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## PRODUCT AND PURCHASING STRATEGY OF EQUIPMENT AND ARMAMENTS OF THE POLISH ARMED FORCES


**ABSTRACT:** The current political situation in the world, marked by the conventional military conflict between Russia and Ukraine, growing contradictions and the desire to redefine the international order obviously translate into increased interest in the armaments market. The authors undertook to work out the issue related to the definition of a new battlefield, factors determining the demand for weapons. This topic is particularly relevant at the time of the current events beyond Poland's eastern border. Military threats resulting from the geographic location and neighborhood of Poland clearly place us as an important, geostrategic player. Only a modernly equipped army is able to ensure the security and integrity of its borders and this modern equipment should be produced domestically as much as possible. The questions that the article tried to answer concern the following: what product and purchase strategy should be implemented by the Polish Armed Forces to face current and future threats? And what should be the direction of implementation of equipment and armaments based on the most modern solutions for production. Therefore, four concepts of building a strategy and the conditions determining its development were presented, in particular from the angle of the Russian-Ukrainian war.

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**KEYWORDS:** armaments market, strategy, trends

## INTRODUCTION

The political transformation in Poland at the turn of the 1980s and 1990s, the dissolution of the Warsaw Pact and the subsequent collapse of the Soviet Union created a completely new situation in Central and Eastern Europe, thus Poland had to redefine its security policy. Back in 1989, Poland's neighbors were only the countries of the Eastern Bloc: the Soviet Union, Czechoslovakia and the German Democratic Republic. Until 1994, none of them survived. Due to the changes made, Poland now neighbors the Russian Federation (Kaliningrad District), Lithuania, Belarus, Ukraine, Slovakia, the Czech Republic and the united Federal Republic of Germany. In 2004, four of these countries were already Poland's NATO allies (Lithuania, Slovakia, the Czech Republic and Germany), while Ukraine maintained a friendly neutrality, leaving the suspension between the East and the West (the Budapest Memorandum). The other two, the Russian Federation and Belarus, remained in only correct relations. It is Russia or the Union State of Russia and Belarus (USRB<sup>1</sup>) that potentially represents the greatest military threat to Poland<sup>2</sup> (Table 1). The unstable situation in Ukraine also does not ensure security. From a country surrounded by allies, Poland has practically become a front-line state on the external border of NATO.

Table 1.

List of selected categories of military potential of the countries bordering the Republic of Poland at the beginning of 2022.

State	Military budget (in M USD)	Rank
Russian Federation	154 000,0	2
Belarus	723,1	52
Ukraine	11 870,0	22
Germany	50 300,0	16
Poland	14 500,0	24
Czechia	3 262,9	41

<sup>1</sup> USRB – Union State of Russia and Belarus

<sup>2</sup> A. Wilk, Rosyjska Armia Białoruska. Praktyczne aspekty integracji wojskowej Białorusi i Rosji, Raport OSW, marzec, Warszawa 2021, ISBN 978-83-65827-62-3.

Slovakia	2 092,0	60
Lithuania	1 145,7	85

Source: Countries Ranked by Military Strength, <http://www.globalfirepower.com/countries-listing.asp>, (21.04.2022)

The transformations of the 1980s/90s turned out to be a serious challenge for the Polish Armed Forces. The problems that were to be faced resulted mainly from: the current, outdated defense doctrine, not a very transparent command structure, low-quality weapons and insufficient mobility reflected the image of the Polish Armed Forces<sup>3</sup>. According to the doctrine in force at the time, the army was to be ready to repel a potential attack from any direction. Joining NATO and the EU was assumed to strengthen Poland's position in the region: politically, economically and militarily. NATO membership provided a solid foundation for security based on an alliance with the military and economic powers of Europe and the world. Participation in many international missions has created opportunities for the Polish Armed Forces to gain valuable experience in the field of cooperation with coalition partners and also (or perhaps above all) led to the definition of the most important modernization needs of the command structures, the quality of armaments and the increase in the operational capabilities of the types of troops. The changes initiated at that time led to the adoption of further programs of technical modernization<sup>4,5,6</sup> as well as the program of Professionalization of the Armed Forces of the Republic of Poland<sup>7</sup>. Those programs defined financing that was crucial for determining the priority for development and modernization of the defense needs of the Republic of Poland and transformed the Polish Armed Forces into a professional army.

The purpose of this article is to outline the product and purchasing strategy of the Polish Armed Forces in relation to the new battlefield resulting from forecast scenarios of threats. These threats can be divided into military and non-military threats. Our field of interest includes military threats, the source of which may have various grounds: political, economic and social

<sup>3</sup> K. Mazurek, R. Ciastoń, P. Fleischer, G. Rdzanek, Siły Zbrojne RP – stan, perspektywy i wyzwania modernizacyjne, Pułaski dla Obronności Polski, Warszawa 2014, p. 11.

<sup>4</sup> Ustawa z dnia 25 maja 2001 r. o przebudowie i modernizacji technicznej oraz finansowaniu Sił Zbrojnych Rzeczypospolitej Polskiej, (Dz.U. 2001 nr 76 poz. 804)

<sup>5</sup> Centrum Operacyjne Ministra Obrony Narodowej, Plan Modernizacji Technicznej do 2026 r. Wybrane Zadania, <https://www.wojsko-polskie.pl>, (accessed: 19.06.2022).

<sup>6</sup> Ministerstwo Obrony Narodowej, Modernizacja techniczna SZRP, <https://www.gov.pl/web/obrona-narodowa/modernizacja-techniczna-szrp>, (accessed: 17.06.2022).

<sup>7</sup> Ministerstwo Obrony Narodowej, Program Rozwoju Sił Zbrojnych RP, <https://www.gov.pl/web/obrona-narodowa/program-rozwoju-sil-zbrojnych-rp>, (accessed: 19.06.2022).

(demographic)<sup>8</sup>, as illustrated by the war between Russia and Ukraine. It also launched a number of initiatives, persuaded many countries to revive European defense cooperation<sup>9</sup>, and strengthened the industrial and technological base of the defense sector<sup>10,11</sup>. The European Defense Agency (EDA) has announced that it will review its military spending structures and investment gaps<sup>12</sup>. It is exemplified by Poland and Germany. In Poland, in 2017, the Program for the Development of the Armed Forces of the Republic of Poland was announced with the development and specification of its content in the form of a package of the so-called derivative plans (essential and supplementary), including the publication of the Technical Modernization Plan for 2017-2026<sup>13</sup>. The Federal Republic of Germany announced in early 2022 a military spending priority plan that would create a “special fund” to better equip the Bundeswehr<sup>14</sup>. In turn, the Dutch Ministry of Defense said it will quickly allocate EUR 450 million to the purchase of ammunition for restocking. The decision to speed up the order was taken because of what the Defense Ministry described as “a tightening ammunition market due to the current security situation”<sup>15</sup>. The war in Ukraine and the threat posed by Russia also emphasize the urgent need to modernize the equipment and thus increase funding of virtually every army of the countries in this region<sup>16</sup>. Individual countries not only increase or prioritize expenditures but also introduce legislative and administrative changes to support building a strong protection of their own and those around them. It also conditions the aforementioned technical modernization of the Polish Armed Forces.

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<sup>8</sup> Departament Zwierzchnictwa nad Siłami Zbrojnymi, Aspekty bezpieczeństwa militarnego w ujęciu Strategicznego Przeglądu Bezpieczeństwa Narodowego, <https://www.bbn.gov.pl>, (accessed: 10.06.2022).

<sup>9</sup> G. Gressel, N. Witney, Out of the dark: Reinventing European defence cooperation, European Council on Foreign Relations, 18 March 2022, <https://ecfr.eu/article/out-of-the-dark-reinventing-european-defence-cooperation/>, (accessed: 19.06.2022).

<sup>10</sup> CzDefence, Amos will help the Czech defense industry, Czech Army and Defence Magazin, <https://www.czdefence.com/article/amos-will-help-the-czech-defense-industry>, (accessed: 10.06.2022).

<sup>11</sup> MEMO, Defence Industry Strategy, Netherlands Ministry of Defence and the Netherlands Ministry of Economic Affairs and Climate Policy, November 2018.

<sup>12</sup> J. Borrell, The war in Ukraine and its implications for the EU, [https://www.eeas.europa.eu/eeas/war-ukraine-and-its-implications-eu\\_en](https://www.eeas.europa.eu/eeas/war-ukraine-and-its-implications-eu_en), (accessed: 10.06.2022).

<sup>13</sup> Ministerstwo Obrony Narodowej, Program Rozwoju Sił Zbrojnych RP, <https://www.gov.pl/web/obrona-narodowa/program-rozwoju-sil-zbrojnych-rp>, (accessed: 1.07.2022).

<sup>14</sup> A. Jarecka, Niemiecka prasa o funduszu dla Bundeswehry: „nakaz chwili”, Deutsche Welle, 31.05.2022, <https://www.dw.com/pl/niemiecka-prasa-o-funduszu-dla-bundeswehry-nakaz-chwili/a-61980227>, (accessed: 1.07.2022).

<sup>15</sup> DEFENCE BRIEF, Dutch MoD accelerates ammunition buy citing ‘tightening’ market, By Defense Brief Editorial, 29 April 2022, <https://defbrief.com/2022/04/29/dutch-mod-accelerates-ammunition-buy-citing-tightening-market/>, (accessed: 19.06.2022).

<sup>16</sup> P. Bednarz, Po ataku na Ukrainę Europa zbroi się na potęgę...”Business Insider”, 18 marca 2022, p. 3.

## THEORETICAL APPROACH

The starting point for building defense potential by purchasing armaments and military equipment is the determination of the future battlefield, i.e. the probability and strength of a given threat and resistance to it. The military's product and purchasing strategies can be created by various approaches. The article uses the division developed by K. Obłój<sup>17</sup>.

The first is a planning school which defines strategies as a process of long-term goals and tasks and the resulting implementation projects. Strategy development takes place in a cycle from planning challenges to general goals and objectives. The three main instruments for strategic planning are (1) forecasting, (2) planning, (3) programming and budgeting. Forecasting, in the case of building a defense potential, including purchasing plans, is based on the extrapolation of trends or scenarios<sup>18</sup>. It assumes that because trends are easy to detect and analyze, they must be precise and then, on the basis of them, you can shape the future in a rational and orderly manner. The group responsible for creating the long-term action plan is top management. This practice dominates the Polish defense sector. It is, among others, the result of a long procedure of acquiring equipment and weapons, the product life cycle<sup>19</sup>.

It has to be remembered that forecasting is different from making pictures of the future<sup>20</sup>. Classic examples of such an approach are presented by H. Kahn<sup>21</sup> and A.J. Weiner<sup>22</sup> and Global Trends<sup>23 24 25 26</sup>.

Second: an evolutionary approach conditioned by the process of partial changes during which a pattern of action is formulated that is repeated over time. The goals in this system are

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<sup>17</sup> K. Obłój, *Strategia organizacji*, wyd. 3 zm., PWE, Warszawa 2014.

<sup>18</sup> *Strategiczny Przegląd Bezpieczeństwa Narodowego, Główne Wnioski i Rekomendacje dla Polski*, BBN, Warszawa 2012, <https://www.bbn.gov.pl/ftp/dok/WNIOSKISPBN.pdf>, (accessed: 1.07.2022).

<sup>19</sup> A. Nowakowska-Krystman, *Zarządzanie strategiczne przedsiębiorstwem zbrojeniowym w aspekcie zmian*, Akademia Sztuki Wojennej, Warszawa 2018, p. 101-106.

<sup>20</sup> G. Ringland, *Scenario Planning. Managing for the Future*, John Wiley & Sons, Chichester, 2006, pp. 13-14.

<sup>21</sup> H. Kahn, *The Next Two Hundred Years: A Scenario for America and the World*, William Morrow & Company, New York, 1976.

<sup>22</sup> H. Kahn, A.J. Weiner, *The Year 2000: A Framework for Speculation on the Next Thirty-Three Years*, Macmillan Publishing Company, New York, 1967.

<sup>23</sup> *Global Trends, Paradox of Progress*, NIC 2017-001, January 2017, <https://www.dni.gov/files/documents/nic/GT-Full-Report.pdf>, (accessed: 4.06.2022).

<sup>24</sup> *Global Trends 2025, Transformed World*, NIC 2008-003, November 2008. [https://www.files.ethz.ch/isn/94769/2008\\_11\\_global\\_trends\\_2025.pdf](https://www.files.ethz.ch/isn/94769/2008_11_global_trends_2025.pdf), (accessed: 4.06.2022).

<sup>25</sup> *Global trends 2030, Alternative Worlds*, NIC 2012-001, December 2012, [https://www.dni.gov/files/documents/GlobalTrends\\_2030.pdf](https://www.dni.gov/files/documents/GlobalTrends_2030.pdf), (accessed: 4.06.2022).

<sup>26</sup> *Global Trends 2040, A More Contested World*, The Strategic Futures Group National Intelligence Council, NIC 2021-02339, March 2021, [https://www.dni.gov/files/ODNI/documents/assessments/GlobalTrends\\_2040.pdf](https://www.dni.gov/files/ODNI/documents/assessments/GlobalTrends_2040.pdf), (accessed: 4.06.2022).

not clear and the decisions taken reflect the system of power rather than deliberate action. Strategies are generated reactively, not proactively. In this way, history plays a huge role in shaping invisible strategic limitations. The evolutionary approach to creating the future, where the assumption is the adaptation and learning process, limited rationality (H. Simon), domination of decision-making heuristics (D. Kahneman and A. Tversky<sup>27</sup>), also seems to be a necessary approach to purchasing of military equipment. Scenario-based thinking should not be included in a rigid planning process, as it is an emerging and spontaneous process<sup>28</sup>. So how to plan purchases, the implementation process of which takes many years?

The third approach is to approach the strategy as building a long-term position that ensures an advantage, therefore the essence of it is to look for sources of advantage<sup>29</sup>. It is built on the basis of a formalized nature, in relation to the environment and stakeholders<sup>30</sup>, therefore the degree of freedom of decisions is limited. It is important in formulating product and purchasing strategies due to the assessment of the importance of key stakeholders, in the form of ministries that are market regulators and often owners; armed forces (clients), consortium members<sup>31</sup>. Its drawback is the underestimation of non-material factors.

The fourth concept means building a strategy based on unique resources, skills and key competences<sup>32</sup>. The most valuable assets are then the intangible resources because they serve to create value significant from the point of view of the beneficiaries. They can be used in many fields, are difficult for opponents to imitate and they evolve along with being used. The resources and skills constituting the basis for building key competences must be valuable, rare, difficult to imitate ('path dependence', 'casual ambiguity') and well organized<sup>33</sup>. When analyzing the available reports, it can be seen that currently a lot of space is occupied by the

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<sup>27</sup> D. Kahneman, A. Tversky, Prospect Theory: An Analysis of Decision under Risk, *The Econometric Society „Econometrica”*, XLVII (1979), pp. 263–291.

<sup>28</sup> H. Mintzberg, The Fall and Rise of Strategic Planning, *Harvard Business Review* January\_February 1994, [https://www.theism.org/documents/Mintzberg\(1994...\)](https://www.theism.org/documents/Mintzberg(1994...)) (accessed: 31.01.2022).

<sup>29</sup> M.E. Porter, *Competitive Strategy. Techniques for Analyzing Industries and Competitors*, Simon and Schuster, 2008, ISBN 1416590358, 9781416590354.

<sup>30</sup> E. Freeman, J. McVea, A stakeholder approach to strategic management, [in:] *Handbook of Strategic Management*, (eds.) M. Hitt M., Blackwell Publishing, Oxford 2011, p. 56.

<sup>31</sup> A. Nowakowska-Krystman, *Zarządzanie strategiczne przedsiębiorstwem ... op. cit.*, pp. 36-40, 110-120.

<sup>32</sup> J. Gryz, A. Nowakowska-Krystman, Ł. Boguszewski, *Kluczowe kompetencje systemu bezpieczeństwa narodowego*, Difin, Warszawa 2017.

<sup>33</sup> A. Nowakowska-Krystman, *Determinanty sukcesu systemu obronnego państwa w świetle teorii zasobowej*, Akademia Obrony Narodowej, Warszawa 2014.

issue of resources and capabilities, both in relation to the armed forces and the defense industry<sup>34, 35</sup>.

The authors assume that only a properly mixed approach, taking into account the above-mentioned approaches, makes it possible to adapt to the changing environment. The predicted scenarios of the development of threats as to the future shape of the battlefield affect the directions of the ongoing technical modernization of the armed forces.

**FACTORS CONDITIONING PRODUCT AND PURCHASE TRENDS FOR MILITARY EQUIPMENT AND WEAPON**

**HAZARD AREAS ANALYSIS**

Currently, the threats are global and constitute a challenge for all countries, although their degree may vary depending on the geographic location. Their analysis shows that the most serious ones that may occur in the next 10 years concern environmental, then societal, economic and geopolitical areas<sup>36</sup>. Another category, risks that worsened the most since the start of the COVID-19 crisis, points to: social cohesion erosion, livelihood crises, climate action failure, mental health deterioration, extreme weather (Table 2).

Table 2.

Risks that worsened the most since the start of the COVID-19 crisis

Rank	Risk
7	Cybersecurity failures
9	Digital inequality
12	Geoeconomic confrontations
15	Interstate relations fracture
20	Adverse tech advances
21	Tech governance failure
22	Geopolitical resource contestation
23	Digital power concentration
28	Interstate conflict

Source: The Global Risk Report 2022, 17<sup>th</sup> Edition, insight report, World Economic Forum 2022, <https://www.weforum.org/reports/global-risks-report-2022>, p. 24.

<sup>34</sup> Defence National Manufacturing Priority, Road map, Australian Government, Commonwealth of Australia 2021. p. 5-6.

<sup>35</sup> Lowy Institute, Asia Power Index, 2021 Edition, <https://power.lowyinstitute.org>, (accessed: 19.06.2022).

<sup>36</sup> The Global Risk Report 2022, 17<sup>th</sup> Edition, insight report, World Economic Forum 2022, [https://www3.weforum.org/docs/WEF\\_The\\_Global\\_Risks\\_Report\\_2022.pdf](https://www3.weforum.org/docs/WEF_The_Global_Risks_Report_2022.pdf), p. 14, (accessed: 1.06.2022).

The multifaceted nature of threats and ensuring a sense of security forces decision-makers to cooperate within international institutions which are able to face such challenges. It is because they have at their disposal appropriate instruments and capabilities, impossible to be achieved by a single state or institution. The dynamic changes taking place in the sphere of the sense of security as a result of contemporary threats analysis have led to the adoption of a dichotomous division of threats into military and non-military threats. Due to the discussed topic, we are interested in the areas that determine the purchases of military equipment. These purchases, being a reaction to the anticipated threats, must take into account the capacity building of the armed forces: (1) the ability to command, (2) the ability to recognize, (3) the ability to destroy, (4) the ability to survive and protect troops (5) the ability to provide logistical support for operations, (6) the ability to support a non-military system in conditions of non-military threats<sup>37</sup>. Russia's aggression against Ukraine has convinced the leaders of many European countries, including Poland, to expand their armed forces and defense industry. In doing so, they should initially focus on capacity gaps and readiness for action.

New and emerging forms of warfare pose unforeseen threats. For example, cyber warfare and utilization of data to attack populations could dismantle countries and cause conflict almost instantaneously. The war in Ukraine has shown the great power of the impact of cyberattacks on the activities of the army and the functioning of the state. Cybersecurity failure has been ranked among the top 10 most likely risks to the world today<sup>38</sup>.

The product and purchase strategy is also conditioned by logistics and stock levels (control of stocks, their replenishment or expansion, including new equipment). The budgets for both the military and services related to the protection of individual areas have increased or are announced to increase. When planning defense spending, the key issues are the capabilities of the domestic industry, its powers, technological capabilities and resources that guarantee greater security of supply, less vulnerable to supply chain disruptions and political factors. However, human and competency resources are extremely important for maintaining supplies and developing technologies.

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<sup>37</sup> W. Zakrzewski, "Wojskowe wsparcie układu pozamilitarnego w sytuacji zagrożeń niemilitarnych," *Studia Administracji i Bezpieczeństwa* nr 3/2017, p. 170.

<sup>38</sup> N. Routley, "Mapped: All the World's Military Personnel, Politics," 11.03.2022, <https://www.visualcapitalist.com/wp-content/uploads/2022/03/military-personnel-by-country-full.html>, (accessed: 9.06.2022).



The key to defense is continuity of supply and minimizing the risks associated with disruptions in the supply chain, in particular strategic raw materials, energy and spare parts. This was demonstrated by both the pandemic and the Russo-Ukrainian war. The Russian Federation is a significant exporter of many of the 35 critical minerals<sup>39</sup>. Another problem is the time it takes to produce military equipment and armaments. It lengthens when supply chains are broken. It is worth noting that the Russian-Ukrainian conflict is transforming defense trade and changing procurement priorities in a way that may favor non-traditional suppliers<sup>40</sup>. Competition also increased, including internal competition for strategic raw materials (e.g. steel, energy carriers, grain) within the EU, NATO or in individual regions.

The defense of the state is also influenced by the protection of critical infrastructure<sup>41</sup>. It aims to ensure the availability of key goods and services. These include energy, transport and medical care. Critical infrastructure relates not only to buildings and installations but also to systems and services in the broadest sense of the word. Power outages, logistical problems or the lack of hospitalization can cause serious damage to the economy and seriously weaken the population. The protection of critical infrastructure includes not only the physical protection of facilities important for the security of the state but also technical, organizational and legal measures, the purpose of which is, if possible, to prevent such failures or, in the event of an accident, to quickly restore functional efficiency. The appropriate product and purchase strategy for military equipment and armaments will have a significant impact on its improvement. The scope of critical infrastructure protection was specified in the National Critical Infrastructure Protection Program published in 2013 by the Government Center for Security<sup>42</sup>.

## **ASSUMPTIONS OF THE IMAGE OF THE FUTURE FIGHT AREA**

The conduct of military conflicts is based on the following assumptions: (1) a large range of activities carried out on land, at sea, in the air as well as in the information space and

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<sup>39</sup> J. Kilpatrick, Supply chain implications of the Russia-Ukraine conflict, 25 March 2022, <https://www2.deloitte.com/xe/en/insights/focus/supply-chain/supply-chain-war-russia-ukraine.html> (accessed: 9.06.2022).

<sup>40</sup> A. Sreekumar, How the Russia-Ukraine War Is Reshaping Defense Trade, *The Diplomat*, 24 March 2022, <https://thediplomat.com/2022/03/how-the-russia-ukraine-war-is-reshaping-defense-trade/>, (accessed: 9.06.2022).

<sup>41</sup> W. Lidwa, *Ochrona infrastruktury krytycznej*, AON, Warszawa 2012, p. 15.

<sup>42</sup> *Narodowy Program Ochrony Infrastruktury Krytycznej. Standardy służące zapewnieniu sprawnego funkcjonowania infrastruktury krytycznej – dobre praktyki i rekomendacje, załącznik 2*, Warszawa 2015, p. 8.

cyberspace, (2) the use of weapons with high precision and destruction efficiency, (3) conducting special operations, (4) robotization of the battlefield, (5) using modern non-kinetic weapons, (6) adapting methods of asymmetric conflict and indirect actions, (7) managing all entities involved in the conflict in real time through a unified information platform, (8) using modern means of communication and means of reconnaissance and radio-electronic warfare, (9) a significant share of armed irregular formations, (10) that the enemy's (military, economic) potential will be reduced or eliminated as part of precise, quick and simultaneous attacks on critical infrastructure throughout its territory. The end of the asymmetric conflict in Afghanistan resulted in a reform of the armed forces, assuming the possibility of implementing a full-scale scenario with a technically advanced enemy<sup>43</sup>. The war in Ukraine redefined these assumptions. Until its outbreak, it was assumed that the clashes between elements with high mobility would be non-contact and that the commencement of military operations would take place without a formal declaration of war<sup>44,45</sup>. The Russian invasion of Ukraine, focusing primarily on the actions of the ground forces, may herald further changes in the way the war is conducted, starting with new tactics and ending with equipment<sup>46</sup>. First, future conflicts of this magnitude will require Large Scale Combat Operations. Secondly, the army must be able to fight in a situation where it deals primarily with Non-Linear and Discontinuous Operations, i.e. to act effectively in the reality when there is no front or it is fragmented, intermittent, discontinuous and rapidly changing. Third, it is necessary to "learn" to fight in cooperation with hybrid partners and against forces of the same nature<sup>47</sup>. In this case, it is about the participation in the war of many different formations with a different combat culture and a different tactical approach, from allied special forces to voluntary, irregular, mercenary formations or territorial defense.

Traditional combat, resulting from the activities of regular formations, requires enrichment, e.g. surprise effect (regular actions are predictable). Predictability is the result of material

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<sup>43</sup> Ł. Pacholski, FLRAA odpowiedzią na potrzeby pola walki przyszłości? Zespół Badań i Analiz Militarnych, 21 lipca 2021, <https://zbiam.pl/flraa-odpowiedzia-na-potrzeby-pola-walki-przyszlosci/> (accessed: 9.06.2022).

<sup>44</sup> A. Nowakowska-Krystman, L. Elak, A. Orzyłowska, Potencjał obronny i potencjał zagrożeń w świetle testu animalizacji, ASzWoj, Warszawa 2018.

<sup>45</sup> P. Ochmann, Prawne implikacje wybranych elementów terminu „wojna hybrydowa”, *Studia Prawa Publicznego* 2019 nr 4 (28)

<sup>46</sup> J. Stavridis, What the U.S. Military Needs to Learn from the Ukraine War, *TIME*, <https://time.com/6165506/military-strategy-ukraine-war/>, (accessed: 9.06.2022).

<sup>47</sup> J. K. Greer, LSCO Lessons: what the army should be learning about large-scale combat operations from the Ukraine war, Modern War Institute-at West Point, 24.06.2022r., <https://mwi.usma.edu/lSCO-lessons-what-the-army-should-be-learning-about-large-scale-combat-operations-from-the-ukraine-war/>, (accessed:28.06.2022).

resources (means of combat) but also non-material resources in the form of a specific structure, doctrine, regulations and instructions<sup>48</sup>. Conventional forces based on land forces (armored, mechanized, heavy artillery) should be supplemented with special forces and light infantry. The mobility of the modern battlefield for artillery units is to be ensured, for example, by the 120 mm mortar system by Hirtenberger and ST Engineering (“shoot and run quickly”)<sup>49</sup>. It is also indispensable to develop reconnaissance and fire systems that allow for non-contact operations, significantly improving the effectiveness of special and light forces operating against heavily armored combat formations.

One of the foundations of defense in Poland is to be the Territorial Defense Forces<sup>50</sup>. The main role of Territorial Defense Forces is to supplement the combat potential of the operational troops by maintaining general readiness to defend the Republic of Poland. The Crisis Management System of Territorial Defense Forces is aimed at enabling quick and effective help and protection of the population against the effects of natural disasters, liquidation of their effects, protection of property, search operations and saving or protection of human health and life<sup>51</sup>. The armament and equipment of this formation are adapted to the nature of light infantry and importantly, largely produced by the Polish defense industry. Recently, those units received very modern Vis 100 pistols, automatic rifles with a modular design, MSBS Grot, 5.56 mm caliber, version A2, sniper rifles and devices for observation and combat at night, incl. binoculars, goggles and night vision sights, rangefinders and wind meters<sup>52</sup>. Virtually all of the above-mentioned items are produced in Polish defense plants.

Accordingly, the U.S. needs to do far more than simply react to the war in Ukraine and help to rebuild NATO. The challenge is global, and it will increase every year. The real lesson of the war in Ukraine is that the U.S. must now plan to work with its strategic partners indefinitely into the future and in ways that meet both (Russian and Chinese) authoritarian threats<sup>53</sup>.

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<sup>48</sup> A. Nowakowska-Krystman, *Determinanty sukcesu sytemu ...* op. cit.

<sup>49</sup> A. Hawser, *Shoot And Scoot*, Defence Procurement International is published by Trident Publications Limited, 12 June 2018, <https://www.defenceprocurementinternational.com/news/land/st-engineering-and-hirtenberger-collaborate-on-120-mm-mortar-systems>, (accessed: 3.06.2022).

<sup>50</sup> Ustawa z dnia 16 listopada 2016 r. o zmianie ustawy o powszechnym obowiązku obrony Rzeczypospolitej Polskiej oraz niektórych innych ustaw (Dz.U. 2016 poz. 2138)

<sup>51</sup> Wojsko Polskie, *WOT w Systemie Zarządzania Kryzysowego resortu Obrony Narodowej*, <https://www.wojsko-polskie.pl/dwot/wola-wot-w-zk/>, (accessed: 1.07.2022).

<sup>52</sup> M. Kowalska-Sendek, *Lekki sprzęt dla lekkiej piechoty*, Polska Zbrojna 08.09.2021, <http://polska-zbrojna.pl/home/articleshow/35170?t=Lekki-sprzet-dla-lekkiej-piechoty>, (accessed: 11.06.2022).

<sup>53</sup> A.H. Condesman, *U.S. Strategy and the Real Lessons of the War in Ukraine: From Cooperation with Russia and China to Lasting Confrontation*, Center for Strategic & International Studies, March 14 2022

As a result of the analysis of the future battlefield and possible threats, states redefine the assumed purchasing objectives. For example, a review of the Department of Defense (DoD) budget for fiscal year 2022 (FY-22) published in May 2021 revealed that the U.S. military canceled funding for at least 105 procurement programs and also cut funding for further 169 programs. This is to allow an investment of \$ 23.9 billion in the priorities of the army modernization, in particular in the requirements of the “Big Six” in the field of: long-range precision missiles, next-generation combat vehicles, future powered-lift (VTOL -Vertical Take Off and Landing), defense networks air and missile defense and reducing the mortality of soldiers<sup>54,55</sup>.

## TRENDS ON THE MILITARY EQUIPMENT AND ARMAMENTS MARKET

Currently, in the area of military equipment and weapons, we can observe changes in individual domains or product groups. This is related to, inter alia, the analysis of threats and conflicts, the war in Ukraine and the characteristics of the future battlefield. Below are examples of product groups or areas of required features of future armaments and military equipment.

Asymmetric conflicts, often carried out in urban areas, built-up areas, factories, ports, inland waters cause the development of product groups such as robots (combat vehicles) or autonomous systems (land, air, sea - inland). Their important feature is the ability to work with non-autonomous systems as well as the ability to turn off the autonomous system and switch to staff operation. Built-in recognition, communication and command systems with elements of artificial intelligence are also crucial. Their ability to operate in various conditions, carrying more and more cargo also increases. RCVs are becoming a platform for mounting newer and newer types of weapons, increasing their firepower and ability to act. An example of this is the RPV platforms designed and manufactured by the ELTA Systems (IAI) group. They are robust, versatile multi-functional / multi-tasking platforms that support and complement the ground

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<https://www.csis.org/analysis/us-strategy-and-real-lessons-war-ukraine-cooperation-russia-and-china-lasting-confrontation>, (accessed: 3.06.2022).

<sup>54</sup> S.W. Miller, US Army Big Six Requirements and Programmes (Part 1), Armada International, January 18,2022 <https://www.armadainternational.com/2022/01/us-army-big-six-requirements-and-programmes-part-1/> (accessed: 11.06.2022).

<sup>55</sup> A. Drwiega, US Army Big Six Requirements and Programmes (Part 2), Armada International, March 18,2022, <https://www.armadainternational.com/2022/03/us-army-big-six-requirements-and-programmes-part-2/> (accessed: 11.06.2022).

forces, increasing their protection in the conditions of the battlefield. In addition to intelligence, observation, target acquisition and reconnaissance (ISTAR) capabilities, RPVs can provide logistical support by moving platoon equipment, delivering ammunition, and transporting the wounded. They can be operated in manual, remote or standalone mode<sup>56</sup>.

Another example of a trend in the development of the battlefield is the actions of the government in Taiwan. In a possible armed conflict with China, the idea of “asymmetric war” is taken into account, in which Taipei wants to use missiles mounted on vehicles to obtain difficult to attack, mobile armed forces with high firepower. “This is exactly what our armed forces are actively developing” said Taiwan’s President Tsai Ing-wen, pointing to the Kestrel handheld grenade launcher equipped with Taiwan’s Military Gendarmerie protecting key government facilities. Taiwan is also developing other missiles that could reach far into China<sup>57</sup>. Taiwan’s ground forces must have high mobility and modular air defense capabilities in the field to operate without air support<sup>58</sup>.

In addition, in order to build Taiwan’s asymmetric military defense capabilities, the Americans are considering supporting them in terms of ISR (intelligence, surveillance and reconnaissance) systems, short-range air defense, coastal defense, protection against sea mines and cruise missiles. The determinants will be cost effectiveness, mobility, resilience and decentralization of the defense system<sup>59</sup>.

Another example from the market is hardware development in China, where capability development could spur the PLA (People’s Liberation Army of China) to consider new tactics to ensure the success of any amphibious operations against Taiwan. These options could include enforcing an air and naval blockade against Taiwan to prevent other countries from providing assistance to it and using a better air and naval force to block the Taiwan Strait from interference by other countries’ electronic reconnaissance and electronic warfare aircraft.

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<sup>56</sup> Arabian Defence, MCL & IAI awarded MOD RPV experimentation programme contract, Thursday, September 2nd, 2021, <https://www.arabiandefence.com/2021/09/02/mcl-iai-awarded-mod-rpv-experimentation-programme-contract/>, (accessed: 11.06.2022).

<sup>57</sup> B. Blanchard, Analysis-Taiwan studies Ukraine war for own battle strategy with China, SWI, March 9, 2022, <https://www.swissinfo.ch/eng/analysis-taiwan-studies-ukraine-war-for-own-battle-strategy-with-china/47415160> (accessed: 11.06.2022).

<sup>58</sup> Ying-Yu Lin, What the PLA Is Learning From Russia’s Ukraine Invasion, The Diplomat, April 20, 2022, <https://thediplomat.com/2022/04/what-the-pla-is-learning-from-russias-ukraine-invasion/> (accessed: 19.06.2022).

<sup>59</sup> J. Grevatt, Ukraine conflict: US sharpens focus on bolstering Taiwan asymmetric capability, JANES, 15 MARCH 2022, <https://www.janes.com/defence-news/news-detail/ukraine-conflict-us-sharpens-focus-on-bolstering-taiwan-asymmetric-capability>, (accessed: 11.06.2022).

Therefore, Taiwan's ground forces must have high mobility and modular air defense capabilities in the field to be able to defend themselves effectively, despite the enemy gaining air dominance<sup>60</sup>.

An example of the direction of air defense development is the Israel Aerospace Industries (IAI) project which developed the first electronic warfare (EW) system that can simultaneously counter multiple threats from different frequencies and directions<sup>61</sup>.

The trend in armament, which manifests itself in all domains and is expected by the military, is associated with such features of the new weapons as: greater firepower, greater accuracy and greater range of operation. In heavy combat vehicles, we can observe an increase in the caliber of weapons and greater possibilities of installing additional weapons, e.g. laser weapons. It is also important to better recognize the surroundings during the night and during the day, faster, uninterrupted communication and a reduction in the number of staff to operate. In the case of light land vehicles, the directions of development are: greater mobility, dual propulsion systems, reduction of combustion allowing to increase the range and reduce the impact of logistics, multi-functionality - multi-tasking of the equipment and the possibility of installing various additional weapon systems. A novelty on the market, presented in 2021, are electric and hydrogen-powered unmanned ground vehicles that can carry out observation and reconnaissance missions, as well as transport soldiers and cargo<sup>62</sup>. Electronic firefighting systems play an important role in this armament segment, e.g. the improved integrated SAMSON RWS All-in-One 30 by Rafael. It provides combat vehicles with MBT-level protection and mission-relevant firepower without compromising mobility. A fire control system with advanced image processing enables fast and accurate target acquisition, while the Head Out function provides situational awareness<sup>63</sup>.

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<sup>60</sup> Ying-Yu Lin, What the PLA Is Learning From Russia's Ukraine Invasion, *The Diplomat*, op. cit.

<sup>61</sup> Using EW to detect and disrupt multiple threats, *Defence Procurement International* is published by Trident Publications Limited, 11 November 2021, <https://www.defenceprocurementinternational.com/news/land/scorpius-ew-simultaneously-targets-multiple-threats-from-different-frequencies-and-directions>, (accessed: 11.06.2022).

<sup>62</sup> A. Chandra, New Unmanned Ground Vehicles Break Cover at ADEX, *Defence Procurement International* is published by Trident Publications Limited, 21 October 2021, <https://www.defenceprocurementinternational.com/news/land/new-unmanned-ground-vehicles-break-cover-at-adex>, (accessed: 19.06.2022).

<sup>63</sup> Rafael Advanced Defense System LTD, Samson™ 30 RWS All-in-One Solution <https://www.rafael.co.il/worlds/land/samson-tm-30-rws-all-in-one-advantage/>, (accessed: 19.06.2022).

These capabilities enable the SAMSON RWS All-in-One System to transform a light vehicle into a lethal combat vehicle on a par with a regular tank<sup>64</sup>.

An example of the development trend of missile weapons seems to be the RALAS missile system, classified as a tactical support system for infantry operations, the basic device of which is a modern self-propelled missile. The RALAS system is designed to isolate the battlefield and anti-tank combat<sup>65</sup>. It can be used for short distances (up to 9 km) against fortifications and command posts. Placed on a suitable platform, it will strengthen the firepower of helicopters, armored vehicles, small ships and fast patrol boats<sup>66</sup>. Another solution is the new version of the Pinaka missile system that has been successfully tested by DRDO<sup>67</sup> and the Indian Army. Thanks to these tests, the missile system is ready for serial production by, more importantly, a national industry partner<sup>68</sup>.

The US Army will continue to develop a system of active protection Iron Fist Light by Israel Military Industries (IMI' Hard-kill Active Protection System) for the Bradley combat vehicle. Iron Fist Light uses independent optical sensors, tracking radar, launchers and counter-ammunition to defeat threats at a safe distance from defended combat vehicles. The system provides 360 ° close-range protection in both open and urban environments<sup>69</sup>.

As part of the vision of the British Army Future Soldier, an approach to the electrification of the battlefield for the next 15 years was presented. It will focus on increasing the use of batteries, sustainable energy and hybrid electric drive technologies across the entire vehicle fleet. Electric vehicles will enable significant advances in stealth mode capabilities thanks to their reduced thermal and acoustic signatures. The transition to vehicle electrification is based on the fact that in the battlefield of the future, military ground capabilities will become

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<sup>64</sup> Defence Procurement International, Rafael Unveils its Enhanced SAMSON 30mm Integrated RWS for Light Vehicles, 8 October 2021, <https://www.defenceprocurementinternational.com/news/land/rafaels-enhanced-samson-30mm-integrated-rws-for-light-vehicle-at-ausa-2021>, (accessed: 9.06.2022)

<sup>65</sup> RALAS - Rocketed Advanced Light Attack System, <https://yugoimport.com/en/proizvodi/ralas-rocketed-advanced-light-attack-system>, (accessed: 9.06.2022).

<sup>66</sup> Defence Procurement International, Yugoimport-SDPR J.P-LAZAR / RALAS ANTITANK MISSILE SYSTEM, 5 February 2019, <https://www.defenceprocurementinternational.com/news/land/yugoimport-sdpr-j-p-ralas-missile>, (accessed: 19.06.2022).

<sup>67</sup> Defence Research and Development Organisation, main agency in the Research and Development Department of the Ministry of Defence of India

<sup>68</sup> A. Świerkowski, Indie stawiają na krajową artylerię rakiętową, 25.04.2022, Defence 24 Polityka obronna, <https://defence24.pl/polityka-obronna/indie-stawiaja-na-krajowa-artylerie-rakietowa>, (accessed: 1.06.2022).

<sup>69</sup> Defence Procurement International, Iron Fight Light APS US Army to proceed with Iron Fist Light for the Bradley Fighting Vehicle, 21 December 2018, <https://www.defenceprocurementinternational.com/news/land/active-protection-system-for-bradley-fighting-vehicle>, (accessed: 7.06.2022).

increasingly “hungry for electricity and its power” with the introduction of initiatives such as new weapons, active protection and an increase in computing. The efficiency and effectiveness of these new capabilities will depend on their ability to power, charge, and maintain them<sup>70</sup>.

The new hybrid Terrex 8x8 Infantry Fighting Vehicle, which ST Engineering affectionately calls “the mothership”, is a modern armored personnel carrier serving as a launch pad for unmanned aerial vehicles (UAVs) and robots. It can be used as a command center on the ground, where smarter surveillance, target acquisition, reconnaissance, targeted energy weapons and newer defense systems can be deployed. The Terrex operating cockpit provides 360 ° observation for full situational awareness and stereo vision for obstacle detection. It is equipped with Automatic Target Detection and Tracking (ATDT) functions to improve combat operations and reduce the cognitive load of the crew<sup>71</sup>.

Vehicle protection systems against various types of missiles, rockets, as well as active camouflage are extremely important.

The group of unmanned combat vehicles, both in reconnaissance, transport and combat versions, is developing strongly. An example is the THEMIS Combat UGV which will be tested by the Royal Thai Army. THEMIS UGV has already been acquired by 12 countries, including several NATO members. In addition to delivering an unmanned vehicle, Milrem Robotics is involved in several system integration projects in collaboration with end users<sup>72</sup>.

In the case of a soldier’s personal equipment, on the example of Ukraine, we can see that the basic protection system is important: a helmet and a bulletproof vest but also modern communication, the ability to see in all conditions (night vision systems). An interesting example of development are the goggles through which soldiers can see the surroundings while being inside the vehicle<sup>73</sup>. In the case of individual weapons, accuracy and range are important. The development of technology in this area concerns electronic sight systems and design changes that allow for a significant increase in range. For the needs of infantry soldiers, the

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<sup>70</sup> Army Be the Best, Army announces battlefield vehicle electrification plans, 17 September 2021, <https://www.army.mod.uk/news-and-events/news/2021/09/army-announces-battlefield-vehicle-electrification-plans/>, (accessed: 7.06.2022).

<sup>71</sup> Defence Procurement International, ST Engineering's Terrex 8x8 IFV Unveiling, 14 February 2022, <https://www.defenceprocurementinternational.com/news/land/st-engineering-terrex-singapore-air-show>, (accessed: 7.06.2022).

<sup>72</sup> Defence Procurement International, TheMis Combat UGV to be Tested by Royal Thai Army, 08 February 2022, <https://www.defenceprocurementinternational.com/news/land/royal-thai-army-takes-delivery-of-a-milrem-robotics-themis-combat-ugv>, (accessed: 7.06.2022).

<sup>73</sup> P. Szoldra, What’s Next In War: US military weapons, gear and tech in 2022, 24 January 2022 Task & Purpose, <https://taskandpurpose.com/news/whats-next-in-war/>, (accessed: 7.06.2022).



parameters of manual anti-aircraft and anti-tank launchers are being improved. We mean range, precision and the ability to operate in bad weather conditions both during the day and at night. The equipment of special forces or reconnaissance troops is also increasingly being used by mini-drones or circulating ammunition<sup>74</sup>. To support the training, training systems are being developed, significantly accelerating it. For example, Indra presents an advanced training solution for urban combat. Indra's VR simulator trains soldiers in complex scenarios, including hybrid warfare<sup>75</sup>. The US Army has placed an order with Microsoft for an augmented reality system on the battlefield. It will be used for both training and combat missions<sup>76</sup>.

In the aviation domain, the most dynamic development concerns the systems of unmanned ships, their ability to cooperate with the current systems of manned facilities, technical capabilities, i.e. operating range, speed, communication, and the possibility of using various subsystems, e.g. observation and combat subsystems. A feature of drones such as payload is rapidly developing. This applies to both the number and type of weapons as well as the ability to perform transport functions (replenishment on the battlefield or delivering medicines or parts in difficult terrain or at long distances)<sup>77</sup>.

The American ground forces plan to test the operation of a drone swarm consisting of as many as thirty aircraft. The task is difficult because unmanned aerial vehicles of different types and with different abilities are supposed to cooperate with each other in an "intelligent" way, additionally taking off from different places and platforms<sup>78</sup>.

Elbit Systems UK will provide autonomous swarms of UAS Vertical Unmanned Aerial Systems (UAS) for the British Army's Robotics and Autonomous Systems (RAS) project. Autonomous UAS swarms will be used for surveillance, with the ability to fly and continuously monitor, scan and detect for up to eight hours<sup>79</sup>. A similar Flyeye reconnaissance and

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<sup>74</sup> H. Królikowski, Amunicja krążąca w siłach operacji specjalnych, *Defence24*, 03.08.2021, <https://defence24.pl/sily-zbrojne/amunicja-krazaca-w-silach-operacji-specjalnych>, (accessed: 19.06.2022).

<sup>75</sup> Defence Procurement International, Indra Unveils Advanced Solution for Urban Warfare Training, 3 November 2021, <https://www.defenceprocurementinternational.com/news/land/indra-vitrix-vr-for-urban-warfare-training> (accessed: 19.06.2022).

<sup>76</sup> A. Hawser, Augmented Reality For US Army, *Defence Procurement International*, 29 November 2018, <https://www.defenceprocurementinternational.com/news/land/microsoft-hololens-for-us-army>, (accessed: 19.06.2022).

<sup>77</sup> Air Force Magazine, USAF Orders 15 Silent Arrow Cargo Delivery Drones for Tactical, Humanitarian Roles, <https://www.airforcemag.com/usaf-orders-silent-arrow-cargo-delivery-drones/>, (accessed: 30.06.2022).

<sup>78</sup> M. Dura, Amerykanie przyspieszają prace nad rojami dronów, *Defence24*, 27.04.2022, <https://defence24.pl/sily-zbrojne/amerykanie-przyspieszaja-prace-nad-rojami-dronow>, (accessed: 19.06.2022).

<sup>79</sup> I.S. Bisht, Elbit Systems to Deliver Surveillance Drone Swarms to British Army, *The Defense Post*, 1 April 2022, <https://www.thedefensepost.com/2022/04/01/elbit-drone-swarms-uk/>, (accessed: 6.07.2022).

observation system is offered by WB Electronics which is successfully used in military operations in Ukraine.

In the case of non-autonomous aircraft, the development concerns the possibility of using new reconnaissance and combat command systems based on artificial intelligence issues, increasing speed (Raider X helicopter), increasing the ability to take other types of weapons, e.g. hypersonic missiles, installing new weapons (laser, drones). Worth mentioning are the pioneering unmanned heavy helicopter flights<sup>80</sup>. Another important factor is the FLRAA (Future Long Range Assault Aircraft) program which is supposed to meet the needs of the advanced battlefield of the future<sup>81</sup>.

The maritime domain, although it may seem not very dynamic in development, is also making significant progress. You can observe such trends as: rearming the current units with drones, weapons or ammunition with a greater, precise range, higher speed in the air and under water. New propulsion systems using e.g. hydrogen fuel are also being developed. In recent years, more and more smaller units have been created, heavily armed, supporting or replacing large units, able to cooperate "in a herd". Autonomous, surface and underwater systems capable of operating 24 hours a day, 7 days a week in almost all weather conditions are developing strongly. These systems mainly operate in the area of reconnaissance and patrolling, but there are more and more armed and combat units<sup>82</sup>. An example of a ship's armament development is the demonstration of the US Navy's equipment which for the first time used a fully electric, high-energy laser weapon to defeat a target representing a subsonic maneuvering missile in flight<sup>83</sup>.

While the new trend is for "ships full of robots" to replace sailors in battle, experts warn that autonomous ships can make it difficult to recreate a seaman's duties and abilities<sup>84</sup>.

By analyzing trends in all domains, it can be concluded that the important features of the future military equipment are the following: mobility, modularity, multi-functionality,

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<sup>80</sup> M. Usidus, Pionierskie bezzałogowe loty ciężkiego śmigłowca, MT News, <https://mlodytechnik.pl/news/30632-pionierskie-bezzałogowe-loty-ciezkiego-smiglowca>, (accessed: 2.06.2022).

<sup>81</sup> Ł. Pacholski, FLRAA odpowiedzią na potrzeby pola walki ... op. cit..

<sup>82</sup> System Amunicji Krążącej WARMATE, <https://www.wbgroup.pl/produkt/system-amunicji-krazacej-warmate/>, (accessed: 22.06.2022).

<sup>83</sup> W. Duffie Jr., Laser Trailblazer: Navy Conducts Historic Test of New Laser Weapon System, America's Navy Office of Naval Research, 13 April 2022, <https://www.navy.mil/Press-Office/News-Stories/Article/2998829/laser-trailblazer-navy-conducts-historic-test-of-new-laser-weapon-system/>, (accessed: 2.06.2022).

<sup>84</sup> P. Verma, The military wants 'robot ships' to replace sailors in battle, The Washington Post, 14 April 2022, <https://www.washingtonpost.com/technology/2022/04/14/navy-robot-ships/>, (accessed: 3.06.2022).

multitasking, greater ability to quickly view omni-directional imaging, increased firepower and impact range, ability to survive and interoperate with other autonomous or manned systems.

## **CONCLUSIONS**

The experience and observations of the battlefield, conflicts of recent years, and especially the wars in Ukraine, make individual countries review the existing weapons, military equipment, its condition and quantity. Purchase plans and planned R&D expenses for the military are modified (the priority is plans enabling faster development of technology versus long-term, costly R&D projects). An example of this is the attitude of Australia, where attention is paid to whether the government is implementing small, smart and cheap projects and not just huge projects of the industrial age. This is because mega projects do not provide significant opportunities within a limited time frame<sup>85</sup>. Therefore, the Technical Modernization Plan of the Polish Armed Forces (in terms of the management of the Product and Purchase Strategy of the Armed Forces) for the years 2021-2035, including the year 2020, which is to be updated every 4 years, which means that the next one should cover the period from 2025 to 2039, due to the war in Ukraine, it should be updated and accelerated in implementation. Its general assumptions were correct, they assumed that the armed forces of the new generation are modern, operationally effective, capable of taking action in any space and time. The culture of combat readiness, the adaptability of structures and equipment to the challenges of the 21st century is key. Demography, urbanization, new technologies and the security situation are of significant importance in the context of the needs of changes in the Polish Armed Forces. The above approach shows a planning approach as well as an evolutionary one. The need to acquire specific competences (competence school) in order to counter the threat (competitive advantage school) is also emphasized.

Analyzing the activities of various countries in the field of the development of military equipment production so far, observing the development trends of individual product groups or technologies, taking into account the nature of contemporary conflicts and wars as well as theaters of operation, the following conclusions can be drawn, which should be included in the modified Product and Purchase Strategy of the Polish Armed Forces:

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<sup>85</sup> M. Hellyer, Defence budget shows signs of a different approach, but is it changing fast enough? Australian Defence Magazine, Australian Strategic Policy Institute, 30 March 2022, <https://www.aspistrategist.org.au/defence-budget-shows-signs-of-a-different-approach-but-is-it-changing-fast-enough/>, (accessed: 3.06.2022).

- Develop and acquire military equipment on the domestic market, maximize the offset and accelerate technology transfers that will allow domestic companies to make a technological leap;
  - Develop and introduce new equipment until it is tested in the short term, bearing in mind the possibility of its quick modification;
    - Acquire, test and develop autonomous, combat and transport equipment, both land, air and sea (including inland);
    - Prepare a comprehensive system of protection, defense and critical infrastructure;
    - Support small and medium-sized enterprises operating in the defense area by including them in the purchasing system and cooperation with the army and services;
    - Build a national supply chain and develop national and regional industrial cooperation;
    - After a national analysis of the industry, its production capacity, capabilities, competences and resources, develop and implement a development plan, in this area adequate to long-term needs. To educate the current employees of the armaments and security sector.
  - Develop innovative hubs, open to all citizens - creating and developing solutions for contemporary defense and state protection needs;
    - Maintain but also develop renovation and modernization capacities. Eliminate deficiencies in the MRO system;
    - Build capabilities and the certainty of securing the needs of equipment and armaments in the event of a prolonged armed conflict;
    - Integrate C4ISR systems, cybersecurity.

The Polish defense industry has recently introduced several important projects that the Polish army should be interested in.

The domestic defense industry market or, more broadly speaking, the defense industry together with the security market is characterized by multi-domain nature and dispersion. It includes both Polish and foreign companies, private and state-owned, small family businesses, groups associating from a few to a dozen or so companies and a large state holding. Despite strong competition at the regional, European or international level, the domestic defense industry offers very high-class services and products in individual product groups. Therefore, we have world-class companies operating in the areas of: cryptography, cybersecurity, C4ISR systems, communications and aviation (including the production of helicopters and many

companies producing components and parts for aircraft), companies in the field of robotics, drones (BSP) and circulating ammunition, anti-drone systems, manufacturers of individual soldier equipment (from shoes to uniform and helmet), camouflage, producers of individual weapons, electro-optics, small and large-caliber ammunition, rocket, weapons mounted on vehicles, aircraft and ships. Poland produces both modern radars and armed vehicles for artillery and air defense. After years of break, we are building ships and units for the Navy. We also have companies that offer equipment and supplies for military units or individual services. In addition to the production sector, we have a significant repair and modernization services sector in the land and air domain. Although in many cases the production is small or currently insufficient, it is in line with the current development trends of the selected military equipment and meets the modernization needs of various services and armed forces of both Poland and other NATO countries.

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