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Artificial Intelligence led Lethal Autonomous Weapon Systems and Terrorism: Risk Assessment and Solutions for Pakistan

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Artificial Intelligence (AI) is undergoing a paradigm shift in the contemporary world and has emerged as a transformative force with significant military applications. As the integration of AI into military systems expands, concerns about the potential risks associated with autonomous weapons have heightened, raising apprehensions about national security in the face of possible terrorist threats. This article examines the evolution of AI in a military context while focusing on Lethal Autonomous Weapon Systems (LAWS). LAWS, robotic weapons, or killer robots are autonomous weapons capable of independently navigating and engaging selective targets. The lack of coherence within the international strategic community in defining autonomous systems has led to legislative complications in controlling or regulating these weapons. Moreover, the potential for non-state

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actors to exploit AI-driven weapon technologies, such as autonomous drones and unmanned ground vehicles, poses profound challenges for Pakistan's national security. In response to these challenges, this article explores potential and possible solutions, addressing the ethical, legal, and strategic dimensions of managing AI-led LAWS to ensure responsible use and prevent unauthorized access to these weapons by non-state actors.

Keywords: Artificial Intelligence, Lethal Autonomous Weapon Systems, Drones, Terrorism, National Security.

Introduction

In 1956, during a conference at Dartmouth College, the initial understanding of artificial intelligence (AI) was expressed: "Every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it."[3] It can also be referred to as the ability of a machine to learn from experience, adjust to new inputs, and perform human-like tasks."[4] In brief, AI is the ability of computer systems to perform tasks often associated with human intelligence (HI). It leverages rapid, iterative, and intelligent algorithms to process substantial data automatically discerning new patterns. The machine learns by processing large volumes of data, assessing the successes and failures, and generating algorithms that help classify objects, thereby predicting certain behavioral pat-

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3. Veisdal, Jorgan. "The Birthplace of AI – The 1956 Dartmouth Workshop." Cantor's Paradise, September 12, 2019. https://www.cantorsparadise.com/the-birthplace-of-ai-9ab7d4e5fb00?gi=95ea7d231c63.

4. Duan, Yanqing, John Edwards, and Yogesh Dwivedi. "Artificial Intelligence for Decision Making in the Era of Big Data – Evolution, Challenges and Research Agenda." International Journal of Information Management 48 (October 2019): 63-71. https://www.sciencedirect.com/science/article/abs/pii/S0268401219300581.

terns.[5]

This capacity holds significant potential across various facets of the contemporary world, including military applications. AI-based learning redefines the projection of combat forces on a battlefield. These AI-led weapon systems are increasingly getting smaller, more flexible, precise, intelligent, and robust. An Autonomous Weapon System (AWS) can choose and attack targets without needing additional input from a human operator once activated.[6] Lethal firepower with AWS resulted in the creation of Lethal Autonomous Weapon Systems (LAWS). As technology evolves, the weaponization of AWS and its use on the battlefield is becoming more popular.

In this context, the potential for non-state actors/ terrorists to exploit the possibility of the use of AI-driven weapon technologies, such as autonomous drones and unmanned ground vehicles, poses profound challenges to Pakistan's national security.[7] In response to these challenges, this article explores potential and possible solutions, addressing the ethical, legal, and strategic dimensions of managing AI-led LAWS to ensure responsible use and prevent unauthorized access to these weapons by non-state actors.

Levels of Autonomy and OODA Loop

Intelligent machines capable of performing tasks by themselves without explicit human control are called autono-

5 . "What is Artificial Intelligence (AI)?" IBM - United States, June 3, 2020. https://www.ibm.com/cloud/learn/what-is-artificial-intelligence.

6 . Allen, Gregory C. "DOD is Updating its Decade-Old Autonomous Weapons Policy but Confusion Remains Widespread." Centre for International and Strategic Studies, June 6, 2022. https://www.csis.org/analysis/dod-updating-its-decade-old-autonomous-weapons-policy-confusion-remains-widespread.

7 . Masood, Maryyum, and Muhammad Ali Baig. "Potential Impact of Lethal Autonomous Weapon Systems on Strategic Stability and Nuclear Deterrence in South Asia." Margalla Papers 27, no. 2 (2023): 27-43. https://margallapapers.ndu.edu.pk/site/article/view/173.

mous machines. The difference between automatic and autonomous weapon systems is often debated. Automatic systems follow pre-programmed instructions to carry out specific tasks, relying on static directives that necessitate human interaction for any adjustments in response to a changing environment. In contrast, autonomous systems are programmed to adapt to their environment dynamically, thus making crucial decisions without human intervention.[8]

The OODA loop (observe-orient-decide-act), a decision-making model was developed by Colonel John Boyd. In human-operated weapon systems, a human operator is responsible for executing these actions whereas in autonomous weapon systems, the human relinquishes control over certain aspects of the OODA loop. Depending on the nature of interaction with human controls in the OODA loop, autonomy can be categorized into three levels: human-in-the-loop (semi-autonomy), human-on-the-loop (supervised autonomy), and human-out-of-the-loop (full-autonomy). The extent of human participation in the OODA loop dictates the level of control humans exert over an AI-based system.

Human-in-the-loop is the semi-autonomous level in which machines conduct supplementary actions while command and control lie with humans. Human has the sole authority to make decisions depending upon the input provided by the machine.[9] Human-on-the-Loop is the supervised autonomous level in which supplementary actions as well as decision making is undertaken by machines without

8. Taylor, Stacy J. "Autonomy." Encyclopedia Britannica, June 20, 2017. https://www.britannica.com/topic/autonomy.

9. Beard, Jack. "Autonomous Weapons and Human Responsibilities." Georgetown Journal of International Law 45, no. 617 (2014): 14-56. https://www.academia.edu/67515752/Autonomous.

human input. However entire process takes place under the supervision of a human operator who can allow the machine to conduct operation autonomously, or he can override the entire operation depending upon the situation.[10] Human-out-of-the-loop is the fully autonomous level where machines execute operations independently without the intervention of human operators in any capacity.[11]

The capability and correspondingly the risks, increase with the level of autonomy in the weapon system. In general, full-autonomous weapon systems are perceived as the riskiest systems due to the lack of human control and the threat of AI acting in an irresponsible and out-of-control manner. Malfunctioning, bugs, system failures, hacking, and unanticipated interaction with the environment can yield unintended consequences. Greater human control is widely believed to be the solution for the mitigation of the aforementioned risks.

However, this generalization is valid when professional security forces are taken into account. The human operator in such cases is bound by the legal framework and is trained to act by standard operating procedures (SOPs) to attain maximum benefit with minimum risks. But the situation changes drastically when a human operator belonging to a terrorist organization is put into the equation. Such hostile actors rely on all means possible to inflict the utmost damage to civilian as well as military targets without worrying about ethical or legal obligations. This makes integration of lethal weapons with all levels of autonomy, no matter in what capacity human is involved, extremely dangerous and hard to counter.

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10 . Saylor, Kelly M. "Defense Primer: US Policy on Lethal Autonomous Weapon Systems." US Congressional Research Service, 2022. https://crsreports.congress.gov/product/pdf/IF/IF11150.

11 . Saylor, *Defense Primer*.

Understanding LAWS

Contemporarily, there is no mutually agreed and globally agreed definition of an autonomous weapon system.[12] China's People's Liberation Army (PLA) perceives LAWS as "a weapon that utilizes AI to automatically pursue, distinguish, and destroy enemy targets; often composed of information collection and management systems, knowledge base systems, assistance to decision systems, mission implementation systems, etc."[13] Russian Ministry of Defense has defined these systems as "an unmanned piece of technical equipment that is not a munition and is designed to perform military and support tasks under remote control by an operator, autonomously or using the combination of these methods."[14] According to NATO, an autonomous system is "a system that decides and acts to accomplish desired goals, within defined parameters, based on acquired knowledge and an evolving situational awareness, following an optimal but potentially unpredictable course of action."[15] From the UK Ministry of Defence's perspective, "An autonomous system is capable of understanding higher-level intent and direction." From this understanding and its perception of environment, such a system can take appropriate action to bring about a desired state. It is capable of deciding a course of action, from several alternatives, without depending on human oversight and

12 . Motoyama, Sono. "Inside the United Nations Effort to Regulate Autonomous Killer Drones." The Verge, August 27, 2018. https://www.theverge.com/2018/8/27/17786080/united-nations-un-autonomous-killer-robots-regulation-conference.

13 . Kania, Elsa B. "China's Embrace of AI: Enthusiasm and Challenges." European Council on Foreign Relations, November 6, 2018. https://ecfr.eu/article/commentary_chinas_embrace_of_ai_enthusiasm_and_challenges/.

14 . Sagarmsingh, Raine. "Lethal Autonomous Weapon Systems: Artificial Intelligence and Autonomy." *Journal of IEEE* 12, no. 12 (2019): 12. http://sixhalfdev.com/projects/wp-wise/wp-content/uploads/2019/04/Raine_S_-FinalPaper.pdf.

15 . "AAP-06 Edition 2020: NATO Glossary of Terms and Definitions." NATO Standardization Office, 2020. https://www.nato.int/docu/logi-en/1997/lo-1709.htm.

control, although these may still be present. Although the overall activity of an autonomous unmanned aircraft will be predictable, individual actions may not.[16]

The US Department of Defense (US DoD) refers to LAWS as "a weapon system that, once activated, can select and engage targets without further intervention by a human operator. This includes human-supervised autonomous weapon systems that are designed to allow human operators to override operation of the weapon system but can select and engage targets without further human input after activation."[17]

Building mutual consensus regarding the definition of LAWS is a major challenge due to the vast disparity in comprehending their technical functionalities and subsequent military applications. In brief, three different groups of thought exist i.e., pessimists, optimists, and realists. Pessimists[18] perceive LAWS as weapons of mass destruction (WMD) that are destabilizing in nature and contradict ethical and legal values. The optimists[19] appreciate the capabilities provided by LAWS and support their further development. Realists[20] have a more balanced point of view

16. "Unmanned Aircraft Systems (JDP 0–30.2)." Ministry of Defence-Gov UK, 2018. https://www.gov.uk/government/publications/unmanned-aircraft-systems-jdp-0-302.

17. Garamone, Jim. "DoD Directive 3000.09 on Autonomy in Weapon Systems." US Department of Defense, January 25, 2023. https://www.esd.whs.mil/portals/54/documents/dd/issuances/dodd/300009p.pdf.

18. "Banning Autonomous Weapons: A Legal and Ethical Mandate." Ethics & International Affairs, July 1, 2022. https://www.cambridge.org/core/journals/ethics-and-international-affairs/article/banning-autonomous-weapons-a-legal-and-ethical-mandate/AFD89F8B51D6C0FA2A8A6568EF0BFF35.

19. Air University. "Laws on LAWS: Regulating the Lethal Autonomous Weapon Systems." Journal of Indo-Pacific Affairs. July 17, 2023. https://www.airuniversity.af.edu/JIPA/Display/Article/ArticleID/1048/laws-on-laws-regulating-the-lethal-autonomous-weapon-systems.

20. Air University. "Laws on LAWS: Regulating the Lethal Autonomous Weapon

related to LAWS as they believe that technological developments of LAWS cannot be capped, and a complete ban is not possible. These three different groups of thought are representations of different countries' positions at the international level and are yet to find a common ground for defining and legislating LAWS. Therefore, the world's leading states should formulate a regulatory mechanism to keep the development and deployment of such systems in check.[21]

Evolution of Autonomy in Unmanned Weapon Systems

Human-operated unmanned systems have been in use in varying capacities since World War I (WWI).[22] The work for the incorporation of autonomy in military systems began during the Cold War. In 1963, US$2 million in funds were granted to MIT by the Defence Advanced Research Projects Agency (DARPA) to research "machine-added cognition" to develop new military applications for achieving technological advantage against the Soviet Union.[23] The evolution of autonomy in unmanned systems can be split into three phases.

The first phase is characterized by remote-controlled systems, which rely on human input to execute every task. During the Cold War, several such unmanned aerial sys-

Systems."

21. Noor, Sitara. "Laws on LAWS: Regulating the Lethal Autonomous Weapon Systems." Journal of Indo-Pacific Affairs, September 21, 2023. https://www.airuniversity.af.edu/JIPA/Display/Article/3533453/laws-on-laws-regulating-the-lethal-autonomous-weapon-systems/.

22. Canan, James W. "On the Horizon: Unmanned Aerial Vehicles." Air & Space Forces Magazine, October 1, 1988. https://www.airandspaceforces.com/article/1088uav/.

23. Van Atta, Richard H. "DARPA Technical Accomplishments: An Historical Overview of Selected DARPA Projects." Internet Archives, no. 2 (1991): 83. https://archive.org/details/DARPATechnicalAccomplishmentsandHistoricalReviewofSelectedDARPAProjectsVolume1.

tems were developed, even employed, primarily for reconnaissance purposes. But these systems were completely void of autonomy of their own. For example, the US MQ-1 Predator Drone, developed in the late 20th century, was remotely piloted and used chiefly for surveillance and reconnaissance roles. Later versions of these drones were capable of following pre-programmed flight paths, executing basic maneuvers, and conducting sustained surveillance independent of human control. In this phase, unmanned systems began to weaponize with precision munitions. However, humans were still in control of making final decisions and completing complex tasks according to evolving situations.[24]

Post 2010 marks the second phase of autonomy integration in unmanned systems. Integration of higher grades of semi-autonomy allowed unmanned systems to adapt according to dynamic combat environments by identifying the changing conditions, crafting feasible solutions, and making rapid decisions with minimum human input. Drones acquired more autonomy in navigation, target recognition, and flight operations. The engagement capability, however, remained under human control. Northrop Grumman X-47B, an unmanned combat aerial vehicle (UCAV), took off and landed on an aircraft carrier after executing in-flight maneuvers on May 14, 2013.[25] Similarly, the Boeing MQ-25 Stingray became the first carrier-based tanker drone, which could perform the complex task of in-flight-refueling autonomously.[26]

24 . Hoehn, John R., Kelley M. Sayler, and Michael E. DeVine. "Unmanned Aerial Systems: Role, Missions, and Future Concepts." US Congressional Research Service, July 18, 2022. https://crsreports.congress.gov/product/pdf/R/R47188.

25 . Subbharaman, Nidhi. "X-47B Drone Completes First Ever Carrier Takeoff and Landing." NBC News, May 15, 2013. https://www.nbcnews.com/tech/tech-news/navys-x-47b-drone-completes-first-carrier-takeoff-flna1c9922371.

26 . Newdick, Thomas. "Navy's MQ-25 Stingray Tanker Drone Goes Aboard a Carrier for the First Time." The War Zone, December 2, 2021. https://www.

The third and most contemporary phase involves the development and employment of military systems with supervised autonomy. Many such systems have been equipped with weapons or have been integrated with warheads - like in the case of loitering munitions or Kamikaze drone boats, essentially transforming them into LAWS. Loitering munitions, also called Kamikaze or suicide drones, represent a unique weapon category that combines the characteristics of both drones and missiles.[27]

These munitions possess the capability to detect and track targets over an extended duration before initiating engagement. Although human input during operational use varies depending on the threat environment and type of weapon being used, loitering munitions have a high degree of autonomy in comparison to traditional combat drones. In some instances, these munitions can autonomously search, identify, decide, and engage targets without any human intervention.[28] Examples include Israel's Harpy, the US's Switch Blade, Turkey's Kargu-II, Russia's Aero-Kub, and Iran's Shahed-136.

In full-scale conflict, Kamikaze drones were first used by Azerbaijan in the Nagorno-Karabakh conflict. Azerbaijan's military effectively used loitering munitions to precisely engage the Armenian military, particularly air defense systems, from stand-off ranges.[29] Similarly, during the Russia-Ukraine conflict, both sides have extensively used weapons with great effect. These suicidal drones have proven their effectiveness against military as well as

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thedrive.com/the-war-zone/43361/navys-mq-25-stingray-tanker-drone-goes-aboard-a-carrier-for-the-first-time.

27 . Scharre, Paul. Army of None: Autonomous Weapons and the Future of War. 1st ed. New York: W.W. Norton & Company, 2018, 53.

28 . Ibrahim, Ahmad. "Loitering Munitions as a New-Age Weapon Systems." CSCR, December 5, 2022. https://cscr.pk/explore/themes/defense-security/loitering-munitions-as-a-new-age-weapon-system/.

29 . Ibrahim, "Loitering Munitions."

civilian targets. The traditional air defense systems have repeatedly been overwhelmed by these munitions, particularly during saturated strikes. [30]

In the maritime domain, Ukraine has successfully employed Kamikaze drone boats to attack the Russian Navy Black Sea Fleet. Despite overwhelming naval superiority, the Russian Navy has been unable to impose a complete blockade of the Ukrainian coast. Ukraine has been using suicidal boats with high-grade autonomy as a sea-denial weapon against the Russian surface fleet. These pilot-less explosive-laden boats have been used to target warships at sea as well as harbor.[31] Allegedly, the well-protected Crimean Bridge was also attacked by an unmanned suicidal boat, which managed to breach multiple layers of Russian defenses.[32] These cheap suicide drone boats have degraded the Russian Navy's ability to operate independently in the Black Sea.

Besides the proliferation of loitering munitions and Kamikaze drone boats, many nations are also in the advanced stages of developing drone-swarm technology with an enhanced level of autonomy. These autonomous swarms of drones, once weaponized, will offer vast military applications along with equivalent levels of risk.[33] As the level of autonomy evolves, the next generations of AWS will eventually enter the battlefields of the future.

30 . Kahn, Lauren. "Can Iranian Drones Turn Russia's Fortunes in the Ukraine War?" Council on Foreign Relations, October 26, 2022. https://www.cfr.org/in-brief/can-iranian-drones-turn-russias-fortunes-ukraine-war.

31 . Zafra, Mariano, and Jon McClue. "Sea Drones and Counteroffensive in Crimea." Reuters, July 17, 2023. https://www.reuters.com/graphics/UKRAINE-CRISIS/CRIMEA/gdvzwrmrlpw/.

32 . Walsh, Nick P. "The Moment Ukraine Used Experimental Sea Drone to Target Russian Bridge." CNN, August 15, 2023. https://edition.cnn.com/2023/08/15/europe/ukraine-crimea-bridge-drone-strike-video-intl/index.html.

33 . Hambling, David. "Israel Rolls out Legion-X Drone Swarm for the Urban Battlefield." Forbes, October 24, 2022. https://www.forbes.com/sites/davidhambling/2022/10/24/israel-rolls-out-legion-x-drone-swarm.

LAWS as Weapons of Terror

The likelihood of terrorists using LAWS depends on the motivation and realistic accessibility of such technology. Numerous factors contribute to the attractiveness of LAWS for terrorists. First, AI-enabled weapons could minimize, if not eliminate, the physical risks associated with terrorist action. Second, fully AWS holds the potential to be invulnerable to countermeasures such as jamming or interception, thus, increasing the rate of success. Thirdly, LAWS offers force multiplication as unlike manual systems that require continuous intervention, those deploying AWS can potentially operate multiple LAWS simultaneously. In sum, AI can potentially act as an enabling technology for terrorism.[34]

When accessibility of such high-end technology to terrorist factions is taken into account, there are three primary obstacles. First, the availability of unmanned systems that can act as carriers; second, the incorporation of sufficiently advanced AI so that the weapon system could undertake tasks autonomously without failure; and third, the ability to integrate a warhead with an unmanned system that can detonate as intended and deliver desired damage. Non-state actors now possess the capability to deploy homemade, remotely piloted drones and weapons capable of autonomously navigating to designated targets and delivering explosive payloads.

Militant organizations have been using manually controlled suicide drones for the past several years. According to an open-source study, 440 terror incidents involving weaponized drones have been recorded between August

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34. Horowitz, Michael. "Artificial Intelligence, International Competition, and the Balance of Power." Texas National Security Review 3 (May 2018): 37. https://tnsr.org/2018/05/artificial-intelligence-international-competition-and-the-balance-of-power/.

2016 and March 2020.[35] Almost the entirety of these attacks (433 out of 440) took place in the Middle East and North Africa.[36] The use of commercial-grade quad-copters for dropping mortars and grenades was first popularized by the Islamic State of Iraq and Syria (ISIS) in 2017 during the war against Iraqi security forces.[37] These drones caught Iraqi and US forces by surprise and inflicted losses to infantry, artillery, and even armored forces. According to a US special ops commander, the usage of "killer bees" in Mosel degraded morale and gave the enemy a tactical advantage through commercial-grade drones.[38] On Jan 2018, ISIS attacked Russian forces in Hmeimim Airbase with several suicide drones. These drones were wrapped with homemade mines and were thwarted by Russian defenses.[39] This was the first instance when an attack of this magnitude was launched by a terrorist outfit against a military.

Fully autonomous suicidal drones represent the next logical step in drone evolution. These drones can also be armed with weapons and will be able to effectively evade traditional defensive systems. Moreover, such systems will be able to identify and strike targets based on visual cues or track individuals using facial or gait recognition. Commercial Unmanned Aerial Vehicles (UAVs), including First

35 . Haugstved, Håvard, and Jan Otto Jacobsen. "Taking Fourth-Generation Warfare to the Skies? An Empirical Exploration of Non-State Actors' Use of Weaponized Unmanned Aerial Vehicles (UAVs — 'Drones')." Perspectives on Terrorism 14, no. 5 (October 2020): 30. https://www.jstor.org/stable/26940037.

36 . Haugstved and Jacobsen. "Taking Fourth-Generation Warfare to the Skies?"

37 . Warrick, Joby. "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.

38 . Layton, Peter. "Commercial Drones: Privatising Air Power." The Lowy Institute, September 27, 2017. https://www.lowyinstitute.org/the-interpreter/commercial-drones-privitising-air-power.

39 . "Russia Thwarts Drone Attack on Hmeimim Airbase." BBC News, January 7, 2018. https://www.bbc.com/news/world-europe-42595184.

Person View (FPV) drones, with their ability to navigate through complex obstacles and target specific individuals, already exhibit this capability due to integrated high-grade autonomy. Besides suicidal attacks for inflicting high losses, AI can also transform specialized tasks, such as sniping, into more routine and less specialized activities.[40] AI-powered suicidal drones can be used to target-kill specific individuals in crowds by terrorist factions.[41] For example, the assassination attempt on Iraqi Prime Minister Mustafa al-Kadhimi's residence in November 2021 was made by a booby-trapped drone.[42]

According to a UN report, the first instance of an AI-powered suicidal drone was recorded in March 2020 in Libya when a Turkish-origin Kargu-II suicidal quad-copter was used to target the Libyan National Army (LNA).[43] The report further stated that "The lethal autonomous weapon systems were programmed to attack targets without requiring data connectivity between the operator and the munition: in effect, a true 'fire, forget and find' capability."[44] The proliferation of loitering munitions and their widespread use in the Russia-Ukraine war indicates that these highly capable munitions will eventually fall into the hands of non-state actors. Once employed, these suicidal autonomous munitions, due to their ability to exploit vul-

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40 . Brundage, Miles. The Malicious Use of Artificial Intelligence: Forecasting, Prevention, and Mitigation. Oxford, U.K.: Future of Humanity Institute, University of Oxford, February 2018, 27.

41 . Brundage, *The Malicious Use of Artificial Intelligence*, 21.

42 . Adnan, Ghassan, and Jared Malsin. "Iraq's Prime Minister Targeted in Assassination Attempt." The Wall Street Journal, November 7, 2021. https://www.wsj.com/articles/iraqs-prime-minister-survives-assassination-attempt-government-says-11636248485.

43 . UNSC. Final Report of the Panel of Experts on Libya Established Under Security Council Resolution 1973 (2011). Relief Web, 2021. https://reliefweb.int/report/libya/final-report-panel-experts-libya-established-pursuant-resolution-1973-2011-s2017466.

44 . *UNSC Final report of the Panel of Experts on Libya*, 17.

nerabilities in defenses, will pose a major challenge to the security of civilian as well as military infrastructure. Similarly, terrorist organizations might also explore the repurposing of commercially available drones, modifying them to carry improvised lethal payloads. While not true autonomous weapons, these modified drones could be used in autonomous or semi-autonomous modes for carrying out attacks.

Besides the use of AI-powered suicidal quad-copters or even loitering mentions, there are a few more potential forms of LAWS that can be exploited for terrorist purposes. Vehicle-Borne Improvised Explosive Device (VBIED), or simple car bomb, has been a weapon of choice for terror outfits for large-scale destruction. In concept, an explosive-laden vehicle is driven by a suicide driver who detonates the vehicle after reaching the destined target. But the convergence of AI with VBIED can potentially create an unmanned suicide vehicle that can operate semi-autonomously or even autonomously and wreak havoc against congested or high-value targets.[45] Although this level of technology is currently beyond the grasp of non-state actors considering the wide adaptation of commercial technology of driverless vehicles (Tesla cars for example), the risk of militarization and eventually terrorization of this technology is very real.

In the maritime domain, militant factions have used man-driven explosive boats for suicide attacks against surface ships. On October 12, 2000, an explosive-laden boat driven by two Al-Qaeda suicide bombers hit United States Navy (USN) destroyer USS Cole, killing 17 sailors and in-

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45. Lewis, Jeffery W. "Smart Bomb in Every Garage – Driverless Cars and Future Terrorist Attacks." National Consortium for the Study of Terrorism and Responses to Terrorism, September 18, 2015. https://www.start.umd.edu/news/smart-bomb-every-garage-driverless-cars-and-future-terrorist-attacks.

juring 39 others.[46] Similarly, in 2016, Royal Saudi Navy Frigate Al-Madinah was struck by a Yemeni Houthi's remotely controlled suicide boat killing two sailors and wounding three more. The attack took place in the Southern Red Sea and was the first incident in modern history involving a successful attack of a remote-operated suicide boat against a warship.

In the Russia-Ukraine war, Kamikaze boats with a higher degree of autonomy are being used extensively to target Russian Warships and naval infrastructure in the Black Sea.[47] The potential risk of employing Kamikaze drone boats incorporated with AI by terrorists poses a major threat to maritime security. These boats would be a grave threat near shores or at choke points. Not only merchant vessels, but even warships will be vulnerable to this new potential threat, thus necessitating countermeasures.[48] Likewise, underwater drones equipped with Global Positioning System (GPS) and armed with explosives have been used by Hamas to target Israel's maritime infrastructure. Although the Israeli Navy countered these underwater suicide drones. Israel was forced to deactivate a natural gas rig chiefly due to the threat of these drones.[49] Recently, the Houthi militia in Yemen has employed rudimentary unmanned suicide boats to target merchant vessels in the Red

46 . "USS Cole Bombing Fast Facts." CNN, November 22, 2022. https://edition.cnn.com/2013/09/18/world/meast/uss-cole-bombing-fast-facts/index.html.

47 . "Unmanned Kamikaze Boats Have Become a Real Ukrainian Weapon of Deterrence." Defence Express, August 24, 2023. https://en.defence-ua.com/news/unmanned_kamikaze_boats_have_become_a_real_ukrainian_weapon_of_deterrence-7731.html.

48 . Ibrahim, Ahmad. "Feasibility of Kamikaze Drone Boats in Modern Warfare." CSCR, July 27, 2023. https://cscr.pk/explore/themes/defense-security/feasibility-of-kamikaze-drone-boats-in-modern-warfare/#:~:text=First%2C%20these%20boats%20can%20be,denial%20envelop%20in%20territorial%20waters.

49 . Gross, Judah Ari. "IDF Says It Thwarted Underwater Drone Attack by Hamas from Northern Gaza." Times of Israel, May 18, 2021. https://www.timesofisrael.com/idf-says-it-thwarted-underwater-drone-attack-by-hamas-from-northern-gaza/.

Sea. The US Navy warships, deployed in the Red Sea under the aegis of Operation Prosperity Guardian, have intercepted numerous suicide drone boats launched by Houthis.[50] Besides surface drones, Houthis have also introduced unmanned underwater vehicles equipped with explosive payloads, to target merchant ships and naval vessels in the Red Sea.[51] The growing complex scale of drone systems deployed by a non-state actor in the maritime domain suggests that as newer technologies become widespread, more capable systems with superior autonomy will also be used by such factions for hostile ambitions.

Perhaps the most concerning form of AI-driven weapon systems is drone swarms, where multiple drones adapt and learn to perform tasks with mutual collaboration.[52] The real peril lies in large swarms of weaponized drones capable of inflicting tens of thousands of casualties.[53] Machine learning algorithms enable a swarm of drones to navigate confined spaces by providing each other with information about their surroundings thus enabling them to learn not only their presence but also the movements of other drones within the swarm.[54] Aerobatic displays fea-

50 . "US Forces Destroy Two Houthi Suicide Drone Boats." The Maritime Executive, February 2, 2024. https://maritime-executive.com/article/u-s-forces-destroy-two-more-houthi-suicide-drone-boats.

51 . Millward, David. "Houthis Deploy Drone Submarine for First Time." The Telegraph, February 18, 2024. https://www.telegraph.co.uk/world-news/2024/02/18/red-sea-houthis-deploy-drone-submarine-shipping-middle-east/#:~:text=Houthi%20rebels%20have%20deployed%20a,CENTCOM)%20said%20in%20a%20statement.

52 . Hambling, David. "What Are Drone Swarms and Why Does Everyone Suddenly Want One?" Forbes, March 1, 2021. https://www.forbes.com/sites/davidhambling/2021/03/01/what-are-drone-swarms-and-why-does-everyone-suddenly-want-one/?sh=7ab4cef52f5c.

53 . Kallenborn, Zachary, and Philipp C. Bleek. "Drones of Mass Destruction." War on Rocks, February 14, 2019. https://warontherocks.com/2019/02/drones-of-mass-destruction-drone-swarms-and-the-future-of-nuclear-chemical-and-biological-weapons/.

54 . Fingas, J. "AI Helps Drone Swarms Navigate through Crowded, Unfamiliar

turing hundreds of centrally controlled UAVs are becoming commonplace, and advancements in technology might enable fully autonomous UAVs in compact sizes. Consequently, terror entities assembling vast numbers of small autonomous weapons could create WMDs. However, the technical complexities of creating a successful autonomous swarm currently limit their development to military actors.

In recent years, non-state actors have demonstrated a propensity for innovative adoption of new technologies including AI. The widespread use of loitering munitions by the Wagner group in the Russia-Ukraine war indicates that several states in the future would be prone to providing or leaking sensitive LAWS tech to non-state actors.

As technology commercializes and dual-use technologies become commonly available, the prospects of terrorization of AI in general and LAWS in particular increase substantially. There is a growing need to formulate legislation to cap the proliferation of such technologies so that easy access to hostile actors may be denied. Given the formidable technical challenges associated with developing a functional autonomous weapons system, however, immediate apprehension about terrorist utilization of AWS may be unwarranted.

Legislation Issues Regarding LAWS

International Humanitarian Law (IHL), also known as the Law of Armed Conflict (LOAC), is designed to oversee armed conflicts and offers mechanisms to safeguard fundamental human rights during violence.[55] The key feature

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Spaces." Engadget, July 18, 2020. https://www.engadget.com/caltech-drone-swarm-ai-174642584.html.

55. "What is International Humanitarian Law." ICRC, July 27, 2004. https://www.icrc.org/en/doc/assets/files/other/what_is_ihl.pdf.

of IHL is the principle of distinction, which requires parties involved in armed conflict to distinguish between combatants and noncombatants and ensures the latter's immunity from being targeted. LAWS, being "human-less" in nature, have questionable credibility in this regard.

Legislation about LAWS is inherently difficult. The challenges stem from the fundamental complications in defining, predicting, and controlling the effects of these weapons. The majority of international agreements that exist to prohibit or regulate certain weapons were established before the emergence of the technology associated with AWS and LAWS.[56] Consequently, the rapid advancement of technology is outpacing the boundaries set by IHL, creating a situation where IHL struggles to keep pace with the evolving landscape of the militarization of AI.

Two expert meetings have been hosted by the International Committee for the Red Cross (ICRC), while the United Nations, operating under the Convention on Certain Conventional Weapons (CCW), has arranged three informal expert meetings to evaluate the technological, military, ethical, and legal aspects of LAWS.[57] As a result of these meetings, the Convention on Certain Conventional Weapons (CCW) established a Group of Governmental Experts (GGE) in 2016. The inaugural meeting of this group, held in November 2017, saw participation from 86 countries, over 60 civil society organizations, the United Nations Institute for Disarmament Research (UNIDIR), and ICRC.[58] The primary objective was to explore legal arguments op-

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56 . Jha, U. C. Killer Robots: Legal Autonomous Weapons Systems, Legal, Ethical and Moral Challenges. Delhi: Vij Publishers, 2016, 59.

57 . Noor. "Laws on LAWS."

58 . "Campaign to Stop Killer Robots, Support Grows for New International Law on Killer Robots." Stop Killer Robots, November 17, 2017. https://www.stopkiller-robots.org/?p=6579.

posing the development, production, and employment of AWS. However, the summit faced a roadblock in the very initial phase due to disagreement on a precise definition of AWS. This obstacle, emanating primarily due to objections from major powers, undermined the prospects of making further progress on the issue.

Since 2018, António Guterres, the Secretary-General of the United Nations, has consistently declared his stance that LAWS are both politically unacceptable and morally repugnant and should be prohibited under international law. In his 2023 New Agenda for Peace, Guterres reiterated this position, urging states to establish a legally binding instrument by 2026 to prohibit lethal systems that operate without human control and cannot adhere to international humanitarian law. He emphasized the absence of specific multilateral regulations, highlighting that the design, development, and use of such systems raise serious humanitarian, legal, security, and ethical concerns. These concerns, he noted, constitute a direct threat to human rights and fundamental freedom.[59]

Several arms control advocates have persuaded the international community to impose a complete ban on the development and deployment of LAWS through a UN-sanctioned international treaty. Human rights organizations like Campaign to Stop Killer Robots call for banning all types of autonomous weapons. Human Rights Watch also advocates for a pre-emptive ban on the development, production, and use of fully autonomous weapon systems.[60]

59 . "Lethal Autonomous Weapon Systems (LAWS)." United Nations Office for Disarmament Affairs, 2023. https://disarmament.unoda.org/the-convention-on-certain-conventional-weapons/background-on-laws-in-the-ccw/.

60 . "Killer Robots." Human Rights Watch, 2010. https://www.hrw.org/topic/arms/killer-robots#:~:text=Human%20Rights%20Watch%20calls%20for,Campaign%20to%20Stop%20Killer%20Robots.

The ICRC has recommended banning unpredictable autonomous weapons because of their indiscriminate effects.[61] Since 2013, 30 nations have endorsed a complete ban on LAWS.[62] Even prominent tech figures, including Elon Musk and Bill Gates, have also suggested banning "killer robots."[63]

However, it has been observed that nations at the forefront of the development of AI-based weapons, including LAWS, resist calls for their prohibition.[64] According to them, a complete ban on LAWS is near-impossible primarily due to the following reasons: a) the difficulty in the categorization of LAWS; b) the military advantages associated with LAWS; and c) the prospect of using commercial-grade technology for developing LAWS. Great powers oppose banning initiatives being counter-productive and potentially outlawing positive applications of militarized AI.[65] These powers have also resisted the new arms control regime by arguing that existing international law is sufficient to cover autonomous weapons.[66] Furthermore,

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61 . "ICRC Position on Autonomous Weapon Systems." ICRC, May 11, 2021. https://www.icrc.org/en/document/icrc-position-autonomous-weapon-systems.

62 . Stauffer, Brian. "Stopping Killer Robots." Human Rights Watch, August 10, 2022. https://www.hrw.org/report/2020/08/10/stopping-killer-robots/country-positions-banning-fully-autonomous-weapons-and#_ftn12.

63 . Clifford, Catherine. "Hundreds of A.I. Experts Echo Elon Musk, Stephen Hawking in Call for a Ban on Killer Robots." CNBC, November 8, 2017. https://www.cnbc.com/2017/11/08/ai-experts-join-elon-musk-stephen-hawking-call-for-killer-robot-ban.html.

64 . Trager, Robert F. "Killer Robots Are Here – and We Need to Regulate Them." Foreign Policy, May 11, 2022. https://foreignpolicy.com/2022/05/11/killer-robots-lethal-autonomous-weapons-systems-ukraine-libya-reg.

65 . Brzozowski, Alexandra. "No Progress in UN Talks on Regulating Lethal Autonomous Weapons." Euractiv, November 22, 2019. https://www.euractiv.com/section/global-europe/news/no-progress-in-un-talks-on-regulating-lethal-autonomous-weapons.

66 . "US Statement at the GGE on LAWS During the Discussion on Agenda Item 5(D)." US Mission Geneva, August 5, 2021. https://geneva.usmission.gov/2021/08/05/u-s-statement-at-the-gge-on-laws-during-the-discussion-of-agenda-item-5d/.

a complete ban will potentially undermine the efforts for developing counter systems against LAWS.

The US asserts that existing international humanitarian laws are adequate, with its policy allowing for human intervention in the use of force decisions.[67] China's stance is ambiguous, supporting research and development in LAWS but opposing their deployment in combat. China also insists on defining LAWS more precisely.[68] Russia has also opposed moves to ban killer robots.[69] The United Kingdom initially endorsed the importance of human control over weapons but later opposed a pre-emptive ban, emphasizing the importance of technological advancements.[70]

Germany advocates for maintaining meaningful human control over the decision to kill other humans and has called for banning these weapons. However, Berlin has not supported proposals to launch treaty negotiations.[71] France neither possesses nor intends to acquire AWS but believes that it's legitimate and vital to continue research in the area of autonomy in weapon systems.[72]

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67 . "Defense Primer: US Policy on Lethal Autonomous Weapon Systems." US Congressional Research Service, 2023. https://crsreports.congress.gov/product/pdf/IF/IF11150.

68 . Kania, Elsa. "China's Strategic Ambiguity and Shifting Approach to Lethal Autonomous Weapons Systems." Lawfare, April 17, 2018. https://www.lawfaremedia.org/article/chinas-strategic-ambiguity-and-shifting-approach-lethal-autonomous-weapons-systems.

69 . "Russia Blocks Move on Ban of Killer Robots." Arms Control Association. July 17, 2023. https://www.armscontrol.org/act/2019-01/news-briefs/russia-blocks-move-killer-robots-ban.

70 . Saufer, Brian. "Stopping Killer Robots: Country Positions on Banning Fully Autonomous Weapons and Retaining Human Control." Human Rights Watch, August 10, 2020. https://www.hrw.org/report/2020/08/10/stopping-killer-robots/country-positions-banning-fully-autonomous-weapons-and#_ftn3.

71 . Brian. "Stopping Killer Robots: Country Positions on Banning Fully Autonomous Weapons."

72 . Brian, "Stopping Killer Robots."

Israel asks for an open-minded approach regarding the capabilities of LAWS and even believes that these weapons even ensure better compliance with IHL in the future.[73] The variability in argumentation suggests that technologically advanced nations pre-dominantly view these weapons as effective tools of warfare and means to achieve military superiority over their adversaries while undermining the risks associated with the misuse of these weapons.

A more targeted approach, as suggested by the European Union Commission, would be to ban the unacceptable use of AI. The unacceptable uses of AI are those that are "considered a clear threat to the safety, livelihoods, and rights of people." This approach, despite being more focused, is still vague and thus unlikely to succeed.[74]

A further complication arises from the competitive nature of global politics. The intensifying security dilemma between global powers, particularly the US and China has triggered an arms race to develop and weaponize emerging technologies. Additionally, the nonproliferation regimes are being bypassed and previously agreed-upon treaties are gradually collapsing. Establishing an environment conducive to constructive dialogue among states for discussions on the prohibition, control, or regulation of the development of LAWS proves to be a formidable task.

A middle-ground suggestion may seek to find a balance between acknowledging the potential risks posed by autonomous systems and recognizing their capacity to mitigate the limitations of traditional weapon systems. Absolute prohibitions are not only impractical but may also

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73. "Stopping Killer Robots."

74. "EU Artificial Intelligence Rules will Ban 'Unacceptable' Use." BBC News, April 21, 2021. https://www.bbc.com/news/technology-56830779.

inadvertently eliminate technological advancements that have the potential to reduce collateral damage in military operations. To nullify this risk, it would be prudent for governments to undertake tiered-based arms-control and anti-proliferation measures.[75] To prevent non-state actors from directly or indirectly accessing weaponized AI technology.

Use of LAWS for Terrorism: Legal Perspective

Regulatory and disarmament frameworks related to LAWS face a major challenge when the potential use of LAWS by terrorist organizations is taken into account. The ICRC has identified "a need for a genuinely human-centered approach to any use of these technologies in armed conflict. It will be essential to preserve human control and judgment in applications of AI… especially where they pose risks to life." The ICRC concludes that "AI and machine-learning systems remain tools that must be used to serve human actors, and augment human decision-makers, not replace them."[76]

The focus of these interstate deliberations is primarily on states' utilization of AI within the framework of international law, especially IHL. States are obligated to assess and comprehend the capabilities of the weapons they deploy, and they can be held accountable for violations of IHL. However, these frameworks will not be able to halt the potential use of AI as terrorist organizations neither abide by international legal regulations nor can they be coerced to do so.

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75 . Kallenborn, Zachary. "Applying Arms Control Frameworks to Autonomous Weapons." Brookings, October 5, 2021. https://www.brookings.edu/articles/applying-arms-control-frameworks-to-autonomous-weapons/.

76 . "Artificial Intelligence and Machine Learning in Armed Conflict: A Human-Centred Approach." International Committee of the Red Cross (ICRC), June 6, 2019. https://www.icrc.org/en/document/artificial-intelligence-and-machine-learning-armed-conflict-human-centred-approach.

In general, terrorism legislation is rooted in human intent and purposes, focusing on actions that seek to influence the government, intimidate a population, or advance religious, political, or ideological goals. While programming AI to carry out attacks for ideological purposes is prosecutable under the existing terrorism legal framework, the challenge arises when addressing precursor behaviors. Terrorism laws traditionally enable legal actions against individuals engaged in activities that precede an attack, such as the possession of information useful to terrorists. However, AI's involvement may eliminate the need for individuals to possess operational material, as instructions to AI components can be given to source information from the internet, making intervention based on possession difficult.

Furthermore, as machine decision-making plays a more significant role, establishing the necessary mental element for criminal liability becomes even more complex. The potential for AI-driven attacks, where machines act autonomously in kinetic scenarios, involving LAWS, poses unexplored challenges for terrorism legislation.

Counter-Terror Solutions for LAWS

The proliferation of autonomous systems on battlefields and the high probability of militarization of commercial autonomous technologies suggests that the threat of LAWS falling into the hands of terrorist groups is a highly probable scenario. Terrorist organizations are already deploying drones for suicide attacks. Their temptation to procure autonomous technologies for employing LAWS for terrorism cannot be ruled out at all. Countering such a level of threat will be a challenging undertaking. Therefore, prompt measures must be taken to address this threat by advancing defensive solutions and supporting practical international

collaboration to stigmatize military applications of artificial intelligence. In brief, there are two primary approaches: denial and defense. These approaches, if implemented with collaborative efforts at a global scale, can potentially deny and counter the use of LAWS by terror outfits.

Denial of LAWS' Technology to Terrorists

There is a need to develop consensus regarding the formulation and implementation of legislation against LAWS at the global scale. Terrorists and non-state outfits do not care about legalities and often pursue their objectives outside the realm of law. However, a mutually agreed legal framework will help in supporting all tangible and intangible measures necessary for countering the production and usage of LAWS by hostile actors.

The fundamental problem is the lack of mutual consensus, particularly among developed and developing nations. Every nation aims to develop and retain control over these technologies while preventing their access by others. Although all countries could gain from prohibiting the destructive uses of autonomy, the absence of universal agreement may create motivations for some nations, including non-state actors, to advance and deploy the technology independently. Denial of technology to hostile actors by exercising strong control over the regulation of AI-based technology is also often presented as a solution to secure the benefits of AI while undermining the risks in parallel.

To deny access to weaponized autonomy to terrorist outfits, three key measures can be taken. First, strict regulations that govern the entire lifecycle of LAWS can be established at national and international levels. These agreements should outline guidelines for the development, deployment, and employment of these weapons, with specific provisions designed to prevent the acquisition of au-

tonomous weapons by non-state actors. Moreover, a comprehensive framework is required to identify and regulate dual-use and commercial-grade technologies, which can potentially be militarized for hostile purposes.

Second, security measures must be integrated throughout the development and manufacturing phases to prevent unauthorized access and potential sabotage. This involves securing supply chains, facilities, and any other points vulnerable to infiltration. To protect LAWs from hacking attempts by malicious actors, continuous safeguard measures should be applied to address vulnerabilities in the programming systems.

Third, intelligence sharing, and mutual collaboration are vital to prevent terrorists or similar hostile actors from acquiring LAWs. This involves close cooperation between governments, intelligence agencies, and relevant international organizations to detect and counter attempts at illicit acquisition. Transparency and accountability at all levels should also be exercised through a mutually agreed legislative framework to ensure adherence to established regulations.

The timely conduct of these measures will be crucial as control over the spread of technology is relatively in the early stages. Once the technology standardizes at a societal level, imposing any pre-emptive control will no longer be feasible. Therefore, above mentioned measures should be applied in synergy at all tiers, from grass root level, to effectively deny the risks of falling LAWs into the wrong hands.[77]

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77 . Kwik, Jonathan. "Mitigating the Risks of Autonomous Weapon Misuse by Insurgent Groups." Laws 12, no. 1 (2023): 5. https://www.mdpi.com/2075-471X/12/1/5.

Defensive Solutions against LAWS

The challenge posed by drones and AI in counterterrorism is especially formidable due to the absence of effective counter-drone or anti-AI expertise. Targeting autonomously controlled drone swarms is particularly challenging due to their dispersion and numbers. It can be argued that the development of new defensive technologies to neutralize the threat of terror-centric LAWS is perhaps the most feasible solution, which can be formulated rather quickly – even with the current level of technology. Security forces could bolster defenses against AI-driven drones by undertaking technological advancements in defensive technologies. AI technology can play a vital role, contributing to the development of defensive applications and strategies. This entails enhancing existing counter-drone systems, providing improved personnel training for capacity building of security forces, and formulating tactics to address drone or autonomous weapon threats. However, implementing anti-AI defenses on a large scale poses a considerable and costly challenge.

Currently, many state-of-the-art, air defense systems like the US Terminal High Altitude Area Defense (THAAD), Israel's Iron Dome, and Russia's S-400 Triumph air defense systems employ AI for computing and intercepting aerial threats autonomously. Warships have been using Close Weapon Systems (CIWS) like the US Phalanx for point defense against a wide spectrum of air-borne threats for the past several years. The land-based version of this system called C-RAM, has been used successfully by the US Army for defending Forward Operating Bases (FOBs) against enemy rockets, mortars, and drones in Iraq and Afghanistan.[78] Further evolution of these systems, with superior sensor

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78 . Osborn, Kris. "Army C-RAM Base Defense Will Destroy Drones." Warrior Maven, November 28, 2018. https://warriormaven.com/land/army-c-ram-base-defense-will-destroy-drones.

suites and higher levels of autonomy, can detect and intercept rudimentary AI-powered weaponized drones, which can be potentially used by terrorists. Moreover, in the future, High-Energy Lasers, intercept drones, etc. can serve as potent defensive solutions against terrorist autonomous weapons. But eventually, being on the defensive end will always keep vulnerability against terror outfits.

Another approach is to utilize LAWS proactively for counter-terror operations (COIN). Combat drones, operated by humans, were also popularized during the War on Terror. LAWS can find similar applications. Autonomous systems can potentially respond more rapidly to imminent threats, making split-second decisions that may be challenging for human operators.

Lethal autonomous weapons, equipped with advanced sensors, could be used for Intelligence, Surveillance, and Reconnaissance (ISR) missions to detect, identify and track known terrorists or high-value targets. Besides ISR, these weapons will be able to conduct precise and targeted strikes against terrorist cells, infrastructure, or individuals – acting as sensors and weapons simultaneously. These weapons could operate independently or in coordination with other military or intelligence assets. In sum, these systems would offer a more objective perspective, potentially averting human errors in judgment and thus avoiding collateral losses during COIN operations.

Proponents argue that in specific conditions, LAWS can outperform humans and could minimize collateral damage. They posit that autonomous systems might demonstrate more humane conduct in military settings, acting cautiously and free from the psychological pressure that can result in emotionally driven decisions. As a result, in theory, at least, these systems have the potential to reduce

the number of noncombatant casualties and minimize collateral damage. In concept, autonomous weapon systems can adhere to an inherent ethical code, thus aligning with the framework of the existing Law of Armed Conflicts (LOAC).

Moreover, to achieve the capacity to differentiate between civilian and hostile individuals, LAWS can incorporate mechanisms such as technological sophistication, integrated restrictions, system updates, and human involvement to make such distinctions, thus ensuring compliance with international humanitarian law (IHL). However, despite the promises made by technology, the ability of AI to positively distinguish a civilian, and terrorist, will remain a subject of extensive debate.

Conclusion

The evolution of autonomy in weapon systems, ranging from semi-autonomous to fully autonomous, is transforming the conduct of warfare. The intersection of LAWS and the potential for their acquisition by terrorist factions presents a formidable challenge to international security. The current warfare landscape reflects a paradigm shift, where the deployment of LAWS is not only a concern for conventional military forces but also a potential tool for asymmetric warfare employed by hostile non-state actors. The proliferation of AI-based technology in the military domain, the militarization of commercial-grade technology, and the potential of leaking or inadvertently transferring this technology to terrorist factions have raised the likelihood of atrocities against humanity.

Addressing these risks demands a comprehensive and collaborative response at the multi-tier level. The legal and ethical concerns repeatedly expressed by human rights

organizations and developing states highlight the urgent need for international agreements and regulations. However, major powers have repeatedly undermined such initiatives, citing the potential operational advantages offered by LAWS in future battlefields. Nevertheless, the risk of placing these weapons in the hands of terrorist organizations necessitates proactive measures for denying the availability of weaponized autonomy to terror outfits, as well as countering the rudimentary LAWS that hostile actors can potentially employ in the future. In sum, balancing technological advancement and responsible governance is imperative to mitigate the risks.