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CANADIAN FORCES COLLEGE / COLLÈGE DES FORCES CANADIENNES  
CSC 30 / CCEM 30

EXERCISE/EXERCICE NEW HORIZONS

**WHEN ROBOTS KILL**

By/par Major Bud Cameron

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## **Abstract**

This paper analyzes the legal and moral issues of future Autonomous Weapons (AW) that kill people. AW are future intelligent machines that can operate independently in military roles and apply deadly force. The paper argues that Canada has a moral duty to develop and deploy AW, based on an analysis of the feasibility, legality and morality of AW. The development of AW is inevitable based on current trends in technology. It will be possible to operate AW legally, within the Law Of Armed Conflict (LOAC). A moral analysis of the common good, human rights and justice shows that on balance it is morally right for free and democratic nations to develop and deploy AW. To meet its moral obligation to defend Canada, DND must develop and deploy AW or risk diminished Canadian Forces (CF) military relevance, increased Canadian casualties and an ever-increasing dependence on allies for our national defence.

Programmed to destroy everything that lived, Berserkers were agents and engines of death. Ages ago, these superb weapons had turned on their living creators and reduced the Builders to interstellar dust. But still the weapons themselves raged on and on across the Galaxy, endlessly repairing and reproducing themselves, improving their own design and refining their killing capabilities.<sup>1</sup>

- Fred Saberhagen

The quote above comes from a fictional distant future, but the capability to build autonomous weapons that kill people is not that far off in the real future. There is already a great deal of automation in modern military weapons systems, but so far humans have retained control of the final decision to use deadly force. Soon it will be possible to deploy intelligent weapons that can make that final decision by themselves, leading to a situation where robots could kill people independently of direct human control. What are the legal and moral implications of using such killer robots in warfare?

This paper is about the legality and morality of allowing killer robots in military combat roles to take human lives. The more neutral phrase “autonomous weapons” (AW) will be used from now on instead of “killer robots”. AW are defined here as intelligent weapon systems able to operate independently and apply deadly force. The goal of the paper is to present a convincing argument that Canada’s Department of National Defence (DND) ought to field AW.

This paper makes three main points to support this argument. First, it shows that current trends in technology and military weapons will inevitably lead to AW on the battlefield. The technology required should be developed within 20 years, and the tremendous military advantages conferred by AW will ensure that military forces develop

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<sup>1</sup> Fred Saberhagen, *Berserker Star* (New York: Tom Doherty Associated, LLC, 2003), 15.

and deploy them. Second, an analysis of the Law Of Armed Conflict (LOAC)<sup>2</sup> shows that there are international legal limitations but no prohibitions on the use of AW, and future treaties banning the use of AW seem unlikely. Third, an analysis using the three basic moral concepts of the common good, human rights and justice shows that the military use of AW is morally right for the common good of humanity and morally neutral with respect to the other moral concepts. To meet its moral obligation to defend Canada, DND must develop and deploy AW or risk diminished Canadian Forces (CF) military relevance, increased Canadian casualties and an ever-increasing dependence on allies for our defence.

The paper concludes that AW will inevitably become legal weapons on the battlefield and DND has a moral obligation to develop and deploy AW.

Autonomous weapons can be thought of as the integration of three enabling technologies: robotics, artificial intelligence (AI), and military weaponry. The robotics is required to give AW the sensors and mobility to operate. The AI is needed to enable decisional and kinetic autonomy to allow AW to make cognitive assessments and decisions, and then to take the appropriate kinetic actions, all independently of direct human control.<sup>3</sup> Military weapons are required to apply deadly force. Once these three technologies are sufficiently developed and integrated, AW will become a reality.

By surveying the current state of these three technology areas and studying the trends in their development and application, one can easily extrapolate to the emergence of AW. Highly developed capabilities already exist in the weapons and robotics

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<sup>2</sup> The LOAC is the recognized international legal authority governing warfare; it comprises treaties between nations and customary international law.

<sup>3</sup> Perri 6, "Ethics, Regulation and the New Artificial Intelligence, Part II, Autonomy and Liability," *Information Communication and Society*, Volume 4, Issue 3, (October 2001): 410-413.

technology areas. AI has not yet matured sufficiently to support AW but the continuing exponential growth in computing power will soon remove this limitation.

Military weapons of every description are widely available and are not a limiting factor in AW development. The remote-controlled Predator Unmanned Combat Aerial Vehicle (UCAV) that released the Hellfire missile in Yemen on November 4, 2002, is a case in point.<sup>4</sup> The weapons and remote control technology already exist and will continue to improve, enabling future AW developments.

The widespread use of robots in industry and science proves that an extensive robotic capability already exists. Global media coverage has made images of robotic automotive assembly lines commonplace. In Canada, images of the Canadarm robotic arm operating on the U.S. Space Shuttle and on the International Space Station are equally familiar. In the military, the capabilities of Unmanned Aerial Vehicles (UAV) are well known and are being further developed by the U.S. Air Force Battlelab.<sup>5</sup> It is clear that robotic capabilities are already highly developed and there is no reason to expect they will be limiting factors in the development of AW.

Progress in AI depends mainly on the computing power available to efficiently run large software programs. Larger and more complex programs are quickly designed to exploit every increase in computing power, driving the need for even more capable computers. The boundaries of AI are therefore constantly being pushed forward, limited only by the computing power available. A famous yardstick for measuring the progress in integrated circuit density, and thus computing power, is Moore's Law:

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<sup>4</sup> Laurie Calhoun, "The Strange Case of Summary Execution by Predator Drone," *Peace Review* 15:2, 2003, 209.

<sup>5</sup> Major Earl Odom, "Future Missions for Unmanned Aerial Vehicles," *Aerospace Power Journal*, Volume 16, Issue 2, (Summer 2002): 84-85.

The observation made in 1965 by Gordon Moore, co-founder of Intel, that the number of transistors per square inch on integrated circuits had doubled every year since the integrated circuit was invented. Moore predicted that this trend would continue for the foreseeable future. In subsequent years, the pace slowed down a bit, but data density has doubled approximately every 18 months, and this is the current definition of Moore's Law, which Moore himself has blessed. Most experts, including Moore himself, expect Moore's Law to hold for at least another two decades.<sup>6</sup>

A detailed analysis of the computing requirements for AI concludes that if Moore's Law holds, the required hardware will be available between the years 2015 and 2024. This was the author's more conservative estimate and his "Postscript II, 28 August, 2000", states that progress in computing power is moving faster than expected.<sup>7</sup> One of the founders of Sun Microsystems also analyzed the implications of Moore's Law and concluded, "By 2030, we are likely to be able to build machines, in quantity, a million times as powerful as the personal computers of today..."<sup>8</sup>. These analyses do not include possible computer design breakthroughs or the multiplying effect of computer networking. This rapid, relentless growth in computing power seems certain to enable the emergence of AI.

The three enabling technologies for AW are already sufficiently developed or will be within 20 years. It only remains to consider the military trends in the use of robotics and automated systems to determine if AW are a realistic possibility.

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<sup>6</sup> Jupitermedia Corporation Inc., "Moore's Law," Mar 22/98, [journal on-line]; available from [http://www.webopedia.com/M/Moores\\_Law.html](http://www.webopedia.com/M/Moores_Law.html); Internet; accessed 30 March 2004.

<sup>7</sup> Nick Bostrom, PhD, "How Long Before Superintelligence?" (25 Oct 1998); available from <http://www.nickbostrom.com/superintelligence.html>; Internet; accessed 1 April 2004.

<sup>8</sup> Bill Joy, "Why the future doesn't need us," *Wired Digital* Inc. (Copyright 1994-2001) [journal on-line]; available from [www.wired.com/wired/archive/8.04/joy\\_pr.html](http://www.wired.com/wired/archive/8.04/joy_pr.html); Internet; accessed 23 March 2004.

The growing acceptance of robots in the U.S. military is noted in the following: “Not long ago Congress forbade even research into a robotic system that had a kill mechanism. Yet during Enduring Freedom the armed Predator demonstrated the effectiveness of remotely piloted airborne craft that could find a target and shoot on demand”.<sup>9</sup> Although the Predator is a precursor to a fully autonomous system, the preceding example does show the commitment of the U.S. military to develop AW technology, as does the following: “Unmanned systems will be essential. The FCS plans for a family of unmanned aerial vehicles that provide sensing and limited attack capability. Ground unmanned vehicles will also vary in size. Some will have guns and be able to fight”.<sup>10</sup> Clearly the U.S. military is planning to incorporate robots into its order of battle.

Autonomous Intelligent Systems (AIS) are a funded field of defence research in Canada and are forecast to have the capabilities “...to perform complex tasks through the perception and understanding of the unstructured environments with minimal human direction and oversight as well as the ability to learn, adapt and share information...” The same research document also states: “Robots or remotely controlled platforms, such as unmanned combat air and land vehicles, will be prevalent on the battlefield of 2020...”<sup>11</sup> This research program demonstrates a conviction that increasingly automated systems will play an important role on the future battlefield.

DND analysts foresee many advantages to using AIS in various battlefield roles:

Robotic Systems will be fully exploited on the future battlefield (e.g., micro-robots for surveillance and target identification, and robotic weapon systems). They can improve lethality, mobility, effectiveness

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<sup>9</sup> Colonel John B. Alexander, *Winning the War*, (New York: Thomas Dunne Books, 2003), 75.

<sup>10</sup> Ibid, 70.

<sup>11</sup> Department of National Defence, “*Technology Investment Strategy 2002*,” (Ottawa: DND, 2001), 20.



and survivability both on the tactical battlefield and in peacekeeping operations. Primary tactical roles include early sensing and shaping of the battlespace...<sup>12</sup>

The modern militaries of the world are moving quickly to adopt robotics for many additional reasons, including conserving human manpower for more critical skilled tasks, reducing risks to human soldiers, and saving costs in the area of manned weapons platforms. This trend is noted in the following: “Certainly, in the area of nontraditional warfare, a primary interest is directed toward saving lives and costly resources. Robotic technology provides an opportunity to achieve this goal.”<sup>13</sup> The author goes on to say, “In an effort to conserve out fighting strength, every effort is being made to minimize exposure of troops to high-risk situations. All services are aggressively pursuing application for robots in their mission areas.”<sup>14</sup> The adoption of AW technology by the military is already well underway and will continue because of the many advantages of using AW.

One final forecast highlights the increasing role of AI and robotics on the battlefield and raises the possibility of robotic soldiers:

...high-technology battlefield warfare now resembles virtual-reality games, ever more intimate interfaces between human soldiers and artificially intelligent systems are being developed, and autonomous artificially intelligent ‘soldiers’ could soon be deployed just as unpiloted missiles have been for decades...<sup>15</sup>

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<sup>12</sup> Department of National Defence, [web page on-line]; available from [http://vcds.mil.ca/dgsp/pubs/rep-pub/analysis/tech/tech7\\_e.asp#5](http://vcds.mil.ca/dgsp/pubs/rep-pub/analysis/tech/tech7_e.asp#5); DND Intranet; accessed 6 Apr 04.

<sup>13</sup> William R. Schilling, *Nontraditional Warfare, Twenty-First-Century Threats and Responses*, (Dulles, Virginia: Brassey’s Inc., 2002), 308.

<sup>14</sup> Colonel John B. Alexander, *Winning...*, 75.

<sup>15</sup> Perri 6, “Ethics...”, 421.

It is clear that AW are no longer science fiction and the enabling technologies will very likely make them a reality within 20 years. The military trends of exploiting increased automation and robotics will continue due to the tremendous military advantages gained. These trends will culminate in the deployment of AW by the military and therefore a legal and moral analysis would be prudent.

The scope of the legal analysis was to consider the *jus in bello* (proper conduct of war) laws of the LOAC and apply them to the use of AW in warfare. A *jus ad bellum* (just war) context will be assumed. It will also be assumed that AW have no legal status as intelligent entities or persons. The LOAC concepts and principles considered most challenging to the use of AW are military necessity, humanity, the Law of Geneva, the Law of War, distinction and proportionality. Each of these topics will be discussed in turn with specific references to articles of the LOAC. Possible future legal developments will also be discussed briefly.

The concept of military necessity requires that the use of force is controlled, the use of force is militarily essential, and the use of force is limited to the amount needed to achieve prompt submission of the enemy.<sup>16</sup> The question of control is particularly sensitive since some perceive that an autonomous machine is out of human control. Individual soldiers who are out of communication with their superiors are not considered to be out of control, so a properly trained artificial intelligence should not be considered out of control either. An AW would most likely be more rule-bound and objective in its actions than its human counterpart, due to the restrictions built into its programming. The issue of limiting force can be controlled by human orders and programming. There may

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<sup>16</sup> Office of the Judge Advocate General, *The Law Of Armed Conflict At The Operational and Tactical Level*, Annotated, B-GG-005-027/AF-021, (Ottawa: DND, Sep 5, 2001), 2-1.

be great difficulty in recognizing the submission of the enemy, and therefore knowing when to stop applying force, for AW or humans. The problem for AW can be overcome both by rules in their programming and by human oversight of the military operation. It could be that AW will be more effective than humans at limiting the use of force by wounding combatants and taking them out of combat without killing them. In general terms, it appears that AW could meet the LOAC standards of military necessity.

The concept of humanity forbids the infliction of suffering, injury or destruction not required for military purposes, and requires proportionality and respect for the immunity of civilian populations.<sup>17</sup> To apply the concept of humanity, an AW would need to understand and recognize unnecessary suffering and damage. It should be possible to program AW with goals and objectives and the ability to determine what activities will contribute to those goals and objectives. Unless programmed to do otherwise, AW would not take actions to inflict suffering or damage if those actions would not contribute to this goal. AW, unless improperly programmed, would not be capable of intentional cruelty or retribution and would therefore meet the LOAC standards of humanity.

The principle of the Law of Geneva requires that persons rendered hors de combat (out of combat) and other non-combatants be respected, protected and treated humanely.<sup>18</sup> AW must be designed to recognize when an enemy combatant is no longer a legitimate target, whether due to surrender or injury, and to treat non-combatants humanely. While this is not an easy task, AW that are endowed with AI would be capable of the complex judgment required to respect the Law of Geneva.

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<sup>17</sup> Ibid, 2-1.

<sup>18</sup> Ibid, 2-2(10).

The principle of the Law of War (also called the Law of The Hague) declares that the means of warfare are not unlimited and that the use of unlawful weapons is prohibited.<sup>19</sup> Since AW have not yet been created and they do not fit into any category of weapons prohibited by the LOAC (such as biological weapons or blinding laser weapons), they cannot be directly judged unlawful weapons. However, there is an obligation under the Geneva Convention, Additional Protocol I, to determine whether a new weapon or means of warfare would be prohibited in any circumstances.<sup>20</sup> The informal legal analysis in this paper is a fir

The principle of proportionality requires that the collateral civilian damage arising from military operations must not “...be excessive in relation to the direct and concrete military advantage anticipated.”<sup>22</sup> Provided that the AW were designed to respond to orders and were fitted with the appropriate weapons for the mission, there would normally be no problem. The application of the principle of proportionality can be very subjective, however. AW would need to be able to compute the expected collateral damage and the military advantage obtained and then make a comparison. There is no reason to expect that the AI residing inside AW would be any worse at making this judgment than humans. Once again, it will be the controlling commander’s ultimate responsibility to ensure this principle is respected.

This brief survey of the LOAC has shown that in normal operations, AW should not violate any principle or article of the laws. However, in the real world things do not always go right. Human errors and other random factors would cause AW to malfunction or make mistakes on occasion. In those cases, the central legal question would be about accountability. As stated in an article about autonomous UCAVs, “The absence of human intervention during the weapons release process proves problematic following violations of the law of armed conflict.”<sup>23</sup> The article presents a scenario where a UCAV in autonomous mode mistakenly attacks friendly forces and then asks, “Would accountability lie with the civilian software programmers who wrote the faulty target identification software, the UCAV squadron’s Commanding Officer, or the Combatant

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<sup>22</sup> Ibid, Article 51(5)(b), 161.

<sup>23</sup> John J. Klein, “The Problematic Nexus: Where Unmanned Combat Air Vehicles and the Law of Armed Conflict Meet,” *Air & Space Power Chronicles*, (22 July 03), [journal on-line]; available from <http://www.airpower.maxwell.af.mil/airchronicles/cc/klein.html>; Internet; accessed 25 Sep 03, 5.

Commander who authorized the operational use of the UCAV?"<sup>24</sup> There is no easy answer. Before AW are deployed operationally, the legal accountability should be made clear for all possible circumstances.

It is possible that there will be future treaties that ban the use of AW and become part of the LOAC. However, that seems unlikely for two reasons. One reason is that the possession of AW will confer a tremendous military advantage and no nation would willingly give up such an advantage. It is more likely that the advanced nations that develop AW will use every means possible to prevent the proliferation of AW technology, in a similar way to the nuclear counter-proliferation efforts of today. The second reason is that the development of AW is a gradual evolution that is already underway. The steady but gradual increases in the automation of weapon systems, the use of robotics and the intelligence of machines will slowly increase the autonomous capabilities of weapon systems so that it will be impossible to determine exactly when the true AW have arrived. The gradual evolution and ubiquitous nature of the AW technology makes it very difficult to effectively oppose AW by treaty or other legal means.

There are currently no legal reasons foreseen that would prevent the development and deployment of AW. Military commanders are responsible for the use of AW in accordance with the LOAC. Commanders must control all soldiers and weapons under their command, no matter how autonomous they may be. Violations of the LOAC by AW are inevitable and the legal accountability must be determined in advance.

Now that AW have been established as probable and legal elements of the future battlefield, it remains to examine the moral issues. It will be assumed that moral

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<sup>24</sup> Ibid, 5.

responsibility cannot be ascribed to AW, in the same way that AW were assumed to have no legal status as intelligent entities or persons for the earlier legal discussion. It will also be assumed that, "...the risk of an evil is itself an evil", so that the creation of a potential for disaster itself carries moral responsibility.<sup>25</sup>

The moral issues raised by using AW will be examined with respect to three basic moral concepts: the common good, human rights and justice. Each of these concepts will be examined in turn, using a similar methodology to the one used by Douglas Lackey to analyze the morality of nuclear weapons policies.<sup>26</sup>

The first moral concept, the common good, considers the welfare of everyone and the interests of humanity as a whole. In situations where the welfare of two groups is mutually exclusive, then a substantial majority must determine the common good. Is the military use of AW good or bad for humanity?

There are many doomsday scenarios associated with AW technology. The killer robot scenario from the quote at the start of the paper is a good example. Two other common doomsday themes are the emergence of superintelligent machines that subjugate humanity, and uncontrolled, self-replicating "nanobots"<sup>27</sup> that have disastrous effects on the global biosphere.<sup>28 29</sup> All three of these doomsday scenarios are possible consequences of developing AW technology. However, the risk to humanity is inherent in the development of these AW technologies (which appears inevitable) and the use or non-use of AW by the military does not significantly change the risk.

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<sup>25</sup> Douglas P. Lackey, *Moral Principles and Nuclear Weapons*, (Totowa, New Jersey: Rowman & Allanheld, 1984), 26.

<sup>26</sup> Ibid, 3-9, 25-27.

<sup>27</sup> A nanobot is a microscopically small robot. It is a potential product of nanotechnology.

<sup>28</sup> Nick Bostrom, PhD, "Ethical Issues In Advanced Artificial Intelligence," (2003); available from <http://www.nickbostrom.com/ethics/ai.html>; Internet; accessed 1 April 2004.

<sup>29</sup> Colonel John B. Alexander, *Winning...*, 82.

It is possible that the use of AW by one military could start an arms race that threatens all of humanity. Even in the case of a “robot versus robot war” in which humans were mainly spectators, there would be an enormous waste of resources, and that would have a detrimental effect on humanity. However, arms races and the diversion of scarce resources to warfare have been a scourge on mankind for millennia. The military use of AW does not change the requirement for political decisions on the allocation of resources.

AW can be considered a part of the current Revolution in Military Affairs (RMA). One concern with the RMA (and by association AW) is that, “...the RMA, as an instrument of Western power, may persuade some countries to retain or expand WMD capabilities as potential asymmetric responses in the event of attack by a country using RMA capabilities.”<sup>30</sup> It is possible that nations unable to match military technologies such as AW will increasingly resort to Weapons of Mass Destruction (WMD). However, it cannot be argued that AW use will inevitably lead to increased use of WMD – disparities in military capabilities have existed as long as warfare itself. In any case, a military disadvantage can never justify the use of weapons banned by the LOAC.

If one accepts that AW technology is inevitable, the moral decision for the common good becomes similar to the one concerning nuclear technology and nuclear weapons. It is possible to use nuclear technology without developing nuclear weapons – Canada is one example of a nation taking this approach. However, Canada enjoys a uniquely secure geopolitical situation and this policy might be unwise if Canada were undefended by allies and threatened by a nuclear power. If all the technologically

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<sup>30</sup> Joel J. Sokolsky, *The Revolution in Military Affairs and the Future of Arms Control and Verification*, (Ottawa: Dept of Foreign Affairs and International Trade, 2001), 43.



advanced Western nations abstained from deploying AW, eventually rogue nations or terrorist organizations would deploy AW and exploit their military advantage to the detriment of freedom and human rights. It would be better for the common good to have AW under the control of Western democracies that respect human rights and the rule of law, and have strong accountability structures for the use of military force. In this way, Western nations would not lose military superiority in the world and could protect security and human rights for all. The greater risk of harm to the common good lies with failing to develop AW in the Western world and therefore Western militaries ought to develop and deploy AW.

The second moral concept is human rights, which includes the rights to life, liberty and the pursuit of happiness. Other rights or preferences cannot overrule human rights; there is no majority rule in the case of rights. Human rights can be waived as in the case of a voluntary combatant in warfare who has waived his right to life (some conditions still apply!). Human rights also have the quality that they can be enforced, provided a greater human right is not violated by so doing.<sup>31</sup> Is it a violation of a combatant's human rights to be detected, targeted and killed by AW?

The idea of people being killed by an autonomous machine seems to hold a special dread. It is not clear why a machine that kills should be more horrific than a trained dog or a man that kills. Yet in considering moral questions, the "gut feeling" that something feels wrong is usually a good indicator that something is morally uncertain. From the perspective of human rights, the main consideration is in treating the adversary as a human being; in other words, respecting his humanity.

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<sup>31</sup> Douglas P. Lackey, *Moral...*, 5-6.

It has always been difficult for a soldier to kill an enemy soldier (unless he is a sociopath). This is the normal human response and the normal human moral inhibition – killing is wrong. Killing has become easier in modern warfare because it is done at great distances:

But, in modern war especially, most of the killing is literally done at a distance, by bombing, shelling, guided missiles and the like...the distancing is psychologically necessary; those who are engaged in the activity of killing would find it much more difficult to do it face to face...To overcome these moral inhibitions it is necessary to resort to the kind of distancing which blinds killers to the humanity of the killed.<sup>32</sup>

It may be that the moral outrage people feel at AW killing people is related to the distancing of the killer from the victim, the depersonalization of the victim. If a targeted person is depersonalized, it could be argued that his humanity is not recognized and his human rights are therefore violated. The problem with this argument is in deciding at what range of standoff weapon, or at what level of weapon system automation, human rights are violated. Norman has noted that, “The contrast between treating human beings as persons and treating them as things is...a matter of degree, and in war in particular there is a continuum of degrees of depersonalization”.<sup>33</sup> The only moral difference between killing with a bayonet, a pistol, a sniper’s rifle, an artillery shell, a long-range cruise missile or AW is in the degree of depersonalization. There is no moral difference in the *type* of the killing acts; the acts are all morally equal, whether they are right or wrong.

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<sup>32</sup> Richard J. Norman, *Ethics, killing and war*, (New York, NY: Cambridge University Press, 1995), 182-3.

<sup>33</sup> *Ibid*, 177.

The reality is that wars will continue to be fought and people will continue to be killed. It is not realistic to expect that nations will forego weapons that give them a military advantage. Since there is no moral difference between killing with modern weapons and killing with AW, it follows that the use of AW is morally neutral with respect to human rights.

The third and final moral concept is justice. The concept of justice is very similar to the idea of fairness. Fairness can be described as a proportionate sharing of the burdens and benefits of a given situation. For example, those who bear the burden of working at a job should share in the benefits of their work (i.e. they should be paid). Many of the standard immoralities, such as cheating and deceit, are offenses against justice. Another aspect of justice is the idea of consistency in applying rules to all equally. These are the concepts of justice that will be applied to the use of AW.<sup>34</sup>

Assuming that the combatants have accepted the risks of the battlefield, is justice served or offended by pitting machines against people? At first blush, there would seem to be little justice for the soldier facing AW that are faster and stronger, and feel no fatigue, hunger, pain or fear. But there is no expectation of “fair play” on the battlefield; no requirement to deploy only evenly matched adversaries. In an ethical discussion of autonomous artificially intelligent machines gone awry on the battlefield, it was observed that:

To be killed...where any appeal for mercy is even less likely to have any effect than upon a group of brutal human soldiers, may not amount to a worse actual harm in the medical quality of death, but the reduction

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<sup>34</sup> Douglas P. Lackey, *Moral...*, 7.

in the chance of escaping death seems, to a certain sense of fairness in each of us...somehow morally more offensive.<sup>35</sup>

The above example is contrived since it deals with an autonomous entity that has overridden its basic programming and is on a murderous rampage. It also assumes that AW would show less mercy, or less acceptance of surrender, than a human soldier, and that is not necessarily true. This type of failure of AW could conceivably happen, but is it morally worse than killing by a group of brutal human soldiers? In the case of a missile launched from miles away, do the victims on the ground care whether it was launched by a human or by an intelligent machine? The same author who found robots gone berserk morally offensive also wrote about civilians caught between two armies:

The fact that instead of being shot by brutalized infantry or bombed by ruthless air pilots or blown up by ‘smart’ laser-guided missiles dispatched from launchers thousands of miles away, they are destroyed by autonomous artificially intelligent machines seems irrelevant.<sup>36</sup>

The moral argument about justice now seems similar to the argument about human rights – there is no moral difference between using different types of legal weapons. However, this discussion does indicate that a predetermined moral accountability framework is advisable to prepare for any AW breach of the LOAC.

Overall, technology is morally neutral with respect to justice. It is the employment of the technology that determines the justice of the act or situation. In the case of AW used in warfare, justice is served provided the LOAC is respected.

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<sup>35</sup> Perri 6, “Ethics...”, 425.

<sup>36</sup> Ibid, 424.

The morality of employing AW in warfare was examined using the three moral concepts of the common good, human rights and justice. It was found that using AW was morally no better and no worse than using other modern weapon systems with respect to human rights and justice. With respect to the common good, it was determined that the risks to humanity would be less if free and democratic countries developed and deployed AW rather than wait for the inevitable use of AW by rogue regimes or terrorists. However, there remain concerns about moral accountability in cases where AW fail to respect the LOAC. For this reason, AW will need to be strictly controlled to avoid the backlash of international public opinion.

It has been established that AW will become very powerful legal weapons on the future battlefield. Canada has a small but modern military and cannot afford to pass up the many advantages of AW as a force multiplier – to do so would further decrease the military relevance of the CF in the world. Should the CF abstain from AW development, it would sustain higher casualties and provide reduced security for all Canadians. Canada cannot afford to rely on allies to guarantee its security and help protect the common good of mankind. As a free and democratic country with an impeccable international reputation, Canada would be trusted to use AW wisely for the common good. DND has a moral obligation to defend Canadians and Canadian values and therefore must take the morally correct action of developing and deploying AW.

Autonomous weapons of many types will appear on the battlefield within 20 years, enabled by the advancing technologies of military weaponry, robotics and artificial intelligence. Military weaponry and robotics are already sufficiently developed to support AW, and AI is being advanced by the continued exponential growth of

computing power. The military will continue to increase its use of AI and robotics technologies because of their military advantages such as reduced risk and cost, increased efficiency and lethality, and many others. These trends will inevitably lead to the deployment of AW by the military, raising legal and moral questions.

The LOAC concepts and principles of military necessity, humanity, the Law of Geneva, the Law of War, distinction and proportionality were considered with respect to the use of AW. While AW are predicted to have some of the same difficulties as human soldiers in ambiguous battlefield situations, there is no reason to expect that AW would make worse decisions than humans. In fact, with AI, an almost unlimited database and many sensors, AW might make better decisions than humans. It should be possible to design AW that can fully comply with the LOAC.

Future treaties banning the use of AW are not likely because nations will not easily give up their military advantages and because the introduction of AW will be gradual. Military commanders remain responsible for the controlled application of military force and must ensure positive control over all AW. Violations of the LOAC by AW are possible and the legal accountability must be determined in advance. In summary, there are currently no legal reasons foreseen that would prevent the development and deployment of AW by the military.

The moral analysis determined that the technologically advanced democratic nations of the West are morally obligated to develop and deploy AW for the common good of mankind. The risk to the common good would be greater if Western nations abdicated their military advantage by refraining from using AW and allowing other less free and democratic regimes to use them first. From the perspective of human rights and

justice, the use of AW is morally equal to the use of other modern weapons and is therefore morally neutral. Even though the deployment of AW would be morally right overall, AW would need to be strictly controlled to allay concerns about moral accountability in cases of AW malfunction.

DND has a moral obligation to defend Canada and Canadian values, and AW will be essential to maintaining that defensive capability. There are no legal barriers to the military use of AW on the battlefield, and there is a moral imperative for free and democratic nations to control AW for the common good of mankind. Therefore, the only moral course of action for DND is to develop and deploy autonomous weapons.

Military establishments that best anticipated change have generally been the most successful in war. By contrast, those that failed to foresee the future, and remained complacent and static, have often been surprised and defeated.<sup>37</sup>

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<sup>37</sup> Richard L. Kluger, “Conventional Operations and Warfare: A New Era Ahead?” in *Strategic Assessment 1999: Priorities for a Turbulent World*, (Washington D.C.: Institute for National Security Studies, National Defense University, 1999), 261.

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