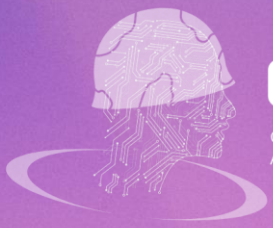

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Proportionality under Pressure: AI-Based Decision-Support Systems, the Reasonable Commander Standard and Human(e) Judgment in Targeting

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1. Introduction

The rapid advancement of AI-based decision-support systems (AI-DSS) is reshaping the landscape of military decision-making, particularly within the Joint Targeting Cycle (JTC). As military organisations increasingly integrate AI to assist in targeting operations, concerns arise regarding the role of human cognition, accountability, and adherence to International Humanitarian Law (IHL). While these tools can be used to enhance situational awareness, support warfighting efforts and, in some cases, even contribute to the protection of civilians through helping to prevent IHL violations,[1] this policy note focuses on the risks that they may introduce. Specifically, it warns that such tools may reduce proportionality assessments to mere numerical computations, sidelining the judgment, ethical deliberation, and legal reasoning essential for maintaining human control. Given that humans are ultimately responsible for ensuring IHL compliance, preserving context-appropriate human judgment is critical. Central to this argument is an analysis of how AI-DSS use can influence a commander's ability to subjectively and reasonably evaluate proportionality. If AI-DSS increasingly guide or dictate (parts of) these assessments, the human capacity for contextual judgment and reasoning may diminish through various cognitive biases and shifts, leading to decisions that may somehow be algorithmically justified but in noncompliance with legal obligations. This done at speed and scale also poses the risk of leading to more civilian harm, rather than less.

This policy note briefly outlines AI-DSS and the JTC, including a section on why AI-DSS continue to be developed and integrated specifically in the context of military targeting operations. First, it gives an overview of the JTC and how AI-DSS are being integrated before focusing specifically on the legal obligations underpinning the IHL proportionality rule. To do this, the policy note builds on a growing body of research that examines how AI-DSS, used across different stages of the JTC, are reshaping the cognitive role of humans in warfare. In particular, this policy note outlines how these systems affect proportionality assessments under IHL, increasingly distancing human judgment—and with it, certain notions of humanity—from critical decision-making in complex battlefield situations. The policy note focuses specifically on how algorithmic systems, by relying on quantification, challenge the foundational role of human cognition and language-based reasoning in military decision-making in the JTC. This shift is not an isolated development driven by AI-DSS alone. Instead, the note argues, it is part of a broader trend toward

[1] Larry Lewis and Andrew Ilachinski, *Leveraging AI to Mitigate Civilian Harm* (Arlington, VA: Center for Naval Analyses, February 2022), https://apps.dtic.mil/sti/trecms/pdf/AD1181578.pdf; See also Wen Zhou and Anna Rosalie Greipl, 'AI in Military Decision-Making: Supporting Humans, Not Replacing Them', Humanitarian Law & Policy Blog, 29 August 2024, https://blogs.icrc.org/law-and-policy/2024/08/29/artificial-intelligence-in-military-decision-making-supporting-humans-not-replacing-them/; As the authors point out, militaries often use AI-DSS to assist in identifying individuals and objects, weaponeering, or estimating collateral damage. In legally required decisions—such as determining whether an object or person can be lawfully targeted—AI-DSS can provide valuable input, but the authors underscore they should never replace human judgment.

quantification logics in warfare, wherein complex ethical and legal judgments are translated into numeric thresholds and statistical models. Essentially, the integration of AI-DSS in the JTC represents a next step in the increasing quantification of warfare.

This trend involves reducing complex human judgment in dynamic and complicated battlefield scenarios. As a result, humanitarian concerns are often overshadowed by numerical or data-driven considerations. One example of these logics is the introduction of the non-combatant casualty cutoff value (NCV) the role it plays in proportionality assessments. As these logics are entrenched in warfare, this note posits that AI-DSS (through the speed and scale which they introduce) threaten to play an outsized role in exacerbating risks that quantification introduces and may further embed the illusion of precision warfare through algorithmic modalities. After the analysis, the policy note concludes with recommendations for various stakeholders.

2. AI-Based Decision-Support Systems and the Joint Targeting Cycle

The growing role of AI in targeting operations has sparked ethical, legal, and operational debates, primarily around autonomous weapons systems (AWS).[2] Since 2013, discussions under the UN Convention on Certain Conventional Weapons have focused solely on lethal AWS.[3] However, the increased integration of AI-based decision-support systems (AI-DSS) adds new complexities that require broader scrutiny.[4] AI-DSS are AI-powered tools that analyse data, generate insights, and offer actionable recommendations and "assist decision-makers situated at different levels in the chain of command to solve semi-structured and unstructured decision tasks."[5]

Unlike AWS, which directly select and engage targets, AI-DSS function in analysis and decision support, reinforcing the view that they merely assist rather than replace human judgment. This perception has led to the assumption that AI-DSS are non-problematic or at least less so than, for example, fully autonomous weapons systems (AWS) because human oversight within verification and validation of targets with additional intelligence sources remains central to final decisions with AI-DSS.[6] Any existing errors or inaccuracies in the AI-DSS are therefore often thought to be non-critical, given the presumption that they can be corrected through human oversight. However, recent conflicts have shown a demonstrable risk of AI-DSS being employed in critical functions

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[2] The latest definition of from the United Nations Convention on Certain Conventional Weapons Group of Governmental Experts on Lethal Autonomous Weapons Systems (CCW GGE LAWS) Rolling Text (26 November 2024): "A lethal autonomous weapon system can be characterised as an integrated combination of one or more weapons and technological components that enable the system to identify and/or select, and engage a target, without intervention by a human user in the execution of these tasks." On file with author.

[3] For a brief overview of some of the latest developments of the GGE LAWS, see Jeroen van den Boogaard, 'Warning! Obstacles Ahead! The Regulation of Autonomous Weapons Systems in the GGE LAWS', *Opinio Juris* (blog), 4 March 2024, https://opiniojuris.org/2024/03/04/warning-obstacles-ahead-the-regulation-of-autonomous-weapons-systems-in-the-gge-laws/.

[4] There have been several reported uses of AI-DSS by Israel in Gaza and potentially in Lebanon, by both Ukraine and Russia in the ongoing conflict, and by the United States in its actions against Houthi rebels in the Red Sea and in Yemen, to name a few. For a comprehensive overview of literature in this space, see e.g., Anna Nadibaidze, Ingvild Bode, and Qiaochu Zhang, 'AI in Military Decision Support Systems: A Review of Developments and Debates - AutoNorms', 4 November 2024, https://www.autonorms.eu/ai-in-military-decision-support-systems-a-review-of-developments-and-debates/.

[5] Elena Şuşnea, 'Decision Support Systems in Military Actions: Necessity, Possibilities and Constraints', *Journal of Defense Resources Management (JoDRM)* 3, no. 2 (2012): 131–132; See also Klaudia Klonowska, 'Article 36: Review of AI Decision-Support Systems and Other Emerging Technologies of Warfare', *Yearbook of International Humanitarian Law, Volume 23 (2020)*, 2022, https://www.semanticscholar.org/paper/Article-36%3A-Review-of-AI-Decision-Support-Systems-Klonowska/ffc22236fb907076b5e977d18e45471a5d15089d..

[6] Jessica Dorsey and Marta Bo, *"AI-Enabled Decision-Support Systems in the Joint Targeting Cycle: Legal Challenges, Risks, and the Human(e) Dimension,"* forthcoming in *International Law Studies*, 2025; See also, Jessica Dorsey, Marta Bo, Ingvild Bode, and Tom Schwarz, academic submission pursuant to Resolution 79/239, *"Artificial Intelligence in the Military Domain and Its Implications for International Peace and Security,"* adopted by the General Assembly on 24 December 2024, in accordance with the request of the UN Secretary-General contained in Note Verbale ODA/2025-00029/AIMD (on file with author).

such as target selection and even nomination,[7] potentially excising or fully excluding human involvement from these core steps within the JTC, raising legal concerns about the effects of AI-DSS on decision-making processes and the ability for users to comply with IHL obligations of precautions and proportionality.[8] Viewing AI-DSS as mere tools has led to an underestimation of their impact on decision-making within the JTC and their role in human-machine teaming.[9] This policy note urges taking a different perspective with more focus on the effects of AI-DSS on proportionality assessments in the JTC.

2.1 The Utility of AI-DSS in Military Targeting Operations

Many militaries and non-state actors worldwide are developing and, in some cases, deploying AI-DSS in active conflicts. These systems have evolved beyond basic computational tools into highly advanced technologies that collect and analyse vast amounts of battlefield data, generate predictive models, and assist in making targeting decisions. Some of their capabilities include:

1. **Data synthesis**: AI-DSS can quickly assess satellite images, footage from intelligence, surveillance, and reconnaissance sources (such as drones), intelligence reporting and signals intelligence to assess battlefield conditions and provide situational awareness.
2. **Pattern recognition:** machine learning algorithms can identify enemy movement patterns, high-value targets, and potential threats at a greater speed than human analysts.
3. **Predictive analytics:** in some scenarios, AI models can simulate potential battle scenarios, play into collateral damage estimation methods (CDEM) and offer suggestions for optimisation of strike strategies.

Many of these advancements can lead to improved decision-making efficiency. This is due to the exponential increase in speed and scale driven by the data-driven insights AI systems provide.[10] However, these additions also introduce risks and raise important questions about the trade-offs speed and scale introduce. More generally, there are concerns about the role of these systems and the structure of human-machine interaction within the JTC.[11] Specifically, and most relevant for this policy note, risks arise around how AI-DSS might be influencing the way commanders cognitively make decisions.

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[7] *"Understanding How Israel Uses 'Gospel' AI System in Gaza Bombings," France 24 English*, YouTube video, 3:29, 2024, https://www.youtube.com/watch?v=E8e2g7CfXAA.

[8] Article 57 of the First Additional Protocol to the Geneva Conventions, precautions in attack, https://ihl-databases.icrc.org/en/ihl-treaties/api-1977/article-57.

[9] Robert Sparrow and Adam Henschke, 'Minotaurs, Not Centaurs: The Future of Manned-Unmanned Teaming', *The US Army War College Quarterly: Parameters* 53, no. 1 (3 March 2023), https://doi.org/10.55540/0031-1723.3207.

[10] 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.

[11] Taylor Kate Woodcock, 'Human/Machine(-Learning) Interactions, Human Agency and the International Humanitarian Law Proportionality Standard', *Global Society* 38, no. 1 (2 January 2024): 100–121, https://doi.org/10.1080/13600826.2023.2267592.

2.2 The Joint Targeting Cycle (JTC) and AI-DSS

Defined as "the process of selecting and prioritizing targets and matching the appropriate response to them, considering operational requirements and capabilities,"[12] targeting is a core military function at the very heart of warfare. The JTC is a structured process used by military forces to identify, evaluate, and engage targets while ensuring compliance with operational, legal, and ethical standards,[13] consisting of six (non-linear) phases:

1. **End-State and Commander's Objectives**: Defining strategic military goals and desired outcomes.
2. **Target Development and Prioritisation**: Identifying, verifying/validating, and prioritising targets based on intelligence and mission goals.
3. **Capabilities Analysis**: Assessing the available strike options and their effectiveness.
4. **Force Assignment**: Allocating specific military assets (e.g., airstrikes, artillery, cyber operations) to engage the target.
5. **Mission Execution**: Carrying out the targeting operation while ensuring compliance with relevant laws and the rules of engagement.
6. **Assessment**: Evaluating the effectiveness of the operation and adjusting for future operations, if necessary.

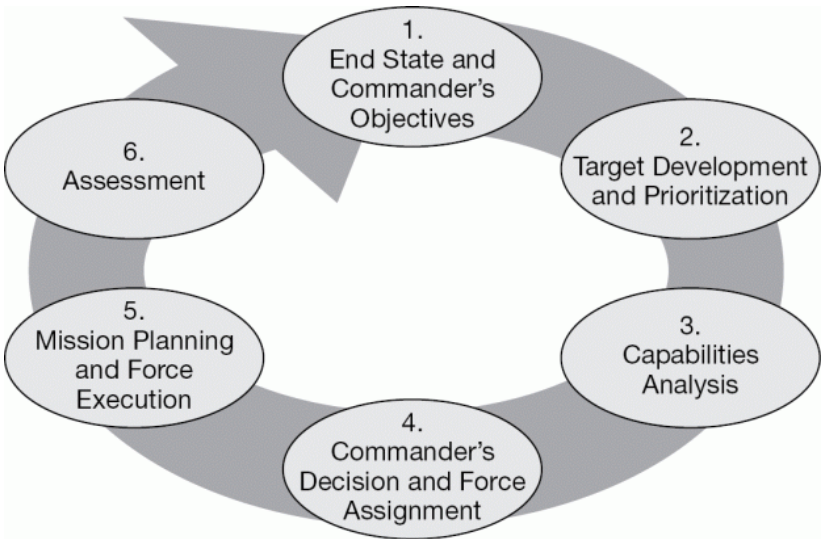

Figure 1: Joint Targeting Cycle (as reproduced with permission)[14]

[12] U.S. Department of Defense, *DOD Dictionary of Military and Associated Terms* (March 2017), https://www.tradoc.army.mil/wp-content/uploads/2020/10/AD1029823-DOD-Dictionary-of-Military-and-Associated-Terms-2017.pdf.
[13] Michael Schmitt et al., 'Joint and Combined Targeting: Structure and Process', in *Weighing Lives in War*, ed. Jens David Ohlin, Larry May, and Claire Finkelstein (Oxford University Press, 2017), 0, https://doi.org/10.1093/oso/9780198796176.003.0014.
[14] Michael Schmitt et al., 'Joint and Combined Targeting: Structure and Process', in *Weighing Lives in War*, ed. Jens David Ohlin, Larry May, and Claire Finkelstein (Oxford University Press, 2017), 0, https://doi.org/10.1093/oso/9780198796176.003.0014.

AI-DSS are increasingly being integrated and used at multiple stages of the JTC, particularly in target development, capabilities analysis, and mission execution.[15] However, use of these systems raises concerns about whether human decision-makers can retain cognitive autonomy over the process or whether humans will become overly reliant on algorithmic outputs.[16]

2.3 The Joint Targeting Cycle (JTC) and AI-DSS

One of the most fundamental principles and rules of IHL is that of proportionality, which requires attacks must not cause excessive civilian harm in relation to the anticipated military advantage.[17] Commanders are required to assess the potential for civilian harm before approving strikes, balance military necessity of strikes against humanitarian concerns, take all feasible precautions to minimise civilian harm to the greatest extent possible,[18] and make ethical and legal judgments in real time—often under intense pressure and time constraints. In efforts to accelerate the Observe-Orient-Decide-Act (OODA) loop,[19] and move through the JTC faster or more efficiently,[20] we are already seeing—and can expect to continue seeing—the growing integration of AI-DSS across various phases of the JTC, particularly in ways that influence proportionality assessments. Some examples of other quantification logics introduced into the JTC include casualty estimation models (sometimes referred to as collateral damage estimation methodologies, or CDEM),[21] blast radius calculations, risk matrices quantifying the probability of civilian harm and the generation of targeting lists (either

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[15] 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/; Elizabeth Dwoskin, 'Israel Built an "AI Factory" for War. It Unleashed It in Gaza.', *The Washington Post*, 29 December 2024, https://www.washingtonpost.com/technology/2024/12/29/ai-israel-war-gaza-idf/; Patrick Kingsley et al., 'Israel Loosened Its Rules to Bomb Hamas Fighters, Killing Many More Civilians', *The New York Times*, 26 December 2024, sec. World, https://www.nytimes.com/2024/12/26/world/middleeast/israel-hamas-gaza-bombing.html.

[16] See e.g., Jessica Dorsey and Marta Bo, *"AI-Enabled Decision-Support Systems in the Joint Targeting Cycle: Legal Challenges, Risks, and the Human(e) Dimension,"* forthcoming in *International Law Studies*, 2025.

[17] As codified in Articles 51(5)(b) and 57(2) of the 1977 Protocols Additional to the Geneva Conventions of 1949., which outlines the proportionality rule as "an attack which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated.". For a comprehensive overview of this topic, see Jeroen van den Boogaard, *Proportionality in International Humanitarian Law: Refocusing the Balance in Practice* (Cambridge University Press, 2023).

[18] The principle of precaution is directly related to proportionality (see Jessica Dorsey and Marta Bo, *"AI-Enabled Decision-Support Systems in the Joint Targeting Cycle: Legal Challenges, Risks, and the Human(e) Dimension,"* forthcoming in *International Law Studies*, 2025).

[19] Chet Richards, 'Boyd's OODA Loop', *142-165*, 2020, https://fhs.brage.unit.no/fhs-xmlui/handle/11250/2683228.

[20] See 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.

[21] International Committee of the Red Cross (ICRC) 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: Current Developments and Potential Implications*, Expert Consultation Report, March 2024, https://www.geneva-academy.ch/joomlatools-files/docman-files/Artificial%20Intelligence%20And%20Related%20Technologies%20In%20Military%20Decision-Making.pdf; See also see Jeroen van den Boogaard, *Proportionality in International Humanitarian Law: Refocusing the Balance in Practice* (Cambridge University Press, 2023) , p. 98-100.

names or locations).[22] The intention of introducing these systems is to increase or enhance situational awareness, but they carry the risk of pushing the idea that proportionality assessments can be reduced (in whole or in part) to a purely datafied or numerical exercise, threatening to sideline contextual human judgement, ethical deliberation and legal reasoning, essential to the careful weighing proscribed by the rule of proportionality.

[22] The most recent examples include the IDF's reported use of systems called *Lavender* and *The Gospel*, first reported by 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/. For more in-depth analysis of these systems, see Jessica Dorsey and Marta Bo, *"AI-Enabled Decision-Support Systems in the Joint Targeting Cycle: Legal Challenges, Risks, and the Human(e) Dimension,"* forthcoming in *International Law Studies*, 2025.

3. AI-DSS and Quantification in Targeting

Military decision-making has traditionally relied on human intuition, strategic reasoning and qualitative judgment.[23] However, the growing integration of AI-DSS into the JTC marks a significant shift away from decisions led fully by humans and toward a model increasingly dominated by quantification. In this model, decision-making is shaped more by data-driven analysis, algorithmic calculations, and statistical probabilities than by intuition and creativity, human factors that cannot be precisely replicated through computational programs.[24] This section outlines how AI-DSS use reinforces quantification logics, and the risks this shift poses to proportionality assessments, and the potential more extensive consequences for the place of human cognition in military operations.[25] The use of quantification in warfare has grown significantly in recent years, driven by major advancements in big data analytics, predictive modelling and optimisation techniques. AI systems can now process vast amounts of intelligence to detect patterns and produce risk assessments.[26] Predictive modelling the estimation of enemy behaviour, potential civilian harm and operational effectiveness based on historical data.[27] Optimisation techniques—central to how AI-DSS function—aim to reduce uncertainty and minimise risk in decision-making.[28]

This trend is rooted in the belief that data-driven insights can enhance decision-making by minimising human error and increasing efficiency. However, military decisions—particularly those related to proportionality—are not simply technical problems to be solved numerically. They involve complex ethical, legal, and strategic judgments that cannot always be captured or addressed through quantitative methods. Proportionality is fundamentally tied to moral, ethical, and humanitarian considerations, alongside the

[23] Rolf I. Roth, 'The Rational Analytical Approach to Decision-Making: An Adequate Strategy for Military Commanders?', *Connections* 3, no. 2 (2004): 71–92..
[24] See also, Elke Schwarz, 'Autonomous Weapons Systems, Artificial Intelligence, and the Problem of Meaningful Human Control', *Philosophical Journal of Conflict and Violence*, 2021, https://qmro.qmul.ac.uk/xmlui/bitstream/handle/123456789/74360/Schwarz%20Autonomous%20Weapons%20Systems,%20Artificial%20Intelligence,%20and%20the%20Problem%20of%20Meaningful%20Human%20Control%202021%20Accepted.pdf?sequence=2.
[25] For an in-depth treatment of shifts in certain decision-making architectures, see Taylor K. Woodcock, "Human/Machine (Learning) Interactions in the Military Domain: A Perspective on Practices of Legal Reasoning," Chapter 4, PhD forthcoming 2025 University of Amsterdam, on file with author. See Taylor Kate Woodcock, 'Human/Machine(-Learning) Interactions, Human Agency and the International Humanitarian Law Proportionality Standard', *Global Society* 38, no. 1 (2 January 2024): 100–121, https://doi.org/10.1080/13600826.2023.2267592.
[26] Mohammad Yazdi et al., 'Navigating the Power of Artificial Intelligence in Risk Management: A Comparative Analysis', *Safety* 10, no. 2 (June 2024): 42, https://doi.org/10.3390/safety10020042.
[27] Avi Goldfarb and Jon R. Lindsay, 'Prediction and Judgment: Why Artificial Intelligence Increases the Importance of Humans in War', *International Security* 46, no. 3 (25 February 2022): 7–50, https://doi.org/10.1162/isec_a_00425.
[28] Junyi Wu and Shari Shang, 'Managing Uncertainty in AI-Enabled Decision Making and Achieving Sustainability', *Sustainability* 12, no. 21 (January 2020): 8758, https://doi.org/10.3390/su12218758.

legal obligations outlined in IHL and other frameworks. Military doctrine also emphasises the need to prevent civilian harm or, when unavoidable, ensure it remains proportionate—an assessment that cannot be reduced to mathematical calculations. Human lives are not mere numbers, and proportionality cannot be determined in advance using absolute arithmetic values. While proportionality assessments can be challenging for commanders and operators, the difficulty is intentional, given the high-stakes nature of such decisions.[29]

The growing reliance on quantitative methodologies in military decision-making for targeting is not an isolated development solely driven by AI-DSS. It is, instead, part of a broader historical trend shifting toward quantification logics in all sectors, including warfare, wherein complex judgments are translated in whole or in part into numeric thresholds and statistical models.[30] One key example of this trend is the introduction of the non-combatant casualty cutoff value (NCV), a classification metric employed by various militaries as policy in targeting assessments.[31] The NCV assigns a numerical threshold for acceptable civilian casualties based on the anticipated military advantage of a strike. If the projected number of civilian deaths falls below this threshold, a strike may be authorised without requiring additional higher-level approval or steps to ensure the legality of the strike.[32]

One implication of the introduction of the NCV is the effect of codifying civilian harm into numerical tolerances, a shift that also carries the risk of minimising civilians to mere data points, rather than living, breathing beings.[33] AI, as it does in other sectors, will only serve to exacerbate this trend through speed and scale introduced.[34] This also threatens a heightened proclivity toward "othering" when operators stop seeing civilians as humans, it can also become more morally acceptable to kill or at least accept their deaths as

[29] The author bases these observations on conversations with high-level military legal advisors. Full remarks on file with author.
[30] Markus Gunneflo and Gregor Noll, 'Technologies of Decision Support and Proportionality in International Humanitarian Law', 21 April 2023, https://doi.org/10.1163/15718107-bja10055, p. 117.
[31] Most notably the United States, but other Western allies have used these as well in coalition operations (e.g., Operation Inherent Resolve) and there have been reports of an NCV also being used by the Israel Defense Forces in proportionality assessments in Gaza. See, e.g., 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/ in which an operator interviewed for this piece stated: "Every person who wore a Hamas uniform in the past year or two could be bombed with 20 [civilians killed as] collateral damage, even without special permission,...[i]n practice, the principle of proportionality did not exist."
[32] Scott Graham, 'The Non-Combatant Casualty Cut-off Value: Assessment of a Novel Targeting Technique in Operation Inherent Resolve', 10 November 2018, https://doi.org/10.1163/15718123-01804002.
[33] Brian Smith, 'Civilian Casualty Mitigation and the Rationalization of Killing', *Journal of Military Ethics* 20, no. 1 (2 January 2021): 47–66, https://doi.org/10.1080/15027570.2021.1949783.; Neil Renic and Elke Schwarz, 'Crimes of Dispassion: Autonomous Weapons and the Moral Challenge of Systematic Killing', *Ethics & International Affairs* 37, no. 3 (March 2023): 321–43, https://doi.org/10.1017/S0892679423000291.
[34] ICRC, '2024 ICRC IHL Challenges Report | ICRC', 26 September 2024, https://www.icrc.org/en/report/2024-icrc-report-ihl-challenges, p. 8: "The deployment of new technologies of warfare risks amplifying these dangerous tendencies. If algorithms are trained in overly permissive targeting rules, the result will be death and destruction among civilians at greater speed and on a larger scale."

justified.[35] It represents a formalised attempt to quantify proportionality—an inherently qualitative and context-dependent principle. IHL requires commanders to assess proportionality on a case-by-case basis, but the NCV introduces a fixed numerical benchmark, having the potential effect of shifting proportionality evaluations from subjective, complex reasoning to algorithmic calculations "rubber-stamped" by human commanders.[36] This also has the knock-on effect of reinforcing data-driven targeting practices, aligning with broader datafication of warfare, where predictive models, surveillance data and algorithmic assessments are increasingly relied upon for targeting decisions. The use of AI-DSS now builds upon this framework, risking a further entrenchment of data-centric approaches to civilian harm understandings. A final risk this introduces is that of decontextualising decision-making. When ethical or legal considerations are embedded into numeric formulas, such as NCV, the risk is that contextual, subjective judgment required for lawful proportionality assessments is gradually or wholly removed. In essence, AI-DSS use has the potential to exacerbate this issue by presenting outputs as statistically optimised solutions at speed and scale which further discourages critical human engagement with the dynamic ethical and legal complexities of warfare, especially in proportionality assessments implicated in the JTC.

AI-DSS inherit and amplify the logic underpinning the NCV by further automating civilian harm estimates, using varying degrees of historical strike data, pattern recognition and probabilistic modelling and presenting these figures as quantitative justifications for or against an attack.[37] They also promote this same kind of longer trend of the illusion of precision in warfare.[38] Just as the NCV assigns a fixed numerical value to acceptable levels of civilian harm, AI-DSS fosters a perception that ethical and legal questions can be resolved through data-driven calculations often at the expense of qualitative moral or legal reasoning. Furthermore, encoding proportionality elements into data models risks diminishing commanders' active cognitive engagement. This can lead to biases discussed below, where human operators begin to rely on AI recommendations without critically assessing or verifying their validity or implications—particularly during phase 4 of the commander's decision-making process within the JTC.

In summary, NCV and similar quantification methods have helped numerical approaches to decision-making in warfare, contributing to a broader erosion of human agency in contexts where it remains essential, such as proportionality assessments. The integration of AI-DSS extends this trend, reinforcing the notion that military ethics and legal judgments can be optimised through statistical models and algorithmic tools. This shift risks creating even greater psychological distance between commanders and the

[35] Jennifer Robinson, "'Bugsplat": The Ugly US Drone War in Pakistan', Al Jazeera, 29 November 2021, https://www.aljazeera.com/opinions/2011/11/29/bugsplat-the-ugly-us-drone-war-in-pakistan.
[36] 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/.
[37] Taylor Kate Woodcock, 'Human/Machine(-Learning) Interactions, Human Agency and the International Humanitarian Law Proportionality Standard', *Global Society* 38, no. 1 (2 January 2024): 100–121, https://doi.org/10.1080/13600826.2023.2267592..
[38] See, e.g., Jessica Dorsey, *"Doubling Down on Distance: Rethinking Civilian Protections in the Era of Military Drones and Algorithmic Warfare,"* forthcoming chapter in *Handbook on Remote Warfare*, edited by Jai Galliot (Oxford: Oxford University Press, 2025) and James Patton Rogers, *Precision: A History of American Warfare* (Manchester University Press, 2023).

decisions for which they are ultimately responsible. In short the risks outlined above, specifically the erosion of human moral agency in decision-making, the devaluation of contextual reasoning in favour of rigid computational outputs and the normalisation of algorithmically driven proportionality assessments risk engendering legally and morally questionable strike methodologies and increased amounts of civilian harm.[39]

[39]Neil Renic and Elke Schwarz, 'Crimes of Dispassion: Autonomous Weapons and the Moral Challenge of Systematic Killing', *Ethics & International Affairs* 37, no. 3 (March 2023): 321–43, https://doi.org/10.1017/S0892679423000291.; Taylor Kate Woodcock, 'Human/Machine(-Learning) Interactions, Human Agency and the International Humanitarian Law Proportionality Standard', *Global Society* 38, no. 1 (2 January 2024): 100–121, https://doi.org/10.1080/13600826.2023.2267592.; Jessica Dorsey and Marta Bo, *"AI-Enabled Decision-Support Systems in the Joint Targeting Cycle: Legal Challenges, Risks, and the Human(e) Dimension,"* forthcoming in *International Law Studies*, 2025.

4. The Role of Human Cognition in the JTC

Traditionally, human cognition and language-based reasoning have played a central role in military decision-making, and especially within the JTC.[40] The IHL rule of proportionality requires commanders to make complex, highly context- specific subjective decisions that consider the balance between military necessity and the risk of civilian harm using the RMC standard.[41] Introducing AI-DSS to this process presents challenges to this dynamic, with the potential to alter cognitive effects of how decisions are made, understood and interpreted iteratively.

The RMC standard requires considering what a trained and competent commander would decide under similar conditions and informs decision-making in the JTC, specifically within Phase 4.[42] This decision-making has traditionally relied largely on human cognitive faculties (e.g., perception, intuition, situational awareness, and strategic reasoning in complex information environments). Within the JTC, the RMC standard dictates commanders use subjective reasoning, legal interpretation and context sensitivity. They must assess the nature and immediacy of threats, the potential of civilian harm, the legality and legitimacy of any target and within dynamic environments how the changing of any of these elements may shift the context and outcomes of proportionality assessments. Unlike AI-DSS, which operate on predefined parameters and data inputs, human cognition allows for situational flexibility, adapting to unforeseen circumstances, interpreting ambiguous information and applying legal reasoning in complex scenarios.[43]

When comparing AI-generated information and suggestions to human cognitive capabilities, one sees the strengths of AI lie in the ability for AI-DSS to carry out pattern recognition, rapid data processing and predictive modelling. However, algorithmically guided systems will not have the flexibility to wrestle with the qualitative aspects of military decision-making, such as moral and ethical deliberation, understanding ambiguity (deterministic data processing disallows any kind of uncertainty, deception tactics or incomplete intelligence), and interpreting the intent of an adversary's motives

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[40] See, e.g., U.S. Army, *Military Decision-Making Process: Organizing and Conducting Planning*, Center for Army Lessons Learned, No. 23-07 (594), November 2023, https://api.army.mil/e2/c/downloads/2023/11/17/f7177a3c/23-07-594-military-decision-making-process-nov-23-public.pdf.

[41] Ian Henderson and Kate Reece, 'Proportionality under International Humanitarian Law: The "Reasonable Military Commander" Standard and Reverberating Effects', *Vanderbilt Journal of Transnational Law* 51, no. 3 (1 January 2018): 835.

[42] This requires a reasonable, good faith assessment based on the information known to him/her at that time.

[43] See, e.g., Yahli Shereshevsky and Yuval Shany, *"Programmed to Obey: The Limits of Law and the Debate over Meaningful Human Control of Autonomous Weapons,"* 57 *Columbia Human Rights Law Review* (forthcoming), March 16, 2025, https://ssrn.com/abstract=5205545

or strategic objectives. When data-driven logic is prioritised over qualitative human judgment, AI-DSS may narrow the cognitive space available for human reasoning, leading to over-reliance on automated assessments and other cognitive biases, the risk of cognitive erosion and decision-making deskilling, discussed in the next section.

5. AI-DSS and Cognitive Biases in Proportionality Assessments

The integration of AI-DSS into the JTC introduces several cognitive biases that may affect a commander's ability to conduct legally sound proportionality assessments. These systems can subtly transfer decision-making authority from human judgment to algorithmic output, having knock-on effects for accountability and legal responsibility. For example, **automation bias**, situations in which humans overly trust AI recommendations, can lead to legally noncompliant decisions, especially when errors occur within the AI (miscalculation of risk or failing to incorporate qualitative factors, e.g.).[44] In the JTC, one example is the generation of such vast targeting lists that situations arise in which (due to time pressure created by the speed introduced) steps to validate or verify targets are skipped entirely.[45]

Anchoring bias, the process when an initial piece of information disproportionately influences subsequent decision-making, is another risk. For example, if an AI-DSS provides an initial estimate of casualties or damage within Phase 3 of the JTC, commanders in Phase 4 may subconsciously adjust their own judgments around this value (even if new information suggests a different conclusion). The introduction of the NCV also implicates this risk. **Deskilling and cognitive erosion**, or the process that occurs when commanders repeatedly follow AI recommendations in the absence of exercising independent judgment, may weaken commanders' own abilities to engage in complex proportionality assessments over time.[46] This raises questions around long-term readiness and the ability for personnel to make critical decisions without the assistance of AI. During phase 6 of the JTC (assessment), the principle of precaution requires understanding all elements of an operation to feed into future strikes and proportionality assessments. If commanders are losing this ability due to deskilling, they will not only risk non-compliance with proportionality but also this valuable principle of IHL as well.[47]

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[44] See e.g., Michael C Horowitz and Lauren Kahn, 'Bending the Automation Bias Curve: A Study of Human and AI-Based Decision Making in National Security Contexts', *International Studies Quarterly* 68, no. 2 (1 June 2024): sqae020, https://doi.org/10.1093/isq/sqae020; and Lauren Kahn, Emelia Probasco, and Ronnie Kinoshita, 'AI Safety and Automation Bias', *Center for Security and Emerging Technology* (blog), November 2024, https://cset.georgetown.edu/publication/ai-safety-and-automation-bias/. See also, Alexander Blanchard and Laura Bruun, 'Bias in Military Artificial Intelligence' (SIPRI, December 2024), https://www.sipri.org/publications/2024/sipri-background-papers/bias-military-artificial-intelligence.

[45] Jessica Dorsey and Marta Bo, *"AI-Enabled Decision-Support Systems in the Joint Targeting Cycle: Legal Challenges, Risks, and the Human(e) Dimension,"* forthcoming in *International Law Studies*, 2025.

[46] Prakash Shukla, Phuong Bui, Sean S. Levy, Max Kowalski, Ali Baigelenov, and Paul Parsons, *"De-skilling, Cognitive Offloading, and Misplaced Responsibilities: Potential Ironies of AI-Assisted Design,"* arXiv preprint arXiv:2503.03924 (5 March 2025), https://arxiv.org/abs/2503.03924.

[47] Jessica Dorsey and Marta Bo, *"AI-Enabled Decision-Support Systems in the Joint Targeting Cycle: Legal Challenges, Risks, and the Human(e) Dimension,"* forthcoming in *International Law Studies*, 2025. On the need for and importance of technical training, see Michael Horowitz and Lauren Kahn, *"The AI Literacy Gap*

Finally, the risk of (partial) **cognitive offloading** (the tendency to transfer cognitive tasks to external systems, reducing the mental effort required for decision-making) is also introduced.[48] Because AI-DSS can handle large amounts of data and generate recommendations very quickly, commanders may be encouraged to offload critical aspects of their judgment onto AI tools creating a dangerous feedback loop where commanders increasingly rely on AI-DSS, assuming that the system has accounted for all necessary variables. In reality, AI systems lack the ability to provide nuanced, intuitive contextual reasoning required to carry out proportionality assessments (as discussed above), and this triggers questions around legal compliance and operational and strategic implications.[49] In order to mitigate all of these potential risks, training is absolutely paramount throughout the lifecycle of these systems.

Hobbling American Officialdom," War on the Rocks, 14 January 2020, https://warontherocks.com/2020/01/the-ai-literacy-gap-hobbling-american-officialdom/.

[48] Xiao Hu, Liang Luo, and Stephen M. Fleming, 'A Role for Metamemory in Cognitive Offloading', *Cognition* 193 (1 December 2019): 104012, https://doi.org/10.1016/j.cognition.2019.104012.

[49] Taylor Kate Woodcock, 'Human/Machine(-Learning) Interactions, Human Agency and the International Humanitarian Law Proportionality Standard', *Global Society* 38, no. 1 (2 January 2024): 100–121, https://doi.org/10.1080/13600826.2023.2267592.

6. Recommendations

Based on the analysis in this policy note, I offer the following recommendations to stakeholders:

- **Recognise** that AI-DSS integration in the JTC, while enhancing speed and scale, introduces operational risks alongside perceived benefits. Military and industry actors must thoroughly understand these risks and design mitigation strategies applicable throughout the AI lifecycle.
- **Build-in** training efforts across the lifecycle of the AI-DSS to counter the propensity for cognitive deskilling and bias.
- **Increase efforts** to minimise civilian harm in conflict and preserve the balance of IHL, preventing AI-DSS use from engendering a preference of military necessity over humanitarian concerns.
- **Address** the incremental effects of AI-DSS design and use on human cognitive reasoning and critical deliberation. Promote awareness and attentiveness as a crucial part of reasserting and strengthening the exercise of human agency in targeting decision-making.
- **Reassert** the central role of human cognitive and legal reasoning by implementing safeguards that ensure proportionality assessments remain rooted in human(e) judgement.
- **Expand** global discussions on military AI beyond AWS to include AI-DSS and leverage existing insights from debates on AWS and research on human-machine teaming and human-computer interaction to inform discussions on AI-DSS. Platforms such as the UN General Assembly's First Committee on Disarmament and International Security and the Global Commission on the Responsible Use of AI in the Military Domain can foster inclusive and complementary discussions on the associated risks and systemic changes AI-DSS introduce.

About the Author

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Jessica Dorsey, J.D., LL.M., is an Assistant Professor of International and European Law at Utrecht University. She is a US- and Dutch-educated international lawyer with expertise in international humanitarian law, human rights law and public international law. Her current research focuses on the legitimacy of military targeting operations in light of increasing autonomy in warfare, with a specific focus on how transparency, accountability and the rule of law contribute to this legitimacy. Jessica is also a renowned legal scholar and practitioner on issues related to the use of force, especially in the context of drone warfare, having worked in the field for more than 15 years. She has written expert advisory reports on the use of armed drones for the European Parliament and Chatham House, among other institutions, and she has consulted in various capacities with UN Special Rapporteurs on Human Rights and Counterterrorism in the context of armed drones, legal frameworks and civilian protection.

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