigade Combat Team (ABCT) and established a number of military installations, including a permanent garrison, in Poland. In total, about 10,000 US troops are stationed in the country.[45]

The upcoming U.S. presidential election, slated to take place in November 2024, will require special attention in the context of U.S. engagement in Europe. Donald Trump, the Republican Party candidate, has for a longer time been using rhetoric that can be considered anti-Ukrainian. In one of his statements on new aid packages for Ukraine, Trump announced that after winning the election, all support for Ukraine would be halted and Kyiv would be forced into peace talks.[46] Other statements by the former U.S. president, particularly those regarding NATO, are also cause for concern. In February 2024, Donald Trump stated that he would encourage Russia to attack those countries in the Alliance that fail to meet their financial obligations to NATO, which could be interpreted as reaching defense spending of at least 2 percent of GDP.[47] Trump's outrageous statements are echoed by his supporters and associates. Gen. Keith Kellogg, one of the key members of the former Trump administration, has proposed the introduction of a two-tier classification of NATO member states. According to Kellogg's concept, only countries meeting the required level of defense spending would be able to count on US military support.[48] In the event of Donald Trump's victory, the biggest threat to Europe would be a permanent reduction of the U.S. military presence on the continent in order to force European countries to take more responsibility for their security. Trump's administration could also potentially seek to limit the Alliance's eastward expansion, closing off the possibility of Ukraine and Georgia joining NATO.[49] Regardless of the outcome of the U.S. election, European NATO members should prepare for changes in U.S. foreign and security policy and take this factor into account in their long-term plans. This is particularly true for Poland, which for the past two decades has treated the alliance with the United States as a guarantee of security and invested in maintaining good relations with Washington through politically dictated arms purchases, among other things. However, the belief in the durability of transatlantic structures and the presence of U.S. troops in the region should not affect Poland's and Europe's ability to defend its borders on their own.

2 Poland's Defense Capabilities

On May 23, 2024, Poland officially suspended the application of the Treaty on Conventional Armed Forces in Europe (CFE), signed in Paris on November 19, 1990.[50] This treaty imposed restrictions on Poland in terms of the number of: troops (234,000); tanks (1,730); armored fighting vehicles, including infantry fighting vehicles (2,150); artillery systems (1,610); combat aircraft (460), and attack helicopters (130).[51] The suspension of the CFE Treaty may mean that Poland will continue its previously adopted ambitious plans to expand and modernize the Polish Armed Forces. Among the most important expected changes is the adoption of new organizational structures within the Land Forces, in which at least some divisions will operate in a four-brigade structure. Media reports from the past two years indicate that the structures of divisions formed according to the new model may consist of 6 tank battalions and 10 mechanized and motorized battalions.[52] In addition, in 2023, the Command of the 2nd Polish Corps-Polish Land Command (D2KP-DKL) was established, the structure of which is expected to ensure interoperability with the U.S. Army's V Corps and the Multinational Corps Northeast.[53] The creation of the D2KP-DKL is not tantamount to the creation of corps structures, given that the command is only to manage troops assigned by the Operational Commander of the Armed Forces for the duration of operations.[54] Since the target organizational structure of the Polish Land Forces has not been revealed so far, and the available studies are based on analyses of the expert community, which have a significant margin of error, this issue will not be discussed in detail in this report. Table 2. presents one of the possible organizational structures of the Land Forces, which was included in a study published by the Office of Analysis, Documentation and Correspondence of the Office of the Senate of the Republic of Poland.

Even before the Russian invasion of Ukraine in February 2022, the Polish government prepared a law to improve the efficiency of the technical modernization process of the Polish Armed Forces and increase the military's ability to effectively defend the country. One of the rationales behind the creation of the new document was the fact that at the time Poland's law regulating military service and other defense-related matters was based on the amended Act of November 21, 1967 on Universal Duty of Defense of the Republic of Poland, which was considered an ideological legacy of communism and the People's Republic of Poland.[55] The new law was intended to put the then-current legal system in order and replace documents that, in the opinion of the lawmakers, did not correspond to the challenges currently facing the Polish Armed Forces. On April 23, 2022, the Law of March 11, 2022 on Defense of the Homeland, which repealed the provisions of the 1967 law and more than a dozen other laws, came into force. The draft of the so-called Homeland Defense Act was first presented in October 2021 by Defense Minister Mariusz Blaszczak and Jaroslaw Kaczynski, who at the time served as chairman of the Committee of the Council of Ministers for National

TABLE 2 Projected structure of Poland's armored and mechanized divisions.

11 DKPanc	12 DZmech	16 DZmech	18 DZmech	1 DPLeg	8 DPAK
bdow (Command Battalion)	bdow (Command Battalion)	bdow (Command Battalion)	bdow (Command Battalion)	bdow (Command Battalion)	bdow (Command Battalion)
10 BKPanc (Armored Brigade)	12 BZmech (Mechanized Brigade)	9 BKPanc (Armored Brigade)	21 BSP (Motorized Brigade)	Bpanc (Armored Brigade)	Bpanc/BZmech (Armored/ Mechanized Brigade)
34 BKPanc (Armored Brigade)	2 BZmech (Mechanized Brigade)	20 BZmech (Mechanized Brigade)	1 BPanc (Armored Brigade)	Bpanc/BZmech (Armored/ Mechanized Brigade)	Bpanc/BZmech (Armored/ Mechanized Brigade)
17 BZmech (Mechanized Brigade)	7 BOW (Mechanized Brigade)	15 BZmech (Mechanized Brigade)	19 BZmech (Mechanized Brigade)	BZmech (Mechanized Brigade)	Bpanc/BZmech (Armored/ Mechanized Brigade)
BPanc/BZmech (Armored/ Mechanized Brigade)	BPanc/BZmech (Armored/ Mechanized Brigade)	Bpanc/BZmech (Armored/ Mechanized Brigade)	Bpanc/BZmech (Armored/ Mechanized Brigade)	BZmech (Mechanized Brigade)	Bpanc/BZmech (Armored/ Mechanized Brigade)
BArt (Artillery Brigade)	BArt (Artillery Brigade)	BArt (Artillery Brigade)	BArt (Artillery Brigade)	BArt (Artillery Brigade)	BArt (Artillery Brigade)
ppanc (Anti-tank Regiment)	ppanc (Anti-tank Regiment)	ppanc (Anti-tank Regiment)	ppanc (Anti-tank Regiment)	ppanc (Anti-tank Regiment)	ppanc (Anti-tank Regiment)
pplot (Anti-aircraft Regiment)	pplot (Anti-aircraft Regiment)	pplot (Anti-aircraft Regiment)	pplot (Anti-aircraft Regiment)	pplot (Anti-aircraft Regiment)	pplot (Anti-aircraft Regiment)
plog (Logistics Regiment)	plog (Logistics Regiment)	plog (Logistics Regiment)	plog (Logistics Regiment)	plog (Logistics Regiment)	plog (Logistics Regiment)

Source: Expansion of the size of the Armed Forces of the Republic of Poland. Possibilities and conditions. Office of analysis, documentation and correspondence. Chancellery of the Senate of the Republic of Poland. Warsaw, 2023.

Security and Defense Affairs. On February 22, 2022, the Council of Ministers adopted the bill, which was sent to the Sejm, where, after three readings and a series of amendments, it was passed with the support of 450 deputies, proving that a political consensus on issues related to national security and defense is possible in Poland despite deep political divisions.[56] The Homeland Defense Act regulates many key aspects of Poland's security and defense, particularly the modernization and growth of the military and its funding.[57] As part of the Homeland Defense Act, the Armed Forces Support Fund (FWSZ), operated by Bank Gospodarstwa Krajowego (BGK), was established to help finance the extremely ambitious modernization and transformation plans of the Polish Armed Forces. The FWSZ is financed by, among others, treasury bonds, payments from the state budget and payments from the profits of the National Bank of Poland.[58] Article 45 of the Homeland Defense Act also allows the BGK to take out loans or credits for the benefit of the FWSZ. This mechanism is used especially in the case of loans from arms-exporting states. According to media reports, such loans have been taken out in Sweden,[59] South Korea, and the United States, among others.[60] So far, BGK has also used dollar-denominated bond issues.[61] In 2023, the FWSZ has spent about PLN 24 billion to finance defense-related programs.[62] Securing stable financing for the technical modernization and personnel of the Armed Forces over the next few years will be one of the most significant challenges facing Poland's ruling coalition. Recently, there has been a marked increase in Poland's debt. Although the ratio of the so-called Sovereign Public Debt to GDP was about 41.1 percent at the end of the first quarter of 2024, which is well below the constitutional threshold of 60 percent of GDP,[63] the situation is quite different when the government debt methodology, the so-called EDP methodology, is applied. According to PKO BP's projections, EDP general government debt is expected to reach 52.3 percent of GDP in 2024 and 54.3 percent in 2025. However, these analyses point to a decline in the public deficit from 5.3 percent in 2024 to 4.9 percent in 2025.[64] The topic of financing the modernization of the Polish Army and assessing the future costs associated with maintaining numerous and modern militaries should be the subject of in-depth analysis in the near future. The financial burden of the technical modernization programs currently underway is also compounded by the fact that a significant portion of purchases will require the import of armaments. These expenditures therefore provide very limited support for the development of the Polish economy and defense industry.

In addition to the five military branches currently in place, the Homeland Defense Act formally established the Cyber Defense Forces (Wojska Obrony Cyberprzestrzeni, WOC) as a specialized component of the Polish Armed Forces designed to defend cyberspace militarily and to carry out related defensive, reconnaissance and offensive activities. The Cyber Defense Forces are commanded by the Cyber Forces Component Commander, who in peacetime reports to the Minister of Defense.[65] The decision to establish the WOC was made as early as 2019, with the establishment of the WOC Component Command taking place in February 2022, prior to the enactment of the Homeland Defense Act. According to current plans, the WOC is expected to reach full operational readiness by the end of 2024.[66]

2.1 Overview of Key Technical Modernization Programs in the Polish Armed Forces

Russian invasion of Ukraine in February 2022 contributed to accelerating the process of modernizing the Armed Forces and taking other initiatives to increase Poland's defensive capabilities. The technical modernization of the Polish Army is a key element of this process. First, increasing the potential of the Armed Forces is a prerequisite for preparing the country for a potential armed conflict with the Russian Federation. Given the scale and scope of the fighting in Ukraine, as well as the amount of military equipment and technology involved, it would currently be extremely difficult or impossible for Poland to conduct such operations in terms of both technology and quantity. Second, the Polish Armed Forces are still operating many obsolete weapons systems, such as PT-91 tanks and BWP-1 infantry carriers, which were designed in the Soviet Union and, despite 25 years of Polish membership in the Alliance, have not been replaced with modern vehicles compliant with NATO standards. Third, Poland needs to fill the gaps in the Armed Forces' equipment caused by the delivery of armaments to Ukraine.

K2 Black Panther Main Battle Tank of the Polish Armed Forces

Author: mł. chor. Daniel Wójcik, 16 Dywizja Zmechanizowana.

This chapter focuses only on the most significant technical modernization programs currently underway.

2.1.1 Armored, Mechanized, and Motorized Troops

Main Battle Tanks

Due to the transfer of several hundred T-72 and PT-91 tanks to Ukraine, **the Polish Ministry of Defense has decided to concurrently acquire two types of new main battle tanks: American Abrams and Korean K2 Black Panther.** In April 2022, a contract was signed for the delivery of 250 Abrams tanks in the latest available variant M1A2 SEPV3,[67] the first units of which are expected to arrive in Poland in 2025.[68] Another contract was concluded in January 2023, this time for 116 ex-U.S. Marine Corps M1A1 FEP tanks, with deliveries ending in mid-2024,[69] which are to be eventually upgraded to the SEPV3 standard. The fleet of Abrams tanks, along with specialized vehicles and a sizable supply of ammunition, including depleted uranium armor-piercing rounds, is to form one of the foundations of the 18th Mechanized Division, which will be the heaviest formation of its type in the Land Forces.[70] The acquisition of Abrams tanks is an important step toward strengthening the capabilities of the Land Forces. However, **the acquisition of the Korean K2 Black Panther main battle tanks – along with the transfer of necessary technologies and future license production in Poland – is much more significant to the security and industrial capability of Poland. Furthermore, this procurement goes in line with the Wilk (Wolf) Program, as described by the previously published Technical Modernization Plan.**[71]

In July 2022, Poland concluded a framework agreement with South Korea for the delivery of 1,000 K2s, which were to include tanks in both an interim, Korean variant, and a target, polonized configuration. A month later, in August 2022, the Armament Agency signed a contract

Abrams Main Battle Tank of the Polish Armed Forces
Author: sierż. Aleksander Perz, 18 Dywizja Zmechanizowana.

with Hyundai Rotem for the delivery of 180 Korean-made tanks, to be delivered by 2025.[72] By the end of August 2024, no further contracts have been signed with the consortium, which includes the Polish Armaments Group (PGZ) and Hyundai Rotem. This is particularly alarming given the huge needs of the Polish Land Forces to fill the gaps left by the armaments transferred to Ukraine and years of delays in the ongoing program to upgrade Leopard 2A4 tanks to the Leopard 2PL standard. Additionally, in the near future, the Land Forces ought to equip an additional two mechanized divisions. Based on available information, it can be assumed that the target structure of the Land Forces may require the fielding of a total of about 1,700–1,800 tanks, with 58 tanks in each armored battalion.[73] Given the scale of the needs and challenges facing the Land Forces, the Ministry of National Defense should prioritize the re-establishment of national capabilities for the production of main battle tanks, their maintenance during their full life cycle, and the development of future modernization packages. It should be noted that in the near future, K2 tanks will replace the obsolete T-72s and PT-91s, and in the long term, most likely, the Leopards 2A5 and 2PL. **Therefore, in the long run, the armored units of the Land Forces should be based on a fleet of M1 Abrams and K2 tanks. This approach seems optimal taking into account the advantages of both constructions and geographical conditions in the region, especially the lowlands of eastern Poland and the area of the northeastern part of the country, between the Kaliningrad region and Belarus, dominated by forested areas, lakes and wetlands, which occupy about 14 percent of Poland's territory.**[74] Abrams tanks are a proven design, used in numerous armed conflicts in which the United States has been involved over the past three decades, including the First Gulf War and the 2003 U.S. invasion of Iraq. The main advantages of Abrams tanks include a very high level of crew protection and the ability to use advanced sub-caliber munitions. It is also worth mentioning that Abrams tanks are the backbone of U.S. armored units, and the design will be further upgraded to the M1E3 version planned for the beginning of the next decade.[75]

K2 Black Panther tanks, on the other hand, represent a much newer design with great modernization potential, given the vehicle's relatively low weight, which does not exceed 58 tons. This is about 10 tons less than American and European tanks, the latest available versions of which reach a weight of about 68 tons. The use of modern hydropneumatic suspension and a powerpack (1,500 hp) with parameters similar to much heavier American and European tanks,[76] together with the low vehicle weight, provide the K2 tanks with a higher power-to-weight ratio (27.3 hp/ton for the K2 and 23.8 hp/ton for the M1A2 SEPV3 tanks). This also guarantees higher maneuverability of the tank combined with the ability to adjust the suspension settings for specific terrain conditions. Thanks to the integration of the automatic loading system, it was possible to reduce the vehicle crew to three soldiers. Also worth noting is one of the most advanced fire control and optoelectronic systems, along with an automatic target tracking system. The K2 tank is also capable of automatic observation of a given sector, which provides greater efficiency for the gunner and vehicle commander through automation.[77] The hydropneumatic suspension of the K2 offers several advantages compared with other MBTs. For example, it allows the tank to be concealed in the terrain, enhances the vehicle's mine protection, and allows for precise targeting of enemies from behind terrain obstacles or during maneuvers in challenging conditions. Media reports indicate that the K2 Black Panther has demonstrated outstanding performance during tests conducted in Norway.[78] Given the aforementioned parameters of these tanks and the results of the simulation conducted by the Casimir Pulaski Foundation and RAND Corporation – during which the K2 vehicles were highly effective in both defensive and counterattack operations – the K2 tanks should be considered the optimal platform for operations in the relatively difficult terrain of northeastern Poland. It is also worth noting that the Polish variant of the tank could feature significantly improved parameters and capabilities of the K2 Black Panther by integrating new solutions recently developed for the South Korean Army. This includes the use of the hard-kill and soft-kill Active Protection System (APS) with a drone jammer, Remote Controlled Weapon System (RCWS), and Situational Awareness System (SAS).[79] A new version of the vehicle, designated K2EX, was unveiled at Eurosatory 2024, which features, among other things, reinforced armor and a new KAPS 2 active protection system with parameters similar to the Israeli Trophy system.[80] The parameters of the Abrams and Black Panther tanks are shown in Table 3.

TABLE 3 Selected parameters of the new types of main battle tanks of the Land Forces.

		Type	
		K2PL	M1A2 SEPV3
Crew		3	4
Weight (ton)		61.5	68
Power-to-weight Ratio (hp/t)		27.3	23.8
Max. Speed (km/h)	Road	68	67
	Off-road	50	40
Suspension		ISU (Attitude Control)	Torsion Bar
Track Tension Adjuster		Automatic	Manual
Main Gun		120 mm Smoothbore Gun (55 cal.)	120 mm Smoothbore Gun (44 cal.)
Automatic Loading		O	X
Situational Awareness		O	X
Active Protection		Hardkill + Drone Jammer	Hardkill

BWP Borsuk

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Infantry Fighting Vehicles

One of the most significant challenges standing in the way of the modernization of mechanized troops is the need to replace the outdated BWP-1 infantry fighting vehicles, given that their obsolete design dates back to the 1960s, when the BMP-1 transporter was developed in the Soviet Union.[81] **It is worth noting that the Polish Land Forces may require up to 2,000 units of modern infantry fighting vehicles.**[82] Considering the required quantity of such vehicles, the production of new IFVs must take place in Poland, and the decision to purchase them should be made as soon as possible due to the time required to prepare production lines and begin serial manufacturing. The BWP-1 is to be replaced by two designs. The first is the Borsuk floating infantry fighting vehicle (BWP) developed by Huta Stalowa Wola (HSW). In early 2023, the Armament Agency signed a framework agreement with HSW for the production of 1,400 units, including 1,000 infantry fighting vehicles with the modern ZSSW-30 turret system and 400 units in specialized variants.[83] The remote-controlled ZSSW-30 turret system is armed with a 30 mm automatic cannon, a 7.62 mm machine gun (UKM) and a Spike LR anti-tank guided missile launcher. BWP Borsuk has a chance to become one of the showpieces of the Polish defense industry with export potential, but for this to be possible it is necessary to sign the first executive contracts and plan future orders to ensure continuity of production and achieve economies of scale in the long run. The first contract, covering the delivery of 159 vehicles, is likely to be signed by the end of this year.[84]

The second type of an infantry fighting vehicle, complementing the capabilities of the BWP Borsuk, is the so-called NCBWP (New Heavy Infantry Fighting Vehicle), which is likely to become the

KTO Rosomak

Author: sierż. Aleksander Perz, 18 Dywizja Zmechanizowana.

primary vehicle of the mechanized battalions of the 18th Mechanized Division, equipped with M1 Abrams tanks. It is also possible that the heavy BWP will be in service in other units, such as the 11th Armored Cavalry Division.[85] In August 2023, Defense Minister Mariusz Blaszczak approved a framework contract for the delivery of 700 heavy infantry fighting vehicles. At the time, it was assumed that the first units would be handed over to the army as early as 2025, but these plans now seem unrealistic. Former PGZ CEO Sebastian Chwałek assured that the technology demonstrator, based on a deep modification of the K9 self-propelled howitzer chassis, would be presented by the end of 2023.[86] The new heavy infantry fighting vehicle is to have a higher level of armor and the ability to carry eight fully-equipped soldiers, two more than the BWP Borsuk. The above changes, compared to the BWP Borsuk program assumptions, will be made possible by the abandonment of the floating capability.[87] The heavy IFV will be integrated with the ZSSW-30 turret system, known from the pre-series BWP Borsuk and new versions of the KTO Rosomak ("Wolverine" Wheeled Armored Personnel Carrier). However, the current PGZ authorities, including CEO Krzysztof Trofiniak, indicate that the development of the final version of the vehicle may take a decade, and the acquisition of a license for the chassis should be considered. It is worth noting that such an approach enabled successful development of the Krab self-propelled howitzer in the past.[88] In favor of the license is the reduction of R&D expenditures and the possibility of redirecting these funds to other projects, the acceleration of production time, and the possibility of using available resources and capabilities of production facilities – including primarily HSW – in other areas. In the context of potential license designs, the Korean AS21 Redback is most often mentioned, although other solutions are also possible, such as the Rheinmetall-developed KF41 Lynx, currently only in use with the Hungarian Armed Forces. Some of the vehicles ordered by Hungary will be produced at the Rheinmetall Hungary Zrt. plant, a joint venture between Rheinmetall (51 percent stake) and the Hungarian government (49 percent). The first vehicles from the Hungarian factory were delivered to the Hungarian army in late 2023.[89]

Wheeled Armored Personnel Carriers

The KTO Rosomak ("Wolverine" Wheeled Armored Transporter) remains the only platform of its type in the Land Forces today. The KTOs used by the Polish Army were manufactured in Poland under license from the Finnish Patria AMV transporter, and the infantry fighting vehicle version is equipped with a Hitfist-30P turret. For many years, the KTO Rosomak was an island of modernity in the Land Forces and a showcase of the modernizing Polish Armed Forces. This was particularly evident on missions abroad, such as in Afghanistan, where some 200 Rosomak KTOs served as part of the ISAF mission.[90] These vehicles appear in the Polish Army in a number of specialized versions, including as medical evacuation vehicles and chassis for Rak self-propelled mortars. Although the design is appreciated by soldiers, in the long run several hundred units of the KTO will require a successor. Further development of this design, export restrictions,[91] and the expiration of the license for their production in Poland in 2028 are also a major issue.[92] In August 2023, the Armament Agency signed a framework agreement with PGZ for the delivery of several hundred units of a new wheeled armored personnel carrier, referred to as NKTO, under the Serwal program between 2028 and 2035. Despite the fact that initial plans assumed the development of the NKTO by domestic industry, recent media reports may suggest that the program will rather be carried out in cooperation with a foreign partner, as the development period of the new platform is estimated by PGZ at 11–12 years.[93] Furthermore, it is difficult to anticipate the target parameters of the vehicle , however, it can be assumed that the NKTO in the infantry fighting vehicle variant will be integrated with the ZSSW-30 turret system, similar to other new vehicles being introduced in the Polish Army. The ZSSW-30 turret is also used on new versions of the KTO Rosomak, 58 of which are expected to be delivered by 2027.[94] Potential candidates for the NKTO platform include the Hyundai Rotem-produced K808 armored personnel carrier or a development version of that vehicle. Collaboration is also possible on a concept known under the working name Next Generation Wheeled Armored Personnel Carrier, with a weight of about 30–35 tons, amphibious capability and a design that allows the development of much heavier and non-floating, but more heavily armored versions.[95] Hyundai Rotem has recently developed a vehicle that meets the aforementioned requirements, which was presented at ADEX 2023 in Seoul in October 2023.[96]

2.1.2 Missile Forces and Artillery

Artillery units in Poland are gradually transitioning to NATO-compliant equipment through fairly consistent modernization programs, initiated by a December 2016 contract for the supply of 96 Krab self-propelled howitzers (AHS), i.e. four Regina divisional fire modules (DMOs) with accompanying vehicles.[97] The development of the Krab encountered difficulties with the implementation of a domestic chassis, but these problems were solved by acquiring a license for the production of the platform used in the Korean K9 self-propelled howitzer. Since then, the 155 mm Krab self-propelled howitzers, equipped with the TOPAZ integrated artillery command and fire control system, have been one of the showpieces of the Polish arms industry, and in particular the main vehicle manufacturer, Huta Stalowa Wola. After the Russian invasion of Ukraine, Poland donated a dozen Krab SPH units to the Ukrainian army, which gathered very positive feedback among users and proved their effectiveness in operations against Russian troops.[98]. Ukraine subsequently acquired several dozen more vehicles, probably 54 units, along with accompanying vehicles.[99] In February 2023, in response to interpellation No. 38445 on the termination of production of the Krab howitzer at the Huta Stalowa Wola in 2025, the then Secretary of State at the Ministry of Defense Wojciech Skurkiewicz announced the completion of deliveries of the first seven batteries, or 56 units of the AHS Krab in 2021 under the 2016 contract.[100] In the second half of 2022, another contract was signed for the delivery of two DMOs (Dywizjonowy Moduł Ogniowy, eng. Battalion Fire Module), or 48 SPHs.[101] Deliveries from the contracts signed so far will be carried out in 2025–2027. The delay in the AHS Krab program has to do with deliveries to Ukraine. Nonetheless, further orders of the AHS Krab are planned. The framework agreement concluded at the end of 2023 provides for the procurement of another 152 guns.[102] However, in August 2024, PGZ CEO Krzysztof Trofiniak reported that PGZ was in the process of negotiating a contract for the supply of 96 SPHs in a new variant, which is to include an automatic loading system.[103] It should also be noted that an unknown number of Goździk howitzers have been delivered to Ukraine. To fill the gaps left by the transferred armaments to Ukraine and in connection with the redirection of Krab SPH production to the Ukrainian army, the Ministry of Defense decided in 2022 to make an emergency purchase of Korean K9 Thunder self-propelled howitzers. In July 2022, a framework agreement was concluded, which stipulates that the Korean side will supply Poland with a total of 672 SPHs in both Korean and polonized versions, the production of which was to begin in Poland in 2026.[104] The first contract, dated August 2022, covers the delivery of 212 vehicles in the K9A1 version, which will be delivered by the end of 2026.[105] In December 2023, the Armament Agency announced the conclusion of the second contract. As a result, Poland has acquired an additional 6 K9A1 and 146 K9PL SPHs, along with the transfer of technology necessary to establish repair, modernization and

K9 Thunder SPH
Author: st. kpr. Piotr Szafarski, 16 Dywizja Zmechanizowana.

HIMARS
Author: mł. chor. Daniel Wójcik, 16 Dywizja Zmechanizowana.

production capabilities for selected elements of the howitzer in the Polish defense industry.[106] In December 2023, the then Minister of National Defense Mariusz Blaszczak announced that Poland, in accordance with the recommendations of the General Staff of the Polish Armed Forces and the General Command of the Armed Forces, would need a total of more than 1,000 self-propelled howitzers.[107] It can therefore be assumed that each division will have at its disposal at least two self-propelled artillery battalions (DAS), that is, 48 Krab or K9 guns in each divisional artillery brigade. Self-propelled artillery battalions are also likely to be included in the structures of all armored, mechanized, and motorized brigades.

The M120K Rak self-propelled mortar program is also currently underway, using a turret system developed by HSW and the base chassis of the Rosomak KTO. A total of 120 M120K Rak units with associated vehicles have been ordered for 15 company fire modules (KMOs) under contracts signed in 2016, 2019, and 2020. Each KMO includes eight M120K guns, four Artillery Command Vehicles (AWD), two Artillery Reconnaissance Vehicles (AWR), three Artillery Ammunition Vehicles (AWA), and one Artillery Armament Repair Vehicle (AWRU).[108] Deliveries of the Rak system will end in 2024.

Missile artillery is one of the areas where some of the most notable changes could be observed since February 2022 with the introduction of modern K239 Chunmoo and M142 HIMARS systems. Even before the Russian invasion of Ukraine in February 2019, Poland ordered 18 M142 HIMARS launchers and two launchers for training.[109] In September 2023, a framework agreement was approved covering 486 M142 launchers to be delivered along with ATACMS tactical ballistic missiles, as well as GMLRS-ER and GMLRS missiles.[110] The Foreign Military Sales (FMS) procedure has already been approved by the U.S. and includes 18 launchers on US chassis, and 468 launchers to be integrated into Jelcz vehicles. The ammunition package consists of: 45 ATACMS ballistic missiles (range of about 300 km), 2766 GMLRS-AW, 3126 GMLRS-U missiles (range of about 80 km), and 3192 GMLRS-ER AW (with a range of up to 200 km).[111] The contract is expected to be signed by the end of 2024.[112] If further executive contracts for the HIMARS system are signed, the launcher is expected to be deployed in a polonized version, using JELCZ vehicles and the TOPAZ fire control system. Command, ammunition and technical evacuation, and other specialized vehicles are also expected to be supplied by the Polish arms industry.[113] Production of ammunition for the HIMARS system remains an important issue, as current procurement plans do not cover ammunition needs, which should suggest future participation of Polish industry in missile production.[114]

In November 2022, a contract was signed for the supply of 218 launchers of the Korean K239 Chunmoo missile system along with several thousand CGR-080 missiles with a range of about 80 km and CTM-290 tactical ballistic missiles with a range of 290 km.[115] This contract is expected to be completed by 2027. On April 25, 2024,

Homar-K Launcher

Author: sierż. Aleksander Perz, 18 Dywizja Zmechanizowana.

a second contract was concluded for the supply of 72 launchers along with three thousand missiles, the deliveries of which are expected to be completed in 2029.[116] Under the second contract, 60 launchers will be manufactured in Poland and there will be a technology transfer enabling the production of pods for Polish 122 mm M-21 FHD FENIKS unguided rockets used in Langusta launchers. Although the K239 launchers from the first contract are manufactured in South Korea, the Polish defense industry is taking an active role in supplying components of the system, which include the Jelcz P882.57 TS T45 K-MLRS 8×8 special armored chassis, the FONET communications system and the TOPAZ fire control system.[117] Unlike the HIMARS launchers, which have only one pod carrying one ATACMS or six GMLRS missiles and were intended to be lighter systems, with the ability to be flown by C-130 transport aircraft,[118] the K239 systems, thanks to the use of a larger 8×8 chassis, can carry two pods for two different types of ammunition simultaneously. Each pod holds 1 CTM-290 tactical ballistic missile or 6 CGR-080 guided missiles. It is also possible to integrate Polish unguided 122 mm missiles produced by Mesko, with each pod carrying 20 missiles. Another contract covering technology transfer is to be signed in 2025, which will allow Polish entities to participate in the production of Korean ammunition.[119]

2.1.3 Air and Missile Defense and Image and Radio Reconnaissance

The development of air and missile defense capabilities is currently one of the largest and highest priorities of technical modernization in Poland. The programs currently underway were included for the first time in the Technical Modernization Plan for the years 2013–2022. The main components of the target structure of the integrated air and missile defense system currently under construction, which is likely to become operational around 2035, are shown in Table 4.

Modernization of the air and missile defense system is currently crucial to Poland's security due to the very limited capabilities of the post-Soviet anti-aircraft systems used by the Polish Armed Forces. Prior to the Russian invasion, Poland remained one of the last users of obsolete 9K33M2/M3 OSA, 2K12 KUB, S-125 Newa, and S-200WE anti-aircraft systems.[120] According to the Oryx website, some of these systems were transferred to Ukraine in 2022 and 2023.[121] The technical modernization programs currently underway will change the situation in Poland dramatically and make the Polish air and missile defense system one of the

TABLE 4 The main components of Poland's air and missile defense system based on current technical modernization programs.

LAYER	SYSTEM	MAIN COMPONENTS
Medium Range Air and Missile Defense (MRAD/MD)	WISŁA	8 Batteries (16 Fire Units). Each battery consists of: • 8 PAC-3MSE launchers; • 2 AN/MPQ-64 or LTAMDS radars; Integrated with IBCS
Short Range Air Defense (SHORAD)	NAREW	23 Batteries (46 Fire Units). Each Battery Consists of: • 2 Fire Units (6 iLaunchers with CAMM-ER missiles); Integrated with IBCS
Very Short and Short Range Air Defense (VSHORAD/SHORAD)	PILICA+	22 Batteries (including one for training) Each battery consists of: • 2 iLaunchers with CAMM missiles • Radars: 1) Bystra and 2) SRL-97 (ELM-2106 NG) – for 6 batteries; 16 batteries will be integrated with a dedicated anti-UAS radar • 6 ZUR-23-2SP Jodek-SP 23 mm systems with GROM/PIORUN missile launchers • Dedicated anti-UAS system
Very Short Range Air Defense (VSHORAD)	POPRAD	79 Launchers Delivered (GROM missiles)
	GROM/PIORUN, 23 mm artillery	GROM/PIORUN MANPADS, 23 mm anti-aircraft artillery

most modern in the world. According to earlier plans, the basis of the ground-based component of Poland's air defense system was to be the Wisła (Vistula) system, a medium-range air defense system capable of intercepting ballistic missiles; and Narew, designed for short-range air defense. In 2018, as part of the Wisła program, a contract was signed for the delivery of the first two Patriot system batteries, consisting of 16 launchers with PAC-3 MSE missiles. In the Polish configuration, this actually means four independent fire units, since each fire unit is equipped with dedicated radar stations. Under the first contract, Poland acquired four AN/MPQ-65 radars, pending the development of LTAMDS target radars. The contract for the delivery of an additional 6 batteries, that is, 12 fire units with 48 M903 launchers (each capable of carrying up to 12 PAC-3 MSE missiles) and 12 LTAMDS radars providing 360-degrees, was signed in September 2023.[122] These radars are made with gallium nitride technology (GaN) and have the ability to track ballistic and hypersonic missiles.[123]

The second component of the Polish air defense system is the Narew system, the implementation of which was initiated through the signing of a framework agreement in September 2021 between the Armament Inspectorate and the PGZ-NAREW Consortium.[124] The consortium consists of: Polska Grupa Zbrojeniowa S.A. as consortium leader, Huta Stalowa Wola S.A., Jelcz sp. z o.o., Mesko S.A., Ośrodek Badawczo-Rozwojowy Centrum Techniki Morskiej S.A., PCO S.A., PIT-Radwar S.A., Wojskowe Zakłady Łączności Nr 1 S.A., Wojskowe Zakłady Uzbrojenia S.A., Wojskowe Zakłady Elektroniczne S.A., Zakłady Mechaniczne Tarnów S.A., with the strategic partner responsible for providing the technology being MBDA UK. The first executive contract worth PLN 18 million gross for the Narew program was concluded in November 2021.[125] In April 2022, another contract was signed for the supply of the Mała (Little) Narew system, a bridging version of the Narew system, under which the first battery consisting of two fire units was delivered in 2022–2023. Each fire unit of the Little Narew system consists of Soła radar, a Zenit-M command system, three iLaunchers with CAMM missiles, and two transport and loading vehicles. In September 2023, two more key contracts were signed with a total value of about PLN 54 billion to introduce the target configuration of the Narew system in 2027–2035.[126] These contracts include the delivery of CAMM-ER missiles – with significantly better performance than the CAMM missiles used in the Little Narew system – and the transfer of technology to enable the production of these missiles in Poland, as well as the completion of a total of 23 batteries

WISŁA Air and Missile Defense System – PATRIOT M903 Launcher

Author: sierż. Aleksander Perz, 18 Dywizja Zmechanizowana.

NAREW Air and Missile Defence System – iLauncher Mounted on JELCZ Chassis.

Author: sierż. Aleksander Perz, 18 Dywizja Zmechanizowana.

or 46 fire units of the Narew system. In the near future, further executive contracts are expected to be concluded for individual components of this system, including the Sajna Multifunctional Fire Control Radars, which were presented at MSPO 2024 in Kielce in September 2024.[127] These radars are equipped with active phase-scanning antennas (AESA) made with gallium nitride (GaN) technology. The Narew system will be one of the key components of Poland's air defense system and will be fully integrated with the Wisła medium-range air defense system. This will be made possible by the Integrated Battle Command System (IBCS) currently being introduced in the Polish Armed Forces, which will make full use of the capabilities of both Wisła and Narew systems, as well as other available sensors and effectors incorporated into the system. Poland is the second country after the United States to introduce the IBCS system.[128] The network-centric architecture of this system makes it possible to leapfrog the capabilities of all air defense systems, as it will be possible to use all the sensors and effectors plugged into the system, including the 5^{th} generation F-35A multi-role combat aircraft purchased by Poland, so as to combat targets with the most optimal effectors. It will be possible, for example, to combat threats seen by the Wisła system's radars with the Narew system's CAMM-ER missiles, and vice versa. Access to multiple data sources, including Wisła and Narew radars and other radars, F-35 aircraft sensors, and potentially other systems, will improve the efficiency of using available means to combat airborne threats. The introduction of the IBCS system therefore implies the integration of at least two layers of air defense – the Wisła and Narew systems – which should be understood as full interoperability of the systems, i.e. the complete integration of separate air defense systems within higher-level command systems.[129] In the Polish configuration, the IBCS system has been optimized for operation in the absence of air superiority, thanks to the use of containers and mobile platforms that allow the system to be repositioned.[130] It is also worth noting that the components of the IBCS system delivered under the second phase of the Wisła program will be produced by the Polish defense industry.

Participating in the deliveries will be, among others, Wojskowe Zakłady Łączności Nr 1 S.A., which will supply Mobile Communication Nodes (MCCs) for the Wisła medium-range system, and in the future, most likely, also for the Narew system. WZŁ No. 1's partner in the design and supply of some components is Northrop Grumman, manufacturer of the IBCS system. Also participating in the program are, among others, Wojskowe Zakłady Elektroniczne S.A., which is responsible for the production of the command system's cabins. The importance of the implementation of the IBCS system and the construction of a multilayered air and missile defense system is undoubtedly evidenced by the scale of potential threats that Polish air defense units would face, such as ballistic and cruise missiles, as well as various classes of unmanned systems, as can be seen from the example of the conflict in Ukraine. This issue is discussed in detail in Chapter Three. The use of the IBCS system ensures that even if individual sensors are eliminated, the air defense system can function effectively. The ability to adapt effectors to combat specific threats is extremely important due to the cost and relatively small scale of production of PAC-3 MSE missiles. Currently, the annual production of these missiles oscillates around the level of 500 units. Lockheed Martin, however, plans to increase production of PAC-3 MSEs to 650 units in 2027.[131] This number seems far from sufficient given the scale of air attacks in Ukraine and the demand for effectors of this type among US allies. Integrating the IBCS system with lower-level sets, such as Narew is therefore an opportunity to partially reduce the costs associated with acquiring more expensive and potentially less available effectors, which should be used primarily against targets that are the most difficult to intercept, such as ballistic and potentially hypersonic missiles. Given these challenges, **full integration of the IBCS with the lower-tier air defense system, such as Pilica+ very short and short-range system equipped with iLaunchers and CAMM missiles, among others, also needs to be considered. Current plans call for Pilica+ sets to be interoperable with IBCS, but it will be possible to fully integrate them with IBCS in the future.**[132]

Pilica Air Defense System

Author: sierż. Aleksander Perz, 18 Dywizja Zmechanizowana.

However, the impact of the development of the structures of the Polish Armed Forces on the final shape of the air and missile defense system remains an open question, particularly concerning the Narew system. In the case of the Wisła system, it seems that all the batteries will become part of the 3rd Warsaw Air Defense Missile Brigade. However, the situation is more complicated in the case of the Narew system, since the number of ordered batteries seems to correspond to the previous four-division structure of the Land Forces. Given the expansion of the Land Forces by the additional two divisions, it will also be necessary to equip two additional anti-aircraft regiments. It is theoretically possible both to allocate a smaller number of Narew batteries to each division or to order an additional 8 batteries, assuming that each regiment would consist of four batteries.[133]

The Pilica+ very-short-range and short-range system, along with POPRAD and other 23 mm anti-aircraft artillery, Grom and Piorun very-short-range portable missiles (MANPADS), currently represent the lowest tier of air defense in Poland. The Pilica+ system is being built on the basis of the existing Pilica rocket-artillery system, developed to protect air bases. In the case of the Pilica+ system, however, the goal is to upgrade the system's parameters and complement the capabilities of the Wisła and Narew systems. In October 2022, a framework agreement was concluded between the Armament Agency and the PGZ-PILICA+ Consortium, which includes PGZ, PIT-RADWAR, PCO, Mesko, OBR CTM, WZU, WZE, and ZM Tarnów. Within the framework of the contracts concluded so far, and on the basis of media reports related to the delivery of further elements of this system, it can be concluded that the target system will consist of 22 batteries.[134] Due to the integration of iLaunchers, Bystra radars and dedicated systems to combat unmanned systems, the entire system will have incomparably greater capabilities than the previously introduced Pilica system, in which the best-performing effector was the Grom/Piorun missile.

Further development and implementation of the Piorun anti-aircraft missiles remains an open question. According to media reports, these missiles have proven themselves during the fighting against Russian troops in Ukraine. A decision on the implementation of the Noteć[135] and Sona,[136] which were included in earlier versions of the

Technical Modernization Plan, is also expected in the near future. In the case of the Noteć program, PGZ companies have for several years been promoting solutions based on 35 mm automatic cannons, which have been used in the OSU-35K naval system, including on mine destroyers of the Kormoran II-class, and in the future they will be included in the equipment of multipurpose frigates of the Miecznik-class.[137] The latest solutions in this regard were presented by PIT-RADWAR at the Kielce MSPO trade fair in September 2024, and included the new SA-35 artillery system, which could use programmable ammunition produced by Mesko.[138] Such a solution would be characterized by much greater range and effectiveness than the systems based on 23 mm. cannons used in the Polish Army to date. In the case of the program formerly known under the codename Sona, the goal is to procure a very short-range mobile air defense system for ground troops, most likely set on future wheeled and tracked platforms. The system would be designed to protect Land Forces' units against a wide range of airborne threats and would have C-RAM (counter rocket, artillery, and mortar) capabilities.[139] It is conceivable that the system could be based on solutions already developed, including the Poprad system, 35 mm artillery systems, the Bystra and Soła radar stations, and development versions of the Piorun missiles.[140]

In addition to the above-mentioned radar systems included in the Wisła, Narew, and Pilica+ systems, the Polish Armed Forces will also acquire other systems that significantly improve their air and missile defense capabilities. In December 2023, the Armament Agency signed a contract with the PGZ-NAREW Consortium for the supply of 24 P-18PL radars, which will be designed to warn of air attack in the meter (VHF) band, determine the location of the target and identify its type. The stations are capable of detecting ballistic and hypersonic targets and will work with the IBCS system to provide information for the Wisła medium-range and Narew short-range air defense systems.

Two second-hand Saab 340 AEW (Airborne Early Warning) aircraft were also ordered in July 2023, with deliveries ending in June 2024.[141] The machines will serve in the Naval Aviation Brigade.[142] The SAAB aircraft provide the Polish Armed Forces with new capabilities, as Poland has so far had to rely on data from NATO's AWACS-class Boeing E-3A Sentry aircraft. Although Saab 340 AEW aircraft are not the most advanced machines of their type, they have the ability to detect targets from hundreds of kilometers away and targets located at very low altitudes, which pose a challenge to ground-based radar stations due to the curvature of the Earth. In the long term, it seems essential to acquire more advanced machines, such as the E-2D Advanced Hawkeye command and control aircraft offered to Poland by Northrop Grumman.[143] The second important purchase in this area is the four sets of aerostats (code-named "Barbara" in Poland) acquired from the United States in May 2024. The Barbara system will complement the capabilities of Poland's air and missile defense system.[144] According to information released by the Ministry of National Defense, these systems can detect low-altitude objects at a distance of about 300 kilometers, which will allow more effective surveillance of the airspace, especially during peacetime.[145]

2.1.4 Tactical Aviation

The F-16C/D Block 52+ multi-role aircraft have remained the workhorse of the Polish Air Force since the completion of deliveries of these aircraft in 2008.[146] Although an extremely successful and versatile design, capable of carrying highly advanced armaments such as JASSM-ER cruise missiles, these aircraft will require modernization in the near future, and their relatively small fleet necessitates the introduction of additional squadrons into service. Analyses carried out back in the 1990s helped outline the requirements that formed the basis for Poland's program to equip the Air Force with modern multi-role combat aircraft. Plans at the beginning of the 21st century stipulated that the Air Force required at least 10 squadrons of multi-role aircraft, or 160 aircraft, to effectively secure airspace and carry out tactical aviation tasks.[147] Budgetary constraints at the time prevented the purchase of such a large number of aircraft, and the 48 F-16 aircraft ordered at the time were enough to equip only three squadrons of tactical aviation. F-16 aircraft have so far undergone various modifications, which were mainly related to the application of new weapons systems. In the near future, a contract is expected to be concluded for the so-called mid-life upgrade,[148] which will enable the machines to improve their capabilities and continue to operate for at least another two decades. To

F-16 Multirole Aircraft of the Polish Armed Forces During the Baltic Air Policing Mission

Author: sierż. Rafał Samluk Operator Combat Camera zespołu reporterskiego Dowództwa Operacyjnego Rodzajów Sił Zbrojnych.

date, a total of two squadrons of obsolete MiG-29 fighter aircraft and Su-22 fighter-bomber aircraft remain in service, whose time in the Air Force is inexorably drawing to a close. In the middle of the second decade of the 21st century, the concept of equipping tactical aviation with 64 new-generation aircraft emerged,[149] but these plans partially materialized only in January 2020, when a contract was signed for the delivery of 32 5th-generation F-35A stealth multi-role combat aircraft. The contract includes the necessary logistics package, spare parts and a training package, including training of pilots and technical personnel in the United States, as well as ground training infrastructure and a simulator.[150] Deliveries to Poland are expected to end in 2030. The F-35A aircraft will be the main type of multirole aircraft for most NATO countries and will primarily replace the single-engine F-16 aircraft in this role. After the Russian invasion of Ukraine in February 2022, the concept of transferring MiG-29 fighter jets to the Ukrainian Air Force emerged, but a final decision on the matter was not made until 2023, most likely due to the initial reluctance of other NATO members and concerns about further escalation of the conflict.[151] Poland has most likely already handed over 14 MiG-29 aircraft, although further deliveries are very likely due to the limited capacity of Polish industry to maintain these aircraft and a lack of necessary spare parts and armament.[152] Due to the above-mentioned situation and the need to rapidly upgrade the Air Force's capabilities in September 2022, the Armament Agency concluded two contracts with Korean Aerospace Industries (KAI) for the delivery of FA-50 light combat aircraft, 12 units in the so-called FA-50GF variants (i.e., FA-50 Block 10) and 36 units in the FA-50PL target version.[153] Although this purchase is presented in the media as controversial, based on the experience gained during the F-16 program, it can be assumed that the decision was dictated by the need to introduce the new machine as soon as possible in tactical aviation squadrons operating outdated Soviet-built MiG-29 and Su-22 aircraft, so that pilots could continue to be trained and maintained. In the 2000s, pilots training on F-16s were already trained on machines of other types, including MiG-21 and Su-22 aircraft.[154] Current training capabilities are still very limited, despite the introduction into service of one squadron of Advanced Jet Trainer (AJT) M-346 Master aircraft. The withdrawal of the Soviet-designed machines would effectively mean that the three tactical aviation squadrons would have no equipment at all. There is no doubt that the FA-50GF aircraft have very limited combat capabilities, but they are not machines of exactly the same class as the M-346 due to their much higher technical parameters (e.g. top speed and max. altitude).[155] Deliveries of all 12 machines in the FA-50GF configuration were completed in November 2023.[156] Deliveries of the remaining 36 machines modified to Polish requirements are expected to take place in 2025–2038.[157] The FA-50PL aircraft are already expected to have much better parameters due to their air-to-air refueling capability, the use of the AESA Phantom Strike radar and the integration of advanced armaments identical to those used by the Polish F-16C/D.

A topic requiring further analysis is the purchase of another 32 modern aircraft for tactical aviation, which would increase the total number of all tactical aviation squadrons to ten. Among the potential candidates are the 5th generation F-35A aircraft purchased by Poland, as well as other designs, such as American and European-made air superiority aircraft. If Poland decides to acquire two more squadrons, it is necessary to take into account the capabilities and tactical-technical parameters of a specific type of aircraft, but also the cost of operation, technical security and the effectiveness and efficiency of the entire pilot training system. An extremely important issue in this context is the current structure of the Air Force and the aircraft availability for basic and advanced training, as well as possible difficulties associated with the introduction of a new type of aircraft into tactical aviation.

2.1.5 Helicopters

Modernization of the Polish Armed Forces' helicopter fleet is one of the most complex challenges, as various types of systems operated by the Land Forces, Air Force, and Navy require replacement. So far, the modernization of the helicopter fleet has not been carried out in a comprehensive manner; instead, it has been rather selective and focused on replacing specific types within each branch of the military. The largest modernization program in this area is the purchase of 96 AH-64E Apache attack helicopters under a contract concluded in August 2024 by the Armament Agency with the U.S. government. According to an announcement by the Ministry of Defense, the AH-64E helicopters will go to the 1st Airborne Brigade of the Land Forces, where they will replace the Mi-24 and Mi-2 aircraft.[158] The value of the contract is estimated at around $10 billion, which means it will be one of the largest technical modernization programs currently underway. The purchase of attack helicopters was included in the 2013 Technical Modernization Plan under the code name "Kruk" (Raven). However, the original plans called for the replacement of the Mi-24 helicopter fleet at roughly a 1:1 ratio, or the purchase of 32 new aircraft. The scale of the AH-64E contract may be surprising not only because of the cost of purchasing and operating such a large fleet but other reasons as well. It should be noted that outside the United States, where hundreds of AH-64 helicopters are in service, no country has such a large fleet of this type of attack helicopter. The latest version of the AH-64E attack helicopters is the most advanced aircraft of its kind in the world. However, both the size of the order and the weapons systems that Poland plans to acquire may raise doubts. This is because the order includes, among others, more than 1,800 AGM-114R2 Hellfire anti-tank missiles and 508 Stinger 92K Block I anti-aircraft missiles.[159] The AGM-114R2 Hellfire was also chosen for the purchase of AW149 helicopters as part of the Perkoz multi-role support helicopter program. The choice of the same effector could suggest that this is a well-considered decision that takes into account the interests of the Polish defense industry. However, the purchase should be viewed in a broader context, taking into account other technical modernization programs underway, namely the standardization of armaments and the participation of Polish industry. According to currently available information, the polonization and production of guided anti-tank missiles in Poland would be provided under contracts in the Ottokar-Brzoza program, which aims to develop a tank destroyer for division-level anti-tank artillery regiments. Despite earlier announcements that envisioned the polonization of Brimstone missiles, it is likely that no decision has been made on the selection of a specific effector.[160] This problem also applies to the Stinger anti-aircraft missiles, which are not in use of the Polish Armed Forces due to the development of indigenous designs, namely the Grom and Piorun missiles. So far it has not been explained on what basis the aforementioned decisions were made, although technological problems should be considered.

Another ongoing modernization program is the purchase of 32 AW149 helicopters under the aforementioned Perkoz program. The contract signed between the Armament Agency and PZL Swidnik in July 2022 provides for the delivery of 32 machines for the Land Forces aviation by 2029.[161] The package includes logistical

AH-64E Apache Attack Helicopter

Author: sierż. Aleksander Perz, 18 Dywizja Zmechanizowana.

assistance, as well as training support with the necessary simulators. The AW149 helicopters will be used to transport soldiers and supplies, support combat operations on the battlefield, and conduct evacuation, search and rescue operations under combat conditions.[162] It is worth noting that this is the second new machine type of this class currently serving in the Polish Army. In 2019 and 2021, two contracts were signed for the delivery of a total of eight S-70i Black Hawk helicopters, manufactured by PZL Mielec, for the Special Forces.[163] Deliveries from the second batch will be completed in 2024. In addition, in the middle of 2023, it was reported that the procedure for the purchase of more S-70i machines, most likely about 20 units, for the Aeromobile Forces was launched.[164] The purchase of two different types of the same class must be questionable, since the parallel use of two systems will translate into higher operating and technical costs. Standardization of the fleet would make it possible to avoid some of the aforementioned problems.

The third new type of helicopters in the Polish Army is the AW101 aircraft, which were ordered in April 2019 for the Polish Navy.[165] The contract includes four helicopters adapted for the implementation of anti-submarine warfare (ZOP) and combat search and rescue (CSAR) operations. Poland has previously utilized more than a dozen Mi-14PŁ helicopters designed for anti-submarine warfare.[166] Therefore, the order of only four AW101 aircraft should be considered far from sufficient, given that AW101s are to perform various types of functions in the Navy. AW101 helicopters are also mentioned as one of the potential successors to the Mi-8 and Mi-17 machines.[167]

2.1.6 Navy

Technical modernization of the Polish Navy is one of the areas that have been treated as secondary in the last decade. A symbol of inconsistency and cutbacks in spending on the development and modernization of the Navy can be seen in the ORP Ślązak, whose construction began in 2001. This ship was supposed to be a prototype of the 621 project series of multi-role corvettes, but after years of delays it was completed as a poorly armed patrol corvette.[168] The failure of the program may also be evidenced by the fact that the ORP Ślązak did not enter service until 2019. In recent years, however, several important decisions have been made that should enable the gradual rebuilding of the Navy's capabilities, in which most ships are over 30 years old (in 2020, the average age of MW (Navy) ships was 34 years).[169] In 2021, the Armament Inspectorate (now the Armament Agency) concluded a contract with the PGZ-Miecznik Consortium for the construction of three multi-role frigates of the Miecznik-class, which will be the Navy's largest vessels with a length of about 138 meters and a displacement of about 7,000 tons.[170] The strategic partner of the consortium is Babcock International Group and Thales UK. Babcock International is the supplier of the Arrowhead 140 shipbuilding technology, which is the basis for the Polish Miecznik frigate project. Thales UK will be responsible for supplying the TACTICOS Integrated Combat System.[171] The Miecznik frigates will be equipped with four eight-cell VLS Mk-41 vertical launchers. Significantly, the CAMM and CAMM-ER anti-aircraft missiles used on the Miecznik-type frigates will also be used in the Narew and Pilica+ air defense systems. The frigates will also receive four twin RBS-15 anti-ship missile launchers, which can also be used against land targets. The ships will each be equipped with a 76 mm OTO Melara Super Rapid Strales cannon and two 35 mm OSU-35K cannons, which have been integrated with Kormoran II type mine destroyers.[172] The ships will also be equipped with modern radar systems, including Sea Master 410 and NS58 from Thales, two ZGS-35K optoelectronic warheads for OSU-35K artillery systems made by PIT-RADWAR, and several hydrolocation systems. The choice of deck helicopters remains an open question. Deliveries of all three Miecznik ships are expected to be completed in 2031.[173]

In November 2022, the Armament Agency concluded a contract with the Swedish company SAAB for the supply of two radio-electronic reconnaissance (SIGINT) ships of the Delfin type.[174] The Polish Remontowa Shipbuilding shipyard is participating in the construction of the ships. The Delfin-type ships are based on the design of the completed Swedish SIGINT ship HSWMS Artemis, in the construction of which the Polish shipbuilding industry participated.[175] The introduction of the two new radio reconnaissance ships will make it possible in the future to replace the proj. 863, Navigator-class ships, which entered into the service of the Polish Navy in the mid-1970s. A program to build three Project 258 mine destroyers (Kormoran II), is also currently underway. The prototype unit of the proj. 258 was put into service in November 2017, and a decision was made to build two more units, which were ordered in December 2017.[176] In June 2022, a contract was signed for the delivery of three more ships in 2026–2027.[177] By the end of the 2020s, the Navy will have six ships of this type. The Kormoran II project is being carried out by a consortium of companies: Remontowa Shipbuilding S.A., PGZ Stocznia Wojenna Sp. z o.o. and Centrum Techniki Morskiej S.A. Research and Development Center. The serial units featured, among other things, the OSU-35K 35 mm remote-controlled anti-aircraft system. The first two serial units, numbered 602 and 603, were equipped with, among other things: the Saab Double Eagle Sarov, Gavia, Kongsberg Hugin submersible vehicles, the Polish depth defense system Gluptak, and the Katfish towed sonar.[178] The latest three units of proj. 258 will be equipped with systems similar to those used in the previous two serial units, although in some cases it was decided to opt for competitive solutions.[179]

The last Navy component worth mentioning is the Naval Missile Unit, which is part of the 3rd Ship Flotilla. Under agreements of December 2008 and July 2014, Poland acquired two Coastal Missile Squadrons equipped with Naval Strike Missile (NSM) anti-ship cruise missiles. In September 2023, the Armament Agency announced the acquisition of two more Naval Missile Squadrons, with deliveries scheduled for 2026–2032.[180] Under this order, Poland will receive hundreds of NSM missiles along with command systems and probably dozens of launchers. The NSM Block 1A missiles feature better performance than their earlier versions, making it possible to fight targets even in very difficult weather conditions, and are estimated to have a range of about 300 km.[181] The systems are also capable of fighting land targets.[182] The contract will also enable technology transfer to enable comprehensive servicing of NSM missiles, the beneficiary of which will be Wojskowe Zakłady Elektroniczne in Zielonka.

2.2 Personnel of the Polish Armed Forces

According to current plans of the Ministry of Defense, 300,000 soldiers are to serve in the Armed Forces, of which 250,000 are to be professionals, and 50,000 are to be part of Territorial Defense Forces.[183] According to plans presented by the Chief of the General Staff of the Polish Armed Forces, General Wieslaw Kukula, the target size of the Armed Forces is to reach 450,000 soldiers including the so-called active reserve.[184] Achieving the aforementioned plans will undoubtedly be a huge challenge not only for financial reasons, but also in terms of finding suitable candidates for service in the Armed Forces and encouraging current personnel to remain in the military. The Homeland Defence Act introduced a number of solutions that, according to its authors, will enable the rapid strengthening of the Polish Army's personnel. According to current legislation, there are four types of military service in Poland:

1. Professional Service;
2. Voluntary and Compulsory Military service, which includes those undergoing basic and specialized training, those who are mobilized, and those called up for voluntary or compulsory military exercises. Only voluntary service is currently possible due to the suspension of compulsory service regulations that governed conscription;
3. Territorial service involving soldiers of the Territorial Defense Forces;
4. Reserve soldiers, that is, persons after military training and army oaths and persons after military qualification. The active reserve consists of persons after military training and oath and persons who have expressed a desire to serve in the military. The passive reserve consists of persons after military qualification and persons after military training and oath who are not interested in serving in the military.

The first of the new initiatives included in the Homeland Defense Act is the establishment of the Voluntary Military Service (DZSW) for those who have not previously received military training and are interested in contributing to the reserves or pursuing a career in the military.[185] Candidates for the DZSW undergo 27 days of initial training, culminating in a military oath, followed by 11 months of specialized training and service in a military unit. The model used for the DZSW is very flexible, as the service guarantees pay at the level of professional soldiers, but can be discontinued at any time. A DZSW soldier who has completed specialized training can then continue professional service, become a soldier in the Territorial Defense Forces, or move to the active or passive reserve. The authors of the Law also provided DZSW soldiers with priority in recruitment to professional military service and public administration, after meeting formal requirements, which is expected to make voluntary service more attractive. The main goal of the DZSW is to increase the number of both professional soldiers and trained reservists who, in the event of a crisis or war, could be used to efficiently replenish the structures of the Polish Armed Forces. The undoubted advantage of the DZSW is a more flexible approach to candidates, which is expected to encourage those who are skeptical of long-term service in the military. On the other hand, this solution may contribute to increased interest in professional careers.

Another of the initiatives aimed at increasing interest in military service is the Academic Legion.[186] Under the Academic Legion program, university students have the opportunity to participate in voluntary military training provided by 49 civilian universities, all military universities, and 11 Polish Army training centers. Military training in the Academic Legion includes basic training culminating in the military oath – as part of voluntary basic military service – as well as non-commissioned officer and officer modules. After completing basic training, the student has the opportunity to continue the studies in the non-commissioned officer module, consisting of theoretical classes and military exercises. After completing the non-commissioned officer module, an Academic Legion participant can take part in 15 days of specialized training in cryptology and cyber security, Special Forces or Military Police, among others.[187] Upon completing training, passing the exams and obtaining the rank of non-commissioned officer, Legion participants can enter the officer module, which lasts at least 62 days and is carried out during one academic year,

Soldiers of the 2nd Mechanized Battalion, 15th Giżycko Mechanized Brigade, in Training

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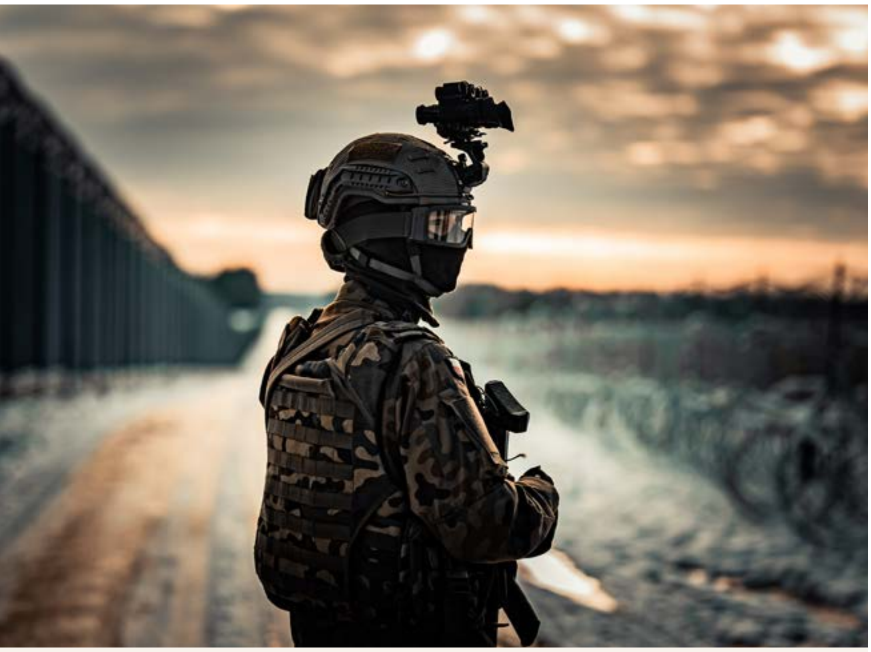
during the summer inter-semester break, at a military college. The officer module ends with an officer's exam, after which it is possible to begin the specialized training of individual choice. As with the DZSW, the program aims to increase the pool of military candidates by offering a more accessible type of military training and service, assuming voluntariness on the part of potential candidates and the possibility of reconciling higher education with military training.

Another initiative under the current reform of the Armed Forces is the Ministry of Defense's scholarship program for students at military and civilian universities, which makes it possible to obtain subsidized education in selected majors. This program is primarily aimed at students of faculties of particular importance for the development of the Polish Army, such as national security, defense, administration, law, robotics and aviation.[188] As part of the contract with the Ministry of Defense, the student agrees to: a) participate in military exercises and classes of the Academic Legion School free of charge, b) complete an officer's course and pass an exam, c) perform professional military service for at least 5 years.[189] In return, the student receives a stipend equal to 50 percent of the basic emolument of an DZSW soldier for the entire period of study. Implementation of the program is based on the same rationale as the Academic Legion. The stipend program is intended to enable increased recruitment of officers among those with specific skills, for whom other military service might be difficult to combine with education. The program is currently running on a very limited basis, with only 100 candidates for the 2024/2025 academic year.[190]

Due to the increase in spending on the Polish Armed Forces, financial benefits for soldiers have also changed. The emolument for new candidates for military service undergoing basic training ending with a military oath has increased from PLN 1,200 to PLN 6,000 gross.[191] The higher benefits are being introduced comprehensively and cover all soldiers of the Polish Army. For example, as of March 2024, professional soldiers can count on a salary of PLN 6,000 to 6,500, in the non-commissioned officer corps from PLN 6,900 to 8,000, and in the officer corps from PLN 8,400 to PLN 13,200 gross.[192] In order to increase the personnel retention rates, incentive benefits were also introduced in the amount of PLN 1,500 for soldiers with seniority in military service of more than 25 years and PLN 2,500 for soldiers with seniority of more than 28 years and 6 months.[193] In addition, each soldier performing a task related to the protection of the Polish border will receive an allowance of PLN 180 for each day of service.[194] These measures are aimed at bringing soldiers' emoluments in line with market salaries, which should have an impact on increasing the attractiveness of a military career, especially in the case of deficit specializations.

2.3 Shield East

One of the most recent initiatives that can be included in the broadly defined deterrence capabilities is the construction of a system of fortifications and other defense infrastructure within the framework of the National Deterrence and Defense Program – Shield East, which aims to strengthen the country's resilience and prepare border areas for defense by strengthening the counterinsurgency capabilities of the Polish Army, reducing the mobility of enemy troops, improving the mobility of the Armed Forces, and increasing the security of troops and protection of the civilian population.[195] The program was established by a resolution of the Council of Ministers on June 10, 2024, and its cost is estimated at about PLN 10 billion.[196] The program envisages securing a total of 700 kilometers of the border, including 400 kilometers of the frontier with Belarus, and is expected to be implemented between 2024 and 2028.[197] The construction of the counterinsurgency capabilities will include, among other things, a detection, warning and tracking system based on a network of base stations using imagery (IMINT), signal (SIGINT), and acoustic sensors, as well as electronic warfare systems (operational centers using artificial intelligence are to be responsible for data analysis); the construction of forward operating bases with logistics nodes, and the necessary infrastructure with systems designed to combat drones. Reducing the enemy's mobility is to be achieved through the construction of anti-tank ditches; the preparation of camouflage (underground mines) for blowing up roads and bridges; the dredging of drainage ditches; and the adaptation of terrain for defensive operations. Troop mobility is to be enhanced through the preparation of crossing axes and the adaptation of infrastructure for transporting heavy equipment. The fourth capability gained through the Shield East program is to ensure the security of the military and protect the civilian population. This item involves the construction of the necessary infrastructure, such as bunkers, warehouses and shelters.[198] One of the first challenges of building this system will be the buyout of private land, without which it will not be possible to begin construction of much of the infrastructure. According to government assurances, Shield East is to be integrated with the so-called Baltic Defense Line, which Lithuania, Latvia, and Estonia plan to build together.



Soldier of the 18th Mechanized Division Patrolling the Border
Author: st. szer. spec. Damian Łubkowski, 18 Dywizja Zmechanizowana.

3 Transformation of the Polish Armed Forces

3.1 The Concept of the Defense of Poland in Light of the Russian Occupation of Ukrainian Territory

The implementation of the National Deterrence and Defense Program – Shield East, discussed in the previous chapter, might imply that the main objective of the defense operation would be to prevent the enemy from seizing the territories of the eastern and northeastern parts of the country and to limit the enemy's military's ability to conduct maneuver warfare that could lead to the temporary occupation of Polish territory. This applies in particular to the so-called Suwałki Gap, which is the only land connection between the Baltic countries and the rest of NATO, and the so-called Brest Gate. Crucial in this context is the strategy of the Russian Federation, one of the elements of which are crimes against civilians and other forms of repression accompanying the occupation of previously captured territories and the conquest of urban centers.[199] At the beginning of the Russian invasion of Ukraine in February 2022, Russian troops prioritized the capture of cities, some of which were of strategic importance and could determine the further course of the campaign. This included Kharkiv, Mariupol, Kherson, Melitopol, Chernihiv and the Ukrainian capital Kyiv. During the initial phase of the invasion, Russian troops heading toward Kyiv laid siege to Chernihiv for several weeks.[200] One of the symbols of Russian aggression was the siege and destruction of one of the main Ukrainian ports on the Sea of Azov, Mariupol, whose seizure enabled the establishment of a land route between Russia and occupied Crimea. During the three-month siege, conducted by units of the 7th Guards Mountain Air Assault Division, naval infantry and troops of the Donetsk People's Republic, Russian troops conducted a continuous bombardment of the city and deliberately destroyed civilian infrastructure, such as hospitals, water and power systems and food distribution points. Analyses of satellite imagery by Human Rights Watch (HRW) indicate that during the siege, 93 percent of residential blocks, 97 percent of educational institutions, and all hospitals were destroyed or damaged, and due to the destruction of infrastructure, all residents have been deprived of a steady supply of water and electricity since March 2022.[201] Water, electricity and gas supply problems affected nearly 450,000 residents already during the first days of the conflict.[202] According to HRW's burial analysis, at least 8,000 people may have died in Mariupol.[203] Ukrainian sources estimate the number of civilians killed at 25,000.[204] By February 2024, the United Nations Human Rights Monitoring Mission in Ukraine confirmed that at least 30,000 Ukrainian residents had been affected by the hostilities.[205] Russian attacks on civilians are systematic and intentional, despite limited access to ammunition and the lack of progress by Russian troops in the current phase of the war.[206] The Russian military's actions in Ukraine are not surprising given the use of the same strategy during the war in Chechnya, where Russia consistently terrorized the civilian population to break the resistance of Chechen soldiers.[207] The attacks on civilian facilities are aimed at collapsing the morale of Ukrainians and forcing the Kyiv government to begin negotiations and political concessions to Russia. Attacks on civilian infrastructure are also aimed at devastating the Ukrainian economy and are one element of the ongoing war of attrition. Analyses by the European Parliament indicate that Russian aggression has led to the collapse of the Ukrainian economy in 2022 and a 30 percent drop in GDP, aided by the destruction of infrastructure, industry and the exodus of the Ukrainian population to the West.[208] According to a December 2023 World Bank estimate, there are nearly 6 million Ukrainian refugees in European countries, and the number of internal refugees in Ukraine, that is, people forced to flee their homes in war zones, is about 3.7 million.[209] According to the European Parliament, rebuilding Ukraine could cost about $486 billion, although analysis by the World Economic Forum suggests that the figure could actually be several times higher.[210]

The above observations are extremely important from the point of view of Poland and the country's preparation for a possible conflict on Polish territory. Given the Vistula River as a strategic frontier of ultimate defense and the impossibility of holding eastern and northeastern Polish territories in the event of Russian aggression from the direction of the Königsberg region and the territory of Belarus, the population living east of the Vistula would be subjected to repression by Russian troops. According to former Deputy Minister of Defense Gen. Waldemar Skrzypczak, the Ukrainian experience clearly indicates that Polish defense plans must be adapted to the Russian scorched earth strategy, which justifies the concept of defending Polish territory at all costs.[211] The scale of the challenge of defending eastern Poland is illustrated by the length of the border with the Königsberg region and Belarus, the terrain in the area and the resulting operational directions – Königsberg, Podlasie, Grodno and Brest. Given the above factors, the technical and personnel potential of the Polish Armed Forces prior to the Russian invasion of Ukraine and the transformation of the Polish Army announced as early as 2022 resulting from the entry into force of the Homeland Defense Act should be considered insufficient to defend and maintain the eastern part of the country in the event of a full-scale war with Russia and limited NATO support. Taking into account the aforementioned factors, a war with Russia would most likely mean the complete destruction of eastern Poland and significant losses among the civilian population – as pointed out, among others, by Gen. Waldemar Skrzypczak – as evacuation from endangered areas could be difficult or impossible in the event of an effective enemy attack.[212]

3.2 Importance of Integrated Air and Missile Defense and Unmanned systems

Another threat that is extremely important from Poland's point of view is massive air and missile strikes using a combination of ballistic and cruise missiles as well as unmanned systems. The issue of air and missile defense is of fundamental importance from the point of view of technical modernization, since the effective use of land-based systems currently being acquired by Poland will be impossible without securing them from the enemy's air assault means. Systems of both Russian manufacture and those supplied by Russia's allies are being used in the attacks on Ukraine. This is particularly true of supplies from Iran – which include thousands of Shahed-136 drones[213] and Fath 360 short-range tactical ballistic missiles[214] – and North Korea, which supplies Russia with artillery munitions and short-range ballistic missiles.[215] According to data revealed by Shin Wonsik, Minister of National Defense of the Republic of Korea, North Korea has sent at least 10,000 containers to Russia, which could hold nearly 5 million artillery munitions.[216] In addition, Russia uses a so-called reconnaissance-strike complex, which – as part of an automated command system – integrates reconnaissance means of various types with artillery systems, unmanned strike systems and radio-electronic warfare systems.[217] The analysis by Lt. Col. Tomasz Lisiecki, Lt. Col. Res. Maciej Korowaj, and Lt. Col. Paweł Jędryczek indicated that the intensive use of unmanned systems, such as ZALA Lancet, for both reconnaissance and strike operations is of particular importance. The study's authors further point out the need for different types of defensive measures, as the Russians are doing, such as preventing the effective use of certain types of precision munitions in the event of GPS signal interference.[218] Russian actions pose a significant challenge to air and missile defense, especially when using diverse means of air attack. This problem affects not only the defense of operational troops, but also critical infrastructure. Between September 2022 and March 2023, Russia used a total of about 2,000 ballistic and cruise missiles and unmanned systems to attack Ukraine's energy infrastructure.[219] While these numbers seem quite significant, especially in the context of the initial phase of the Russian invasion, they are relatively modest considering the scale of the United States' use of Tomahawk cruise missiles during Operation Desert Storm[220] and Iraqi Freedom,[221] but this does not mean that these operations are ineffective. During the period in question, Russian attacks were limited to the simultaneous use of a maximum of 50–100 missiles, which limited their effectiveness, especially with the presence of Western air defense systems and sufficient anti-aircraft assets. Ukrainian anti-aircraft defenses also proved quite effective against the Russian air force, although this is partly due to inadequate preparation of the February 2022 offensive, which failed to eliminate Ukrainian anti-aircraft units in the first days of the war.[222] The relatively high effectiveness of Ukraine's air defense, however, does not change the fact that the available, very limited assets must simultaneously be used to defend troops in regions where fighting is currently taking place, but also to defend cities and critical infrastructure elements. In late 2023 and early 2024, the situation changed due to the members of the Republican Party blocking an American aid package for Ukraine. According to analysis by the Institute for the Study of War, a reduction in Ukrainian air defense capabilities due to insufficient ammunition stocks led to a decline in the percentage of intercepted missiles and unmanned systems launched by Russia.[223] Between December 2023 and February 2024, Ukrainian air defense was capable of destroying about 60 percent of Russian missiles and unmanned systems; as of March 22, 2024, the percentage had fallen below 50 percent. Russia did not significantly intensify airstrikes during this period. Since March 2024, most Russian attacks on Ukrainian energy infrastructure have destroyed or damaged up to 80 percent of Ukrainian energy production capacity.[224] The effectiveness of Russian air and missile strikes has also increased due to the use of highly diversified means of aerial assault, including Shahed unmanned systems, cruise missiles and, above all, ballistic missiles. The latter currently pose the greatest threat to Ukraine, given that the Ukrainian armed forces have a very limited number of systems capable of intercepting ballistic missiles. Concentrated strikes against energy infrastructure can be assumed to further worsen the situation in which Ukraine's economy currently finds itself. Energy supply problems may also discourage Western countries from taking initiatives to rebuild Ukraine and establish production of Western weapons systems. Economic problems along with massive airstrikes could also lead to a new wave of refugees, which would pose a huge challenge to the government in Kyiv as well as its European partners.

NAREW Air and Missile Defense System – iLauncher Mounted on JELCZ Chassis
Author: sierż. Aleksander Perz, 18 Dywizja Zmechanizowana.

The Ukrainian experience and the evolution of the Russian strategy over the past year allow for several key conclusions to be drawn. First, Russia's fundamental mistake in the first phase of the campaign was its failure to launch massive air and missile strikes that would have made it possible to eliminate Ukrainian air defenses and thus enable the Russian air force to achieve air dominance. Although Russia's use of aviation has been very limited, there has been an apparent change in the tactics of its employment, especially in the use of various bombs and missiles. Despite the supply of Western anti-aircraft systems, Ukrainian capabilities are limited by the number of available systems and scarce ammunition, the capabilities of particular types of air defense systems, and the need to simultaneously defend critical infrastructure, urban centers and operational troops, among others. It should not be assumed that in the event of a war with NATO countries, Russia would make the same mistakes.

Second, Russia's use of a combination of many different types of assets such as ballistic and cruise missiles and unmanned systems, requires detailed analysis. Russian air and missile strikes pose a formidable challenge to air defense systems not only because of their scale and range, but also because of the difficulty of combating multiple targets of different types simultaneously. These observations clearly indicate that the effectiveness of air defense will be determined by the integration and cooperation between different types of systems and their adequate saturation. In the case of Ukraine, an insufficient number of Patriot system batteries means a choice between defending its own troops and protecting cities and critical infrastructure.[225] Given the scale of production of PAC-3 MSE missiles for the Patriot/Wisła systems and the unit cost of each missile, which is estimated at $4.2–6 million,[226,227] it should be considered particularly important to make optimal use of the available air and missile defense sets, which means the need to adapt the effectors, such as PAC-3 MSE missiles, CAMM-ER and lower tier systems, to the threats Poland's air and missile defense will face. In this context, the possibility of integrating Pilica+ sets with the IBCS system should be analyzed, due to the possibility of more effective use of cheaper short- and very-short-range effectors (CAMM and Piorun).

WISŁA Air and Missile Defense System – Patriot M903 Launcher

Author: sierż. Aleksander Perz, 18 Dywizja Zmechanizowana.

Third, the Ukrainian experience perfectly illustrates the importance of unmanned systems on the modern battlefield. Both sides of the conflict use unmanned systems of various classes for reconnaissance, targeting and direct strikes against enemy infrastructure and troops. From Poland's point of view, the development of reconnaissance and strike platforms and the large-scale use of systems designed to disrupt and destroy enemy unmanned systems should be considered particularly important. This implies the simultaneous development of electronic warfare capabilities and systems designed to destroy unmanned units by kinetic effectors. Available analyses suggest that Ukrainian self-propelled artillery is primarily countered by unmanned systems, such as the Lancet,[228] rather than by counter-battery fire. Both the Ukrainians and Russians use circulating munitions systems to counter armored vehicles, including tanks and infantry fighting vehicles.[229] According to the Associated Press report in April 2024, the strike drones used by Russia have forced Ukrainian troops to change their tactics of using U.S.-donated M1A1 Abrams tanks and withdraw them from some parts of the front.[230] Both sides in the conflict are forced to use improvised vehicle defenses, which are

Unmanned Aerial Vehicle During FEX-24 Experimental Training

Author: st. szer. spec. Damian Łubkowski, 18 Dywizja Zmechanizowana.

most vulnerable to destruction or damage in the event of an attack from above.[231] These threats prove that it is necessary to have an adequate saturation of air defense measures within anti-aircraft units designed to protect operational troops, but also dedicated systems to combat loitering munitions, including active protection systems, which can also be effective against anti-tank systems supporting the operations of Russian artillery troops.[232]

Unmanned systems are the backbone of operations at the tactical and operational levels, and without their adequate saturation, it is not possible to make effective use of other weapons systems, especially missile and artillery systems. Unmanned systems can also extend capabilities of artillery and missile troops, provided that they have an adequate number of reconnaissance support. The Gladius reconnaissance and strike system program currently underway in Poland, developed by WB Electronics, appears to meet the challenges described above. Currently being introduced to the 18th Artillery Regiment in Nowa Dęba, the Gladius system uses FT-5 Łoś (Moose) reconnaissance drones and BSP-U loitering munitions, which are carried by launchers mounted on Waran vehicles.[233] A new version of WB production circulating munitions with a range of several hundred kilometers – Warmate 50[234] – was also presented at MSPO 2024. Given the experience in Ukraine, where systems of this type are used in thousands, it should be considered reasonable to develop mass production capabilities for the above systems in Poland and introduce them to the Armed Forces. In the near future, it will also be necessary to make decisions on the purchase of unmanned systems of virtually all types, from micro drones to operational-level systems, which are particularly important in the context of the technical modernization programs currently underway, especially in the area of artillery and missile and forces.

Although the air force plays a limited role in the ongoing conflict, it should be noted, both sides are trying to adapt to the changing conditions and new means used by the enemy. Since the beginning of 2024, there has been an increased use of glide bombs by the Russian air force. In the first two months of 2024, Russia dropped some 3,500 bombs of this type, several times more than in the whole of 2023.[235] Among others, Russia uses FAB-500 glide bombs with a range of about 50–60 km and D-30SN with a range of about 80–85 km.[236] Russia uses these systems to attack Ukrainian positions; in a day it can be as many as 100–120 bombs.[237] Attempts to counter the Russian air force are forcing Ukraine to move some of its anti-aircraft batteries closer to the front line, exposing them to attacks from the Russian reconnaissance and strike complex.

3.3 The Need to Transform the Land Forces

Wider conclusions can be drawn from simulations conducted by the Casimir Pulaski Foundation and the RAND Corporation and from an analysis of Russian and Ukrainian actions in the land domain, which is crucial for both sides in the conflict and would also be critical to the success of a defense operation in Poland. Fundamental to this discussion is the scale of operations and the amount of forces and resources committed by Russia and Ukraine. The Institute for the Study of War has drawn up the orders of battle for both Russia,[238] and Ukraine,[239] which makes it possible to estimate the amount of equipment committed in the first phase of the Russian invasion. Given that the war has been going on for more than two and a half years and both sides are introducing new weapons systems and constantly adjusting concepts of weapon use depending on the actions of the enemy, for the purposes of this study it was assumed that the scale of operations and the challenges involved would be most effectively illustrated by the losses of both sides, rather than the structure of the troops involved in the first phase of the Russian invasion. Table 5 presents the equipment losses of Russian and Ukrainian troops from the beginning of the war until mid-September 2024, which takes into account equipment destroyed, damaged or seized by the enemy, based on an analysis of photos by the Oryx portal.

The figures presented in Table 5 show how important it is to have significant armored forces, mechanized forces, and artillery and missile troops, as well as adequate equipment reserves. The losses reported by the Oryx portal are certainly underestimated, and the figures given above should not be used as a basis for evaluating the effectiveness of certain types of weaponry. A good example are the lower losses of towed artillery on both the Russian and Ukrainian sides compared to armored, mobile self-propelled artillery systems. In the case of Ukrainian losses, this is most likely due to the use of these types of systems closer to the front line and the actions of Russian unmanned systems that prioritize attacks on Ukrainian self-propelled guns, as discussed in Section 3.1.

TABLE 5 Ukrainian and Russian land forces' equipment losses from February 2022 to September 2024

COUNTRY	EQUIPMENT	QUANTITY
Ukraine	Main Battle Tanks	940
	Infantry Fighting Vehicles	1036
	Armored Personnel Carriers	546
	Towed Artillery	224
	Self-propelled Artillery	404
	Multiple Rocket Launchers	78
Russia	Main Battle Tanks	3408
	Infantry Fighting Vehicles	4621
	Armored Personnel Carriers	490
	Towed Artillery	412
	Self-propelled Artillery	834
	Multiple Rocket Launchers	421

Compiled from Oryx service data.

CASE STUDY Ukrainian offensive in the spring and summer of 2023.

According to the analysis by the Royal United Services Institute (RUSI), during the Ukrainian offensive in the late spring and summer of 2023 in the Zaporizhia and Donetsk regions, armored and mechanized units formed the backbone of the Ukrainian strike.[240] From the description of the actions of Ukrainian and Russian troops in the vicinity of the village of Novodarivka, among others, a picture emerges of the many problems faced by Ukrainians pushing against Russian positions on the so-called Surovikin Line. Offensive operations in the region began in May 2023 and were initiated by the increased use of 155 mm artillery systems, which were supplied with sufficient ammunition after months of restrictions in this regard. The Ukrainians also tried to weaken Russian tactical reserves by using improvised unmanned systems to counter armored vehicles, a tactic that was only effective in situations where Russian electronic warfare systems were not operating nearby.[241] On the morning of June 4, 2023, Ukrainian mechanized units were to launch an attack on weakened Russian positions located in areas with a relatively lower density of minefields. The attack was started with the launching of anti-mine charges by UR-77 Meteorit vehicles, which created a six-meter-wide corridor in the Russian mine barrier for a column of, among others, MaxxPro MRAP vehicles spearheaded by tanks. The terrain conditions proved too difficult for the Ukrainian wheeled transporters, which got bogged down in the waterlogged terrain blocking the passage of other vehicles. The situation was exploited by two camouflaged Russian tanks, which eliminated a sizable part of the Ukrainian column. The threat from the Russian tanks was eliminated only after anti-tank teams equipped with SPG-9 anti-tank recoilless guns pulled up to engage them. A similar situation occurred during the attack through a second route created with Meteorit systems. A column of armored personnel carriers led by a pair of tanks was attacked by hidden Russian tanks. In this case, instead of waiting to be destroyed, Ukrainian units attempted to evade the immobilized vehicles at the head of the column, but the limited width of the demined corridor – only six meters wide – caused the overtaking vehicles to enter the minefield and become immobilized. The infantry from the immobilized vehicles were forced to complete the assault on foot under fire from Russian artillery and other fire support measures. The final assault on Russian positions in Novodarivka defended by company-level forces cost the Ukrainians the loss of two companies worth of equipment.

The attack on neighboring Rivnopil, the capture of which was crucial to continuing the advance deeper into the Russian positions, was carried out by Ukrainian forces in a completely different way – using tanks not as the front of the advance, but as direct fire support to enhance light infantry maneuvers. A pair of Ukrainian tanks set up in protected positions began firing at the Russian positions, taking turns – one tank would fire after leaning out of cover and then retreat, after which the other tank would perform exactly the same maneuver. After a brief shelling, the tanks released a smoke screen and approached the Russian positions – feigning an attack with the support of infantry obscured by smoke. Under the cover of the diversionary fake tank attack, Ukrainian light infantry deployed on the flank of the Russian forces, pretending to prepare for an assault. The limited situational awareness of the defending Russian troops enabled the Ukrainian troops hidden on the opposite flank to launch an assault supported by renewed tank fire.

The actions described in the RUSI reports during the Ukrainian offensive in June 2023 demonstrate the great importance of taking a comprehensive view of modernizing the armed forces – and ground troops in particular. In addition to the completely obvious tactical considerations – which are not the subject of this analysis – the success or failure of operations is determined by the entire system and the availability of adequate forces and resources for commanders at every level of tactical and operational levels. This includes adequate saturation with equipment, the amount of available ammunition, and logistical and engineering capabilities. There is no doubt that the conditions of the Russian-Ukrainian conflict – such as the availability of modern military technology, its application and the low density resulting from the length of the front – are quite different from those that would apply to a defensive war in Poland. The course of the Polish border with Belarus and the Kaliningrad region suggests that much larger forces would have to fight each other in a relatively small area as opposed to the operations on an extended front line in Ukraine.

Taking into account the above factors and the course of the simulation conducted by the Casimir Pulaski Foundation and the RAND Corporation, it can be assumed that the comprehensive modernization and expansion of the Land Forces to six mechanized divisions – or

K2 Black Panther Main Battle Tank of the Polish Armed Forces During Training

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Abrams Main Battle Tank of the Polish Armed Forces During Training

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a combination of armored and mechanized divisions – should make it possible to effectively defend Poland's borders, especially in the event of the establishment of defense infrastructure under the Shield East program. In addition to the issues of air and missile defense, discussed in the previous chapter, and unmanned systems combat capabilities more broadly, it is necessary to systematically examine the capabilities of the Land Forces and their adequate saturation with equipment – from armored forces designed to counter-strike and destroy enemy troops, through infantry fighting vehicles, artillery equipment, anti-tank systems, radio-electronic warfare systems, unmanned systems and the necessary logistics facilities. In this context, it is worth highlighting the importance of several fundamental technical modernization programs, most of which are discussed in Chapter Two. First, the achievement of the aforementioned capabilities implies the need to make the earliest possible decisions in the context of establishing production of K2 tanks in Poland and starting the mass production of BWP Borsuk. Based on the Ministry of Defense's announcements to date, it can be concluded that both vehicles will form the basis of armored and mechanized forces in the future. Looking ahead to 2035, it will be necessary to produce more than 1,000 K2 tanks and more than 1,000 Borsuk BWPs. Given the time required to establish serial production and the potential pace of deliveries, these decisions must be made as soon as possible. Together with the delivery of M1A1 and M1A2 Abrams tanks and the production of heavy infantry fighting vehicles, these programs make it possible to create armored and mechanized armies that can be a viable defensive force against Russian troops. Second, missile and artillery modernization programs must continue, but they must be understood in a broader context – while the production of launchers or self-propelled cannon howitzers significantly improves the Polish Army's capabilities, artillery systems alone will quickly become useless without adequate ammunition reserves and production capabilities at home. Advanced rocket launchers and 155 mm self-propelled howitzers can be effectively used to destroy Russian systems with lower range and accuracy than the systems currently being acquired by Poland. Third, a comprehensive look at improving anti-tank capabilities is needed. This includes both the need to implement programs such as the Ottokar-Brzoza tank destroyer and to establish serial production of anti-tank systems in Poland, which would complement the capabilities of the SPIKE missiles, among others. Fourth, the scale of technical modernization programs currently underway must take into account an effectively functioning logistics system that ensures access to fuel, spare parts and ammunition. This topic requires additional analysis that would take into account the current problems in the Polish Army and lessons learned from the Russian-Ukrainian war. In the case of Poland, both the military logistics and the importance of critical infrastructure, especially fuel and energy, should be taken into account, as Poland is currently dependent on shipping oil – from directions such as Saudi Arabia, Norway, and the United States[242] – and natural gas, which is currently transported through the Baltic Pipe pipeline and the Swinoujscie LNG terminal.[243]

Participants in the simulation, organized by the Casimir Pulaski Foundation and RAND Corporation, also stressed that Poland's possession of two additional divisions – and thus a total of six mechanized divisions – carries broader implications. Assuming the consistent implementation of the technical modernization process and the implementation of the Shield East program, Land Forces in the strength of six divisions may be perceived by Russia as an offensive force, which should be considered a deterrent. Given the geography and potential of the countries of the Central and Eastern European region, it can be assumed that the Baltic states, which have too limited economic and demographic capabilities to defend themselves, will be most at risk of Russian attack. A key factor in this context is the length of the Baltic States' border with Russia, Belarus and the Kaliningrad region, which is about 1,000 km,[244] as well as the relatively small presence of Alliance troops on the territory of Lithuania, Latvia, and Estonia. Defense of the territory of the Baltic States would be extremely difficult without significant reinforcement with Alliance troops, and the situation the Ukrainians are currently facing proves that the Russians are able to prepare quite quickly to defend the territory they seized earlier. For the NATO countries, this would mean the need for a very difficult campaign to retake the territory of the Baltic States, particularly in the event that Russia seizes the so-called Suwałki Gap, thus cutting off the land route to the Baltic States.

Consideration of the need to retake Polish territory or the Baltic States should take into account the Ukrainian experience in this regard and the adaptability of the Russians to the tactics employed by the Ukrainian military. The Ukrainian attack on Novodarivka demonstrates the dangers of conducting offensive operations against prepared positions of the Russian Federation. The dense and systematically installed minefields create an extremely difficult barrier to overcome, and the widely present in the structures of the Russian forces remote mine-laying vehicles – such as the modern ISDM Zemledeliye systems and older designs of this type – are used indiscriminately and lead to high losses in equipment and personnel on the Ukrainian side.[245] The Russians also use specialized engineering vehicles for trench construction, such as the BTM-3.[246] Positions prepared in this way have fire support from tanks and other armored vehicles, demonstrating the need for both anti-tank measures and tanks and infantry fighting vehicles capable of accurately combating Russian vehicles on the move and breaking through enemy defensive positions. Poland's possession of additional two divisions could potentially allow it to designate some Polish

NATO Immediate Response 24 Exercise

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forces to support the defense of Lithuania with its allies, making it more difficult for Russia to seize Lithuania and block the connection between the Baltic States and the rest of NATO. It is also worth noting that in the event that Poland possesses missile and artillery troops that are expanded in quantity and quality, along with significant ammunition reserves, it would be possible to eliminate a significant portion of Russian troops in Belarus. Ukraine's experience proves that such a scenario should be taken into account, as Ukrainian attacks on Russian territory have not led to an escalation of the conflict and, for example, Russia's use of nuclear weapons. On the other hand, the potential of Russian air defense remains a huge challenge, establishing air superiority by NATO forces will require the deployment of significant amounts of precision-guided munitions to neutralize Russian anti-aircraft batteries. Given Russia's problems in developing new-generation land-based weapons systems, a heavily armed Polish Army could pose a formidable challenge even to a sizable Russian force. The Kremlin would therefore have to take into account the possibility of engaging the Polish Armed Forces on the territory of the Baltic States and the impact of the Polish Army's actions on Russia's ability to achieve its objectives. The very fact of forcing Russia to make such calculations can be considered an element of deterrence, which could potentially have a fundamental impact on Moscow's decision to possibly attack Poland and the Baltics. Building the Land Forces on the basis of six divisions will be extremely expensive, but this expenditure could be justified by obtaining a deterrence capability. The Land Forces would then be a means of countering the outbreak of armed conflict, the cost of which could potentially be many times higher than the initiatives discussed in this report to transform the Polish Army.

3.4 Key Challenges in the Development of the Polish Armed Forces

The issues discussed in the previous chapters are only part of the overall system that should be behind the transformation of the Polish Armed Forces. One of the fundamental problems in the long term is ensuring a stable supply of personnel for the Polish military. This issue requires a very broad view that takes into account demographics and declining fertility rates, financial issues related to ensuring an adequate level of soldiers' emoluments, Poland's economic situation and labor market conditions. A modern military requires significant financial resources and qualified personnel, however, these are derived from a strong economy and socio-economic development. Modernization and development of the Polish Armed Forces' capabilities must not come at the expense of Poland's economic progress. On the contrary, the expenses incurred by Polish taxpayers should not only enhance the country's security, but also actively support economic development. Therefore, political decisions on state security and defense must be part of a broader vision for the development and modernization of the state, which should be strategic in nature. However, certain measures should be taken in the short to medium term to fill gaps in specific capabilities. Among other things, the Homeland Defense Act proposes a systemic approach to encouraging young people to begin a military career, which is absolutely necessary. However, it is crucial to constantly analyze the solutions adopted in the Act and adapt them to changing conditions, such as the labor market. In this context, scholarship programs, which should probably be more focused on narrow specialties relevant to both state security and civilian sector development are particularly attractive.

These issues are directly linked to the problems of socio-economic development in Poland, whose economy is not particularly innovative. In the short to medium term, there should be a definite focus on greater involvement of the Polish defense industry in the implementation of technical modernization programs and increased funding for those R&D programs that can realistically contribute to the development

Ammunition supply
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of innovative products for the needs of both the Polish Army and export customers. It applies in particular to those areas where Polish companies have the relevant competencies and technologies, and those sectors where it is possible to establish domestic production on the basis of foreign licenses in the short term. Poland has a fairly well-developed arms sector, e.g. in the area of the production of unmanned systems, heavy equipment (e.g. artillery systems), radiolocation systems and other technologies of crucial significance for national security and defense. Enterprises operating in the aforementioned sectors should form the basis for the future modernization of the Armed Forces and contribute to the further development of the Polish economy, so that it will be possible to significantly increase the ability of Polish industry to participate in the production and design of new weapons systems in the future. Priority should be given in particular to those areas where the Polish defense industry has ready-made products or is able to implement license production fairly quickly. This includes the BWP Borsuk, K2 tanks, K9 and Krab self-propelled howitzers, and many unmanned systems currently being implemented and operated. Particular attention is required to support the production of modern munitions in Poland based on Polish and foreign technologies. Given the current very difficult situation, it seems reasonable to have the broadest possible participation of Polish public and private entities in such initiatives, regardless of ownership structure.

The logistics issues, which were not discussed in this paper, undoubtedly require additional analysis.Nonetheless, based on the available data, it is possible to draw some general conclusions related to the overall view of the Armed Forces. Given that Poland currently operates many different weapons systems of a similar type, which can be considered a transitional state, it is necessary to think about the target standardization of the equipment and ammunition in service. In the perspective to 2030, this will be partly possible thanks to the withdrawal of the post-Soviet equipment, but it is also necessary to think about the entire logistics system in the long run. Poland should strive to standardize military equipment and armaments based on the most modern solutions currently being integrated in the Polish Armed Forces as well as based on domestic industrial capabilities. It will also be necessary to bring many of the weapons systems currently being acquired to the same standard to enable their long-term operation. An example is the M1A1 FEP Abrams tanks delivered to the Land Forces, which will need an upgrade after 2030 to the M1A2 SEPV3 standard. Standardization, along with the withdrawal of obsolete or less advanced equipment, should make it possible to reduce the number of types of similar armaments and simplify supply chains as much as possible in the future. Also of utmost importance is the need for multi-year planning, adaptation of tactical-technical requirements to new threats, and a comprehensive approach to arms procurement, including training systems and specialized versions of various types of vehicles. In this context, it is worth recalling the experience of the KTO Rosomak program, where there were apparent problems with licensing, the development of specialized versions, and finally the lack of R&D plans, which now prevent the implementation of a new wheeled transporter developed by the Polish defense industry.

Summary

The authors of this study have limited their analysis to selected elements of the modernization and development process of the Polish Army. This report is a synthesis of general conclusions drawn from the analysis of threats to Poland's security, ongoing technical modernization programs, and observations of the Russian-Ukrainian war. The issues discussed are intended to indicate the most urgent needs arising from the study of the aforementioned issues and to encourage further discussion of the future of the Polish Armed Forces by both decision-makers and the expert community in Poland. There is no doubt that the analysis contained in the report does not exhaust the list of problems currently facing Poland. Future research should focus on specific areas related to technical modernization, such as the Navy, whose importance in Poland is often questioned, despite Poland's dependence on imports of energy resources by sea. An extremely important issue is, among others, the problem of civil defense, which does not receive much media attention compared to the spectacular purchases of modern armaments, although in light of the situation in Ukraine it should be treated as one of the utmost priorities. Equally important is a systemic approach to arms purchases, their long-term operation and modernization. This topic is linked to the security of supply chains and the efficiency of military logistics systems. The role of the Armed Forces in securing critical infrastructure also calls attention because of its crucial importance to the economy and the country's defense capabilities.

Recommendations

1. Ensuring Long-term Development of Poland's Defense Capabilities

Ensuring the development of Poland's defense capabilities requires, above all, consistent implementation of long-term plans, including technical modernization programs. Poland's security and defense require cooperation between all political options and cannot be subject to political rivalry. The modernization and development of the Polish Armed Forces is a long-term process that should not be subject to sudden changes resulting from the interests of individual political parties. The implementation of technical modernization programs, the increase of the Polish Armed Forces personnel, and their training will require securing adequate financial resources in the medium and long term. In the near future, we should expect an increase in spending resulting not only from purchases, but also from the introduction of new weapons systems and the cost of their operation. Decisions on the implementation of technical modernization programs and the selection of specific weapons systems must take into account the full costs associated with the life cycle of a given system, its future modifications and modernization, and the construction of the necessary infrastructure, such as warehouses for storing equipment and armaments. The implementation of technical modernization programs must also take into account the full securing of logistical capabilities in terms of technology and the provision of broad access to qualified technical personnel who are necessary to maintain complex weapons systems. In parallel, access to appropriate munitions must be secured through purchases from foreign partners and as part of domestic capacity building. Analyses should take greater account of the economic consequences of a given program to maximize the resources that will remain in the Polish economy. **Defense spending should not just be a cost of improving state security, it should be seen as an opportunity to develop Poland's defense industry, modernize the economy and stimulate economic growth based on advanced technologies.**

2. Developing a Long-term Strategy for the Development of the Polish Defense Industry

The implementation of technical modernization programs must prioritize the participation of the Polish defense industry in areas where Poland has adequate competence or is capable of building it within a few years. Funds spent in the Polish industry will strengthen the Polish economy, which will translate into higher tax revenues and higher employment. Support for the production of modern munitions in Poland, such as 155 mm artillery ammunition, based on Polish and foreign technologies, requires special attention. Given the current, very difficult, situation, **it seems reasonable to have the broadest possible participation of Polish public and private entities in the implementation of technical modernization programs and munitions production, regardless of their ownership structure, to reduce Poland's dependence on external suppliers.** Increasing the participation of the Polish defense industry in the implementation of technical modernization programs is also necessary from the point of view of security of supply, the ability to maintain equipment, and its future modernization.

The programs being implemented now should also aim to build new capabilities in the Polish defense industry, so that in 10 years Polish companies will be more capable of creating new, innovative solutions. Given the current situation and the challenges facing Poland, it is necessary to act in two ways. First, **the Polish defense industry requires technology transfers that will enable the production of key weapons systems in Poland. This includes the production of main battle tanks and rocket artillery systems. On the other hand, the development of the Polish defense industry in the long term requires both a significant increase in R&D spending and multi-year planning for such programs.** Poland should strive to have R&D capabilities in the development of modern defense technologies, which requires a significant increase in R&D spending. In the short to medium term, consideration should be given to licensing production and acquiring the necessary technologies and other know-how to establish certain production capabilities in the Polish defense industry, and ultimately the ability to develop modern solutions based on Polish technologies or in cooperation with foreign partners. Supporting the Polish defense industry should also involve active promotion of Polish products abroad. However, the aforementioned issues require systemic solutions and the development of a long-term strategy for the development of the Polish defense industry, which should be the subject of detailed analysis in the near future.

3. Organization of the Wartime Command System

One of the most significant organizational and legal challenges is to organize and improve the wartime command system, which should effectively use peacetime cadres and command structures. An extremely important issue is also to determine the subordination of allied units stationed on Polish territory until a decision is made by NATO countries to launch an allied operation, and the ability to perform pre-emptive actions in the event of aggression against one of the members of the Alliance. Scenarios involving potential strikes from the territory of third countries – as was the case during the Russian attack on Ukraine carried out from the territory of Belarus, among others – and the resulting consequences for NATO should also be analyzed.

4. Personnel

Expanding the potential of the Armed Forces to the level of 300,000, and in the case of the General Staff's plans – which include active reserve soldiers – even up to 450,000 soldiers, will require a systemic approach to attracting new cadres and retaining professional soldiers in service. Initiatives to make military careers more attractive, especially for those with the most useful skills and specializations from the military's point of view, appear to be the optimal solution in this regard. Given the very difficult demographic situation in Poland, managing the new generations will be an increasing challenge. One potential solution is to increase the scale of the Ministry of Defense's scholarship programs, as they make it possible to support young people in selected fields of study that are particularly useful from the military's point of view, and, on the other hand, guarantee an influx of new cadres committed to remaining in the military for five years. It is also necessary to improve the system of training personnel reserves – and reserve officers in particular – and the need to include various types of modern armaments in the training process. The technical modernization programs currently underway should also affect changes in military education, for example, to ensure that future technical personnel are trained to operate modern weapons systems. It is also necessary to analyze future personnel needs and the ratio between the number of professional, reserve, and WOT soldiers.

5. Expanding the Capabilities of the Land Forces

Poland's possession of six divisions could be one element of its deterrence system and a sufficient force to secure the areas of eastern and northeastern Poland. From Russia's point of view, such a significant ground force may have offensive potential, which the Kremlin would have to take into account in calculating a potential attack on NATO's eastern flank, particularly the Baltic states and Poland. Achieving the aforementioned capabilities means that decisions must be made as soon as possible in the context of continuing technical modernization programs.

First, it is necessary to establish production of K2 tanks in Poland and to begin serial production of the BWP Borsuk. Based on the announcements of the Ministry of National Defense, both vehicles are to form the core of armored and mechanized units in the future and thus, it can be assumed that more than 1,000 K2 tanks and more than 1,000 BWP Borsuk will need to be produced by 2035. Given the time required to establish serial production and the potential pace of deliveries, these decisions must be made as soon as possible. Together with the delivery of M1A1 and M1A2 Abrams tanks and the production of heavy infantry fighting vehicles, these programs make it possible to create armored and mechanized armies that can be a viable defensive force against Russian troops.

Secondly, artillery missile troops' modernization programs must continue, but they must be understood in a broader context. While the production of multiple rocket launchers or self-propelled howitzers significantly increases the capabilities of the Polish Armed Forces, artillery systems themselves will quickly become useless without adequate ammunition reserves and production capabilities at home. Modern missile and artillery weapons systems can be effectively used to destroy less advanced Russian counterparts. In this context, it is also important to recall programs that have not been implemented to date, such as the purchase of RAK company fire modules on a tracked chassis.

Third, a comprehensive look at improving anti-tank capabilities is essential. This includes both the need to implement programs, such as the Ottokar-Brzoza tank destroyer, and the establishment of the serial production of anti-tank systems in Poland, which would complement the capabilities of, among others, SPIKE anti-tank missiles.

Fourth, the scale of technical modernization programs currently underway must take into account an effectively functioning logistics system that ensures access to fuel, spare parts and ammunition. This topic requires additional analysis that would take into account the problems that currently exist and the lessons of the Russian-Ukrainian war. In the case of Poland, both the military dimension of logistics and the role of critical infrastructure should be taken into account. It is also necessary to strive for standardization of the equipment and armaments used and, in the long term, to reduce the number of types of weapon systems. This would make it possible to simplify supply chains and reduce the costs associated with operating multiple weapons systems simultaneously. Standardization should also include ammunition, so that when two similar systems are involved, the same types of ammunition can be used.

Given the losses of Russian and Ukrainian troops, Poland should also have adequate equipment reserves to replenish losses. Land Forces must have extensive engineering capabilities for both supporting their own troops and limiting the mobility of enemy troops. The experience of the war in Ukraine indicates that it is necessary, among other things, to have mine-laying capability. At every level of command in the Land Forces but also in other types of troops, it is also necessary to continue implementing systems enhancing situational awareness as well as secured communications systems. The ability to conduct operations in conditions of GPS signal interference is also extremely important.

6. Integrated Air and Missile Defense System

The construction of an air and missile defense system is of fundamental importance from the point of view of technical modernization, since it will be impossible to make effective use of the land-based systems currently being acquired by Poland without securing them against the enemy's air attack capabilities. The Ukrainian experience proves that it is also necessary to have sufficient anti-aircraft and anti-missile capabilities to defend critical infrastructure. Poland should continue to implement air defense programs at every level, this applies in particular to the Wisła, Narew, and Pilica+ systems. Given the expansion of the Land Forces and the potential threat of air and missile strikes against critical infrastructure, it seems reasonable to analyze the currently implemented programs in the context of future needs and threats. The possibility of full integration of the Pilica+ system with the IBCS system should be analyzed. Given the potential threats to Polish tactical aviation, exercises should be intensified at highway strips. In addition to the purchase of new aircraft for two additional tactical aviation squadrons, the prospects for acquiring aerial refueling aircraft should be analyzed in the near future.

7. Anti-UAS Capabilities and Electronic Warfare Systems

It is also necessary to develop capabilities to combat unmanned aircraft and loitering munitions using electronic warfare systems as well as kinetic effectors. It is necessary to expand the use of systems designed to combat UAVs and circulating munitions and radio-electronic warfare means, and to review the organizational structures of the Armed Forces in the context of strengthening such capabilities.

8. IMINT/SIGINT Surveillance and Reconnaissance Capabilities

The modern weapons systems being introduced into the Polish Armed Forces require equally modern solutions for image and radar reconnaissance. This includes the large-scale introduction of various types of unmanned reconnaissance systems, as well as satellite-based radar reconnaissance systems.

9. Rebuilding the Navy's Capabilities

In the near future, it will be necessary to conduct studies on the expansion of the Polish Navy's capabilities. Given the fundamental importance of undersea and offshore critical infrastructure to Poland's economy, anti-submarine warfare capabilities, anti-mine capabilities, and the ability to accept equipment and other material resources from allies may be considered particularly important.

10. Territorial Defense Forces and Critical Infrastructure Defense

The training of soldiers of the Territorial Defense Forces should give greater consideration to the defense of various types of critical infrastructure and urban centers so that the burden on operational troops can be relieved.

11. Implementation of the Shield East Program

Given the simulation conducted by the Casimir Pulaski Foundation and the RAND Corporation, the Shield East Program should be considered essential in the context of enhancing Poland's defense capabilities. This initiative is extremely important in light of the experience of the Russian-Ukrainian war. Bearing in mind the scale of destruction, Russian crimes committed against civilians, and attacks on cities and critical infrastructure, any program aimed at preventing the enemy from seizing northeastern and eastern Polish territory should be considered essential. Any Russian occupation would involve significant civilian casualties and the destruction of cities, as the ongoing war in Ukraine demonstrates. The experience of both Russia and Ukraine proves that well-prepared defensive lines can effectively hinder an opponent's ability to conduct offensive operations. The construction of defense infrastructure can be one of the elements of Poland's deterrence system. Poland should cooperate with the Baltic states in this regard, especially in the context of defending the so-called Suwałki Gap.

12. The Need for a Holistic View of State Security, Crisis Management, and the Construction of a Civil Defense System

The experience of Ukraine, where Russia has systematically attacked and destroyed civilian facilities, cities, and elements of critical infrastructure, should make Polish policymakers realize that it is necessary to develop systemic solutions for civil defense and a holistic view of improving state security. Poland is currently unprepared to meet the threats faced by the people of Ukraine. What is needed in this context is both new legislation to fill the gaps in the Homeland Defense Act and practical solutions and plans to prepare the state for a potential conflict. It should be expected that the new legislation will also provide the necessary funding to build infrastructure, such as shelters. Poland should also be prepared to evacuate the population from areas threatened by hostilities. It is also critical to ensure the ability to rebuild or repair damaged critical infrastructure. Polish services should be prepared to counter hybrid and terrorist threats and be equipped with encrypted communications systems. It is also important to emphasize the importance of the civilian health care system, which should be prepared for a possible conflict so that irreparable losses can be minimized by providing effective medical care for the injured.

Endnotes

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