



CENTRE for AEROSPACE & SECURITY STUDIES

**Automating Warfare:
Implications of Lethal Autonomous
Weapons on the Battlefield**

Shaza Arif

Research Assistant, National Security

Working Paper

© Centre for Aerospace & Security Studies

March 2023

All rights reserved. No part of this Publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior permission of the Editor/Publisher.

Opinions expressed are those of the author/s and do not necessarily reflect the views of the Centre. Complete responsibility for factual accuracy of the data presented and bibliographic citations lie entirely with the author/s. CASS has a strict zero tolerance plagiarism policy.

President

AIR MARSHAL FARHAT HUSSAIN KHAN (RETD)

Edited by:

SARAH SIDDIQ ANEEL

Layout

HIRA MUMTAZ

All correspondence pertaining to this publication should be addressed to CASS, through post or email at the following address:

Centre for Aerospace & Security Studies

✉ cass.thinkers@casstt.com

☎ +92 051 5405011

f [cass.thinkers](https://www.facebook.com/cass.thinkers)

in Centre for Aerospace
& Security Studies

@ [cassthinkers](https://www.instagram.com/cassthinkers)

🐦 [@CassThinkers](https://twitter.com/CassThinkers)

Old Airport Road, Islamabad, Pakistan
www.casstt.com



CENTRE for AEROSPACE & SECURITY STUDIES

**Automating Warfare:
Implications of Lethal Autonomous
Weapons on the Battlefield**

Working Paper

Shaza Arif

Research Assistant, National Security

TABLE OF CONTENTS

Abstract	5
Introduction	6
US and China Advancements in LAWS	6
Implications of LAWS	13
Implications of LAWS	13
De-humanisation of Decision-making	13
Lowering the Cost of Conflict.....	15
Unpredictability	16
Reliability Issues.....	19
Accountability Gaps.....	20
Proliferation/Diffusion	21
Policy Recommendations	22
Agreement on Definition of LAWS	23
Adopt Global Legislation.....	23
Define Meaningful Human Control & Level of Autonomy.....	24
Ensure Accountability and Transparency	25
Train Human Resource	25
Create Awareness and Intensify Activism	25
Conclusion	26

Abstract

Autonomy is emerging as a central element of the technological realm. Amongst other domains, its scope has also extended to warfare. Technologies such as Lethal Autonomous Weapon Systems (LAWS) are redefining the scope of autonomy. Humans are less hesitant to materialise the idea of machines making critical decisions, such as target selection and engagement. The arms technology race in LAWS, particularly between the United States and China, is reflective of the fact that a ban on such systems will not be in the offing in the foreseeable future. The introduction of this technology will certainly make the battlefield more complex and uncertain. The Working Paper aims to shed light on the implications and consequences of LAWS on the battlefield or during conflicts, such as dehumanisation of decision-making, unpredictability, lower cost of war, accountability gaps and diffusion/proliferation and impact on unintended responses and stability. The paper will conclude with brief recommendations to mitigate the dangers posed by this technology.

Keywords: LAWS, Artificial Intelligence, Autonomy, Warfare, Battlefield.

Introduction

The advent of new technologies is shaping the world on several fronts, be it social, economic, informational, political, or military. Their impact is getting more pronounced in our daily lives. While humanity continues to reap benefits from emerging technologies, these technologies are also dual-use and being rapidly integrated into the defence sector. As a prominent application of Artificial Intelligence (AI), Lethal Autonomous Weapon Systems (LAWS) also known as Killer Robots, are perceived to be an effective instrument in achieving military objectives via military force and have caught the attention of policymakers around the world.

While the technology is still nascent and will take considerable time before it matures, it is important to discuss its implications. The initial portion of the paper briefly analyses United States (US) and China's advancements on LAWS, followed by a review of various implications of their use on the battlefield. The paper concludes with recommendations regarding this technology. In terms of methodology, secondary research tools were used to gather information from relevant books, journal papers, working papers, reports, and articles. One limitation of the research is that it focusses more on the offensive side of LAWS as compared to the defensive side.

US and China Advancements in LAWS

Military technologies are often developed for two major reasons: to make their forces robust/ enhancement of power or to add new tools of warfighting.¹ It is for this reason that defence forces around the world are on a constant hunt to add new kinds of weapons in their arsenal and LAWS constitute one such technology.

LAWS have become a widely discussed subject of warfare. Similar to AI, there is no accepted definition of LAWS. However, for the purpose of this paper, the often-cited definition provided by the US Department of Defense (DoD) Directive 3000.09 issued in 2012 is being used. According to the US DoD, LAWS 'can select and engage targets

¹ Ajey Lele, "Debating Lethal Autonomous Weapon Systems," *Journal of Defence Studies* 13, no.1 (2019): 51-70, <https://idsa.in/system/files/jds/jds-13-1-2019-debating-lethal-autonomous-weapon.pdf>.

without further intervention by a human operator.² The decision is based upon internal processing systems and sensory data. If the machine requires some degree of human assistance, it cannot be termed a fully autonomous weapon. In simple words, LAWS are a group of weapons that can independently identify and target without human interference using an algorithm. They refer to absolute autonomous or near-total autonomous systems once activated.

The fully 'autonomous mode' of LAWS may not have been fielded for the time being,³ however, several factors have promoted their sudden proliferation in conflict environments, like the Russia-Ukraine War.⁴ Enhanced speed, endurance, engaging targets with precision, facilitating decision-making, ensuring mission success, operations in communication degraded/denied environment, keeping humans away from the dangers of war and reducing the stress on humans appear to be some of the key reasons responsible for their appeal.⁵

It is yet ambiguous how the international community defines and employs them, but it is apparent that developed states are eagerly conducting Research and Development (R&D) about this technology. Global military spending is expected to reach USD 16 billion for AI and USD 18 billion for LAWS⁶ which depicts their increasing popularity. These systems have the potential to give rise to significant technological, security, ethical and legal issues.⁷ However, a ban is unlikely to materialise.⁸

² U.S. Department of Defense, "DoD Directive 3000.09, Autonomy in Weapon Systems, January 25, 2023," <https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodd/300009p.pdf> [Accessed September 4, 2022].

³ Steven Umbrello, Phil Torres and Angelo F. De Bellis, "The Future of War: Could Lethal Autonomous Weapons make Conflict more Ethical?" *AI & Society* 35, no.1 (2020): 273-282, <https://link.springer.com/article/10.1007/s00146-019-00879-x>.

⁴ Robert F. Trager, "Killer Robots: How to Regulate Lethal Autonomous Weapons Systems in Ukraine and Libya," *Foreign Policy*, May 11, 2022, <https://foreignpolicy.com/2022/05/11/killer-robots-lethal-autonomous-weapons-systems-ukraine-libya-regulation/>.

⁵ Umbrello, Torres and De Bellis, "The Future of War," 274.

⁶ Justin Haner and Denise Garcia, "The Artificial Intelligence Arms Race: Trends and World Leaders in Autonomous Weapons Development," *Wiley Online Library*, September 26, 2019, https://onlinelibrary.wiley.com/doi/full/10.1111/1758-5899.12713?casa_token=AdqLBZcGgpkAAAAA%3AYT7mGqz6izbPp0lJPaha0xXYfcz7se8kpU5cWzA2NQdD9oHaJAcmW2X3Jm7QTQ03uPPZ3qbeMVZh7w.

⁷ Ludovic Righetti, Phạm Quang Cường, Raj Madhavan, Raja Chatila et al., "Lethal Autonomous Weapon Systems: Ethical, Legal, and Societal Issues," *IEEE Robotics & Automation Magazine* 25, no. 1 (2018): 123-126, doi: 10.1109/MRA.2017.2787267.

⁸ P.W. Singer and Matthew Waxman, "Why a Ban on Lethal Autonomous Weapons Is Unlikely," *International Security* 41, no. 3 (2016): 42-87, doi: 10.1162/ISEC_a_00263.

LAWS have immense potential in the battlefield and military powers would not want to restrict their defence options by banning such a technology.⁹ Furthermore, given dual use, there is high likelihood that they will remain accessible to Non-State Actors (NSAs). Hence, states are not likely to deprive themselves of a technology that remains available to such actors.¹⁰ Moreover, countries like the United Kingdom (UK), Australia, Israel, Russia, and the US, have opposed regulating the technology,¹¹ which suggests that they might not favour an outright ban. However, there is wider recognition of the need of an international treaty on the use of autonomous weapons.¹² Given the opposition from states such as Russia and the US, no progress has been made.¹³ In fact, as leading military powers, the US and China are especially actively developing LAWS. Both have demonstrated their inclination towards integrating AI in the defence sector to increase autonomy and revamp their military capabilities. In recent years, both states have been investing in AI-powered weapons and development of LAWS is seen as a strategic advantage that could provide their militaries an edge in any future conflicts.

Artificial Intelligence (AI) has been a crucial element of US military policy following the DoD's Directive 3000.09 in 2012 and the 'Third Offset Strategy' launched in 2015.¹⁴ The former provides the US perspective on LAWS, whereas the latter calls for more investments in cross-technologies with a central focus on AI¹⁵ to adapt autonomous systems and facilitate AI-enabled battle networks.¹⁶ The most recent US National Security Strategy released in October 2022¹⁷ also highlights the importance of AI,

⁹ Wallach Wendell, "Toward a Ban on Lethal Autonomous Weapons: Surmounting the Obstacles," *Communications of the ACM* 60, no. 5 (2017): 28-34, https://dl.acm.org/doi/fullHtml/10.1145/2998579?casa_token=1BFRfPK0r8gAAAAA:hruZwKyIXO XZLC6KI-eAdJFpHFO9ITvrPIZfkHpDvmmLYwpSZuKn3b9rlie6lgjRSdNhjnRI-A.

¹⁰ Ibid.

¹¹ Damien Gayle, "UK, US and Russia among those Opposing Killer Robot Ban," *Guardian*, March 29, 2019, <https://www.theguardian.com/science/2019/mar/29/uk-us-russia-opposing-killer-robot-ban-un-ai>.

¹² Mary Wareham, "The Future of Artificial Intelligence", Human Rights Watch, November 28, 2022, <https://www.hrw.org/news/2022/11/28/future-artificial-intelligence>

¹³ Ibid.

¹⁴ Bob Work, "The Third U.S. Offset Strategy and its Implications for Partners and Allies," (speech, Washington, January 28, 2015), U.S. Department of Defense, <https://www.defense.gov/News/Speeches/Speech/Article/606641/>.

¹⁵ Ibid.

¹⁶ Gian Gentile, Michael Shurkin, Alexandra T. Evans, Michelle Gris , et al., *A History of the Third Offset*, report (Santa Monica: RAND Corporation, 2021), 35, https://www.rand.org/pubs/research_reports/RRA454-1.html.

¹⁷ The White House, "Biden-Harris Administration's National Security Strategy," October 2022, <https://www.whitehouse.gov/wp-content/uploads/2022/10/Biden-Harris-Administrations-National-Security-Strategy-10.2022.pdf> [Accessed February 19, 2023].

particularly in wake of the Russia-Ukraine War. It called for investing in AI, amongst other technologies to develop an industrial base empowered to innovate and creatively design solutions to meet new battlefield requirements¹⁸ and work with allies and partners to effectively harness the technology.¹⁹

In 2018, the US DoD launched the Joint Artificial Intelligence Center to expedite the military's adoption of AI via calculation of existing risks and encouraging extensive experimentation to prepare the military for future warfare which has the potential to be dominated by new and emerging technologies, such as killer robots. The US DoD's 'Artificial Intelligence Strategy' also highlighted the dangers of failing to recognise the pressing need of AI in the defence sector.²⁰ It also asserted that responsible use of AI could contribute positively to all aspects of the Department.²¹ In parallel, the 'Joint All Domain Command and Control' (JADC2) with the ultimate objective to centralise the planning and execution phase is also seen with optimism²² to create a single common operating platform for decision-making.²³ Moreover, initiatives such as 'Project Convergence'²⁴ initiated by the US Army, 'Advanced Battle Management System' by the US Air Force,²⁵ and the 'Unmanned Systems Integrated Roadmap 2017-2042',²⁶ suggest that the role of AI in US military will increase.

The US DoD is tasked to chalk out a pathway regarding LAWS. Its 2012 Directive approved using semi-autonomous weapons to engage already chosen targets by human operators. It also allowed these weapons to autonomously select and engage

¹⁸ Ibid., 21.

¹⁹ Ibid., 33.

²⁰ U.S. Department of Defense, *2018 DoD Artificial Intelligence Strategy*, report (Washington, D.C.: U.S. Government Publishing Office, 2018), <https://media.defense.gov/2019/Feb/12/2002088964/1/-1/1/DOD-AI-STRATEGY-FACT-SHEET.PDF>.

²¹ Ibid.

²² Sherrill Lingel, Jeff Hagen, Eric Hastings, Mary Lee, et al., *Joint All-Domain Command and Control for Modern Warfare: An Analytic Framework for Identifying and Developing Artificial Intelligence Applications*, report (Santa Monica: RAND Corporation, 2020), 1, https://www.rand.org/content/dam/rand/pubs/research_reports/RR4400/RR4408z1/RAND_RR4408z1.pdf.

²³ Ibid., 32.

²⁴ Morgan Dwyer and Jeffrey Engstrom, "Project Convergence: An Experiment in Multidomain Operations," *Center for Strategic and International Studies*, September 15, 2020, <https://www.csis.org/analysis/project-convergence-experiment-multidomain-operations>.

²⁵ Philip Bianco, Michael Bandor, Mario Benitez, Jeff Boleng et al., "2020 Year in Review: Artificial Intelligence and Machine Learning," Software Engineering Institute, https://www.sei.cmu.edu/publications/annual-reviews/2020-year-in-review/year_in_review_article.cfm?custome1_datapageid_315013=315521.

²⁶ Megan Eckstein, "Pentagon Unmanned Systems Integrated Roadmap 2017-2042," *USNI News*, August 30, 2018, <https://news.usni.org/2018/08/30/pentagon-unmanned-systems-integrated-roadmap-2017-2042>.

targets subject to the approval of a senior DoD official.²⁷ The US sees AI and its applications, such as LAWS key to countering China and to some extent Russia, vis-à-vis anti-access/area-denial (A2/AD) capabilities.²⁸

Possession of LAWS by near-peer militaries can disrupt American military strength which is essential to project its hegemony. Washington is opposed to a ban on LAWS given their potential benefits.²⁹ US legislators are of the view that existing regulations can be applied or tweaked to govern LAWS.³⁰ Hence, their use will become easier for the US given its intent, technological prowess, and availability of resources.

China also sees itself as an AI leader and its pursuit of AI is no secret.³¹ It is expanding its military capabilities with this technology and is also of the view that more autonomy will ease the process of offsetting conventional military superiority of the US.³² Conceptualisation and the operationalisation of AI in warfare is seen as instrumental for its future power projection. It has adopted an innovation-driven strategy to become an AI leader by 2030, both in civil and military domains.³³ Chinese President Xi Jinping hinted in one of his speeches, regarding the emergence of a revolution in military affairs,³⁴ which is reflective of Chinese interest in AI. The 'New Generation Artificial Intelligence Development Plan' (AIDP) has become central to injecting autonomy in various fields. Launched in 2017, AIDP is aimed at making Chinese progress in AI at

²⁷ Department of Defense, "Directive 3000.09".

²⁸ Burgess Laird, "The Risks of Autonomous Weapons Systems for Crisis Stability and Conflict Escalation in Future U.S.-Russia Confrontations," *RAND Blog*, June 3, 2020, <https://www.rand.org/blog/2020/06/the-risks-of-autonomous-weapons-systems-for-crisis.html>.

²⁹ Olivia Solon, "US Rejects Calls to Regulate or Ban Killer Robots," *Guardian*, December 2, 2021, <https://www.theguardian.com/us-news/2021/dec/02/us-rejects-calls-regulating-banning-killer-robots>.

³⁰ Kelley M. Saylor, *Defense Primer: U.S. Policy on Lethal Autonomous Weapon Systems*, report (Washington, D.C.: Congressional Research Service, 2020), 1, <https://sgp.fas.org/crs/natsec/IF11150.pdf>.

³¹ Stanford University, "Full Translation: China's 'New Generation Artificial Intelligence Development Plan,'" <https://digichina.stanford.edu/work/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017/> [Accessed August 24, 2022].

³² Ryan Fedasiuk, "China Invests in Artificial Intelligence to Counter US Joint Warfighting Concept: Records," *Breaking Defence*, November 10, 2021, <https://breakingdefense.com/2021/11/china-invests-in-artificial-intelligence-to-counter-us-joint-warfighting-concept-records/>.

³³ Aiden Warren and Alek Hillas, "Red Robots: Chinese Military Modernization and Perceptions of Lethal Autonomous Weapons Systems," *Cornell International Affairs Review* 15, no.2 (2021): 9-48, https://www.researchgate.net/publication/360555720_Red_Robots_Chinese_Military_Modernization_and_Perceptions_on_Lethal_Autonomous_Weapons_System.

³⁴ Robert O. Work and Greg Grant, *Beating the Americans at their Own Game: An Offset Strategy with Chinese Characteristics*, report (Washington D.C.: Centre for a New American Security, 2019),6, <https://www.cnas.org/publications/reports/beating-the-americans-at-their-own-game>.

world-leading levels by 2030.³⁵ It provides a comprehensive roadmap to integrate AI into both civilian and military sectors.³⁶ It particularly focuses on the application of civil-military integration development strategy to augment defence capabilities vis-à-vis AI.

Between 2013 to 2018, China’s investment in AI has been more than any other country in the world, amounting to USD 47.9 billion.³⁷ Progress in AI is being facilitated by cooperation between the government and civil sector in terms of data, capital reserves and human resources. China sees AI’s potential in decision-making support; AI-enabled data synthesis; offensive and defensive use; autonomous unmanned systems; war-gaming, simulation, and training; and information warfare.³⁸ With regards to LAWS, China sees five traits essential for LAWS, as indicated in Table 1:

Table 1: China’s Definition of LAWS

N	Trait	Explanation
1	Lethality	Sufficient pay load (charge) and means to be lethal.
2	Autonomy	Absence of human intervention and control during the entire process of executing a task.
3	Impossibility of Termination	Once started, no way to terminate the device.
4	Indiscriminate Effect	Device will execute the task of killing and maiming regardless of conditions, scenarios, and target.
5	Evolution	Through interaction with the environment, the device can learn autonomously, expand its functions and capabilities exceeding human expectations

Source: United Nations Office for Disarmament Affairs, “Group of Governmental Experts of the High Contracting Parties to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects,” April 11, 2018, [https://docs-library.unoda.org/Convention_on_Certain_Conventional_Weapons_-_Group_of_Governmental_Experts_\(2018\)/CCW_GGE.1_2018_WP.7.pdf](https://docs-library.unoda.org/Convention_on_Certain_Conventional_Weapons_-_Group_of_Governmental_Experts_(2018)/CCW_GGE.1_2018_WP.7.pdf) [Accessed February 20, 2023].

³⁵ Stanford University, “Full Translation: China’s ‘New Generation Artificial Intelligence Development Plan.’”

³⁶ Ibid.

³⁷ Statista, “Artificial intelligence (AI) Investment and Financing in China from 2013 to 2018,” <https://www.statista.com/statistics/941152/ai-investment-and-funding-in-china/> [Accessed February 2023]; Statista, “Global AI Investment and Funding Share,” <https://www-statista-com.ezproxy.neu.edu/statistics/941446/ai-investment-and-funding-share-by-country/> [Accessed September 2, 2022].

³⁸ Elsa B. Kania, *Battlefield Singularity: Artificial Intelligence, Military Revolution, and China’s Future Military Power*, report (Washington D.C.: Center for a New American Security, 2017), 28, <https://www.cnas.org/publications/reports/battlefield-singularity-artificial-intelligence-military-revolution-and-chinas-future-military-power>.

LAWS appear to be a valuable asset for China to reduce the gap between its military and the US military, often cited as ‘leap-frog’ development³⁹ and project more power, particularly in the Asia-Pacific region.

However, China has also emphasised generating a consensus on defining LAWS and defining the mode and degree of human involvement.⁴⁰ In addition, it accepts that given that LAWS appear more appealing in dangerous situations, lowering the threshold for war, the international community needs to exercise caution and refrain from their use against civilians.⁴¹ But, like the US, China is also not convinced about a ban on their development.⁴² In fact, Chinese civil-military fusion to augment R&D technologies also appears to be seen as a considerable advantage for the state.⁴³ On the other hand, the civil-military fusion in the US has met opposition as reflected in the protests staged by Google employees over the organisation’s involvement in Project Maven.⁴⁴ China enjoys an advantage in this regard as there is less resistance domestically. Approximately, 70% of Chinese trust AI technologies.⁴⁵

Table 2: China and USA: Perceptions about LAWS

Country	Intent to Develop AI	Citizen Trust in AI	Supports Ban on Development of LAWS	AI related Publications (2010-2019)
China	High	70%	No	Grew from 13 to 31%
USA	High	25%	No	Fell from 55 to 51%

Source: Author’s own analysis.

As summarised in Table 2, it is fairly evident that given the pace of advancements being undertaken by the US and China, both have a firm inclination to excel in this field. Hence, other states are also likely to follow suit. It remains to be seen which state reaches the demonstration point of LAWS first.

³⁹ Kania, *Battlefield Singularity*.

⁴⁰ Ibid.

⁴¹ Ibid.

⁴² Elsa Kania, “China’s Strategic Ambiguity and Shifting Approach to Lethal Autonomous Weapons Systems,” *Lawfare*, April 17, 2018, <https://www.lawfareblog.com/chinas-strategic-ambiguity-and-shifting-approach-lethal-autonomous-weapons-systems>.

⁴³ Work and Grant, *Beating the Americans at their Own Game*.

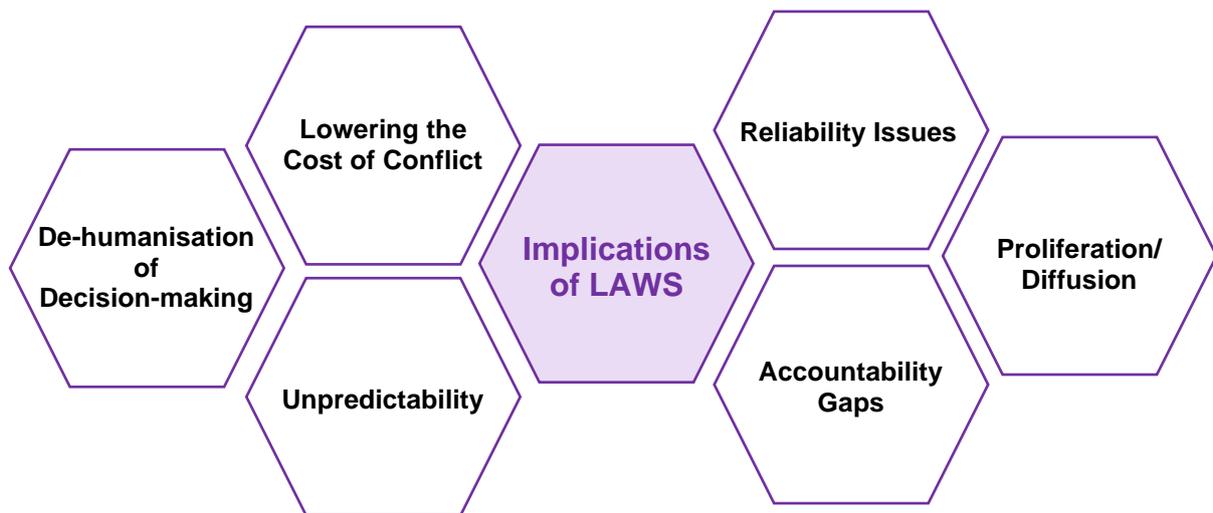
⁴⁴ Scott Shane and Daisuke Wakabayashi, “‘The Business of War’: Google Employees Protest Work for the Pentagon,” *New York Times*, April 4, 2018, <https://www.nytimes.com/2018/04/04/technology/google-letter-ceo-pentagon-project.html>.

⁴⁵ Haner and Garcia, “The Artificial Intelligence Arms Race.”

Implications of LAWS

As with every technology, the introduction of LAWS poses diverse challenges for warfare. The following section of the paper will discuss the various implications of LAWS on the battlefield (Figure 1).

Figure 1: Broad Implications of LAWS



Source: Author's own.

De-humanisation of Decision-making

LAWS are likely to lead to greater de-humanisation of military decision-making. If LAWS are deployed in contested spaces, they would likely separate/release or mitigate the role of human decision-making. It is pertinent to mention that functions such as autonomous takeoff and landing, navigation or refueling etc., are not problematic.⁴⁶ The problem lies in situations where the machine is delegated the authority to make critical decisions, for example where civilians are involved or regarding the intensity of a retaliation. Handing over such choices to an algorithm de-humanises the decision and can impact it adversely.

Before proceeding further, it is necessary to understand how LAWS operate. LAWS make use of AI either through:

⁴⁶ Pax for Peace, "Killer Robots", April 8, 2019, <https://paxforpeace.nl/media/download/pax-booklet-killer-robots-what-are-they-and-what-are-the-concerns.pdf>.

1. Logical Processing (LP) or
2. Machine Learning (ML).⁴⁷

LP works on a specific model or pattern developed by field experts, to direct instructions that the machines follow when they are present in the specific environment.⁴⁸ On the other hand, ML uses abundant amounts of data of the respective area. The training algorithm uses the data to determine and interpret the mathematical functions. ML models are more efficient than an expert-driven model given that they can process data much more quickly than the human mind.⁴⁹ ML layers are stacked to become what is known as ‘deep learning.’⁵⁰ Each layer can learn and interpret a specific aspect of the environment. Ultimately, this working provides an overview of the environment to the weapon, which can operate autonomously considering the given context.

The degree of human involvement remains to be seen. However, machine autonomy will undoubtedly increase over time. Even though designs of neural networks are influenced/motivated by the human mind, there is a considerable contrast between the two. Stellan Ohlsson, in his book *‘Deep Learning: How the Mind Overrides Experience’*, asserts that the brain uses multiple areas as well as levels of neural cortex during usual/routine activity.⁵¹ Ohlsson refers to what he terms ‘monotonic learning’ which enables human beings to learn from their historical experience, revealing trends and patterns and apply reasoning for future scenarios.⁵² However, in parallel, he describes the concept of ‘non-monotonic learning’ according to which the human brain can repress previous experiences, overriding the push to act in a certain way.⁵³ This is due to the human mind’s distinctive capacity to have mental discussions, innovative thoughts and flexible outcomes which even the best ML models lack.

Daniel Kahneman also emphasised this aspect and explained that the human mind possesses both automatic systems and analytical functions.⁵⁴ The former is

⁴⁷ Terrence J. Sejnowski, *The Deep Learning Revolution* (Massachusetts: MIT Press, 2018), 3.

⁴⁸ Ibid.

⁴⁹ John D. Kelleher, *Deep Learning* (Massachusetts: MIT Press, 2019), 9.

⁵⁰ Ibid.

⁵¹ Stellan Ohlsson, *Deep Learning: How the Mind Overrides Experience* (Cambridge: Cambridge University Press, 2011), 34.

⁵² Ibid., 35.

⁵³ Ohlsson, *Deep Learning: How the Mind Overrides Experience*, 21.

⁵⁴ Kahneman, *Thinking Fast and Slow*, 33-35.

programmed to respond to routine and emergency situations, while the latter can override the former by performing calculations and comparing available options. However, Kahneman further asserted that even the human mind is prone to errors and can be influenced by factors such as emotions, ego, sleeplessness, fatigue and hunger.⁵⁵ Hence, machines, which are intrinsically different from the human brain, could make even bigger mistakes.

The human brain can readjust from one set of beliefs to another and can adapt to changing circumstances. Whether a machine uses LP, ML or a blended set of mechanisms to arrive at what appears to be a logical decision to itself, it is limited to a specific design which they are programmed to follow. They can act at a much faster rate than humans, but the underlying technology is not able to think. Conversely, non-monotonic thinking enables humans to apply logic and reasoning in complex/ non-linear environments.

Lowering the Cost of Conflict

De-humanisation of decision-making and availability of more autonomous weapons can lower the cost of conflicts since human beings may not be directly involved or even present on the battlefield.⁵⁶ In addition, LAWS are perceived to be more accurate reducing the chances of collateral damage, further lowering the threshold for entering into wars.⁵⁷ Once a military leader sends somebody's children into war, there must be a concrete justification to support the decision. However, if one's children are not threatened, justifying war or initiating conflicts is likely to become a less controversial decision.

The role of machines will be much more pronounced in future conflicts with the use of LAWS. However, if machines drive tactical and operational fighting, the option of managing crises via communication and diplomatic channels may also remain limited.

⁵⁵ Kahneman, *Thinking Fast and Slow*, 34.

⁵⁶ "On Banning Autonomous Weapon Systems: Human Rights, Automation, and the Dehumanization of Lethal Decision-making." *International Review of the Red Cross* 886, no. 94 (2012): 687-709, <https://international-review.icrc.org/sites/default/files/irrc-886-asaro.pdf>.

⁵⁷ Noreen Herzfeld and Robert H. Latiff, "Can Lethal Autonomous Weapons Be Just?" *Peace Review* 33, no.2 (2021): 213-219, <https://www.tandfonline.com/doi/abs/10.1080/10402659.2021.1998750?journalCode=cper20>.

Their introduction will also negatively impact crisis signalling and interpretation.⁵⁸ This can become even more complex for situations when the conflicting parties are Nuclear Weapon States, even though, nuclear weapons will continue to play a deterrent role in crisis escalation and all-out kinetic war.⁵⁹

The posturing of LAWS during a crisis could trigger the fear of a prompt and potent attack by an adversary and instill the possibility of considerable damage to one's forces. Situations like this can force a country to undertake a pre-emptive strike rather than respond to an attack with a weakened force. During a crisis, the same worry can force one party to increase the fighting intensity. Similarly, for defending actors, if attacked by LAWS, response time would shrink, which could lead to rash decisions that escalate a conflict.

Hence, given the speed at which they can operate, LAWS enhance the risk of unintended escalation. A study by RAND revealed that during war-gaming exercises, the speed of autonomous systems led to unintended escalation multiple times. The use of force was observed even when the states involved in the conflict did not have the intentions to cross a certain threshold in the war-gaming series. Similarly, more actors were forced into the conflict when autonomous decision-making was used.⁶⁰ The report concluded that the widespread use of autonomous systems would ultimately risk stability by increasing the danger of unintended escalation.

Unpredictability

Lowering the cost of conflicts by the introduction of LAWS and their role in decision-making and target execution can lead to more unpredictability. While it is true that the presence of LAWS would increase the distance between a target and attacker, minimise the probability of being caught as well as lesser risk to human life while simultaneously increasing attack precision,⁶¹ one cannot foresee the exact outcome.

⁵⁸ Burgess Laird, "The Risks of Autonomous Weapons Systems for Crisis Stability and Conflict Escalation in Future U.S.-Russia Confrontations", *RAND Blog*, June 3, 2020, <https://www.rand.org/blog/2020/06/the-risks-of-autonomous-weapons-systems-for-crisis.html>.

⁵⁹ Rose Gottemoeller, "The Standstill Conundrum: The Advent of Second-Strike Vulnerability and Options to Address It," *Texas National Security Review* 4, no.4 (2021):115-124, https://tnsr.org/2021/10/the-standstill-conundrum-the-advent-of-second-strike-vulnerability-and-options-to-address-it/#_ftn15.

⁶⁰ Yun Huh Wong, John Yurchak, Robert W. Button, Aaron B. Frank et al., *Deterrence in the Age of Thinking Machines*, report (Santa Monica: RAND Corporation, 2020), 52, https://www.rand.org/pubs/research_reports/RR2797.html.

⁶¹ Haner and Garcia, "The Artificial Intelligence Arms Race."

One cannot conclude with certainty how LAWS will choose their targets and the intensity of the attack. Experts such as Kai fu Lee in his book *'AI Superpowers: China, Silicon Valley, and the New World Order'*, express considerable doubt regarding whether AI could equate its intelligence fully with human beings.⁶² In addition, it is unclear how LAWS developed by opposing forces would interact with each other.

Also, there could be a notable discrepancy if used with International Humanitarian Law (IHL). Currently, LAWS are being dealt with under the Convention on Certain Conventional Weapons (CCW).⁶³ Meetings have been convened since 2014 to discuss the emerging challenges regarding LAWS. In the 2018 meeting, a set of guiding principles was finalised, and it was decided that LAWS would be subject to IHL.⁶⁴ Secondly, that humans would decide the options regarding the use of force. In addition, it was also advised to look into the risk associated with the acquisition/proliferation of LAWS by terrorists/NSAs. Hence, LAWS must be in accordance with the IHL.

However, adherence to 'Distinction', 'Proportionality' and 'Precaution' in an attack remains a demanding challenge. What if LAWS were unable to know the difference between combatants and non-combatants? For instance, it would be difficult to differentiate between a terrorist and a person with the same attire. Secondly, how would it be ensured that absolutely no civilians are targeted? Similarly, if LAWS are programmed to meet a particular goal, how will it be safeguarded that they would still exercise caution and avoid significant harm to civilians?

Several voices advocate for more autonomy in warfare. Tesla Chief Executive, Elon Musk, has repeatedly asserted that AI is a risk to the whole world and has advocated repeatedly for a ban on autonomous weapons.⁶⁵ Earlier in 2017, Musk and Alphabet's

⁶² Kai-Fu Lee, *AI Superpowers: China, Silicon Valley, and the New World Order* (Boston: Houghton Mifflin Harcourt, 2018), 13.

⁶³ United Nations, "The Convention on Certain Conventional Weapons," <https://www.un.org/disarmament/the-convention-on-certain-conventional-weapons/> [Accessed February 17, 2023].

⁶⁴ United Nations Office for Disarmament Affairs, *Report of the Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems*, report (Geneva, 2018), 5, [https://docs-library.unoda.org/Convention_on_Certain_Conventional_Weapons_-_Group_of_Governmental_Experts_\(2018\)/CCW_GGE.1_2018_WP.5%2BICRC%2Bfinal.pdf](https://docs-library.unoda.org/Convention_on_Certain_Conventional_Weapons_-_Group_of_Governmental_Experts_(2018)/CCW_GGE.1_2018_WP.5%2BICRC%2Bfinal.pdf).

⁶⁵ Peter Holley, "Elon Musk calls for Ban on Killer Robots before 'Weapons of Terror' are Unleashed," *Washington Post*, August 21, 2017, <https://www.washingtonpost.com/news/innovations/wp/2017/08/21/elon-musk-calls-for-ban-on-killer-robots-before-weapons-of-terror-are-unleashed/>.

Mustafa Suleyman led a group of 116 subject experts calling for a ban on autonomous weapons.⁶⁶ Similarly, as per Human Rights Watch, ‘the autonomous weapons would cross a moral threshold, and their humanitarian and security risks would outweigh possible military benefits.’⁶⁷ Although compliance of LAWS on the basis of IHL is a technical issue and could be solved through programming, such programming would be strenuous task and must cater to contextual variations. The challenges are likely to be immense especially if the theatre of war is heavily populated. The employment of UAVs by US forces during various phases of the War on Terror offers valuable lessons regarding the vulnerability of innocent civilians to such systems. Loosely defined defence/counterterrorism categories may be harmful in actually figuring out the exact target for autonomous systems. This is a Pandora’s box that can lead to operational risks and dangerous consequences. If there is some level of human supervision over the machine, it is predictable, whereas the predictability will be ambiguous when absolute autonomy is delegated to the machine. Despite their sophistication, LAWS are systems and not soldiers. Their level of sophistication does not empower them to act and reason as human soldiers.

ML networks are inherently so complicated that engineers involved in shaping them are themselves unclear of the phenomena as to how these reach their respective outputs, by virtue of which these systems are also called ‘black boxes’.⁶⁸ Likewise, according to a report by SIPRI, they are ‘unpredictable by design.’⁶⁹ Cognitive distancing, in terms of time space and understanding vis-à-vis employment of force,⁷⁰ can lead to more unpredictability about possible consequences within the duration of its launch (both in terms of the force applied and the area affected).⁷¹

⁶⁶ Samuel Gibbs, “Elon Musk leads 116 Experts calling for Outright Ban of Killer Robots,” *Guardian*, August 20, 2017, <https://www.theguardian.com/technology/2017/aug/20/elon-musk-killer-robots-experts-outright-ban-lethal-autonomous-weapons-war>.

⁶⁷ Human Rights Watch, *Making the Case: The Dangers of Killer Robots and the Need for a Preemptive Ban*, report (New York: 2016), 3, <https://www.hrw.org/report/2016/12/09/making-case/dangers-killer-robots-and-need-preemptive-ban>.

⁶⁸ Patrick Tucker, “Pentagon to Adopt Detailed Principles for Using AI,” *Defense One*, February 18, 2020, <https://www.defenseone.com/technology/2020/02/pentagon-adopt-detailed-principles-using-ai/163185>.

⁶⁹ Vincent Boulanin, Neil Davison, Netta Goussac and Moa Peldán Carlsson, *Limits on Autonomy in Weapon Systems*, report (Stockholm:Stockholm International Peace Research Institute, 2020),7, https://www.sipri.org/sites/default/files/2020-06/2006_limits_of_autonomy_0.pdf.

⁷⁰ *Ibid.*,12.

⁷¹ *Ibid.*,11.

Reliability Issues

The increasing unpredictability, an offshoot of greater autonomy, can lead to greater reliability challenges on the battleground. LAWS will remain heavily dependent on data and ML models. However, both are increasingly prone to sabotage and deception. Hence, there is a high chance that they can be deceived and manipulated. With limited human direction, ML agents are only as good as the data used to train them.⁷² Data generation is also a social phenomenon marred by human biases.⁷³ Hence, ML agents learn both good and bad human biases. Ultimately, automated learning on inherently biased data could lead to biased results.⁷⁴ Furthermore, given the immense complexity of data patterns and the sheer scale of available data, ML systems are bound to learn more autonomously which suggests that ML would reflect human biases.⁷⁵ According to Gartner, as far as 85% of AI-related technology is error-prone given the potential of partiality in algorithms, data, and/or the teams managing them.⁷⁶ In a world where big data holds considerable significance, these biases could prove consequential.

ML can be hacked as well and can be prone to coding errors. In May 2010, one such coding error showed its lethality when it wiped out USD 1 trillion worth of stock in an autonomous financial trading system in a few moments.⁷⁷ Adversarial attacks also remain a pressing challenge to ML models, adversely impacting the outcomes.⁷⁸

Moreover, it has been seen that AI has the potential to be discriminatory towards minority groups. Consequently, over-targeting or false-targeting can be more frequent if facial recognition becomes more integrated into the battlefield.⁷⁹ Bias can be shaped

⁷² Osonde Osoba and William Welser, *An Intelligence in Our Image: The Risks of Bias and Errors in Artificial Intelligence*, report (Santa Monica: RAND Corporation), 17, https://www.rand.org/pubs/research_reports/RR1744.html.

⁷³ Ibid.

⁷⁴ Shaza Arif, "Adversarial Attacks on Machine Learning – An Appraisal," (paper, Centre for Aerospace & Security Studies, Islamabad, 2022), <https://casstt.com/post/adversarial-attacks-on-machine-learning-an-appraisal/699>.

⁷⁵ Osoba and Welser, *An Intelligence in Our Image*, 18.

⁷⁶ Gartner, "Gartner Says Nearly Half of CIOs are Planning to Deploy Artificial Intelligence," press release, February 13, 2018, <https://www.gartner.com/en/newsroom/press-releases/2018-02-13-gartner-says-nearly-half-of-cios-are-planning-to-deploy-artificial-intelligence>.

⁷⁷ Bob Pisani, "What caused the Flash Crash? CFTC, DOJ weigh in," *CNBC*, April 21, 2015, <https://www.cnbc.com/2015/04/21/what-caused-the-flash-crash-cftc-doj-weigh-in.html>.

⁷⁸ Arif, "Adversarial Attacks on Machine Learning – An Appraisal."

⁷⁹ Sarah Myers West, Meredith Whittaker and Kate Crawford, *Discriminating Systems: Gender, Race, and Power in AI*, report (New York: AI Now Institute), 5, <https://ainowinstitute.org/discriminatingystems.pdf>.

by the dominance of a certain military regarding its own strength. How can it be ensured that the decision to execute a given action has taken into consideration all the available factors regarding the possibility of an all-out war and is based upon fair judgement and logical reasoning. The absence of human-in-the-loop can also pose a challenge in ensuring that the actions of LAWS are in alignment with the larger military strategy.⁸⁰

Hence, these risks suggest that employment of LAWS will make the battlefield less reliable. Reliability of weapons can be impacted by the environment, the complexity of the task and how the systems interact with the environment.⁸¹ While a particular system may perform in a reliable way in one environment, it may perform in a different manner in another, leading to lesser reliability of both the system and the battlefield.⁸²

Accountability Gaps

The advent of LAWS can give rise to significant accountability gaps. Before employing LAWS, the military commander must evaluate guidance of the leadership, nature of the target and the operational requirements. The particular decision has to be justified as well. In case, LAWS are making the decisions, accountability remains a pressing issue. Although as per CCW,⁸³ responsibility of the use of any emerging technology must be retained to humans, given that machines cannot be held accountable. Nevertheless, responsibility lines and chain of accountability may not always be clear. In case a system is misused, who will be held responsible? Will it be the programmer, the developer, the military commander in-charge, the larger Command and Control or a combination of all? A programmer or the developer may lack the information regarding the intent of potential use of a weapon in different scenarios, whereas the commander who may be responsible for that weapon may not be fully informed

⁸⁰ Nancy Cooke and Robin Chadwick, "Lessons Learned from Human–Robotic Interaction on the Ground and in the Air," in *Human-Robot Interactions in Future Military Operations*, eds. Michael Barnes and Florian Jentsch (London: CRC Press, 2010), 358.

⁸¹ International Committee of the Red Cross, *Autonomy, Artificial Intelligence and Robotics: Technical Aspects of Human Control*, report (Geneva, 2019), 2, <https://www.icrc.org/en/document/autonomy-artificial-intelligence-and-robotics-technical-aspects-human-control>.

⁸² *Ibid.*, 11.

⁸³ United Nations Office for Disarmament Affairs, "Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects," April 19, 2021, https://documents.unoda.org/wp-content/uploads/2020/07/CCW_GGE1_2020_WP_7-ADVANCE.pdf.

regarding the limitations of the weapon. Hence, the potential use of these weapons without accountability mechanisms can ultimately lead to adverse results.

Proliferation/Diffusion

Given the high expectations from LAWS, it is likely that their development and deployment will lead to diffusion at a considerable pace and scale. Many have postulated that LAWS are going to cause a Revolution in Military Affairs (RMA).⁸⁴ Although one can debate whether they constitute a RMA, they can alter the existing power projection paradigms, enabling smaller states to challenge the hegemony of larger ones. They have the potential to surge tensions and roll out in the form of a conflict.

Diffusion could force the hegemon to re-evaluate its capabilities and re-secure its position by further augmenting this technology.⁸⁵ This could also make the weaker states imitate, securing their respective power base from their rivals, causing proliferation of the technology. A more intelligent and flexible military can achieve victory against a more powerful enemy by effectively using new technologies with precision.⁸⁶

At the moment, LAWS-enabling technology is possessed by (or is being developed by) a handful of technologically advanced nations such as US, China, Israel, Russia, India, and South Korea etc.⁸⁷ However, with its proliferation, it could become more accessible to smaller states. Moreover, it could also fall into the hands of Non-State Actors (NSAs) leading to unimaginable devastation. Armed drones are already being used by terrorist wings such as Islamic State of Iraq and Syria,⁸⁸ Boko Haram,⁸⁹ and

⁸⁴ Austin Wyatt, "Charting Great Power Progress toward a Lethal Autonomous Weapon System Demonstration Point," *Defence Studies* 20, no.1 (2020):1-20, DOI: 10.1080/14702436.2019.1698956.

⁸⁵ Ibid.

⁸⁶ Tyson Wetzel, "Killer Robots' are Coming. Is the US Ready for the Consequences?" *Atlantic Council*, June 17, 2022, <https://www.atlanticcouncil.org/content-series/automating-the-fight/killer-robots-are-coming-is-the-us-ready-for-the-consequences/>.

⁸⁷ Trager, "Killer Robots: How to Regulate Lethal Autonomous Weapons Systems in Ukraine and Libya."

⁸⁸ Joby Warrick, "Use of Weaponized Drones by ISIS spurs Terrorism Fears," *Washington Post*, February 21, 2017, https://www.washingtonpost.com/world/national-security/use-of-weaponized-drones-by-isis-spurs-terrorism-fears/2017/02/21/9d83d51e-f382-11e6-8d72-263470bf0401_story.html.

⁸⁹ Dionne Searcey, "Boko Haram is Back. With Better Drones," *New York Times*, September 13, 2019, <https://www.nytimes.com/2019/09/13/world/africa/nigeria-boko-haram.html>.

Houthi rebels.⁹⁰ In other words, war/conflict can become an easy and attractive option in the presence of LAWS.

More attention has been paid to the potential benefits of LAWS and less is being paid on the apparent risks associated with them. The implications listed in the paper are not exhaustive. With such uncertain technologies, there will always be unanticipated consequences. These consequences are being overlooked as LAWS have become highly sought-after systems. The fact remains that they are going to give rise to greater challenges, risks, and uncertainties on the battlefield.

Policy Recommendations

From the above analysis, it is clear that autonomy of a lethal weapon is voluntarily being handed over to a technology or system, which is likely to create more ambiguity and can lead to decrease in meaningful human control.⁹¹ As this technology develops, it is necessary to consider its utilisation and employment. The absence of consensus on the definition and the potential benefits of the technology in the form of a more robust defence force inhibits international consensus to ban it. Hence, it is time to start thinking about how to mitigate the risks associated with it. Given that fully autonomously used systems are some years away, it is time to re-examine the existing security apparatus and devise strategies, counterstrategies, and treaties to address impending challenges. In this regard, the following are posited as critical recommendations (Figure 2)

⁹⁰ Sune Engel Rasmussen, "Yemen's Houthi Rebels Claim Aerial Attacks on U.A.E. Capital," *Wall Street Journal*, January 17, 2022, <https://www.wsj.com/articles/yemens-houthi-rebels-claim-suspected-drone-strikes-on-u-a-e-capital-11642416716>.

⁹¹ Elka Schwarz, "The (Im)possibility of Meaningful Human Control for Lethal Autonomous Weapon Systems," *Humanitarian Law and Policy*, August 29, 2018, <https://blogs.icrc.org/law-and-policy/2018/08/29/im-possibility-meaningful-human-control-lethal-autonomous-weapon-systems/>.

Figure 2: Critical Policy Directions to address LAWS Challenges



Source: Author's own.

Agreement on Definition of LAWS

One of the prerequisite to govern LAWS is to first define them. At the moment, there is no widely accepted definition which impedes the process of international consensus on how to deal with this technology in future. Hence, it is the dire need that states collectively adopt a globally agreed upon definition of LAWS.

Adopt Global Legislation

One worrying aspect is that global legislation on LAWS is too slow and too divided. As discussed earlier, it is unfortunate that international level talks have failed to arrive at meaningful consensus for many years now. While countries like the US, the UK, Russia, Israel, India don't want a legally binding treaty banning them since they are already developing them; nations like Spain, Sweden, Kuwait, and Portugal want human control and while they don't want to possess these lethal systems, they don't want a complete ban either; and then, there are states like Pakistan, Jordan, Algeria, Bolivia, Ghana, Cuba, Djibouti, Ecuador, Egypt, Iraq, El Salvador, Namibia, Uganda, Zimbabwe etc., that support a complete ban through an international legally binding treaty. On the side lines are France and Germany that want 'political declaration that is legally not binding', and then China that wants 'banning the use, not development and production.'⁹²

⁹² Subhrangshu Pratim Sarmah, "India Must Remain Practical Amid Politics Around 'Killer Robots'," *Quint*, December 28, 2021, <https://www.thequint.com/opinion/india-must-take-a-practical-approach-amid-politics-around-killer-robots#read-more>.

As the technology matures, there will be an emergence of even bigger challenges, not just global polarisation on the subject. Hence, these weapons need to be brought under a new treaty as they differ from the previously existing weapons and pose unique challenges that the existing international law cannot address. There is a need for states to define where IHL ceases to address LAWS and what kind of new rules/regimes/standards are needed for this technology. Treaties and norms that regulate nuclear, biological, and chemical weapons can be used as blueprints for a LAWS global governance regime.⁹³ However, it is unfortunate the the current international environment is of such nature where negotiating such regulations seems unlikely. The increasing US-China competition on the technological⁹⁴ and economic front,⁹⁵ and the US-Russia hostility after the Russian invasion of Ukraine in February 2021 has further worsened the climate.

Define Meaningful Human Control & Level of Autonomy

Various entities use their own interpretations of LAWS. While defining LAWS is crucial for formulating new norms, regimes, treaties, etc., it is equally important to define what constitutes 'meaningful human control' over LAWS. In the development, testing, decision-making and operational phase, the degree of autonomy can vary as per different levels.⁹⁶ Hence, 'meaningful human control' in various stages needs to be defined clearly.

At the state level, governments need to maximise the advantages and minimise the risks of LAWS. AI could be used to assist militaries in diverse tasks but should not be delegated authority to take critical decisions. From formulating objectives, choosing, and approving targets, checking compliance with IHL, assessing collateral damage, and finally using force, humans/civilian leadership should be kept in/on the loop in operations where LAWS are present.

⁹³ Schwarz, "The (Im)possibility of Meaningful Human Control for Lethal Autonomous Weapon Systems."

⁹⁴ Chatham House, *US-China Strategic Competition: The Quest for Global Technological Leadership* report (London, 2019), 4, <https://www.chathamhouse.org/sites/default/files/CHHJ7480-US-China-Competition-RP-WEB.pdf>.

⁹⁵ *Ibid.*, 34.

⁹⁶ Neil Davison, "A Legal Perspective: Autonomous Weapon Systems under International Humanitarian Law," (paper, United Nations Office for Disarmament Affairs Occasional Papers, no. 30, 2018), 5-18, <https://www.un-ilibrary.org/content/books/9789213628942c005>.

Ensure Accountability and Transparency

As mentioned in the paper, some level of human control is imperative. Given that humans need to be held accountable for using force during an armed conflict, there is a need to further streamline the contours of accountability while taking into confidence the private sector given that they also have notable responsibility vis-à-vis the development of such weapons. Furthermore, governments around the world should take a more inclusive approach to ensure transparency. Feedback should be taken from civil society and AI experts regarding LAWS development programmes. In addition, there should be regular updates on the progress of the measures taken by the state to ensure safety and security of these systems. Establishment of oversight mechanisms need to be prioritised.

Control Deployment

There should be control over the environment in which LAWS may be deployed. For example, they should not be deployed in areas where civilians are present or should not be present during tactical operations.

Train Human Resource

The role of human resource is crucial. Training operators vis-à-vis complete knowledge of the system; the environment in which it is deployed; understanding of limitations; ability to cope with risks and familiarisation with sensitive areas should be ensured.⁹⁷

Create Awareness and Intensify Activism

A public debate is needed to understand and create awareness regarding the implication of LAWS. More seminars, conferences, and workshops are needed to highlight the repercussions of using fully autonomous weapons. The events should include a hybrid group of people from both the strategic community as well as technical experts. Activism, at the organisational level, can also play a positive role in this regard. Previously, Google had to withdraw from its contract of Project Maven with the Pentagon due to widespread protests by company employees over ethical concerns.⁹⁸

⁹⁷ Boulanin, Davison, Goussac and Carlsson, *Limits on Autonomy in Weapon Systems*, 9.

⁹⁸ Shannon Liao, "Google Will Not Renew its Drone AI Contract with the Pentagon," *Verge*, June 1, 2018, <https://www.theverge.com/2018/6/1/17418406/google-maven-drone-imagery-ai-contract-expire>.

Similarly, both national and international-level campaigns are needed to revamp efforts against the challenges these systems will bring in their wake.

Non-Government Organisations (NGOs) can also play an effective role in this regard. Human Rights Watch has been the co-founder of the Campaign to Stop Killer Robots.⁹⁹ Leading the coalition of 187 countries based in 67 countries, the group advocates for prohibition on autonomous weapon systems and calls for maintaining meaningful control over them.¹⁰⁰ Such organisations can increase their impact by having more active presence on social media, engaging more frequently with policymakers, academics and mobilising grassroots support through public demonstration and petitions.

Conclusion

The age of LAWS is already here. They will be an important component of warfare in the future. These systems may outperform humans in general calculation but in a war zone, they are going to cause challenges with regards to decision-making, unpredictability, reliability, accountability, and proliferation/diffusion. Global commitment and oversight are necessary given that the technology is likely to proliferate rapidly, can undermine peace and is vulnerable to attacks. If timely constraints are not enacted, LAWS can become a major risk. While the technology offers considerable opportunities in the military sector, it has the potential to be highly destabilising for the current world order.

If analysed from a South Asian lens, Pakistan has been one of the first countries to advocate for a ban on LAWS. However, the regional environment is increasingly hostile and conflict prone. India openly supports their development and is keen to ornate its military with AI. The fact remains that the race to develop this technology is not going to stop. Although, Pakistan should continue to advocate against the use of this technology, it needs to invest in R&D regarding to explore its advantages and limitations. For this purpose, national level infrastructure is needed to pool in financial

⁹⁹ "Killer Robots: Military Powers Stymie Ban," *Human Rights Watch*, December 19, 2021 <https://www.hrw.org/news/2021/12/19/killer-robots-military-powers-stymie-ban#:~:text=Human%20Rights%20Watch%20is%20a,over%20the%20use%20of%20force.>

¹⁰⁰ Ibid.

and human resources in order to ensure that the country does not fall behind in this inevitable technological race.

ABOUT THE AUTHOR



Shaza Arif is a Research Assistant at the Centre for Aerospace & Security Studies (CASS), Islamabad, Pakistan. Her areas of interest are Space, Artificial Intelligence and Strategy. She writes articles on issues related to politics, modern warfare, and strategy. She has studied Defence and Diplomatic Studies from the Fatima Jinnah Women University, Rawalpindi, Pakistan.

ABOUT CASS

The Centre for Aerospace & Security Studies (CASS), Islamabad, was established in 2018 to engage with policymakers and inform the public on issues related to aerospace and security from an independent, non-partisan and future-centric analytical lens. The Centre produces information through evidence-based research to exert national, regional and global impact on issues of airpower, defence and security.

VISION

To serve as a thought leader in the aerospace and security domains globally, providing thinkers and policymakers with independent, comprehensive and multifaceted insight on aerospace and security issues.

MISSION

To provide independent insight and analysis on aerospace and international security issues, of both an immediate and long-term concern; and to inform the discourse of policymakers, academics, and practitioners through a diverse range of detailed research outputs disseminated through both direct and indirect engagement on a regular basis.

PROGRAMMES

Foreign Policy
National Security
Emerging Technologies
Aviation Industry & Technology Studies
Economic Affairs & National Development
Warfare & Aerospace
Strategic Defence, Security & Policy
Peace & Conflict Studies



**CENTRE FOR
AEROSPACE & SECURITY
STUDIES, ISLAMABAD**

Independence. Analytical Rigour. Foresight

📍 Old Airport Road,
Islamabad, Pakistan

☎ +92 051 5405011

🌐 www.casstt.com

✉ cass.thinkers@casstt.com

in Centre for Aerospace
& Security Studies

@ cassthinkers

🐦 @CassThinkers

f cass.thinkers