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Emerging Norms around Military Applications of AI: The Case of Human Control

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1. Introduction

The development and use of AI technologies in warzones around the world is increasing.[1] This raises the question of how AI in the military domain changes international norms. International norms can take the form of legal norms and social norms.[2] Legal norms range from binding prohibitions and regulations such as treaties or protocols to soft, voluntary commitments, such as political declarations or lists of principles. Social norms are understandings of appropriateness that are often implicit, not written down, and typically not publicly discussed.[3] But such social norms shape and communicate what states consider 'appropriate' behaviour when it comes to AI in the military domain.

We can track evolving norms in two ways: first, military applications of AI may influence (the interpretation of) existing, legal norms, for example the principle of proportionality in international humanitarian law (IHL). Second, military applications of AI may lead to new norms emerging that can have the character of social norms or legal norms. We may also find effects on norms that cut across both categories, for example the norm of human control over the use of force that this policy brief takes as its focus.

The ways in which AI in the military domain changes the role humans play in use-of-force decision-making has been an integral part of the international debate since the mid-2010s. Such a concern has originally been primarily associated with the notion of ”human control” (often with the added qualifier 'meaningful') and variations such as ”human oversight” or ”human judgement”.[4] Human control already has an implicit basis in international law in relation to accountability.[5] Stated explicitly, the need to exercise a sufficient level of human control over use-of-force decision-making has become a recognised governance principle across various international initiatives. The Guiding

[1] AI technologies are broadly defined as “computational techniques and technologies that extract statistical correlations […] from large datasets” Lucy Suchman, 'The Uncontroversial “Thingness” of AI', *Big Data & Society* 10, no. 2 (1 July 2023): 20539517231206790, https://doi.org/10.1177/20539517231206794.

[2] Ingvild Bode, 'Contesting Use of Force Norms Through Technological Practices', *Journal of International Law* 83, no. 1 (14 May 2023): 39–64, https://doi.org/10.17104/0044-2348-2023-1-39; Ingvild Bode, 'Practice-Based and Public-Deliberative Normativity: Retaining Human Control over the Use of Force', *European Journal of International Relations* 29, no. 4 (1 December 2023): 990–1016, https://doi.org/10.1177/13540661231163392.

[3] Ingvild Bode, 'Practice-Based and Public-Deliberative Normativity: Retaining Human Control over the Use of Force', *European Journal of International Relations* 29, no. 4 (1 December 2023): 990–1016, https://doi.org/10.1177/13540661231163392.

[4] Heather M. Roff and Richard Moyes, *Meaningful Human Control, Artificial Intelligence and Autonomous Weapons*, briefing paper prepared for the Informal Meeting of Experts on Lethal Autonomous Weapons Systems, UN Convention on Certain Conventional Weapons, Geneva, 11–15 April 2016 (London: Article 36, 2016), https://article36.org/wp-content/uploads/2016/04/MHC-AI-and-AWS-FINAL.pdf; Merel Ekelhof, 'Moving Beyond Semantics on Autonomous Weapons: Meaningful Human Control in Operation', *Global Policy* 10, no. 3 (2019): 343–48, https://doi.org/10.1111/1758-5899.12665.

[5] Christof Heyns, 'Autonomous Weapons Systems: Living a Dignified Life and Dying a Dignified Death', in *Autonomous Weapons Systems: Law, Ethics, Policy*, ed. Claus Kreβ et al. (Cambridge: Cambridge University Press, 2016), 3–20, https://doi.org/10.1017/CBO9781316597873.001.

Principles agreed upon by the Group of Governmental Experts on emerging technologies in the area of lethal autonomous weapons systems (GGE on LAWS) draw attention to a requisite quality of "human-machine interaction";[6] the REAIM Call to Action speaks of "ensuring […] human oversight of the use of AI systems";[7] and the US Political Declaration on Responsible AI in the Military Domain likewise seeks to ensure that "senior officials effectively and appropriately oversee the development and deployment of military AI capabilities".[8] An explicit commitment to human control has therefore become a soft legal norm that is simultaneously grounded in hard legal norms.

But, while resting on a general level of agreement, what precisely counts as a requisite quality of human control is unclear. In other words, what is the precise substance of this norm? This question could be answered by considering how states discuss the implementation of human control principles. But beyond this, we can already gauge the contours of what the human control norm means in practice by considering established patterns of use.

State practices of designing and using military applications of AI have long already shaped what counts as the requisite quality of human control over the use of force at the level of an implicit social norm. The debate about military applications of AI started with a focus on AWS that "select and apply force to targets without human intervention."[9] But integrating sensor-based targeting into weapon systems or relying on computerised forms of decision support systems is, of course, not new. This longer historical trajectory of military systems that integrate predecessor technologies of what is now referred to as AI since at least the 1960s is crucial to understanding what has become seen as a requisite quality of human control over the use force. Such patterns of use therefore define the substance of the human control norm.

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[6] United Nations, *Report of the 2019 Session of the Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems*, UN Document CCW/GGE.1/2019/3 (Geneva: United Nations, 25 September 2019), app. 3, https://documents.unoda.org/wp-content/uploads/2020/09/CCW_GGE.1_2019_3_E.pdf.

[7] "REAIM Call for Action," February 2023, para. 12.

[8] U.S. Department of State. *Political Declaration on Responsible Military Use of Artificial Intelligence and Autonomy*. Washington, D.C.: U.S. Department of State, 2023, para c. https://www.state.gov/bureau-of-arms-control-deterrence-and-stability/political-declaration-on-responsible-military-use-of-artificial-intelligence-and-autonomy.

[9] International Committee of the Red Cross. *ICRC Position on Autonomous Weapon Systems*. Geneva: ICRC, 12 May 2021, p. 2. https://www.icrc.org/en/document/icrc-position-autonomous-weapon-systems.

To track the substance of the human control norm, I draw on in-depth empirical analysis of three types of military systems integrating automated, autonomous, and AI technologies based on open-source data: air defence systems, loitering munitions, and AI-based decision support systems (AI DSS).[10] Section 2 reviews how practices related to these three types of systems have contributed to shaping an emerging norm of what counts as the requisite quality of human control exercised over the use of force. All three types of systems continue to involve humans in their employment, including, for example, in the forms of humans authorising specific attacks. But the quality of control that humans can exercise is compromised due to the complexity of the tasks they need to perform in using the system and the demands they are placed under, for example in terms of speed and overseeing multiple, networked systems. I close the policy brief by drawing attention to policy advice arising out of these findings.

[10] I conducted the empirical data collection that is the basis of this analysis collaboratively, including in the context of the European Research Council-funded AutoNorms project. Ingvild Bode and Tom F. A. Watts, 'Meaning-Less Human Control: Lessons from Air Defence Systems on Meaningful Human Control for the Debate on AWS', February 2021, https://www.researchgate.net/publication/349494662_Meaning-less_Human_Control_Lessons_from_Air_Defence_Systems_on_Meaningful_Human_Control_for_the_Debate_on_AWS; Tom FA Watts and Ingvild Bode, 'Automation and Autonomy in Air Defence Systems Catalogue (v.1)', 8 February 2021, https://doi.org/10.5281/zenodo.4485695; Ingvild Bode and Tom Watts, 'Loitering Munitions and Unpredictability: Autonomy in Weapon Systems and Challenges to Human Control', 7 June 2023, https://pure.royalholloway.ac.uk/en/publications/loitering-munitions-and-unpredictability-autonomy-in-weapon-syste; Tom F. A. Watts and Ingvild Bode, 'Automation and Autonomy in Loitering Munitions Catalogue (v.1)', 25 April 2023, https://doi.org/10.5281/zenodo.7860762; Anna Nadibaidze, Ingvild Bode, and Qiaochu Zhang, 'AI in Military Decision Support Systems: A Review of Developments and Debates', Report, *AI in Military Decision Support Systems* (Odense: Center for War Studies, 4 November 2024).

2. The Practice-Based Emergence of the Human Control Norm

The following section reviews how states have developed and used three types of military systems integrating automated, autonomous, or AI technologies: air defence systems, loitering munitions, and AI-based decision support systems (AI DSS). Air defence systems are one of the oldest and most widely spread weapon systems to integrate automated and autonomous technologies in targeting. Loitering munitions can tell us something about the current edge of this development in the spectrum of weapon systems. AI DSS extend the analysis beyond weapon system to consider how the integration of AI in earlier stages of the targeting process affects the human control norm.

2.1 Air Defence Systems

According to estimates provided by the Stockholm International Peace Research Institute, 89 states operate different types of air defence systems, signifying their global spread.[11] Air defence systems with autonomous technologies were initially developed in the 1960s in response to perceiving that the reaction time, firepower, and operational availability of existing systems could not handle the threat posed by low-flying, anti-ship missiles. There was a concern that human operators have a limited ability to conduct targeting at the speed perceived to be required. As a result of the ambition to fight at machine speed, practices of designing air defences system increasingly minimized the role of human operators in favour of 'delegating' more and more tasks to the system. We can see such practices in how ship-mounted close-in weapon systems are designed. Systems such as the Russian-manufactured AK-630M, the French-manufactured Crotale, and the US-manufactured Phalanx that became operational in the late 1970s all have 'fully automatic' tracking and targeting capabilities.[12] In the Crotale, for example, all decision-making tasks in target detection and tracking "are automated to achieve reduced reaction-times", while the operator is on-the-loop with a time-restricted "option of overriding the sensor automatically selected by the operational software".[13]

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[11] Vincent Boulanin and Maaike Verbruggen, 'Mapping the Development of Autonomy in Weapon Systems' (SIPRI, November 2017), p. 40, https://www.sipri.org/publications/2017/policy-reports/mapping-development-autonomy-weapon-systems.

[12] Tom FA Watts and Ingvild Bode, 'Automation and Autonomy in Air Defence Systems Catalogue (v.1)', 8 February 2021, https://doi.org/10.5281/zenodo.4485695.

[13] Army Technology, 'Crotale NG Short Range Air Defence System', *Army Technology* (blog), 2021, https://www.army-technology.com/projects/crotale/.

Integrating autonomous technologies into air defence systems does not only involve 'delegating' motor and sensory tasks, but also cognitive tasks in the form of automated target recognition.[14] This decision has increased the complexity of air defence systems. In this, integrating autonomous technologies into air defence systems has fundamentally changed the role of human operators. The major change is that their role has been minimised while also making it more complex. These observations speak, in particular, to human-machine interaction challenges related to target identification.

Human operators face three major challenges to the exercise of their role: A first challenge is a potential lack of situational awareness. This results from human operators having been relegated from active controllers to passive supervisors in the process of integrating autonomous technologies.[15] Because of this, human operators find themselves either underloaded or overloaded with tasks. As many tasks have been 'delegated' to the system, operators are left without anything useful to do until they are called upon to act very quickly. A second challenge results from system complexity. Autonomous technologies introduce comprehension barriers limiting the extent to which human operators can follow and understand the system's functionality. Human operators may therefore be more likely to misperceive or misunderstand the system's behaviour. A third and final challenge is the speed at which targeting decision-making happens. If human operators are in or on the loop, the reaction time that they have to decide whether to authorise the use of force or not is often only a couple of seconds.

In sum, even though air defence systems are used with a human in/on the loop, practices of human-machine interaction in these systems present challenges to the quality of human control operators can exercise. Such challenges inherent to complex human-machine interaction matter because they have been factors in failures of air defence systems that led to the downing of civilian airplanes and instances of friendly fire.[16] Already in the case of air defence systems, the choice of integrating autonomous technologies therefore appears to accept a reduced role of humans in specific use of force situations.

2.2 Loitering Munitions

Loitering munitions are "expendable uncrewed aircraft which can integrate sensor-based analysis to hover over, detect and explode into targets".[17] Such systems have been

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[14] Tom FA Watts and Ingvild Bode, 'Automation and Autonomy in Air Defence Systems Catalogue (v.1)', 8 February 2021, https://doi.org/10.5281/zenodo.4485695.

[15] John K. Hawley, 'Patriot Wars' (Center for a New American Security, 2017), https://www.cnas.org/publications/reports/patriot-wars.

[16] The analysis of air defence systems was based on the downing of three civilian airplanes (IR655 in 1988, MH17 in 2014 and PS752 in 2020) and two instances of fratricide during the invasion of Iraq (2003).

[17] Ingvild Bode and Tom Watts, 'Loitering Munitions and Unpredictability: Autonomy in Weapon Systems and Challenges to Human Control', 7 June 2023, p. 3, https://pure.royalholloway.ac.uk/en/publications/loitering-munitions-and-unpredictability-autonomy-in-weapon-syste.

developed since the 1980s and are currently in service with at least 15 militaries worldwide.[18] Loitering munitions have made headlines news in Russia's war in Ukraine – and because they have been used in other recent conflicts, such as Libya, Nagorno-Karabakh, and Syria. Such systems also occupy a prominent place in the debate about AWS. Early platforms used against radars, such as the Harpy, are considered as being one of the examples of an AWS capable of automatically applying force via sensor-based targeting without human intervention.[19]

More recent models show how such capabilities have developed. Most manufacturers characterize their platforms as human in/on the loop systems. But loitering munitions in use today also integrate autonomous technologies to identify, track, and select targets. Many manufacturers also allude to the potential capacity of the systems to attack targets without human intervention.[20] This draws our attention to some uncertainties regarding whether and, if so, how loitering munitions may operate without human control and assessment of sensor inputs.

A closer look at one platform that has drawn significant attention illustrates this: the Kargu-2. In May 2021, a report authored by a UN Panel of Experts on Libya characterised the Kargu-2 as a LAWS.[21] The report argued that, in March 2020, forces affiliated with the Libyan Government had used the Kargu-2 to attack militias autonomously, that is without human supervision or intervention. The system's manufacturer, STM, disagreed, noting that the platforms missions are "fully performed by the operator, in line with the Man-in-the-Loop principle".[22] However, prior to the publication of the UN report, STM had advertised the Kargu-2 in different terms. Then, the system was argued to possess "both autonomous and manual modes," and utilising "real-time image processing capabilities and *deep learning* algorithms".[23] Even the potential integration of facial recognition was mentioned.[24]

[18] Tom F. A. Watts and Ingvild Bode, 'Automation and Autonomy in Loitering Munitions Catalogue (v.1)', 25 April 2023, https://doi.org/10.5281/zenodo.7860762.
[19] International Committee of the Red Cross. *ICRC Position on Autonomous Weapon Systems*. Geneva: ICRC, 12 May 2021, p. 5. https://www.icrc.org/en/document/icrc-position-autonomous-weapon-systems.
[20] Ingvild Bode and Tom Watts, 'Loitering Munitions and Unpredictability: Autonomy in Weapon Systems and Challenges to Human Control', 7 June 2023, p. 8-9, https://pure.royalholloway.ac.uk/en/publications/loitering-munitions-and-unpredictability-autonomy-in-weapon-syste.
[21] United Nations Security Council, *Final Report of the Panel of Experts on Libya Established Pursuant to Security Council Resolution 1973 (2011)*, UN Doc. S/2021/229 (8 March 2021), https://documents.un.org/doc/undoc/gen/n21/037/72/pdf/n2103772.pdf.
[22] STM, *Tactical Mini UAV Systems* (STM, 2021), https://www.stm.com.tr/uploads/docs/1644928865_taktik-mini-iha-eng.pdf?
[23] STM, *KARGU - Autonomous Tactical Multi-Rotor Attack UAV*, 2018, https://www.youtube.com/watch?v=Oqv9yaPLhEk; Sema Susar, 'KARGU UAV System', *English Defence News* (blog), 5 April 2020, https://en.defenceturk.net/kargu-uav-system/.
[24] Sema Susar, 'KARGU UAV System', *English Defence News* (blog), 5 April 2020, https://en.defenceturk.net/kargu-uav-system/.

The fact that many loitering munitions appear to have been designed with a latent capability to engage in sensor-based targeting without human assessment is noteworthy.[25] As investigations on automation bias suggest, under stressful and rapidly changing combat conditions, it is possible that humans may uncritically trust the system's outputs.[26] Also, in certain situations, human operators may lack the sufficient situational awareness to doubt what the platform suggests as targets. [27] Further, within the internal logic of warfare, having access to an even latent capability may mean that conflict parties will eventually come to use it.

Further, loitering munitions introduce greater uncertainty about where force will be applied. At the point of launch and when the platforms are in the air, the precise target is unclear.[28] The selection of anti-personnel loitering munitions we examined have an operational endurance between 15 minutes and six hours and a range between 5 and 50km.[29] The geographical area within which an attack might happen therefore becomes large. This potentially creates more spatial and temporal distance between the use of force and humans exercising deliberative judgement. Such emerging patterns of using loitering munitions therefore further illustrate accepting a reduced quality of human control as 'appropriately' fulfilling the human control norm.

2.3 AI-based Decision Support Systems

Reports about practices of use indicate a much broader pattern of integrating AI technologies into military decision-making on the use-of-force than only weapon systems. Such systems are often subsumed under the notion of AI-based decision support systems (AI DSS). As this term implies, their use is intended to assist humans by identifying patterns in large datasets, forecasting scenarios, or suggesting potential

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[25] Ingvild Bode and Tom Watts, 'Loitering Munitions and Unpredictability: Autonomy in Weapon Systems and Challenges to Human Control', 7 June 2023, p. 9, https://pure.royalholloway.ac.uk/en/publications/loitering-munitions-and-unpredictability-autonomy-in-weapon-syste.

[26] Raja Parasuraman and Dietrich H. Manzey, 'Complacency and Bias in Human Use of Automation: An Attentional Integration', *Human Factors* 52, no. 3 (June 2010): 381–410, https://doi.org/10.1177/0018720810376055; Ingvild Bode and Tom Watts, 'Loitering Munitions and Unpredictability: Autonomy in Weapon Systems and Challenges to Human Control', 7 June 2023, p. 9, https://pure.royalholloway.ac.uk/en/publications/loitering-munitions-and-unpredictability-autonomy-in-weapon-syste.

[27] Ingvild Bode and Tom Watts, 'Loitering Munitions and Unpredictability: Autonomy in Weapon Systems and Challenges to Human Control', 7 June 2023, p. 9, https://pure.royalholloway.ac.uk/en/publications/loitering-munitions-and-unpredictability-autonomy-in-weapon-syste.

[28] Ingvild Bode and Tom Watts, 'Loitering Munitions and Unpredictability: Autonomy in Weapon Systems and Challenges to Human Control', 7 June 2023, p. 11, https://pure.royalholloway.ac.uk/en/publications/loitering-munitions-and-unpredictability-autonomy-in-weapon-syste.

[29] Tom F. A. Watts and Ingvild Bode, 'Automation and Autonomy in Loitering Munitions Catalogue (v.1)', 25 April 2023, https://doi.org/10.5281/zenodo.7860762.

courses of action.[30] While AI DSS could be used across many potential military contexts, I focus on a sub-set of AI DSS related to targeting and the use of force. [31] Military targeting is a networked, complex exercise that is conducted across different time periods and multiple stages where AI DSS could be used.[32] The development of AI DSS appears to be a global, persistent, and long-standing trend, but most open-source reporting covers a limited number of cases that, however, are indicative of diverse uses and can therefore be taken as representative.[33] In AI DSS, AI technologies are part of earlier stages of the military decision-making process on the use of force when compared with weapon systems. Militaries plan to integrate such systems at strategic, tactical, and operational levels – with an apparent (current) focus on the latter two levels.

The use of AI DSS represents forms of human-machine interaction as such systems are designed to assist and inform humans in the use-of-force decision-making loop. Human personnel interact directly with AI DSS as "epistemic tools" and remain the ultimate decision-makers on the use-of-force.[34] However, as I have argued in the preceding two sections, simply retaining human personnel in/on the loop does guarantee the exercise of high quality of human control. Such reasoning also applies to AI DSS, especially as such systems will likely be employed in multiple, interconnected ways at different stages of the decision-making process.[35]

The resulting, multiple ways in which humans use AI DSS are bound to not only affect the quality of human control but the very exercise of human agency over the use of force. Human agency can be defined as the capacity to understand the context, make deliberative decisions, and act upon these decisions in a way that ensures responsibility.[36] As the process of using AI DSS involves humans sharing thinking tasks with AI technologies, it appears clear that how humans exercise their agency will be

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[30] Anna Nadibaidze, Ingvild Bode, and Qiaochu Zhang, 'AI in Military Decision Support Systems: A Review of Developments and Debates', Report, *AI in Military Decision Support Systems* (Odense: Center for War Studies, 4 November 2024), p. 3.

[31] International Committee of the Red Cross and Geneva Academy of International Humanitarian Law and Human Rights, *Artificial Intelligence and Related Technologies in Military Decision-Making on the Use of Force in Armed Conflicts* (Geneva: ICRC and Geneva Academy, March 2024), p. 7–8.

[32] Merel Ekelhof and Giacomo Persi Paoli, *The Human Element in Decisions About the Use of Force* (Geneva: United Nations Institute for Disarmament Research, 2020), https://unidir.org/files/2020-03/UNIDIR_Iceberg_SinglePages_web.pdf; H. W. Meerveld et al., 'The Irresponsibility of Not Using AI in the Military', *Ethics and Information Technology* 25, no. 1 (14 February 2023): 14, https://doi.org/10.1007/s10676-023-09683-0.

[33] The three most reported cases are the United States' Project Maven as well as various AI DSS used in the Russia-Ukraine war (2022-) and the Israel-Hamas war (2023-).

[34] Jannik Zeiser, 'Owning Decisions: AI Decision-Support and the Attributability-Gap', *Science and Engineering Ethics* 30, no. 4 (18 June 2024): 27, https://doi.org/10.1007/s11948-024-00485-1.

[35] Anna Nadibaidze, Ingvild Bode, and Qiaochu Zhang, 'AI in Military Decision Support Systems: A Review of Developments and Debates', Report, *AI in Military Decision Support Systems* (Odense: Center for War Studies, 4 November 2024), p. 6–7.

[36] Ingvild Bode, 'Human-Machine Interaction and Human Agency in the Military Domain', Centre for International Governance Innovation, 15 January 2025, https://www.cigionline.org/publications/human-machine-interaction-and-human-agency-in-the-military-domain/.

modified. Military thinking recognises this but only appears to consider intentional and militarily beneficial parts of this process.[37] Using AI DSS is thought to address human (informational) weaknesses, thereby delivering an "intelligence advantage".[38] But this perspective under-appreciates how modifications of human agency resulting from using AI technologies are not only intentional and can amount to more than strategic benefits.[39]

Patterns of use indicate that AI DSS risk delimiting and diminishing the exercise of human agency by turning human personnel into cogs within a socio-technical system.[40] Human decision-making involving AI DSS is also subject to a well-documented range of cognitive biases. Prominent among these are, again, automation bias that can lead humans to over-trust AI outputs in comparison to their own critical thinking skills;[41] and action bias that leads humans to prefer action over inaction with potentially adverse consequences.[42] Practices of use also indicate how the increased decision-making speed associated with the use of AI DSS shortens the timeframe available to exercise human agency.[43]

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[37] Jen Judson, 'The Robots Are Coming: US Army Experiments with Human-Machine Warfare', Defense News, 25 March 2024, https://www.defensenews.com/unmanned/2024/03/25/the-robots-are-coming-us-army-experiments-with-human-machine-warfare/; UK Ministry of Defence, *Joint Concept Note 1/18: Human-Machine Teaming* (London: Ministry of Defence, May 2018), https://assets.publishing.service.gov.uk/media/5b02f398e5274a0d7fa9a7c0/20180517-concepts_uk_human_machine_teaming_jcn_1_18.pdf.

[38] Lt Gen Dash Jamieson, *Human Machine Teaming: The Intelligence Cycle Reimagined*, Mitchell Forum No. 53 (Arlington, VA: Mitchell Institute for Aerospace Studies, January 2024), 4, https://www.mitchellaerospacepower.org/human-machine-teaming-the-intelligence-cycle-reimagined/.

[39] Ingvild Bode, 'Human-Machine Interaction and Human Agency in the Military Domain', Centre for International Governance Innovation, 15 January 2025, p. 6-8, https://www.cigionline.org/publications/human-machine-interaction-and-human-agency-in-the-military-domain/.

[40] Reported in Yuval Abraham, '"Lavender": The AI Machine Directing Israel's Bombing Spree in Gaza', +972 Magazine, 3 April 2024, https://www.972mag.com/lavender-ai-israeli-army-gaza/; Geoff Brumfiel, 'Israel Is Using an AI System to Find Targets in Gaza. Experts Say It's Just the Start', *NPR*, 14 December 2023, sec. World, https://www.npr.org/2023/12/14/1218643254/israel-is-using-an-ai-system-to-find-targets-in-gaza-experts-say-its-just-the-st; Vitaliy Goncharuk, 'Survival of the Smartest? Defense AI in Ukraine', in *The Very Long Game: 25 Case Studies on the Global State of Defense AI*, ed. Heiko Borchert, Torben Schütz, and Joseph Verbovszky (Cham: Springer Nature Switzerland, 2024), 375–95, https://doi.org/10.1007/978-3-031-58649-1_17.; Katrina Manson, 'AI Warfare Is Already Here', *Bloomberg.Com*, 28 February 2024, https://www.bloomberg.com/features/2024-ai-warfare-project-maven/.

[41] Nicholas Carr, *The Glass Cage: Who Needs Humans Anyway?* (Vintage, 2016).

[42] Marta Bo and Jessica Dorsey, 'Symposium on Military AI and the Law of Armed Conflict: The "Need" for Speed – The Cost of Unregulated AI Decision-Support Systems to Civilians', *Opinio Juris* (blog), 4 April 2024, https://opiniojuris.org/2024/04/04/symposium-on-military-ai-and-the-law-of-armed-conflict-the-need-for-speed-the-cost-of-unregulated-ai-decision-support-systems-to-civilians/.

[43] Klaudia Klonowska, 'Article 36: Review of AI Decision-Support Systems and Other Emerging Technologies of Warfare', in *Yearbook of International Humanitarian Law, Volume 23 (2020)*, ed. Terry D. Gill et al. (The Hague: T.M.C. Asser Press, 2022), 123–53, https://doi.org/10.1007/978-94-6265-491-4_6.

3. Conclusion

Practices of use associated with AI in the military domain as part of both weapon and decision support systems have long shaped the norm on human control over the use-of-force.

First, in air defence systems, integrating automated and autonomous technologies have not only minimised the role that human operators play but have also made it more complex. Human operators may lack the necessary functional understanding of how automated or autonomous technologies 'make decisions' on targets, they may lack situational understanding due to their decreased role as passive supervisors, and they are supposed to provide targeting authorisations with only seconds at their disposal.

Second, the design and use of loitering munitions introduces a new level of complexity in human-machine interaction. This is because of the possible changes in the operational environment between the time when a loitering munition is activated and when authorisation from human operators to conduct a strike may be requested. In current doctrine, the targeting decisions made using loitering munitions are shaped by the parameters established in the systems' pre-programmed targeting profiles and the human operators who remain in/on the loop. But most loitering munitions appear to have a latent capability to engage targets without requiring human authorisation. The development and use trajectory of loitering munitions contributes to illustrating how integrating autonomous and AI technologies into targeting generates significant uncertainties regarding where, when, against whom, and under what conditions force is used.

Third, patterns of using AI DSS indicate broader effects on the potential to exercise human control because such systems can be integrated across various stages of targeting decision-making. AI DSS therefore introduce multiple points where humans interact with AI in processing information and making targeting decisions. This creates a shared decision-making space in between human personnel and AI technologies. The effects of this only appear to have been recognised as advantageous for militaries, i.e. how the use of AI DS advances human decision-making through data-driven insights. But interacting with AI also delimits the exercise of human agency on account of the technologies' complexity and the increased speed it brings to decision-making processes, by how humans become reactive parts in socio-technical systems, and by amplifying adverse human biases. Patterns of use associated with AI DSS therefore evidence more foundational effects of using AI in the military domain for human control than become visible only by its integration in weapon systems.

In sum, diverse pattern of use associated with integrating AI in the military domain have shaped a norm on what constitutes the requisite quality of human control over the use of force. The current shape of this norm appears to accept a reduced form of human control when interacting with AI in the military domain as 'appropriate'. The current shape of this norm is not intentional: it results from how various states have incrementally, over decades, performed practices of designing and using weapon and decision support systems integrating AI and predecessor technologies.

Going forward, the shaping effects of these practices must be fully recognised and integrated into how states consider implementing principles of human control and human-machine interaction that are common to all military AI governance initiatives. Such implementation processes need to recognise and evaluate how human-machine interaction in the military domain does not only present opportunities but also limitations for the exercise of human agency. The final shape of the norm defining what constitutes a requisite quality of human control in use-of-force should not be left to an un-intentional, un-reflective build-up of practices. It should result from policymakers making explicit, ultimately, normative-ethical choices.[44]

There are four ways forward for stakeholders involved in the debate about AI in the military domain. These all share a commitment to the significance of human control as a regulatory principle. As such, the ways forward are designed to reshape the underlying practices sustaining current counter-productive tendencies towards such practices that actually serve to strengthen and sustain human control as a norm.

(1) **Clarify the goals that the various humans involved in human control should fulfil.** The current, diminished quality of human control results at least partly from not specifying clearly what types of goals the humans involved are meant to accomplish. The international debate has mentioned various goals for humans exercising control. These include ensuring that accountability is maintained, acting as a corrective to improve system performance, acting as a fail-safe in the case of an emergency, strategically slowing down decision-making processes, and acting in protection of human dignity.[45] These roles and goals need to be spelled out in a systematic way and, simultaneously, be associated with specific (groups of) humans across the entire lifecycle of an AI system rather than just at the point of use.[46]

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[44] Ingvild Bode, 'Human-Machine Interaction and Human Agency in the Military Domain', Centre for International Governance Innovation, 15 January 2025, https://www.cigionline.org/publications/human-machine-interaction-and-human-agency-in-the-military-domain/.

[45] Rebecca Crootof, Margot Kaminski, and Nicholson Price, 'Humans in the Loop', *76 Vanderbilt Law Review 429*, 2022, p. 473–87.

[46] IEEE SA Research Group on Issues of AI and Autonomy in Defence Systems, *A Framework for Human Decision-Making Through the Lifecycle of Autonomous and Intelligent Systems in Defence Applications* (New York: IEEE Standards Association, 2024).

(2) **Map opportunities and limitations for the exercise of human agency arising from human-machine interaction.** This brief offers thinking about how practices of human machine interaction shape the quality of human control that can be exercised at different points of the AI lifecycle. To better understand such practices and manage their consequences, militaries could use this thinking to consider the resulting opportunities and limitations to the exercise of human agency across different contexts and domains of use. This would allow them to better understand where the overall balance between opportunities/limitations for human control is moving and, on that basis, help assess whether that direction is desirable.

(3) **Critically analyse opportunities and limitations.** What stakeholders count as a desirable balance between opportunities and limitations to the exercise of human control will be dependent on context and type of application. To get to this, differentiating between thresholds of risk associated with different contexts and types of application could be a useful measure. This stage will require making explicit, ultimately ethical-normative, choices.

(4) **Develop and integrate thinking about the *interactional* aspect of human-machine interaction into practices of implementing the human control principle.** Current practices in relation to human control appear to diminish the quality of such control because these do not take into account the fundamental reality of human-machine interaction: how it involves the creation of a shared decision-making space in between humans and AI technologies. [47] Such a shared decision-making space is not subject to unidirectional human control and results, as detailed, in both intended and unintended effects on human agency. These interactional components therefore need to integral parts of implementing the human control norm. This should include drawing much more explicitly on the body of knowledge within human-computer interaction that already informs practices within other safety-critical systems.[48] Such knowledge provides crucial, under-used insights for safely governing human-machine interaction with regard to AI in the military domain.

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[47] Madeleine Clare Elish, 'Moral Crumple Zones: Cautionary Tales in Human-Robot Interaction', *Engaging Science, Technology, and Society* 5 (23 March 2019), p. 54–55: 40–60, https://doi.org/10.17351/ests2019.260.
[48] Rebecca Crootof, Margot Kaminski, and Nicholson Price, 'Humans in the Loop', *76 Vanderbilt Law Review 429*, 2022, p. 492–97; Marc-André Kaufhold et al., '"We Do Not Have the Capacity to Monitor All Media": A Design Case Study on Cyber Situational Awareness in Computer Emergency Response Teams', in *Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems*, CHI '24 (New York, NY, USA: Association for Computing Machinery, 2024), 1–16, https://doi.org/10.1145/3613904.3642368.; Thea Riebe, *Technology Assessment of Dual-Use ICTs: How to Assess Diffusion, Governance and Design* (Springer Nature, 2023).

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