Marek MADEJ[1]
University of Warsaw, Poland
ORCID: 0000-0003-1266-2565

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IMPLICATIONS OF THE UNMANNED AND AUTONOMOUS WEAPONS' DEVELOPMENT FOR NATO FUNCTIONING – DELINEATING THE RESEARCH AREA[2]

INTRODUCTION: ALLIANCES-TECHNOLOGY NEXUS

In the last few decades, almost no other emerging technology introduced to military operations has caused as much enthusiasm and controversies among researchers and military practitioners as drones – unmanned military vehicles, particularly in armed (combat) versions.[3] For many, their use on the battlefield was a harbinger of the future evolution of warfare, directed at reducing human losses by fighting parties (although primarily among their own personnel) simultaneously with the increase in operational effectiveness (Schwing, 2007; White, 2017). Others have seen drones primarily as a technical, moral, and ethical challenge and – consequently – maybe even a threat to the principles and logic of International Humanitarian Law – IHL (Schulzke, 2017). Drone enthusiasts stressed their operational advantages, particularly visible in the case of Unmanned Aerial Vehicles (UAVs), namely higher precision of attacks and poten-

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[3] Usually, unmanned vehicles (drones) are understood as crew-less vehicles or military platforms, remotely controlled (unmanned systems) or able to act autonomously (autonomous systems), which, unlike guided air rocket missiles or the so-called loitering munition, can serve many functions, not only kinetic one (reconnaissance, communication, homing, etc.). Moreover, they can be used at any time due to the ability to return to the base after completing the operational task. Currently, however, that interpretation has slightly changed due to the quick growth in use in combat (particularly in the conflict in Ukraine) of so-called loitering ammunition ("one-time" unmanned missiles or vehicles, controlled remotely or with various levels of autonomy, but able to identify and engage the target independently) and highly similar "kamikaze drones" (also unmanned and able to engage independently, but less capable in context of target identification and location, often pre-programmed before the start to reach defined target). As a result, the term "drone" is commonly used to describe all these categories. Drones can be used in any operational environment (the land, the water, the air), although currently – mainly due to technological and operational reasons – aerial vehicles (UAVs) are the most advanced and most employed (Kreps, 2016: 21–24; Bode, Huelss, 2022: 18–20).

tially higher level of humanitarian standards in operations (thanks to their ability to loiter for a long time in the area and therefore to improve target recognition), but lower costs of production and use (also due to the lack of necessity to ensure the safety of a crew). Concerns, however, were raised primarily by the foregoing practices in the operational use of Unmanned Combat Aerial Vehicles – UCAVs, especially by the countries pioneering these technologies – the USA and Israel – which employ them frequently for so-called targeted and extrajudicial killing of people suspected of being involved in terrorist activities, often doing it on the territories of other states or densely populated areas (Barela, 2015; Enemark, 2021). Some weaknesses, however, of that kind of combat system that started to manifest gradually during operations (i.e., their limited speed and high reliance on communication lines, both due to the necessity of being remotely controlled by the operator) ultimately spurred the discussion on the need of further development of unmanned technologies, including equipping them with some form of autonomy in decision-making.[4] That would eliminate or reduce the majority of their current deficiencies, but simultaneously, however, even deepen concerns over complex legal issues generated by such an autonomy as well.

The impact of technological advances on warfare – with the current "unmanned revolution" as one of its examples – has been known and analyzed for a long time. For many researchers, technology constitutes the most important determinant of warfare evolution (Buzan, 1987; Lantis, 2016; Madej, 2023). In recent decades, with the growing dependency of societies on modern technologies, mainly being the result of information revolutions, the tendency to stress the relevance of technological development in shaping armed conflicts and warfare has further increased, what is evidenced by the rich and quickly expanding literature on Revolution in Military Affairs and – particularly in the US – on so-called Second and Third Offset Strategies.[5]

However, the relations between the technological progress in military science and the creation, functioning, and collapse of alliances is much less researched. It is quite surprising considering the fact that alliances are both one of the oldest and one of the most popular forms of institutional cooperation in the security and defense realm, and the new technologies, by offering the allies alternative options of building their own

[4] A fully autonomous system (*human out of the loop*) is one that, once deployed, is able to operate on its own – that is, with no interference from human operator or supervisor. Lethal Autonomous Weapons System (LAWS) is a system that, after activation, can select and engage targets without further intervention by a human operator. A human-supervised autonomous weapon system (*human on the loop*) is also an autonomous device or weapon. However, in this case, the human operator retains the ability to intervene and terminate engagements, including in the event of a weapon system failure, before unacceptable levels of damage occur (Scharre, 2018: 35–50).

[5] Second Offset Strategy (seen also as a beginning of the Revolution in Military Affairs) relied on by-passing (offsetting) of the Soviet quantitative advantage in conventional weapons not – as in the First Offset Strategy – through the increase of nuclear potential (neutralized by the already achieved nuclear parity), but thanks to development of non-nuclear, conventional means capable of long-range but nevertheless precise attack even on targets in the hinterland of the enemy, deep into his territory. Discussion on the Third Offset Strategy started in the US in the second decade of the 21st Century, when in the development of unmanned, remotely controlled, or autonomous conventional weapons, many started to see the response to the challenges encountered in the course of the post 9/11 military interventions, particularly associated with the needs of force protection and reduction of the human losses among deployed contingents (Singer, 2009; White, 2017).

security, can even led to – at least theoretically – the collapse of the coalition (Walt, 1997: 159). Nevertheless, the impact of technological changes on alliances, their functioning, evolution, and roles in international relations has not been discussed very often and predominantly only in the context of specific technological solutions, e.g., a new category of weapons (*vide* nuclear weapons) or some other military equipment (e.g., satellites as the tool for command, control, and communication). Moreover, if such a subject was brought up, the research was usually limited to more technical issues, e.g., the compatibility of the allies' military doctrines and strategies with the possessed armaments. Relatively rarely there was any reflection on whether technological changes can influence the very essence of alliances, or whether these changes will alter significantly relations between particular participants of a given coalition and the ways how they cooperate. Importantly, however, if such debates did take place, they usually referred to NATO, seemingly not only due to its significance in international relations and the level of its members' technological advancement but also because of its relatively high degree of institutionalization and rather solid – albeit different in various periods in the Alliance's history – confidence among its members in the Organization's effectiveness and reliability (Salminen, 1992; Soare, 2021).

Hence, the main goal of this article is not to present in detail the current level of the development of unmanned or autonomous military technologies and the achievements of particular NATO members in this regard. It is rather to discuss possible implications of the further evolution and proliferation of such technologies, LAWS in particular, among allies for the intra-alliance cooperation on many highly interlinked (or even intertwined) levels, including strategic-political, operational, legal, and economic. In other words, the objective is rather to define the research field in the context of the link between technological development in automation and autonomy on the one hand and patterns and characteristics of cooperation between allies within NATO on the other, as well as to identify main problems and issues in this regards that will most probably require additional research in future. That also justifies the primarily deductive, not empirical, character of the study.

UNMANNED AND AUTONOMOUS WEAPONS – IMPLICATIONS OF THEIR INTRODUCTION FOR NATO

In the context of NATO, the first deeper reflection on the links between the alliance's functioning and technological changes took place in the 60s., after the achievement nuclear parity with the US by the Soviet Union was achieved, due to what both blocks started to be able to deter effectively each other by massive nuclear retaliation. It was argued that further development of nuclear weapons could even threaten the very existence of the Alliance since, for the members who possess nuclear weapons, staying in the coalition could start to be counterproductive. In such a configuration, these members (but, in fact, namely the US) would not require the self-defense of any allies, while so-called extended deterrence would lose credibility in conditions created by nuclear parity, as too demanding and risky for those who deter with their weapons from the attack on non-nuclear states (Galois, 1961). Nevertheless, although some

concerns over NATO's cohesion emerged, it did not cause the erosion of the coalition (created, after all, when the nuclear bomb was already invented). Actually, the main consequence was a modification of the alliance's primary goal, from readiness to fight a war to being able to evade it through effective deterrence (Carey, 1996: 79). Simultaneously, however, what has been noticed was the significance of the optimal use of the newest technological achievements in conventional armaments for the execution of NATO basic tasks (i.e., effective defense against the Soviet Union and the Warsaw Pact). In addition, the relevance of technology was recognized for the patterns of burden sharing in the Alliance, that is, the distribution of risks, benefits, and costs of participation in the coalition between allies (Furniss, 1967: 339–352). Nevertheless, all that led primarily to the debates on the adequacy of official NATO strategic concepts and doctrines to technological conditions intensified after the replacement of the strategy of massive retaliation by the strategy of flexible response in 1967 and particularly in the 80s., when they were further stimulated by the advances in strategic weapons on the one hand (deployment of intermediate-range missiles and SDI program) and the introduction on larger scale of precision-guided munition with the implementation of the already mentioned Second Offset Strategy on the other. That spurred the search for the most preferable for NATO – but particularly for its European members – an adaptation of the concept of forward defense to the new technological options (Dean, 1987: 61–82; Salminen, 1992).

However, the impact of current technological changes on NATO, including the proliferation of unmanned and autonomous technologies, could be deeper and more complex than in the Cold War period. It is determined primarily by two factors (apart, obviously, of the pace and scope of technological changes). Firstly, it is due to the expanding scope of NATO's basic tasks, no longer limited to – despite its current (after 2014) regained priority – the collective defense of the members' territories, but also including crisis management in the form of stabilization missions of expeditionary type, the fight with terrorism and other asymmetric threats, as well as building security through cooperation with the third states (cooperative security). Such diversity of tasks requires a very broad spectrum of capabilities and technological solutions. Secondly, current technological advances are primarily in conventional weapons, so the category of equipment that is actually used – contrary to nuclear weapons – in military operations.

Hence, one could assume that the relevance of unmanned and autonomous technologies from the NATO perspective will only increase in the future since, even currently, they constitute – at least in non-lethal roles, as a support element (intelligence, reconnaissance, communication) – a significant component of the military potential of many of them (Schaub, Kristensen, 2015: 251). Additionally, NATO members are generally among the most developed countries in the world, so their military capabilities and scientific and industrial potentials are relatively advanced, and the application of any new inventions, including unmanned and autonomous ones, by them seems highly probable. Equally important is the specificity of their national security interests, both in regional and global dimensions, which require simultaneous maintenance ability to execute collective defense in the treaty area and to conduct expeditionary operations elsewhere, including regions very distanced from NATO territory (NATO, 2022:

20–46). In all these tasks, unmanned and autonomous weapons can be an attractive option. Their broader employment could also be caused by the democratic regimes of NATO member states (or at least of their vast majority) and the "post-heroic" character of their societies (which means low tolerance for human losses). Such countries should be inclined to look for the solutions that are the most economical (in financial and political terms) on the one hand and offer the chance to maximize force protection on the other (Nissen, 2017). Crucial, however, will be the role played by the leader of the Alliance – the US – interested in keeping (together with allies, but also independently) global military superiority and technological edge over any potential enemy, both state and non-state. With Americans aiming for as common application of unmanned and autonomous technologies as possible, other members will be somewhat forced to follow (Work, 2015).

One must assume, however, that these technologies will not be distributed equally within the Alliance, and the pace of their development will vary significantly among the allies. The level of implementing unmanned and autonomous technologies is already uneven within the Alliance, and such obvious factors as costs of acquisition or attitudes of public opinion will surely escalate it, particularly taking into account the diversification of the economic and technological potentials of NATO member states. One must also remember that the security interests of allies, although convergent, are not identical, so their defense and security needs and priorities will vary, determining the appetite for unmanned and autonomous technologies (including lethal ones) and, consequently, the scope and pace of their implementation. In addition, the economic interests of particular states, especially major allies, and their defense industries will play a significant role. Obviously, NATO as an organization could reduce these divergences through various coordinative efforts or minimize and manage their consequences, but with most probably moderate results.

Further development and spread of unmanned technologies and also autonomous and lethal ones (LAWS) will thus result in various implications and challenges for the functioning of NATO. They will manifest primarily in four – strongly interlinked, as it was mentioned – dimensions: strategic-political (i.e. scope of the implementation of unmanned and autonomous technologies), economic (i.e. distribution of costs and benefits from their development), legal (incl. assessment of the legal status and ethical admissibility of their use) and operational (cooperation and interoperability of soldiers and machines on the ground). Some of these implications will mean only intensification of the challenges that will emerge with every technological innovation anyway (i.e., problems with interoperability of "old" and "new" equipment). Other will be specific exclusively for unmanned and autonomous technologies (i.e., the issue of legal accountability for excessive damage or civilian losses in the case of LAWS). It can also be assumed that the pace and scale of implementation of unmanned and autonomous solutions by the allies will decide on the intensity, time of emergence, and complexity of the consequences for intra-alliance cooperation as well as on the shape of the relations between allies.

Seemingly most evident will be implications in the operational sphere – in this regard, very important will be the growing risk of a decrease in interoperability of allies' forces. Members who introduce – by necessity, calculation, or choice – such techno-

logical inventions slower than the others and, therefore, who remain more dependent on human personnel could be gradually less and less capable of cooperating effectively with partners and, therefore, less able to make relevant contribution to joint operations (Nissen, 2017: 19). NATO, having as much as 32 members of diversified sizes and financial capabilities and with the US being simultaneously the most influential ally and among those most interested (at least as for now) in development of unmanned and autonomous weapons, seems to be highly susceptible for such risk. Inability of some members to "keep the leaders' pace" in technological progress will result in erosion of NATO cohesion, possibly bringing about even questions, particularly from American perspective, concerning further utility of the Alliance in its current configuration. Obviously, such changes will take place gradually, and – after all – even the US will not abolish it in the foreseeable future manned weaponry totally. That should reduce the negative impact of the abovementioned changes on interoperability. Nevertheless, the most probable response of the smaller allies to that challenge will be the efforts (already undertaken, although not necessarily due to an "unmanned and autonomous revolution") to deepen the specialization and "division of labor" within NATO through the development of niche capabilities (i.e., special forces) or focus on some highly specialized types of activities, i.e., logistics or medical aid, instead of direct combat or intelligence operations (Nissen, 2017: 27). Solutions of that type, although rational from the perspective of NATO as a whole, would exacerbate problems in cooperation on strategic and political levels, starting from growth in dependency on NATO in securing the most fundamental security interests in case of the increasing number of allies (whose armed forces will no longer be able to do stand-alone operations) and ending with the question of the optimal model of specialization among the allies.[6]

Other implications in the operational dimension will be rooted in the fact that simultaneous (or parallel) deployment of unmanned or autonomous vehicles and "traditional" manned units will cause multiple challenges in the context of command and control (C2), communication, and coordination of activities. Extremely important, particularly in the case of autonomous weapons, will be the problem of formal as well as – maybe even more important – actual control of allied commanders in the

[6] Seemingly, some niche capabilities, e.g., special forces or mobile hospitals, would turn out to be – for various reasons (economic, technical, political) – particularly attractive or available options for many countries, but not necessarily the most needed from the perspective of the NATO as a whole. This could cause the imbalanced development of the potential of the Alliance as such since, at the same time, there would most probably appear to be "a shortage" of those willing to develop other resources, which are less promising in terms of building the prestige and visibility in the organization, requiring great expenditures and are not always useful in the broad spectrum of operations, but nonetheless are indispensable for the NATO's smooth functioning – e.g. means of intelligence, surveillance, and reconnaissance (ISR). Then, the latter would be ensured by a few members, probably in limited quantity and a somewhat conditional form (with some caveats), which would negatively impact the general efficiency of the Alliance. The feasibility of such scenarios is proved by the limited outcomes of coordinative initiatives from NATO in the recent past, starting from the Prague Capabilities Commitments adopted at the Prague 2002 Summit (which envisaged a deeper specialization of the allies in creating particular abilities but did not eliminate, for instance, the deficits in the NATO's capabilities regarding ISR or precision-guided munition). Also, the joint or coordinated development programs of military capabilities within the EU's Common Security and Defense Policy framework have brought about only moderate successes (Yost, 2014: 31–44, 77–88; Śledź, 2021: 157–220).

field over the deployed machines, especially when these commanders originate from countries other than the owners of LAWS. One could also expect some difficulties and complexities in information exchange and coordination of activities between manned contingents and unmanned or autonomous vehicles (McDonald, 2019: 141–151). In addition, in case of a threat posed by the enemy or other factors (i.e., malfunctions, accidents, harsh weather, etc.), the necessity would arise to decide which resource in a given operation is more valuable, having, therefore, a priority in protection: the unmanned or autonomous vehicle that could in some occasions constitute "a scarce resource" costly, difficult to obtain, in possession of just a few members and that offers unique capabilities, or perhaps the human contingent, which is, in a sense, more easily replaceable. It will not be easy to decide, despite the fact that the development of unmanned and autonomous military technologies was stimulated, to an extent, by the desire to limit human losses. The necessity of retaining allied forces' capabilities intact to operate in the area of deployment could push for "saving of the rarer resource" in the form of highly advanced equipment at the cost of an increased risk for the soldiers deployed in a mission (especially if the latter would be from other states than the possessor of drones). Such risk will be most probably augmented by the fact that unmanned and autonomous drones will be deployed primarily to distant, hardly accessible areas, where communication with the rest of the forces of allies could be difficult or relatively easy to interrupt (Gow, Dijxhoorn, 2019: 319–320). Some researchers mention in this context also the increased risk of so-called friendly fire in case of "mixed" deployment (i.e., human units and unmanned, autonomous vehicles from various states) or even suggest the possible loss of trust and rise of concerns over consequences of such cooperation in the area of deployment.[7] All that foreshadows possible growth in complexity of the debates in NATO over burden sharing – already intensive and somewhat divisive for the Alliance – both in context of individual operations (i.e., which ally would take a greater risk of human and material losses in the course of the given mission and to what extent particular allies are responsible for securing the success of the endeavor), as well as in more general terms, on a strategic level (i.e. who contributes more to military potential of the NATO and who brings less?; who develops particularly valuable and needed capabilities, thus being a 'good' ally, and who is a 'free-rider'?; can the burden sharing in the Alliance be seen as just or optimal for all members?).

The issues discussed above will have some important economic implications, too. The necessity of maintaining NATO cohesion and interoperability can lead some allies to accept military modernization plans and acquisition of armaments not fully justified in light of their security needs and national interests but nevertheless costly (i.e., in the case when already existing capabilities allow for effective defense and protection of its own national territories, but due to technological innovations in other members' these military arsenals are gradually started to be obsolete and incompatible with those possessed by the rest of allies and will require replacement to keep interoperability).

[7] For instance, deployed soldiers (but also political leaders deciding about the participation of a given country in an operation) could fear that their activities in the region of the conflict would be registered (and thus documented) by an active unmanned system of an ally present in the same area; this way, it could deliver, e.g., a body of evidence in matters regarding prospective violations of the humanitarian law during armed conflicts (Hynek, Solovyeva, 2022: 99–102).

Obviously, this can also result in tensions related to the issue of competitiveness of the defense industries of allies, as well as their technological cooperation. In the context of maximizing NATO's operational effectiveness and reducing problems with interoperability, the broad standardization and unification of the equipment in use would be highly preferable and beneficial. That will, however, require from the technological leader (or leaders) of the Alliance a readiness to share the know-how and achievements in this field (an act of unusual generosity, taking into account the scale of investments necessary to develop them). Alternatively, it will make highly probable the scenario in which a given branch of defense industry will be fully – and rather permanently, considering the duration of the cycle of production and use of military equipment – dominated by the most technologically advanced ally (or allies, but rather a few). For NATO members, it most probably means that a majority of NATO members will purchase unmanned and autonomous weaponry from the US[8] and – as a consequence of large costs of maintaining them and reduced demand for the prospective products – gradually resign from the development of their indigenous, independent capabilities in this regard. Moreover, it could have an impact even on other branches of their defense industries (for example, buying LAWS in the US could lead to the acquisition of ISR tools as the most compatible and interoperable with already purchased weapons; that, however, would reduce incentives to develop independent research and development programs also in the context of ISR, since the potential market would shrink). Certainly, that should cause a lot of reservations among the allies, particularly those with developed defense industries (Carey, 1996: 81–88). The fact that unmanned technologies, and even more autonomous ones (including Artificial Intelligence), are largely dual use and employed often for civilian purposes complicates the problem even further, meaning that a substantial, sometimes maybe decisive role in shaping the course of their evolution will be played by private actors, particularly so-called Big Tech – global technological corporations, not controlled or supervised by the governments (i.e., US-based or originated Meta, Google, but also non-Western ones, like Huawei or only formally Singaporean, but de facto Chinese Tik-Tok) (Leonard, 2021: 31–65; Scharre, 2023: 155–169).

On the other hand, in the legal dimension, particularly in the context of the IHL, even a fast spread of unmanned technologies, including lethal ones, should not evoke serious consequences in relations between allies, apart obviously from those already existing due to e.g. allies' diversified participation in the main IHL agreements and differences in the interpretations of their content (e.g. the US, contrary to the majority of NATO members, are not a party of the Second Additional Protocol to the Geneve Conventions). Regardless of the lack of a human crew on board, the unmanned weapon is nevertheless controlled by a human operator, thereby making it possible to unambigu-

[8] This is evidenced by the fate of many NATO initiatives aimed at the joint development of military capabilities in the post-Cold War period, like Allied Ground Surveillance – AGS (after almost two-decade-long debates, the core of the program was ultimately secured by the purchase of the US-produced Global Hawks UAVs), Strategic Airlift Capability (the purchase of American C-117 Globemaster heavy lift planes) or current formula of nuclear-sharing (ongoing replacement of older types of dual-capable aircraft – including European Tornadoes – with F-35s by all the participants).

ously attribute personal accountability and legal responsibility for their use, also lethal ones. Thus, the evaluation of the legality of possessing and using unmanned weapons is no different in the context of fundamental IHL principles from a gunman's rifle, a shell, or a long-range missile with a warhead (Jimenez-Bacardi, 2022: 156–173). In the case of LAWS, however, the situation is somewhat different – because of the possibility that a machine will decide to use lethal force autonomously, without any human involvement, responsibility for any violations of IHL in the course of such operation is not so obvious and clearly regulated in the light of the currently existing norms (Leveringhaus, 2016; Alcala, Jensen, 2019). This, in turn, can significantly complicate the conduct of allies' joint operations since the rules of engagements (ROEs) of the individual contingents will most probably vary, similarly to the permissibility – in the light of internal law, also in view of different international obligations – of getting involved in combat operations with the use of autonomous weapons.[9] Moreover, although this is a symptom of a broader problem of the prospective status of the use of autonomous weapons in military operations (e.g., whether an action by such a system will be considered a form of military aggression, similar to an attack on it), it can be assumed that at least some forms of combat use of drones against any of the allies could lead to discussion whether it constitutes *casus foederis* and should trigger the collective defense obligations from article 5 of the Washington Treaty (Sadler, 2016: 16). Uncertainties in this regard will surely be erosive for trust between the allies, escalating the risk of so-called entrapment (being dragged by an ally into conflict) or abandonment (being left with no assistance by the allies).

Legal controversies over unmanned and (particularly) autonomous drones are strongly interlinked with the attitudes of public opinion in member states – and the position of their political elites – towards the development and use of technology of this kind. Previous experiences (equivocal when it comes to legality, but also the actual strategic and tactical efficiency of the employment of these weapons) together with various other factors (differences in allies' strategic cultures of allies, their research and development capabilities, economic stance, specificity of national security interests, transparency of debates and decision-making in defense matters, etc.) mean that in individual societies the acceptance for use of unmanned and autonomous weapons already varies. That has an impact on respective governments' positions, making it difficult to build consensus among allies concerning the directions of the future evolution of these technologies, the scope and pace of their introduction into NATO armed forces, and above all, the acceptance of different ways and modes of their use in joint operations. As for now, the Alliance was able to resolve these discrepancies only partially by adopting several documents and guidelines in this regard – namely the *NATO Autonomy Implementation Plan* in 2022 r. and the *NATO AI Strategy* of 2021 (revised in 2024) – also due to their relatively general character.

This already high complexity of the issue discussed here is further multiplied by the recent experience of the full-scale armed conflict in Ukraine, ongoing since 2022.

[9] It is worth remembering here about the already mentioned practice of using UCAVs by some of the allies (e.g. the USA and Turkey) in counterterrorist operations on other countries' territories; this use raises concerns over its legality and diverges from the operational standards of the other NATO members, but it is continued nonetheless (Lushenko, 2022: 86–92).

Although NATO is not directly involved in the fighting, a support for Ukraine offered by its member states as well as a need of preparing for similar future contingencies require constant monitoring of the trends in combat use of drones revealed by the hostilities there. Moreover, on the basis of the experience from the Ukrainian conflict, it can be assumed that in the future, unmanned weapons with continuously expanding levels of autonomy will be in common use both to perform support, not-lethal tasks as well as kinetic combat actions. Moreover, it will most probably mean the employment of small tactical machines that are cheap, relatively simple, and often attritable (for one-time use) but will be deployed in large numbers (Pettyjohn, 2024). Especially relevant seems to be the latter of these trends, manifested by intensive use by Ukrainians (and to a somewhat lesser extent Russians) of improvised means of attack – i.e., small commercial drones, usually of FPV (*First Person View*) type, modified to carry explosives – or loitering ammunition with a substantial level of autonomy (like US made Switchblades or Polish Warmate). That goes against earlier predictions and intuitions of analysts and researchers, who assumed that full autonomy will – because of the costs and complexity of such innovations – be initially introduced rather to big, multifunctional, and multi-use platforms, which, due to their technological advancement and substantial prices will not be available to every NATO member, not to mention the countries outside the Organization. Hence, the "low-cost drone revolution" that takes place now in Ukraine is seemingly already changing the attitudes toward the military use of drones within NATO. That harbinger of it could be the Pentagon's announcement in September 2023 of the Replicator Initiative – a program aimed at quickly (within a year or a bit more) "delivering all-domain attritable autonomous systems (ADA2) to warfighters at a scale of multiple thousands, across multiple warfighting domains" (Defense Innovation Unit, 2024). A pivot to such low-cost, irritable solutions will cause many additional questions and dilemmas for cooperation among allies, including economic dimension (need for simultaneous development of Research, Development, Testing, and Evaluation – RDT&E – programs both for "multi-use," complex and high-end vehicles as well as the simple, attritable low-end ones of loitering munition type, in order to keep the technological edge and ability to counter enemies' capabilities; new industrial niches for some of the allies), operational (wider presence and diversity of unmanned and autonomous weapons on the battlefield), but above all strategic-political and legal aspects (i.e., the issue of actual control over actions of attritable autonomous means of attack, if used on a massive scale, as well as the question of accountability and legal responsibility for consequences of their combat engagements). All that makes a full recognition of the consequences of the development of unmanned and autonomous military technologies really crucial for NATO, since only then the allies could look for an effective response to that challenge.

CONCLUSION

The list of implications for NATO of the development of unmanned and autonomous weapons presented in this article is somewhat initial and, therefore, obviously incomplete. As it was said, hoverer, the goal of this work was rather to draft the scope of

the problem, which seems to be increasingly relevant, taking into account the current pace of technological changes in warfare and the virtually global growth of interest in unmanned and autonomous weapons. Nonetheless, what seems noticeable already now is the fact that the majority of the consequences of developing and implementing unmanned and autonomous technologies presented here will have rather a negative impact on the functioning of alliances and coalitions, including their cohesion. In the case of NATO, it could be particularly important since this Alliance collects a substantial number of highly diversified sizes and military capabilities in countries that are – at least in their vast majority – both democratic and relatively highly developed and with security interests and needs that go beyond regional scope. This even more so testifies to the need for further reflection in this regard, both in academia or analytical communities as well as in the allies' governmental bodies that shape defense and security policies. There is also a need to stimulate a serious public debate on this issue, since – on the one hand – it would increase the awareness among NATO members' societies of challenges and threats posed by the introduction of unmanned and autonomous military technologies and could resolve some not fully justified concerns (as well as hopes) regarding the legitimacy and utility of their development on the other. It is highly unlikely, however, that NATO allies' contingent abolishment of unmanned and particularly autonomous capabilities, including lethal ones, would induce other countries, potential rivals or enemies of the Alliance among them, to act accordingly. Hence, we should expect that in future the, the military unmanned technologies, and most probably also autonomous ones, will proliferate and be used more commonly, making understanding of the implications of that development for the Alliance even more urgent and important.

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ABSTRACT

The article deals with the impact of the development of unmanned and autonomous weapons on NATO's functioning as a political-military alliance. Its central goal is to establish the scope and intensity of possible consequences of the development of unmanned and autonomous military technologies for NATO, identifying simultaneously key implications of that technological change for the Alliance functioning in four dimensions: political-strategic, legal, economic, and operational. That will help define and map the research field in the context of the nexus of the technology and coalition's functioning. The article is based on the assumption that changes in the nature and forms of cooperation between NATO allies triggered by the advances in unmanned and autonomous weapons and other military systems would potentially be much more profound than in the case of the majority of similar technological breakthroughs in the past, leading to the emergence of serious challenges for allies in all four dimensions recognized in the study. The article offers arguments to support that thesis and identifies the main actual and potential implications of the development of unmanned and autonomous military technologies for NATO, stressing also the need of increasing the awareness of the problem among both security policies' researchers as well as their practitioners (politicians, military, NATO personnel).

Keywords: North Atlantic Treaty Organization (NATO), unmanned weapons, autonomous weapons, artificial intelligence (AI), drones, Unmanned Aerial Vehicles (UAVs), Lethal Autonomous Weapons System (LAWS)

WPŁYW ROZWOJU BRONI BEZZAŁOGOWEJ I AUTONOMICZNEJ NA FUNKCJONOWANIE NATO – ZARYS PROBLEMATYKI

STRESZCZENIE

Artykuł podejmuje temat wpływu rozwoju i wdrażania technologii bezzałogowych oraz autonomicznych w wojskowości na funkcjonowanie NATO jako sojuszu polityczno-wojskowego. Jego najważniejszym celem jest określenie zakresu i intensywności możliwych następstw postępu w rozwoju technologii bezzałogowych i autonomicznych dla NATO, a także identyfikacja kluczowych z tych implikacji w wymiarze strategiczno-politycznym, prawnym, ekonomicznym i operacyjnym. Pozwoli to na zdefiniowanie pola badawczego w tym zakresie. Główną tezą opracowania jest, iż zmiany w charakterze i przebiegu współpracy międzysojuszniczej w NATO w wyniku rozwoju i upowszechniania technologii bezzałogowych oraz autonomicz-

nych będą potencjalnie znacznie poważniejsze, niż w wypadku większości zmian technologicznych w wojskowości w przeszłości, tworząc istotne wyzwania dla sojuszników we wszystkich uwzględnionych w badaniu wymiarach ich współpracy. W artykule przedstawiono argumenty świadczące o zasadności założenia o wadze przemian w funkcjonowaniu NATO w wyniku rozwoju technologii bezzałogowych i autonomicznych, identyfikując szereg aktualnych i potencjalnych następstw tej ewolucji dla NATO, a także wskazano na konieczność pogłębiania świadomości problemu zarówno w środowisku badaczy, jak i praktyków polityki bezpieczeństwa.

Słowa kluczowe: Sojusz Północnoatlantycki (NATO), broń bezzałogowa, broń autonomiczna, sztuczna inteligencja (AI), drony, bezzałogowe pojazdy latające (UAVs), śmiercionośne autonomiczne systemy bojowe (LAWS)

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