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# Applying the Rules of Just War Theory to Engineers in the Arms Industry

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**Key Words:** Engineering Ethics, Just War Theory

**ABSTRACT:** *Given the close relationship between the modern arms industry and the military, engineers and other professionals who work in the arms industry should be held accountable to the principles of just war theory. While they do not deploy weapons on the battlefield and are not in the military chain of command, technical professionals nonetheless have a moral duty to abide by principles of jus ad bellum and jus in bello. They are morally responsible both for choosing the companies that employ them (and to whom these companies sell arms) and as well as what types of arms they develop.*

While there has been a great deal of discussion about the changes that America's new war on terrorism will bring on the nature and morality of warfare, there are a number of lingering issues from the previous global conflict: the cold war rivalry between the United States and its now vanquished rival, the Soviet Union. One consequence of the last war which has gone without much comment from professional military ethicists,<sup>a</sup> is the formation of a large-scale, permanent military industry designed to support American and foreign militaries.<sup>b</sup> The budget of the US Department of Defense for the 2004 fiscal year was approximately 400 billion dollars. It dwarfs almost any other expenditure by the federal government, including \$68.7 billion in procurement alone (even in a time of massive budget deficits, the procurement budget increased by \$6.7 billion in 2003 dollars from the preceding year.)<sup>2</sup> Arms manufacturers in the United States, largely comprised of engineers and other highly trained technicians, supply

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a. One exception is the work of Nicholas Fotion and Gerard Elfstrom.<sup>1</sup>

b. I will use the term "arms industry" throughout this paper (as opposed to the more common "defense industry") in acknowledgement of the fact that a number of weapons (specifically those sold overseas) are not used for defensive purposes. This is not meant as a pejorative assertion, but merely a factual one.

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Paper received, 11 December 2004; revised, 22 February 2006; accepted, 19 October 2006.

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arms, training, support and technology not only to the American military, but also to forces throughout the world. These companies and their employees have revolutionized the nature and conduct of war and they have done so for an immense amount of profit.<sup>c</sup>

However, despite their close financial and political connection, the *moral* connection between the arms industry and the military has been largely overlooked. As a whole, these industries are run like any other civilian business, and generally perceive themselves as such. The ethical codes of most defense contractors do not acknowledge any unique ethical responsibilities incumbent upon these firms arising from the special nature of the goods that they produce. Rather, they invariably discuss their responsibilities towards shareholders and to the firms, subcontractors, and governments with which they do business, promising to adhere to the strictest codes of appropriate business practices. For example, the ethics code of Lockheed Martin (the largest arms manufacturer in the world), entitled *Setting the Standard*, refers exclusively to ethical business practices and says nothing about the use of their goods by the American military or any of the other nations with whom they do business.<sup>4</sup> The ethical code for Scientific Applications International Corporation (SAIC), another major defense contractor, makes reference to corporate and employee responsibility, professional integrity, and the protection of private client data, but says nothing about the moral nature of the goods that they produce.<sup>5</sup> On the other hand, military ethicists have been reflecting about the moral consequences of the use of weapons for millennia. Clearly, there seems to be a disconnect between perceptions regarding the moral obligations of those who design, develop, and build these weapons and those who actually use them on the battlefield.

The ethical codes of professional engineering societies are likewise silent on the ethical consequences of defense research. The Institute of Electrical and Electronics Engineers (IEEE), one of the largest professional societies pledges “to accept responsibility in making engineering decisions consistent with the safety, health and welfare of the public, and to disclose promptly factors that might endanger the public or the environment.”<sup>6</sup> Likewise the American Society for Engineering Education (ASEE) asserts that, “Because engineering has a large and growing impact on society, engineers must be equipped by their education to fulfill their ethical obligations to the public at large, to their profession, and to their clients and employers. The ethical problems that may be confronted by engineers include such issues as conflicts of interest, threats to public health and safety or to the environment, trade secrets and proprietary information, gifts from contractors and others, honesty in research and testing, and yet other problems which will inevitably result from the application of new and revolutionary technologies.”<sup>7</sup> Finally, the National Society of Professional Engineers (NSPE), with one of the longest ethics codes asserts that, “Engineers shall hold paramount the safety, health, and welfare of the public.”<sup>8</sup> While all of these professional codes assert a general ethical responsibility to promote the public good, they ignore the specific moral quandaries that engineers in the arms industry must

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c. *Defense News* reports that the top five defense contractors made \$127 billion in profit from arms related activities in 2005.<sup>3</sup>

confront. Arms manufacturers produce goods that are designed, either directly or indirectly, to inflict harm on others, and this generates unique moral quandaries that require independent analysis.

The notion of who should be considered a combatant has been deeply challenged by the rise of modern terrorism, stretching the notion of war as organized conflict to the extreme. However, this paper pushes the ethics of armed conflict in a somewhat different direction, specifically by applying it to engineers and other technical professionals who work in the civilian arms industry: military ethics is not exclusively an issue of concern for soldiers, commanders, and governments, but is also relevant for engineers and others who work in the civilian arms sector. Just war theory provides some basic principles and a philosophical foundation of relevance to this argument. Despite some important differences between civilian engineers and soldiers, military ethics has a general moral authority over engineers. There are at least two ways that engineers should think of themselves as constrained by the principles of just war theory, corresponding to the traditional principles of *jus ad bellum* (“just cause”) and *jus in bello* (“just means”). Ultimately, engineers employed in the arms industry bear unique and important obligations in relation to the weapons that they design – obligations that are obscured if they are perceived only as researchers and employees.

## **I. Just War Theory**

The ethical tradition of just war theory has numerous roots in ancient pagan and Christian thought, along with secular-legalistic traditions of Rome.<sup>9</sup> While it has had an influence on the modern laws of war and the nascent field of international criminal law, and substantially intersects with these fields, it is generally perceived as an autonomous ethical realm. Much of the laws of war and international criminal law are legal articulations of the principles of just war theory and have developed from them. Traditionally, these theories have directed themselves towards political leaders and combatants “in the field” and are taught to cadets at military academies and other military training centers. However, in the world of modern warfare, the contours of the battlefield have become as blurry as the notion of a combatant, and thus, these principles must be put to new uses in order to properly fulfill their purpose.

While there is a large amount of scholarly debate about the exact parameters of each of the principles of just war theory, they are usually broken down into principles of *jus ad bellum*, dictating when it is acceptable to go to war, and principles of *jus in bello* that determine ethical conduct during war. The principles of *jus ad bellum* include principles excluding aggressive war, a principle of *last resort* (that war can only be conducted after all non-violent solutions have been exhausted), a principle of *legitimate authority* (only legitimate political institutions may wage war), and a principle of *right intention* (that wars can only be waged with legitimate goals in mind). The principles of *jus in bello*, on the other hand, include a principle of *discrimination* (“just warriors may directly target personnel participating in the enemy nation’s wrongdoing but should not directly target other enemy nationals”)<sup>10 (p.87)</sup> and

*proportionality* (“The harm inflicted on the aggressor must not be disproportionate to the aggression”).<sup>(11 (p.587))</sup>

These axioms of just war theory have been given their justification through each of the different major ethical traditions. Kant scholars have shown that many of the theory’s injunctions against aggressive war can be found in the categorical imperative and were expressed in Kant’s *Perpetual Peace*.<sup>12</sup> Similarly, utilitarians have developed elaborate analyses regarding the responsibilities of soldiers and political leaders in the conduct of armed conflict.<sup>1</sup> Finally, Aristotleans have shown that the virtues of the warrior ethos and political *phronesis* (practical wisdom) constrain the conduct of war.<sup>d</sup> While each ethical tradition emphasizes different aspects of just war theory, each endorses its central principles along with a general assertion that individuals involved in making and conducting war bear certain unique moral responsibilities for their actions.<sup>11</sup> Regardless of which ethical tradition one finds compelling, the central principles of just war theory remain largely the same, only with different emphases.

## II. Initial Objections

Engineers, system designers, computer scientists and their managers are as essential to the conduct of modern war as soldiers on the battlefield. However, as a vast number of these engineers are employed in the private sector and are, formally at least, civilians, it is not immediately obvious how their professional work relates to the ethics of warfare. The differences between the two professions are stark: Civilians working in a cubicle or in a private laboratory are far removed, both geographically and chronologically, from the battlefield or the command post, the traditional places where one considers war crimes or lapses of military ethics. Civilians are not usually quartered with troops and do not serve under a military command (although an officer or two is usually an essential part of the development process). Engineers and researchers answer to a supervisor and ultimately to stockholders, not to a commanding officer. Finally, engineers are removed from the military decision-making processes where choices regarding when to use weapons or who to use them against are ultimately made. They have no uniform or rank. Thus, it does not seem plausible at first glance that the canons of military ethics should apply to civilian engineers in the workplace in any meaningful way.

Further, engineers have a set of professional responsibilities that preclude an obligation to military ethics. Engineers in the private sector are employees who have certain obligations to their managers, their fellow employees, and ultimately their shareholders. They are not personally responsible for the use of their weapons. However, so the argument goes, they *do* have a responsibility to provide the best product for their employers and to fulfill their client’s wishes to the greatest degree possible. An engineer or weapons designer who failed in this task because he felt a duty to design moral weapons would be an irresponsible employee, not a just warrior.

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d. In his *Politics*, Aristotle argues that “We wage war for the sake of peace,”<sup>13</sup> and Theodore Westhusing has written on the Aristotelian virtues in relation to the modern soldier.<sup>14</sup>

It is unreasonable to expect such individuals to hold contradictory loyalties. It is best if they stick to the clear guide of professional responsibility, rather than murky considerations regarding the use or misuse of their creations. Thus, engineers are not beholden to the ethical principles of warfare, but rather have professional duties to their clients in a manner akin to doctors, lawyers, or other trained professionals.

However significant they are, these initial differences do not override the importance of military ethics for engineers. First, it is clearly false to suggest that one must brandish a weapon or be a member of a military unit, formal or otherwise, to be under the jurisdiction of military ethics. Such a stark difference between combatants and noncombatants would be far too simplistic. Individuals with no training or uniform who choose to bear arms against an enemy, by that fact alone become legitimate targets and must (if they are behaving ethically) discriminate in the use of force. The mere fact that individuals are not designated combatants by any formal code does not *in itself* make him a “moral civilian” or noncombatant. The very fact that armed civilians are morally condemned and harshly punished when acting as “unlawful combatants” suggests that they have placed themselves in the domain of military ethics and thus have violated its doctrine. Institutional affiliations, then, are no reason in and of themselves to reject the moral obligations articulated by military ethics.

The duties of responsible employees are not the only ethical commitments that one can hold at one time. Nor are they necessarily supreme. Take the case of whistle blowing. When an individual violates his obligations to his employer in the pursuit of (what he believes to be) a *higher* or more significant moral code, that individual has not violated any real moral principle but only a *prima facie* duty to his employer, a duty that is trumped by larger concerns.<sup>15</sup> If whistle blowing is morally acceptable (even laudable) behavior, and good employees can be responsible for immoral acts that are committed out of loyalty to an employer, then it is unclear why the obligations of engineers to their employers are superior to the broader, less context-dependent moral code of just war theory. “Context dependent”, here means that employees have loyalty to their employers only insofar as they have a formal, specific, and agreed upon relationship of employer and employee – non-employees do not have any specific obligations of loyalty to their non-employers. Thus, the business ethics of responsible engineering are subordinate to the ethical obligations imposed upon engineers by other moral codes.

There is an analogy between the moral responsibilities of employee-engineers and the conduct of a soldier accused of war crimes. “Following orders” has not been an acceptable defense in military courts and international criminal tribunals since the military tribunal at Nuremberg, regardless of whether or not these orders are viewed as a genuine duty or as a subtle form of coercion. A *prima facie* responsibility to carry out the will of a superior, whether he is a higher-ranking officer, a corporate body, or a client does not override other obligations stemming from other ethical codes. Just as a soldier on the battlefield may not use such organizational obligations as a criminal defense, an engineer may not cite an obligation to a business or a superior as a moral defense for a violation of just war principles. The principles that govern the morally acceptable use of force in war are not contextual – they do not disappear when an

individual is not affiliated with a particular discipline, institution, or way of life in the way that legal ethics or journalistic ethics might be. Again, whether the individual has breached an ethical code by conducting research or developing a particular weapons system (see below) is a question to be answered by the unique principles of *military ethics* and cannot be avoided merely by referring to the obligations of the individual towards his or her employer.

This is not to suggest that engineers are liable in the same fashion as a combatant or a tactical officer – that there is a one-to-one correspondence between the duties incumbent upon a soldier and those of an engineer. Clearly this is not the case. Because of the differences between the positions of soldier and technical professional, they will not be responsible in the same fashion for their actions. An engineer who designs a perfectly normal weapon of war cannot be held responsible if this weapon is turned against civilians. Further, given a violation of military ethics, the options available to an engineer will differ dramatically from those of a soldier. The former will be faced with difficult challenges about whether a particular unconscionable project requires blowing a whistle, resigning, or in extreme cases, civil disobedience in the workplace. When confronted with possible violations of military ethics, soldiers have a variety of options available to them (disobedience, protests, etc.), some of which will cause them to suffer sanctions, others will not. The choices may be less dramatic for engineers in the private sector, but they are choices that are structured largely by the principles of just war theory.

Also important to consider is the nature of contemporary arms production. The design and production of weapons is, of course, a necessary part of national defense and American arms manufacturers have contributed a great deal to the nation's security. However, it is important to note that the modern weapons industry does not make its profits exclusively from selling its goods to the US government, but rather sells offensive and defensive weapons throughout the world.<sup>e</sup> While anecdotal evidence suggests that many employees are proud of their work for the American government and feel a particularly strong sense of patriotism about this work, it is a profit-directed industry run by corporate CEOs with a secondary goal (albeit an important one) of protecting and defending any particular nation. This means that strategic or real need for a particular weapon is not as crucial to the conduct of the industry as is the existence of a market for it and the profits to be gained from its manufacture. Weapons such as the V-22 Osprey and the Crusader Howitzer, weapons that many experts believe to no longer be necessary for the defense of our nation,<sup>f</sup> but whose elimination is fought desperately by industry lobbyists and other economically interested groups, testify to the profit motive behind the modern arms industry. This is not to suggest that the conduct of the arms industry in these cases is inherently immoral, but rather to suggest that the patriotic dimension of the American arms industry is a second order

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e. Recent statistics from the Congressional Research Service point to a 12 billion dollar overseas arms market.<sup>16</sup>

f. For the statement on the weaknesses of the Crusader system see the comments of former Deputy Defense Secretary Paul Wolfowitz before the Brookings Harvard Institution in May 2002.<sup>17</sup>

concern to those of profit. The patriotic impulse that is often associated with weapons research, if such impulses have *any* moral significance in and of themselves,<sup>18</sup> do not adequately reflect the economics of the modern arms industry.

### **III. Just War Theory and the Conduct of Engineers: *Jus ad Bellum***

As discussed above, the principles of military ethics are relevant for those who design, produce and manufacture weapons of war. In addition, the commonly accepted principles of just war theory are also relevant to the designers and manufacturers of weapons even though they were designed with a context in mind that is very different from the workplace of the engineer. Both *jus ad bellum* principles as well as *jus in bello* principles are in some sense relevant to the engineer. The commonly accepted principles are the best starting point for interpreting the principles of just war in the context of engineering. The goal here is to show how these principles are relevant for engineers in the workplace and to start a discussion that can be continued in other contexts, rather than to provide an exhaustive or perfect analysis.

As previously described, the responsibilities incumbent upon the engineer are different in character from soldiers on the battlefield just as the responsibilities of these soldiers differ from the responsibilities of their political and civilian superiors. The responsibilities of most engineers constitute what one might call “second order responsibility”. These responsibilities are the functional equivalent of a battery of concepts found in criminal law, such as accessory, conspiracy, and *culpa in causa* (from the civil law tradition in Europe). In each of these concepts, individuals who do not commit the actual criminal act bear an important responsibility for the act itself by lending material support to the criminal (in accessory), being part of a common plan (conspiracy), or knowingly taking part in a series of events that led to the criminal act (*culpa in causa*). Many of the Nazi leadership in Nuremberg, for example, were tried for being part of a “common plan” to commit aggressive war regardless of whether they ordered the attacks themselves. While one may be inclined to suggest that such breaches of law and ethics are not of the same order as those of the actual individuals who perpetrate the act, the breaches of second order responsibilities are, nonetheless, serious moral lapses. A number of the Nazis in Nuremberg were executed solely on the grounds that they were part of this conspiracy.

The relationship between the principles of *jus ad bellum* and the ethical obligations of engineers is a difficult matter to discern because adherence to or violation of these principles is usually far removed from the power of the vast majority of individuals, regardless of their profession. Decisions regarding the commencement of hostilities are often made at high levels of the political and military command structure, and soldiers on the ground do not have any say in if, when, and how to go to war. Similarly, nobody consults engineers as to whether an aggressive or immoral war should be avoided or undertaken. Further, one of the central principles of moral war-making articulated by Rousseau, among others, is that individual combatants are not responsible for violations of the principles of *jus ad bellum* committed by their political leaders, that there is a fundamental distinction between the state at war and the individuals who

comprise this state.<sup>8</sup> If we cannot hold an enlisted man responsible for violations of the principles of *jus ad bellum*, how can we possibly hold engineers, who operate even further from the centers of political power and influence?

Of course, engineers are neither political leaders nor generals. Thus they are not responsible for violations of *jus ad bellum* in any direct or obvious way. Rather, the relationship between the principles of just cause and the moral responsibility of engineers must be interpreted through the notion of the *military-industrial complex* (MIC) famously articulated by President Eisenhower in his final farewell speech in 1960. Here the lifelong military commander pointed to what he saw as a looming danger developing because of the very source of American military power:

This conjunction of an immense military establishment and a large arms industry is new in the American experience. The total influence – economic, political, even spiritual – is felt in every city, every State house, every office of the Federal government.

...

In the councils of government, we must guard against the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex. The potential for the disastrous rise of misplaced power exists and will persist.

...

The prospect of domination of the nation's scholars by Federal employment, project allocations, and the power of money is ever present and is gravely to be regarded.<sup>20</sup> (pp.206-207)

Eisenhower's point is that the influx of a large-scale, permanent arms industry has a potential to sway the government towards a reliance on a policy of war. Prior to the Second World War, no such threat existed because the vast majority of industry profited well in times of peace and would not profit greatly from a conversion to a wartime economy. After the war, these industries would push, consciously or otherwise, a peaceful government to utilize the arms they manufactured. Further, a vast stockpile of weapons may ultimately upset a balance of power by giving leaders a sense of military invincibility; encouraging recourse to conflicts to solve political problems that may otherwise find other solutions. The arms industry only gains in times of war, either at home or abroad.

Again, Eisenhower's claims about the MIC are grand statements, certainly not *directly* related to the research work of an individual engineer working in his cubicle. However, individuals *do* have a choice of whom they work for, and bear some responsibility for the social and political ramifications of the work they do. An engineer, who chooses to work for a cigarette manufacturer, helping to design its factory equipment, and being fully aware of the impact of tobacco on human health,

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g. "War is a relation, not between man and man, but between State and State, and individuals are enemies only accidentally, not as men, nor even as citizens, but as soldiers; not as members of their country, but as its defenders."<sup>19</sup>



accepts a certain amount of moral responsibility for what they are doing. A person who sells weapons to a street gang, or one who knowingly profits from this sale, bears responsibility for some of the violence committed by the gang, even if they did not choose to initiate hostilities or select the targets to be hit. Likewise, an engineer who knowingly helps create a context where the principles of *jus ad bellum* are likely to be violated must consider himself morally blameworthy. He did not pull the trigger, nor did he order the commencement of war, but nonetheless bears some responsibility for their decisions.

The most extreme example of the way that the interests of the private sphere can intrude upon the principles of *jus ad bellum* was brought to light in the Nuremberg trials. Gustav Krupp, a civilian industrialist and founder of Krupp enterprises designed and built tanks, submarines, and the “Big Bertha” canon that were used by Germany with devastating effectiveness during the First World War. Krupp, a Nazi who had no direct relationship to the holocaust or other military decisions during the war was indicted along with Goering, Ribbentrop, and other Nazi leaders for being part of a common plan to wage an aggressive war against the rest of Europe. While the decrepit Krupp lacked the mental capacity to stand trial at the end of the war, he was *not* removed from the indictment because he lacked military status. Being a civilian was irrelevant to his criminal responsibility. Nor was he removed because of the fact that he was not part of the Nazi military’s high command – his political status was likewise irrelevant. Without being a soldier or member of the Nazi government, Krupp was considered to be a military aggressor and to be in violation of the fundamental principle of *jus ad bellum*.<sup>21</sup>

Other than high-placed management who may have a say in who a corporation chooses to do business with, the duties of *jus ad bellum* must be placed on the conscience of the engineer as an employee. It is clear that the engineer must ask himself a number of important questions when choosing an employer: Is his company doing work that is more likely to make conflict more likely? Do they support or sell to governments who make warfare more likely through acts of aggression? (Even research into purely defensive technology can make warfare more likely by providing the leadership with the aforementioned sense of invincibility against a foe who they may find more intimidating on a level playing field.) The answers to these and related questions are not easy, nor are they clearly answerable in every case. They will depend upon one’s analysis of the corporate culture of the particular employer as well as with the current political situations of states with which they do business. An arms manufacturer who sells powerful weapons to unstable and aggressive states must bear some moral responsibility for its acts, and an engineer of conscience must consider these issues when choosing an employer and a workplace ethos. These matters cannot be reduced to a clear decision procedure available for the working engineer. Nonetheless, they must be a part of the moral concerns of all who choose to work in the arms industry, regardless of their position in the corporate hierarchy. Most importantly for this essay, these questions are not the questions of responsible employees or responsible researchers *per se*, but are rather questions that stem directly from military ethics.

#### IV. Just War Theory and the Conduct of Engineers: *Jus in Bello*

Although the principles of just means in war were largely designed with military forces in mind, they nonetheless may be translated into a unique set of moral considerations for engineers in the workplace. While engineers are responsible for the principles of just cause in a very weak sense, insofar as they must carefully choose the employer with whom they affiliate themselves, their relationship with the principles of just means are less oblique. The principles of *jus ad bellum* relate to the projects that one chooses to work on as well as the actual weapons that one designs.

Despite their shared ultimate goals, not all weapons are the same, morally speaking. Some of these differences depend on who uses them (a rifle that shoots an innocent is the same physical object as that which shoots an enemy combatant); others come from their very nature. Some weapons are not accidentally immoral, but are intrinsically so and engineers have a moral obligation to avoid working on them. Such weapons could never be used in a fashion that coheres with the principles of *jus in bello*. Several types of weapons that would qualify as such are:

1. Weapons that are inherently cruel.
2. Weapons that are inherently indiscriminate.
3. Weapons that are inherently unchivalrous.

Development of each of these types of weapons is a clear violation of the principles of *jus in bello*, and the engineer involved in such projects is morally blameworthy as are those in the military chain of command who deploy them. These extreme examples can serve as a moral baseline from which we can examine other types of weapons to determine the morality of their design, as opposed to their use or misuse, which falls under the responsibility of soldiers and their commanders.

These weapons are “inherently immoral” because their prescribed use violates the canons of military ethics.<sup>22</sup> They cannot be used ethically. Just as torture is inherently cruel because the practice of torture is by definition wrong (There is no such thing as torture that is not cruel!), there are certain weapons that are so terrible that their use cannot be justified in *any* circumstances. Inherently immoral weapons are clearly immoral to design, develop, and build independent of their deployment. Biological and chemical weapons are clearly of such a nature. The inhumanity of such weapons has been spelled out in a legal context through numerous treaties, including the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare (1925),<sup>23</sup> which declares such weapons as “justly condemned by the general opinion of the civilized world” and the Hague Declaration Concerning Asphyxiating Gases (1899). Their use is no longer acceptable to civilized nations and has been rightly considered as both immoral and criminal in character. These weapons are so odious in their use and indiscriminate in their destruction that they *could not* find a context where their use is justified.

Of course this does not mean that all research in these fields is immediately wrong. Clearly, biological research conducted to counteract the effects of these weapons when deployed by an enemy should not be condemned. Nor should a researcher be

condemned for conducting research or designing “hypotheticals” – mock weapons that seek to understand the nature, feasibility, and battlefield deployment of immoral weapons. Clearly, as long as such weapons are used as they are intended, there is no moral issue. Of course, there is a possibility that such defensive research could be hijacked and put towards offensive ends, but in this respect the engineer’s freedom is limited. Whether one is to be praised or condemned for such research will depend to a large extent on one’s awareness regarding the possible use or misuse of these weapons by one’s superiors (and their superiors). Given the number of specific variables that would impact on such research, it is difficult to speak in any general way about them. Suffice it to say that it is debatable whether such research is actually weapons research, but is better characterized as defensive research and not really subject to the jurisdiction of military ethics.

Similarly, nuclear weapons (in their current form) are equally unacceptable by their nature. These weapons produce massive amounts of destruction in the initial explosive blast along with large doses of radioactive fallout that can spread great distances beyond the confines of its target. As the International Court of Justice in its 1996 Advisory Opinion on *The Legality of the Threat or Use of Nuclear Weapons* observed:

By its very nature, that process [of fission], in nuclear weapons as they exist today, releases not only immense quantities of heat and energy, but also powerful and prolonged radiation. ...These characteristics render the nuclear weapon potentially catastrophic. The destructive power of nuclear weapons cannot be contained in either space or time. They have the potential to destroy all civilization and the entire ecosystem of the planet.

The radiation released by a nuclear explosion would affect health, agriculture, natural resources and demography over a very wide area. Further, the use of nuclear weapons would be a serious danger to future generations. Ionizing radiation has the potential to damage the future environment, food and marine ecosystem, and to cause genetic defects and illness in future generations.

In consequence...it is imperative for the Court to take account of the unique characteristics of nuclear weapons, and in particular their destructive capacity, their capacity to cause untold human suffering, and their ability to cause damage to generations to come.<sup>24</sup> (paragraphs 35-36)

The point made by the Court in this opinion is not merely a judgment about the use of nuclear weapons in a particular context (such as aggressive war or defensive war, war within or outside of the U.N. Charter), much less the legal interpretation of treaties and customary international law, but is rather one about the intrinsic immorality of nuclear weapons. These weapons are, by their nature, cruel and indiscriminate and thus irredeemably immoral.

While it is clear that those who order the use of such inherently inhumane weapons are morally blameworthy, it is likewise true that their designers and manufacturers bear responsibility for what they contribute to the resulting atrocities. They cannot be used in a way that is moral and thus their immoral character extends beyond their

deployment, to their design and manufacture. It is not a matter of being unaware of their intended use because such weapons could not have a humane or humanitarian use – to use them at all is to violate the principles of just war theory. If such weapons remain unused, then perhaps the engineer is not blameworthy, but that would mean that he or she would have some knowledge or control over their use or non-use, which is beyond his or her control. Regardless, engineers fashion weapons to be used, and designing weapons that cannot be used in a manner consistent with moral principles is a breach of the ethics of warfare.

It is also worth noting how hollow defenses such as “I was just doing my job as an engineer” or “I am merely a civilian” sound when compared with the massive devastation caused by these weapons. Those who design them, whether for the United States or for other nations, cannot rely on institutional affiliation, professional training, or national identity as a shield from moral responsibility. A biological researcher in North Korea searching for a more lethal form of anthrax or an engineer in Pakistan designing a means by which they can destroy entire nations (civilians and all) are obviously immoral, regardless of their apparent status as civilians or their limited influence on determining the use of these weapons. A researcher in the jungles of Sri Lanka who (hypothetically) designs camouflage that allows soldiers to disguise themselves as children or elderly people is likewise in the wrong. If this is true for engineers employed by Al Qaeda then it is true of engineers regardless of the country with which they align themselves. Not only are they morally in the wrong, but also importantly for the argument presented here, they are wrong in ways that can only be adequately grasped by referring to the canons of military ethics. They are wrong because the principles of proportionality, discrimination, and chivalry determine not only the use of weapons, but also their design and construction.

Further, not only is the engineer responsible for the weapons that are used, but additionally, s/he is morally responsible for the designing of equipment that facilitates their use. Designing and producing so-called “dual use” equipment, equipment that could be used for peaceful purposes (or, at a minimum, purposes that fit the canons of just war theory) violates the principles of just war *if the designers know their use is specifically or primarily not for peaceful purposes*. It is fallacious to suggest that those who design delivery systems for biological or nuclear weapons are not responsible for their use, just as it is false to suggest that a man who loads a gun, knowing it will be used to kill an innocent is innocent of the crime. This holds true for criminal law, with the concept of accessory, as well as for the canons of moral philosophy. Thus, it might be best to interpret the notion of weapons design in line with principles of criminal law: the weapon does not only include the direct use of the weapons, but also their design, delivery, and support apparatus.

Although biological, chemical, and nuclear weapons are inherently immoral and designing or developing them is a violation of the canon of military ethics, there is likewise a category of weapons that are mixed in this regard. Napalm and flamethrowers are certainly terrible weapons with a use that is to a large degree immoral – that is, it is very difficult to find places where they are used appropriately. However, at times they can be used acceptably (such as their use in destroying enemy

pillboxes during World War II). Most weapons exist somewhere along a continuum – with biological weapons and other inherently immoral weapons on one extreme and defensive weapons on the other. In between these extremes are “morally mixed” weapons, weapons that are more-or-less prone to abuse on the battlefield based exclusively on the character of the weapons themselves and not the individuals hands into which the weapons fall. To describe such weapons as morally mixed is just to say that in certain, rare circumstances, they may be used in a legitimate fashion, but the vast majority of uses are not acceptable.

Landmines are another important case where the use of weaponry is *almost* always immoral. This is, of course, the result of discrimination problems inherent in the design and use of antipersonnel landmines, not on account of their inherent cruelty. As is well known, the threat posed by mines usually continues long after conflicts have moved or ceased entirely, with leftover landmines killing or maiming civilians by the thousands in once hostile but now peaceful territories. According to the International Center to Ban Landmines, 30-40% of all victims of landmines are under the age of 15 and civilian casualties are particularly common in places like Bosnia, Afghanistan, and Cambodia. As the Center puts it:

When [landmine defenders] talk about the effects of landmines, they confine themselves to the duration of the battle. They do not address the life-cycle of the landmine, which continues for decades. Clearly when the life of the weapon and the resulting impact of generations of civilians are taken into account, the cost-effectiveness of landmines is dwarfed by their long-term socio-economic impact.<sup>25</sup>

However, despite grim statistics, and horrifying pictures of limbless children, there is some argument to be made that these weapons can at times be deployed in safe, responsible ways. Places like the demilitarized zone between North and South Korea are safely quarantined from any harm that they might cause to unsuspecting innocents (at least for the time being) and do not run the risk of killing a hapless noncombatant. Thus one can say that in a few cases, these weapons can be described as morally mixed.

There is more to be said about the responsibility relationship holding between weapons designers and the use and misuse of their creations. However, the point here is to suggest that this is a matter that must be explored through the concepts of just war theory. Morally mixed weapons simply prove this rule. Their use may be justified in certain circumstances against certain foes, but their use is a moral issue not only for the actual combatants, but also for the designers and builders of these weapons. The engineer must ask him or herself whether s/he is producing weapons that violate the canons of just war theory in circumstances common enough to result in responsibility for their use. S/He cannot simply avoid the topic by referring to limited responsibility as an employee or to duties to employer and clients. Reference to other moral issues, such as responsibility to one’s employer is not the issue, nor is one’s patriotism – the moral point in regards to these weapons is defined by and through just war theory. To

defend the weapons designed by reference to their (possibly) justified use is to assume that the use of such weapons is a moral issue for the engineer.

The liability that engineers have towards the use or misuse of their weapons cannot be a strict one, but it cannot be so loose that there is a complete disconnect between the design of weapons and their use. The theory of strict liability, that an engineer is responsible for the harm that the product causes regardless of whether or not the engineer was negligent in some clearly definable way, seems totally inappropriate for a case where virtually all of the products s/he designs are intended to cause harm. However, the fact that all weapons may be misused in some way or another does not absolve the engineer from their use. As Hart and Honoré have argued:

When the occurrence of harm is an essential part of the ground for blame the connection of the person blamed with the harm may take any of the forms of causal connection we have examined. These simple forms are the paradigms for the lawyer's talk of harm "directly" caused. But we blame people also for harm which arises from or is the consequence of their neglect of common precautions; we do this even if harm would not have come about without the intervention of another human being deliberately exploiting the opportunities provided by neglect.<sup>26</sup>

While it is clear that engineers do not bear a strict liability, they are not free of any responsibility for the destruction caused by "mixed" weapons, and they bear a very strong responsibility for inherently immoral weapons such as nuclear, chemical, and biological weapons.

None of this is meant to oversimplify the role of the individual engineer in the process of designing and manufacturing weapons. Frequently, engineers do not work on "a weapon" but rather are confined to a very small part of a much larger project, designing equipment that can have peaceful as well as military usage. Often aspects of a project are given to a subcontractor who may have no understanding of the ultimate purpose of the work. Again, these issues are too complex and too unique to each case to be addressed by a general theory. This article is only meant to establish a general responsibility for engineers and other technical professionals towards the material that they design and develop. The parameters of this responsibility (as well as affirmative duties to learn about the use of their creations) require further consideration.

#### **IV. Conclusion**

The underlying theme of this paper has been to suggest that restricting discussions of military ethics solely within the domains of the military and its political leadership is to leave many important and relevant individuals beyond its scope. Not only engineers, but also others in the private sector have an enormous influence on the conduct of war and their moral role in this context needs to be carefully considered. Other types of research scientists, manufacturers, and civilian contractors participate in some very important and unique ways in the conduct of modern war. To leave unexplored the moral dimension of their roles in warfare runs the risk of, on one hand, making military

ethics increasingly less relevant to conduct on the battlefield, and on the other, leaving a large number of quasi-combatants in a moral limbo that is ultimately to no one's advantage. By clearly articulating the relation between these quasi combatants and the principles of military ethics, this ethical system can become a more diverse, more robust, and significantly more useful normative discourse.

**Acknowledgements:** Thank you to Nicholas Fotion, Harvey Fichtelberg, and David Ermann for commenting on earlier drafts of this paper. This paper is dedicated to the memory of Colonel Theodore Westhusing (US Army) who, more than anybody else I have met, personified the principles of just war theory and the martial virtues.

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