

The Automation and Proliferation of Military Drones and the Protection of Civilians

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I. INTRODUCTION

In the last decade, the growing use of the Unmanned Aerial Vehicle (UAV) for intelligence, surveillance and reconnaissance has been a game changer on the battlefields of Iraq, Afghanistan and the Middle East. The US is leading the technology, with Israel in second place. There were only 150 robots in the Iraq War in 2004, including bomb disposal robots. Now there are thousands of small, unarmed aerial surveillance drones being used by troops on the ground—so many, in fact, that it is difficult to obtain an accurate estimate of their number.

The main concern of this paper is the use of drones armed with missiles and bombs. Missions in Afghanistan and Iraq are mainly flown by ‘pilots’ of the 432nd Air Expeditionary Wing at the Creech Air Force Base in the Nevada desert, thousands of miles away from the operations. Operators sit at video consuls making decisions about when to apply lethal force. Because these (unmanned) planes can be flown around the clock, the pilots can take a break from ‘battle’ at any time or even go home for dinner with their children. This unusual combination of spending all day in the theatre of war and then returning home in the evening is apparently causing a new kind of battle stress that has not been known before. The argument is that military personnel at war normally spend their time with their comrades and this reduces their stress (but the jury is still out on this until substantial evidence accrues).

MQ-1 Predators, unmanned Combat Air Vehicles (UCAV) which each carry a payload of two hellfire missiles, clocked up 750,000 miles in the air between 2007 and 2010. In October 2007, the Predator was joined by the much larger and more powerful MQ-9 Reaper. The MQ-9 Reaper carries a payload of up to 14 hellfire missiles or a mixture of missiles and bombs. These so-called hunter-killer UAVs have conducted many decapitation strikes since they were first deployed in Afghanistan in October 2007.

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Despite cutbacks in US defence funding, the Obama administration has continued to increase its spending on UCAVs. In 2010 the Air Force aimed to spend \$2.13 billion on unmanned technology, with \$489.24 million earmarked to procure 24 new heavily armed Reapers. The US Army planned to spend \$2.13 billion on unmanned vehicle technology. This includes the purchase of 36 more unmanned predators. The US Navy and Marine Corp planned to spend \$1.05 billion on unmanned vehicles, including armed MQ-8B helicopters.

US drone developments are moving quickly, with plans well underway to arm both the Fire Scout unmanned helicopter and the small rail-launched Shadow RQ7-B (approx 4.6 m long). Aeroenviroment, a US company, has developed the Switchblade, a small 2lb backpack UAV launched from a tube. It unfolds its wings and streams video back to the controller. When a target is detected, the controller designates it and the Switchblade folds its wings back to become an autonomous missile.

Israel is the second largest producer of UAVs and is continually enhancing its military strike capabilities and range. China's plans for new concept UAVs are also coming along very strongly. Many other countries are following suit. The first step for most countries will be to arm their UAVs, and the next step will be to automate them. Again, the US and Israel are the leaders.

Before we examine the ethical and legal implications of the new robot weapons, we will first take a broad sweep over some of the recent history of UAV development and proliferations. We will then look at the current use of UAVs before discussing the near-future of autonomous supersonic (and faster) air craft and how these developments could impact on civilian populations if they remain unchecked. Finally, we will express concerns about how military necessity could unlock the use of autonomous war planes even though they remain indiscriminate weapons.

II. PROLIFERATION

In the post-9/11 era, aerial drones have come to dominate military operations. Troop movements are almost always accompanied by intelligence, surveillance and reconnaissance drones. The military success of UAVs in the theatre of war in Iraq and Afghanistan create massive worldwide demand for the technology. It is massive business. The Teal Group has estimated that the market will increase to \$11.3 billion per year over the next decade, not including the billions of dollars in development costs. Teal does not have access to the figures for military robotics spending from major countries such as Russia, China or Iran.¹

¹ Teal group corporation website, <http://bit.ly/psA7rB> (accessed 1 September 2011).

There are now at least 50 countries using UAVs.² Many of these are being developed in-house and many are being bought in (and probably copied). The US sells many of its drones to its closest allies in Europe, and recently the US company General Atomics was granted permission to sell its earlier generation predators in the Middle East and Latin America. Israel has an even wider range of markets, having recently expanded into Latin American countries. Countries that do not have the advantage of being a close ally of the US cannot yet buy armed drones, and so they are having to find other means of acquiring or developing them. India and Pakistan are working hard to develop attack drones, having failed to purchase any from the US or Israel. Russia has shown models of the MiG Skat unmanned combat aircraft, which is intended to carry out strike missions on air defences. It is, according to reports from Russia, able to carry cruise missiles and can strike both ground and naval targets. Iran demonstrated a rocket-launched UAV, the Karrar or ambassador of death, to the press in 2010. It carries two cruise missiles. It is not possible to ascertain how operational the Iranian and Russian craft are, but it is clear that, at the very least, they are moving in the right direction to make the technology.

China is showing the greatest commercial potential for selling armed UAVs over the coming decade. It has made a showing of many different types of UAV at its air shows over the last five years, some almost replicas of the US drones. The US-China Economic and Security Review Commission said that China 'has deployed several types of unmanned aerial vehicles for both reconnaissance and combat'.³ According to the *Washington Post*, at the Zhuhai air show in China in November 2010, there were more than two dozen Chinese UAV models on display.⁴ Worryingly, the *Washington Post* quotes Zhang Qiaoliang of the Chengdu Aircraft Design and Research Institute as saying, 'The United States doesn't export many attack drones, so we're taking advantage of that hole in the market.'

This is worrying because it indicates the opening up of a large and expanding market of which all the major players will want a share. If it looks like China's combat UAVs threaten to dominate the market, then others will start selling them and every developed nation will have them. This could have a significant impact on how disputes are handled and what constitutes a war.

2 I have personally read valid robotics reports for each of the following countries, and there may be many more: Australia, Austria, Brazil, Bulgaria, Canada, Chile, China, Columbia, Croatia, Czech Republic, Ecuador, Finland, France, Germany, Greece, Hungary, India, Indonesia, Iran, Israel, Italy, Japan, Jordan, Lebanon, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Peru, Philippines, Poland, Romania, Russia, Serbia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Tunisia, Turkey, United Arab Emirates, United Kingdom, USA, Vietnam.

3 210 Report to Congress of the US-China Economic and Security Review Commission, November 2010, p 79, www.uscc.gov.

4 William Wan and Peter Finn, 'Global Race On to Match US Drone Capabilities' *Washington Post*, 4 July 2011, <http://wapo.st/mfRa62> (accessed 10 August 2011).

III. KINETIC ATTACKS AND ACTION SHORT OF WAR

Legal and political loopholes for drones are already being created in US that give us some insight into what the future might hold when every major power is regularly deploying armed robots. Will drones change the definition of what constitutes a war? Will their use be considered to be an act of war, a policing action or action short of war (under *jus ad bellum*)? US operations in Libya have sparked an argument between President Obama and the US Congress over the War Powers Resolution. The US 1973 War Powers Resolution limits the ability of a president to wage war without Congressional approval. The president is required to obtain congressional approval or terminate a mission within 60 days

[i]n the absence of a declaration of war, in any case in which United States Armed Forces are introduced—(1) into hostilities or into situations where imminent involvement in hostilities is clearly indicated by the circumstances; (2) into the territory, airspace or waters of a foreign nation, while equipped for combat, except for deployments which relate solely to supply, replacement, repair, or training of such forces ...⁵

The President did not seek Congressional approval for the United States' role in NATO's Libya mission within the statutory 60 days. Harold Koh, the most senior lawyer in the state department, has strongly defended the legality of US military involvement in Libya without Congressional approval. The argument was that since April 2011 the USA's role in the NATO-led mission in Libya has mainly involved assisting in operations (refuelling and providing intelligence) and this complies with (2) above, or carrying out missile strikes with armed drones.

A report to the US lawmakers explaining why the President did not need to seek Congressional approval stated: 'US operations do not involve sustained fighting or active exchanges of fire with hostile forces, nor do they involve the presence of US ground troops, US casualties or a serious threat thereof.'⁶

The actual wording of the 1973 War Powers Resolution concerns the introduction of *armed forces* into hostilities or into the territory, airspace or waters of a foreign nation, while equipped for combat. The argument here would have to be that use of drone strikes in Libya did not constitute the introduction of US armed forces into hostilities or into foreign airspace.

There are at least two important questions that need be addressed here. The first is this: are drones now considered to be action short of warfare? As the White House told

⁵ War Powers Resolution of 1973, Public Law 93-148, 93rd Congress, HJ Res. 542, 7 November 1973, http://avalon.law.yale.edu/20th_century/warpower.asp (accessed 27 July 2011).

⁶ Letter from the President on the War Powers Resolution, 15 June 2011 www.whitehouse.gov/the-press-office/2011/06/15/letter-president-war-powers-resolution (accessed 17 August 2011).

the *New York Times*: 'American involvement fell short of full-blown hostilities.'⁷ The second question is, does the use of remotely piloted armed aircraft constitute the introduction of armed forces or not?

Although the US Congress has only been concerned about involvement in Libya, the use of drones for targeted killing has been carried out in at least three other countries that the US is not at war with: Somalia, Yemen and Pakistan. Other than Libya, US drone operations in these countries are carried out by the intelligence services. Following the withdrawal of the DASH in 1979, the Central Intelligence Agency (CIA) was the first in the US to use armed drones. In 2002 they killed five men travelling in a Sport Utility Vehicle in Yemen.⁸

Department of Defense lawyers considered this to be a legitimate defensive pre-emptive strike against al-Qaeda by US Department of Defense lawyers. Since then, the use of drones for targeted killings or 'decapitation strikes' in states that are not at war with the US has become commonplace.

Although the US will neither confirm nor deny the strikes officially, the *Asia Times* has called the CIA drone strikes 'the most public "secret" war of modern times'.⁹ The former Director of the CIA, Leon Panetta, has certainly been vocal about the operations. In 2008 he told the Pacific Council on International Policy: 'it's the only game in town in terms of confronting and trying to disrupt the al-Qaeda leadership.'¹⁰ Revealing the CIA's intentions regarding the expansion of targeted drone kills, Panetta went on to say of al-Qaeda that, 'If they're going to go to Somalia, if they're going to go to Yemen, if they're going to go to other countries in the Middle East, we've got to be there and be ready to confront them there as well. We can't let them escape. We can't let them find hiding places.'¹¹

Apart from Libya, none of the drone strikes in countries not at war with the US have even been considered by Congress under the War Powers Resolution. This is a dangerous precedent which is, at best, legally questionable under international humanitarian law as pointed out by Philip Alston, UN Special Rapporteur on extrajudicial killings. He challenged the legality of the targeted killings at a UN General Assembly meeting in October 2009. A request was issued for the US to provide legal justification for the CIA's

7 Charlie Savage and Mark Landler (2011), 'White House Defends Continuing US Role in Libya Operation' *New York Times*, 15 June 2011, www.nytimes.com/2011/06/16/us/politics/16powers.html?pagewanted=all (accessed 3 August 2011).

8 Israel may have been using armed drones for longer but they denied this for several years despite eyewitness testimony. It cannot be verified here.

9 Nick Turse, 'Drone Surge: Today, Tomorrow and 2047' *Asia Times*, 26 January 2010, www.atimes.com/atimes/South_Asia/LA26Df01.html (accessed 17 July 2011).

10 Leon Panetta, *Director's Remarks at the Pacific Council on International Policy*, Central Intelligence Agency, 18 May 2009, www.cia.gov/news-information/speeches-testimony/directors-remarks-at-pacific-council.html (accessed 23 September 2010).

11 *Ibid.*

targeting and killing of suspects with a question about who was accountable. The US refused to comment on what they said were covert operations and a matter of national security.

US Department of State legal advisor Harold Koh rebutted Alston indirectly, stating that 'US targeting practices including lethal operations conducted by UAVs comply with all applicable law including the laws of war'.¹² However, there are no independent means of determining how the targeting decisions are being made. It remains unclear as to what type and level of evidence is being used to make decisions that effectively amount to death sentences by Hellfire missiles for non-state actors. The suspects are not provided with an opportunity to appeal or even to surrender. It is also unclear as to what other methods, if any, are exhausted or attempted to bring the suspects to justice. The whole process is taking place behind a convenient cloak of national secrecy.

US law professor Kenneth Anderson questioned the CIA's use of drones in a prepared statement to a US Senate hearing:

[Koh] nowhere mentions the CIA by name in his defense of drone operations. It is, of course, what is plainly intended when speaking of self-defense separate from armed conflict. One understands the hesitation of senior lawyers to name the CIA's use of drones as lawful when the official position of the US government, despite everything, is still not to confirm or deny the CIA's operations.¹³

A subsequent report by Alston in 2010 to the UN General Assembly¹⁴ describes drone strikes as violating international and human rights law because both require transparency as to the procedures and safeguards that are in place to ensure that killings are lawful and justified: '[A] lack of disclosure gives States a virtual and impermissible license to kill.' Some of Alston's arguments also revolve around the notion of 'the right to self-defence' and whether drone strikes are legal under Article 51.

It appears that the US does not consider the CIA strikes or the deployment of armed drones in Libya as acts of war. How far will this go? All of the countries that have been subject to strikes are militarily inferior and pose little threat to western nations. It seems unlikely that more militarily sophisticated countries such as China or Russia would see such actions on their territory as actions short of war. The precedent is now in place and it will be interesting to see what happens when other countries start doing the same.

¹² Harold Koh, 'The Obama Administration and International Law', speech delivered at the Annual Meeting of the American Society of International Law, Washington, DC, 25 March 2010.

¹³ Kenneth Anderson, Submission to US House of Representatives Committee on Oversight and Government Reform Subcommittee on National Security and Foreign Affairs, Subcommittee Hearing, *Drones II*, 28 April 2010, [20].

¹⁴ Philip Alston, Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions, *Report of the Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions, Addendum, Study on Targeted Killings* (28 May 2010), UN Doc A/HRC/14/24/Add.6.

IV. AUTONOMY AND THE PACE OF BATTLE

Since 2004, all roadmaps of the US forces have made clear the desire and intention to develop and use autonomous battlefield robots. Execution of these plans to take the human out of the loop is well underway. The end goal is that robots will operate autonomously to locate their own targets and destroy them without human intervention.¹⁵

Autonomous lethal targeting is not illegal so long as it accords with the principles of distinction and proportionality. In a military rich environment with few civilians in, say, a desert or at sea, there may be few problems with using armed robots to kill targets. Legally this may be little different from firing rockets from a distance, dropping bombs or sending cruise missiles. However, armed robots are set to change the pace of battle dramatically in the coming decade. It may not be militarily advantageous to keep a human in control of targeting.

The speed of an unmanned craft is limited only by the integrity of its structure and components and not by human G-force limitations. Unmanned planes can not only travel faster than piloted planes but can also manoeuvre much faster, taking sharp turns that would kill a human pilot.

The US has been testing the supersonic Phantom Ray and the X-47b. The US Navy would like to replace the F-35s on their carriers with the X-47b.¹⁶ The Chinese (Shenyang Aircraft Company) are working on the Anjian (Dark Sword) supersonic unmanned fighter aircraft, the first UCAV designed for aerial dogfights. DARPA and the Pentagon want armed unmanned vehicles that can reach anywhere on the planet within 60 minutes. The DARPA HTV-2 programme is a good example of the direction of technological developments. The Falcon HTV-2 is a hypersonic unmanned plane that in recent tests flew at a velocity of between 17 and 22 Mach, ie, 17 to 22 times the speed of sound at its altitude. That is a maximum speed of 13,000 mph (20,921.5 kph), which is around 8.5 times faster than the Russian MiG-25, maximum velocity Mach 2.3 (1,520 mph or 2,446 kph).

However, as with any mobile system controlled by complex software we cannot predict how it will react in all circumstances. A series of unpredictable events could occur, or there could be an undetected bug in the program or a hardware fault. A hypersonic drone could be off target by 5 km in less than a second.

A simple example of just two interacting software algorithms running out of control happened on the Amazon website. The out-of-print 1992 book *Making of a Fly* usually sells for around \$50. But on 19 April 2011 Borderbooks were selling it for \$23,698,655.93

¹⁵ Noel Sharkey, 'Cassandra or the False Prophet of Doom: AI Robots and War' (2008) 23(4) *IEEE Intelligent Systems* 14.

¹⁶ 'USN Wants to Replace F-35s with UAVs' *Strategy Page* (online), 11 September 2011, www.strategypage.com/htmlw/htnavai/articles/20110911.aspx (accessed 11 September 2011).

(plus \$3.99 shipping) on the Amazon website.¹⁷ This astonishing price was created because an automatic algorithm from bookseller Profnath was interacting with Borderbooks' automatic algorithm. The story is that when Borderbooks does not have a book in stock, they automatically list it at 1.27059 times the price of the highest other seller. So when a customer orders it from them, they can buy and sell at a profit. The problem was that Profnath's algorithm made their prices 0.9983 times the highest price of other booksellers. So each time Borderbooks increased their price, so did Profnath, and they spiralled out of control.

This was quite harmless, as no one was prepared to pay these kinds of prices. However, imagine two or more complex algorithms interacting on high-speed armed robots. Without any knowledge of the other algorithms, there is no way to tell what would happen. They might just crash into one another or into the ground, or they might end up unleashing their destructive power in completely the wrong place. The point is that software algorithms on autonomous armed drones spiralling out of control is something to be very seriously concerned about.

As I have written elsewhere,¹⁸ allowing robots to make decisions about the use of lethal force could breach both the principle of distinction and the principle of proportionality as specified by international humanitarian law. These are the pillars of the laws of war. Currently and for the foreseeable future no autonomous robots or artificial intelligence systems have the necessary properties to enable discrimination between combatants and civilians or to make proportionality decisions.

Under the principle of distinction, only combatants/warriors are legitimate targets of attack. All others, including children, civilians, service workers and retirees, should be immune from attack. The same immunity covers combatants who are *hors de combat*—those who are wounded, have surrendered or are mentally ill.¹⁹ The principle of proportionality applies in circumstances where it is not possible to fully protect non-combatants in an action. It requires that the loss of life and damage to property incidental to attacks must not be excessive in relation to the concrete and direct military advantage anticipated.

Distinguishing between civilians and combatants is problematic for any robot or computer system. First, there is the problem in the specification of 'civilian-ness'. A computer can compute any given procedure that can be written as a program. We could, for example, give the computer or a robot an instruction such as, 'if civilian, do not shoot'. This would be fine if and only if there was some way to give the computer a precise

¹⁷ Mike Eisen, 'Amazon's \$23,698,93 book about flies' (it is NOT junk, 22 April 2011), www.michaieleisen.org/blog/?p=358 (accessed 10 September 2011).

¹⁸ eg Sharkey (n 15); Noel Sharkey, 'Grounds for Discrimination: Autonomous Robot Weapons' (2008) 11(2) *RUSI Defence Systems* 86; Noel Sharkey, 'Saying No! to Lethal Autonomous Targeting' (2010) 9(4) *Journal of Military Ethics* 299.

¹⁹ But see also John S Ford, 'The Morality of Obliteration Bombing' (1944) 5 *Theological Studies* 261.

specification of what a civilian is. The laws of war don't help. The 1949 Geneva Convention requires the use of common sense to determine the difference between a civilian and combatant, while the 1977 Protocol essentially defines a civilian in the negative sense as someone who is not a combatant.

Two major software components are necessary in order for robots to distinguish between combatants and non-combatants. The first is highly accurate and discriminative sensing and visions systems. While technology has improved dramatically over the past 50 years, the development of software for vision systems has been very slow. Currently we have vision systems that can detect whether something is a human or not by its shape, although these can easily be fooled by a mannequin or a dancing bear. We have face recognition systems that are effective so long as individuals stay still long enough to be identified, and we have various biometric tests for people who are stopped.' In the fog of war all of these methods run into insurmountable difficulties.

The second necessary component is reasoning from situational awareness. It is unclear as to when we might even get a foot in the door for this problem. There are always optimists, but the truth is that such systems are in the realm of 'hope ware' rather than software. There is no way to be certain that they will never be achieved, but equally there is currently no evidence to suggest that they will ever be achieved. If they are achieved, it could be in hundreds of years.

In terms of the laws of war, we must go on the information and evidence that we currently have. We should not rely on technological fixes that are just around the very elastic corner that we may never reach. The bottom line is that autonomous robots that can kill without a human making the lethality decisions are indiscriminate weapons. They may properly belong in the United Nations Convention on Certain Conventional Weapons (CCW or CCWC).²⁰

V. MILITARY NECESSITY

The statement 'Armed robots will always have a person somewhere in the loop for lethal targeting decisions' is often repeated by Western powers. But saying 'somewhere in the loop' is not the same as saying that a human will always make the lethal targeting decisions. There are clearly instances where military necessity may override having anyone in the loop. In the extreme, if the very survival of the state was at stake and it was possible to use autonomous armed robots to save the day, it is fair to say that they would be used.

In these circumstances the use of autonomous killing machines may even be considered a legitimate action—or, at least, such an action might not be considered to be

²⁰ United Nations Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May be Deemed to be Excessively Injurious or to Have Indiscriminate Effects, in force since 2 December 1983 and an annex to the Geneva Conventions of 12 August 1949.

illegitimate if judged relative to the International Court of Justice's decision, or more properly non-decision, regarding the use of nuclear weapons by States. As is well known, the Court ruled that, in the current state of international law and given the facts at its disposal, it was not possible to conclude definitively whether the threat or use of nuclear weapons would be lawful or unlawful in extreme circumstances of self-defence (circumstances in which the very survival of the defending State would be at stake).²¹ It would not be too fantastic to imagine the phrase 'autonomous armed robots' being substituted for 'nuclear weapons'. Armed robots are a lesser beast than nuclear weapons—unless they are armed with nuclear weapons of course. So the substitution is easy. However, it is likely that it would take much less than the imminent collapse of a state before indiscriminate autonomous robots were deployed.

History is littered with much examples in which humanitarian considerations have been overridden for the protection of soldiers rather than for the survival of the state from imminent collapse.

The attacks on the French market town of St. Lô during the Normandy invasion by allied forces in 1944 provide a good example of the indiscriminate use of air power. Although the town was full of friendly French civilians, an elite German Panzer division residing there was blocking the allied forces from breaking out of Normandy. Canadian, US and British forces took very heavy casualties. In response, according to Cohen, 'The town was attacked on 25 July, by 1,500 heavy bombers, 380 medium bombers, and 550 fighter bombers, one of the largest air attacks in World War II. Panzer Lehr was virtually wiped out, and the town was turned into rubble.'²² The path was cleared for the allied advance, but many thousands of French citizens lost their lives in the process.

These actions were (and are still being) defended on the grounds that they were necessary to achieve military success. It is argued that the bombings were directly proportional to the military advantage gained. On the other hand, Walzer has robustly argued against the actions on moral grounds and in terms of just war.²³

Another case of 'military necessity' was the practice of US troops in Korea and Vietnam of firing back at targets in areas laden with civilians when they came under enemy fire. When the troops were pinned down they automatically employed tanks to return fire into hillsides as well as call for air strikes and artillery support. These actions, whilst saving the lives of US troops, indiscriminately killed civilian men, women and children.²⁴

Cohen points out that this was not an illegal act. The law of war is not necessarily moral; it 'allows troops under fire to fire back without ascertaining that there are no

21 ICJ, *Legality of the Threat or Use of Nuclear Weapons* (General List No 95) (8 July 1996).

22 SM Cohen, *Arms and Judgment: Law, Morality, and the Conduct of War in the Twentieth Century* (Westview, 1989) 34.

23 M Walzer, *Just and Unjust Wars* (Basic Books, 2006).

24 *Ibid.*

civilians mingled with the troops who are firing upon them. It allows troops under fire to fire back even if they know civilians are mingled with the enemy.²⁵ Surely, this means that if soldiers are fired on, then lethally autonomous robots could be deployed in the same way as artillery or indiscriminate air strikes.

If countries at war or in conflict have armed autonomous robots that will save many of their soldiers' lives, will the deployment of those robots be deemed a military necessity? If it impacts both on the protection of soldiers' lives and on the ultimate success of the mission, then there will be a great temptation to use the technology. Imagine a situation where UAV deployment is what is giving state A the edge in an armed conflict with state B. Now imagine that state A has its communications disabled and its radio and GPS signals jammed. If state A can return to its advantageous position using its stock of (indiscriminate) autonomous armed UAVs to maintain its advantage, will it not do so?

Pushing the point home further, suppose that, having disrupted the remote control of state A's UAVs, state B now deploys autonomous attack craft; will state A not follow suit? Will concerns about keeping a person in the loop or unleashing possibly indiscriminate weapons prevent the use of lethal autonomous UAVs? It seems unlikely that a country will lose a war because it decides that moral superiority is more important than victory.

VI. CONCLUSION

After nearly a century of development, the Unmanned Aerial Vehicle has become perhaps the most desired asset amongst the modern militaries of the world. The military successes of UAVs in post-9/11 conflicts has created a rapid proliferation of the technology. Although there is currently a 'man-in-the-loop' for lethal targeting operations, that role will shrink incrementally until there is a capability for fully autonomous operation. The autonomous functions are likely to be ready long before robots will be able to distinguish between combatants and non-combatants in any way that requires battlefield awareness. They will not be able to reason appropriately or to make proportionality decisions barring some incredible and unpredictable technological breakthrough.

Concerns over the proliferation of the technology were expressed in this paper. The United States and Israel are currently well ahead of the field in terms of armed robot planes, but that may change in the near future. Russia has plans for armed unmanned combat aircraft, Iran claims to have them, and China is catching up quickly. More than 50 countries have been buying and developing the technology. It was pointed out that China will soon start selling and exporting its armed drones on the international market.

25 Cohen (n 22).

It they are not stopped, autonomous drones will likely be the tool of choice in future wars. While there is a lot of talk that humans will remain in the loop to make lethal targeting decisions until the robots can be shown to be capable of obeying the principle of distinction, it is likely that military necessity will dictate that this constraint is dropped, ready or not. The mantra could then change to 'Don't worry, there will be technological fixes in the future'. This is similar to what the US has said about not signing the treaty banning cluster munitions.

The eventual proliferation of autonomous armed robots raises many questions of concern. What will happen when two complex algorithms meet in battle? Will the use of drones lead to lowering the bar to war because they appear to make it 'risk free'? Early indications from the current US administration is that drone use is already being considered an action short of warfare. What dangerous precedents are being set up by the current spate of CIA decapitations for when other countries have similar technology?

It is unclear what changes will need to be made to current international humanitarian law (IHL). IHL clearly covers the requirements for discrimination and proportionality. However, the mapping between the new technologies and IHL can be problematic when the operational detail of the new technology is not clear and keeps changing. Some clarifications and additions to IHL may be required, but it will be difficult to future-proof them. Armed autonomous robots are indiscriminate and disproportionate weapons and we must treat them as such now. As such the United Nations should consider placing them on the prohibited list of weapons under the Convention on Certain Conventional Weapons. We rely on possible future technological fixes at our peril.

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