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I Fought the Law and the Law Is Winning: The Rise and Impact Lethal Autonomous Weapons on International Relations

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Exercise Solo Flight

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INTRODUCTION

1. There is an ancient Chinese curse that roughly translated means "may you live in interesting times". Between the Russian invasion of Ukraine and the continued rise of China as a global superpower in the east, the world certainly finds itself living in a time of geo-political unrest. Far from 'the end of history' as boldly predicted in the early 1990s[1], the last few years have seen multiple challenges arise to the unipolar world order set up by the United States after the fall of the Soviet Union. Challenges due to climate change, as well as changing rules-based orders and new technologies have all impacted international relations and seek to upend the once clear dominance of the United States over global relations.

2. Against the backdrop of this increasingly dangerous and insecure world there has been the development of new military technologies that have the potential to be the largest revolution in military affairs since the development of the atomic bomb. Once the domain solely of science fiction authors, new advancements in computation, Artificial Intelligence (AI) and imaging has allowed for the development of a new generation of Lethal Autonomous Weapon Systems (LAWS). These so called 'Killer robots' are on the cutting edge of military development and are expected to continue to be developed, refined, and more importantly proliferated throughout nation states over the next few decades. Nowhere are the changes more pronounced than in the development and proliferation of new military drones based on emerging AI and imaging methods that will drive operations with less required human intervention.

3. The primary tactical and operational advantage to this new generation of armed, autonomous weapons is potential speed within the so-called 'OODA Loop'. Short for 'Observe,

[1] Francis Fukuyama, *The end of History and the Last Man* (New York: Free Press, 1992)

Orient, Decide and Act', it is a military concept developed by the United States Air Force and used as a shorthand way of expressing how quickly a military unit adapt and to rapidly changing conditions. The faster one can conduct the loop, the faster one can react to an enemy before they can react in return, allowing for a massive operational and tactical advantage.[2] The potential ability of autonomous drones to act on the order of nanoseconds, far faster than current human lead technology, has driven a huge increase in proliferation. Already more than 30 nations possess armed drones, with over 90 state and non-state actors field some level of autonomous unarmed drone system.[3] Billions are being spent on research and development globally[4] to develop new autonomous capabilities. These developments are not without controversy, as experts are already concerned about the moral, legal and ethical considerations of removing human decision making from key aspects of warfare.

4. Given the massive increase in spending, the development and fielding of LAWS is expected increase throughout the developed and developing world over the next few decades.[5] From a strategic standpoint the primary advantage of LAWS is that it limits exposure to wartime casualties of friendly forces while still being able to inflict casualties on one's enemy. This change in the calculous of warfare will have an outsized effect on the ability of nations to go to war and will act as a disruptive force on international relations. For this reason, the development and deployment of Lethal Autonomous Weapon Systems will have a destabilizing effect on international relations and increase the potential for future armed conflicts.

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[2] "The OODA Loop: How Fighter Pilots Make Fast and Accurate Decisions", *FS,* accessed May 2nd 2022, https://fs.blog/ooda-loop/

[3] Elisa Ewers et al., "Drone Proliferation", *Center for New American Strategy*, June 2017, https://drones.cnas.org/wp-content/uploads/2017/06/CNASReport-DroneProliferation-Final.pdf

[4] Jon Harper, "$98 Billion Expected for Military Drone Market", *National Defense Magazine*, Last modified Jan 6th, 2022, https://www.nationaldefensemagazine.org/articles/2020/1/6/98-billion-expected-for-military-drone-market

[5] Ewers, "Drone Proliferation", 9

WHAT MAKES A ROBOT KILLER?

5. Before we can discuss the state of LAWS proliferation globally and the effects it will have on international relations, we must define what LAWS are. As it is an emerging field of technology there is not currently a widely accepted definition. There are a number of academic, military and interest groups that have staked a definition of LAWS that we can work from in order to determine what makes a LAWS and how it differs from current military technology that may appear to be itself autonomous.

6. The highest profile and vocal group campaigning against LAWS is the 'Campaign to Stop Killer Robots'. This activist group was formed 2012 and is currently involved in lobbying activities within the United Nations with the aim to draft legislation to ban LAWS globally. They argue that LAWS are inherently immoral, dehumanizing and lack the ability to have any responsibility within the current international framework of the laws of armed conflict. Their definition of 'Killer Robots' however is vague and includes "weapon systems that automatically select and engage targets based on the processing of sensor information, whereby a human operator does not determine specifically where, when or against what force is applied".[6] This definition for LAWS is overly broad, and could be equally applied to past military technology, including torpedoes and landmines. Neither of these weapons are considered a LAWS but both are lethal, and capable of selecting and engaging targets without human oversight (in the case of a landmine a simple pressure switch is the sensor information used). From a lobbying

[6] Campaign to Stop Killer Robots, "Recommendations on the Normative and Operational Framework for Autonomous Weapon Systems", June 2021. https://www.stopkillerrobots.org/wp-content/uploads/2021/09/CSKR_Normative-and-Operational-Framework-Written-Commentary.pdf

perspective it makes sense to have the broadest possible definition, but clearly a narrower definition is needed to provide clarity on the subject.

7. Unsatisfied with the above definition as well, there is an emerging field of academic literature written around the legal and ethical questions caused by LAWS, with the goal being to accurately define what makes a weapon system autonomous. There are several leading definitions, including "the capacity to operate in the real-world environment without any form of external control"[7] to a "capacity to learn what it can to compensate for partial or incorrect prior knowledge".[8] These definitions however remain incomplete. Writing in *Autonomous Weapon Systems: Law, Ethics Policy*, Giovanni Sartor and Andrea Omicini seek a more academically robust definition of what constitutes LAWS. They frame the issue around three orthogonal axis of capabilities which they term "the three dimensions of autonomy"[9], namely: independence; cognitive skills; and cognitive architecture.

- Independence is defined as the ability of an autonomous agent to achieve a task without interference or control from an outside agent. This is also referred to as t-autonomy or task autonomy, and is also used in the DOD's definition which will be covered next
- Cognitive skills are the agent's ability to perform complex computational functions, including sensor analysis, target discrimination and implementation. The ability to distinguish between targets or perform sensor fusion (using the output of multiple sensors to increase its target sensing capability) are key abilities in the cognitive skill axis.

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[7] P. Lin, K. Abney and G.A Bekey, "Current trends in robotics: technology and ethics", *Robot Ethics: The Ethical and Social Implications of Robotics* (Cambridge, MA: MIT, 2012), 18
[8] S.J Russell and P. Norvig, *Artificial Intelligence: A Modern Approach* (Upper Saddle River, NJ: Prentice Hall, 2010), 39
[9] G. Sartor and A. Omicini, "The Autonomy of Technological Systems and responsibilities for their use", in *Autonomous Weapon Systems Law, Ethics, Policy* (Cambridge, UK: Cambridge Press, 2016), 58

- Cognitive architecture involves the agent's ability to see and understand its operating environment. This includes the ability to adapt to changing conditions to better respond to challenges and the ability to use its understanding of the environment to identify appropriate means to achieve its goals.

8. From the above definitions a picture of what constitutes an 'autonomous' weapon system begins to develop. Taking the previous example of a landmine or a torpedo, we see that while the landmine has a great deal of independence – its task being to blow up something above it which it can achieve without any other intervention, it has extremely limited cognitive skills (limited to a pressure switch) and no cognitive architecture (understanding of its environment). Similarly, a torpedo has independence and limited cognitive skills in terms of its ability to sense noise, but no cognitive architecture to adapt on the fly to its environment. On the flip side, a support drone such as Loyal Wingman (a drone designed to fly alongside and support manned fighters)[10] has excellent Cognitive skills and Cognitive architecture. It can quickly compute sensor data and understand the changes in its operating environment to adapt its actions to meet its goals but has limited independence to achieve those goals without direct operator involvement.

9. Modern militaries have released limited publicly available information on the topic of LAWS. While the United States, China and Russia are all believed to be expending massive amounts of capital on the research and development of autonomous weapons[11], largely for operational reasons, neither Russia nor China have any publicly release polices or directives on

[10] Stefano D'Urso, "Lets talk about Boeing Loyal Wingman Unmanned Aerial Vehicles First Flight" *The Aviationist*, Last updated March 3rd, 2021. https://theaviationist.com/2021/03/03/lets-talk-about-boeing-loyal-wingman-unmanned-aerial-vehicles-first-flight/

[11] Ryan Royswan, "The Burgeoning Arms Face in Lethal Autonomous Weapons", *The Transatlantic Puzzle*, Last updated June 28th, 2020. https://transatlanticpuzzle.com/2020/06/28/the-burgeoning-arms-race-in-lethal-autonomous-weapons

autonomy in weapon systems. The United States DOD however, released directive 3000.09 in 2012 on the topic of Autonomy in Weapon Systems. In it they define autonomous weapon system 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."[12]

10. Although a loser and more operational definition than the one put forward by Sartor & Omicini, the DOD definition aligns with the concept of task autonomy and provides a good framework in which to view the role and capabilities of LAWS. Once the definitions of autonomous weapons is clear, we can then turn to an examination of their role in the global arms arena, and impact on the calculus of armed conflict.

DUAL USE

> *Its great that I don't have to hail a cab or go to a grocery store, actually, I hope I never have to drive again – or navigate, or use cash, or cook or work or learn. But what if all this technology is trying to kill me? The same technology that is making your life easier, is being weaponized. That feature that unlocks your cell phone with your face? Here it is attached to a self firing machine gun. Its manufacturer, Kalashnikov, made this video to show the gun using object recognition software to identify targets. They say it gets more actuate the more you use it. That drone you use to get awesome snowboarding shots? Here's one that doesn't require a pilot. This ad shows it with a high explosive warhead – it*

[12] US Department of Defense (DOD) Directive 3000.09, *Autonomy in Weapon Systems*, 21 November 2012

hangs out in the sky till it finds an enemy radar system then crashes headfirst into it.[13]

11. The proliferation of LAWS throughout major and regional powers is greatly aided by the concept of *Dual Use*. Dual use describes the fact that the core AI development that is driving increasingly autonomous weapons is the same AI development used in civilian and commercial applications. Machine learning techniques are used in self driving cars developed by Tesla and other companies, and the development of advanced AI agents such as Apple's *Siri* directly contributes to the design of AI agents in LAWS. In essence, civilian technologies are driving rapid development in LAWS, to the point now where a number of leading researchers in AI are very concerned with state of AI as it pertains to LAWS. Prominent names in the tech world have joined their voices in support a ban on weaponized robots, including Elon Musk and the head of Googles DeepMind AI project, Mustafa Suleyman.[14]

12. The net effect of this dual use design is that cost of entry for LAWS development is reduced, as so much of your research and development can be piggybacked off civilian research. Once advanced AI techniques are "out in the wild", it becomes very difficult to restrict them to solely civilian use, and so, the same technique that allows a Tesla car to recognize and stop for a pedestrian at a crosswalk, allows for a drone to recognize and target an enemy combatant. Thus, the civilian drive for "smarter" and more autonomous consumer goods, is at the same time, driving the parallel development of autonomous weapons, quietly increasing the proliferation of LAWS.

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[13] New York Times, "AI is making it easier to Kill (You)", December 13th, 2019, Online Video, https://www.youtube.com/watch?v=GFD_Cgr2zho&t=1s

[14] Ariel Conn, "Leaders of Top Robotics and AI Companies Call for Ban on Killer Robots", *Future of Life Institute*, last modified August 2010th, 2017. https://futureoflife.org/2017/08/20/leaders-top-robotics-ai-companies-call-ban-killer-robots/

PROLIFERATION

13. To date there has been a very quiet, yet very pronounced arms race over the development of LAWS. The global leader in spending on military technology, the United States, has implemented what they term their *Third Offset Strategy*, which pursues increasingly autonomous military technology to offset the larger size of the armed forces of both China and Russia. This strategy is "focused on encouraging the U.S. military to rapidly innovate, failing fast alongside civilian partners in an effort to innovate, adopt and integrate increasingly autonomous military technologies".[15]

14. America's rivals have not been quiet during this push for more autonomous weapons. Although China has no publicly facing military policy or doctrine to support development in LAWS, public statements from senior Chinese leadership has demonstrated that they believe that "a new revolution in military affairs is beginning and they do not want to risk being left behind again."[16] Peoples Liberation Army (PLA) doctrine emphasises gaining superiority in domains of emerging military rivalry, and Chinese leadership is focused on AI improvement, including their 2016 success with AlphaGo, an AI that can beat the worlds best Go players, which Chinese officials consider a "Sputnik moment" in terms of challenging the current global hegemon the U.S. It is believed that China views LAWS as the primary method to overtake U.S. military superiority, an approach which has been characterized as 'leapfrog' strategic to beating the United States.

[15] Austin Wyatt, *The Disruptive Impact of Lethal Autonomous Weapon Systems Diffusion: Modern Melians and the Dawn of Robotic Warriors* (Sydney: Taylor & Francis Group: 2021), 96
[16] Wyatt, *The Disruptive Impact…,* 96

15. Russia has also spent a great deal of resources on developing autonomous weapons capabilities, with an estimated commitment of 346 billion USD from 2016-2025 in the development of LAWS capabilities[17]. Although recent experiences in the Ukraine War have demonstrated serious deficiencies in the conventional Russian armed forces[18], development in LAWS has increased and it seen, much like in the case of China, as a requirement to maintain pace with the United States. Russia has deployed its Uran-9 Unmanned Ground Combat Vehicle (UGCV) for the first time within Syria, although to apparently poor results[19]. The designed of the Uran-9 allows for the drone to detect, maneuver and target independently, although it still requires a human to engage – by Sharkey's categories it would be a level three drone, considered to have a dangerous level of automation.

16. Not to be outdone, smaller and regional powers are getting into the LAWS space, with countries such as South Korea creating full autonomous sentry drones in the DMZ[20] and Israel establishing itself as "a pioneer of autonomous weapons"[21]. Both countries are considered leaders in third party LAWS design and sales. At least 16 countries currently have armed drones[22], with more than a dozen other countries currently developing or seeking to acquire the capability, and "a handful of countries are pursuing stealth combat drones"[23], which are able to

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[17] Wyatt, 107
[18] "Ukraine war exposes Russia military shortcomings – analysts", *France24*, Last modified April 25th, 2022. https://www.france24.com/en/live-news/20220425-ukraine-war-exposes-russia-military-shortcomings-analysts
[19] Kyle Mizokam, "Russia's tank drone performed poorly in Syria", *Popular Mechanics*, June 18th, 2018, https://www.popularmechanics.com/military/weapons/a21602657/russias-tank-drone-performed-poorly-in-syria/
[20] Loz Blain, "South Korea's autonomous robot gun turrets: deadly from kilometers away", *New Atlas*, Last modified December 7th, 2010. https://newatlas.com/korea-dodamm-super-aegis-autonomos-robot-gun-turret/17198/
[21] Adam Bensaid, "Israel's autonomous 'robo-snipers' and suicide drones raise ethical dilemma' , *TRTWORLD*, Last modified February 26th, 2021. https://www.trtworld.com/magazine/israel-s-autonomous-robo-snipers-and-suicide-drones-raise-ethical-dilemma-44557
[22] Paul Scharre, *Army of None* (New York: W.W. Norton, 2018), 56
[23] Scharre, *Army of None,* 57

operate more covertly in contested territories. It would seem already that the genie is out of the bottle.

THE LOW, LOW COST OF ENTRY

> *Even with these advantages, there are significant downsides. For example, when warfare becomes just a matter of technology, will it make engaging in war more attractive? No commanding officer has to write a letter to the mothers and fathers, wives and husbands, of a drone lost in battle. Politically, it is more palatable to report equipment losses than human casualties. In addition, a country with superior killer robots has both a military and psychological advantage. To understand this, let us examine the second question posed to attendees of the 2016 World Economic Forum: If your country was suddenly at war, would you rather be invaded by the sons and daughters of your enemy, or an autonomous AI weapon system?[24] A significant majority, 66% responded with a preference for human soldiers[25]*

17. As discussed previously, the lower barrier to entry and with technology being pushed forward by dual use AI development, LAWS are proliferating throughout established powers such as Russia, China and the US, as well as smaller regional powers. Although LAWS have not yet reached the demonstration point, defined as when "a first mover reaches the requisite level of autonomy and operational integration to demonstrate the capability to deploy an unmanned

[24] Branka Marijan, "On Killer Robots and Human Control", *Ploughshares Monitor* 37 no. 2 (Summer 2016) as quoted in Louis Del Monte, *Genius Weapons* (New York: Prometheus Books, 2018)
[25] Louis Del Monte, *Genius Weapons* (New York: Prometheus Books, 2018), 13

platform that meets the working definition"[26], each power wants to be the first and is making enormous investments towards that goal[27], resulting in the above-mentioned quiet arms race as the great powers vie to be first and the regional powers look to not fall too far behind. President of Russia, Vladimir Putin put it best in a 2017 statement saying "the one who becomes the leader in this sphere will be the ruler of the world".[28] This arms race will have an impact on hegemonic powers as well, as due to the ease of adoption, "the early proliferation of AWS to a greater number of actors will reduce the value of the US security guarantee and increase the risk of unexpected conflict within or between their coalitions".[29]

18. According to the Campaign to Stop Killer Robots, the proliferation of LAWS changes the calculus of war for the worse[30]. It lowers the barrier of entry of any armed conflict and has the potential to increase, not decrease international conflicts. In our current international relations construct, any belligerent power must take into consideration potential losses before entering war with another state. Although some powers are far more willing to take large losses than others, see the Russian invasion of Ukraine as an example[31], the generally accepted bargaining model of international relations states that as the cost of war (in personnel and materiel) goes up, the probability of entering that war decreases in proportion[32]. Historically we have seen the results

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[26] Wyatt, *The Disruptive Impact…* 88
[27] David H. Freedman, "US Is Only Nation with Ethical Standards for AI Weapons. Should We Be Afraid?", *Newsweek*, Last modified September 15th, 2021. https://www.newsweek.com/2021/09/24/us-only-nation-ethical-standards-ai-weapons-should-we-afraid-1628986.html
[28] "'Whoever leads in AI will rule the world': Putin to Russian children on Knowledge Day", RT, Last modified September 1st, 2017. https://www.rt.com/news/401731-ai-rule-world-putin/
[29] Wyatt, *The Disruptive Impact…* 166
[30] "Military and killer robots", *Campaign to Stop Killer Robots*, Accessed March 25th, 2022 https://www.stopkillerrobots.org/military-and-killer-robots/
[31] Derek Saul, "Russians Ukraine war's mounting Death Toll", *Forbes*, Last modified April 26th, 2022. https://www.forbes.com/sites/dereksaul/2022/04/26/russia-ukraine-wars-mounting-death-toll-latest-estimates-suggest-russian-troops-have-been-hit-harder/?sh=5ccbd5d94549
[32] William Spaniel. "Does increasing the cost of conflict decrease the probability of war?" Blog, March 14th, 2016 https://williamspaniel.com/2016/03/14/does-increasing-the-costs-of-conflict-decrease-the-probability-of-war/

of costly and unpopular wars, such as the Vietnam War in the 1960-70s, that have resulted in a change foreign policy and lead to a much more measured response to aggression in the years afterwards[33], with America largely forgoing any armed conflict for the next few decades without first achieving massive force overmatch to avoid the costly mistakes of Vietnam.

19. If a great or regional power could enter into or escalate a conflict with a technology that not only minimizes its own exposure to casualties but is also extremely lethal to their opponent the cost / benefit analysis of that action skews heavily towards action. The ability of a state to "coerce or impose force upon their neighbours without risking the lives of their soldiers"[34] could lead to states resort to warfare "without due consideration"[35]. Looking at the previous historical example with Vietnam, would the United States have been as reluctant to enter other wars in the decades between the 1970s and 9/11 had the experience of Vietnam been one of losing drones and not people?

20. Proponents of drone warfare argue that a proliferation of LAWS will see a sterilization of the battlefield – that is a large decrease of human casualties due to the increased use of automated drones. However, this counter argument ignores most human history. Gatling invented his famous gun after seeing the horrendous cost of human lives in the American Civil War. His intent was to reduce the number of humans required to be on the battlefield by increasing and concentrating firepower. He wrote in a letter to a friend in 1877:

> *In 1861, during opening events of the war, residing at the time in Indianapolis, Ind., I witnessed almost daily the departure of troops to the front and the return*

[33] "The Vietnam war: A Moment of change in American foreign policy?", *The York Historian*, November 7th, 2018. https://theyorkhistorian.com/2018/11/07/the-vietnam-war-a-moment-of-change-in-american-foreign-policy/
[34] Wyatt, *The Disruptive Impact…* 163
[35] Wyatt, 164

> *of the wounded, sick and dead. The most of the latter lost their lives, not in battle, but by sickness and exposure incident to the service. It occurred to me if I could invent a machine – a gun – which could by its rapidity of fire, enable one man to do as much battle duty as a hundred, that it would, to a great extent, supersede the necessity of large armies, and consequently, exposure to battle and disease be greatly diminished*[36]

21. Regardless of the intent, the result was massive increase in bloodshed by machineguns in World War One and beyond. Saying that humans will keep to drone on drone warfare is on some level naive and ignores our human tendency towards resistance. The likelihood of a country surrendering simply because its drone force is depleted is low, and what will happen is that drones will get a new target as fighting continues – humans.

WHODUNNIT

22. Another problematic issue with the emergence of LAWS in conflict zones is in the realm of deniability. A LAWS force is inherently more deniable than a manned force.[37] This is largely due to the lack of front-line soldiers involved that could be traced to a particular country, as well as the fact that a single drone supplier may supply multiple countries with the same type of drones. With no human casualties or prisoners to worry about, a country could conceivably remove any markings and have a completely anonymous LAWS fleet. Thus, allowing the

[36] Jordan Gatling as quoted by Julia Keller, "Mr. Gatlings Game-Changing Gun", *HistoryNet*, Last modified February 28th, 2018. https://www.historynet.com/mr-gatlings-game-changing-gun/
[37] Wolfram Lacher, "Drones, Deniability, and Disinformation: warfare in Libya and the new International Disorder", *War on the Rocks*, March 3rd, 2020. https://warontherocks.com/2020/03/drones-deniability-and-disinformation-warfare-in-libya-and-the-new-international-disorder/

aggressor country the ability to strike at neighbouring countries without any risk of diplomatic or military reprisal.

23. More worrying than just anonymous strikes however are the increase potential for false flag operations. These are military operations where the actor disguises their forces like a third party, with the intent of deceiving the attacked party into thinking the aggression came from another source. The ability to easily disguise your forces as coming from another source could be a huge destabilizing factor in future conflicts. Co-incident with the rise of weaponized misinformation that can be leveraged to exploit fault lines[38] in international relations, which already has the potential to cloud the truth as to military actions, the ability to easily disguise your drone forces as another actor is a huge potential destabilizing force.

WHERE DO WE FIT IN?

24. Although the very definition of autonomous weapons might lead some to preclude any human involvement, there remains a great deal of discussion within military, academic and international relations spaces as to the expected role of humans in the deployment and use of LAWS. While the rise of autonomous agents is expected to come with some minimization of the human role in that aspect of warfare, there are still an expect role for human commanders in the conflicts to come, and there is still an open question as to where we will fit in.

25. DOD 3000.09 makes the Department of Defense policy clear with respect to the role of humans as it states that "Autonomous and semi-autonomous weapon systems shall be designed to allow commanders and operators to exercise appropriate levels of human judgement over the

[38] Sarah Jacobs Gamberini, "Social Media Weaponization: The Biohazard of Russian Disinformation Campaigns", *Center for the study of Weapons of Mass Destruction*, accessed April 20th 2022. https://wmdcenter.ndu.edu/Publications/Publication-View/Article/2422660/social-media-weaponization-the-biohazard-of-russian-disinformation-campaigns/

use of force".[39] While the use of appropriate in this context is left vague, it makes it clear that humans will have control over the use of force and maintain overall responsibility for the conduct of the automated weapon system.

26. Although DOD 3000.09 is a good starting point when looking at the role of humans, its detractors, both within academia and in international activism ague that is it deliberately vague about specifics of the human / robot integrations, and "to say that there is a human in the control loop does not clarify the degree of human involvement"[40]. Looking more broadly at the role of human commanders, we can widen our view to different categories of human interaction with LAWS. The role of future commanders and operators will generally fall into one of the following categories, as defined by the US Navy Office of Research: Human delegated (also known as Human-in-the-loop), Human supervised (Human-on-the-loop) and finally fully autonomous (human-out-of-the-loop).[41]

- Human Delegated: In this construct the human operator or commander is an integral part of the decision and act loop. While the automated system is normally able to perform basic tasks independently, in a human delegated system the decision to apply force remains solely with the human involved.
- Human Supervised: This arrangement sees the human commander overseeing the automated weapon system – in essence getting veto power over the LAWS as it conducts its mission. The human is not required to actively authorize force but is monitoring and can 'step-in' and stop or alter the target as required.

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[39] DOD Directive 3000.09,
[40] Neil Sharkey, "Staying in the Loop: human supervisory control of weapons", in *Autonomous Weapon Systems Law, Ethics, Policy* (Cambridge, UK: Cambridge Press, 2016), 26
[41] US Navy's Office of Naval Research, quoted by Williams, "Defining Autonomy in Systems," in Williams and Scharre, *Autonomous Systems*, 2015, 42

- Fully Autonomous: In this system once activated there is no human oversight of the LAWS. A fully autonomous or human-out-of-the-loop weapon systems is defined as being able to conduct its mission without any human intervention or monitoring.

27. Although the above categories are widely used in AI research and military writing, researcher Neil Sharkey, writing in *Human supervisory control of weapons,* expands the above categories even further into 5 categories of human control over weapons, progressively getting less and less human control:

- Level one – Human engages with and selects target and initiates any attack
- Leve two – program suggests alternative target and human chooses which to attack
- Level three – program selects target and human must approve before attack
- Level four – program selects target and human has restricted time to veto
- Level five – program selects target and initiates attack without human involvement[42]

HUMANS NOT ALWAYS THE SOLUTION

28. It may seem simple solution to ethical issues to always keep - at the very least, a human on the loop. However, within Sharkey's analysis, only levels one and two "provide the necessary conditions for the notions of meaningful control"[43] whereas levels three through five do not. The higher automation levels fail not due to the automated system but due to human cognitive weaknesses. Sharkey argues that due to the higher levels' reliance on speed and quick thinking (in order to operate inside your opponents OODA loop), the human operator or commander is

[42] Sharkey, "Staying in the Loop…", 37
[43] Sharkey, 37

then forced to rely on their "automatic reasoning", which introduces a great deal of potential human error into an already complex operating environment.

29. In brief, Sharkey's reasoning comes from the idea of 'dual process theory'[44], which states that there are two different types of thinking capable by human beings. In its simplest form, the two levels of control are a quick 'automatic' system that handles 90% of day-to-day control, and a far slower, 'deliberate' control, that is used when humans encounter a problem that cannot be quickly solved and requires reasoning. Sharkey argues that meaningful human control of autonomous weapon systems requires deliberate reasoning – and deliberate reasoning is slow "[requiring] attention and memory space"[45]. Automatic reasoning is fast – but also lazy, it "is biased to believe and confirm "and "focuses on existing evidence and ignores absent evidence" and for that reason "in the context of supervised control of lethal targeting, things could go badly wrong"[46]. The key takeaway is that just inserting a human within the loop, or worse, on the loop, is not a silver bullet solution to the issues caused by increasing automation and may make things worse. Given the speed at which commanders are expected to have to make decision in the future, we may make things worse.

MACHINE IMPERFCT

> *The complexity of autonomous robotic systems involves complex technological components, many human hands and human-machine interfaces, and this means*

[44] Daniel Kahneman, *Thinking Fast and Slow* (New York: Farrar, Straus and Giroux, 2011)
[45] Sharkey, "Staying in the Loop…", 39
[46] Sharkey, 39

responsibility is distributed broadly. Thus it can be a daunting challenge to trace back who or what is at fault when something goes wrong[47]

30. While activists such as the Campaign to Stop Killer robots believe that the ability for robots to target and kill autonomously is inherently unethical and against human dignity[48], There is a school of academic thought that believes that we can build LAWS to be more ethical and operate far better within the framework of international laws of armed conflict. This school of thought is best represented by Ronald Arkin's book *Governing Lethal Behavior in Autonomous Robots*, in which he agues that its possible to produce an artificial conscience in a new class of robots, by taking a behavioral design approach that builds ethical constraints up as a key design consideration from the beginning of programing[49]. Proponents of this school like Arkin would point out that well designed LAWS "are able to face contexts of risk and danger without being overwhelmed by those emotions and attitudes that so often lead humans to commit atrocities: fear, revenge, panic, and genocidal hatred"[50]. If the correct design approach is taken, they argue, then we could create the perfect robotic soldier, operating exactly within the existing international rule set, with none of the messiness that comes with human soldiers.

31. While there is some validity to the above claims, including the lack of an emotional response, this approach ignores both the challenges of creating a working ethics model as well as the gulf between cultural approaches to ethics and the existing laws around armed conflict. It is unlikely that any country would handicap its drone force by programing to an ethical standard

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[47] M. Noorman and D. Johnson, "Negotiating autonomy and responsibility in military robots", *Ethics and Information Technology,* 16(2015), 63

[48] Military and killer robots", *Campaign to Stop Killer Robots*, Accessed March 25th, 2022 https://www.stopkillerrobots.org/military-and-killer-robots/

[49] Ronald Arkin, "Governing Lethal Behavior in Autonomous Robots", in *Industrial Robot: An International Journal,* Volume 37, Issue 2, February 2009.

[50] G. Sartor and A. Omicini, "The Autonomy of Technological Systems…" 66

that would allow a rival power to exploit ethical programing to their advantage. In the case of ethical challenges, most robots would fall back to a simpler "is it legal" approach, which itself is problematic, as former army ranger Paul Scherre writes about in his book *Army of None* where his squad in Afghanistan had been exposed by a young girl working as a spotter for the Taliban, and afterwards they were discussing what they could have done better:

> *In our discussion, no one needed to recite the laws of war or refer to abstract ethical principals. No one needed to appeal to empathy. The horrifying notion of shooting a child in that situation didn't even come up. We all knew it would have been wrong without needing to say it. War does force awful and difficult choices on soldiers, but this wasn't one of them. Context is everything. What would a machine have done in our place? If it had been programmed to kill lawful enemy combatants, it would have attacked the little girl. Would a robot know when it is lawful to kill, but wrong?*[51]

32. This approach also ignores the fact that drones break, software can malfunction – hardware can fail. The consequences to an armed drone failing can be sever, as it could be difficult to distinguish between a hardware or software failure and a deliberate engagement. There is a particularly well known case from the 1980s, where a soviet era missile launch system detected, with its highest confidence rating, the launch of 5 U.S. missiles heading towards Russia.[52] Thankfully, the human commander in the loop was able to exercise deliberate reasoning and noted if the American's were to launch a pre-emptive missile strike, it would be

[51] Scherre, *Army of None*, 4
[52] Kiona Smith, "The Computer that almost started a nuclear war and the man who stopped it", *Forbes*, Last modified September 26th, 2018. https://www.forbes.com/sites/kionasmith/2018/09/25/the-computer-that-almost-started-a-nuclear-war-and-the-man-who-stopped-it/

with a lot more than five missiles[53]. In this case, it was a sensor failure of the soviet detection system – it had mistaken sun reflections off clouds as missile launches. Had that system been automated however, even with a human on the loop relying on automatic reasoning, the results could have been global destruction. In a more modern context, the results might not be global thermonuclear war, but still could lead to an increase in conflicts throughout the globe. If an individual or swarm of drone's malfunction and engage a target outside of their assigned mission parameters, the attacked country would have to treat that as a deliberate engagement and respond accordingly, and the result would be war.

CANADA: THE MODEL OF A MODERN MELIAN

33. Given all the issues outlined with LAWS, it may be seen as prudent, even advantageous, to simply sit out the coming arms race and continue to rely solely on level one and two, or human in the loop, weapon systems. For a country such as Canada, which prides itself on adherence to international law and values its perceived reputation as a 'peace keeping nation', adopting so-called kill robots may run counter to Canadian values and be perceived as not in Canada's interest. Indeed, the Campaign to Stop Killer Robots has looked to Canada to lead the way in banning LAWS, trading on Canada's reputation as an "honest broker, as a country that others can trust"[54]. To date Canada has made no official policy announcement on LAWS, but at the same time the CAF has not pursued any LAWS system that does not fall under the categories of level one or two on the Sharkey scale.

[53] Smith, "The computer that started the war.."
[54] Mike Blanchfield, "Canada under pressure to lead ban on 'killer robots'" *CTV* News, Last modified March 30th, 2018. https://www.ctvnews.ca/politics/canada-under-pressure-to-lead-ban-on-killer-robots-1.3864718

34. Unfortunately, its not that simple just to not engage in the LAWS space. Just as countries could not ignore the development of the machine gun in the 19th century, there is no space to sit this one out either. As Major General Mick Ryan (AUS) writes in his assessment of future Robot/Human warfare, "when robots with OODA loops of nanoseconds start killing humans with OODA loops of milliseconds, there will be no more debate"[55]. No country, especially not a country like Canada, which has always relied on its technology and training to make up for a comparatively tiny armed forces, can afford to be left behind. Canada, like all countries will have to decide – get on board with LAWS on terms that it can live with, or risk being massively outclassed by those who have.

CONCLUSION

35. As I have shown, the development and widespread adoption of Lethal Autonomous Weapon Systems has great potential to be the next revolution in military affairs and massively change the way humans fight in the future. However, as I have outlined, there remains significant ethical, moral, and technological challenges to fielding such weapons and they will have a destabilizing effect on international relations. Even with trying to keep humans involved in the decision process, the speed at which modern and future LAWS will operate will challenging our ability to think rationally and deliberately. Furthermore, relying on machine autonomy will lower the barrier to conflict, make false flag attacks easier and result in higher number of potential sources of error on the battlefield.

36. Nevertheless nation states will have to chart their own course in our robotized future and embrace the technology should they want to be relevant militarily in the future. It will be

[55] Mick Ryan, "Human Machine Teaming for Future Ground Forces" *Center for Strategic and Budgetary* Assessments, 2018 https://csbaonline.org/uploads/documents/Human_Machine_Teaming_FinalFormat.pdf

impossible to ignore, if the adversary already has the technology. As the United States deputy Secretary of Defense Bob Ward stated appropriately, “If our competitors go to Terminators, and it turns out that Terminators are able to make decisions faster, even if they are bad, how would we respond?”.[56] It is clear whether we want to or not, we are in for some interesting times ahead.

[56] Scherre, *Army of None*, 8

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