



NATO PARLIAMENTARY ASSEMBLY
ASSEMBLEE PARLEMENTAIRE DE L'OTAN

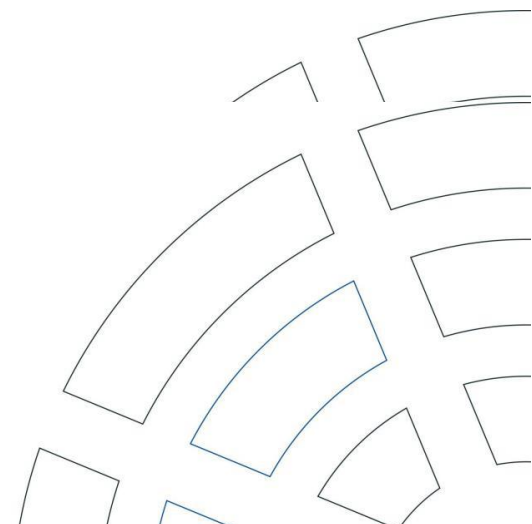
SCIENCE AND TECHNOLOGY COMMITTEE (STC)

NATO AND ARTIFICIAL INTELLIGENCE: NAVIGATING THE CHALLENGES AND OPPORTUNITIES

Special Report
Sven CLEMENT (Luxembourg)
Rapporteur

058 STC 24 E rev. 2 fin – Original: English – 24 novembre 2024

Founded in 1955, the NATO Parliamentary Assembly acts as a consultative interparliamentary organisation which is institutionally separate from NATO. This report was adopted by the Science and Technology Committee at the 2024 NATO PA Annual Session in Montréal, Canada. It is based on information from publicly available sources or NATO PA meetings – which are all unclassified.



Artificial Intelligence (AI) is set to rapidly change how people live and work, but also the ways in which wars will be fought. Experts believe that the integration of AI into military systems has the potential to revolutionise warfare. The potential use cases of AI in the military are far-reaching and promise advancements on decision-making, autonomous systems, and the role of soldiers. However, the actual process of incorporating AI into armed forces remains challenging. Procurement processes require adjustments, interoperability across armies cannot be taken for granted, and the prospect of AI-powered weapons raises significant ethical and legal questions.

It is, nonetheless, clear that AI will be widely adopted. Various countries and international organisations are already engaged in efforts to navigate the opportunities and challenges of AI through the adoption of strategies and regulatory frameworks. This report takes stock of ongoing efforts by NATO and Allies as well as external actors, such as China and Russia, to integrate AI into the armed forces. Due to the inherent dual-use characteristics of many AI applications and the fact that innovation is mainly driven by non-military entities, this mapping exercise covers both civilian and military activities. Yet, the broad applicability of AI necessitates a thematic focus, which in the context of this report will be the military sector.

To successfully navigate the challenges and opportunities of this process, the Alliance and NATO Parliamentarians should:

- raise awareness for the role of AI to enhance its legitimacy and the acceptance of increased investments whilst taking into account the inherent dual-use aspect of AI;
- engage in close discussions to strike a balance between political and military considerations; work towards up-to-date and coherent strategic documents and activities;
- support ongoing efforts to create an innovation ecosystem to make AI available for armed forces; enhance cooperation with the EU and other partners; continue the development of standards for an ethical use of AI;
- and engage with external actors to reach universally agreed-upon standards.

I-	INTRODUCTION	1
II-	MILITARY IMPLICATIONS OF ARTIFICIAL INTELLIGENCE	2
A.	THE MILITARY BENEFITS AND CHALLENGES OF ADOPTING AI	2
B.	ETHICAL AND REGULATORY IMPLICATIONS OF ADOPTING AI	3
III-	EXISTING EFFORTS OF INCORPORATING AI IN THE ARMED FORCES.....	5
A.	NATO	6
B.	UNITED STATES AND CANADA.....	7
C.	EUROPE.....	8
D.	CHINA	9
E.	RUSSIA	10
IV-	CONCLUSIONS AND RECOMMENDATIONS	11
	BIBLIOGRAPHY	14

Acknowledgement: The Rapporteur extends appreciation to the Committee's Director, Bryjna Oskardottir, and its Researcher, Moritz Neubert, for their research contributions to this report.

“Artificial Intelligence is ready to be harnessed. What this means exactly is up to us.” Foreign Minister Bettel, Foreword to *Artificial Intelligence: a strategic vision for Luxembourg*.

I- INTRODUCTION

1. Artificial Intelligence is rapidly changing how people live and work, but also the ways in which wars will be fought. At the same time, the implications of this technology are difficult to fathom due to its rapid development and multiple potential applications. One fundamental challenge when discussing AI and its implications is, for instance, the lack of a definition of what constitutes “intelligence” in the first place. An elaborate definition would hold that AI is about systems that can react to situations like humans and can observe, assess, and make decisions that normally require a human level of expertise. Put differently, AI is about developing systems that can imitate the intellectual processes associated with humans, such as the ability to reason, discover meaning, generalise, or learn from experience.

2. Despite over half a century of research on AI, its true breakthrough only happened in the previous decade, when AI became increasingly embedded in daily lives, ranging from industrial production to language assistants (e.g., Alexa) and large language models (LLMs), often known as chatbots (e.g., ChatGPT). Indeed, since 2010, the total number of AI publications has more than doubled (Stanford University, 2023). The key forces driving this evolution include: (1) the exponential growth in computing performance; (2) expanded datasets; (3) advances in the implementation of machine learning techniques and algorithms (especially in the field of deep neural networks); and above all, (4) the rapid expansion of commercial interest and investment in AI (Johnson, 2019).

3. AI is set to engender transformations across the board. Accordingly, countries and international organisations are engaged in efforts to navigate the opportunities and challenges of AI. Numerous countries have published or are working on national AI strategies. A 2023 report lists over 60 countries that have published such a document, and about 15 more that are in the process of developing one (Stanford University, 2023). At the same time, various governments and international organisations seek to regulate and govern the technology. For example, the European Union (EU) adopted its AI act in March 2024, which is considered a landmark in international efforts to regulate AI by, amongst others, putting “safeguards on general purpose artificial intelligence”, limiting the use of biometric identification systems by law enforcement, banning social scoring and AI used to manipulate or exploit user vulnerabilities, and ensuring the right of consumers to launch complaints and receive meaningful explanations (EP, 2024). While it does not apply to military and defence, the EU AI act is going to shape activities of EU member states more broadly. Due to the dual-use characteristics of most applications, the AI act could also have ramifications for armed forces.

4. The Organisation for Economic Co-operation and Development (OECD) also adopted AI principles in May 2019, which were updated in May 2024 (OECD, 2024). Moreover, the Council of Europe’s Framework Convention on Artificial Intelligence and Human Rights, Democracy, and the Rule of Law has been opened for signature in September 2024 (Council of Europe, 2024a). The Convention has, amongst others, been signed by the EU, the United Kingdom, and the United States (Murgia & Espinoza, 2024). However, the text specifies that “[m]atters relating to national defence do not fall within the scope of this Convention” (Council of Europe, 2024b). Lastly, the United Nations General Assembly (UNGA) adopted the first resolution on AI in March 2024 (UN, 2024). Taken together, countries and international organisations are concurrently seeking to reap the rewards of AI whilst regulating the technology’s use. In addition, a UN advisory body called for the regulation of AI through a global and inclusive institution that centres human rights. The proposal includes, amongst others, a call for an international scientific panel and a governance dialogue at the UN. Moreover, it encourages the creation of a global fund that would allow states to benefit from the technology whilst working towards the Sustainable Development Goals (SDGs) (Lederer, 2024).

5. In short, the opportunities, risks, and regulation of AI are on everyone's mind. Given that views on AI range from it being a blessing to being a curse, any sensible evaluation of its implications must seek to stay clear of the surrounding hype and potentially unrealistic expectations, and instead seek to provide a balance sheet of its potential advantages and drawbacks in the military domain. In security and defence, AI is mostly used to support humans in improving situational awareness or in analysing different options in terms of decision-making or target selection. Its military benefits do, however, go hand in hand with significant legal and ethical questions.

6. This report builds and expands upon previous STC reports, notably on "Artificial Intelligence: Implications for NATO's Armed Forces" presented by Matej Tonin in 2019 (Tonin, 2019). The report has also benefitted from the visit of the Sub-Committee on Technology Trends and Security (STCTTS) to Belgium and the Netherlands, which covered a wide range of issues, including practical illustration of the ways in which NATO uses AI-powered tools (NATO PA, 2024). Given the rapid pace of AI development, this current report provides an overview of recent developments and remaining questions for the usage of AI by militaries, takes stock of existing initiatives by NATO, Allies, external actors, and concludes with recommendations on the way ahead for NATO and the NATO PA.

II- MILITARY IMPLICATIONS OF ARTIFICIAL INTELLIGENCE

7. While the opportunities of AI in the commercial sector are undisputed, experts also believe that the integration of AI technologies into military systems has the potential to revolutionise warfare. Some even consider AI to be the third revolution in weapons technology, after the invention of gunpowder and the atomic bomb (FLI, 2015). The potential use cases of AI in the military are far-reaching and promise advancements on decision-making, autonomous systems, and the role of soldiers. Large language models (LLM) can, for instance, assume tasks such as "intelligence data summarization, target identification and selection, decision support, labelling geospatial imagery, automating cyber capabilities, and even integration into nuclear command and control" (Shoker et al., 2024). At the same time, it remains challenging to integrate AI in the armed forces as procurement processes require adjustments and an effective human-machine interaction within and across armies which cannot be taken for granted. AI applications are also not error-free and there continue to be risks for malfunction, including the problem of hallucinations by LLMs, i.e. information that is not correct, sensible or real, which pose challenges to their applicability. Moreover, the adoption of AI-powered capabilities raises fundamental ethical and legal questions for the conduct of war.

A. THE MILITARY BENEFITS AND CHALLENGES OF ADOPTING AI

8. A major reason for the assessment that the technology will revolutionise warfare is the fact that AI-supported or enhanced decision-making processes could well prove decisive. As noted by the NATO's Science and Technology Organisation (NATO STO), AI is a "fulcrum around which big data will be turned into actionable knowledge, and, ultimately, a NATO decision advantage" (NATO STO, 2020). Such "AI decision support systems (AI-DSS) are computerised tools that use AI software to display, synthesise and/or analyse data and in some cases make recommendations – even predictions – in order to aid human decision-making in war" to increase, for example, situational awareness (Stewart & Hinds, 2023). In addition, AI-driven predictive analytics and machine learning algorithms empower military planners with real-time intelligence, enabling them to conduct more accurate threat assessments that keep pace with a rapidly changing environment. AI will also enable swarm intelligence for enhanced situational awareness, as well as predictive analytics to forecast an opponent's movements (Mayer, 2023). Given their ability to handle large amounts of data in a short period of time, their capacities easily surpass those of humans. At the same time, the issue of LLM

hallucinations, whereby outputs are factually wrong or do not make sense, points to prevailing implementation challenges.

9. By augmenting human capabilities and by optimising resource allocation across the military spectrum, AI serves as a force multiplier (Weingarten, 2023). AI will provide a boost to autonomous systems, such as uncrewed aerial and ground vehicles (UAVs/UGVs). It could prevent humans from getting into harm's way while at the same time surpassing human abilities, for example when it comes to navigation, surveillance, or target acquisition. Autonomous robotic platforms equipped with AI algorithms can also serve to enhance logistical operations, supply chain management, and maintenance activities. Moreover, AI-enabled cyber defence systems enhance resilience against cyber threats by reducing vulnerabilities through the detection, prediction, and mitigation of threats (Car & Marcelin, 2024). AI can also improve simulation and training efforts, which enhances the preparedness of military personnel. Finally, AI will also dramatically improve the ability to prevent, detect, and contain biological threats, whether deliberate attacks or naturally occurring pandemics (Clement, 2021).

10. While the growing use of AI in the military is inevitable, the actual process of incorporating AI into armed forces remains fraught with procurement, interoperability, ethical questions, and legal challenges. Most AI-related products, particularly software, are developed by small start-up companies that have no experience in working with defence ministries or the armed forces. Moreover, the development of AI and related technologies is moving at a speed that outpaces established procedures and regulations for buying and testing equipment for military forces. Hence, when it comes to digital technologies, "defence institutions are under much more pressure to either adapt to civilian industry products and standards or to pay a significant premium to suppliers to secure military-grade equipment and software" (Christie, 2022).

11. Exploiting the opportunities presented by AI, therefore, requires not only the proper technology but also an adjustment of bureaucratic processes. In the case of AI, "there are many excellent prototypes and pilot projects in numerous defence institutions, but there are also serious outstanding challenges in terms of scaling up to enterprise-wide solutions, let alone Alliance-wide solutions" (Christie, 2022). In line with the realisation that AI – as well as other emerging disruptive technologies – requires broader changes in the established development and procurement processes, some countries, as well as NATO, are now trying to better connect innovation drivers like start-ups with the defence sector. These efforts, which are analysed in more detail below, are of crucial importance as procurement and innovation follow different patterns to legacy systems. It is no longer only established defence institutions or companies that are driving solutions tailored to the needs of armed forces but rather tech companies whose more broadly applicable products can be useful for militaries. The development and production cycle, therefore, looks different and requires adjustments in procurement processes.

12. Another major challenge for military coalitions or alliances will be AI interoperability. On the one hand, the need to define interoperability and relevant standards will become ever more urgent, which requires defining and conducting verification, validation, and accreditation of AI-enabled systems for use in Alliance military operations. On the other hand, such procedures must be applied without hindering the rapid adaptation of AI into the armed forces. As AI is both about economic competition between Allies as well as military cooperation among them, finding the right balance will be a major challenge in the years ahead.

B. ETHICAL AND REGULATORY IMPLICATIONS OF ADOPTING AI

13. Despite its transformative potential, the widespread adoption of AI in military applications also raises significant ethical and legal considerations regarding autonomy, accountability, and compliance with international humanitarian law (IHL) and its four basic principles that govern the conduct of hostilities: distinction, military necessity, humanity, and proportionality. A particular

challenge are potentially lethal autonomous weapon systems. Regulating their usage faces several obstacles. There is no agreed-upon definition and discussions within the UN Convention on Certain Conventional Weapons have thus far not reached a breakthrough. The UN Secretary General, António Guterres, called on states to reach a legally binding instrument by 2026 “to prohibit lethal autonomous weapon systems that function without human control or oversight, and which cannot be used in compliance with international humanitarian law, and to regulate all other types of autonomous weapons systems” (UNODA, 2023).

14. The International Committee of the Red Cross (ICRC) points out that the potential usage of lethal autonomous weapon systems raises various legal and ethical concerns (ICRC, 2022). It can be very difficult to anticipate the behaviour of such AI-powered systems as the model’s decision-making mirrors a “black box”. As such, they may not always choose lawful targets and “machine learning systems also raise concerns about encoded bias, including in terms of race, gender and sex” (ICRC, 2022). An expert consultation report by the Geneva Academy and the ICRC notes that these questions are not only relevant for autonomous weapon systems, but also other similar but distinct use cases such as AI decision support systems (AI-DSS), “including, but not limited to, the specific decision tasks of target selection and the application of force” (ICRC & Geneva Academy, 2024). The issues around targeting and biases are particularly relevant in this regard and merit a closer examination.

15. There have been reports about the usage of AI, for instance by Ukraine and Israel, as a decision-support tool in targeting processes (see, for instance, The Economist 2024a, 2024b; Fraser 2024). These reports and associated discussions point to the concerns around AI-supported targeting. As Jimena Sofia Viveros Álvarez, Member of the UN Secretary General High-level Advisory Body on AI concludes: “AI’s revamped targeting capabilities are uncharted waters and despite any alleged advantages, these technologies lack appropriate testing and review standards prior to their deployment. Moreover, being the result of human activity, these systems are also fallible since they are inherently unpredictable and unexplainable, the data used to train them will never be perfect, and their inherent risks will only be exacerbated if the increasing use of AI-DSS can lead to automation bias in the battlefield. This is why effective human judgment must be a hard requirement prior and throughout the entirety of any military operation” (Viveros Álvarez, 2024).

16. These concerns with regards to AI-powered targeting processes point to ethical and legal questions around underlying biases. Notwithstanding the risk of issues such as hallucinations that are prevalent with LLMs, “AI systems do not fail” per se, as the expert Arthur Holland Michel notes: “As long as they haven’t been hacked or experience a strictly technical malfunction, computers produce outputs in accordance with their algorithms and their coding. If a child is killed by humans acting on the recommendation of an AI system, the AI was doing its job exactly as it was designed to; it was the humans who were at fault” (Holland Michel, 2024). Algorithmic biases can stem from the underlying data set, can be introduced due to technical development decisions, or can emerge during the usage of AI tools as well as the review of decisions (Bode & Bhila, 2024). Developing so-called “kill lists” can, for instance, be influenced by societal biases which may include “racial and identity stereotypes” (Bode & Bhila, 2024). That is why experts highlight the need for developers and militaries to acknowledge the risk of biases and strive for their mitigation in order to live up to the ethical, legal, and responsible use of AI in the military domain. Such steps include, amongst others, standardisation methods, bias mitigation strategies, and full human awareness and control.

17. Challenges around targeting and biases, combined with the fact that humans may be entirely out of the decision-making loop, bring responsibility questions for potential IHL violations to the fore. Restricting autonomy by limiting certain technological parameters could minimise such risks to some degree. At the same time, such restrictions might result in a loss of operational performance, against an opponent who disregards these ethical or legal concerns. This underlines the importance of establishing clear guidelines and regulatory frameworks to govern the use of AI in conflict, as NATO

has done with its principles of responsible use for AI in Defence (Bellaby, 2021; Stanley-Lockman, 2021; Johnson, 2022; Csernaton, 2024).

18. The military use of AI is neither inherently “good” or bad”. What matters is the context and the rules that guide the application of AI. Since a complete ban of AI is unrealistic, one has to accept that the tension between the operational advantages of AI and its potential drawbacks can never be entirely overcome. It is, therefore, essential that the regulatory frameworks attempt to keep pace with the accelerating technological progress. Thus far, the strong emphasis on these questions in national and NATO AI documents suggests that NATO Allies and non-NATO nations alike realise the importance of regulating AI. Moreover, the fact that interest in AI ethics is increasing dramatically – as is the number of cases of AI misuse – demonstrates the continuing importance of that subject (Stanford University, 2023). However, lawmakers need to grapple with the challenge of implementation on the ground as the rapid innovative pace tends to make regulatory frameworks obsolete as soon as they are agreed.

III- EXISTING EFFORTS OF INCORPORATING AI IN THE ARMED FORCES

19. It is obvious that AI will be widely adopted by armed forces. At the same time, it is not without its challenges as the preceding discussion demonstrated. To identify a strategy for navigating the challenges and opportunities, it is, therefore, worthwhile to take a closer look at existing efforts of incorporating AI in the armed forces. Despite the focus of this report, such an analysis should not restrict itself to exclusively military activities. AI-powered applications can be adjusted to specific use cases, have dual-use characteristics, and innovation is mainly driven by non-military entities. Therefore, the following mapping exercise includes both civilian efforts in general as well as military activities in particular.

20. It is worthwhile to recall regulatory efforts by several governments and international organisations before turning to the efforts by NATO, Allies, and external actors, such as Russia and China. Marietje Schaake, Special Adviser to the European Commission who also sits on the UN Secretary General’s High-level Advisory Board on AI, notes that AI Safety Institutes in Western countries do not focus on the use by the military (Schaake, 2024). A recently published analysis shows that there are various initiatives to govern AI, but only seven dedicated ones for the military sphere (Sweijts & Romansky, 2024). These initiatives include, amongst others, the US-initiated Political Declaration on Responsible Military Use of Artificial Intelligence and Autonomy as well as a (draft) UNGA Resolution on LAWS.

21. Another notable initiative is the Summit on Responsible Artificial Intelligence in the Military Domain (REAIM). After the first Summit in 2023 took place in the Netherlands, the Republic of South Korea co-hosted the second Summit in 2024 together with the Netherlands, Singapore, Kenya and the United Kingdom. Around sixty countries endorsed a “Blueprint for Action” during this year’s Summit, with China being amongst the approximately 30 countries that were present but did not support the document (Lee, 2024). The document covers several issue areas on the tactical level, acknowledges the strategic implications of AI, and calls for further exchanges, but, according to an expert, “reflects the lowest common denominator” (Rosen, 2024). Going further, the REAIM host countries “are planning to bring a new resolution on the military use of AI to the UN General Assembly (UNGA) this October, putting the issue on the UNGA agenda for the first time” (Vestner & Cleobury, 2024).

A. NATO

22. AI is one of the nine priority technology areas for NATO (NATO, 2023c). Next to AI, these emerging disruptive technologies are autonomy, quantum, biotechnology and human enhancements, hypersonic systems, space, novel materials and manufacturing, energy and propulsion, and next-generation communications networks. AI is not only important in itself, it is also crucial for advancements in other areas, as it acts as a multiplier: “Of all these dual-use technologies, Artificial Intelligence is known to be the most pervasive, especially when combined with others like big data, autonomy, or biotechnology” (NATO, 2021a).

23. In line with the logic that the development of AI and other emerging disruptive technologies will be driven largely by smaller companies, NATO has invested in a venture capital fund equipped with 1 billion EUR. The NATO Innovation Fund (NIF) seeks to attract innovative start-ups by giving them access to test sites and by providing crucial funding to bridge the so-called “valley of death” before commercialisation. The NIF announced its first investments in June 2024. They support, amongst others, ARX Robotics, which is “a manufacturer of scalable robotic systems for mass deployment in defence”, and Fractile, which is “an AI company that is developing transformative computing technology to enhance collective AI capabilities by enabling the largest and most capable neural networks of today and tomorrow to run faster, more efficiently and sustainably” (NIF, 2024). Moreover, the fund supports OTB Ventures and Vsquared Ventures, two deep tech funds that have AI in their portfolio (NIF, 2024).

24. The Defence Innovation Accelerator for the North Atlantic (DIANA) is another important initiative that explicitly focuses on dual-use innovation. DIANA has recently expanded its network of available test centres (NATO, 2024a). In September 2024, DIANA announced that ten start-ups have been selected for the next phase whereby they will receive an additional funding of 300.000 EUR. These companies offer various solutions to the DIANA challenges, including intelligent antennas (NATO, 2024d). In addition, DIANA received 2.600 applications to participate in its new accelerator programme that seeks to tackle five new challenges (NATO, 2024d), three of which mention AI in their problem statements (DIANA, 2024). This broadens the opportunities for innovative companies to use national organisations to connect with military end users. Such new mechanisms are part of efforts to forge new and more dynamic innovation ecosystem that should, over time, allow for the faster integration of AI into the defence sector.

25. In October 2021, NATO released its first AI Strategy (NATO, 2021a), which attempts to position NATO as the leader of AI adoption in defence. In line with this ambition, NATO revised said strategy in July 2024 (NATO, 2024b). The unclassified summary of the first strategy emphasises the importance of AI for all three core tasks of NATO and reiterates the Allies’ commitment to transatlantic cooperation on the development and use of AI in defence (NATO, 2021b; Stanley-Lockman and Christie 2021). Central to the Strategy are the six “NATO Principles of Responsible Use of Artificial Intelligence in Defence”, namely Lawfulness; Responsibility and Accountability; Explainability and Traceability; Reliability; Governability; and Bias Mitigation. As such, the Alliance is at the forefront of developing an ethical and lawful use of AI in defence.

26. The revised strategy accounts for recent developments in the field of AI and identifies several priority areas, such as: “advancing the implementation of NATO’s Principles of Responsible Use; increasing interoperability between AI systems throughout the Alliance; the combination of AI with other emerging disruptive technologies; and expanding NATO’s AI ecosystem through closer cooperation with Allied industry and academia, NATO’s Defence Innovation Accelerator DIANA, the NATO Innovation Fund and like-minded partners” (NATO, 2024c). Moreover, it mentions AI-powered disinformation, information operations as well as gender-based violence as issues of relevance. Lastly, it stresses the need to ramp up protection about the adversarial usage of AI (NATO, 2024c).

27. NATO's efforts are reinforced by the work of several agencies in this field. In May 2022, the NATO STO and the NATO Communications and Information Agency (NCIA) launched an AI horizon scanning strategic initiative in order "to better understand AI and its potential military implications" (NCIA, 2022). The NATO STO's 2024 Collaborative Programme of Work lists several activities in different areas that directly relate to potential use cases of AI for armed forces (NATO STO, 2024). Such practical applications of AI were showcased during the NATO PA's STCTTS visit to the NCIA in September 2024 (NATO PA, 2024; NCIA, 2024). In October 2022, Allies adopted a NATO Data Exploitation Framework, established NATO's Data and Artificial Intelligence Review Board (DARB), and adopted NATO's Autonomy Implementation Plan (NATO, 2022a; NATO, 2022b). In July 2023, Allies adopted NATO's Digital Transformation Implementation Strategy, which seeks to link digital transformation to capability development goals and interoperability requirements (NATO, 2023b).

28. In February 2023, NATO's DARB – a group that includes lawyers, engineers, military personnel, and experts in ethics – started to develop a user-friendly and responsible AI certification standard "to help industries and institutions across the Alliance make sure that new AI and data projects are in line with international law, as well as NATO's norms and values" (NATO, 2023a). The standard will "translate" NATO's Principles of Responsible Use "into concrete checks and balances, notably in terms of governability, traceability and reliability" (NATO, 2023a). This will help to build trust among the innovation community, operational end users, and the general public.

B. UNITED STATES AND CANADA

29. The United States is the global leader in AI. Through various agencies, the United States government invests significantly in AI research and development. The United States is home to leading AI companies and research institutions, including Open AI, Google, Microsoft, or the MIT. The United States is also at the forefront of AI education and workforce development, given that AI is now widely used in the United States in commercial applications, including healthcare diagnostics, financial services, autonomous vehicles, and consumer technology. Like other countries, the United States is grappling with the ethical questions and with the regulatory challenges posed by AI. Given its leading role, the United States will play a major role in shaping the future of AI development (CRS, 2023a). This also applies to the military sphere.

30. Over the past few years, the US Department of Defense (US DOD) has produced numerous documents on AI. The 2018 AI Strategy (US DOD, 2019) outlines the key aims from a military perspective, e.g. delivering AI-enabled capabilities for key missions; partnering with leading private sector technology companies, academia, and global allies; cultivating a leading AI workforce; and leading in military ethics and AI safety. In November 2023, the Pentagon published its Data, Analytics, and Artificial Intelligence Adoption Strategy, which seeks to unify previous strategic guidance and facilitate the scaling of advanced capabilities (Clark, 2023; US DOD, 2023). The United States is also working with Allies on military AI through the advanced capabilities of the Australia-United Kingdom-United States (AUKUS) partnership and the creation of an AI Strategy for NATO.

31. In implementing these capstone documents, the Pentagon prioritises the developing and fielding of AI for military applications, including through Project Maven (a programme to develop and integrate computer vision algorithms in support of counterinsurgency and counterterrorism operations) (Manson, 2024), and the Replicator Initiative (a programme working towards uncrewed systems) (Scharre, 2023). The Pentagon's unclassified investments in AI have grown from just over 600 million USD in FY2016 to approximately 1.8 billion USD for FY2025 (CRS, 2023a). The intelligence community has also released a strategy for using AI, as well as principles and a framework on AI ethics (CRS, 2023b; Dheda, 2023). The Pentagon currently runs over 800 unclassified AI projects, demonstrating the determination of the United States to maintain its global lead in military AI.

32. At the same time, the United States government is at the forefront of working towards a responsible and ethical use of AI in the military. In February 2020, the US Department of Defense adopted Ethical Principles for Artificial Intelligence, which resulted from consultations with AI experts as well as the public (US DOD, 2020). In June 2022, the US Department of Defense published its Responsible AI Strategy and Implementation Pathway which, amongst others, formulates several principles applicable to non-combat and combat applications of AI: responsible, equitable, traceable, reliable, and governable (US DOD, 2022). Moreover, the United States took the initiative towards the application of existing international rules and norms through the Political Declaration on Responsible Military Use of Artificial Intelligence and Autonomy, which it launched during the REAIM Summit 2023 and has been endorsed by almost all NATO member countries (US DOS, 2023).

33. The Canadian Department of National Defence and its armed forces also published an Artificial Intelligence Strategy in March 2024, which identifies several lines of effort: fielding and employing AI capabilities; change management; ethics, safety and trust; talent and training; and partnerships (Canada, 2024a). At the REAIM Summit 2024, the Canadian Minister of National Defence stated that “our strategy aims to position the Canadian Armed Forces and our Department of National Defence as an AI-enabled organization by 2030. And it envisions the ethical, inclusive, and trusted use of AI to achieve interoperability and strategic advantage in the battlefield while enhancing stewardship of our resources” (Canada, 2024b). The United States also actively collaborates with other NATO member countries. The United States, the United Kingdom, and Canada announced the collaboration between their military science and technology organisation when it comes to cyber security and AI research (UK, 2024).

C. EUROPE

34. Most European countries that are members of NATO and/or the EU published national AI Strategies and other major policy documents over the past years. These documents lay out their ambition to fully exploit AI’s opportunities while also dealing with AI’s ethical challenges. Since AI is largely data-driven, harnessing its potential is an objective for smaller countries as well as for bigger ones. Virtually all Allies seek to incorporate AI into their armed forces. While a comprehensive overview is beyond the scope of this Report, some examples should serve to demonstrate a general trend that is likely to intensify in the years ahead.

35. Luxembourg has a growing ecosystem of AI start-ups and companies, taking advantage of the country’s business-friendly environment and strategic location in Europe. In 2019, the government launched an AI Strategy (Luxembourg, 2019a) and the Digital Innovation Hub initiative, which aims to support the digital transformation of businesses, including the adoption of AI technologies (Luxembourg, 2019b). The country’s “Defence Guidelines 2035” and “Defence Space Strategy” mention AI, with the latter emphasising the technology’s potential for “the automated processing of the mass of geospatial data produced” (Luxembourg, 2022, 2023).

36. Other smaller European countries have stated similarly ambitious goals for developing the full potential offered by AI. Estonia, for example, which is regarded as one of the most cyber-savvy countries, has adopted an approach to AI that focusses mostly on improving public services. This is in line with the country’s emphasis on e-governance (Robinson, 2021). Moreover, Estonia hosts NATO’s Cooperative Cyber Defence Centre of Excellence and a regional hub office of DIANA, and the government signed a joint statement on defence cooperation with the AI company Helsing (Estonia, 2024).

37. France released its national AI strategy in March 2018, which aims at positioning the country as a global AI leader and supporting the growth of AI start-ups and industries (France, 2018). A year earlier, France had already initiated project ARTEMIS.IA (Architecture for Processing and Massive Exploitation of Multi-source Information and Artificial Intelligence) to provide the country with a secure big data and AI processing platform that can exploit and analyse the massive volumes of

data gathered by military and other sensors (Machi, 2022). France also adopted “Ethics Guidelines for Trustworthy AI”, which outline principles for the responsible development and deployment of AI systems. In March 2024, France again staked its claim to become a leading AI nation (France, 2024). To this end, the country also runs an ambitious national AI training programme. In June 2023, President Macron announced 500 million EUR in new funding to create AI “champions”. In March 2024, the French AI Commission submitted a report to the President that made a strong case for investing in AI across the board (France, 2024). These efforts extend to the military domain as well, reflected in, amongst others, the intention “to build Europe’s most powerful classified supercomputer to take the lead in artificial intelligence for defense purposes” (Ruitenbergh, 2024).

38. Germany boasts that the budget allocated to AI development has grown twenty-fold since the launch of its AI Strategy in 2018, which it updated in 2020 (Clasen, 2023). However, neither document contains references to the role of AI in defence. The 2023 Defence Guidance only mentions AI once (German MOD, 2023). However, individual services have embraced AI, and parts of the additional budget devoted to the armed forces in the context of the so-called “Zeitenwende” have been earmarked for AI. The armed forces are running an open-source intelligence system for crisis early warning that uses AI for data analytics and predictive analysis, develop AI-based radar warning receivers for helicopter protection, work on intelligent image processing for missiles, and use AI for stockpile management and medical services (Borchert et al., 2023). In addition, the German Bundeswehr established a Cyber Innovation Hub which works with start-ups and innovators to solve military challenges, with one of its innovation projects being a laboratory for Artificial Intelligence (Bundeswehr, n.d.)

39. Türkiye has published several documents that state its AI ambitions and priorities, notably the 2021 National Artificial Intelligence Strategy (Türkiye, 2021) and the Development Program, counting AI among the priority R&D areas that would elevate the Turkish economy. The database of the non-governmental organisation Turkish AI Initiative lists 254 AI start-ups as of October 2022. Türkiye runs several defence AI-related projects, with a clear priority on autonomous systems, mainly uncrewed aerial vehicles (UAVs) for which there is an increasing global demand. .

40. The United Kingdom has launched several major initiatives and provides its leading research institutions with significant funding. In 2017, the government published the “UK Digital Strategy”, updated in 2022, which includes commitments to invest in AI research, develop AI talent, and promote the adoption of AI technologies across various sectors (UK, 2022). The United Kingdom also published an “AI Code of Conduct” to promote ethical AI use. Moreover, the United Kingdom published its first Defence Artificial Intelligence Strategy in June 2022 (UK MOD, 2022). The document lays out an ambitious blueprint for transforming the armed forces into an ‘AI ready’ organisation by adopting and exploiting AI through cross-domain integration, decision-making, and international cooperation. It also advocates the building of a stronger defence AI ecosystem through cross-sector partnerships between government, industry and academia. The United Kingdom is building a singular and secure ‘Digital Backbone’, a ‘Digital Foundry’, and a ‘Digital Function’ for its defence enterprise and force. The United Kingdom’s Ministry of Defence’s (MOD) 2023 Defence Command Paper argues that the digital transformation will accelerate further (UK MOD, 2023).

D. CHINA

41. China is widely believed to be a strong contender for global leadership in AI, with the government having declared the development of AI a national priority (Haotian, 2023). In 2017, China published the “New Generation Artificial Intelligence Development Plan”, which underscored the importance that country attaches to AI (Webster et al., 2017). Initially lagging behind other nations, China managed to catch up and has now become an industry leader, largely through a dedicated effort to improve the country’s AI competency. Through Chinese companies, Beijing also has access to data produced globally, including in Western countries. China also has a large population that

uses a lot of online tools, thereby contributing to the large databases needed to develop AI. China also has a strong domestic interest in developing this technology because AI can be tailored to allow for the tighter surveillance and control of one's citizens (DeSmith, 2023).

42. China sees AI playing a central role in advancing its military power and its approach of Military-Civil Fusion seeks to appropriate select private technological advancements, including some developed in cooperation with international research partners, to augment the People's Liberation Army's (PLA) capabilities. Chinese Communist Party (CCP) General Secretary Xi Jinping has set ambitious goals for the PLA to "basically complete" its modernisation by 2035 and transform into a "world-class" military by the middle of the century (Stokes, 2024). While China's enthusiasm for the military potential of AI is well documented through its research and development activities, information about the fielding of specific military AI systems remains sparse. However, the roles for AI within China's military modernisation plans are believed to centre on (1) intelligent and autonomous vehicles; (2) intelligence, surveillance, and reconnaissance; (3) predictive maintenance and logistics; (4) information and electronic warfare; (5) simulation and training; (6) command and control; and (7) automated target recognition (Scharre, 2023).

43. Among AI technologies, China places the top priority on uncrewed combat systems and equipment along with other advanced military innovations. In his speech to the CCP's 20th National Congress in October 2022, Xi called on China to "speed up the development of unmanned, intelligent combat capabilities" (Stokes, 2024). Uncrewed technology has been profoundly changing the dynamics of warfare and unmanned equipment is one of the first options for future combat equipment. China has a large and sophisticated drone industry and is the world's largest exporter of military drones. It is not yet clear, however, whether these uncrewed vehicles are also autonomous, i.e. whether they have already been equipped with sophisticated AI. In sum, while the degree to which AI-enhanced weapons systems have already entered the PLA's arsenal is not entirely clear, the trends towards AI in military applications is obvious. For China, AI plays a key role in moving towards a much stronger military.

44. At the same time, a recent analysis of more than 50 academic publications by Chinese defence experts revealed interesting insights into current thinking, even though it may not be fully representative of the government. It shows that China lacks sufficient access to high-quality and digital data, faces cyber vulnerabilities, struggles with testing and evaluating AI-powered systems, and sees problems with sufficient reliability and trust by soldiers in the technology (Bresnick, 2024a). Moreover, Chinese experts appear to worry about the escalatory risks associated with AI as dynamics may be out of human control (Bresnick, 2024b).

E. RUSSIA

45. Russia also considers AI a priority area. In 2017, Russian President Putin declared that whichever country becomes the leader in Artificial Intelligence (AI) "will become the ruler of the world" (Vincent, 2017). However, the government initially had been slow to realise the need for cooperation between the private and public sector. For example, government support for AI start-ups had long been lacking, contributing to Russia's weaker performance when compared to the United States or China (Nadibaidze, 2022). This initial neglect has given way to a series of policy documents that clearly express Russia's AI ambitions. Russia's first national AI strategy was released in 2019, providing a comprehensive list of goals, for example investment, R&D, training, legal frameworks, and recruitment of talent to the military (Zysk, 2023a).

46. Yet, the private sector AI ecosystem remains small, and there are problems with talent development and retention. Russia's AI-related research also lags behind the United States and China. Russia's micro-electronics industry is weak, and the country's civilian technology sector is still heavily reliant on semiconductor equipment from the United States, Taiwan, and South Korea. Hence, many observers remain sceptical of Russia's potential in emerging technologies, including

AI (Kozyulin, 2023). Despite these challenges, the government persists in its prioritisation of AI development and continues to support relevant efforts, including calls for international regulation (Bendett, 2023).

47. The Russian defence ministry has set up a network of research and development organisations that reach across the military-industrial complex, academia, and the private sector, with the aim to work on military robotics and the integration of AI into military systems. In August 2022, the ministry announced the official creation of an AI department for implementing AI in weapons development. A recently published 10-year defence plan features a specific section on AI with a corresponding budget line to ensure the application of AI for defence systems (Starchak, 2024). The Ministry of Defence Directorate in charge had been supporting more than 500 projects as of September 2022, which cover various issue areas (Zysk, 2023b). Yet, Russia's mixed experience of using uncrewed aerial vehicles (UAVs) in its aggression against Ukraine has revealed stark technological limits (CNA, 2022). Moreover, the war against Ukraine, which resulted in Western sanctions, has inhibited the country's progress. Among other challenges, the "brain drain" of IT specialists as well as Western sanctions on certain technologies have complicated Russia's AI development.

48. For the foreseeable future, Russia's limited progress will not allow it to develop AI, whether in commercial or economic terms, on a level comparable to the United States or China (CNA, 2022). This is due to "long-standing structural problems, such as insufficient funding, extensive corruption, inefficient use of resources, poor quality control, low labour productivity across the economy, the reliance of the defence industry on state order, and preferential funding that undermines competition and innovation" (Zysk, 2023b). The Russian usage of AI should, nonetheless, not be underestimated. For example, a recently published analysis by the NATO Strategic Communications Centre of Excellence points to the increasing role and use of AI tools in Russian disinformation and propaganda campaigns (NATO STRATCOM COE, 2024).

IV- CONCLUSIONS AND RECOMMENDATIONS

49. The incorporation of AI into Allies' armed forces has already started and constitutes an irreversible trend. For NATO to maintain its technological edge and upper hand in collective defence, it is essential to focus on future interoperability and avoid siloed innovation. As national armed forces begin to implement AI into their tactical, operational and strategic structures, complications in terms of misaligned data and AI applications in multinational operations must be avoided. Additionally, with the widening capability gap of national AI capabilities, NATO must make sure that less equipped members or the Alliance itself will be able to respond to adversaries using AI-enabled technology or autonomous systems in a future faster conflict environment. In order to successfully navigate the challenges and opportunities of this process, the Alliance and NATO Parliamentarians should:

- raise awareness for the role of AI to enhance its legitimacy and the acceptance of increased investments whilst taking into account the inherent dual-use aspect and ethical concerns when it comes to AI;
- engage in close discussions to strike a balance between political and military considerations to ensure an ethical, legal, and responsible use whilst reaping military rewards;
- work towards up-to-date and coherent strategic documents and activities across the Alliance;
- support ongoing efforts to create an innovation ecosystem and reap the benefits of commercial advancements to make AI available for armed forces;
- avoid future interoperability issues of Allies by ensuring joint standards across systems;

- enhance cooperation with the EU and other partners in this field;
- continue the development of standards for an ethical use of AI in various international frameworks, striving for inclusive and universal norms, standards and rules; and
- engage with external actors to reach universally agreed-upon standards.

50. As a democratic Alliance accountable to its public, parliaments play an important role in explaining the rationale for AI to a broader audience. This is even more necessary as the apparent scepticism towards AI within Western and democratic societies is more likely to cause a consequential public backlash. The challenge for political and military communities alike is to highlight why AI is playing an ever-greater role in maintaining security, yet without trivialising its risks. The NATO PA is well suited to play an educating role in this context.

51. As AI enters NATO's armed forces, it remains crucial to avoid any disconnect between military requirements and political guidelines for regulating the use of AI. While the military may perceive certain restrictions as too limiting – since some competitors may be less inhibited by ethical or legal considerations – it ultimately stands to benefit from the positive image created by its adherence to agreed rules. At the same time, political decision-makers as well as technical experts need to understand the requirements of the military when drafting such guidelines. These efforts should include the development of shared mitigation terms, applications, and goals when it comes to biases of AI instruments as well as education of service members to detect and prevent algorithmic and cognitive biases. Since the NATO PA is situated at the nexus of security policy and the military, it could play a useful role in raising awareness among its members, and Parliamentarians more generally, of the need to reconcile the different needs and approaches whilst ensuring civilian control and oversight.

52. NATO should continue to regularly review its AI Strategy, as it has recently done, to keep pace with technical developments, reflect the progress made in Allied national AI documents, and seek to harmonise them. NATO's STO and other technology-oriented bodies such as the NCIA and Allied Command Transformation's Innovation Hub can play an important advisory role in this regard. To ensure that these documents are having their desired impact on the public's perceptions of AI, the NATO PA should be kept informed of their respective drafting processes, so it can play its natural role as a matchmaker between the defence sector and the broader public. In this regard, NATO Parliamentarians should urge our national governments to adhere to the aims and goals, the desired outcomes, as well as the six principles of responsible use enshrined in NATO's Revised AI Strategy.

53. Given that AI, as well as other emerging disruptive technologies, is enforcing massive changes in the way Allies approach innovation and its adaptation into the armed forces, NATO should continue its current emphasis on building a new innovation ecosystem across the Alliance. The NIF, DIANA and other initiatives, as well as NATO's AI Strategy and other guiding documents, demonstrate NATO's commitment to change. In line with NATO's commitment to the responsible use of AI, which includes bias mitigation, funding decisions taken by NIF, DIANA or other NATO bodies should prioritise projects with clear protections for data management and against biases. Other recent innovations, such as regular meetings by the national security advisers, or entirely new kinds of gatherings, such as digital summits that bring together governments and the private sector to discuss cooperation in security-related AI, could further strengthen this policy track. In this context, NATO should also leverage private sector expertise when it comes to the elimination of biases in AI and the promotion of diversity within the AI workforce.

54. The EU is playing an increasingly important role in setting up regulations for the application of AI. While these efforts are largely aimed at the civilian use of AI, they could also have serious implications for the military use of this technology. Hence, NATO and the EU need a structured dialogue on AI that helps to bridge the differences in both organisations' memberships and ensures that the key AI documents of both institutions remain aligned.

55. NATO should continue to strongly support the development of standards for an ethical, legal, and responsible use of AI in the military domain. Such efforts are even more important as major regulatory documents, such as the EU AI Act or the Council of Europe's Convention, exclude the defence sector. Building on NATO's Revised AI Strategy, initiatives by NATO member countries, such as the Political Declaration on Responsible Military Use of Artificial Intelligence and Autonomy, as well as the REAIM Summit, Allies should continue to jointly work towards inclusive and universal norms, standards and rules in this policy area. This includes support for ongoing processes within the UN. Such efforts should adapt to the rapid pace of innovation and include strong mechanisms to monitor their implementation.

56. Even if the adoption race for AI is ongoing, Allies should pursue parallel attempts to bring the key competitors, i.e. China and Russia, into the discussion of establishing norms and confidence-building measures on AI. In doing so, NATO member countries should draw on existing channels and pursue dialogue within and across the multiple multilateral frameworks that are dealing with the regulation and governance of AI, including the United States-China AI Dialogue. Whether these countries see themselves as true stakeholders in crafting a global set of rules remains to be seen, although the scenario of AI used for developing chemical and biological weapons, for example, should be as abhorrent to them as for everyone else. In any case, it is important that NATO is perceived as a responsible and credible stakeholder in this process, as it is in other areas, such as cyber or space. In short, when it comes to AI, NATO must lead by example.

BIBLIOGRAPHY

- Bellaby, Ross W., "Can AI Weapons Make Ethical Decisions?", *Criminal Justice Ethics*, vol. 40, no. 2, 21 July 2021.
- Bendett, Samuel, "Military AI Developments in Russia", In: Raska, Michael and Bitzinger, Richard (Eds.), *The AI Wave in Defence Innovation. Assessing Military Artificial Intelligence Strategies, Capabilities, and Trajectories*, 2023.
- Bode, Ingvild, and Bhila, Ishmael, "The problem of algorithmic bias in AI-based military decision support systems", *Humanitarian Law & Policy*, ICRC (International Committee of the Red Cross), 03 September 2024.
- Borchert, Heiko, Schütz, Torben, and Verbovszky, Joseph, "Master and Servant: Defense AI in Germany", DAIO (Defense AI Observatory), 2023.
- Bresnick, Sam:
- (2024a) "Into the Minds of China's Military AI Experts", *Foreign Policy*, 18 July;
 - (2024b) "Could AI Lead to the Escalation of Conflict? PRC Scholars Think So", *Lawfare*, 20 September.
- Bundeswehr, "Laboratory for artificial intelligence", No Date (n.d.).
- Canada (Government of Canada):
- (2024a) "The Department of National Defence and Canadian Armed Forces: Artificial Intelligence Strategy", 22 March;
 - (2024b) "Minister of National Defence Remarks at the Responsible AI in the Military domain (REAIM) Summit 2024", 10 September.
- Car, Polona, and Marcelin, Tristan, "Artificial intelligence and cybersecurity", European Parliamentary Research Service (EPSR), April 2024.
- Christie, Edward Hunter, "Defence cooperation in artificial intelligence: Bridging the transatlantic gap for a stronger Europe", *European View*, vol. 21, no. 1, 2022.
- Clement, Sven, "Biological Threats: Technological Progress and the Spectre of Bioterrorism in the Post-Covid-19 Era", NATO Parliamentary Assembly, Report by the Sub-Committee on Technology Trends and Security, Science and Technology Committee (STCTTS), 10 October 2021.
- Clark, Joseph, "DOD Releases AI Adoption Strategy", 2 November 2023.
- Clasen, Alina, "Germany launches AI action plan to boost investments, European cooperation", *EurActiv*, 8 November 2023.
- CNA (Center for Naval Analysis), "Artificial Intelligence and Autonomy in Russia: A Year's Reflection Occasional Paper", September 2022.
- Council of Europe:
- (2024a) "Council of Europe opens first ever global treaty on AI for signature", 5 September;
 - (2024b) "Council of Europe Framework Convention on Artificial Intelligence and Human Rights, Democracy and the Rule of Law", 5 September.
- CRS (Congressional Research Service):
- (2023a) "Artificial Intelligence: Overview, Recent Advances, and Considerations for the 118th Congress (R47644)", 4 August;
 - (2023b) "Highlights of the 2023 Executive Order on Artificial Intelligence for Congress (R47843)", 17 November.
- Csernatoni, Raluca, "Charting the Geopolitics and European Governance of Artificial Intelligence", Carnegie Europe, March 2024.
- DeSmith, Christy, "Why China has edge on AI, what ancient emperors tell us about Xi Jinping", *The Harvard Gazette*, 16 March 2023.
- Dheda, Govind, "Pentagon AI Initiative Acceleration: A Comprehensive Overview", Open AI Master, 9 December 2023.
- DIANA (NATO Defence Innovation Accelerator for the North Atlantic), "DIANA Challenge Programme: Call for Proposals", 2024.

Economist (The):

- (2024a) "How Ukraine is using AI to fight Russia", 08 April;
- (2024b) "Israel's use of AI in Gaza is coming under closer scrutiny", 11 April.

EP (European Parliament), "Artificial Intelligence Act: MEPs adopt landmark law", 13 March 2024.

Estonia (Government of Estonia), "Estonian Ministry of Defence and Helsing OÜ sign joint statement on AI-driven defence cooperation", 14 August 2024.

FLI (Future of Life Institute), "Autonomous Weapons: an Open Letter from AI & Robotics Researchers", 28 July 2015.

France (Government of France):

- (2018) "Artificial Intelligence for Humanity: The French AI Strategy";
- (2024) "Commission de l'Intelligence Artificielle. IA: Notre Ambition pour la France", March.

Fraser, Callum, "AI's baptism by fire in Ukraine and Gaza offers wider lessons", IISS (International Institute for Strategic Studies), 22 April 2024.

German MOD (German Ministry of Defence), "Defence Policy Guidelines 2023", 2023.

Haotian, Qi, "China's Evolving AI Development. Emergent Process Transcending Instrumentalism and Morality", In: Raska, Michael and Bitzinger, Richard (Eds.), *The AI Wave in Defence Innovation. Assessing Military Artificial Intelligence Strategies, Capabilities, and Trajectories*, 2023.

Holland Michel, Arthur, "The Machine Got it Wrong? Uncertainties, Assumptions, and Biases in Military AI", *Just Security*, 13 May 2024.

ICRC (International Committee of the Red Cross):

- (2022) "What you need to know about autonomous Weapons", 26 July;

ICRC and Geneva Academy (International Committee of the Red Cross and Geneva Academy of International Humanitarian Law and Human Rights), "Expert Consultation Report on AI and Related Technologies in Military Decision-Making on the Use of Force in Armed Conflicts", March 2024.

Johnson, James:

- (2019) "Artificial intelligence & future warfare: implications for international security", *Defense and Security Analysis*, vol. 35, no. 2;
- (2022) "The AI Commander Problem: Ethical, Political, and Psychological Dilemmas of Human-Machine Interactions in AI-enabled Warfare", *Journal of Military Ethics*, vol. 21, no. 3-4, 2022.

Kozyulin, Vadim, "Assessing Russia's National Strategy for AI Development", In: Raska, Michael and Bitzinger, Richard (Eds.), *The AI Wave in Defence Innovation. Assessing Military Artificial Intelligence Strategies, Capabilities, and Trajectories*, 2023.

Kurç, Çağlar, "Enabling Technology of Future Warfare. Defense AI in Turkey", DAIO (Defense AI Observatory), 2023.

Lederer, Edith M., "UN experts urge United Nations to lay foundations for global governance of artificial intelligence", *Associate Press*. 20 September 2024.

Lee, Joyce, "Sixty countries endorse 'blueprint' for AI use in military; China opts out", *Reuters*, 10 September 2024.

Luxembourg (Government of the Grand Duchy of Luxembourg):

- (2019a) "Artificial Intelligence: a strategic vision for Luxembourg", May;
- (2019b) "Official launch of the Luxembourg Digital Innovation Hub", 30 September;
- (2022) "Defence Space Strategy", February;
- (2023) "Luxembourg Defence Guidelines 2035", May.

Machi, Vivienne, "France approves final phase of Artemis big-data processing platform", *Defense News*, 11 July 2022.

Manson, Katrina, "AI warfare is already here", *Bloomberg*, 28 February 2024.

Mayer, Michael, "Trusting machine intelligence: artificial intelligence and human-autonomy teaming in military operations", *Defense & Security Analysis*, vol. 39, no. 4, 2023.

Murgia, Madhumita, and Espinoza, Javier, "US, Britain and Brussels to sign agreement on AI standards", *Financial Times*, 05 September 2024.

Nadibaidze, Anna, "Russian Perceptions of Military AI, Automation and Autonomy", FPRI (Foreign Policy Research Institute), 27 January 2022.

NATO (North Atlantic Treaty Organisation):

- (2021a) "NATO releases first-ever strategy for Artificial Intelligence", 22 October;
- (2021b) "Summary of the NATO Artificial Intelligence Strategy", 22 October;
- (2022a) "NATO's Data and Artificial Intelligence Review Board", 13 October;
- (2022b) "Summary of NATO's Autonomy Implementation Plan" 13 October;
- (2023a) "NATO starts work on Artificial Intelligence certification standard" 8 February;
- (2023b) "NATO Consultation, Command and Control Board (C3B) approves Digital Transformation Implementation Strategy", 24 May;
- (2023c) "Emerging and disruptive technologies", 22 June;
- (2024a) "DIANA, NATO's innovation accelerator, doubles the size of its transatlantic network", 14 March 2024;
- (2024b) "Summary of NATO's revised Artificial Intelligence (AI) strategy" 10 July;
- (2024c) "NATO releases revised AI strategy", 10 July 2024;
- (2024d) "NATO DIANA announces companies chosen for the next phase of its accelerator programme" 10 September 2024.

NATO PA (NATO Parliamentary Assembly), "NATO Parliamentarians take stock of the Alliance's technological advances in Belgium and the Netherlands", 23 September 2024.

NATO STRATCOM COE (NATO Strategic Communications Centre of Excellence), "Hijacking Reality: The Increased Role of Generative AI in Russian Propaganda", *Virtual Manipulation Brief 2024/1*, 2024.

NATO STO (NATO Science and Technology Organisation):

- (2020) "Science & Technology Trends 2020-2040: Exploring the S&T Edge", March;
- (2024) "2024 Collaborative Programme of Work", May.

NCIA (NATO Communications and Information Agency):

- (2022) "NATO launches artificial intelligence strategic initiative", 5 October;
- (2024) "NATO Parliamentary Assembly visits NCIA in The Hague", 13 September.

NIF (NATO Innovation Fund), "NATO Innovation Fund makes first investments to secure the future of the Alliance's 1 billion citizens", 18 June 2024.

OECD (Organisation for Economic Co-operation and Development), "OECD AI Principles overview", May 2024.

Robinson, Nick, Hardy, Alex, and Ertan, Amy, "Estonia: a curious and cautious approach to artificial intelligence and national security", *Routledge Companion to Artificial Intelligence and National Security Policy*, 2021.

Rosen, Brianna, "From Principles to Action: Charting a Path for Military AI Governance", Carnegie Council for Ethics in International Affairs, 12 September 2024.

Ruitenbergh, Rudy, "France preps Europe's fastest classified supercomputer for defense AI", 18 June 2024.

Schaake, Marietje, "Military is the missing word in AI safety discussions", *Financial Times*, 30 April 2024.

Scharre, Paul, "Obstacles and Opportunities for Transformative Change: Testimony before the House Committee on Armed Services, Subcommittee on Cyber, Information Technologies, and Innovation", 19 October 2023.

Stanford University, "Artificial Intelligence Index Report 2023", April 2023.

Stanley-Lockman, Zoe, "Responsible and Ethical Military AI: Allies and Allied Perspectives. Issue Brief", CSET (Center for Security and Emerging Technology), Georgetown University, August 2021.

Stanley-Lockman, Zoe, and Christie, Edward Hunter, "An Artificial Intelligence Strategy for NATO", *NATO Review*, 25 October 2021.

Shoker, Sarah, Reddie, Andrew, Hickey, Alan, and Walker, Leah, "New Tools Are Needed to Address the Risks Posed by AI-Military Integration", *Lawfare*, 18 March 2024.

Starchak, Maxim, "Russian defense plan kicks off separate AI development push", *Defense News*, 16 August 2024.

- Stewart, Ruben, and Hinds, Georgia, “Algorithms of war: The use of artificial intelligence in decision making in armed conflict”, *Humanitarian Law & Policy*, ICRC (International Committee of the Red Cross), 24 October 2023.
- Stokes, Jacob, “Military Artificial Intelligence, the People’s Liberation Army, and U.S.-China Strategic Competition: Testimony before the U.S.-China Economic and Security Review Commission”, 1 February 2024.
- Sweijts, Tim and Romansky, Sofia, “International Norms Development and AI in the Military Domain”, CIGI (Centre for International Governance Innovation) and HCCS (The Hague Centre for Strategic Studies), September 2024.
- Tonin, Matej, “Artificial Intelligence: Implications for NATO’s Armed Forces”, NATO Parliamentary Assembly, Report by the Sub-Committee on Technology Trends and Security, Science and Technology Committee (STCTTS), 13 October 2019.
- Türkiye (Government of Türkiye), “Ministry of Industry and Technology and Digital Transformation Office of the Presidency National Artificial Intelligence Strategy, 2021-2025”, August 2021.
- UK (Government of the United Kingdom):
- (2022) “Digital Strategy”, 4 October;
 - (2024) “UK, US and Canada to collaborate on cybersecurity and AI research”, 20 September.
- UK MOD (United Kingdom Ministry of Defence):
- (2022) “Defence Artificial Intelligence Strategy”, 15 June;
 - (2023) “Defence’s response to a more contested and volatile world”, July.
- UN (United Nations), “General Assembly adopts landmark resolution on artificial intelligence”, 21 March 2024.
- UNODA (United Nations Office for Disarmament Affairs), “Lethal Autonomous Weapon Systems (LAWS). United Nations Office for Disarmament Affairs”, 2023.
- US DOD (United States Department of Defense):
- (2019) “Summary of the 2018 Department of Defense Artificial Intelligence Strategy: Harnessing AI to Advance Our Security and Prosperity”, 12 February;
 - (2020) “DOD Adopts Ethical Principles for Artificial Intelligence”, 24 February;
 - (2022) “Responsible Artificial Intelligence Strategy and Implementation Pathway”, June;
 - (2023) “Data, Analytics, and Artificial Intelligence Adoption Strategy. Accelerating Decision Advantage”, November.
- US DOS (United States Department of State), “Political Declaration on Responsible Military Use of Artificial Intelligence and Autonomy”, November 2023.
- Vestner, Tobias, and Cleobury, Simon, “Putting the Second REAIM Summit into Context”, *Just Security*, 05 September 2024.
- Vincent, James, “Putin says the nation that leads in AI ‘will be the ruler of the world’”, *The Verge*, 4 September 2017
- Viveros Álvarez, Jimena Sofia, “The risks and inefficacies of AI systems in military targeting support”, *Humanitarian Law & Policy*, ICRC (International Committee of the Red Cross), 04 September 2024.
- Webster, Graham, Creemers, Rogier, Triolo, Paul, and Kania, Elsa, “Full Translation: China’s ‘New Generation Artificial Intelligence Development Plan’”, 1 August 2017.
- Weingarten, Joe, “Developing Future Capabilities: Robotics and Autonomous Systems”, NATO Parliamentary Assembly, Report by the Sub-Committee on Technology Trends and Security, Science and Technology Committee (STCTTS), 7 October 2023.
- Zysk, Katarzyna:
- (2023a) “High Hopes Amid Hard Realities: Defense AI in Russia”, DAIO (Defense AI Observatory);
 - (2023b) “Struggling, Not Crumbling: Russian Defence AI in a Time of War”, RUSI (Royal United Services Institute), 20 November.