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The soldier’s tolerance for autonomous systems

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Abstract: Autonomous robots are here and military leaders have typically sought to understand the human-machine relationship as a matter of trust - a human-machine engineering problem with a largely technical solution. This paper argues that engineering is merely one part of the challenge and that trust in robotics and automation ought to be understood in a much broader socio-psychological context, defined by a power process, the capacity of soldiers to endure subjection to technology and the extent to which automation impinges upon one’s autonomy or otherwise impacts the soldier’s wellbeing.

Keywords: robots, lethal autonomous weapons systems, autonomous systems, trust, autonomy, strategy formation

1 Introduction

Autonomous military robots are here, but they cannot yet do everything in the soldiering profession. Difficult decisions will therefore need to be made in which the gain to be derived from adopting autonomous systems is weighed against the implications for human workforces. While there is a dearth of relevant data, anecdotal evidence from the limited experience society has had in dealing with automation in the civilian realm suggests that the introduction of robotics and autonomous systems is highly disruptive and there exists a pattern whereby unskilled and semi-skilled labor is, eventually, partially or completely replaced by technology. Of course, the prospect of losing so many jobs to automation and robotisation is likely to generate serious political repercussions in a military context. Decision makers will, to some extent, need to accommodate the needs and demands of those in unskilled and semi-skilled labor positions until such time as the transition to a modernised military workforce is complete. Until this occurs, the implication of the revolution for the average soldier in any given developed military force remains that the increasingly roboticised and automated world is simultaneously becoming an easier and more difficult place in which to live, work and fight.

Establishing and maintaining effective human-machine interaction is tricky business and investigated by the military – and ordinarily expressed in strategy documents – in terms of trust. In the future, soldiers will almost certainly find themselves putting their lives or the lives of others in the hands of highly autonomous walking military robots, armed aerial robots or perhaps flying drone ambulances and their decision on whether or not to trust the judgment of a machine during the heat of battle may have life or death consequences. Armed forces have, therefore, already invested in much human-robot interaction research [1–3]. Research has found that soldiers who place too little trust in automated systems may disuse those systems, with implications for safety and mission outcomes, as the automation may be better equipped to handle some scenarios better than human soldiers. In fact, evidence suggests that certain groups who do not trust a robot have a tendency to disengage its autonomous capabilities, often leading to damage of both the robot and its environment, particularly when the avoidance of automation involves reversion to direct control [4]. Problems can also arise when too much trust is placed in an autonomous system, such as when users internalise a certain level of trust only to find that it puts themselves or others in harm’s way. As in the civilian realm, there are also concerns about the potential displacement of military personnel, despite reassurances from senior military leaders and practical imperatives which dictate that soldiers will remain the core fighting force of any military force [5].

Military forces have typically sought to understand trust and the broader relationship between humans and machines as an engineering challenge that begins as early as interacting with a robot’s interface, but this paper argues that engineering is merely one part of the challenge and that trust in robotics and automation ought to be understood in a much broader social context. It is suggested that the problem for military robotics and automation is less a matter of trust than it is tolerance, defined by the
capacity of soldiers to endure subjection to technology and the extent to which automation impinges upon one’s autonomy or otherwise impacts the soldier’s wellbeing. Through a unique application of the work of philosopher of technology, Theodore Kaczynski, it is argued that soldiers will tolerate robots for so long as, and up to such point that, they remain engaged in the power process that governs their influence on the operating environment and hence the soldier’s social and psychological welfare. It is contended that what constitutes being involved in this power process is likely to vary from soldier to soldier. Many factors will impact one’s level of tolerance. For example: age and gender. Older soldiers further along in their careers might be less tolerant of new technologies that promise to change the way things have been done, whereas younger soldiers who have grown up with smartphones might be apt to trust the next generation of technology more easily. The gender of soldiers might also make a difference in that women, often ostracised in the armed forces, might tolerate a non-biased technological system more so than a sexist make soldier. The impact of these factors will be important to a practical understanding of tolerance, but as the first step toward this and the implementation of change, this paper examines the overarching potential for disruption of this power process, how soldiers are generally likely to adjust beyond simply disengaging from technology and what strategies can be implemented to limit disruption of the power process and enhance soldiers’ wellbeing, thus building tolerance and trust in automated robotic systems.

2 Trust, military technology and the power process

This paper proceeds on the basis that human beings have a fundamental and innate need to engage in a ‘power process’, which consists of meeting one’s psychological need to exert power and effort to fulfill goals and satisfy certain drives, as discussed in Kaczynski’s Technological Slavery [6] and defended by this author elsewhere [7]. Kaczynski suggested that the need to engage in the power process was innately biological and defined it in a way that did not necessarily entail the need to exert power over others, as one might assume in a military context, but rather the need for everyone to have goals whose attainment requires some degree of effort and needs to succeed in attaining at least some of their goals. At the most basic level, these goals are to obtain the physical necessities that any soldier is trained to seek out as part of their basic training: food, water and whatever other essential provisions and shelter are required to sustain life in the particular environment in which one is situated [6]. At a higher level and in a typical operational context, this might entail having some degree of control over mission parameters, being empowered to make decisions relevant to one’s conduct in war and operating in a context that provides opportunity to make a meaningful contribution to a particular mission or outcome. In essence, this involves having an element of autonomy or the capacity to work toward goals on one’s own initiative, direction and control. It is particularly important to recognize the importance of this autonomy or authority because proponents of a ban on certain robotic weapons have advanced the argument that said systems can never be programmed to act discriminatorily on the complex battlefield because they lack the human capacity of empathy, among other characteristics [8, 9], failing to recognize the importance of humans in the engineering phase and the fact that most people do not exert this initiative, direction and control on an individual basis, especially those individuals serving in the armed forces. For the sake of the individual and the argument pertaining to a ban, it is usually sufficient to act as a member of small team that exists as an artificial entity. When soldiers discuss a mission with their superiors or amongst each other and then make a joint effort to succeed in that mission, their collective acentral need to engage in the power process is fulfilled, but if they work under such rigid orders from above or in such a large group that leaves them no flexibility to exercise their own initiative or virtually no capacity for autonomous decision making, the power process is not served. Soldiers, of course, are not automatons and do not practice blind obedience to authority in conflict, even though they act within a firm hierarchy. Soldiers are not trained to kill blindly and in executing and interpreting orders are making fine-grained moral and legal decisions. The argument here is that the introduction of autonomous robotics could usurp autonomy in this context and impinge upon fulfillment of the power process and that if this occurs, soldiers’ tolerance of – and trust in – autonomous systems will wane.

There are, however, a number of respects in which robotics and automation currently enhance autonomy or better facilitate the rational exercise of power in military operations. Driven by new technology, today’s autonomous systems are yielding increasingly better discrimination on the battlefield in a way that suggests the relevant human capability is, at least in some respects, being improved. This is because today’s autonomous systems are being designed with what is often referred to as ‘urban warfare precision’. This is in recognition that the nature of warfare is changing and that combatants will of-
tend to locate themselves among innocent civilians (as was often the case with Al-Qaeda and is today with ISIS & ISIL), meaning that the need for discrimination is of great importance. New weapons are being designed with cameras and optical sensors of ever increasing strength, and many are able to be re-programmed up until the second of impact. The capability of automated systems is relevant in this regard because, in some respects, they assist the relevant users in deliberating on the appropriate course of action by helping them capture, collate and analyse information and data. For example, in their sales demonstrations to the military, representatives of the drone industry argue that their piece of military hardware will grant them the opportunity to see ‘beyond the next hill’ in the field and ‘around the next block’ in congested urban environments, enabling them to acquire information that they would not otherwise have access to without incurring significantly greater risk [10–12]. Automated robots go one step further. An Israeli airman who tested a Spike missile used in fire, observe and update mode, designed for use in unmanned systems, has said that as the weapon gets closer to its target, the picture gets clearer and clearer, ‘makes it much easier to distinguish legitimate from non-legitimate targets’, and if it turns out not to be a combatant, the missile can be harmlessly steered away with the assistance of an autonomous guidance system [13]. For some, then, technology is clearly seen as empowering rather than alienating. Of course, there may be some respects in which the agency of the individual overseeing an autonomous weapon cannot be improved with live audio, video and other information being streamed over satellite links, aimed at compensating for the distance between operator and the kinetic effects they often unleash. That is, it may be that those responsible for the oversight of autonomous systems miss out some sort of input or information that is critical to the exercise of power and that their procedural autonomy is therefore compromised. This may not be an entirely convincing argument in relation to the systems that are in operation today, in the sense that better sensors currently seem to allow for improved control and command but, as will later be argued, increasing levels of autonomous operation might have unintended consequences.

There are other respects in which today’s autonomous systems may allow operators to more meaningfully engage in the power process than if they were controlling a non-autonomous system, and these could have the benefit of improving compliance with just war theory and the laws of armed conflict, therefore limiting casualties and improving outcomes. Much criticism was levelled against the use of robotics during the mid-to-late phases of the conflicts in Iraq and Afghanistan because of the culture and conditioning surrounding the US drone program. Critics said the program was dehumanising because unmanned systems operators where shooting at what had become, to some, nothing more than a ‘target’ [14]. Indeed, critics still say that with the way unmanned systems are operated, with their game-like interfaces, these ‘targets’ are nothing more than a hotspot on a computer screen and that when operators come to attack these ‘targets’, they are not given proper moral consideration, as they are not seen as human beings. The less the enemy is taken to be a human being and the more inanimate and non-sentient the target seems, the easier he or she is to kill or maim, or so it is said. Hugo Slim [15] says that this kind of dehumanisation is bound to occur when the operator is removed at great distance from the consequences of the use of his/her weapons, but automation may help here. As the number of aircraft operations are automated, those responsible for operating or overseeing the relevant systems will arguably have more time to evaluate the situation than they might have otherwise had, meaning that they are probably less likely to violate any rules [16]. Let us consider a scenario in which a highly autonomous unmanned air combat vehicle (UCAV) is utilised in a congested air environment to support ground troops. With the help of the UCAV, those responsible for overseeing the system are able to spend less time manipulating flight control surfaces and more time focusing on life and death decisions, better enabling the operator/s to achieve mission outcomes and protect those on the ground.

This is to say that automation confers upon humans-in-the-loop an enhanced ability to act conservatively: they need not worry about protecting the robot as autonomous robots do not need to have self-preservation as a foremost drive, if at all [17]. Here there is a general analogy with other domains, such as medicine, where fencing the human from danger and workload permits better decision making. They can also be used in a self-sacrificing manner, provided that technology and software were protected to avoid exploitation by adversaries or, alternatively, autonomous systems could take self-preservation measures that do not jeopardise or interfere with the exercise of power in support of mission objectives. Some might contend that the ability to act conservatively might eventually translate into killing with too great a physical and psychological ease, or could lead to military action being exercised in a rather clinical and dispassionate manner, easing any of operators’ existing moral qualms. Noel Sharkey offers support this argument in drawing attention to reports collected by Singer [18]. Amongst a variety of other disturbing statements, he cites one twenty-one year old sol-
dier who talks about his acts of killing with casual indifference: ‘the truth is, it wasn’t all I thought it was cracked up to be. I mean, I thought killing somebody would be this life-changing experience. And then I did it, and I was like, ‘All right, whatever’ [19]. Later, he says that ‘killing people is like squashing an ant. I mean, you kill somebody and it’s like ‘allright, let’s go get some pizza’ [19]. Daniel Brunstetter and Megan Braun say that what they call the ‘separation factor’ (distance + automation), muddies the water of targeting and can potentially make discriminating between combatants and noncombatants more difficult [20]. Yet it is not clear that the ability to act conservatively will lead armed forces down such a slippery slope. Indeed, the operator’s ability to freely and openly confer with colleagues, superior officers or legal advisors ought to be regarded as critical factor to a soldier’s autonomy and their tolerance of robots. Autonomous robots and their operations are also subject to the same requirements as other weapons used in war [21–29], but their technological advantages coupled with the removal of risk to soldiers means that they should, at the least in theory, make satisfying the power process an easier task and, at the same time, make operators more reluctant to kill in situations where doubt exists as to the legitimacy of the potential victim of aggression.

3 Military technology’s potential to disrupt the power process

While it is true that there exist ways in which robotics and automation can enhance human autonomy or better facilitate the rational exercise of power in military operations in support of a presumptive case for deploying automated robots on the battlefield, technology is a double-edged sword with both benefits and risks. Autonomous military robotics are no exception, especially when thinking about these systems in the context of trust and tolerance. But this is not always recognised. This point is supported by the fact that most new technological advances considered individually seem to be desirable. Few people, could have resisted the allure of electricity, indoor plumbing, mobile phones or the Internet, in much the same way that few soldiers could go without their rifle or latest piece of revolutionary kit. As already mentioned, each of these and innumerable other military technologies seemed worthy of employment on the basis of the average cost-benefit analysis in which the threatening aspects of technology are balanced with temptingly attractive features, such that it is often considered absurd not to utilise a particular piece of technology. Technologies that initially appear not to threaten freedom regularly prove to threaten freedom in very serious ways after the initial adoption phase. Traffic lights promised to improve order and cut travel time and yet modern commuters find themselves waiting aimlessly at red lights on empty roads, able to travel only where and when the lights and road system dictate. Computers, for instance, initially promised to eliminate the mundane and provide people with more time for human interaction. And yet people now find themselves unable to withdraw from computer screens that inhibit meaningful human interaction. The problem is that these technologies gradually impinge upon one’s ability to autonomously choose a goal and satisfying certain drives [6]. Kaczynski splits these human drives into three categories: drives that can be satisfied with minimal effort, drives that can be satisfied with significant effort, and drives that have no realistic chance of being satisfied no matter how much effort is exerted. The first category leads to boredom. The third category leads to frustration, low self-esteem, depression and defeatism [6]. The power process is satisfied by the second category, but the problem in a military context is that robotics and automation are likely to push most goals into the first and third categories, at least for those in the lower ranks and potentially also for senior military figures.

Recall that when decisions are made by the individual soldier or officer, or indeed a small platoon or other small organisation that the individual can influence, the individual has some element of power and control over the circumstances of their own physical and psychological wellbeing, as well as military outcomes, which satisfies the need for autonomy. But with the application of robots and automation across different spheres of defence organisations, there is opportunity for military life to become more regimented than it already is and to be negatively impacted by virtue of technological processes and the way in which the proper functioning of increasingly automated military-technical systems is likely to become even more focused on effectiveness and efficiency, meaning that goals become either trivially easy or nigh impossible. To make this point and also follow on from the previous section, let us understand that in order to make the appropriate decisions on the battlefield, soldiers must be capable of fully considering and deliberating about the consequences of their actions, understanding the relevant risks and benefits they will have and to whom they will apply. Many autonomous military systems have such complex processes that they get in the way of assessing the validity and relevance of the information they produce or help assess and, as such, can actually prevent a user from making the appropriate decision within an operational context.
and therefore have a direct impact on their fulfillment of the power process. It is in the face of this complexity that people have the aforementioned tendency to rely either too much or not enough on automated systems like those we increasingly find embedded into unmanned aircraft or their control systems, especially when in the time-critical and dynamic situations which are characteristic of modern warfare [30].

The other implication is that military personnel who rely on automated systems too much might mistakenly find that they can satisfy their drives with minimal effort, while those who choose not to rely on said systems will find that they have no realistic chance of completing some tasks to which a computer is best suited. The U.S.S. Vincennes most shockingly illustrated this during its deployment to the Persian Gulf amid a gun battle with Iranian small boats. Although this warship was armed with an Aegis Combat System, which is arguably one of the most complex and automated naval weapons system of its time (it can automatically track and target incoming projectiles and enemy aircraft), the U.S.S. Vincennes misidentified an Iranian airliner as an F-14 fighter jet and fired upon it, killing nearly three hundred people [31]. Post-accident reporting and analysis discovered that overconfidence in the abilities of the system, coupled with a poor human-machine interface, prevented those aboard the ship from intervening to avoid the tragedy. Despite the fact that disconfirming evidence was available from nearby vessels as to the nature of the aircraft, it was still mischaracterised as a hostile fighter descending and approaching them at great speed. In the resulting investigation, a junior officer remarked that ‘we called her Robocruiser...she always seemed to have a picture and...[always] seemed to be telling people to get on or off the link as though her picture was better’ [32]. The officer’s impression was that the semi-autonomous system provided reliable information that was otherwise unobtainable. In this case, such a belief was incorrect. The system had not provided other- wise unobtainable information, but rather misleading information. It is therefore questionable whether the war-making agent has a more comprehensive understanding of the relevant state of affairs because of the employment of advanced military technology or whether said agent’s understanding and knowledge are less accurate [33]. This indicates that though there may be an aggregate increase in the amount of information that is accessible, there is a morally relevant decrease in understanding which single piece of information ought to influence autonomy of action and the resulting decision-making, even when the bulk of information is clear and accurate.

A consequence is that this might stimulate or exacerbate micromanagement. If, for instance, a senior commander who perceives that a soldier or platoon has lost faith in the utility of a particular piece of technology might be inclined to utilise the technology more directly, impinging upon or eliminating the autonomy of the operator/platoon in question. Once upon a time, there were great disincentives for generals and the like to interfere at the tactical level. The senior leadership was almost exclusively concerned with strategy and generally somewhat distanced from the most dangerous parts of the conflict zone on the basis that the military could not afford to lose its most experienced officers and strategicians. Today, these barriers are no longer present, and conditions exist for ‘tactical generals’ to become much more commonplace. When live video and other data are combined with automated programs that can alert commanders when critical operations are about to begin, it becomes clear that the higher ranks are being enabled by technology just as much, if not more, than the lower ranks. Peter Singer describes how one four-star general he interviewed had watched hours of Predator drone footage that had been beamed to the officer overseeing the situation and eventually gave the order to strike, along with directions as to what size bomb his pilots should drop on the compound so as to ensure that the attack would be proportionate [19]. But as Singer asks, who was doing the general’s job while he was doing a job that could have been done by a captain in the field or a legal officer afar and was this senior officer going to accept responsibility if something went wrong? [19] No matter how it occurs, the micromanagement enabled by automated networking technologies of the kind that are prevalent in network centric warfare stand to undermine individual judgement and responsibility [34], further challenging fulfillment of the power process.

Micromanagement also allows politicians and commanders to build their skills at the cost of others. This has led to a disparity in the benefit derived from the use of automated robotics in the sense that these new technologies allow commanders to make tactical decisions of the kind that were ordinarily beyond their remit, while the captains, majors, colonels and so on that these higher level officers cut out of the chain are not similarly empowered to take on new tasks or given time to dedicate thought to the big strategic and policy questions that their more senior counterparts would normally have been wrestling with instead [19]. This poses a problem for the satisfaction of certain drives and fulfilment of the power process, one that could escalate and become more even more systemic in nature because of the risk that this disparity poses to opportunities to exercise power and control at different lev-
els, important to leader development. More generally, the use of increasingly autonomous systems entails the risk of losing experienced judgement in land and other traditional operations that may need to be relied upon in the event that technology fails or is for some reason rendered redundant [11]. As Daniel Sukman writes, in a world of ‘autonomous and semi-autonomous systems, the need for lower-level operators who make life-and-death decisions shrinks’ [35]. This limits the autonomy of these operators but may also have the detrimental affect of degrading or even crippling an entire cohort that needs that experience if they are to become operation or strategic leaders of the future. The US Department of Defense’s Unmanned Systems Roadmap also makes this quite clear:

...the automating of actual operation/fighting of platforms will decrease the need for people to crew them, while the personnel needed to simply maintain the vehicles are likely to increase. This has the potential to radically alter the ‘tooth to tail’ ratio in combat forces to heavily favor support personnel vice combat personnel. At the same time, the need for middle-to-senior combatant leaders and decision makers will not change, since they will know the tactics and strategy necessary to operate and direct the autonomous systems. The challenge will be developing middle to senior combatant leaders needed in an environment allowing fewer junior leaders [36].

This issue could be further compounded if it extends to the soldier’s character. The loss of traditional soldiering context might mean, for instance, that we also lose the opportunity to cultivate key moral virtues that contribute to a soldier’s character and the warrior ethos, cardinal examples of which include wisdom, honesty, courage, integrity, loyalty, patience and moderation. That is, if the moral skills in the use of lethal force are supplemented by digital systems or not cultivated at the appropriate level, where and how they will they be cultivated and of what value will these skills be in the case of forces that have become dependent on technology? It must be acknowledged the soldiers of today and tomorrow will need these moral skills as well as technical and core combat skills, and that cultivation of these skills becomes more difficult as each piece of mediating technology enters service. This is concerning because it is the individual soldier who will, for the time being, be the fall back (if not active) defence mechanism for his or her nation and who must be most unconditional in exercising moral restraint and adhering to rules of war [11]. It is, after all, soldiers more than any other war-making agential group, who have the most influence on war’s outcomes, as well as the ability to introduce a moral component to military decisions. In Michael Ignatieff’s words, ‘the decisive restraint on inhuman practice on the battlefield lies within the warrior himself – in his conception of what is honourable or dishonourable for a man to do with weapons’ [37]. Indeed, limiting the soldier’s ability to exercise moral authority - which involves what is perhaps the most innate drive one might aim to satisfy and therefore constitutes the ultimate impingement upon the power process - might lead to moral injury, a potential consequence further explored in the following section.

Beyond having an impact on the moral autonomy of soldiers and their professional development, autonomous robots might also have an impact upon unit cohesion or the chemistry that builds within a unit and allows it to reach its full potential in terms of autonomously exercising power, control and restraint. This is because unit cohesion requires members of a team to trust each other and anticipate others’ needs and, where robotics and automation are thrown into the mix, trust becomes significantly more complicated in a number of respects. For example, soldiers may be reluctant to serve alongside a robot that will report their errors and infractions in much the same the way that police officers are unwilling to work alongside officers who report infractions of law enforcement policy in contravention of the ‘blue wall of silence’, which dictates that officers not testify against each other given the ease with errors can occur in a lethal environment and the importance of trust in such environments [38]. What might be considered ‘ethical’ in human-machine teams in terms of infraction reporting is open to debate and must balance military creeds with obligations to civilians. As automated technologies spread through the military, they change the ways in which soldiers organise themselves, as well as how they communicate their needs and requirements. While counts involving autonomous system-soldier teaming are yet to flow down into the public domain, as another example of the potential impact, one US marine veteran has spoken about an incident which took place outside Fallujah in 2005 and involved the targeting of insurgents by several drones. An unarmed surveillance drone identified the insurgents and passed along their coordinates to the operators of the armed drone, after which the enemy was taken out. This occurred without team members speaking over the radio or phone, or even via other personnel. Instead, they coordinated and carried out the entire operation by texting each other in a communications programs not dissimilar to an internet chat room [19]. This is problematic in that even the best technology cannot bridge the divide imposed by being in different locations and makes it virtually impossible to develop the same sense of trust that soldiers develop in the field. Texting, of course, may not be barrier to trust in civilian environments where the stakes are lower. This points to the importance of infor-
4 How soldiers are likely to adjust

At the most abstract level, then, this paper advances the idea that by encouraging soldiers to conform to machines rather than vice versa, technological industrialisation within the military space could create an environment that is hostile to human potential and even the utility of armed forces. A military system that is even only partly automated and roboticised must, by its very nature, force people to behave in ways that are increasingly remote from the natural pattern of human behavior, in conflict or otherwise. People will adjust in different ways based on their level of autonomy and need to engage in the power process. Within any organisation, including military forces, there exist different types of people who will have low levels of autonomy and little need to meaningfully engage in the power process. There will also be some whose power drive is relatively weak and which may initially be fulfilled by engaging with the organisation to which they belong or the technology that threatens there existence. For instance, it may be that an uncritical soldier who has to date been quite happy developing his fighting skills and obeying his superiors will be content in embracing technology and identifying with it the sense that the each new technology or the automation of each functions seems to be having a positive effect on military effectiveness and efficiency when assessed individually. This individual is likely to be perceived as a good combat soldier doing their best to adapt their fighting skills to the technology saturated battlespace, whether it be an infantryman working alongside autonomous robotic mules, a seaman riding aboard an unmanned surface vessel or airmen agreeing to assume roles operating/overseeing unmanned aerial vehicles. This sort of compliance will be financially incentivised. Indeed, the US Air Force is already offering select fighter pilots bonuses – amounting to as much as a quarter of a million dollars – to permanently move into the unmanned aircraft specialisation for their entire careers [39]. However, the limited evidence available suggests that few personnel will blindly adapt to or identify with the military-technical enterprise. A recent review conducted by the US Government Accountability Office of remotely piloted aircraft (RPA) units found that morale was low, which seemed to be linked to the fact that about four out every ten in these groups reported that they believed their was a negative stigma or sentiment attached to be an RPA pilot [40]. It may be that said stigma remains even once the number of RPA pilots exceeds the number of traditional pilots, whether because of the nature of the world or because many of the core techniques and tactics of air warfare were developed an earlier phase in which only a very small number of people are expert. For most soldiers, it would therefore seem that it is through the power process – having a goal and making an autonomous effort to attain it – that ‘self-esteem, self-confidence and a sense of power are acquired’ [6].

Those whom are slightly more critical might identify with powerful military forces and the technological movement in a more active sense, seeing the onset of technology as an opportunity to develop relevant technical skills as a technician, engineer or scientist and perhaps influence the trajectory of their military force’s technological development. But this too is a mere distraction and an example of what Kaczynski calls a ‘surrogate activity’ – artificial goals pursued not for their own sake but for the sake of fulfillment [6]. While those who wish to be involved with technology in this way may claim to be motivated by an innate curiosity, the opportunity to develop skills that may enhance their autonomy or the opportunity to exercise control over outcomes, these are unlikely to be the actual motives of those from within a system in any sense dominated by technology [6]. Technological development is such that technicians, engineers, scientists and the like typically end up working on highly specialised elements of
broader problems that do not allow curiosity to be satisfied, outcomes to be influenced or the development of anything but a very narrow set of skills that are likely to be of significantly less use beyond the military and its highly specialised systems. An individual lacking the necessary degree of power or certain goals joins the technical element of the technological movement within their military, adopts its goals and objectives, and works towards them so that when they are realised the individual can feel as though they have gone through the power process even though they may have only played a very insignificant role working amongst many others in achieving the goal. Of course, here too there are other motivations, whether they be financial or status-based, the latter being more prevalent in hierarchical organizations whether military, paramilitary or otherwise.

Those soldiers whose drive for power or autonomous nature are such that they will neither blindly embrace technology, nor seek to identify with it by means of supporting it in a technical capacity, are left with two options. They can completely abandon their military life affected by robots and automation that inhibits the power process and impinges upon their autonomy (if they are free to do so) at risk of leaving themselves further compromised, or they can begrudgingly tolerate autonomous robotic systems and continue on in support of the wider military-technical system. In regards to the latter and perhaps more likely outcome, it must be said that while a new item of technology may be introduced as an option that an individual can choose to use in the context of their employment, it does not necessarily remain optional. In many cases, new technology changes organisations and society in such a way that people eventually find themselves forced to use it [6]. This will no doubt occur in the military as the autonomous robotics revolution unfolds. Senior leaders and politicians will adopt autonomous robots because they are safer than ever and spare society from thousands of accidents, only to later find that such action eliminates the need for soldiers in some roles or that it contributes to the atrophy of deliberative skills and other negative consequences that are detrimental to the military, as described throughout this paper. The ‘decision’ of those who remain within the system is likely to have psychological consequences that impact on the performance of their duties, but these will be magnified if employed in roles where actions and decisions are vulnerable to automation and/or where involved with mediated conflict, i.e., where military personnel execute lethal action with the aid of automated systems. Research conducted by the US Air Force has already found that the operators of armed drones suffered from high levels of operational stress, anxiety and depression, thought to originate partly from constant exposure to high resolution images of real-time killing, and partly from having limited ability to impact events once they have been authorised from afar [41, 42]. These issues may continue to worsen, as automation increases exposure by virtue of allowing personnel to progress from operating a single system to simultaneously overseeing several systems, increasing the psychological burden on the individual. At the same time, being disengaged from the power process may compromise a soldier’s self-esteem and self-confidence, compounding the erosion of the technological soldier’s self-image in an age of post-heroic war that does not yet engender the esteem of others.

It may also be that ‘moral stress’ impacts the adjustment of operators to automation, if such an adjustment is at all possible. ‘Moral stress’ refers to the possibility that deciding upon moral dilemmas via technologically mediated means may not only cause physiological stress, as discussed elsewhere in this paper, but may also lead to unconscious changes in the evaluation of values and reasons that are relevant to problem solving and the power process. If increasingly autonomous systems limit the exercise of autonomy or exert undue power and control over an operator’s ability to oversee the execution of lethal action in a just manner or that which accords with one’s own values systems and that of their military organisation, they may be ‘moral injury’. There are two oft-cited definitions of moral injury in the academic literature. The most popular is that presented by Jonathon Shay, who defines it as being ‘influenced by doing something that violates one’s own ethics, ideals or attachments’ [43]. Similarly, Brett Litz and others describe the harm people can suffer when they fail to do the right thing in important situations, an abundance of which exist in the military domain: ‘potentially morally injurious events, such as perpetrating, failing to prevent, or bearing witness to acts that transgress deeply held moral beliefs and expectations’ that ‘may be deleterious in the long-term, emotionally, psychologically, behaviorally, spiritually, and socially’ [44]. Matthew Beard writes that perhaps the oldest recorded incidence of a kind of moral injury is found, alongside the first mythical representation of robots, in the Iliad when Agamemnon robs Achilles of his rightful prize and slave-girl, Briseis [45]. This betrayal is said to be a serious transgression of Achilles’ moral code, according to which he is confronted with a world that is no longer predictable. The moral norms that he relied upon to experience and interpret the world have varied. It is only when these norms are ‘consistently respected that the world is predictable and reassuring’, argues Beard [45]. So, if increasingly autonomous systems are less predictable in regard to caus-
ing value digressions or similar, it may mean that those responsible for overseeing the systems will come to see the world as untrustworthy and thus have less tolerance for robotics and automation, for while robots make certain things more predictable, human-robot interaction is not.

Of course, there is a limit to what one can or will begrudgingly accept. Machines and computers commence service offering to do the dull, dirty and dangerous tasks to which no soldier aspires but offer important formative experience, and then proceed to assist in disturbing decision making and fulfillment of the power process to a point whereby soldiers are left helpless and may engage in activities that are dangerous to any military’s overall success. To consider how such circumstances might come about, consider the following scenario:

Suppose Mr. A is playing chess with Mr. B. Mr. C, a Grand Master, is looking over Mr. A’s shoulder. Mr. A of course wants to win his game, so if Mr. C points out a good move for him to make, he is doing Mr. A a favor. But suppose now that Mr. C tells Mr. A how to make ALL of his moves. In each particular instance he does Mr. A a favor by showing him his best move, but by making ALL of his moves for him he spoils his game, since there is not point in Mr. A’s playing the game at all if someone else makes all his moves. The situation of modern man is analogous to that of Mr. A. The system makes an individual’s life easier for him in innumerable ways, but in doing so it deprives him of control over his own fate [6].

Now suppose that Mr. A represents the average soldier and that Mr. C, the grand master, is actually some form of automated system or intelligent military robot. Where a soldier is almost completely derived of control over his own fate, i.e. where it is nigh impossible to fulfill the power process, the consequences will be damaging for all the relevant stakeholders. Soldiers will tolerate robots only for so long as, and up to such point that, they remain engaged in the power process that governs their influence on the operating environment and, indirectly, their social and psychological welfare. Some might, as a last resort, engage in salubrious surrogate activities – gambling driven by an overactive desire for financial wealth or perhaps excessive sexual gratification, something that has plagued military forces in recent years because of the exploitation of others (namely young female military recruits) in pursuit of this gratification. Even if pursued autonomously, these artificial goals often fail to bring about any real fulfillment. Some might commit suicide rather than face a perceivably meaningless life. Since the existence of automated military technologies threaten humanity in the armed forces, some others – operating on the possible belief that the nature of a largely automated military, once established, is such that it cannot be reformed in a way that reconciles freedom with technology – might argue that it must destroyed and therefore try to revolt against the system or commit sabotage from within. This course of action was advocated by Kaczynski himself [6], but steps can be taken to protect against these negative outcomes and to encourage tolerance of robotics and automation in the military, all be them difficult.

5 The difficulty in limiting disruption of the power process and improving tolerance

At the outset, it must be acknowledged that efforts to limit disruption of the power process and improve tolerance of robots and automation are constrained by the fact that modern technology is a unified and holistic system in which all parts are dependent on one another like cogs in a mechanical machine [6]. This is particularly so in military systems where tactics, technology and strategy are closely intertwined. You cannot, Kaczynski says, simply get rid of the ‘bad’ or autonomy-limiting parts of technology and retain only the ‘good’ or desirable parts. Progress in military robotics and automation depends on progress in related fields including physics, engineering, computer science and others. Some of today’s military operations could not occur without expensive, high-tech equipment that can be made available only by a technologically progressive, economically rich society. States cannot maintain the same level of international security without the whole technological system and everything that goes with it. Security, as well as defence and security strategy, is based on the constant evolution of military technology. No matter how dire the circumstances, one cannot eliminate defence scientists, nor robots. Each is critical to mounting a robust defence and/or deterrent. This is certainly also true of soldiers themselves, at least for the time being, because the military-technical ecosystem depends on humans for the maintenance of environments conducive to technological warfighting and for the making of non-automatable decisions, as well as the manufacture and maintenance of the robotic equipment. But even if international security could be maintained without automated systems and robotics, a precedent has been set in the public mind. Suppose, for example, that we were to introduce a moratorium on the development and use of autonomous robotics. When the next conflict surfaces, the public would demand that politicians and senior military leaders offer equally effec-
tive solutions to problems, but without the casualties – demands that can only be met by exploiting other emerging military technologies such as biological enhancement or lowering the standards according to which the force is applied and later judged, which is likely to have a negative impact upon non-combatants.

Technology is an incredibly powerful social force, some would argue more so than any social or military movement. It slowly but repeatedly encroaches upon and narrows human freedom, individual and collective [6]. This makes achieving a lasting compromise between military technology and the freedom of soldiers a difficult task. Technological progress, Kaczynski [6] argues, marches in only one direction. Once a particular technical innovation has been made, people usually become dependent on it so that they can never again go without said innovation, unless a new iteration of it becomes available and yields some supposedly desirable attribute or benefit. Defence of one’s nation and international security aside, one can imagine what would happen, for example, if computers, machines and robots were to be switched off or eliminated from modern military forces or society at large. People have become so dependent on these technologies and the technological system that turning them off or eliminating them would seem to amount to suicide for the unenlightened within that system. Thus, the system can only move in one direction: forward, toward greater technologisation. This occurs with such rapidity that those who attempt to protect freedom by engaging in long and difficult social struggles to hold back individual threats (technologies – robot, software or otherwise), are likely to be overcome by the sheer number of new attacks. These attacks, it is worth noting, will increasingly come from developing nations. The possible creation of advanced industrial and technological structures in regions such as the Middle East and East Asia, in particular, could pose real problems, for while many will conceive of what Western military forces are doing with modern technology to be reckless, they arguably exercise more self-restraint in the use of technoindustrial power than those elsewhere are likely to exercise. This moral asymmetry has been obvious amongst non-state and state sponsored groups in recent conflicts. Insurgents in Iraq used road-side improvised explosive devices (IEDs) early in the Iraqi war. This escalated to essentially human-powered smart bombs (worn and driven IEDs by suicide bombers), often against civilian targets or without respect for civilian collateral damage. Now, Islamic State and other state-sponsored groups are using drones to deliver relatively small payloads. Yet the danger at the state level rests not only in the escalating use of intentionally destructive technologies such as autonomous military robotics, which have already begun to proliferate from China to a variety of other less-developed nations [12], but also in seemingly benign applications of technologies (e.g. genetic technologies, nanobots, etc.) that may have unanticipated and potentially catastrophic consequences within the military sphere and beyond.

As highlighted in the introduction to this paper, many have suggested that the best way to deal with the above described threat posed by increasingly autonomous systems is to treat the matter as an engineering challenge. In dealing with autonomous robots in this context and as a standardly conceived matter of trust, the most important thing is to ensure a robot’s ability to live up to the often-implied contract of behaviour with its human observer and the broader military to which it belongs. One common way to ensure that robots live up to the expected standard is to determine what a typical soldier or commander’s expectations are and to program the robot to conform to these expectations. For example, American soldiers might expect an armed autonomous ground robot to declare ‘cleared hot’ before firing, as a platoon commander might declare before his soldiers are permitted open fire. A second approach is to model the robot on the soldier. Peter Asaro is a proponent of this approach and advocates ‘modelling of the moral user’, which he says involves three key elements [46]. First, we would need to draw on cognitive psychology to understand the representations, decision rules and emotional requirements for proper ethical decision-making. He says that this might involve undertaking detailed empirical studies of some of the emotions mentioned in the previous sections: fear, anger, sympathy and so on [46]. Second, we would need to use recent work in experimental psychology on moral intuition, value comparisons, and call on experimental economics to understand the nature of risk assessment and probability estimation [46]. All this would be needed in order to get some understanding of what sort of framework people use for their ethical decision making, while keeping in mind that many do not use any kind of recognisable framework. Third, we would need to determine what standards we, as a society, want to hold soldiers to, to what extent we can impose these on soldiers through technology, and also the level of psychological risk to which it is preferable to expose our warfighters [46]. These approaches and others like them are aimed improving soldiers’ understanding of robots and consequently their trust in them.

Yet it is not clear how, or to what extent, any of these changes stand to limit disruption of the power process and/or promote tolerance of robotics. Building understanding in the design and development phase might promote tolerance of today’s fairly basic autonomous systems
if these measures can make it clearer to soldiers what an automated system is doing, how it is doing it, what functions are left for humans to perform and how the robot is influencing human decision-making. This would require autonomous systems be designed in a way that allows the user to better observe the systems and understand the specific ways in which the robot will contribute to the team as opposed to what the human teammate will contribute. This might be achieved by providing live feedback as to the robot’s programmatic intentions, the predictive success of particular actions and performance against objectives [47]. The requirement for humans to engage in the power process would at all times have to be considered. At no time should the human operator feel unnecessary to the performance of the system or the attainment of a goal toward which it is used [48]. But this presents yet another problem – this is a requirement that can only be satisfied with the employment of the most basic forms of automation and hardware of the kind military forces currently use. They are unlikely to be satisfied in relation to the complex software and hardware systems of the future. This is quickly becoming obvious in the civilian realm. Until recently, most people could (if they wished) understand most technologies in everyday use – cars, lighting, household appliances, etcetera [49]. But this is becoming less true by the day as people place more emphasis on technology functioning effectively, such that it becomes more complex and we will shortly enter an era where most people will not be able, even if they wished, to understand the technologies in use in their everyday life, compromising their ‘sense that understanding is accessible and action is possible’ [50]. Of course, it must be acknowledged that unlike civilian technological enterprise, the military-technical system does not exist to satisfy human needs, at least not those of military personnel (armed forces do serve people indirectly, via the state). Nonetheless, soldiers should not be forced into choosing between using technologies within existing oppressive and potentially exploitative power structures or dedicating their lives to building knowledge and understanding of the software and robotics that facilitate participation in the military-technical system.

It may be that alienation from the power process is becoming part of the human condition and that it can never be fully overcome in the military domain as the complexity and conflicts of military life make it impossible to reconcile all separations and differences between human beings, nature, military objectives and technologies. Yet we should be aware that technologies ranging from the robotics to automation, and potentially including some mix of these with biotechnology, have the ability to profoundly transform the lives of soldiers, as human beings and cogs in military machines. Each individual technology arguably produces specific forms of disruption that can be delineated, attacked and in some cases offset. As already argued, humans will only tolerate robots up to a certain point and military forces must be careful not to alienate those who are required to maintain an effective and efficient defence in making progress toward a more automated future. This can only be achieved by maintaining a careful balance between human and machine assets. To set the parameters, military forces will need to monitor tolerance of robotics, which can be done by examining the level of time that their personnel invest in surrogate or semi-surrogate activities, which will serve as an indicator of how well the power process is being fulfilled. Fine and regular adjustments can then be made to the man-to-machine ratio. That is to say that the only way to truly limit disruption of the power process by robotics and automation is to limit the application of these technologies and find meaningful new applications of human mental ingenuity to military problems.

6 Conclusion

This paper has sought to demonstrate that the problem for the deployment of military robotics and automation is less a matter of trust than it is tolerance, defined by the capacity of soldiers to endure subjection to technology and the extent to which automation impinges upon one’s autonomy or otherwise impacts the soldier’s overall wellbeing. To be clear, the potential for autonomous robots to disrupt human autonomy and the exercise of power and control is clear and present, and military forces cannot afford to pass the potentially insoluble problem of dealing with untested automation solutions on future generations. To conclude and further demonstrate the importance of the issue hand, imagine a future in which computer scientists and other defence scientists are able to develop intelligent machines that can do most things better than human soldiers [6]. In this case, it may be that machines are permitted to make all of their own ‘decisions’ or that some human control is retained. If the former occurs, no precautions can be made about the result or how machines might behave, except to say that soldiers would be at the mercy of the machines. Some will object that such control will never be handed over to machines, but it is conceivable that as military forces come to face an increasing number of challenges, there will be reason to hand over more and more decisions to machines by virtue of their ability.
to yield better results in handling complex matters, potentially reaching a point whereby the volume and nature of the decisions will be incomprehensible to soldiers, meaning that machines will be in effective control. To unplug the machines would, for some, be tantamount to committing suicide [6]. If, on the other hand, military personnel retain some control, it is likely that the average person will only exercise control over very limited elements of a machine’s operation, with higher level functions and broader control over the system of systems being automated or maintained by an all too narrow core tactical generals [6]. This must be reflected in strategy, along with the fact that that even if computer scientists fail in their efforts to develop strong artificial intelligence of broad application, so that human decision making remains more obviously necessary, machines seem likely to continue taking over the simpler tasks such that there will be a growing surplus of soldiers who are either unable or unwilling to sublimate their needs and substitute their skills to support and preserve the military-technical system.

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