# REPORT DOCUMENTATION PAGE

*Form Approved*
*OMB No. 0704-0188*



| 1. REPORT DATE *(DD-MM-YYYY)* | 2. REPORT TYPE | 3. DATES COVERED *(From - To)* |
|---|---|---|
| Update | FINAL | |

**4. TITLE AND SUBTITLE**
**FUTURE REAR VIEW MIRROR: How We Learned to Love Lethal Autonomous Systems**

**5a. CONTRACT NUMBER**

**5b. GRANT NUMBER**

**5c. PROGRAM ELEMENT NUMBER**

**6. AUTHOR(S)**

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**5d. PROJECT NUMBER**

**5e. TASK NUMBER**

**5f. WORK UNIT NUMBER**

**7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)**

Naval War College
686 Cushing Road
Newport, RI 02841-1207

**8. PERFORMING ORGANIZATION REPORT NUMBER**

**9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)**

**10. SPONSOR/MONITOR'S ACRONYM(S)**

**11. SPONSOR/MONITOR'S REPORT NUMBER(S)**

**12. DISTRIBUTION / AVAILABILITY STATEMENT**
Distribution Statement A: Approved for public release; Distribution is unlimited.
Reference: DOD Directive 5230.24

**13. SUPPLEMENTARY NOTES** Update. .

**14. ABSTRACT:** **FUTURE REAR VIEW MIRROR: How We Learned to Love Lethal Autonomous Systems.**

**Since their introduction, robots and the technology that drives them have continued to evolve rapidly. That technology is now on the verge of becoming fully autonomous and lethal. Many are fearful and outright oppose the development of Lethal Autonomous Systems (LAS) or what some call "killer robots." However, when we look back twenty years from now and LAS have replaced man on the battlefield, many of those same people and organizations will look back and wonder why, despite their efforts, they could not stop the employment of such systems. Despite calls for a ban, lethal autonomous systems (LAS) will see widespread future use in the military for three main reasons – the militarization of law enforcement and border protection has provided a ripe testing ground, commercially designed, dual use systems are easily converted to lethal systems, and the long-standing feeling that we can somehow control the context of a weapon's introduction and eventual employment. They are not here yet, and though they may be a technological inevitability, there is still time to develop a framework to govern LAS employment in the military and all other sectors. With a US-led consensus, the international community can solidify norms and standards for the most ethical, moral, and legal employment of LAS in wartime and in peace.**

**15. SUBJECT TERMS**
**killer robots, lethal autonomous systems, ethics, future technology**

| 16. SECURITY CLASSIFICATION OF: | 17. LIMITATION OF ABSTRACT | 18. NUMBER OF PAGES | 19a. NAME OF RESPONSIBLE PERSON |
|---|---|---|---|
| | | | Ass. Dean-Electives & Research |

| a. REPORT | b. ABSTRACT | c. THIS PAGE | | | 19b. TELEPHONE NUMBER *(include area code)* |
|---|---|---|---|---|---|
| UNCLASSIFIED | UNCLASSIFIED | UNCLASSIFIED | | **38** | 401-841-3556 |

**Standard Form 298 (Rev. 8-98)**

**NAVAL WAR COLLEGE**
**Newport, R.I.**

# FUTURE REAR VIEW MIRROR: *How we Learned to Love Lethal Autonomous Systems*

**by**

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**A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Ethics and Emerging Military Technology Certificate Program.**

**The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.**

**24 MAY 2017**

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**Paper Abstract**

Since their introduction, robots and the technology that drives them have continued to evolve rapidly. That technology is now on the verge of becoming fully autonomous and lethal. Many are fearful and outright oppose the development of Lethal Autonomous Systems (LAS) or what some call "killer robots." However, when we look back twenty years from now, and LAS have replaced man on the battlefield, many of those same people and organizations will look back and wonder why, despite their efforts, they could not stop the employment of such systems. Despite calls for a ban, lethal autonomous systems (LAS) will see widespread future use in the military for three main reasons – the militarization of law enforcement and border protection has provided a ripe testing ground, commercially designed, dual use systems are easily converted to lethal systems, and the long-standing illusion that we can somehow control the context of a weapon's introduction and eventual employment. They are not here yet, and though they may be a technological inevitability, there is still time to develop a framework to govern LAS employment in the military and all other sectors. With a US-led consensus, the international community can solidify norms and standards for the most ethical, moral, and legal employment of LAS in wartime and peace.

## Introduction and Thesis

Since their introduction, robots and the technology that drives them have continued to evolve rapidly. That technology is now on the verge of becoming fully autonomous and lethal. There is much debate over the ethics of the use of lethal autonomous robots in the military. There has been strong opposition and serious ethical concerns voiced at the highest international levels over the use of such technology.[1] However, when we look back twenty years from now, and these "killer robots" have replaced man on the battlefield, many of those same people and organizations will look back and wonder why, despite their efforts, they could not stop the employment of such systems. While the debate continues about the use of killer robots in the military, the applicability and continued use of the same kinds of technology in other sectors is paving the way for their inevitable lethal use in the military. Despite calls for a ban, lethal autonomous systems (LAS) will see widespread future use in the military for three main reasons – the militarization of law enforcement and border protection has provided a ripe testing ground, commercially designed, dual use systems are easily converted to lethal systems, and the long-standing illusion that we can somehow control the context of a weapon's introduction and eventual employment.

Unless we act now to develop an ethical framework for how we plan to use these technologies in all sectors, it will be too late to govern their eventual lethal use in the military successfully. Before we tackle these main arguments, it is important to understand the technological progression of robotics and the ethical concerns with their continued evolution toward lethal autonomy.

[1] Among these opponents are groups such as Human Rights Watch's "Campaign to Stop Killer Robots," Elon Musk led and $1B funded non-profit "OpenAI," and the Future of Life Institute which has signatures of over 14,000 researchers demanding the ban of LAS

**From a Remote Controlled Boat to the Terminator**

"At the time I really thought it would abolish war, because of its unlimited destructiveness and exclusion of the personal element of combat" – Nikola Tesla

In 2002, the Central Intelligence Agency used a remotely piloted aircraft, or drone, to engage and kill six suspected terrorists in Yemen from a control station thousands of miles away. This is widely held as the first such event of its kind.[2] This tactical strike was executed less than one year after testing the capability with retrofitted Hellfire missiles on an RQ-1 Predator, a platform originally built solely for reconnaissance.[3] In the civilian world, this type of tactical application of remotely piloted vehicles was unheard of. However, in 2016 police in Dallas utilized a ground-based robotic platform to remotely deliver an explosive charge and bring an end to a standoff with a suspect who killed five Dallas policemen.[4] Both these incidents showed that after many years of developing the technology, particularly in the military, it was finally proving to be tactically beneficial. However, it has been a long road to acceptance and for the technology to get to this point.

In 1898, Nikola Tesla demonstrated a radio-controlled boat capable of carrying a warhead to the American government. At the time, the military did not see the value in his invention, and without funding, the idea faded and was almost forgotten.[5] During the two World Wars, more efforts were put forward that produced such technologies as a remotely piloted aircraft used as a rudimentary cruise missile, a drone controlled from an aircraft twenty miles

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[2] Christian Enemark, *Armed Drones and the Ethics of War* (New York: Routledge, 2014), 19.
[3] Ibid., 16.
[4] Kevin Sullivan, Tom Jackman and Brian Fung, "Dallas police used a robot to kill. What does that mean for the future of police robots?," *Washington Post*, July 21, 2016, 17 November 17, 2016, https://www.washingtonpost.com/national/dallas-police-used-a-robot-to-kill-what-does-that-mean-for-the-future-of-police-robots/2016/07/20/32ee114e-4a84-11e6-bdb9-701687974517_story.html
[5] Armin Krishnan, *Killer Robots: Legality and Ethicality of Autonomous Weapons* (Surrey: Ashgate, 2009), 15.

away and "flying bombs" from B-17s and B-24s. The German and Japanese efforts produced such platforms as the V-1 jet propelled aircraft which carried a 2000 pound warhead 150 miles with some rudimentary guidance, the Goliath remote-controlled tank, and Japanese tanks which could be remote controlled and automatically reloaded.[6] Unfortunately, all suffered the same fate as Tesla's remote controlled boat and never became militarily practical during their time due to the high costs, low accuracy, and technology gaps that could not be closed.

The next major leap towards autonomous technology came during Vietnam through two major initiatives. On the border of South Vietnam, a network of air delivered seismic and acoustic sensors were laid to prevent infiltration of personnel and supplies from the north. This anti-infiltration strategy, called the McNamara line, relied almost exclusively on sensor activated anti-personnel mines and virtually no ground forces.[7] Second, the emergence of smart weapons and "fire and forget" systems were introduced. The effectiveness of these weapons was still relatively low, and while they were nowhere near a fully autonomous system, they laid the foundation of two key components critical to the future development of autonomous systems. The decision to fire was no longer reliant on visual recognition of a target from a human and the weapons themselves were automated to follow cues from sensors to find and attack their targets.[8]

With the promise and potential shown, these technologies continued to improve steadily. Automated self-defense systems such as Aegis, Phalanx, and Patriot were born from such technologies in the 70's and 80's. After a dip in funding post-Cold War, the wars in Iraq and Afghanistan have brought the use of drones and unmanned systems to the forefront of combat once again. Since 2001, unmanned systems have poured into both theaters for a myriad of

[6] Ibid., 16-19.
[7] Ibid., 20.
[8] Ibid., 21

mission sets. Explosive ordnance disposal, intelligence, surveillance and reconnaissance, surface and subsurface maritime patrolling, and special operations are just a few of the missions in which these platforms have been utilized. The total number of systems in unmanned aircraft platforms alone jumped from less than 100 in the year 2000 to almost 11,000 in 2013.[9] In the 168-page FY2013-2038 Unmanned Systems Integrated Roadmap, the word autonomous is mentioned 155 times.[10] Currently, Department of Defense (DoD) Directive 3000.09 mandates that appropriate levels of judgment over the use of force should be designed into autonomous and semi-autonomous systems.[11] However, Pentagon officials have left the door open to the possibility of taking humans "out of the loop" should our competitors decide to do so first.[12] With Moore's Law in effect, developments in fields such as nanotechnology, artificial intelligence, robotics, sensors, and information technology are combining to make a fully autonomous lethal system more and more of a possibility. As this day draws closer, calls to examine the ethics of use are growing louder as well.

**The Ethics of Autonomous Killing**

As the technology involved continues to develop in both the military and civilian markets rapidly, the technical feasibility of lethal autonomous systems (LAS) is becoming less of a question of "if" and more of a question of "when." The real debate among ethicists, military professionals, scholars, and industry is now more about "should" we allow LAS on the

[9] United States Department of Defense, *Unmanned Systems Integrated Roadmap: FY 2013-2038, 14-S-0553 (Washington DC, 2013), 5,* http://archive.defense.gov/pubs/DOD-USRM-2013.pdf
[10] Ibid.
[11] United States Department of Defense, *DoDD 3000.09, Autonomy in Weapons Systems*, Washington, DC: UnderSecretary of Defense, November 21, 2012, 2, http://www.dtic.mil/whs/directives/corres/pdf/300009p.pdf
[12] Frank Sauer "Stopping 'Killer Robots': Why Now is the Time to Ban Autonomous Weapons Systems." *Arms Control Today* 46, no. 8 (October, 2016), 13, accessed November 18, 2016, http://search.proquest.com/docview/1829055999?accountid=322

battlefield when they become technically feasible in the near future. Those in favor for their use feel that LAS could protect our soldiers in harm's way and as the technology advances past human capabilities, could be more humane for noncombatants. Those opposed to the employment of LAS, generally do so for two ethical reasons. First, that removing the risk to soldiers altogether changes the nature of warfare. Second, and most importantly, allowing a machine to make the decision to kill a human is a violation of our most basic human dignity.

*The Ethical Case for Killer Robots*

Some feel that in a purely utilitarian sense if LAS could prove to be both more cost effective and more capable than humans in the performance of certain mission sets they should be employed. Only the results should matter.[13] A growing intolerance for casualties on the battlefield combined with the rapid growth of technology is driving major trends in warfare to make systems "faster, reach further, and operate longer" particularly in areas that are difficult for their human counterparts to operate.[14] The Pentagon defines these as environments which are dull, dirty or dangerous.[15] In many of these cases, such as a nuclear, chemical or biological environment, an unmanned system is the preferred alternative.[16] Additionally, in these cases, the enemy has a vote and the moral decision not to employ the technology by one, does not prohibit adversaries from doing so. In such cases, human soldiers might be put in a decidedly disadvantageous position and unable to react to the speed of an enemy LAS.

[13] Kirshnan, *Killer Robots*, 121.
[14] M. Shane Riza, *Killing Without Heart: Limits on Robotic Warfare in an Age of Persistent Conflict* (Washington, D.C., Potomac Books, 2013), 39.
[15] DoD, *Unmanned Systems Integrated Roadmap*, 20.
[16] Ibid.

Others feel that in addition to protecting military personnel, LAS could make war more humane for noncombatants as well. While there are still technological hurdles to overcome, LAS could eventually be programmed free of human emotions such as anger, spite, fear, or panic and could lead to situations where less lethal force was taken which would reduce unnecessary deaths in war.[17] As sensors continue to become more precise, autonomous systems will be able to assume risks on behalf of noncombatants that humans constrained by the fog of war simply cannot safely take. As Georgia Tech's Ron Arkin puts it "one day killer robots could be so precise that it might become inhumane not to use them."[18]

Finally, like many other weapons of war, LAS are merely a tool of warfare implemented by a state. The mere fact that a state possesses LAS doesn't change that state's traditional Jus ad Bellum moral calculus for going to war, in fact an army of robots could possibly serve in a deterrence capacity to prevent war from happening in the first place.[19] If war, as Clausewitz tells us, is a continuation of politics through other means, LAS would only be utilized in the context of achieving political goals once the moral decision to go to war had been made.[20] Their use would depend on the ultimate aims of a nation at war. If LAS could be shown to be better and more efficient at achieving those goals, there may not be any moral objections strong enough to make their deployment "morally impermissible."[21]

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[17] UN warns stop killer robots now. *Flare*. July 15, 2013, 53. http://www.lexisnexis.com/lnacui2api/api/version1/getDocCui?oc=00240&hnsd=f&hgn=t&lni=58T8-2MH1-JB1X-W09T&hns=t&perma=true&hv=t&hl=t&csi=384359&secondRedirectIndicator=true

[18] Eyder Peralta, "Weighing the Good and the Bad of Autonomous Killer Robots in Battle". *NPR*, accessed November 18, 2016, http://search.proquest.com/docview/1786716919?accountid=322

[19] Christopher J. Spinelli, *The Rise of Robots: The Military's Use of Autonomous Lethal Force* (Research Report, Air War College, 2015). 5

[20] Carl von Clausewitz. *On War*. Eds. and trans. Michael Howard and Peter Paret, Princeton: Princeton University Press, 1976

[21] Duncan Purves, Ryan Jenkins, and Bradley J. Strawser. "Autonomous Machines, Moral Judgment, and Acting for the Right Reasons." *Ethical Theory and Moral Practice* 18, no. 4 (August, 2015): 851-72, http://search.proquest.com/docview/1700524757?accountid=322

*The Ethical Case against Killer Robots*

The first major objection to LAS centers on the reduction in risk to the military professional due to the increasing distance between the human warfighter and the battlefield. LAS detractors believe that risk is an essential part of war and without it, participants are conducting something that is very un-warlike.[22] For hundreds of years, however, military commanders have attempted to reduce the unnecessary risks to their personnel while attempting to make the battlefield more lethal for their opponents. In the future, LAS may make it possible to eliminate risk to soldiers (altogether). In the past, the willingness to die for a cause has been seen as part of the moral calculus for going to war. Part of the nobility and honor of a warfighter's cause has been the thought that they were willing to sacrifice themselves for a better life for their people in the future. In turn, the civilian population has accepted that the killing their warfighters must undertake in combat is morally just.[23] What then becomes the moral value of war when one side is pursuing their goals with impunity from risk for all their soldiers in the field? Even today, the pilot flying an unmanned aircraft from thousands of miles away might be more aptly compared to a professional assassin or executioner than a military professional.[24] This absence of risk from the warfighter does not mean that risk disappears from the battlefield.

In the case of LAS, the risk eliminated from human soldiers is sometimes transferred to the noncombatants on the battlefield. Should LAS become the future of modern warfare, it will be the first time in human history where those responsible for fighting the war would be at less risk than noncombatants on both sides. In this case, the rules of war we use today may begin to crumble.[25] Even with a more precise and efficient LAS, mistakes will be made. The notion that

[22] Enemark, *Armed Drones*, 76
[23] Ibid., 81
[24] Ibid., 94.
[25] Riza, *Killing Without Heart*, 45.

all civilian casualties would be eliminated is unrealistic, but at what cost are they weighed against? There would be no more comparisons of combatant versus noncombatant deaths when weighing a cost of war to a society. Others fear that lowering the risk to a country's own blood and treasure would significantly reduce the barriers to going to war.

Once the deeds and actions necessary in warfare that generate risk to the human soldier have been separated from human moral decision making, the inhibitions to go to war will become lower as well.[26] As the technology proliferates and becomes more available and cheaper, the monetary cost of entry into war will follow suit. For those states that may not be able to afford to organize, train and equip large militaries, an army of cheap LAS may seem appealing. Those nations looking for an asymmetric advantage may not share the same moral compass as those who choose to withhold such systems from the battlefield for moral reasons. This approach will surely be appealing for non-state actors. This leaves wars to be fought by belligerents who in principle do not kill for what many modern societies would deem as acceptable reasons.[27] Once the decision to kill has been transferred entirely to a LAS, it stirs an even more fundamental objection.

The second, and most vocal argument against LAS is that transferring the decision to kill a human to a machine undermines basic human dignity and the mere existence of this capability is an unprecedented threat to humanity.[28] Many argue that a human should always be "in the loop" when the decision to take another human life is being made. This is often referred to as meaningful human control and goes much deeper than the Pentagon standard of "appropriate level of human judgment."[29] Some legal scholars have made the argument that when the human

[26] Kirshnan, *Killer Robots*, 128
[27] Purves, Ryan Jenkins, and Bradley J. Strawser, "Autonomous Machines," 865
[28] Kirshnan, *Killer Robots*, 4
[29] Sauer, "Stopping 'Killer Robots"

is removed from the loop, it is a violation of human rights law and impacts on the concept of human dignity.[30] Additionally, the potential lack of responsibility from a LAS is a violation of humanitarian rights law as well.[31] Should a LAS commit a violation of the Law of Armed Conflict or specific rules of engagement, who would be responsible? Is it the military commander, the software developer, the manufacturer, or some other entity?

No matter how sophisticated and advanced artificial intelligence ultimately becomes, there are worries that it will never reach a human's ability for judgment and ability to read the finer context of a situation.[32] Regardless of how effective a machine might become in making life and death decisions, the technology will never relieve humans from the ethical impact of those decisions in both peace and war.[33] If we transfer the decision to kill to a LAS, the system may not truly understand the value of human rights and we may cross a moral threshold from which we cannot retreat.[34] Without this understanding and reflection, war is in danger of becoming nothing but mechanical slaughter.[35]

While both sides of the debate about the ethics of LAS use in warfare have valid points, a solution is nowhere in sight. Most of the debate has focused solely on the military application of the technology, but has done little to address the rapidly maturing technology itself and the applications outside the military. As the discussion continues at the highest levels of government and international organizations, one thing is clear – those developing the technology are not waiting for answers and are finding other markets to tap into until the military markets are ready

[30] Denise Garcia. "Killer robots: Why the US should lead the ban". *Global Policy* 6, no.1 (January, 2015): 61
[31] Ibid.
[32] Alex Brown. "One congressman's crusade to save the world from killer robots. *The Atlantic*, July 17, 2014, accessed November 17, 2016, https://www.theatlantic.com/politics/archive/2014/07/one-congressmans-crusade-to-save-the-world-from-killer-robots/442179/
[33] "UN warns stop killer robots now"
[34] Peralta, "Weighing the Good and the Bad"
[35] "UN warns stop killer robots now"

to cross the line. When the question is finally settled about the appropriateness of use for the military we may look back and see that the technological genie is already out of the bottle and the decision was made too late to put it back in. The international community did not have an opportunity to stop the development of the atomic bomb prior to its use as they do here with LAS. They were only able to limit the weapon's use after its destructive potential had already been demonstrated twice – at a great cost to civilian lives. Despite the fears, there are many markets outside of the military providing ample motives to continue developing LAS technology which will provide them a path to being. Two of the markets that will serve as a testing ground and pave the way for LAS in the military are domestic law enforcement and border protection.

## The Militarization of Domestic Law Enforcement

The ongoing militarization of fields such as law enforcement and border protection have created a demand signal for very similar capabilities that are offered in non-lethal LAS role. In these non-lethal or "less than lethal" roles, the autonomous systems utilize the same technologies of the more lethal variants to locate, target, and fire some type of weapon system. However, in "less than lethal" systems, something such as a Taser, rubber pellets or tear gas are loaded in the place of bullets. Even these systems, if used improperly, could produce lethal results.

Multinational criminal activity, drug and human trafficking, and terrorism are just a few mission sets that have transcended international boarders and created broad threats to national security. This phenomenon has tended to blur the lines between the Department of Defense and all levels of traditional law enforcement agencies. It has also transferred some of the risks associated with the missions from the military to law enforcement. Law enforcement personnel, like those in the military, have signed a moral contract to sacrifice their life, if necessary, to

protect and serve. Much like soldiers who feel out of place risking their lives overseas on humanitarian missions, more violent cross-border crime and terrorism is changing the moral contract for law enforcement officers and making some feel that "this isn't what I signed up for."[36] Due to these threats, domestic policing is becoming a more lethal profession. In 2016, ambush style killings were up 167% for police officers in the United States, and the total of 64 officers shot and killed was a five-year high.[37] In the case of terrorism, officers are facing enemies bound by no rules and who commonly target first responders to increase the fear and confusion post-attack. Under the banner of these challenges, Congress has authorized the Department of Defense to enhance domestic law enforcement through direct or material support.[38] The introduction of this initiative, known as the 1033 Program, has opened the door for the militarization of law enforcement and a similar reliance on military style technologies and equipment for mission accomplishment.

In 1989, the National Defense Authorization Act requested the DoD take the single lead between federal and local agencies in the integration of the command and control and surveillance networks for illegal drug production and trafficking. This was followed with authorities to directly transfer excess equipment to federal and state agencies that were suitable for use in those type activities.[39] In 1997, this authority was extended to counter-terrorism activities and redubbed the 1033 Program.[40] In Section 1052 of the 2016 NDAA, the 1033

[36] Kirshnan, *Killer Robots*, 122.
[37] Susan Miller, "Officer down: Police deaths hit a 5-year high." *USA Today*, 29 December, 2016, accessed March 12, 2017, https://www.usatoday.com/story/news/nation/2016/12/29/officer-down-police-deaths-hit-5-year-high/95984998/.
[38] Daniel H. Else "The "1033 Program," Department of Defense Support to Law Enforcement," (Congressional Research Service # R43791), Washington, DC: Congressional Research Service, 2014, https://fas.org/sgp/crs/natsec/R43701.pdf
[39] Ibid.
[40] Ibid., 2

Program was expanded directly to the Department of Homeland Security.[41] Since its inception, over 11,000 agencies have registered in the program and 8,000 of them have received equipment at no cost as the equipment is characterized as "on loan."[42] The transfer program includes items as benign as office furniture up to lethal systems such as weapons, armored vehicles, robotics, and manned and unmanned aircraft. The value of the equipment transfers since 1990 exceeds $5 billion dollars, $1.4 billion of which was tactical equipment.[43] Of particular note, this number includes the transfer of 987 reconnaissance and bomb disposal robots since 2003.[44] Over 3,900 items have gone to DHS which includes numerous robots and drones.

With the missions and equipment sets continuing to blur, so are the risks to personnel. Senior officers and federal agents alike see this technology as a way to reduce risk to their personnel in the field. In July 2016, a gunman killed five Dallas police officers and proceeded to barricade himself in a building, continuing to fire at officers from inside. Seeing no other option, Dallas police utilized their bomb disposal robot to deliver an explosive charge and detonated it to remotely eliminate the threat. Police Chief David Brown stated, "other options would have exposed our officers to grave danger."[45] He also added, "I would use any tool necessary to save our officers' lives."[46] Similar feeling were expressed by a senior border patrol agent in response

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[41] Nafeez Ahmed, "Pentagon Allowed to Supply Military Gear to Homeland Security Department for "War on Immigrants"" *Truthout*. 14 May 2016, accessed November 17, 2016, http://www.truth-out.org/news/item/35998-pentagon-allowed-to-supply-military-gear-to-homeland-security-department-for-war-on-immigrants.

[42] Else, "The 1033 Program," 1

[43] Shawn Musgrave, Tom Meagher and Gabriel Dance, "The Pentagon Finally Details its Weapons-for-Cops Giveaway." *The Marshall Project*, 3 December , 2014, accessed November 17, 2016, https://www.themarshallproject.org/2014/12/03/the-pentagon-finally-details-its-weapons-for-cops-giveaway#.A2XwBHEwA.

[44] Kevin Sullivan, Tom Jackman and Brian Fung, "Dallas Police Used a Robot to kill. What Does that Mean for the Future of Police Robots?" *The Washington Post*. 21 July, 2016, accessed November 17, 2016, https://www.washingtonpost.com/national/dallas-police-used-a-robot-to-kill-what-does-that-mean-for-the-future-of-police-robots/2016/07/20/32ee114e-4a84-11e6-bdb9-701687974517_story.html.

[45] W.J. Hennigan and Brian Bennett, "Dallas Police Used a Robot to Kill a Gunman, a New Tactic that Raises Ethical Questions." *Los Angeles Times*, 8 July, 2016, accessed November 17, 2016, http://www.latimes.com/nation/la-na-dallas-robot-20160708-snap-story.html.

[46] Sullivan, "Dallas Police Use Robot to Kill"

to the border patrol using robots to run drug tunnels found beneath the border, "if anyone is going to get hurt, it better be that robot."[47] Even departments of wildlife, parks and conservation share the same concerns. Many of those agencies respond far away from any kind of backup, in rural and remote areas, where many of the suspects they encounter are already armed with high-powered hunting rifles.[48] This is one of many scenarios where former military specific technologies are beginning to replace humans to reduce the risks to personnel. The future use of such technology also seeks to reduce risk to citizens as well.

While police and border agents have a very different charge to protect human life than does the military, the transfer of military equipment and advancing technology is providing new opportunities to conduct their jobs in a manner safer to both officers and citizens.[49] Even those who are most opposed to LAS see similar competitive advantages in law enforcement as those that exist for military personnel. The greater speed of processing offered by LAS could easily be applied to hostage situations, suicide bomber scenarios and relieve humans of the dull, dangerous and dirty police work.[50] If allowed, improvements in facial recognition and processing speeds for targeting could provide an ability for a LAS to take a split second shot when humans might be too slow to react.[51] Other potential uses include crowd control, perimeter protection or targeting a certain type of perpetrators such as poachers and prison rioters or escapees.[52] The trend is already moving toward autonomous police forces.[53] South Korea has invested $44M in

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[47] Fernanda Santos, "Border's New Sentinels Are Robots, Penetrating Deepest Drug Routes." *The New York Times*. 22 February, 2014, accessed February 27, 2017, https://www.nytimes.com/2014/02/23/us/borders-new-sentinels-are-robots-penetrating-deepest-drug-routes.html?_r=0

[48] Musgrave, "Pentagon finally details"

[49] Henningan and Bennett, "Police Used a Robot to Kill a Gunman"

[50] Christof Heyns, "Human Rights and the Use of Autonomous Weapons Systems (AWS) During Domestic Law Enforcement." *Human Rights Quarterly* 38, no. 2 (2016): 350-78, doi:10.1353/hrq.2016.0034.

[51] Ibid.

[52] Ibid., 359

[53] Garcia. "Why the US Should Lead the Ban," 58.

developing a robot police force, Russia has a robot that polices public spaces and records offenses with a camera, and the UK and US are investing in micro drones for surveillance.[54]

Along the border, DHS sees the future as something less like a physical wall and more like the next evolution of the Vietnam era McNamara line. Since the 70's, they have been leveraging that technology and constantly modernizing to create a "virtual wall." Their vision of the future includes a fused network of sensors, surveillance towers, drones, blimps and other advanced technological equipment to provide situational awareness and response to the US-Mexico border.[55] While the results and technology have come a long way since the Vietnam conflict, the border surveillance effort is still manpower intensive, so organizations are continuing to enhance their networks in order to become more efficient through autonomy.

In 2016, DHS issued a solicitation for innovative ways to use unmanned vehicles. While they currently use a mix of unmanned maritime vessels and aircraft, they are expensive to operate on a budget significantly smaller than the DoD. Two of their three focus areas for funding include a need for autonomous technology. The first area, Sensors, seeks to detect, identify and track multiple targets autonomously. The second, Platform Security, seeks to lay in defensive capabilities against unauthorized actors seeking to disrupt or disable their UAVs.[56] Israel's Viper and Gardium systems are already in use to provide similar capabilities in their cities without the need for a pilot.[57] As these technologies become more and more capable of defensive and non-lethal offensive actions it is becoming clearer that LAS may be available for

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[54] Ibid.

[55] Matt Novak, "US Border Patrol Doesn't Want a Wall-They Want Drones and Sensors." *Gizmodo*, 28 April, 2016, accessed February 27, 2017, http://gizmodo.com/us-border-patrol-doesnt-want-a-wall-they-want-drones-an-1773661854

[56] Aaron Boyd, "Border Patrol Calls on Silicon Valley for Advice on Small Drones." *Federal Times*, 18 July, 2016, accessed February 27, 2017, http://www.federaltimes.com/story/government/dhs/2016/07/18/cbp-suas-call/87259176/.

[57] Garcia, "Why the US Should Lead the Ban" 58.

domestic law enforcement in the near future as well. LAS use in law enforcement should be scrutinized even harder than its use in the military for obvious concerns with the impacts to the rights of everyday citizens. Unfortunately, their development has not attracted the same kind of attention as their use in the military.[58] There is a booming industry for making unmanned weapons for law enforcement and despite being branded as "less lethal," many can also be used in a different mode to carry out deadly force.[59] Once proven in the domestic sector, the ease of conversion of this technology from valid, domestic and non-lethal needs to lethal functions is the second main driver that will pave the way for their acceptance and use in the military.

**The Slippery Slope of Dual Use and Selectable Lethality**

There are seemingly endless applications for autonomous technology in the civilian world. Search and rescue, natural disaster infrastructure assessments, surveillance, weather pattern monitoring, oceanographic mapping, driverless cars, even the Roomba wondering around our homes is relying on a kind of autonomous technology. These applications are not free of ethical concerns, but typically they are more closely tied to personal safety and privacy rights.[60] However, it is becoming increasingly more difficult to separate the technologies used to create "helpful" autonomous systems from those designed specifically for military application.

Developments in the labs are advancing similarly to the swarm tactics being used by robots in the field to solve complicated problems.[61] There is no central control. The development of the technology is distributed among a network of military and civilian laboratories, university

[58] Heyns, "Human Rights and the Use of Autonomous Weapons Systems (AWS)," 352.
[59] Ibid., 358-359
[60] Enemark, *Armed Drones*, 2.
[61] Mark Coeckelbergh, "From Killer Machines to Doctrines and Swarms, Or Why Ethics of Military Robotics is Not (Necessarily) about Robots." *Philosophy & Technology* 24, no. 3 (09, 2011): 269-78, accessed November 17, 2016, http://search.proquest.com/docview/1622291517?accountid=322

and corporate research centers, private individuals and state-level governments. LAS design incorporates a wide range of technologies whose development are dependent on advances from each other – biotechnology, robotics, artificial intelligence, sensors and processors, and information systems technologies. They rely on the integration of material and sub-systems that are, in many cases, commercial-off-the-shelf products. The convergence of these technologies has accelerated the pace at which progress in one area affects progress in another.[62] Already, these advances in multiple technologies are moving so fast that regulations on their use are beginning to lag.[63] From Uber replacing a highly regulated taxi service to self-driving cars, the technology is proving ready for use well before local or state-level communities across the globe are prepared to administrate them.[64]

The dual use appeal has presented a much more challenging problem than has been associated with potential breakthrough military technologies in the past. In contrast, the development of nuclear technology was not only more centralized in development, but could be connected to a centralized government and potential users to aid in its regulation.[65] Other military technologies, such as blinding lasers, chemical weapons, and biological weapons clearly did not have an intended use other than military applications. Even with centrally controlled technologies such as these, regulation was still no easy task. By the time the US atomic bomb had become a reality, researchers and scientists were virtually excluded from any policy decisions on its use.[66] In today's marketplace, corporations and private developers continue to

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[62] Kirshnan, *Killer Robots*, 3.
[63] Branka Marijan, "On Killer Robots and Human Control: Debating the Sophistication of Artificial Intelligence in Lethal Autonomous Weapons Systems," *Ploughshares Monitor* 37, no. 2 (2016): 20.
[64] Ibid.
[65] Coeckelbergh, "From Killer Machines to Doctrines and Swarms," 277
[66] David R. Haws, "Engineering the just War: Examination of an Approach to Teaching Engineering Ethics." *Science and Engineering Ethics* 12, no. 2 (2006): 365-72, accessed November 17, 2016, http://search.proquest.com/docview/750426224?accountid=322

blur the line as they find more and more civil uses outside the military domain for robotics and autonomous technology. As these products are developed, fielded, and refined to overcome technological hurdles through their use in commercial sectors, the temptation and ease to weaponize them grows.

Unmanned underwater vehicles (UUVs) serve as a prime example of this phenomenon. UUVs developed for oceanographic mapping turned to autonomous operation to overcome the limitations with radio signals traveling underwater.[67] Once proven in the field, the technological gap and subsequent approval of their use in military applications such as mine clearance, anti-submarine warfare or other subsurface attack missions grows significantly narrower. Similarly, in a search and rescue capacity, microelectromechanical systems or swarming robots need to rapidly coordinate and cooperate in real time without direct human control.[68] This same technology, once proved in concept in the civilian world, could provide significant military capability once weaponized with relatively little additional cost. While many have strong moral aversions to LAS, they often fail to see the similarities in autonomous systems intended for civilian use, such as driverless cars. The driverless car industry is addressing similar challenging moral car crash scenarios such as choosing between striking a child vs. an elderly pedestrian, one person vs. a crowd, or saving the driver vs. a pedestrian. Despite utilizing the same type of technology to make similar morally based choices, these systems are mainly seen as promising technologies which will ultimately serve a great good in the world.[69]

Similar to non-lethal and dual use systems, autonomous systems used purely for defensive purposes have managed to avoid the greater ethical debates concerning their use. They

[67] Kirshnan, *Killer Robots*, 79
[68] Kirshnan, *Killer Robots*, 35
[69] Purves, Jenkins, and Strawser, "Autonomous Machines," 867

have done this through ensuring the systems have a human in the loop for either the direct command to fire or when they select an autonomous mode when the decision-to-fire time is prohibitive for a human to ensure protection of personnel (such in missile defense). These systems have been called semi-autonomous, automatic, or precursor systems and are already widely in use.[70] However, this adjustable autonomy only disguises the true autonomous capability of the systems which could easily be applied to other platforms in a more offensive capacity.[71] In these scenarios, humans are increasingly becoming the weakest link as processing speeds of computers outpace human decision-making speed. This becomes particularly problematic when multiple systems are controlled by a single individual. To achieve their fullest potential, these systems must be designed from the beginning to function autonomously, free of a human in the loop. The option for human control will eventually become an illusion as the speed and the nature of weapons designed to counteract these purely defensive systems continues to evolve.

The very existence of such autonomous anti-missile defensive systems such as Aegis, Iron Dome and Patriot are driving development of technologies to defeat them which are also autonomous and far from non-lethal. In these defensive systems, a sophisticated radar and sensors which can track multiple inbound threats (or targets) are integrated into weapons systems. Without direct human control, these systems are able to autonomously launch missiles or fire guns to neutralize identified threats. In one such future scenario designed to defeat such systems, a disarming attack would be carried out by small swarming offensive weapons which would overwhelm the defensive system's ability to track and target all the potential threats.[72]

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[70] Sauer, "Stopping 'Killer Robots," 8
[71] Kirshnan, *Killer Robots*, 35.
[72] Sauer, "Stopping 'Killer Robots," 9.

This, in turn, is pushing these defensive systems away from their stationary positions, expanding the parameters of operation beyond their current tight controls, and removing more and more human control and supervision.[73] These represent many of the same qualities which would also be appealing in a LAS. The cycle of development for LAS is already starting to take the shape of an arms race, but the potential for dual use and non-lethal applications has many urging the technology to move forward.

In the April 2016 United Nations meeting of the Convention on Certain Conventional Weapons, despite a growing concern over LAS, some nations felt that it was too early in the development of autonomous systems to make a decision as to their future.[74] Advocates feel it is important to test the limits of autonomous capabilities before a policy can be developed by any governing body and that a ban on weaponized systems could prevent the development of potentially lifesaving technologies.[75] Irrational fears of terminators with machine guns shouldn't interfere with systems such as missile defense which could ultimately reduce civilian casualties.[76] Canada, in particular, felt that it was too difficult to separate the "good" applications from the "bad" and an outright ban would be detrimental to the development of the dual use technology.[77] In areas where robotics are being used for missions like land mine removal, a highly regulated and high cost advanced system loses its third world appeal.[78] However, these deliberations may be end up being merely another version of humans justifying the things we

[73] Ibid.
[74] Marijan, "On Killer Robots and Human Control," 23.
[75] Alex Brown, "One Congressman's Crusade"
[76] Ibid.
[77] Marijan, "On Killer Robots and Human Control," 23.
[78] KTMU Hemapala and Roberto P. Razzoli, "Design and Development of a Landmines Removal Robot." *International Journal of Advanced Robotic Systems* 9, no. 1 (2012): 5. doi:10.5772/50907, accessed November 18, 2016.

want to do by attempting to control the context of their use. Unfortunately with LAS, once we lose control of the context, there may be no going back.

## The Illusion of Control and Why Context Matters

The DoD Unmanned Systems Integrated Roadmap recognizes that the "current state of autonomous systems require highly structured and predictable environments."[79] Going forward, research aims to either better define and control the environment of the system or to make a machine that is more capable of interacting with the environment in which it operates. The former is much easier to accomplish. Current autonomous weapons systems are only deployed in a limited context into environments where the risk to human life is small and the benefits, such as protection of troops, outweighs the risk.[80] This is mainly seen in defensive systems that are onboard ships or protecting troop locations in contingency environments.

Any deviations away from an environment which might limit a commander's ability to adhere to DoD's "appropriate levels of human judgment over the use of force" policy or that may require unusual uses of autonomous technology must be approved by a senior-ranking defense official.[81] These lower risk environments are used because it is easier to limit the scope of autonomous operations to a certain mission or domain with low civilian populations (i.e. underwater) as opposed to a highly complex setting such as an urban environment. Current systems perform much better at these well-defined problems because the technology is not yet capable of tasks such as differentiating between combatant and noncombatant. Thus far, autonomous technologies have seemingly been kept "in a box" to control their effects much

[79] DoD Unmanned Systems Roadmap, 69.
[80] Purves, Jenkins, and Strawser, "Autonomous Machines," 869.
[81] Peralta, "Weighing the Good and the Bad"

better than technologies such as landmines and chemical weapons. Our inability to control the effects of the latter drove the international community toward widely accepted treaties which banned their use.[82] However, the technological ability to overcome the current limitations of LAS is approaching very rapidly. As these incremental advances in capability are achieved, control of the system is evolving in a parallel track. We are slowly (or perhaps not so slowly) moving from full command, to partial command aka "human in the loop," to mere oversight of autonomous systems.[83] When this transition is complete, the issues presented by a machine that is more capable of interacting with a non-controlled environment must be addressed.

Many, such as Georgia Tech's Ron Arkin, feel that autonomous systems can be programmed with a sort of "ethical governor."[84] Once the technological hurdles such as facial recognition, target discrimination, and target delineation, among others, are addressed, he feels that a LAS could be programmed based on any set of current governing standards in the conduct of warfare. These might include international laws, specific rules of engagement, or even broader ethical principles.[85] Once these systems could incrementally be proven to be as ethical and effective as a human conducting the same mission, there would be no reason why they shouldn't be employed. Even the Pentagon has stated that when the technology is reliable enough, it would be open to the possibility of a LAS being able to fire without direct human permission.[86] Developers are not trying to create LAS that would be immune from ethical mistakes, merely ones that could outperform a human on the battlefield given the same situation with respect to

[82] Bonnie Docherty, *ValueWalk: Losing Control: The Dangers of Killer Robots. Newstex*, 2016, accessed November 18, 2016, http://search.proquest.com/docview/1797276083?accountid=322
[83] Mark Gubrud, "Stopping killer robots," *Bulletin of the Atomic Scientists* 70, no. 1 (2014): 33.
[84] Kirshnan, *Killer Robots*, 108.
[85] Ibid.
[86] Ibid., 34.

international law.[87] While meeting these ethical standards may ultimately lead to the eventual acceptance of LAS on the battlefield via public opinion, the context and the nature of future conflicts may have more influence on the timeline of their employment.

Context always matters and the development timeline and eventual deployment of LAS will be no exception to this rule. Until autonomous systems could prove to be operationally and cost effective their development languished. Once their use was proven to be militarily beneficial in the wars in Afghanistan and Iraq (and the greater war on terror), their development and employment has exploded. There is public concern over the use of LAS just as there was for many other revolutionary military technologies over history. Crossbows, catapults, and submarines were all once considered inhumane weapons which had their role limited in combat. But over time the context of wars changed and so did public opinion on their use. Social conditioning is used in many fields to slowly overcome concerns of the general population.[88] The self-driving car is being tested and unveiled methodically and incrementally to overcome public fears and deep rooted social norms. The environment is being limited and controlled to prevent accidents that might erode public confidence in the cars and setback their eventual widespread use by years or even decades. The same is happening with LAS. The environments are being controlled until steady technological gains allow them to slowly expand in capabilities, mission sets and most importantly, public support and trust. However, the context of a state's situation in the world can change quickly and eliminate the need for a slow and steady acceptance.

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[87] Jason Lomberg, "Autonomous Military Robots: A Short Survey". www.ecnmag.com, 24 November, 2009 Rockaway: Advantage Business Media. https://www.ecnmag.com/blog/2009/11/autonomous-military-robots-short-survey

[88] Kirshnan, *Killer Robots*, 113.

Opponents of the introduction of LAS frequently point to the Martens Clause and the Law of Armed Conflict. In the absence of definitive international law when fielding a new weapons system, the Martens Clause stresses the importance of customary norms, the principles of humanity, and the dictates of the public conscience in the conduct of warfare.[89] The public conscience aspect of the clause is frequently cited to prevent the introduction of potentially disruptive technologies onto the battlefield, such as LAS. Public conscience has proven to be fickle time and time again and context plays an important role in determining which side of the argument the public rests. Several recent research efforts have attempted to highlight this fact.

Most surveys in regards to LAS are taken in a vacuum and offer a simple binary choice without context - "do you support the use of lethal autonomous systems." In this narrow context, the majority of those polled seem to oppose their introduction and cite a lack of trust or moral issues with outsourcing killing to robots as primary reasons for opposition.[90] As part of a YouGov Omnibus survey, one thousand Americans were polled on the employment of LAS, but were then allowed to provide open-ended comments to explain their answer. Out of this, two key important contextual patterns became evident. First, family members of military veterans (not necessarily the vets themselves) tended to support the deployment of LAS more. Second, both sides valued saving human lives and were particularly supportive of protecting "our troops" from harm.[91] While the basic oppositions may be in line with the premise of "meaningful human control," the comments begin to underscore that opposition is contextual and could be swayed.

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[89] Rupert Ticehurst, "The Martens Clause and the Laws of Armed Conflict." *ICRC*, 30 April, 1997, accessed March 23, 2017, https://www.icrc.org/eng/resources/documents/article/other/57jnhy.htm

[90] Charli Carpenter, "*Who's Afraid of Killer Robots? (and Why)*." *The Washington Post*, 2014, accessed November 18, 201, http://search.proquest.com/docview/1531028666?accountid=322

[91] Ibid.

Michael Horowitz has followed up this YouGov survey in an attempt to determine which factors might be key to swaying public opinion on the employment of LAS.[92] While overall public knowledge about LAS was deemed to be low, there was also significant bias of opinion conjured up from Hollywood images of LAS portrayed in movies like the Terminator. His survey provided a series of if/then options in regards to employment of LAS instead of a traditional binary choice of support vs. not support. Three factors were highlighted that would significantly increase support for LAS – if they protect US forces, if the military necessity increases, or if other countries develop them first. Opinion shifted from only 38% support to 61% support if LAS were proven to be more effective at protecting US forces and up to 50% if proven to be more militarily effective in attacking the enemy. In a second survey, opposition fell from 56% to only 38% (68% change) if another country developed them first.[93] While the survey does indicate there is still some hesitation to support their employment even if LAS prove to be more effective, it more importantly highlights that public opinion is highly malleable on the subject depending on the context. As these are hypothetical scenarios in a laboratory environment, it could be assumed to have an even more powerful effect on public opinion if these scenarios played out in the real world with significant media exposure and higher stakes.

One informal survey that might be the most telling was taken at the 2016 World Economic Forum. National level leaders and politicians were asked two questions pertaining to their nation suddenly being at war. The first asked if they would rather be defended by their sons and daughters or a LAS. The second asked if they would rather be invaded by sons and daughters of their enemy or that same LAS. The results were an astounding 88% that preferred to be

[92] Michael C. Horowitz, "Public Opinion and the Politics of the Killer Robots Debate." *Research & Politics* 3, no. 1 (2016): 7, doi:10.1177/2053168015627183
[93] Ibid.

defended by LAS and the inverse (12%) which preferred to face LAS.[94] While these numbers are somewhat lower when extended to larger survey population it does highlight the ongoing trend toward casualty avoidance and a growing confidence in technology to take our own forces further away from the fight. If public opinion is the driver of the future employment of LAS, changes in context throughout history have shown that public opinion usually lies on the side of self-interest and self-preservation.[95] These changes in context also fuel emotions and irrational fears, which only aid in the acceleration to develop and field LAS.

Two major fears are driving the rapid development of LAS, despite calls to slow down and re-examine the ethical implications. First, there is significant fear over current systems being stolen by the enemy, or worse, turned against its own forces through unsecure networks and datalinks. There is also a growing trend in electronic warfare that will require systems to operate in a denied environment, where communications back to a control station may not be possible. To be successful, the system will be required to execute missions without direct human control. Similar to underwater environments where radio signals are unable to reach the depth and distances required, autonomy provides a practical solution. A self-contained system with a preprogrammed mission or decision and execution matrix that isn't reliant on human commands can continue to work even in the era of quantum computing, where no current encryption will be safe.[96]

Second, and alluded to in the Horowitz survey, is the fear that if "we don't do it, someone else will get them first." This has driven trends in warfare and arms races for decades. The US nuclear program is a prime example. When the context of WWII placed the US in front of an

[94] Marijan, "On Killer Robots and Human Control," 20
[95] Carpenter, *"Who's Afraid of Killer Robots"*
[96] Kirshnan, *Killer Robots*, 39.

existential threat and the prospects for tens of thousands of deaths during an invasion of mainland Japan, public opinion was decidedly swayed and opposition to having used the destructive power of the atomic bomb were significantly lowered. The same may prove true for LAS. Deputy Secretary of Defense Bob Work has stated that the United States will not delegate lethal decision-making authority to a machine, but followed up with "but self-restraint might be unsustainable if an authoritarian rival acts differently."[97] While we attempt to control the gradual employment of LAS until it proves to be reliable and effective, he recalls the old adage that in war, the enemy has a vote.

## Counter Arguments

Some critics of LAS do not see their employment and future use as technologically inevitable. Many are also taking active roles to ensure this vision of the future doesn't happen and are calling for a pre-emptive ban on "killer robots." Major donors, such as Elon Musk, are counted among those who are working to "save humanity" from the dangers of artificial intelligence and LAS. In 2015, Musk announced $1 billion in funding for a new non-profit effort, OpenAI, dedicated to deploying new technologies only in ways that are safe for humanity.[98] Prior to that, 14,000 researchers penned an open letter through the Future of Life Institute demanding world leaders ban LAS.[99] Most recently, Human Rights Watch has championed the "Campaign to Stop Killer Robots" effort to push the UN CCW to ban such technologies. The ethical reasons discussed in this paper, fear of a "killer robot arms race," and the moral issues

[97] Sauer, "Stopping 'Killer Robots," 12.
[98] *ValueWalk: U.S. May Need to Catch Up with China and Russia's Army of Killer Robots*. Chatham: Newstex, 2015, accessed November 18, 2016, http://search.proquest.com/docview/1749476792?accountid=322
[99] Joel Achenbach, "Here's the Argument for Banning Killer Robots before we're Swarmed by them." *The Washington Post*, 2015, accessed November 18, 2016, http://search.proquest.com/docview/1706197445?accountid=322

associated with a machine taking a human life without a "man in the loop" are all frequently cited as reasons for the call for a preemptive ban. Within these groups, there is a collective fear that if we don't get a handle on this technology now, it will be too late to do anything about it. Although many countries have policies committed to responsible development of LAS, it does little to dissuade the fear that "good intentions never won an arms race."[100] The groups pushing for a ban feel a more formal mechanism for self-restraint on development and employment of LAS is needed. While these efforts may temporarily slow down the eventual deployment of LAS, an outright ban has little chance to succeed for many reasons.

There are several types of weapons that have been subject to some kind of international control regime - anti-personnel mines, chemical weapons, blinding lasers. Those weapons, unlike LAS, were all nearing a limited military value even bordering on becoming obsolete when they were banned.[101] This is certainly not the case with LAS. Now, and for the foreseeable future, LAS are not seen as niche weapons and will have significant strategic importance at nearly every level and domain in warfare. As systems become more and more advanced and environments become more contested, LAS are seen as more and more of a military necessity. Their upsides are exceedingly high to militaries concerned with dull, dirty, or dangerous missions that are also under pressure to reduce budgets affected by rising personnel costs. As we continue to see images from Syria, Iraq and other parts of the world where there are seemingly inordinate amounts of innocent civilians being killed in war, a technology that potentially offers better precision, discrimination and less human suffering is not likely to be turned off from the development pipeline. As discussed previously, context and public opinion is malleable and

[100] Brown, "One Congressman's Crusade"
[101] Kirshnan, *Killer Robots*, 96

without a strong push from civil society to lay down a no-go red-line for LAS, their development will continue.[102]

Furthermore, no weapon system has ever been preemptively banned prior to their development and use. Visions of Hollywood terminators are generating fears based on "what if" scenarios as opposed to the "what was" scenarios that drove bans in the past. It can be argued that even efforts such as nuclear non-proliferation, generally considered to be successful, would not be possible had the weapon's devastating power not been unleashed first. Too much money has been invested in LAS worldwide to collectively throw in the towel because of "what if" scenarios. The momentum is already heavily moving in the direction of LAS with no tangible proof that the bad will outweigh the good. In fiscal year 2013, the US spent almost $6 billion on unmanned systems and predicts the unmanned aerial vehicle market to more than double in the next ten years reaching nearly $90 billion.[103] Admittedly, the majority of that growth is predicted in the civilian markets, not the military.

Finally, if there was to be an attempt at an outright ban, there is no consensus over what grounds or legal framework LAS would fall under for governance or control. Some feel it is most appropriate under human rights law, others feel humanitarian law (which deals mainly with its application during wartime). Others feel that both discussions are moot as autonomous only refers to a control method and not the weapon itself.[104] The possession of a weapon system in itself is not illegal, but rather how it is employed according to preexisting and accepted international laws of warfare. In this case, a LAS may only be deemed to be illegal if it would cause more unnecessary suffering or noncombatant losses than the current weapons systems

[102] Gubrud, "Stopping killer robots," 34.
[103] DoD Unmanned System Roadmap, v.-4.
[104] Kirshnan, *Killer Robots,* 97

employed today. As contextual surveys show, if LAS were proven to be as efficient or better than current systems, their legality may not be a significant concern. With so many unknowns about the true future capabilities of LAS, no hard evidence of disproportionate effects on the battlefield, many differing legal considerations, and obvious dual use commercial interest an outright ban does not seem likely or practical. Particularly, a ban on LAS through the notoriously slow UN CCW process seems more likely to join the ranks of other "good ideas that go on to die a slow death." [105]

## Conclusion

In the not too distant future, we will see LAS on the battlefield either working with our human soldiers or totally independently. There are several efforts underway to limit or prevent their eventual use, but as those discussions slowly advance the development of LAS technology is moving at a blinding speed. By the time the question of their ethical or legal use in the military is settled on the international stage, it will be too late to change the path and momentum of LAS technology. Some future analysis on why the efforts to ban LAS failed will likely identify three primary reasons. First, the same technology will have proved itself in law enforcement and border patrol type applications with relatively little scrutiny as compared to its military use. Secondly, once the technologies such as facial recognition, target identification, tracking and targeting have been proven in the field to be reliable and efficient, the conversion for lethal military application will be relatively simple. Finally, the context of LAS use will be tightly controlled until a point when public opinion is supportive of their use due to military necessity, efficiency, or a variety of other factors. Many feel that will be the point of no return. If LAS on

[105] Sauer, "Stopping 'Killer Robots"

the battlefield is a technical inevitability, instead of relying on a hope that they can be banned outright, we should work to establish acceptable parameters of their use.

## Recommendations

The world-renowned Stockton Center for the Study of International Law at the U.S. Navy War College has done extensive work on the legal aspects of LAS. They have been on the forefront of many issues associated with the introduction of LAS on to the battlefield and the recommendations that follow are based on some of their initial work. To ensure that when LAS are introduced on the battlefield they are used in a way that satisfies ethical and legal concerns, the following initiatives and parameters are recommended. All should be perused concurrently as many provide overlap and are mutually supportive. While the adaptation of these standards by an internationally recognized global organization such as the United Nations or through an international treaty would provide the optimum solution, the United States should lead the way and develop policies to enact these recommendations internally first. Recommendations #2-5 should be internally implemented relatively quickly to aid in setting the roadmap and requirements for future development.

1. *Develop a US-led international consensus on the acceptable uses of LAS*. The use of UAVs in Pakistan and Afghanistan has somewhat eroded the US credibility in the ethical debate about the employment of LAS. Now is the time to reassert the US lead in the responsible development and employment of LAS in the future. As Singer and Roff write, this must be done sequentially at three distinct levels – through our current partners and allies, then with regional groups, then at the global level with our near peer competitors such as China and

Russia.[106] Most importantly, this will establish that the international community acknowledges that these systems will become reality and a ban is not practical. Once this has been settled, the international community can move forward with placing boundaries on how LAS will be used. Some precedent has already been set through US statements at the CCW and the publication of DoDD 300.09.

2. *Restrict use of LAS to only platform-level targets*. This capability already exists in some forms today. To avoid the ethical and moral challenges of targeting individuals on the battlefield, LAS should only be utilized to target large systems such as enemy aircraft, naval forces, radar sites, missile systems, etc. While challenges remain with proper target identification and selection, characteristics such as radar signatures, hull profiles, and friend/foe protocols are much more discernable between military systems than are possible between combatants and noncombatant civilians. There would be no distinction between manned and unmanned systems during wartime as their nature is inherently military regardless of how the system is operated. However, this will not alleviate legal concerns with proportionality, which will also need to be sufficiently met.
3. *Require every LAS to be identifiable and attributable to the country that employs them*. This is no different than the flag that each member of a nation's armed forces wears on their distinct uniform. The same is represented in the tail number of an aircraft. The lack of adherence to this standard is one of the reasons terrorist organizations are universally repudiated by the international community. The requirement for LAS should be the same. This would serve to address the concern of attribution and limit the chance that a non-state

[106] Heather M. Roff and P.W. Singer, "The Next President Will Decide the Fate of Killer Robots-and the Future of War." *Wired*, 6 September, 2016, accessed March 30, 2017, https://www.wired.com/2016/09/next-president-will-decide-fate-killer-robots-future-war/

actor could release a system "to the world" without fear of attribution or repercussion from the international community. Most major military platforms in use today follow the same requirement of marking and identification.

4. *Restrict the domains where a LAS might be employed.* Some domains, such as underwater or air, are less burdened with the potential for unnecessary civilian casualties. In domains where the risk would be low and would see more system vs. system level clashes (i.e. submarine or air to air), LAS could be employed with limited restriction. In other domains or environments, such as urban combat, a LAS would be much more problematic. In these cases, where risk to civilians is high, it would be more appropriate to keep a human in the loop. However, LAS could be employed in urban areas provided recommendation #2 was followed and they were restricted to military platform based targets only. This may, however, increase the risk of enemy violations of codified laws of armed conflict, such as surface to air missiles near hospitals. The restriction on environment may happen automatically if sufficient technology doesn't exist to allow a LAS to act with appropriate distinction in urban environments.
5. *Restrict the use of LAS to only conflicts with declared state on state hostilities.* The same moral calculus for going to war should still apply regardless of the technology available. Fears that LAS might lower the barriers required to go to war may be mitigated through the requirement to formally declare war or recognize the beginning of hostilities at the international level. This would go to further stigmatize the use of LAS by non-state actors and potentially raise the threshold before LAS could be "switched on." If this level of notification is not achievable, an alternative would be a formal notification to the UN

Security Council of LAS employment like is done when states act in self-defense under Art. 51.

6. *Better define "defensive systems."* There are autonomous systems conducting defensive missions today with much defined parameters. As the capability of autonomous systems expands, the defensive rings of protection potentially do as well. How far out will this extend on a ship vs. a base perimeter? Will they be required to be stationary or can they become mobile or airborne? Can they follow a squad of marines on the ground? At what level of target (system vs. human) will they be able to engage? All must be clearly defined as much of the same technology will be utilized in purely offensive systems as well.
7. *Internationally ban LAS and the option of selectable lethality from use in all non-military applications.* This would serve to reinforce recommendation #5. While the technology would certainly be appealing for a dictator to suppress uprisings, riots or to conduct aggressive crowd control, this cannot be tolerated internationally. In those cases, even the over aggressive use of non-lethal systems must be highly scrutinized as well. Additionally, it may not seem like a likely scenario now, but there are some compelling arguments to give police, federal agents and even commercial security organizations this capability in the future. We should hold the domestic application of this technology to a much higher standard, but yet systems are being developed today to readily go from non-lethal applications to lethal ones. Because of uniquely different moral and ethical calculations and due process for citizens, these systems should always require a human in the loop and never be designed specifically for lethal operations. This recommendation is also predicated by the ability to come to an internationally agreed upon definition of a LAS and a distinction from purely defensive systems.

We may not be able to stop the eventual employment of Lethal Autonomous Systems, but with all these recommendations in place, we may be able to set the conditions where they are employed in the most ethical, moral and responsible manner. If we don't act soon, it may be too late to have a say. The technology itself is not inherently evil, but how we choose to employ (or not employ) it will determine the future of modern conflict and maybe even how we define humanity itself.

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