

Risks and Robots – some ethical issues

Peter Olsthoorn

Lambèr Royakkers

Netherlands Defense Academy,
P.O. Box 90002, 4800 PA Breda,
The Netherlands

PHJ.Olsthoorn.01@nlda.nl, LMM.Royakkers@nlda.nl
telephone 0031765273822

Introduction

In World War II the Japanese navy equipped some of their submarines with the Kaiten, a manned torpedo offering no chances of survival for its pilot; he was sacrificed for a rather modest increase in accuracy. Today, we see what is essentially the opposite development: unmanned vehicles such as PackBots from iRobot, Talons from Foster-Miller and, the latter's armed version, SWORDS (all on land), Israel's Hermes and the US's Predators and Reapers (in the air), make it possible to engage the enemy from a very safe distance – the pilots of Predators and Reapers, for instance, although wearing flight suits, do so without leaving their cubicle in Nevada (Singer 2009: 329).

While in many countries the use of unmanned systems is still in its infancy, as for instance is the case in the Netherlands, other countries, most notably Israel, South-Korea, and the US, are much ahead. To illustrate, in 2009 more than 17,000 military robots were active in the US military (Singer 2009 and Krishnan 2009). Most of these robots are unarmed, and are mainly used for reconnaissance and clearing improvised explosive devices. However, over the last years the deployment of armed military robots is also on the increase, especially in the air. Developments in this area seem to go considerably quicker than those in what is essentially its reverse image: the development of non-lethal weapons that are designed to avoid casualties among the local population as much as possible. What's more, as a result of a lot of money and effort spent Western militaries seem to get better at this killing without getting killed than they already were.

This use of unmanned systems, although reducing the risks for military personnel involved to about zero, is, on first sight at least, not *very* different (as long as there is “a

human in the loop” that is) from using an aircraft to drop a bomb from a high altitude. It in fact seems to be part of a larger, and older, trend: civilian casualties among the local population are, in general, deemed less important than Western military casualties (Shaw 2005: 79-88; see also Olsthoorn 2010)). It is perceived that way by both politicians and the populations at large in the West, hence the emphasis on relatively safe ways of delivering firepower, such as artillery and high-flying bombers. This reduction in risk for own military personnel, by the use of UAV’s and otherwise, raises some questions, though.

The role of emotions

To begin with the credit side: unmanned systems (especially autonomous ones where the man is removed from the loop)¹ are immune to frustration, boredom, and anger. This might make unethical conduct less likely to happen, seeing that these emotions amount to an important factor in its occurrence. For instance, a survey done by the US Army Surgeon General’s Office showed that troops who were angry, anxious, had unit members become a casualty, or who had handled dead bodies or human remains were more likely to say they had mistreated civilian non-combatants (Mental Health Advisory Team 2006: 38-41).² And since unmanned systems have no instinct of self-preservation they are able to hold their fire in ambiguous situations (for instance, in the case of a land-based system, at a checkpoint). The fact that using such systems distances soldiers from direct physical contact with some of the sources of the emotional stress inherent to warfare might therefore have important advantages. As the authors of a report on autonomous military robots, written for the US Navy, put it: unmanned systems are “unaffected by the emotions, adrenaline, and stress that cause soldiers to

¹ An UAV in fact already qualifies as an autonomous system insofar as it navigates by itself to its (given) destination, as Reapers and Predators do. However, an armed UAV does not function as an autonomous system when it uses its weapons; by that moment a human has taken over again and the UAV in fact functions as a remote controlled weapon. The use of the term robots for autonomous systems is widespread, yet as a criterion for a robot autonomy is tricky. A cruise missile, for instance, navigates *and* explodes without human intervention, while land mines and many IED’s are pretty autonomous too (see also Hellström 2010). We do not call them robots though, probably because of the straightforwardness of what they are doing. A close-in weapon system (CIWS), for instance ship-mounted systems such as the US Phalanx and Dutch Goalkeeper, is more complex and makes a “decision” to engage an incoming missile by itself (following criteria installed by humans, of course), and come closer to qualifying as a robot.

² For example, less than half of soldiers and marines serving in Iraq said that non-combatants should be treated with dignity and respect, and seventeen per cent even held that all civilians should be treated as insurgents (Mental Health Advisory Team 2006: 35). Moreover, fewer than half of the soldiers would report a colleague for unethical battlefield behaviour (ibid. 37).

overreact or deliberately overstep the Rules of Engagement and commit atrocities, that is to say, war crimes” (Lin, Bekey, and Abney 2008: 1). The authors continue their optimistic note by expressing the hope that because of robots they “would no longer read (as many) news reports about our own soldiers brutalizing enemy combatants or foreign civilians to avenge the deaths of their brothers in arms—unlawful actions that carry a significant political cost. Indeed, robots may act as objective, unblinking observers on the battlefield, reporting any unethical behavior back to command; their mere presence as such would discourage all-too-human atrocities in the first place” (ibid.). Notwithstanding this optimism, there are some drawbacks too.

Although fighting from behind a computer is not as emotionally potent as being on the battlefield, pushing a button to kill someone can still be a stressful job; various studies have reported physical and emotional fatigue and increased tensions in the private lives of military personnel operating the Predators in Iraq and Afghanistan (Donnelly 2005; Kaplan 2006). First of all, these human operators, or “cubicle warriors,” computer operators who remotely control armed military robots, can be emotionally and psychologically affected by the things they see on screen. For example, a drone pilot may witness war crimes yet find himself in a situation in which he is helpless to prevent it, or he may see how civilians are killed by his own actions. Seeing the rising civilian death toll as a result of the use of UAV’s (see also below), this is not an entirely hypothetical situation. A second factor that increases stress is the fact that the use of remote controlled military robotics causes operators to live in two worlds at the same time: a “normal” life in the civilian world, and a virtual life of combat. As a result, these warriors constantly experience radical shifts in contexts: from battlefield to private family life. As one of them describes it: “You are going to war for 12 hours, shooting weapons at targets, directing kills on enemy combatants and then you get in the car, drive home and within 20 minutes you are sitting at the dinner table talking to your kids about their homework” (Horton 2009).

This problem of “residual stress” of cubicle warriors has led to proposals to diminish these tensions. In particular, the visual interface can play an important role in reducing stress; interfaces that only show abstract and indirect images of the battlefield will probably cause less stress than the more advanced real images (Singer 2009). From a technical perspective this proposal is a feasible one, since it will not be hard to digitally recode the war scene in such a way that it induces less moral discomfort with the war operator. Such “photo shopping” of the war, however, raises some serious ethical issues by itself.

Dehumanization

The last observation brings us indeed to a somewhat related point: the social psychologist Albert Bandura (1999) pointed to the important role of dehumanization, i.e., seeing people for something less than humans, in making unethical conduct more likely to occur. Showing abstract images would in fact dehumanize the enemy, and as a result would desensitize military personnel operating unmanned systems even further. In this case, it is no longer the real war that is numbing the soldier, but the digital recoding of that war. The depersonalization of war can even go as far that the he would no longer be aware of the fact that he is actually involved in a real war. In the current situation it can already be hard to distinguish between a video war game and operating a drone. From a technological perspective it is only a minor step to let him think he is playing a computer game, and destroying enemy “avatars,” while he is actually killing real people at the other side of the globe. From a moral point of view this would mean that soldier gets detached, both physically and emotionally, from his actions even further than at present is the case (see also Royakkers and Van Est 2010).

The consequence of this disengagement is that the decision of a soldier is not the result of moral reflection, but is mainly determined or even enforced by a military robot. In other words, the decisions of soldiers are not made in complete freedom, and military personnel may come to over rely on military robots (Cumming 2006). This is bound to happen more often in the future; at present, the soldier *controls* the situation, i.e., he provides or assigns tasks or brings changes and verifies the robot’s execution to meet the requirements, while his future role may be restricted to *monitoring*, meaning that the cubicle warrior keeps an eye on the process and only interferes if something goes wrong. This may have consequences for his *locus of control*, a term from psychology which refers to the extent to which individuals believe that they can control outcomes. Treviño and Youngblood (1990) have argued that there is a link between the locus of control and moral decision-making; those who see a clear connection between their own behaviour and its outcomes are more likely to accept responsibility for that behaviour (see also Levenson 1981; Rotter 1966). Conversely, people who believe that they have little personal control in certain situations – such as monitoring – are more likely to go along with rules, decisions and situations even if they are unethical or have harmful effects (Detert et al. 2008).

The most effective remedy for who wants to prevent unethical conduct consists of “humanization,” a not so clearly defined concept that, however, includes the affirmation of common humanity, instead of distancing oneself “from others or divesting them from human

qualities” (Bandura 1999: 202-3). Or, as Hugo Slim put it in his *Killing Civilians*, to be effective civilian immunity “requires that armed people find a fundamental *identification* with those called civilians and not an excessive *distinction* from them” (2007: 34). Seeing people primarily as members of an enemy group is probably easiest “from an air force bomber or a computer screen that is miles away from the individuals one is killing” (ibid. 175). It is, indeed, rather hard to imagine how one can respect the local population, a vital element of the hearts and minds approach, from, for instance, a control room in Nevada (where the pilots of Predators and Reapers mostly work from). As was famously shown by the well-known Milgram experiments on obedience, it is difficult to be cruel, or just indifferent, as long as the other has a face. At a time that unmanned aerial vehicles take out insurgents from afar, with at the remotest in Qatar someone who thinks that his job is “like a video game. It can get a little bloodthirsty. But it’s fucking cool” (Singer 2009: 332), that face is most probably not always there. With such a distance – physical, but also psychological – between a soldier and the horrors of war, it has to be feared that killing might get a bit easier (see also ibid. 395-6; Sparrow 2009: 179).

Civilian casualties

This brings us to the matter of collateral damage. On the credit side: an UAV can, because it is unmanned (and cheap compared to manned aircraft) fly low and slow, something that should make mistakes less likely to happen. However, this capability has not prevented that in reality the use of the American Predator and Reaper, and Israel’s Hermes has in recent years taken many innocent lives in Pakistan, Afghanistan, and Gaza. In Pakistan, for instance, on January 13, 2006 18 villagers died in an attempt to kill Ayman al-Zawahiri. In the three years that followed 60 drone attacks killed 14 Taliban leaders, but local authorities in Pakistan claim that near the Afghan border drone strikes on Al Qaeda and affiliate targets have killed at least 687 civilians (Mir 2009; Ghosh and Thompson 2009). At the same time, the use of unmanned systems increases the asymmetry, and thus “forces” opponents to make use of asymmetric methods such as terrorism; waging war with an army of undefeatable robots makes the civilian population of the nation that deploys that army a likely, though not legitimate, target.

Aside from the evident fact that reducing the risks for Western soldiers in ways that increase the chances of civilian casualties among the local population stands in rather stark contrast to the universalistic ambitions behind most of today’s military interventions, there is an argument based on expedience against this risk transfer too. According to a recent report of

the Human Rights Watch on civilian casualties in Afghanistan, taking “tactical measures to reduce civilian deaths may at times put combatants at greater risk,” yet is a prerequisite for maintaining the support of the local population (2008: 5), which in its turn is something the mission in Afghanistan depends on. Clearly, a mounting civilian death toll is something that might very well strengthen the resentment against the West and makes recruitment easier for both the insurgency and the terrorist groups the coalition troops are trying to fight; Baitullah Mehsud, the Pashtun commander of the Pakistani Taliban, claimed that each drone attack “brings him three or four suicide bombers” (Ghosh and Thompson 2009), mainly found among the families of the drones’ victims. It is an effective method, though: Mehsud was killed by an UAV in August 2009.

Responsibility

Who is responsible for these civilian casualties (and other bad effects) is not always clear if the person who selects the target is not the one who pulls the trigger (or pushes the button), while the rules and procedures followed have been devised by a third person (see also Sparrow 2009: 178) – responsibility is one of the more underemphasized aspects of the use of unmanned systems concerns. According to Robert Sparrow, a fundamental condition of fighting a just war is that someone may be held responsible for civilian deaths in the course of it, and that this condition is one of the requirements of *jus in bello*:

The assumption and/or allocation of responsibility is also vital in order for the principles of *jus in bello* to take hold at all. The principle of discrimination, for instance, which requires that combatants distinguish between legitimate and illegitimate targets, assumes that we can specify who is responsible for attacks that may violate it. More generally, application of the principles of *jus in bello* requires that we can identify the persons responsible for the actions that these principles are intended to govern (2007).

This is basically the problem of the many hands – an old problem that has gotten a new relevance with the emergence of unmanned systems. More problematic even will be the attribution of responsibility in the case of learning military robots or fully autonomous military robots, which are able to decide on a course of action and to act without human intervention (South-Korea already has autonomous robots, stationary but armed with a derivative of the FN Minimi, guarding the border with North Korea; the US expects to operate

autonomous robots in 2035). In that case the programmer is added to the list of people possibly responsible (and there might be a lot of programmers involved as a complicated system has programs consisting of millions of lines of code written by teams of programmers instead of individuals). What's more, the rules by which such systems operate will not be fixed during the production process, but can be changed during the operation of the robot, by the robot itself (Matthias 2004). In that case it is no longer the soldier, but a military robot that takes the decisions, which would imply that we cannot hold a soldier reasonably responsible for his decisions anymore since he has no real control over the outcomes.

So, the problem with these robots is that they will bring about a class of actions for which no one can reasonably be held responsible, since no-one has sufficient *control* over the actions of these robots, and because no one is capable of predicting the future behaviour of these robots any more. The control then transfers to the robot itself. Some might therefore hold that in the end we will have to hold the robot responsible (see for instance Hellström 2010), but that seems not the best of ideas for more than one reason. To name one: the military robots that will be built in the next two decades do not possess anything like intentionality or a real capability for agency.³ The deployment of learning armed military robots will therefore constitute a *responsibility gap* (Matthias 2004). This gap cannot be bridged without violation the jus in bello principles, meaning that it will be unethical to use these military robots in the battlefield, since it would be injustice of holding men responsible for actions of robots over which they could not have control. This difficulty with the attribution of responsibility is morally problematic for at least two reasons.

The first reason is that many people, especially victims and the general public, but often also members of the military community, will find it morally unsatisfactory if, for instance, there is no one to be held responsible in case innocent civilians get killed. Of course, this search for somebody to blame may be misperceived, but at least in situations with civilian casualties it seems reasonable to say that somebody should bear responsibility. The second reason is the wish to learn from mistakes, to do better in the future and to achieve a certain result (Van de Poel and Royakkers 2011). If no one can be held responsible, this is less likely to take place. This matter of unclear responsibility has another downside: the already mentioned Bandura counts the displacement and diffusion of responsibility among the “many

³ Although we can state that the robot is causally responsible, but the robot is off the hook regarding moral responsibility. Some authors claim that fully autonomous robots can be considered as moral agents (Dennet 1996), but this discussion is beyond the scope of this article: we are looking towards *humans* for culpability for any ethical errors the robot makes in the lethal application of force.

social and psychological manoeuvres by which moral self-sanctions can be disengaged from inhumane conduct” (1999: 194).

Just war theory

The issue of responsibility brings us, briefly, to the related issue how the use of unmanned systems and, more in general, ways of delivering firepower that reduces risks for own military personnel at the possible expense of the local population, relates to the theory of just war. The introduction of military robots, transforming the battlefield into a computer laboratory to some extent, has already changed military missions considerably, and will continue to do so in the coming years. These changes are not, as some assume, simply cosmetic; the introduction of unmanned systems has implications for just war theory that are not always recognised. This might lead the militaries to “turn back to just war theorists for answers” (Orend 2006), while these answers might not necessarily apply to the current situation.

For instance, the ability to wage a war risk free might have the effect of lowering the price of going to war (Sparrow 2007). Without UAV’s the current “war” in northern Pakistan, for instance, would have been much smaller, if existent at all (if only because Pakistan would not have allowed manned aircraft in there skies). While this mainly touches upon war’s designated role as “a last resort,” one of the criteria of *jus ad bellum*, there are also implications of the use of UAV’s for *jus in bello*. Although the risk-transfer by means of UAV’s (or otherwise) will generally remain within the limits of the “double effect” clause of the just war tradition in that civilian casualties are an unintended (and proportional) side-effect of legitimate attacks on military targets. It possibly falls short, however, in light of Walzer’s restatement of that clause holding that soldiers have a further “obligation to attend to the rights of civilians” (1992: 155), and that “due care” should be taken. Especially since it is not enough for a soldier to make efforts to avoid civilian casualties as much as possible; he, writes Walzer, has to do this “accepting costs to himself” (*ibid.*). This adds up to what Walzer calls the idea of double intention, with the first intention being that it is the intention to hit the target and not something else, while the second intention consists of two rather separate aspects: 1) efforts should be made to reduce the number of civilian casualties; 2) when needed at increased risk to oneself. It is of course the second aspect that is rather demanding, and it is precisely because it is demanding that we want to see it: we tend to “look for a sign of a positive commitment to save civilian lives” that says that “if saving civilian lives means risking soldiers’ lives, the risk must be accepted” (1992: 156).

Of course, one could argue the contrary, as Lin, Bekey, and Abney do, emphasizing the fact that the use of UAV's can be seen as the extra precaution Walzers seems to ask for in the first term (make efforts to avoid civilian casualties) of his idea of double intention (2009: 52-53). Most, however, will see the use of UAV's as falling short in meeting the demand in the second term as it boils down to a clear refusal to accept costs to oneself.⁴ It seems, all things considered, best to stay on the safe side; as one report states, "until and unless military robots are capable of having a risk of collateral damage on parity with (or better than) human soldiers, there will be serious moral qualms in deploying them under generally accepted *jus in bello* restrictions" (Lin, Bekey, and Abney 2008: 68).

Conclusion - Consequences for the military profession

Walzer's remarks bring us to the fact that running no risks and running a limited risk are not the same. This might, first of all, have consequences for (the image of the) military profession too. In earlier days, bows, catapults, and firearms have already been vilified for being the weapon of choice of cowards, yet it seems that robots push things even a bit further by doing away with risk altogether – which raises the interesting question to what extent risk is fundamental to the military profession, and whether the elimination of risk will change it. Now, some see mainly advantages in this development: "I never, ever want to see a Sailor or a Marine in a fair fight. I always want them to have the advantage," the US Admiral Roughead said following the demonstration of the Rail Gun with a range of over 200 miles.⁵ One could imagine, on the other hand, that the profession becomes a less honorable one, as honor involves acting against one's own well-being to further a higher interest. As one author formulated it:

For men to join in battle is generally thought to be honorable, but not if they are so situated as to be able to kill others without exposing themselves to danger whatever.

⁴ The use of ground troops or low flying manned aircraft would amount to a sufficient indication of the acceptance of costs to oneself, and thus of a good intention, but if that would in fact pose a greater risk to the local population than the use of UAV's one might ask what the point is, as it would boil down to accepting higher risks to oneself *and* the local population just to prove your good intention. Walzer's emphasis on "accepting cost to oneself," stemming from his wish to see proof of a good intention, passes by the fact that it is sometimes possible to reduce the risk to the local population *without* increasing the risk to Western military personnel.

⁵ See <http://www.globalsecurity.org/military/library/news/2008/02/mil-080201-nns04.htm>.

On the contrary, the willingness to risk one's life – it could be in an act of passive resistance – comes as the test of honor we most often hear invoked (Welsh 2008: 4).

Journalists Ghosh and Thompson from *Time* described how in Waziristan, the region in Pakistan that has seen a lot of drone attacks on Taliban leaders, the use of unmanned aircraft is certainly seen as dishonorable and cowardly (2009). Although that latter fact is understandably not a big concern to many, it seems nonetheless somewhat ironic that iRobot, a leading manufacturer of robots, named its latest creation for the military “Warrior” – which, incidentally, will also be the name of the upgraded Predator (the name Reaper for the Predator's bigger brother, a drone especially designed as a “hunter-killer,” seems more adequate). Even so, after initial reluctance possibly due to the perceived dishonorableness of their use, militaries have now embraced the use of robots (Singer 2009: 216-7) – just as bows and catapults in the earlier days.

To stay with the catapult: Niccolò Machiavelli held that in war nothing ever really changes, and hence thought that the invention of the firearm amounted to nothing more than just a new variety of the age-old catapult. It is tempting to think likewise about the use of unmanned systems, i.e. as a development that does not really raise issues different from those raised a long time ago by artillery, and more recently by highflying bombers. And in part, there is something to be said for this view. On the other hand: Machiavelli was, of course, wrong; the invention of the firearm proved as crucial for warfare as the spread of the stirrup some thousand years before. Possibly, the use of unmanned systems will prove to be equally significant, especially since the development of these systems has only just begun. That, for instance, the future will hold autonomous systems – i.e., without the man in the loop mentioned in the introduction – seems almost a given and will raise a host of ethical issues that are truly new, especially concerning the question who can be held responsible.

References

- Bandura, A. (1999) Moral disengagement in the perpetration of inhumanities, *Personality and Social Psychology Review*, 3(3), pp. 193-209.
- Challans, T. L. (2007) *Awakening Warrior: Revolution in the Ethics of Warfare* (Albany: State University of New York Press).
- Cook, M. L. (2004) *The Moral Warrior: Ethics and Service in the U.S. Military* (Albany: State University of New York Press).
- Cumming, M.L. (2006) Automation and accountability in decision support system

- interface design, *Journal of Technology Studies*, 32(1), 23-31.
- Detert, J.R., L.K. Treviño and V.L. Sweitzer (2008) Moral disengagement in ethical decision making: A study of antecedents and outcomes, *Journal of Applied Psychology*, 93(2), 374-391.
- Donnelly, S.B. (2005) Long-Distance Warriors, *Time Magazine*, 4 December.
- Ghosh and Thompson (2009) The CIA's Silent War in Pakistan, *Time*, 1 June.
- Hellström, T. (2010) Terminator Ethics. What's right and wrong for battlefield robots? (draft). Available at <http://www8.cs.umu.se/~thomash/reports/Terminator%20ethics%20DRAFT.pdf>.
- Human Rights Watch (2008) "*Troops in Contact*": *Airstrikes and Civilian Deaths in Afghanistan* (New York: Human Rights Watch).
- Horton, S. (2009) Prepare for the Robot Wars: Six Questions for P.W. Singer, Author of *Wired for War*, *Harper's Magazine*, www.harpers.org/archive/2009/01/hbc-90004275.
- Kaplan, R.D. (2006) Hunting the taliban in Las Vegas, *Atlantic Monthly* 4, August.
- Krishnan, A. (2009) *Killer Robots. Legality and Ethicality of Autonomous Weapons* (Farnham: Ashgate Publishing Limited).
- Levenson, H. (1981) Differentiating among Internality, Powerful Others, and Chance. In: H.M. Lefcourt (ed.) *Research with the Locus of Control Construct: Vol 1. Assessment Methods* (New York: Academic Press), pp. 15-63.
- Lin, P., G. Bekey, and K. Abney (2008), *Autonomous Military Robotics: Risk, Ethics, and Design* (San Luis Obispo: California Polytechnic State University).
- Matthias, A. (2004) The responsibility gap: Ascribing responsibility for the actions of learning automata, *Ethics and Information Technology* 6, pp. 175-183.
- Mir, A. (2009) 60 drone hits kill 14 al-Qaeda men, 687 civilians, *The News*, http://www.thenews.com.pk/top_story_detail.asp?Id=21440.
- Olsthoorn, P. (2010) *Military ethics and virtues: An interdisciplinary approach for the 21st century* (London: Routledge).
- Orend, B. (2006) *The Morality of War* (Orchard Park, N.Y.: Broadview Press).
- Rotter, J.B. (1966) Generalized expectancies for internal versus external control of Reinforcement, *Psychological Monographs: General and Applied* 80, 1-28.
- Royakkers, L.M.M. and Q. van Est (2010) The cubicle warrior: The marionette of digitalized warfare, *Ethics and Information Technology* 12, 289-296.
- Shaw, M. (2005) *The New Western Way of War* (Cambridge: Polity Press).

- Singer, P. W. (2009) *Wired For War: The Robotics Revolution and Conflict in the Twenty-First Century* (New York: Penguin Books).
- Slim, H. (2007) *Killing Civilians: Method, Madness and Morality in War* (London: Hurst & Company).
- Sparrow, R. (2007) Killer robots, *Journal of Applied Philosophy*, (24)1, pp. 62-77.
- Sparrow R. (2009) Building a better warbot: ethical issues in the design of unmanned systems for military applications, *Science and Engineering Ethics*, 15(2), pp. 169-87.
- Treviño, L.K. and S.A. Youngblood (1990) Bad apples in bad barrels: A causal analysis of ethical decision-making behaviour, *Journal of Applied Psychology* 74, pp. 378-385.
- US Army Surgeon General's Office (2006). Mental Health Advisory Team (MHAT) IV: Operation Iraqi Freedom 05-07 Final Report, November 17, 2006.
www.globalpolicy.org/security/issues/iraq/attack/consequences/2006/1117mhatreport.pdf.
- Van de Poel, I.R. and L.M.M. Royakkers (2011). *Ethics, Engineering and Technology* (Oxford: Blackwell).
- Walzer, M. (1992) *Just and Unjust Wars* (New York: Basic Books).
- Walzer, M. (2009) Responsibility and Proportionality in State and Nonstate Wars, *Parameters: US Army War College Quarterly*, (39)1.