

Journal of Law & Cyber Warfare

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JOURNAL OF LAW & CYBER WARFARE

VOLUME 8

ISSUE 2

2022

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No More Humans? Cybernetically-Enhanced Soldiers Under the Legal Review of Article 36

Thibault Moulin*

INTRODUCTION

The manga series *Ghost in the Shell* depicts a futuristic society where humans are enhanced with cybernetic devices. Following an accident, Motoko Kusanagi, the main character, had her brain transferred into a cybernetic body and was incorporated into the so-called ‘Public Security Section 9’. In the movie released in 2017¹, a discussion occurs between the designer of the body (Dr. Ouelet) and the CEO of her company (Mr. Cutter):

- [Cutter] Will it work?
- [Ouelet] Absolutely she’s a miracle. A machine can’t lead, it can only follow orders. A machine can’t imagine or care or intuit. But as a human mind in a cybernetic frame, Mira [Motoko Kusanagi] can do all those things and more.
- [Cutter] The first of her kind. She will join Section 9 as soon as she is operational.
- [Ouelet] Please don’t do that. You’re reducing a complex human to a machine.
- [Cutter] I don’t think of her as a machine. She’s a weapon. And the future of my company’.

The merger between a human and a machine and henceforth, the qualification of an augmented soldier as a weapon might appear as a highly hypothetical and futuristic scenario – it is not. As a matter of fact, the emergence of brain-computer interfaces (BCIs) could challenge this fundamental distinction in the foreseeable future, by allowing direct and remote control of weapons (drones, robots) by brain signals – i.e. ‘telepresence’. It indeed appears that ‘[e]very action our body performs begins with a thought and with every thought comes an electrical signal. The electrical signal can be received by brain-computer interface, consisting of an electroencephalograph (EEG) or an implanted electrode, which can then be translated,

*Dr Thibault Moulin is a Lecturer at the Catholic University of Lyon, France. This article was written in the framework of a 2018-19 research fellowship at the Federmann Cyber Security Center of the Hebrew University of Jerusalem. The author would like to thank Professor Noam Lubell (University of Essex) and Professor Yuval Shany (Hebrew University of Jerusalem), as well as the anonymous reviewers and the JLCW editorial team, for their assistance and comments. Responsibility for any mistakes is mine. Email: tmoulin@univ-catholyon.fr.

¹ *Ghost in the Shell* (Paramount Pictures 2017).

and then sent to the performing hardware to produce the desired action’.² This means that a physical intervention – such as pulling a trigger or pushing a button – would not be systematically necessary to launch an attack. Rather, BCIs – whether invasive, non-invasive or semi-invasive – would rely on brain signals to do so. The impact of BCIs on the battlefield is however not limited to the remote control of objects. They also have the potential to inform decision-making, by rapidly processing external information gathered by human senses and/or analyzing signals subsequently produced by the brain to recommend that a soldier opens fire – or not. The first part of this article investigates such issues, and discusses whether BCIs themselves – as well as the soldiers operating them – may qualify as weapons, means or methods of warfare. It concludes that they may, under certain circumstances, indeed be described as means or methods of warfare (I). Considering that BCIs and the connected soldier qualify as such, and that states might contemplate using such technologies on the battlefield, this article considers whether states are under the obligation to proceed with a legal review, as required by Article 36 of Geneva Conventions’ Additional Protocol I.³ In fact, it appeared during the Diplomatic Conference on the Reaffirmation and Development of International Humanitarian Law Applicable in Armed Conflicts that a mechanism was required to ensure the effectivity of the restrictions on weapons, which may cause superfluous injuries or have indiscriminate effect.⁴ If some states pushed for the creation of a new committee, which would have been in charge of determining whether new weapons complied with such prohibition, they encountered resistance from others.⁵ The latter argued that it would lead to disarmament, which was outside the scope of the Conference, and would not take military or political considerations into account.⁶ A compromise was eventually found with Article 36.⁷

According to Article 36, ‘[i]n the study, development, acquisition or adoption of a new weapon, means or method of warfare, a High Contracting Party is under an obligation to determine whether its employment would, in some or all circumstances, be prohibited by this Protocol or by any other rule of international law applicable to the High Contracting Party’. Hence, the next part of this article determines whether the ‘employment’ of these new technologies is lawful, under both ‘this Protocol’

² Rajesh Uppal, *New Brain Computer Interfaces being developed for treating neurological disorders, and controlling military robots with thoughts*, INTERNATIONAL DEFENCE SECURITY & TECHNOLOGY (October 18, 2019), <https://idstch.com/geopolitics/breakthroughs-in-brain-implanted-electrodes-will-allow-brain-computer-interfaces-to-control-anything-with-thought/>.

³ Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts, June 8, 1977, 1125 UNTS 3.

⁴ INTERNATIONAL COMMITTEE OF THE RED CROSS (ICRC), COMMENTARY ON THE ADDITIONAL PROTOCOLS OF 8 JUNE 1977 TO THE GENEVA CONVENTIONS OF 12 AUGUST 1949 421-23 (Claude Pilloud et al. eds., 1987).

⁵ *Id.*

⁶ *Id.* On the same topic, see, Natalia Jevglevskaja, *Legal Review of New Weapons: Origins of Article 36 of AP I*, 25 F.Y.B.I.L. 109 (2015).

⁷ ICRC, *supra* note 4, at 421-23.

(Additional Protocol I) or ‘any other rule of international law’. If the prohibitions contained in the former mainly aim at protecting enemy soldiers and civilians, the latter also calls for the consideration of additional sets of rights, especially those guaranteed by international human rights law (IHRL). This means, in particular, that the rights of a state’s own soldiers need to be considered in the review. This aspect actually raises some concerns, and it appears that certain applications of cybernetic enhancement would be illegal (II). Even though Additional Protocol I was not ratified by the United States, and that the question whether Article 36 is now part of customary law remains disputed,⁸ legal review is indeed carried out by the Department of Defense. In fact, the United States describes Article 36 as a provision from the Additional Protocol that ‘may not reflect customary international law, but may be consistent with longstanding U.S. practice’.⁹ It was even emphasized that ‘the DoD policy and practice of conducting weapons reviews preceded this provision of AP I’.¹⁰

Another issue pertains to the time in which the legal review should start. If Article 36 admittedly gives the answer – ‘[i]n the study, development, acquisition or adoption’ phases – major changes appeared in the R&D landscape with the development of BCIs. There is an increasing overlap between civilian and military technologies, and these new challenges must be analyzed (III). It must be noted, however, that the question of individual responsibility for war crimes, which is a customary rule of international law,¹¹ remains outside the scope of this article. Furthermore, the legality of experimentations themselves – i.e. those issues pertaining to free informed consent of the subjects and the adequacy of risk and benefit – remain outside the scope of this article.¹² In fact, Article 36 only invites states to determine whether the ‘employment’ of cybernetic enhancement would breach international law, at a later stage.

I. CYBERNETIC ENHANCEMENT AS A MEANS OR A METHOD OF WARFARE

⁸ ARTICLE 36, ARTICLE 36 REVIEWS AND ADDRESSING LETHAL AUTONOMOUS WEAPONS SYSTEMS (April 2016), 1, www.article36.org/wp-content/uploads/2016/04/LAWS-and-A36.pdf (last visited November 1, 2020); the Netherlands and Switzerland, Weapons Review Mechanisms, UN Doc CCW/GGE.1/2017/WP.5, at 4 (2017). See, also, Natalia Jevglevskaja, *Weapons Review Obligation under Customary International Law*, 94 I.L.S. 186, 205-213 (2018).

⁹ Department of Defense (United States), *Law of War Manual* 1178 (2015), <https://dod.defense.gov/Portals/1/Documents/pubs/DoD%20Law%20of%20War%20Manual%20-%20June%202015%20Updated%20Dec%202016.pdf?ver=2016-12-13-172036-190>.

¹⁰ *Id.*

¹¹ International Committee of the Red Cross (ICRC), *Rule 151. Individual Responsibility*, at https://ihl-databases.icrc.org/customary-ihl/eng/docs/v1_rul_rule151 (visited December 20, 2019). ¹² I actually had the opportunity to study this question in: Thibault Moulin, *Doctors Playing Gods? The Legal Challenges in Regulating the Experimental Phase of Human Enhancement*, 54(2) ISR. LAW REV. (2021) [forthcoming]. *infra*.

Article 36 of Additional Protocol I mentions that the subject of legal review is ‘a new weapon, means or method of warfare’. The analysis carried out in this part reveals that a cybernetic enhancement would hardly qualify as a weapon **(A)**. It appears that some forms of cybernetic enhancement might indeed be considered as means of warfare, but not all of them. In this sense, such qualification might be described as asymmetric **(B)**. In contrast, the resort to cybernetic enhancement appears to be a method of warfare **(C)**.

A. The Implausible Qualification of Cybernetic Enhancement as a Weapon

The term ‘weapon’ – as well as the terms ‘means’ or ‘method’ of warfare – do not find a consensual and universal definition. This article suggests that a ‘weapon’ might be seen as an object or a substance used to cause intentional harm **(1)**. It then demonstrates that, to the extent that neurotechnology merely constitutes an interface between a human being and a weapon, it cannot be described as a weapon in and of itself **(2)**.

1. ‘Weapon’ as an object or a substance used to intentionally cause harm

While several experts underline that there is no consensual definition in international law of the term ‘weapon’, two doctrinal proposals became very influential in legal scholarship.¹³ A first definition, proposed by the Program on Humanitarian Policy and Conflict Research at Harvard University (HPCR), reads that: “[w]eapon” means a means of warfare used in combat operations, including a gun, missile, bomb or other munitions, that is capable of causing either (i) injury to, or death of, persons; or (ii) damage to, or destruction of, objects’.¹⁴ A second definition was

¹³ William Boothby refers to both of them, and mentions: ‘[a] weapon comprises an offensive capability that can be applied to a military object or enemy combatant. The means whereby this is achieved will involve a device, munition, implement, substance, object, or piece of equipment that is used, that it is intended to use or that has been designed for use to apply the offensive capability, usually causing injury or damage to an adverse party to an armed conflict’. See: William Boothby, *Dehumanization: Is There a Legal Problem Under Article 36?* in DEHUMANIZATION OF WARFARE 21, 22 (Wolff Heintschel von Heinegg, Robert Frau & Tassilo Singer eds., 2018).

¹⁴ HPCR, MANUAL ON INTERNATIONAL LAW APPLICABLE TO AIR AND MISSILE WARFARE XXV (2013). It was subsequently mentioned by: William Boothby, *How Will Weapons Reviews Address the Challenges Posed by New Technologies*, 52 MIL. L. & L. WAR REV. 37, 39-40 (2013). He adds: ‘[...] the notions of use, intended use or design purpose are additional features that are critical to the concept of a weapon and thus of a weapon system’. It was also mentioned by: TALLINN MANUAL 2.0 ON THE INTERNATIONAL LAW APPLICABLE TO CYBER OPERATIONS (Michael N. Schmitt ed., 2017), at 452; Heather Harrison Dinniss & Jann Kleffner, *Soldier 2.0: Military Human Enhancement and International Law*, 92 I.L.S. 432, 437 (2016).

offered by Justin McClelland: '[t]he term connotes an offensive capability that can be applied to a military object or enemy combatant'.¹⁵

Most states elaborated their own definition of the term 'weapon'. A 'weapon' is defined by Australia as 'an offensive or defensive instrument of combat used to destroy, injure, defeat or threaten';¹⁶ by Germany as 'instruments that are intended or suitable to kill or injure persons, eliminate or decrease offensive or defensive capacity, and/or to destroy or damage objects';¹⁷ by the United States as '[a] device designed to kill, injure, disable or temporarily incapacitate people or destroy, damage, disable or temporarily incapacitate property or materiel';¹⁸ and in the Canadian Criminal Code as 'anything used, designed to be used or intended for use (a) in causing death or injury to any person, or (b) for the purpose of threatening or intimidating any person'.¹⁹ According to New Zealand, '[w]eapons and munitions means every device designed or adapted to cause harm to the opposing force including all arms, firearms, systems, explosive ordnance, projectiles, ammunition, rockets, mines, explosive devices, bombs, and missiles, including experimental weapons and munitions not yet in use'.²⁰ A first 'common denominator' which stems from these various definitions is that a weapon might be an 'instrument', a 'device' a 'thing' – i.e. something inanimate, lifeless.²¹ A second common denominator is that weapons 'kill', 'injure' or 'incapacitate' people, 'destroy' or 'damage' property – i.e. they potentially 'cause harm'. With the apparent exception of Justin McClelland's definition, it also seems

¹⁵ Justin McClelland, *The review of weapons in accordance with Article 36 of Additional Protocol I*, 85 I.R.R.C. 397, 404 (2003). It was, subject to some refining, a frame of reference for: Luke Chircop & Rain Liivoja, *Are Enhanced Warfighters Weapons, Means, or Methods of Warfare*, 94 I.L.S. 161, 174-5 (2018). It was also mentioned by: Harrison Dinniss and Kleffner, *supra* note 14, at 437.

¹⁶ Australia, The Australian Article 36 Review Process, UN Doc CCW/GGE.2/2018/WP.6, at 3 (2018).

¹⁷ Federal Ministry of Defence (Germany), *Prüfung neuer Waffen, Mittel und Methoden der Kriegführung* (June 13, 2016), at 37, available at https://files.premt.net/ZDv_A-2146_1.pdf.

¹⁸ Department of the Air Force (United States), *The Law of War* (August 3, 2018), at 13, available at https://static.e-publishing.af.mil/production/1/af_ja/publication/afi51-401/afi51-401.pdf. The DoD Law of War Working Group had come up with a slightly different definition: 'all arms, munitions, materiel, instruments, mechanisms, or devices that have an intended effect of injuring, damaging, destroying or disabling personnel or property'. See: ICRC, A GUIDE TO THE LEGAL REVIEW OF NEW WEAPONS, MEANS AND METHODS OF WARFARE: MEASURES TO IMPLEMENT ARTICLE 36 OF ADDITIONAL PROTOCOL I OF 1977 9 (2006), <http://e-brief.icrc.org/wp-content/uploads/2016/09/12-A-Guide-to-the-Legal-Review-of-New-Weapons.pdf>.

¹⁹ Criminal Code (Canada), para. 2.

²⁰ New Zealand Defence Force, *Law of Armed Conflict* (2017), at 7-4, available at https://files.premt.net/dm_69_2ed_vol_4-3.pdf. It may also be mentioned that a 'weapon' is defined by the Oxford English Dictionary as '[a]n instrument of any kind used in warfare or in combat to attack and overcome an enemy': Weapon Definition, OED Online (2016). Black's Law Dictionary defines this term as '[a]n instrument used or designed to be used to injure or kill someone.' Weapon Definition, Black's Law Dictionary (11th ed., 2019).

²¹ One could admittedly object that some weapons are not strictly 'lifeless', for instance bacteriological ones.

that weapons might be used for both offensive and defensive purposes.²² A question must however be answered: whether weapons must be ‘designed’ (as weapons) or also ‘used’ (as weapons). The first approach was adopted by the United States,²³ whereas most states resort to the second approach.²⁴ A sensible interpretation of Article 36, however, would be that the article tolerates both. On the one hand, Article 36 would apply to the ‘study’ and ‘development’ of weapons ‘by design’. On the other hand, Article 36 would also apply whenever the instrument subject to ‘acquisition’ or ‘adoption’ is intended to be ‘used’ as weapons. It must also be noted that some states may not consider munitions as being part of a weapon,²⁵ or are unclear on this issue,²⁶ and international treaties are also inconsistent on this aspect.²⁷ It however appears to me that this position might lead to paradoxical outcomes,²⁸ and I join the HPCR in qualifying munitions as weapons.²⁹ Last but not least, the definition offered in this article for the term ‘weapon’ might not suit a civilian or medical context,³⁰ and is restricted to the framework of an armed conflict.³¹

²² For an interesting insight on the question, see: Chircop & Liivoja, *supra* note 15, at 175.

²³ Department of the Air Force (United States), *The Law of War*, *supra* note 18, at 13.

²⁴ Criminal Code (Canada), para. 2; Federal Ministry of Defence (Germany), *Prüfung neuer Waffen, Mittel und Methoden der Kriegführung*, *supra* note 17, at 37; New Zealand Defence Force, *supra* note 20, at 7-4.

²⁵ Federal Ministry of Defence (Germany), *Law of Armed Conflict – Manual* (May 1, 2013), at 61, available at <https://www.bmvg.de/resource/blob/93610/ae27428ce99dfa6bbd8897c269e7d214/b-02-02-10-download-manual-law-of-armed-conflict-data.pdf>.

²⁶ Weapon ‘includes weapon systems, damaging or injuring mechanisms, computer systems designed to attack enemy computer systems, and targeting devices’. See: Australia, The Australian Article 36 Review Process, *supra* note 16, at 3; Ministry of Defence (Belgium), *Commission d’Évaluation Juridique des nouvelles armes, des nouveaux moyens et des nouvelles méthodes de guerre*, DGJUR-SPS-CJBCEJ-CXX-001 /LEGAD-Int, at 4 (2018).

²⁷ Munitions and weapons are both considered as components of a ‘weapon’ in the protocol on incendiary weapons. See: Protocol on prohibitions or restrictions on the use of incendiary weapons, Article 1(1) (1980). They are both considered as ‘munitions’ in the Wassenaar Arrangement. See: Wassenaar Arrangement Secretariat, List of Dual-Use Goods and Technologies and Munitions List, Public Doc Vol II, 4.D.4, 179 s. (2017). They are distinguished in the Ottawa convention. See: Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction, Art 2(2), December 3, 1997, 2056 UNTS 211.

²⁸ For instance, not considering a missile or a nuclear bomb as a weapon because a launching platform is required, or considering a hand-thrown grenade as a weapon but not the grenade thrown by a grenade-launcher.

²⁹ HPCR, *supra* note 14, at 6. See also: Chircop & Liivoja, *supra* note 15, at 175-6.

³⁰ For example, a euthanasia agent might cause death, but would not be viewed as a weapon in a medical context. Similarly, a bulldozer might cause destruction, but would not be considered as a weapon in a civilian context, e.g. on a construction site. Regarding the use of armored vehicles in the context of warfare, see, Eric Schmitt, *U.S. Army Buried Iraqi Soldiers Alive in Gulf War*, N.Y. TIMES (Sept. 15, 1991), <https://www.nytimes.com/1991/09/15/world/us-army-buried-iraqi-soldiers-alive-in-gulf-war.html>. I also acknowledge that some specific types of weapons – i.e. bacteriological ones – may from a certain perspective not be considered as entirely ‘lifeless’.

³¹ Stuart Casey-Maslen worked on a broad definition that might be used in situations of ‘armed conflict’ and ‘law enforcement’: ‘[a]ny device constructed, adapted, or used to kill, harm, disorient,

Hence, this article proposes a wide working definition of ‘weapon’: ‘any instrument, device, projectile or substance designed or used in the context of an armed conflict to intentionally cause death, injury, incapacitation or damage to property, for offensive or defensive purposes’.

Now that a definition of ‘weapon’ has been offered, it is now time to determine whether neurotechnology – i.e. BCIs and perhaps, the connected warfighters – may qualify as weapons.

2. Neurotechnology as a mere interface between the warfighter and the weapon

As demonstrated later in this article, a BCI per se may qualify as a means of warfare, and would thus be subject to legal review if its use is contemplated on the battlefield. Could this new technology, though, qualify also as a weapon? At first sight, a BCI – ‘a device that directly translates brain signals into actions for computer software [...] –³² never directly ‘cause[s] death, injuries, incapacitation or damage to property’. As its name suggests, it appears as nothing more than an ‘interface’ between the brain and an external device – which may or may not be a weapon. A study of international agreements related to arms control confirms this interpretation. According to the Arms Trade Treaty,³³ ‘conventional arms’ include battle tanks,³⁴ armored combat vehicles,³⁵ large-caliber artillery systems,³⁶ combat aircraft,³⁷ attack helicopters,³⁸ warships,³⁹ missiles and missile launchers,⁴⁰ as well as small arms and light weapons.⁴¹ Protocols II, III, IV, and V of the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May be Deemed to be Excessively Injurious or to have Indiscriminate Effects (CCW) allows the

incapacitate, or affect a person’s behaviour against their will, or to damage or destroy buildings or materiel. A weapon acts through the application of kinetic force or of other means, such as the transmission of electricity, the diffusion of chemical substances or biological agents or sound, or the direction of electromagnetic energy. the term ‘weapon’ includes cyber weapons that damage computer systems and networks or result in physical harm to people or objects’. See: Stuart Casley-Maslen,

Editor’s Preface in WEAPONS UNDER INTERNATIONAL HUMAN RIGHTS LAW XV, XX (Casley-Maslen ed., 2014).

³² Brain Center Rudolf Magnus, *About Brain Computer Interface*, NEUROPROSTHESIS, http://neuroprosthesis.eu/?page_id=61 (visited December 24, 2019).

³³ Arms Trade Treaty, April 2, 2013, 3013 UNTS 1.

³⁴ *Id.*, Art. 2(1)(a).

³⁵ *Id.*, Art. 2(1)(b).

³⁶ *Id.*, Art. 2(1)(c).

³⁷ *Id.*, Art. 2(1)(d).

³⁸ *Id.*, Art. 2(1)(e).

³⁹ *Id.*, Art. 2(1)(f).

⁴⁰ *Id.*, Art. 2(1)(g).

⁴¹ *Id.*, Art. 2(1)(h).

identification of further categories of conventional weapons: mines,⁴² remotely-delivered mines,⁴³ anti-personnel mines,⁴⁴ booby-traps,⁴⁵ various types of explosive devices,⁴⁶ incendiary weapons,⁴⁷ blinding laser weapons,⁴⁸ and explosive ordnance.⁴⁹ Then, there are ‘biological weapons’,⁵⁰ and ‘chemical weapons’.⁵¹ Both nuclear weapons⁵² and non-lethal weapons⁵³ may be considered as weapons. Hence, it appears in practice that weapons include a harmful substance or munitions, as well as their means of delivery. They do not include, for example troop carriers (even if the conveyed soldiers hold weapons), or radar stations (even if they help guiding missiles).

As I underline later, warfighters equipped with BCIs, who retain control over their own movements (or the movements of a remotely-controlled drone or avatar) but forfeit the control of their weapons to a third person or an automatic system may be considered as means of warfare. This is related to who holds the ultimate decision-making over the use of lethal capacities, and to how they become accessory to their weapons. What happens, however, if the connected warfighter also forfeits control

⁴² Protocol on Prohibitions or Restrictions on the Use of Mines, Booby-Traps and Other Devices as amended on 3 May 1996, Art. 2(1), May 3, 1996, 2048 UNTS 93.

⁴³ *Id.*, Art. 2(2).

⁴⁴ *Id.*, Art. 2(3).

⁴⁵ *Id.*, Art. 2(4).

⁴⁶ *Id.*, Art. 2(5). They are defined as those ‘manually-emplaced munitions and devices including improvised explosive devices designed to kill, injure or damage and which are actuated manually, by remote control or automatically after a lapse of time’.

⁴⁷ *Id.*, Art. 1(1)(a).

⁴⁸ Additional Protocol to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons which may be deemed to be Excessively Injurious or to have Indiscriminate Effects (Protocol IV, entitled Protocol on Blinding Laser Weapons), October 13, 1995, 1380 UNTS 370.

⁴⁹ Protocol on Explosive Remnants of War to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons which may be deemed to be Excessively Injurious or to have Indiscriminate Effects (Protocol V), November 28, 2003, Art. 2(1), 2399 UNTS 100.

⁵⁰ Convention on the prohibition of the development, production and stockpiling of bacteriological (biological) and toxin weapons and on their destruction, April 10, 1972, 1015 UNTS 1-14860.

⁵¹ Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction, Art. II(1), September 3, 1992, 1975 UNTS 45. They include ‘[t]oxic chemicals and their precursors [...] Munitions and devices, specifically designed to cause death or other harm through the toxic properties of those toxic chemicals [...] which would be released as a result of the employment of such munitions and devices [...] Any equipment specifically designed for use directly in connection with the employment of [those] munitions and devices’.

⁵² ‘Nuclear weapon’ is defined by NATO as ‘[a] complete assembly (i.e. implosion type, gun type, or thermonuclear type), in its intended ultimate configuration which, upon completion of the prescribed arming, fusing and firing sequence, is capable of producing the intended nuclear reaction and release of energy’. See: NATO, Glossary of Terms and Definitions, AAP-06, at 91 (2019).

⁵³ ‘Non-Lethal Weapons are weapons which are explicitly designed and developed to incapacitate or repel personnel, with a low probability of fatality or permanent injury, or to disable equipment, with minimal undesired damage or impact on the environment’. See: NATO, *NATO Policy on non-lethal weapons*, Art. 1(2), available at <https://www.nato.int/docu/pr/1999/p991013e.htm> (visited December 24, 2019).

over his movements, and can be controlled by a third person as a video game character? Luke Chircop and Rain Liivoja contemplated the situation where pharmaceutical enhancement would erase ‘human agency’ and ‘free will’,⁵⁴ thus ‘turning the warfighter into a mere automaton or a remotely controlled biological avatar’.⁵⁵ In this situation, they consider that it would ‘be possible to speak of warfighters as weapons’.⁵⁶ They also note that ‘a person launched as a human cannonball would become a projectile, and thus a weapon’.⁵⁷ If this reasoning was applied to remotely-controlled soldiers – and with respect to the definition of the term ‘weapon’ identified earlier – this would mean that the reification of the warfighter went so far that he became similar to an ‘instrument, device, projectile or substance’. This would probably only be conceivable under extreme circumstances, and it is not certain that remotely-controlled soldiers directed to the enemy lines without any gun in a ‘cannon fodder’ scenario could be considered as weapons (the sending state could, however, be held responsible for a breach of the right to life).⁵⁸ As a matter of fact, what would ‘cause death, injuries, incapacitation or damage to property’ would technically not be the soldier, but what he bears in his hands or operates with his brain. Comparatively, the qualification of attack dogs as weapons remains disputed, even though they were integrated with their ‘offensive’ capabilities (teeth) right from birth.⁵⁹

If BCIs per se would not constitute weapons, only the most extreme conditions would allow a qualification of connected warfighters as such. Whether they constitute means of warfare, however, calls for a more nuanced answer.

B. An Asymmetric Qualification of Cybernetic Enhancement as ‘Means of Warfare’

Even if there is no common definition of ‘means of warfare’, it appears that this term is usually given a broad meaning in practice. Following a lengthy analysis, this article proposes a definition that includes weapon and the devices that facilitate their proper functioning (1). On the basis of this definition, it will be explained that the qualification of BCIs as means of warfare is certain (2). Finally, it will be

⁵⁴ Chircop & Liivoja, *supra* note 15, at 177.

⁵⁵ *Id.*

⁵⁶ *Id.*

⁵⁷ *Id.*, at 176.

⁵⁸ As noted by Heather Harrison Dinniss and Jann Kleffner, ‘the enhanced human soldier, per se, is not to be considered a weapon, because it is not the person that constitutes the offensive capability that can be applied to military objectives or enemy combatants’. They add however that: ‘the use of the technology does not convert the human into an object that could be considered a weapon’. See: Harrison Dinniss and Kleffner, *supra* note 14, at 438.

⁵⁹ Anna Marie Brennan, *Armed to the teeth: do military animals deserve protection in war?*, THE UNIVERSITY OF WAIKATO (September 4, 2018), at <https://www.waikato.ac.nz/news-opinion/media/2018/armed-to-the-teeth-do-military-animals-deserve-protection-in-war>.

demonstrated that the warfighter connected to a BCI may be considered as a means of warfare if he gives up his ultimate decision-making capacity (3).

1. 'Means of warfare' as weapons and the elements that facilitate their proper functioning

Lacking a consensual definition of 'means of warfare', various doctrinal proposals were made by experts.⁶⁰ Again, most states adopted their own terminology. According to France, 'means of warfare refer to weapon, projectiles and substances used'.⁶¹ Germany defines them as 'instruments which, without being weapons themselves, have an impact on particular offensive or defensive capacities',⁶² and they would include 'weapons, ammunition, material and other ordnance'.⁶³ It must also be noted that 'means of warfare' often overlap with, include, or replace the notion of 'weapon system'. Belgium thus defines the term 'weapon and means of warfare' as '[a]ny type of weapon, weapon system, projectile, ammunition, powder, explosive, or substance conceived to incapacitate persons and/or material'.⁶⁴ Rather than referring to 'means of warfare', both Australia⁶⁵ and NATO⁶⁶ resort to the notion of 'weapon

⁶⁰ For example, they include, according to the HPCR, 'weapons, weapon systems or platforms employed for the purposes of attack': HPCR, *supra* note 14, at 4. Again, HPCR's works prove to be influential, as this definition is also adopted by William Boothby, who 'succinctly' notes in parallel that they are 'the equipment used to undertake the hostilities': Boothby, *How Will Weapons Reviews Address the Challenges Posed by New Technologies*, *supra* note 14, at 40. The Tallinn Manual also refers to the HPCR manual and suggests that 'means of cyber warfare' are 'cyber weapons and their associated cyber systems', and 'therefore include any cyber device, materiel, instrument, mechanism, equipment, or software used, designed, or intended to be used to conduct a cyber attack': TALLINN MANUAL 2.0, *supra* note 14, at 452-3. According to Yoram Dinstein, they 'are weapons, weapon systems, or matériel (such as means of communications and signaling devices)': Yoram Dinstein, *Warfare, methods and means*, in MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, para. 2 (2015). Médecins Sans Frontières defines them as 'the weapons or weapons systems used': Médecins Sans Frontières, *Methods (and Means) of Warfare*, <https://guide-humanitarian-law.org/content/article/3/methods-and-means-of-warfare/> (last visited December 24, 2019). Finally, Justin McClelland submits 'that the terms, "means" and "methods of warfare" can, in practice, be read together. In that way they will include those items of equipment which, whilst they do not constitute a weapon as such, nonetheless have a direct impact on the offensive capability of the force to which they belong': McClelland, *supra* note 15, at 405. Gregor Noll suggests that '[t]o the extent that neurotechnology informs future weapons systems, states are under an obligation to consider how the resulting weapons system would relate to IHL obligations': Gregor Noll, *Weaponising Neurotechnology: International Humanitarian Law And The Loss Of Language*, 2(2) LONDON REV. INT'L. L. 201, 211 (2014).

⁶¹ Ministry of Defence (France), *Manuel du droit des conflits armés*, at 64 (2012).

⁶² Federal Ministry of Defence (Germany), *Prüfung neuer Waffen, Mittel und Methoden der Kriegführung*, *supra* note 17, at 37.

⁶³ Federal Ministry of Defence (Germany), *Law of Armed Conflict – Manual*, *supra* note 25, at 61.

⁶⁴ Ministry of Defence (Belgium), *supra* note 26, at 4.

⁶⁵ Australia, The Australian Article 36 Review Process, *supra* note 16, at 3.

⁶⁶ NATO, Glossary of Terms and Definitions, *supra* note 15, at 131.

system', which is defined as the 'combination of one or more weapons with all related equipment, materials, services, personnel and means of delivery and deployment (if applicable) required for self-sufficiency'.⁶⁷

Even if this specific aspect is not explicitly made by states, a plausible interpretation is that each component contributing to the 'means of warfare' should not be reviewed separately. I thus postulate that Article 36 calls for a somewhat 'holistic' approach in this case, and the legality of the system has to be considered as a whole. A conflicting point, however, is whether human beings (the 'personnel') should be regarded as part of the 'weapon system' – and thus 'means of warfare'.⁶⁸ It is however obvious that for the time being, no 'weapon' or 'weapon system' can actually perform its functions without an external (and human) intervention at some point. The warfighter always remains the final decision-maker, and it appears necessary to refine the approach to the question. This article proposes a functional criterion: a warfighter should be considered as part of the 'weapon system' as soon as he facilitates the proper functioning of a weapon, becomes a component or a technical characteristic of it – rather than the ultimate decision-maker. As to the technology at stake, it could also be considered as a means of warfare whenever it contributes to the proper functioning of a given weapon. For example, gun powder, propellant, missile vehicles or targeting and navigational systems are means of warfare – in contrast with, for instance, field rations, helmets, or radio. I thus suggest the following working definition: 'means of warfare include weapons and the elements – whether animate or inanimate – that facilitate their proper functioning ("weapon system")'.

On the basis of this definition, it will now be demonstrated that BCIs could qualify as means of warfare.

2. The certain qualification of BCIs as means of warfare

Two types of projects carried out by DARPA might shape the future battlefield. A first type, called 'Avatar', was launched in 2012 and could be used by the Army,

⁶⁷ See also: France, *Arrêté du 17 avril 1989 relatif à l'enrichissement du vocabulaire en usage au ministère de la défense*.

⁶⁸ The 'personnel' was not included in the Belgian definition of 'means of warfare', and such is the case for most dictionary definitions of 'weapon system'. See: 'Weapon system' is defined by the Encyclopedia Britannica as 'any integrated system, usually computerized, for the control and operation of weapons of a particular kind'. See: Weapons System Definition, Encyclopedia Britannica, at <https://www.britannica.com/technology/weapons-system> (visited June 16, 2019). It is defined by Collins dictionary as 'a weapon and the components necessary to its proper function, such as targeting and guidance devices'. See: Weapon System Definition, Collins, at <https://www.collinsdictionary.com/dictionary/english/weapon-system> (visited June 16, 2019). It is defined by the Oxford English Dictionary as 'a military weapon together with all the equipment required to make use of it, such as detection and control apparatus, a launcher, and a delivery vehicle'. See: Weapon System Definition, OED online (2016), at <https://www.oed.com>. However, Australia, NATO and France took the opposite view in their definition of 'weapon system'.

Marines and Special Forces.⁶⁹ This program ‘will develop interfaces and algorithms to enable a soldier to effectively partner with a semi-autonomous bi-pedal machine and allow it to act as the soldier’s surrogate’.⁷⁰ Hence, soldiers will be able to complete important missions, while avoiding exposure to enemy fire.⁷¹ A second type of project aims at developing telepresence, and would benefit aerial warfare. The ‘Human Assisted Neural Devices’ (HAND) program started in 2006, and the ‘Next-Generation Nonsurgical Neurotechnology’ (N3) project was launched in 2018.⁷² At present, the goal is ‘to develop high-resolution, bidirectional brain-machine interfaces for use by able-bodied service members’.⁷³ These ‘wearable interfaces’ would enable – among others – control of swarms of unmanned aerial vehicles.⁷⁴ As a matter of fact, DARPA subsequently announced that, thanks to neuronal implants, a quadriplegic woman managed to ‘pilot’ a Cessna on a flight simulator, then a F-35 fighter –⁷⁵ and, eventually, three aircraft at once.⁷⁶ Hence, current research could develop BCIs that allow the remote control (and probably the firing) of drones and jet fighters, as well as robots or avatars equipped for ranged or hand-to-hand combat. In such situations, they would indeed facilitate the proper functioning and control of the weapon, and thus qualify as means of warfare.

Still, the contribution of BCIs on the battlefield is not limited to telepresence. Current research also focuses on systems that would contribute to decision-making, by helping the soldier in deciding whether he should open fire or not. Such is the case for the CT2WS system, which is currently developed by DARPA. This system ‘built on the concept that humans are inherently adept at detecting the unusual’, which means that ‘[e]ven though a person may not be consciously aware of movement or of unexpected appearance, the brain detects it and triggers the P-300 brainwave, a brain

⁶⁹ Department of Defense (United States), *Fiscal Year (FY) 2013 President's Budget Submission* (2012), at 1-123, available at [https://www.darpa.mil/attachments/\(2G4\)%20Global%20Nav%20-%20About%20Us%20-%20Budget%20-%20Budget%20Entries%20-%20FY2013%20\(Approved\).pdf](https://www.darpa.mil/attachments/(2G4)%20Global%20Nav%20-%20About%20Us%20-%20Budget%20-%20Budget%20Entries%20-%20FY2013%20(Approved).pdf).

⁷⁰ More specifically, the goal is to ‘allow soldiers to remain out of harm’s way while still leveraging their experience and strengths to complete important missions such as sentry/perimeter control, room clearing, combat casualty recovery, and, eventually, dismounted combat maneuver’: *id.*

⁷¹ *Id.*

⁷² Department of Defense (United States), *Fiscal Year (FY) 2007 Budget Estimates* (2006), at 11, available at [www.darpa.mil/attachments/\(2G10\)%20Global%20Nav%20-%20About%20Us%20-%20Budget%20-%20Budget%20Entries%20-%20FY2007%20\(Approved\).pdf](http://www.darpa.mil/attachments/(2G10)%20Global%20Nav%20-%20About%20Us%20-%20Budget%20-%20Budget%20Entries%20-%20FY2007%20(Approved).pdf).

⁷³ DARPA, *Six Paths to the Nonsurgical Future of Brain-Machine Interfaces*, DARPA (May 20, 2019), at <https://www.darpa.mil/news-events/2019-05-20>.

⁷⁴ *Id.* Other uses include ‘control of active cyber defense systems’ and ‘teaming with computer systems to multitask during complex missions’.

⁷⁵ Zayan Guedim, *DARPA’s BCI Chip Allows Pilots to Control Drones Telepathically*, EDGY (September 11, 2018), <https://edgy.app/is-this-real-darpas-hivemind-is-operational>.

⁷⁶ *Id.*

signal that is thought to be involved in stimulus evaluation or categorization’.⁷⁷ It thus includes a camera and computer-run algorithms ‘to identify potential targets and cue images for operator review’, as well as ‘an electroencephalogram cap that monitors the operator’s brain signals and records when the operator detects a threat’.⁷⁸ When equipped with the CT2WS, ‘a soldier scanning a given region would be shown approximately ten images per second, on average. Instead of having to process potential threats oneself, the soldier (and an operator reviewing key images) would instead rely on subtle brain signals – picked up by the EEG cap – to hone in on hazards’.⁷⁹ In fact, ‘[t]he EEG data’ would ‘enhance accuracy and hasten the rate at which threats are detected, by spotting them inside the brain before a soldier has even processed the situation’.⁸⁰ When used on the battlefield, such equipment would constitute a characteristic of the weapon system, facilitate and refine the proper functioning of the weapon, and thus be considered as a means of warfare.

It was previously underlined that the proposed definition of ‘means of warfare’ could include animate elements. The next subsection proposes to determine whether a warfighter connected to a BCI might qualify as a means of warfare.

3. An assimilation of the connected warfighter to a means of warfare linked to his ultimate decision-making capacity

As highlighted above, a human being could be considered as a means of warfare if he ‘facilitates the proper functioning’ of a weapon – i.e. turns into a component or a technical characteristic of it – rather than the ultimate decision-maker. Does the warfighter retain his freedom of choice and control over the weapon? If he is still able to maintain control over his actions and thus, free to decide whether he should open fire or not, then he is not a means of warfare. When resorting to telepresence, his situation would be similar to that of a drone pilot. When using a threat-warning system, he would remain a soldier, albeit equipped with state-of-the-art technologies. By contrast, if his cognitive capacities are only required to ‘make the aircraft fly over’ the battlefield, ‘make the avatar walk on’ it, or ‘detect threats’, but the control of the weapon lies in the hands of another person or the system is adjusted to shoot automatically when an anomaly is detected, then the warfighter gives up his

⁷⁷ Katie Drummond, *Military’s “Luke Skywalker” Binoculars Use Brain Waves to Spot Threats*, FORBES (September 18, 2012), at www.forbes.com/sites/katiedrummond/2012/09/18/darpa-threat-recognition/#7a1dbd921272.

⁷⁸ Bruce Sterling, *Augmented Reality: DARPA Cognitive Technology Threat Warning System*, WIRED (December 19, 2012), at <https://www.wired.com/2012/09/augmented-reality-darpa-cognitive-technology-threat-warning-system/>; Brown University, *Brown to receive up to \$19M to engineer next-generation brain-computer interface*, BROWN (July 10, 2017), at www.brown.edu/news/2017-07-10/neurograins.

⁷⁹ Drummond, *supra* note 77.

⁸⁰ *Id.*

ultimate decision-making capacity and becomes a means of warfare. This would also be the case for the remotely-controlled soldiers mentioned previously.

A hypothesis formulated by Luke Chircop and Rain Liivoja calls for some thought. ‘Where the BMI [brain-machine interface] does not use external sensors to record neural activity but relies on implanted electrodes’, they argue, ‘the integration of the warfighter with the weapon system is such that it is difficult to separate the two. In such circumstances, the warfighter becomes part of the weapon system, and thus a component of a means of warfare’.⁸¹ I nevertheless wonder if the criterion of ‘implanted electrodes’ might not be too narrow. For instance, the HAND project allowed the subject, thanks to an invasive device, to remotely pilot three aircrafts. Yet, and even if the electrodes are implanted in the brain of the subject, there is always that time when cables are removed. It is thus still possible to physically separate the warfighter from the weapon system. Things may change over time, though. Nowadays, the technology used might influence the accuracy of the control over the external device. Hence, non-invasive BCIs allow less precise control, owing to the fact that they receive ‘dirtier’ signals.⁸² Future techniques might nevertheless correct this flaw, thanks to new types of detectors. For instance, the ‘Neural Dust’ program aims at developing ‘[a] tiny implant the size of a grain of sand’ that ‘can connect computers to the human body without the need for wires or batteries’.⁸³ Smaller implants could eventually be implanted into the brain,⁸⁴ and researchers are developing neural dust that could remain in the human body for a decade, and – because they are wireless – would make a permanent hole in the skull unnecessary.⁸⁵ At the same time, the N3 program ‘aims to develop high-performance, bi-directional brain-machine interfaces for able-bodied service members’, which would rely on the so-called ‘minutely invasive’ techniques.⁸⁶ The latter ‘will permit nonsurgical delivery of a nanotransducer’.⁸⁷ The image given by the head of the project (Al Emondi), is that of

⁸¹ Chircop & Liivoja, *supra* note 15, at 180.

⁸² Durham, *First-ever noninvasive mind-controlled robotic arm* (2019), at <https://engineering.cmu.edu/news-events/news/2019/06/20-he-sci-robotics.html>

⁸³ Ian Johnston, *Invention of ‘neural dust’ could mean people will be able to communicate with computers using the power of their mind*, INDEPENDENT (August 3, 2016), at www.independent.co.uk/news/science/neural-dust-implant-sensor-brain-nerve-humans-machines-prosthetics-berkeley-a7170251.html

⁸⁴ *Id.*

⁸⁵ *Id.*

⁸⁶ They would enable ‘technology for diverse national security applications such as control of unmanned aerial vehicles and active cyber defense systems or teaming with computer systems to successfully multitask during complex military missions’. , Al Emondi, *Next-Generation Nonsurgical Neurotechnology*, DARPA <https://www.darpa.mil/program/next-generation-nonsurgical-neurotechnology> (last visited December 24, 2019).

⁸⁷ ‘[...] this could include a self-assembly approach, viral vectors, molecular, chemical and/or biomolecular technology delivered to neurons of interest to reach single neuron resolution’. , DARPA, *Next-Generation Non-Surgical Neurotechnology (N3)*, GRANTS.GOV 4-5 (March 23, 2018),

total control: ‘[j]ust as service members put on protective and tactical gear in preparation for a mission, in the future they might put on a headset containing a neural interface, use the technology however it’s needed, then put the tool aside when the mission is complete’.⁸⁸ In such a case, the warfighter cannot be viewed as ‘part’ of the weapon system, and he would not qualify as a means of warfare. His situation would actually be more similar to that of a conventional drone pilot. Things would be different if the ‘neural dust’ or the ‘nanotransducer’ does not allow the subject to ‘remain in control’, and that – when the warfighter puts on the headset or is wirelessly connected – the control over shooting or movements is given to a third person or becomes automated.

Fortunately, it is less difficult to answer the next question, i.e. whether resort to cybernetic enhancement might constitute a method of warfare.

C. Cybernetic Enhancement as a Method of Warfare

In spite of the lack of a consensual definition of ‘method of warfare’, this term appears as sufficiently broad, and – following an investigation of doctrinal and state perceptions – is defined in this article as the strategies and tactics aimed at gaining or preserving a military advantage (1). It actually appears that the use of cybernetic enhancement may arguably be described as a method of warfare (2).

1. ‘Methods of warfare’ as the offensive or defensive strategies and tactics deployed to gain or preserve a military advantage

Isabelle Daoust, Robin Coupland, and Rikke Ishoey were among the first scholars to propose a definition of the term ‘method of warfare’ – which ‘is usually understood to mean the way in which weapons are used’ –⁸⁹ and subsequently became influential in legal scholarship.⁹⁰ Another definition which became influential is that of the HPCR.⁹¹ According to the HPCR, “Methods of warfare” mean attacks and other

<https://www.grants.gov/web/grants/view-opportunity.html?oppId=302121> (visited November 9th, 2020)

⁸⁸ DARPA, ‘Six Paths to the Nonsurgical Future of Brain-Machine Interfaces’, *supra* note 73.

⁸⁹ Isabelle Daoust, Robin Coupland & Rikke Ishoey, *New wars, new weapons? The obligation of States to assess the legality of means and methods of warfare*, 84 I.R.R.C. 345, 352 (2002).

⁹⁰ Justin McClelland refers to this definition, and concludes: ‘[i]t is submitted that the terms, “means” and “methods of warfare” can, in practice, be read together’: McClelland, *supra* note 15, at 405.

⁹¹ This definition influenced William Boothby, who added in parallel that ‘methods of warfare are activities designed adversely to affect the enemy’s military operations or military capacity’, and ‘compris[ing] essentially, the manner in which the hostilities are conducted’: Boothby, *How Will Weapons Reviews Address the Challenges Posed by New Technologies*, *supra* note 14, at 40. The works of the HPCR also influenced the Tallinn Manual, that defines ‘methods of cyber warfare’ as ‘the cyber tactics, techniques, and procedures by which hostilities are conducted’, ‘how cyber operations are mounted, as distinct from the instruments used to conduct them’: TALLINN MANUAL 2.0, *supra* note 14, at 453.

activities designed to adversely affect the enemy's military operations or military capacity, as distinct from the means of warfare used during military operations, such as weapons'.⁹² The HPCR adds that '[i]n military terms, methods of warfare consist of the various general categories of operations, such as bombing, as well as the specific tactics used for attack, such as high altitude bombing'.⁹³ Other definitions were proposed – among others – by Yoram Dinstein,⁹⁴ Luke Chircop and Rain Liivoja.⁹⁵

Definitions used by states tend to be similar to those found in the literature. 'Methods of warfare' may refer to 'how warfare is conducted' (the United States),⁹⁶ 'strategies or tactics' (France),⁹⁷ 'tactics' (the United Kingdom).⁹⁸ It might be noted that the terms 'strategy' and 'tactic' do not have exactly the same meaning.⁹⁹ Broadly

⁹² HPCR, *supra* note 14, at 5.

⁹³ *Id.*

⁹⁴ They 'encompass', according to Yoram Dinstein, 'almost every facet of hostilities', and include 'starvation of civilians', 'blockade', 'exclusion zones', 'perfidy', 'improper use of emblems, flags and uniforms', 'ruses of war', 'tunnels', 'espionage', 'seizure and destruction of enemy property', 'belligerent reprisals', 'the taking of hostages'. See, Yoram Dinstein, *Warfare, methods and means*, in MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, para. 22 (2015).

⁹⁵ In the framework of a painstaking analysis, Luke Chircop and Rain Liivoja identify a 'narrow' and a 'broad' definition of the term 'methods of warfare'. On the one hand, '[t]he narrow definition considers methods of warfare to be the way, mode, or manner in which means of warfare (especially weapons) are used. On this reading, a method of warfare is always associated with a particular type of weapon or means of warfare'. On the other hand, the broad definition of 'methods of warfare cover[s] tactics and operations'. They reject the 'narrow' approach but, with respect to the broad approach, note '[o]ne potential danger': 'almost everything the armed forces do in an organized manner during an armed conflict could be construed as a method of warfare'. They consequently suggest that 'methods of warfare for purposes of the law of armed conflict should only include such tactics and operations that are capable of causing harm to persons or objects, or, at the very least, adversely affect the enemy's military operations or military capacity'. See: Chircop & Liivoja, *supra* note 15, at 181-3.

⁹⁶ Department of Defense (United States), *Law of War Manual*, *supra* note 9, at 185.

⁹⁷ Ministry of Defence (France), *supra* note 61, at 64.

⁹⁸ Ministry of Defence (United Kingdom), *The Joint Service Manual of the Law of Armed Conflict* (2004), at 82, available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/27874/JSP3832004Edition.pdf.

⁹⁹ 'Strategy' would refer to '[t]he art or practice of planning or directing the larger movements or long-term objectives of a battle, military campaign, etc.', and is apparently '[o]ften distinguished from tactics, considered as the art of directing forces engaged in action or in the immediate presence of the enemy': Strategy Definition, OED Online (2016), at <https://www.oed.com>. 'Tactic' is defined by Black's Law Dictionary as follows: '1. An adroit or artful maneuver, esp. against an adversary. 2. A method of employing or redirecting force in combat. 3. (*pl.*) The study of military and naval maneuvers, esp. during hostilities; specif., the art of handling troops in proximity of the enemy or applying practiced movements on the battlefield'. See: Tactic Definition, Black's Law Dictionary (11th ed., 2019), available at Westlaw. It may be noted that this subtlety is also valid in the French language. 'Stratégie' is defined by Larousse dictionary as follows: '[a]rt de combiner l'action de forces militaires en vue d'atteindre un but de guerre déterminé par le pouvoir politique'; 'Art de coordonner l'action de forces militaires, politiques, économiques et morales impliquées dans la conduite d'une guerre ou la préparation de la défense d'une nation ou d'une coalition'. See: Stratégie

speaking, ‘tactics’ are the methods deployed to win a battle, whereas ‘strategies’ are the methods deployed to win a war. The ICRC defines methods of warfare as ‘the ways in which they [tools of war] are used’.¹⁰⁰ Germany is less laconic, defining ‘method of warfare’ as ‘the planification, concepts or doctrines for military procedures that are conceived to affect the military operations and capacities of the enemy, or to protect one’s own military operations and capacities’,¹⁰¹ including ruses of war and the prohibition of perfidy,¹⁰² starvation,¹⁰³ cyber operations,¹⁰⁴ military information activities,¹⁰⁵ as well as reprisals.¹⁰⁶ As for Additional Protocol I, it mentions a single concrete example of forbidden methods – the ‘starvation of civilians’ –¹⁰⁷ even if the term appears throughout its provisions.¹⁰⁸

If the use of the word ‘methods’ undoubtedly ‘implies a certain degree of planning and a measure of consistency in conduct over time or space’,¹⁰⁹ it must be underlined that methods of warfare do not necessarily cause harm to persons or objects.¹¹⁰

Definition, Larousse, <https://www.larousse.fr/dictionnaires/francais/strategie/74818?q=strategie#73968> (last visited September 1, 2019). ‘Tactique’ is defined by Larousse dictionary as follows: ‘[a]rt de diriger une bataille, en combinant par la manœuvre l’action des différents moyens de combat et les effets des armes, afin d’obtenir un résultat déterminé ; cette manière de combattre elle-même pendant la bataille’. See: Tactique Definition, Larousse, <https://www.larousse.fr/dictionnaires/francais/tactique/76391?q=tactique#75504> (last visited September 1, 2019).

¹⁰⁰ ICRC, *A Guide to the Legal Review of New Weapons, Means and Methods of Warfare: Measures to Implement Article 36 of Additional Protocol I of 1977*, *supra* note 18, at 3.

¹⁰¹ Federal Ministry of Defence (Germany), *Prüfung neuer Waffen, Mittel und Methoden der Kriegführung*, *supra* note 17, at 37.

¹⁰² Federal Ministry of Defence (Germany), *Law of Armed Conflict – Manual*, *supra* note 25, at 73-4.

¹⁰³ *Id.*, at 74.

¹⁰⁴ *Id.*

¹⁰⁵ *Id.*, at 75.

¹⁰⁶ *Id.*

¹⁰⁷ Additional Protocol I, Arts 14, 54(1).

¹⁰⁸ *Id.*, Arts 35(2), 35(3), 51(4)(b), 51(4)(c), 51(5)(a), 55(1).

¹⁰⁹ Luke Chircop and Rain Liivoja quote a definition from the OED: ‘a way of doing anything, esp. according to a defined and regular plan; a mode of procedure in any activity, business, etc.’. See: Chircop & Liivoja, *supra* note 15, at 181. ‘Method’ is however defined by Black’s Law Dictionary as ‘[a] mode of organizing, operating, or performing something, esp. to achieve a goal’. See: Method Definition, Black’s Law Dictionary (11th ed., 2019), available at Westlaw. ‘Method’ is defined by Merriam-Webster dictionary as ‘a procedure or process for attaining an object: such as [...] a systematic procedure, technique, or mode of inquiry employed by or proper to a particular discipline or art [...] a systematic plan followed in presenting material for instruction [...] a way, technique, or process of or for doing something [...] a body of skills or techniques’. See: Method Definition, Merriam-Webster, at <https://www.merriam-webster.com/dictionary/method> (visited September 2, 2019).

¹¹⁰ As a matter of fact, the choice of a somewhat broad formulation of ‘method of warfare’ was deliberate, as evidenced by the *travaux préparatoires* when it comes to the choice of the term ‘warfare’ (instead of ‘combat’). According to the ICRC, ‘[t]he Conference preferred the term

I thus build on those definitions and remarks, and suggest the following working definition of ‘methods of warfare’: ‘offensive or defensive strategies and tactics deployed by an army, in order to gain or preserve a military advantage’.

Pursuant to this definition, it is now explained why cybernetic enhancement plausibly qualifies as a method of warfare.

2. The plausible qualification of cybernetic enhancement as a method of warfare

Whether human enhancement technologies qualify as a method of warfare was discussed by some experts,¹¹¹ and only scarce state practice is available regarding the use of other new technologies as ‘methods of warfare’.¹¹² However, the working

“methods and means of warfare” to the term “methods and means of combat”, which was used in the ICRC draft, “for the reason that “combat” might be construed more narrowly than “warfare”. It is clear that the term “warfare” encompasses “combat”, a term that is used occasionally in the Protocol’. See, COMMENTARY ON THE ADDITIONAL PROTOCOLS OF 8 JUNE 1977 TO THE GENEVA CONVENTIONS OF 12 AUGUST 1949, *supra* note 4, at 398. In addition, nothing in state practice confirms the validity of a narrower meaning.

¹¹¹ According to Heather Harrison Dinniss and Jann Kleffner, ‘human enhancement technologies can be considered to be methods of warfare if and when their use constitutes an integral part of offensive activities at the strategic and tactical levels’. ‘In other words’, they provide that, ‘if human enhancement technologies were to emerge as organizational features of, and techniques for, weapons and military units to deliver force against opposing armed forces and military objectives, they will trigger the review obligations under Article 36 [...] and/or under domestic regulations’. See: Harrison Dinniss and Kleffner, *supra* note 14, at 439. According to Luke Chircop and Rain Liivoja, ‘[t]he enhanced warfighters themselves are obviously not methods of warfare, as this phrase relates to activities rather than entities or objects’. Then, ‘[n]either can the process of enhancing them be described as a method of warfare’, a ‘conclusion’ apparently ‘reached under both the narrow and broad definition of methods of warfare since an enhancement is not a particular way of using a weapon, nor is it in itself a way of adversely affecting the adversary’.¹¹¹ However, ‘the deployment of enhanced humans in hostilities could amount to a method of warfare’. First, and ‘[b]ased on the narrow approach, utilization of enhanced warfighters would be a method of warfare if closely associated with a specific means of warfare’. Second, and ‘[a]ccording to the broader approach, the use of human enhancement techniques or the use of enhanced humans in hostilities in an organized and consistent manner would be a method of warfare in a wide range of circumstances’, and ‘[i]f the particular tactic depended for its success on the enhancement of warfighters, the claim that the tactic is a method of warfare would be stronger than if the enhancement merely improved performance in some way’. See: Chircop & Liivoja, *supra* note 15, at 183-4.

¹¹² When cyber-warfare emerged, the United Kingdom acknowledged that ‘[t]he laws governing means and methods of war and protections apply equally to cyber activity, as they would traditional methods of warfare’: Ministry of Defence (UK), *Cyber Primer* (2016), at 14, available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/549291/20160720-Cyber_Primer_ed_2_secured.pdf. Then, ‘[i]n the ICRC’s view, means and methods of warfare which resort to cyber technology are subject to IHL just as any new weapon or delivery system has been so far when used in an armed conflict by or on behalf of a party to such conflict’: ICRC, INTERNATIONAL HUMANITARIAN LAW AND THE CHALLENGES OF CONTEMPORARY ARMED

definition proposed above would help identifying when cybernetic enhancement could be described as a method of warfare. What happens before the deployment of warfighters would not qualify as such. For instance, the surgical implantation of brain sensors, the setting of the EEG cap or – should the development of ‘minutely invasive’ techniques succeed – the injection or sniffing of nano-detectors would, even if used at a large scale, not qualify as a method of warfare. The subsequent training of soldiers would not qualify as a method either. However, the systematic and planned use of brain-controlled drones to carry out missions of reconnaissance or targeted killing, the replacement of ground troops by avatars for the purpose of land warfare and their deployment would qualify as methods of warfare. The use of an avatar to secure an escape route, as a last resort by beleaguered troops, might qualify as such. It would be the same if commanders received early instructions regarding the preferential sacrifice of avatars (or that of warfighters) in such situations. The accidental hack of a neural implant, by a belligerent soldier who thought he was intruding in a traditional computer, would not constitute a method of warfare. It won’t constitute one either if, in case of doubt, instructions say that the intrusion must continue. However, the planned and generalized neutralization of BCIs by state-sponsored hackers would certainly qualify as methods of warfare.

II. THE POTENTIAL PRIMA FACIE UNLAWFULNESS OF SOME TYPES OF CYBERNETIC ENHANCEMENT

On the one hand, and as highlighted in the introduction, a review in the light of forms of employment ‘prohibited by’ Additional Protocol I invites lawyers to consider whether the rights of civilians and enemy soldiers would be violated by this or that weapon, means or method of warfare. It actually appears that BCIs would plausibly comply with the rules contained in this protocol (A). However, the test does not stop there. Article 36 also obliges states to determine whether the employment of weapons, means or methods of warfare would be prohibited ‘by any other rule of international law applicable to the High Contracting Party’. Such rules may include, for instance, the prohibition on specific weapons.¹¹³ They would also include IHRL. In fact, it is generally agreed that IHRL ‘is applicable to everyone within the jurisdiction of the state concerned in time of peace as well as in time of armed conflict’, in contrast with IHL, which is applicable ‘in time of armed conflict and occupation’.¹¹⁴

CONFLICTS 36-37 (2011), <https://www.icrc.org/en/doc/assets/files/red-cross-crescent-movement/31st-international-conference/31-int-conference-ihl-challenges-report-11-5-1-2-en.pdf>.

¹¹³ For instance, treaty and customary rules exist with respect to asphyxiating gases, poison or poisoned weapons, bacteriological and chemical weapons etc. See: ICRC, A GUIDE TO THE LEGAL REVIEW OF NEW WEAPONS, MEANS AND METHODS OF WARFARE, *supra* note 18, at 11-14. It would be arguable that a device used to deliver such substances would be unlawful.

¹¹⁴ European Union, Guidelines on promoting compliance with international humanitarian law (IHL), OJ C327/04, para 12 (2005). This means that, where a state has effective control over a territory, its obligations arising under human rights law must apply. See, Cordula Droegge, *The Interplay between*

This article thus looks into the relationship between a state and its own soldiers,¹¹⁵ and how IHRL will benefit the latter **(B)**. It assumes in particular that, in the scenarios considered, members of the armed forces are within the jurisdiction of their state of allegiance, and that its human rights obligations must apply.¹¹⁶

A. The Plausible Compliance of Cybernetic Enhancement with the Rights of Civilians and Enemy Soldiers in the Light of International Humanitarian Law

According to Article 48 of Additional Protocol I, ‘[i]n order to ensure respect for and protection of the civilian population and civilian objects, the Parties to the conflict shall at all times distinguish between the civilian population and combatants and between civilian objects and military objectives and accordingly shall direct their operations only against military objectives’. This rule is known as part of the principle of distinction. In addition, Article 51(5)(b) of Additional Protocol I prohibits those attacks that ‘may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated’. This rule is known as ‘proportionality’. Then, Article 57(1) of the same protocol underlines that, ‘[i]n the conduct of military operations, constant care shall be taken to spare the civilian population, civilians and civilian objects’. This rule is known as ‘precautions’. These three rules aim at protecting civilians from the vicissitudes of war, and are also part of international customary law.¹¹⁷ As a matter of fact, new types of BCIs could enhance compliance with the rules of distinction, proportionality and precautions, as they may help to distinguish between soldiers and civilians, and improve strike accuracy **(1)**. According to Article 35(2) of Additional Protocol I, ‘[i]t is prohibited to employ weapons, projectiles and material and methods of warfare of a nature to cause superfluous injury or unnecessary suffering’. With the exception of some types of

International Humanitarian Law and International Human Rights Law in Situations of Armed Conflict, 40 ISRAEL L. REV. 310, 334 (2007); Alexander Orakhelashvili, *The Interaction between Human Rights and Humanitarian Law: Fragmentation, Conflict, Parallelism, or Convergence?*, 19(1) E.J.I.L. 161 (2008).

¹¹⁵ As underlined by Vincent Boulanin and Maaïke Verbruggen, ‘IHRL also forms part of the corpus of international law that needs to be considered in the conduct of an Article 36 review’ and ‘[e]nhanced soldiers, by virtue of being alive in the world, possess human rights’. See, VINCENT BOULANIN & MAAÏKE VERBRUGGEN, ARTICLE 36 REVIEWS – DEALING WITH THE CHALLENGES POSED BY EMERGING TECHNOLOGIES 30 (2017).

¹¹⁶ It may be noted that the emergence of BCIS mitigates the number of situations where soldiers would need to be deployed overseas – without causing their complete disappearance – as telepresence would allow them to physically remain within the territory of their state of allegiance. It may also be noted that the HRC ‘considers killing in armed conflict, even when the state party does not exercise control over the territory, to fall within the ambit’ of the ICCPR: WILLIAM SCHABAS, NOWAK’S CCPR COMMENTARY 116142 (2019).

¹¹⁷ ICRC, *Customary IHL*, at https://ihl-databases.icrc.org/customary-ihl/eng/docs/v1_rul.

weapons that are considered unlawful by nature, the application of this provision calls for a balancing test that cybernetic enhancement might pass (2).

1. Cybernetic enhancement as a factor of increased compliance with the rules of distinction, proportionality and precautions

Estimates indicate that ‘between 80 and 85 per cent of accidents involving the armed forces are caused directly by human error attributed to failures of cognitive performance’, and that ‘[t]hese failures are the result of biological stressors’.¹¹⁸ It however appears that the integration of a soldier’s brainwaves into the weapon system may improve compliance with the rule of distinction.¹¹⁹

The use of ‘EEG-based human filtering’ was first tested to reduce the amount of false alarms.¹²⁰ Previous experimentations indicated that the number of false alarms drop significantly when such technology is used, while allowing a very high target recognition rate.¹²¹ In addition, the ‘cognitive algorithms’ have potential for highlighting ‘many events that would otherwise be considered irrelevant but are actually indications of threats or targets, such as a bird flying by or a branch’s swaying’.¹²² Some investigations were thus carried in this direction, and a study conducted at the Wright-Patterson Air Force Base sought to assess the efficacy of transcranial direct current stimulation (tDCS), in view of improving information processing capabilities during a multitasking environment.¹²³ The results were convincing, and it was proven ‘that tDCS has the ability to augment and enhance multitasking capability in a human operator’.¹²⁴ In parallel, and in the framework of a project sponsored by the Intelligence Advanced Research Projects Activity (IARPA), a team based in New Mexico University ‘stimulated the brains of more than 1,000

¹¹⁸ Ioana Maria Puscas, *Military Human Enhancement*, in NEW TECHNOLOGIES AND THE LAW IN WAR AND PEACE 182, 217 (William Boothby ed., 2018).

¹¹⁹ Heather Harrison Dinness, *Legal Aspect of Human Enhancement Technologies*, in NEW TECHNOLOGIES AND THE LAW IN WAR AND PEACE 230, 237 (William Boothby ed., 2018).

¹²⁰ DARPA, *DARPA’s CT2WS Program Improves Target Detection*, SCI TECH DAILY (September 19, 2012), at <https://scitechdaily.com/darpas-ct2ws-program-improves-target-detection/>. See also: Robbin Miranda et al, *DARPA-funded efforts in the development of novel brain–computer*, 244 J. NEUROSCI. METHODS 52 (2015).

¹²¹ ‘In testing of the full CT2WS kit, absent radar, the sensor and cognitive algorithms returned 810 false alarms per hour’. Then, ‘[w]hen a human wearing the EEG cap was introduced, the number of false alarms dropped to only five per hour, out of a total of 2,304 target events per hour, and a 91 percent successful target recognition rate’. See: *id.*

¹²² *Id.*

¹²³ This ‘noninvasive brain stimulation technique’ would be applied to ‘a scalp location over the left dorsolateral prefrontal cortex (IDL PFC)’. See: Justin Nelson et al., *The Effects of Transcranial Direct Current Stimulation (tDCS) on Multitasking Throughput Capacity*, 10 FRONT HUM NEUROSCI 1 (2016).

¹²⁴ *Id.*

volunteers using a 9V battery connected to electrodes on the scalp'.¹²⁵ The experimentation revealed that, after half an hour of stimulation with a current of two milliamps, volunteers were able to detect more threats.¹²⁶ Moreover, brain stimulation was tested to determine whether friendly-fires might be avoided. It seems that, '[a]fter deciding that he has seen an enemy, a soldier with his finger on the trigger takes between 400 and 450 milliseconds to pull it'.¹²⁷ Yet, 'brainwave data can indicate that he has realised he has made a mistake in as little as 200 milliseconds. This should be enough time for a shot to be blocked by disabling the firing mechanism automatically, and for a comrade's life thus to be saved'.¹²⁸

In a nutshell, 'EEG-based human filtering', whether associated or not with brain stimulation, has potential for reducing false alarms, avoiding friendly-fires and allowing a better detection of the enemy. If such devices can be used to determine whether enemy soldiers operate in the surrounding area (or not), and whether other persons are members of the allied forces, then using threat-detection systems to distinguish between civilians and soldiers, adults and children could be the next step. It would result in a better compliance with the rule of distinction, and such interfaces would pass the legal review of Article 36.

It is also arguable that cybernetical enhancement has potential for increasing compliance with the rule of proportionality and precautions.¹²⁹ In a report released by the US the Director of National Intelligence (DNI) in 2017, it was reported that between January 2009 and December 2015, the United States had carried out 473 counter-terrorist airstrikes.¹³⁰ According to this document, it was also estimated that between 2372 and 2581 combatants had been killed as a result of these strikes, while between 64 and 116 'non-combatants' died.¹³¹ This means that the ratio of incidental loss was approximately between 2 and 5%.¹³² Yet, progress in neuroscience may help

¹²⁵ *Know your Enemy, How to make soldiers' brain better at noticing threats*, ECONOMIST (July 27, 2017), at www.economist.com/science-and-technology/2017/07/27/how-to-make-soldiers-brains-better-at-noticing-threats.

¹²⁶ More specifically, 'volunteers spot in test photographs 13% more snipers, makeshift bombs and the like than do volunteers given a "sham" current of 100 microamps (5% of the experimental current) that mimics the skin-tingling induced by the experimental current'. See: *id.*

¹²⁷ *Id.*

¹²⁸ *Id.*

¹²⁹ For a discussion of the application of proportionality to drone warfare: David Akerson, *Applying Jus In Bello Proportionality to Drone Warfare*, 16(2) O.R.I.L. 173 (2014).

¹³⁰ Department of Defense (United States), *Summary of Information Regarding U.S. Counterterrorism Strikes Outside Areas of Active Hostilities* (2017), <https://www.dni.gov/index.php/newsroom/reports-publications/reports-publications-2017/item/1741-summary-of-information-regarding-u-s-counterterrorism-strikes-outside-areas-of-active-hostilities>.

¹³¹ *Id.* It must nevertheless be noted that the numbers of civilian casualties are disputed. See: Conor Friedersdorf, *America's Shadow Death Row*, ATLANTIC (January 22, 2021), <https://www.theatlantic.com/ideas/archive/2021/01/americas-shadow-death-row/617757/>.

¹³² For a general review of the use of drones, see: Dan Sabbagh, *Killer drones: how many are there and who do they target?*, GUARDIAN (November 26, 2019), <https://www.theguardian.com/news/2019/nov/18/killer-drones-how-many-uav-predator-reaper>. It

decrease expected incidental loss. In fact, it has potential for improving accuracy and for reducing fatigue-related problems, which is an issue for UAV operators, who analyze images for a long time.¹³³ For instance, resort to real-time neuro-imaging could improve target recognition ‘by recognizing subconscious objective identification rather than an operator having to process and actively react’.¹³⁴ To achieve this result, it might be enough to equip the operator with a hairnet, that would detect changes in brain activity.¹³⁵

2. The probable compliance of cybernetic enhancement and hacking techniques with the prohibition of superfluous injury and unnecessary suffering

At first glance, assessing the legality of BCIs that merely facilitate the functioning of existing weapons or weapon systems (aircrafts, drones, rifles etc.) should not raise much difficulty. One could indeed argue that deploying these ‘traditional’ instruments, albeit via a new method (a BCI rather than the human hand) does not raise much concern, as long as the decision to fire belongs to a human. However, several evolutions of the technology are conceivable, that would raise problematical situations. First, research in the wake of the CT2WS program could end up with a weapon system that automatically shoots when brain signals detect a threat

(a). Second, armies could develop hacking techniques which aim at neutralizing the brain chip of enemy soldiers, or produce various impairments (b).

- a. The ‘automatic firing’ scenario

The theme of autonomous weapon systems (AWS) gained attention from both experts and states over the last years. Unfortunately, the question of superfluous injury

must be noted, though, that some experts challenge the fact that UAV’s cause less damage than traditional airstrikes: Steven Barela and Avery Plaw, *The Precision of Drones: Problems with the New Data and New Claims* (August 23, 2016), <https://www.e-ir.info/2016/08/23/the-precision-of-drones-problems-with-the-new-data-and-new-claims/>.

¹³³ Rajesh Uppal, *Military is developing brain control interfaces which allow controlling UAV swarms, fighter aircrafts and weaponry with the speed of thought*, INTERNATIONAL DEFENCE SECURITY & TECHNOLOGY (March 10, 2019), at <https://idstch.com/technology/biosciences/military-developing-brain-control-interfaces-control-uav-swarm-fighter-aircrafts-weaponry-speed-thought-arrived/>.

¹³⁴ *Id.*

¹³⁵ *Id.*

remains in its infancy in current discussions. Most scholars¹³⁶ and states¹³⁷ merely mention that AWS must comply with this prohibition of superfluous injury, but do not address this issue further. As the prohibition of superfluous injury is generally interpreted as rendering unlawful those weapons designed to aggravate the injuries of persons hors-de-combat,¹³⁸ the employment of an AWS which is unable to distinguish between an active threat and a soldier who is hors-de-combat, and carries on shooting on the latter clearly appears as unlawful. Such devices shall not pass the legal review of Article 36. Apart from this aspect, it has long been understood that the prohibition flowing from Article 35(2) encompasses the employment of ‘arms, projectiles, or material calculated to cause unnecessary suffering’, such as the use of poison and poisoned weapons, explosive bullets and projectiles filled with glass, dum-dum bullets, asphyxiating gases etc.¹³⁹ The use of a device for the purpose of delivering such projectiles or substances would then be prohibited.

What happens, however, with an ‘automatic firing’ neural interface, which is configured to shoot in the head or the chest – rather than in the arm? The purpose of such device would indeed be to kill, and would not consider whether rendering an enemy soldier hors-de-combat could be achieved by a less-lethal method. Despite some claims to the contrary,¹⁴⁰ it seems that there is no obligation to resort to the so-called ‘least harmful means’ against belligerent forces in the strictest sense. In fact, a violation of the prohibition of superfluous injury and unnecessary suffering occurs whenever military action is not justified by military necessity or the opportunity to

¹³⁶ James Farrant & Christopher Ford, *Autonomous Weapons and Weapon Reviews: The UK Second International Weapon Review Forum*, 93 I.L.S. 389, 407 (2017); Kenneth Anderson, Daniel Reisner & Matthew Waxman, *Adapting the Law of Armed Conflict to Autonomous Weapon Systems*, 90 I.L.S. 386, 399 (2014).

¹³⁷ Russian Federation, Potential opportunities and limitations of military uses of lethal autonomous weapons systems, CCW/GGE.1/2019/WP.1. (2019); United States, Human-Machine Interaction in the Development, Deployment and Use of Emerging Technologies in the Area of Lethal Autonomous Weapons Systems, CCW/GGE.2/2018/WP.4. (2018); Poland, Working Paper on Lethal Autonomous Weapons Systems, CCW/GGE.1/2018/WP.3. (2018).

¹³⁸ Djibouti, *Manuel sur le droit international humanitaire et les droits de l'homme applicables au travail du policier* (2004), at 11, available at https://ihl-databases.icrc.org/customary-ihl/eng/docs/v2_cou_dk_rule70; Solomon Islands, *Letter dated 19 June 1995 from the Permanent Representative of Solomon Islands to the United Nations, together with Written Statement of the Government of Solomon Islands* (June 19, 1995), para. 3.74, available at <https://www.icj-cij.org/files/case-related/95/8714.pdf>.

¹³⁹ COMMENTARY ON THE ADDITIONAL PROTOCOLS OF 8 JUNE 1977 TO THE GENEVA CONVENTIONS OF 12 AUGUST 1949, see *supra* note 4, 402-407. They were previously mentioned by Articles 23(e) and 23(a) of the Regulations respecting the Laws and Customs of War on Land, the Declaration of St Petersburg of 1868, the Hague Declaration III of 1899, the Geneva Protocol of 1925.

¹⁴⁰ Ryan Goodman, *The Power to Kill or Capture Enemy Combatants*, 24(3) E.J.I.L. 819, 822 (2013). See, also, ROBIN COUPLAND, *THE SIRUS PROJECT 5* (ICRC ed., 1997); NILS MELZER, *INTERPRETATIVE GUIDANCE ON THE NOTION OF DIRECT PARTICIPATION IN HOSTILITIES UNDER INTERNATIONAL HUMANITARIAN LAW* 77-82 (2009); Alexander Greenawalt, *Targeted Capture*, 59 HARV. INT'L L.J. 1 (2018).

gain a military advantage.¹⁴¹ The position of the United States, for instance, is clear in that respect:

[i]n the absence of expected harm to civilians and civilian objects or of wanton destruction that is not justified by military necessity, the law of war imposes no limit on the degree of force that may be directed against enemy military objectives, including enemy military personnel (but not including enemy personnel who are placed hors de combat). For example, the principle of military necessity does not require that only the minimum force that is actually necessary in a specific situation may be used against military objectives. Instead, the broader imperatives of winning the war may be considered, and overwhelming force may be used against enemy military objectives. In addition, combatants need not offer opponents an opportunity to surrender before carrying out an attack.¹⁴²

¹⁴¹ This view is also confirmed by the historical context. Article 14 of the Lieber Code defines ‘military necessity’ as those ‘measures which are indispensable for securing the ends of the war, and which are lawful according to the modern law and usages of war’. See, FRANCIS LIEBER, WAR DEPARTMENT, INSTRUCTIONS FOR THE GOVERNMENT OF ARMIES OF THE UNITED STATES IN THE FIELD (April 24, 1863), <https://ihl-databases.icrc.org/ihl/INTRO/110>.

¹⁴² Department of Defense (United States), *Law of War Manual*, *supra* note 9, at 203-204. See, also, *U.S. v. List*, 11 NMT 1230 (American Military Trial, 1948), at 1253.

Similar views were adopted by most states¹⁴³ – who apparently share a large vision of ‘military advantage’ or ‘military necessity’ –¹⁴⁴ and experts.¹⁴⁵ States also made

¹⁴³ According to New Zealand: ‘[a]ll weapons and munitions are designed to render members of the opposing force unable to continue to fight or to degrade that force’s equipment or other property. This is done to gain a concrete and direct military advantage. Although regrettable in humanitarian terms, suffering and injury is an inevitable part of armed conflict and is not unlawful when it results from an attack with lawful weapons directed against a military objective. There is no LOAC obligation to refrain from using a lawful, but highly destructive, weapon against members of the opposing force in favour of one that is less effective. Being better armed than the enemy is not a breach of LOAC. A weapon is not unlawful simply because it is liable to cause large numbers of casualties amongst the opposing force, or large numbers of fatalities amongst those casualties. Large projectiles used to destroy materiel will almost certainly kill outright any person hit by one. However, the effect on persons does not render the munition unlawful since it is designed to achieve its lawful purpose and no more. By contrast, some weapons or munitions cause superfluous injury and unnecessary suffering or uselessly aggravate suffering or the wounding effect to an extent that goes beyond that demanded by military necessity’. See: New Zealand Defence Force, *supra* note 20, at 7-5. According to Germany, ‘[t]he employment of methods and means of warfare causes superfluous injury or unnecessary suffering if the expected impairment does not serve any military purpose or if injuries or suffering are caused by the effects of weapons or projectiles that are not necessary to neutralize the adversary forces’. See, Federal Ministry of Defence (Germany), *Law of Armed Conflict – Manual*, *supra* note 25, at 52. See also, Department of National Defence (Canada), *Law of Armed Conflict at the Operational and Tactical Levels* (2001), para. 503.

https://www.fichl.org/fileadmin/migrated/content/uploads/Canadian_LOAC_Manual_2001_English.pdf. A slightly more moderate view was adopted by the Netherlands, and perhaps by the United Kingdom. According to the Dutch government, ‘[i]t seems that suffering may be called “unnecessary” when its infliction was not necessary to attain a lawful military advantage or greatly exceeds what could reasonably have been considered necessary to attain that military advantage’. See, The Netherlands, *Written Statement of the Government of Netherlands* (1994), para. 27, <https://www.icj-cij.org/public/files/case-related/93/13407.pdf>. In 1995, the UK government took the view that this principle ‘requires that a balance be struck between the military advantage which may be derived from the use of a particular weapon and the degree of suffering which the use of that weapon may cause’. See, United Kingdom, *Letter dated 16 June 1995 from the Legal Adviser to the Foreign and Commonwealth Office of the United Kingdom of Great Britain and Northern Ireland, together with Written Comments of the United Kingdom* (June 16, 1995), para. 3.64, <https://www.icj-cij.org/public/files/case-related/93/10947.pdf>. Yet, in 2004, the Ministry of Defence adopted the more traditional view that ‘the use of force in ways which are not otherwise prohibited is legitimate if it is necessary to achieve, as quickly as possible, the complete or partial submission of the enemy [...] conversely, the use of force which is not necessary is unlawful, since it involves wanton killing or destruction’. It referred to the Lieber Code and the Declaration of St Petersburg for the purpose of defining military necessity. See: Ministry of Defence (United Kingdom), *supra* note 98, at 22.

¹⁴⁴ Western states also seem to share a large vision of this ‘military advantage’. According to the war manual of the United Kingdom, ‘[m]ilitary necessity permits a state engaged in an armed conflict to use only that degree and kind of force, not otherwise prohibited by the law of armed conflict, that is required in order to achieve the legitimate purpose of the conflict’ – i.e. ‘the complete or partial submission of the enemy at the earliest possible moment with the minimum expenditure of life and resources’. See, Ministry of Defence (UK), *The Joint Service Manual of the Law of Armed Conflict*, *supra* note 98, para. 2.2. Similar provisions appear in the war manuals of Canada, France, and New Zealand. See, Department of National Defence (Canada), *Law of Armed Conflict at the Operational and Tactical Levels* (2001), para. 202, available at

clear that the use of weapons that ‘render death inevitable’ is not necessarily incompatible with IHL.¹⁴⁶ Hence, there is no prima facie incompatibility between a neural interface designed to shoot enemy combatants in the head or the chest and the prohibition of superfluous injury and unnecessary suffering. It is because – at least in some circumstances – killing the enemy will be required by military necessity. A device of this kind would thus pass the legal review of Article 36. It may also be mentioned that a similar device which would generally be configured to shoot in the arm, but the setup of which could be modified to shoot in the head or the chest, would in any case pass the test under the legal review of Article 36. This relates to the fact that it would constitute a misuse, to which states are normally not required to give attention. As a matter of fact, ‘[t]he determination is

https://www.fichl.org/fileadmin/migrated/content/uploads/Canadian_LOAC_Manual_2001_English.pdf; Ministry of Defence (France), *supra* note 61, at 65-6; New Zealand Defence Force, *supra* note 20, at 4-4. In addition, it seems that the views expressed by the Israeli Supreme Court in the *Targeted Killing* case do not contradict this practice. The statement, according to which ‘a civilian taking a direct part in hostilities cannot be attacked at such time as he is doing so, if a less harmful means can be employed’ might as well be embedded in Israeli domestic law or IHRL – rather than in IHL. See, *Public Committee v. Government of Israel*, HCJ 769/02 (Supreme Court of Israel, 2006). See, also, Hays Parks, *Part IX of the ICRC Direct Participation in Hostilities Study: No Mandate, No Expertise, and Legally Incorrect*, 42 N.Y.U. J. INT’L L. & POL. 769, 792-93 (2010); APV Rogers, *Direct Participation in Hostilities: Some Personal Reflections*, 48 MIL. L. & L. WAR REV. 143, 159 (2009).¹⁴⁵ Gabriella Blum, *The Dispensable Lives of Soldiers*, 2 J. LEGAL ANALYSIS 115, 117-18 (2010); Jens-David Ohlin, *The Duty to Capture*, 97 MINN. L. REV. 1268, 1298 (2013); Jann Kleffner, *Section IX of the ICRC Interpretive Guidance on Direct Participation in Hostilities: The End of Jus in Bello Proportionality as We Know It*, 45 ISRAEL L. REV. 35, 45 (2012); Geoffrey Corn *et al.*, *Belligerent Targeting and the Invalidity of A Least Harmful Means Rule*, 89 I.L.S. 536 (2013); STUART CASEY- MASLEN & STEVEN HAINES, *HAGUE LAW INTERPRETED: THE CONDUCT OF HOSTILITIES UNDER THE LAW OF ARMED CONFLICT* 211-12 (2018). See, also, COMMENTARY ON THE ADDITIONAL PROTOCOLS OF 8 JUNE 1977 TO THE GENEVA CONVENTIONS OF 12 AUGUST 1949, *supra* note 4, at 408.

¹⁴⁶ United Kingdom, *Letter dated 16 June 1995*, *supra* note 143, para. 3.66. According to the United States, the argument that a given weapon would violate the principle because it ‘render[s] death inevitable’ was allegedly ‘based on a misconception of the St. Petersburg principle’ which ‘was directed at anti-personnel weapons that were deliberately designed to kill when that design feature was not needed to disable enemy combatant’. See, United States, *Letter dated 20 June 1995 from the Acting Legal Adviser to the Department of State, together with Written Comments of the Government of the United States of America* 32-33 (June 20, 1995), <https://www.icj-cij.org/public/files/case-related/93/8804.pdf>. For a different view, see, Burundi, *Règlement n 98 sur le droit international humanitaire* 81 (2007); Chad, *Droit international humanitaire, Manuel de l'instructeur en vigueur dans les forces armées et de sécurité* 79 (2006); Denmark, *A Cost-Benefit Analysis of a Possible Introduction of a National Danish Moratorium on All Cluster Munitions* 14 (2008); Côte d'Ivoire, *Droit de la Guerre, Manuel d'Instruction* 12-14 (2007). The relevant extracts are available on the website of the ICRC: https://ihl-databases.icrc.org/customary-ihl/eng/docs/v2_rul_rule70. See, also, JEAN-MARIE HENCKAERTS & LOUISE DOSWALD-BECK, *CUSTOMARY INTERNATIONAL HUMANITARIAN LAW – VOLUME I: RULES* 241 (2005); Steven Haines, *Weapons, means and methods of warfare, in PERSPECTIVES ON THE ICRC STUDY ON CUSTOMARY INTERNATIONAL HUMANITARIAN LAW* 258, 264-5 (Elizabeth Wilmschurst & Susan Breau, eds., 2016).

to be made on the basis of normal use of the weapon as anticipated at the time of evaluation'.¹⁴⁷

b. The hacking techniques aiming at neutralizing enemy BCIs

If some armies decide to resort to BCIs in the framework of future conflicts, a reaction from the enemy must be expected. Methods that aim at neutralizing BCIs, or those who wear them – i.e. hacking techniques –¹⁴⁸ will emerge. These methods of warfare will also call for a review under Article 36. In fact, security breaches that occurred with neuromodulation devices reveal that it is already possible to hack into those systems and alter motor function,¹⁴⁹ provoke pain,¹⁵⁰ or induce emotional changes.¹⁵¹ The sophistication of these techniques will probably allow the neutralization of adverse BCIs in the foreseeable future.

As underlined above, the lawfulness of a military action is to be evaluated in light of military advantage. Even if the damage caused is likely to result in death, permanent blindness, paralysis or mental impairment, it is likely that hacking an implant inserted in the enemy's brain will be necessary to fulfil a military objective at least in some situations. Consequently, there is no *prima facie* unlawfulness, and such techniques shall pass the test of Article 36.

What happens, however, if a hacking technique is designed to cause the explosion of the chip, and to spread undetectable debris in the brain? According to the Protocol on Non-Detectable Fragments, '[i]t is prohibited to use any weapon the primary effect of which is to injure by fragments which in the human body escape detection by X-rays'. Even if the 'primary effect' of a hacking technique is 'to injure by fragments which in the human body escape detection by X-rays', it is not certain

¹⁴⁷ COMMENTARY ON THE ADDITIONAL PROTOCOLS OF 8 JUNE 1977 TO THE GENEVA CONVENTIONS OF 12 AUGUST 1949, *supra* note 4, at 423.

¹⁴⁸ With respect to this question, Heather Harrison Dinniss and Jann Kleffner note that the principle 'generally allows for more serious injuries resulting from anti-materiel weapons [...] than it would for weapons typically designed for anti-personnel use'. They note that a brain implant may be viewed 'as military materiel separate from the individual' and hence, 'the permissible level of injury and harm necessitated by the effects of a weapon designed to counter that chip may be higher than that of a weapon directed at unenhanced personnel'. It could thus be argued 'that any countermeasure used against implantable brain chips is designed to destroy the electronics in the implanted chip and any resulting brain damage to the soldier would be incidental'. They nevertheless add that, if 'blindness' or 'permanent brain injury or damage to neural circuitry' are 'necessarily' caused 'when used in the circumstances for which it was procured, it may be difficult to show that it was not designed for that purpose'. See: Harrison Dinniss and Kleffner, *supra* note 14, at 441-2.

¹⁴⁹ Laurie Pycroft et al., *Brainjacking - Implant Security Issues in Invasive Neuromodulation*, 92 WORLD NEUROSURG 454, 456 (2016).

¹⁵⁰ *Id.*

¹⁵¹ *Id.*, at 457.

that it would not pass the legal review of Article 36. In fact, most states confirm that this provision merely applies to the projectiles used by an army.¹⁵²

If attacks on invasive devices (implants) could lead to harmful results, non-invasive BCIs are not immune from such attacks – especially bidirectional ones. Bidirectional BCIs ‘establish a two-way direct communication link between the brain and the external world’, with a ‘decoder’ that ‘translates recorded neural activity into motor commands and an encoder delivers sensory information collected from the environment directly to the brain creating a closed-loop system’.¹⁵³ We could imagine hacking techniques that redirect false or an excess of external information to the brain, thus preventing a normal functioning of neural and muscle activity (for instance, respiratory functions).¹⁵⁴ Again, there would be no *prima facie* violation of IHL and the method shall pass the legal review, as it might be necessary to gain a military advantage in some situations.

The present subsection suggested that cybernetic enhancement will probably pass the legal review of Article 36 when it comes to their compliance with the prohibition of superfluous injury and unnecessary suffering, as well as with the principle of distinction. The compliance with the latter could indeed be upgraded thanks to the resort to BCIs. In the next subsection, the concerns related to the rights of an army’s own soldiers will be underlined.

B. The Potential Non-Compliance of Cybernetic Enhancement with the Rights of an Army’s own Soldiers in the Light of International Human Rights Law

The following developments rely on the fundamental assumption that, despite enhancement, members of the armed forces are still human.¹⁵⁵ It will thus be

¹⁵² Chad, *Droit international humanitaire, Manuel de l'instructeur en vigueur dans les forces armées et de sécurité* (2006), at 79; Ecuador, *Aspectos Importantes del Derecho Internacional Marítimo que deben tener presente los Comandantes de los Burques* (1989), para. 9.1.1; Netherlands, *Humanitair Oorlogsrecht: Handleiding* (2005), para. 0470; Nigeria, *The Laws of War*, para. 11; Sweden, *International Humanitarian Law in Armed Conflict* (1991), at 79; Switzerland, *Bases légales du comportement à l'engagement* (2005), paras. 228(3), 229. The relevant extracts are available on the website of the ICRC: https://ihl-databases.icrc.org/customary-ihl/eng/docs/v2_rul_rule79. See also: Ministry of Defence (UK), *The Joint Service Manual of the Law of Armed Conflict*, *supra* note 98, at 110; Department of the Navy & Department of Homeland Security (United States), *The Commander’s Handbook on the Law of Naval Operations* (2007), at 9-1, available at [www.marines.mil/Portals/59/Publications/MCTP%2011-10B%20\(Formerly%20MCWP%205-12.1\).pdf?ver=2017-07-11-151548-683](http://www.marines.mil/Portals/59/Publications/MCTP%2011-10B%20(Formerly%20MCWP%205-12.1).pdf?ver=2017-07-11-151548-683).

¹⁵³ Fabio Boi et al., *Interface Featuring a Neuromorphic Hardware Decoder*, 10 FRONTIERS IN NEUROSCIENCE 1, 1 (2016).

¹⁵⁴ Regarding the connection between the brain and respiratory functions, see: Douglas Jonhson, *Control of Ventilation*, UPTODATE, at <https://www.uptodate.com/contents/control-of-ventilation> (visited June 30, 2019).

¹⁵⁵ Harrison Dinniss and Kleffner, *supra* note 14, at 452. As also underlined by Heather Harrison Dinniss and Jann Kleffner: [I]est the argument be made that a genetic change, technological implant or biological modification somehow remove the enhanced soldier from the human family, it should be

determined how the different rules enshrined in the European Convention on Human Rights (ECHR) and/or the International Covenant on Civil and Political Rights (ICCPR) might be affected by the emergence of cybernetic enhancement: the right to life (1), the prohibition of torture, inhuman or degrading treatment (2), freedom of thought (3) and the right to privacy (4). As mentioned above, this analysis focuses on the relationship between a state and its own soldiers, and assumes that it has jurisdiction in the different scenarios considered.

1. The Right to Life

As underlined previously, the resort to neural interfaces has the potential to decrease casualties on the battlefield. But in parallel, soldiers' lives might still be endangered. If the mere death of a soldier is insufficient for amounting to a breach of Article 2 ECHR, members of the armed forces should 'not be exposed to situations where their lives would be avoidably put at risk without a clear and legitimate military purpose or in circumstances where the threat to life has been disregarded'.¹⁵⁶ That is how the British Ministry of Defence (MoD) was accused of breaching the Human Rights Act – which incorporates the ECHR – by negligence in the Smith case. In a first event, soldiers were shot by friendly fires, and the Ministry was accused of failing 'to properly equip the tanks involved and to give soldiers adequate recognition training'.¹⁵⁷ In a second event, two soldiers were killed by improvised explosive devices level, while on board of Snatch Land Rovers.¹⁵⁸ It was argued that the MoD was already aware that the vehicles were unsuitable, and that more robust ones were available at the time – but belatedly deployed.¹⁵⁹ Lord Hope – with whom the majority agreed – considered that the MoD had two positive obligations with respect to Article

2. The first obligation is 'a systemic duty', which consists in the implementation of 'a legislative and administrative framework' in favor of 'the effective prevention of the risk' to the 'health and well-being' of soldiers – and 'effective deterrence against threats to the right to life'.¹⁶⁰ The second obligation consists in ensuring that 'where

recalled that the jurisprudence of human rights bodies [...] have found breaches of protected rights of those whose brains are not yet fully formed (in cases involving an unborn child), those who have physiological differences, those who have genetic or chromosomal abnormalities and those whose bodies have been changed by medical intervention'. See: *id.*, at 453.

¹⁵⁶ Committee of Ministers, Recommendation CM/Rec(2010)4 on human rights of members of the armed forces, para. 6.

¹⁵⁷ Supreme Court (United Kingdom), *Press Summary* (June 19, 2013), at <https://www.supremecourt.uk/cases/docs/uksc-2012-0249-press-summary.pdf>.

¹⁵⁸ *Id.*

¹⁵⁹ Richard Norton-Taylor, *British soldiers protected under human rights law, supreme court told*, GUARDIAN (Feb. 18, 2013), <https://www.theguardian.com/law/2013/feb/18/british-soldiers-human-rights-court>.

¹⁶⁰ Lord Hope added: '[d]epending on the facts, this duty could extend to issues about training and the procurement of equipment before the forces are deployed on operations that will bring them into

there is a real and immediate risk to life, preventative operational measures of whatever kind are adopted to safeguard the lives of those involved so far as this is practicable'.¹⁶¹ Positive obligations of the state must however not be 'unrealistic or disproportionate'.¹⁶² The House of Commons subsequently recommended that '[t]he MoD should consider an "off the shelf" purchase as an immediate and interim replacement for Snatch'.¹⁶³ What would be the implications for a legal review under Article 36? The mere fact that a soldier's brain chip might be hacked and lead to his death would not appear as a *prima facie* incompatibility with Article 2 – and the product could thus pass the legal review. However, the state could subsequently be held responsible if this happens, and proceedings reveal that an equivalent military advantage could have been gained by using an EEG-cap (non-invasive) instead of brain implants (invasive). The state could also be held responsible if there is proof that the device was faulty, and did not look for an alternative.

Another question, which remains debated, is the following: if human enhancement techniques have the potential for increasing survivability on the battlefield, is there a state duty to augment soldiers? For instance, it was underlined by the US National Research Council that, '[i]n the modern Army environment', contexts of 'infrequent but intense moments of terror' would 'involve surging information loads on individuals who must process all the relevant information quickly and appropriately to avoid the twin performance faults: failure to respond or incorrect response'.¹⁶⁴ Yet, '[w]hen peak demands are coming from multiple cognitive tasks – e.g., perceptual judgment, information assimilation to cognitive schema, and choice selection (decision-making in a broad sense), all of which must be carried out with urgency – cognitive overload is likely to degrade performance'.¹⁶⁵ To tackle this issue, the 'Augmented Cognition' and the 'Improving Warfighter Information Intake Under Stress' (IWIIUS) programs were intending to study 'how the effectiveness of warfighters can be improved by making the human-computer interface respond to human performance capabilities and limitations in stressful operational environments',¹⁶⁶ and showed promising results.¹⁶⁷

contact with the enemy'. See, *Smith & Ors v. Ministry of Defence* (2013) UKSC 41 (Supreme Court of the United Kingdom, 2013), para. 68.

¹⁶¹ *Id.*

¹⁶² *Id.*, para. 76.

¹⁶³ Defence Committee of the House of Commons (United Kingdom), UK Operations in Iraq, HC 1241 (August 10, 2006), para. 59.

¹⁶⁴ NATIONAL RESEARCH COUNCIL, OPPORTUNITIES IN NEUROSCIENCE FOR FUTURE ARMY 68 (2009).

¹⁶⁵ *Id.*

¹⁶⁶ J.G. Morrison, D.A. Kobus and C.M. Brown, DARPA *Improving Warfighter Information Intake Under Stress - Augmented Cognition, Phase 2: Concept Validation Experiment* (2006), at 5, at <https://apps.dtic.mil/dtic/tr/fulltext/u2/a457526.pdf>.

¹⁶⁷ *Id.*, at 59.

Of course, no binding interpretation exists regarding a hypothetical duty to enhance soldiers. Yet, in the wake of the Smith proceedings, the Defence Committee of the House of Commons expressed different concerns regarding the way members of the British armed forces were treated in Iraq. MPs were, for instance, concerned with heat. They noted that ‘[e]ffective recuperation is crucial to troops’ alertness and hence to the avoidance of casualties’, and recommended adequate air-conditioning when soldiers are both on duty and at rest.¹⁶⁸ The safety of Hercules helicopters was also questioned. The MPs welcomed a decision to equip some of them with Explosion Suppressant Foam, but recommended that all Hercules in operational theatres be fitted that way.¹⁶⁹ In fact, they were ‘alarmed by the suggestion that the MoD might not be fitting protective systems because of the impact on other priorities’ – as ‘[t]he protection’ of the armed forces ‘should be given the highest priority’.¹⁷⁰ These recommendations are probably not of a legal nature, and do not refer to Article 2 ECHR. They nevertheless give good indications regarding the steps expected from governments to protect the lives of their soldiers. Resources should be dedicated to this objective, should benefit as many soldiers as possible and – if more protecting devices are available on the market – their purchase must be considered. Hence it is conceivable that, if military BCIs become available and help reducing the risk for soldiers, armies might have to dedicate resources to their purchase, make sure that the equipment does not become obsolete and benefit the most soldiers. They might have to replace ground troops by ‘avatars’ and traditional aircrafts by remotely-controlled UAVs whenever possible, with respect to the legitimacy and the feasibility of the mission. When the resort to real soldiers is required on the battlefield, they should be equipped with threat-warning systems as far as possible.

Given the similarities between Article 2 ECHR and Article 6(1) ICCPR, it is conceivable that a similar solution would raise under the latter. It indeed guarantees that ‘[e]very human being has the inherent right to life. This right shall be protected by law. No one shall be arbitrarily deprived of his life’. In addition – and according to General Comment No 36 – ‘States parties’ are ‘under a due diligence obligation to undertake reasonable positive measures, which do not impose on them disproportionate burdens, in response to reasonably foreseeable threats to life originating from private persons and entities, whose conduct is not attributable to the State’.¹⁷¹ They include, *inter alia*, those measures necessary ‘to protect individuals against reasonably foreseen threats of being murdered or killed by criminals and organized crime or militia groups, including armed or terrorist groups’ and the mission

¹⁶⁸ Defence Committee of the House of Commons (United Kingdom), *supra* note 163, para. 63. The failures of the government were particularly criticized: ‘UK troops have been operating in Iraq for over three years: it is unacceptable that resources have not yet been provided to combat the high temperatures’: *id.*, para. 62.

¹⁶⁹ *Id.*, para. 74.

¹⁷⁰ *Id.*

¹⁷¹ HRC, General Comment No 36 on article 6 of the International Covenant on Civil and Political Rights, on the right to life, CCPR/C/GC/36, para. 21 (2018).

to ‘disband irregular armed groups, such as private armies and vigilante groups, that are responsible for deprivations of life and reduce the proliferation of potentially lethal weapons to unauthorized individuals’.¹⁷² State parties are also expected to ‘take appropriate measures to protect individuals against deprivation of life by other States, international organizations and foreign corporations operating within their territory or in other areas subject to their jurisdiction’.¹⁷³

If life-threatening situations would not entirely disappear with BCIs, they might nevertheless help limiting the number of casualties among the armed forces resorting to them. However, interacting so closely with the brain might have long-term consequences, and it is necessary to study in which situation the prohibition of torture, inhuman or degrading treatment might be affected.

2. Torture, Inhuman or Degrading Treatment

The installation of a BCI on a soldier may itself cause complications over a longer or shorter period of time (cancers, hemorrhages, infections, burns). Can Article 36’s legal review be used to show that such employment amounts to torture, inhuman or degrading treatment? Is the outcome influenced by the consent – or lack of consent – of the soldier? Then – and assuming that the enhancement itself does not constitute ill-treatment – could the existence of torture, inhuman or degrading treatment be proven if this technology is used to coerce soldiers to do something they might not have done on their own? In fact, the outcome varies depending on the treaty analyzed: the ICCPR, the Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (UNCAT), or the ECHR.

According to Article 7 ICCPR, ‘[n]o one shall be subjected to torture or to cruel, inhuman or degrading treatment or punishment. In particular, no one shall be subjected without his free consent to medical or scientific experimentation’. A highly controversial question is whether a violation of Article 7 still occurs when the victim consents to ill-treatment. No clear answer was provided by the Human Rights Committee (HRC),¹⁷⁴ and experts disagreed on this subject.¹⁷⁵ It may nevertheless be

¹⁷² *Id.*

¹⁷³ *Id.*, para. 22.

¹⁷⁴ The HRC only acknowledged that ‘[t]he Covenant does not contain any definition of the concepts covered by article 7’ and made clear that it did not ‘consider it necessary to draw up a list of prohibited acts or to establish sharp distinctions between the different kinds of punishment or treatment; the distinctions depend on the nature, purpose and severity of the treatment applied’. See, HRC, GENERAL COMMENT NO. 20: PROHIBITION OF TORTURE, OR OTHER CRUEL, INHUMAN OR DEGRADING TREATMENT OR PUNISHMENT (ART. 7), para. 4 (1992).

¹⁷⁵ According to Yoram Dinstein, ‘torture, unlike medical or scientific experimentation, is unlawful even if the victim (say, for masochistic reasons) agreed to be subjected to it’: Yoram Dinstein, *The Right to Life, Physical Integrity, and Liberty*, in THE INTERNATIONAL BILL OF RIGHTS 114, 125 (Louis Henkin ed., 1981). In reply to Dinstein, Manfred Nowak contended that ‘both the wording of the provisions and the *travaux préparatoires* tend to indicate the contrary’: MANFRED NOWAK, UN COVENANT ON CIVIL AND POLITICAL RIGHTS – CCPR COMMENTARY 191 (2005).

argued – as asserted by Nowak – that it would not be the case. In fact, it was considered during the travaux préparatoires that the lack of free consent was a sign of the inhuman character of an experimentation,¹⁷⁶ and ‘that consent given under pressure could never be regarded as “free” consent’, as ‘[i]t was unthinkable that anyone would freely submit himself to torture or cruel, inhuman or degrading practices’.¹⁷⁷ When soldiers consent to be equipped with a BCI, Article 7 is probably not breached, regardless of the inconvenience experienced. If the soldier is coerced into being enhanced or into doing something he would not have done on his own, then experiences pain or humiliation in the process, this could be regarded as a breach of Article 7. Lacking the infliction of pain or humiliation, it is however not certain that such coercion could be regarded as a breach of Article 7.¹⁷⁸

A more precise definition of the term ‘torture’ was given by the UNCAT.¹⁷⁹ Regardless of whether the subject consents to the enhancement or not, it is however clear that by virtue of this definition, it never constitutes torture. Pain must actually be ‘intentionally inflicted’ to be viewed as torture, and such would not be the case with enhancement. In fact, pain would only be an ‘accidental result’ in this situation.¹⁸⁰ In contrast, cybernetic enhancement may sometimes be viewed as cruel, inhuman or degrading treatment [CIDT], which is also prohibited by the UNCAT.¹⁸¹ As underlined by Manfred Nowak – the UN Special Rapporteur on Torture and other Cruel, Inhuman and Degrading Treatment or Punishment – the ‘decisive criteria’ for distinguishing torture from CIDT ‘may best be understood to be the purpose of the conduct and the powerlessness of the victim, rather than the intensity of the pain or

¹⁷⁶ NOWAK’S CCPR COMMENTARY, *supra* note 116, at 214.

¹⁷⁷ UNGA, Report of the Third Committee, UN Doc A/4045, at 5-6 (1958).

¹⁷⁸ The HRC considered that ‘for punishment to be degrading, the humiliation or debasement involved must exceed a particular level [...]’: HRC, *Vuolanne v. Finland*, CCPR/C/35/D/265/1987, para. 9.2 (1989).

¹⁷⁹ ‘For the purposes of this Convention, the term “torture” means any act by which severe pain or suffering, whether physical or mental, is intentionally inflicted on a person for such purposes as obtaining from him or a third person information or a confession, punishing him for an act he or a third person has committed or is suspected of having committed, or intimidating or coercing him or a third person, or for any reason based on discrimination of any kind, when such pain or suffering is inflicted by or at the instigation of or with the consent or acquiescence of a public official or other person acting in an official capacity. It does not include pain or suffering arising only from, inherent in or incidental to lawful sanctions’. See, Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment, Art. 1(1), Dec. 10, 1984, 1465 UNTS 85.

¹⁸⁰ A court in the United States considered that ‘[t]he intent requirement therefore distinguishes between suffering that is the accidental result of an intended act, and suffering that is purposefully inflicted or the foreseeable consequence of deliberate conduct’. See, *Takky Zubeda v. John Ashcroft*, 333 F.3d 463 (3d Cir. 2003). See, also, Erin Huntington, *Torture and Cruel, Inhuman or Degrading Treatment: A Definitional Approach*, 21 U.C. DAVIS J. INT’L L. & POL’Y 279, 289 (2014).

¹⁸¹ According to Article 16(1): ‘[e]ach State Party shall undertake to prevent in any territory under its jurisdiction other acts of cruel, inhuman or degrading treatment or punishment which do not amount to torture as defined in article 1, when such acts are committed by or at the instigation of or with the consent or acquiescence of a public official or other person acting in an official capacity [...]’.

suffering inflicted’.¹⁸² Hence, ‘[o]utside a situation of detention and similar direct control, the prohibition of CIDT is subject to the proportionality principle’.¹⁸³ This means that, when the victim is not powerless, proportionality allows to determine whether the treatment at stake was either ‘cruel’, ‘inhuman’, or ‘degrading’. Under this ‘proportionality principle’, it is thus conceivable that, even if the pain that occurs in the wake of BCI installation is not deliberately inflicted, and even if the soldier consents to it, it may constitute a CIDT if it goes beyond simple annoyance. In contrast, if the soldier does not feel pain or humiliation when he is coerced into being enhanced or into doing something he would not have done on his own, no CIDT occurs.

On the European sphere, the distinction between ‘torture’, ‘inhuman or degrading treatment’ and ‘inhuman and degrading punishment’ was made clear in the Greek case of 1969. According to the European Commission of Human Rights, ‘[t]reatment or punishment of an individual may be said to be degrading if it grossly humiliates him before others or drives him to act against his will or conscience’.¹⁸⁴ Then, ‘[t]he notion of inhuman treatment covers at least such treatment as deliberately causes severe suffering, mental or physical, which, in the particular situation, is unjustifiable’, whereas ‘[t]he word “torture” is often used to describe inhuman treatment which has a purpose, such as the obtaining of information or confessions, or the infliction of punishment, and it is generally an aggravated form of inhuman treatment’.¹⁸⁵ It was also underlined that ‘[i]t is plain that there may be treatment to which all these descriptions apply, for all torture must be inhuman and degrading treatment, and inhuman treatment also degrading’.¹⁸⁶ In the Ireland v. UK case of 1978, the Court considered that ‘this distinction derives principally from a difference in the intensity of the suffering inflicted’.¹⁸⁷ The Court added that ‘ill-treatment must attain a minimum level of severity if it is to fall within the scope of Article 3’, and that the ‘assessment of this minimum’ was ‘relative’.¹⁸⁸ If the soldier consents to it, then

¹⁸² Report of the Special Rapporteur on torture and other cruel, inhuman or degrading treatment or punishment, UN Doc E/CN.4/2006/6, para. 39 (2006).

¹⁸³ Manfred Nowak & Elizabeth McArthur, *The distinction between torture and cruel, inhuman or degrading treatment*, 16(3) TORTURE 147, 151 (2006).

¹⁸⁴ *The Greek Case*, 12 YEARBOOK OF THE EUROPEAN CONVENTION ON HUMAN RIGHTS, 186 (ECtHR, 1969).

¹⁸⁵ *Id.*

¹⁸⁶ *Id.* With respect to torture, the Court highlighted in *İlhan v. Turkey* that: [i]n addition to the severity of the treatment, there is a purposive element, as recognized in the United Nations Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment [...] which defines torture in terms of the intentional infliction of severe pain or suffering with the aim, inter alia, of obtaining information, inflicting punishment or intimidating (Article 1 of the United Nations Convention)’. See, *İlhan v. Turkey*, 34 EHRR 36, para. 85 (ECtHR, 2000).

¹⁸⁷ *Ireland v. the UK*, 2 EHRR 25, para. 167 (ECtHR, 1978).

¹⁸⁸ According to the Court: ‘[t]he assessment of this minimum is, in the nature of things, relative; it depends on all the circumstances of the case, such as the duration of the treatment, its physical or mental effects and, in some cases, the sex, age and state of health of the victim, etc’. See: *id.*, para. 162

the simple act of enhancing him does not constitute torture, inhuman or degrading treatment as he would not be coerced into acting ‘against his will or conscience’. If the soldier does not consent to enhancement – and if the BCI provokes ‘severe suffering, mental or physical’ – there might be a degrading treatment, rather than torture or an inhuman treatment. It is because pain would not be caused ‘deliberately’. If the BCI is used to coerce a soldier into doing something he might not have done on his own, it might also constitute degrading treatment, as he would be driven to act ‘against his will or conscience’.

Concerns with respect to the right to life and the prohibition of torture, inhuman or degrading treatment might raise in relation to BCIs; yet, concerns may also arise in connection with rights disconnected from bodily integrity. Such is the case for the freedom of thought.

3. Freedom of Thought

Both the ICCPR and the ECHR are quite clear regarding the non-derogable nature of freedom of thought (in contrast with their manifestation).¹⁸⁹ However, two recent studies highlighted that the emergence of BCIs might constitute a potential danger for this freedom.

A first study focused (in a therapeutic purpose) on ‘decoding spoken phrases’ from brain activities.¹⁹⁰ Would freedom of thought be breached if the use of BCIs – whether invasive or non-invasive – allows the army to read everything the soldier thinks? Actually, there is a right not to express one’s opinion, under both the ICCPR and the ECHR.¹⁹¹ As this right is non-derogable, even compelling reasons related to national security cannot justify limitations for members of the armed forces. In a similar fashion, the soldier could not be ordered to use an equipment that reveals his

¹⁸⁹ ‘According to Art. 4.2 of the ICCPR, no derogation is permitted from the following rights: [...] To freedom of thought, conscience, and religion or belief (Art. 18)’: ORGANIZATION FOR SECURITY AND CO-OPERATION IN EUROPE, HANDBOOK ON HUMAN RIGHTS OF ARMED FORCES PERSONNEL AND FUNDAMENTAL FREEDOMS OF ARMED FORCES PERSONNEL 37 (2008), <https://www.osce.org/odihr/31393>. By virtue of the ECHR, ‘Article 9 unconditionally protects freedom of thought, conscience and religion and enshrines a conditional right to manifest one’s belief, subject to the restrictions in Article 9§2’: ECtHR, NATIONAL SECURITY AND EUROPEAN CASE-LAW 22 (2013), <https://rm.coe.int/168067d214>.

¹⁹⁰ Christian Herff et al., *Brain-to-text: decoding spoken phrases from phone representations in the brain*, 9 FRONT NEUROSCI 1 (2015).

¹⁹¹ The HRC revealed in 1994 that, ‘[i]n accordance with articles 18.2 and 17, no one can be compelled to reveal his thoughts or adherence to a religion or belief’: HRC, General Comment No 22: Article 18 (Freedom of Thought, Conscience or Religion), CCPR/C/21/Rev.1/Add.4, para. 3. (1993). A ‘negative aspect of freedom to manifest one’s religious beliefs’ also exists under the ECHR, and ‘means that individuals cannot be required to reveal their religious affiliation or beliefs; nor can they be forced to adopt behavior from which it might be inferred that they hold – or do not hold – such beliefs’: COUNCIL OF EUROPE, GUIDE ON ARTICLE 9 OF THE EUROPEAN COURT OF HUMAN RIGHTS 23 (April 30, 2019), https://www.echr.coe.int/Documents/Guide_Art_9_ENG.pdf.

thoughts, even if such is not the primary goal of the BCI. It is however conceivable that this device could be used if the consent of the warfighter was obtained – and would thus pass the legal review of Article 36. As underlined by Woodrow Barfield and Alexander Williams: ‘[a]s the technology to access the mind matures, governments could punish a person not only for the actual spoken expression of their thoughts, but just for formulating a thought contrary to enforced dogma [...] Therefore, for reasons of ensuring freedom of the mind in the coming cyborg age, it is imperative that the human body and mind be considered sacrosanct; to invade a person’s mind without their consent should be an egregious human rights violation and punishable under criminal law statutes’.¹⁹²

A second study ‘provide[d] a “proof-of-concept” that adherence to high-level abstract beliefs can be experimentally neuromodulated’.¹⁹³ How would the freedom of thought be affected if the army decided to stimulate soldiers to influence their beliefs and feelings? Would it be acceptable to induce a patriotic feeling, or to reduce fear and pain? Again, there would be a clear violation of Article 18.2 ICCPR if the consent of the soldier was not obtained, as this provision guarantees that ‘[n]o one shall be subject to coercion which would impair his freedom to have or to adopt a religion or belief of his choice’. The ECHR would probably take the same position, as the sole ‘[f]reedom to manifest one’s religion or beliefs’ may be subject to restrictions.¹⁹⁴ It is however conceivable that limited neuromodulation would be acceptable, if the soldier consents to it and is not influenced by this treatment in such a way that he would be ready to take disproportionate risks. For these reasons, such devices shall pass the legal review of Article 36.

A last right that might be affected by the emergence of BCIs is privacy. This will be the object of the next subsection.

4. The Right to Privacy

As mentioned above, ‘reading someone’s thoughts’ would, lacking his consent, amount to a violation of the freedom of thought. However, other rights might be affected by the use of BCIs – such as privacy. As mentioned above, devices like the CT2WS require an external operator to analyze what the warfighter sees. It is not excluded that further BCIs will rely on some forms of visual surveillance or recording, and the classical test for determining the lawfulness of limitation to ECHR rights may be implemented in this case. First, the existence of an interference must be assessed. Second, it must be determined whether the interference was in accordance with the law. Third, whether it was necessary in a democratic society, in relation to the

¹⁹² Woodrow Barfield & Alexander Williams, *Law, Cyborgs, and Technologically Enhanced Brains*, 2 PHILOSOPHIES 1, 11-12 (2017).

¹⁹³ Colin Holbrook et al., *Neuromodulation of group prejudice and religious belief*, 11(3) SOCIAL COGNITIVE AND AFFECTIVE NEUROSCIENCE 387, 391 (2016).

¹⁹⁴ ECHR, Art. 9(2).

legitimate aim sought (i.e. proportionality), must be checked. As to the ICCPR, the HRC made clear that ‘unlawful and arbitrary interference’ with Article 17 were prohibited.¹⁹⁵ On the one hand, ‘[t]he term “unlawful” means that no interference can take place except in cases envisaged by the law. Interference authorized by States can only take place on the basis of law, which itself must comply with the provisions, aims and objectives of the Covenant’.¹⁹⁶ On the other hand, ‘[t]he introduction of the concept of arbitrariness is intended to guarantee that even interference provided for by law should be in accordance with the provisions, aims and objectives of the Covenant and should be, in any event, reasonable in the particular circumstances’.¹⁹⁷ The method chosen by the HRC to determine whether the right to privacy was violated is close to the test adopted by the ECtHR.¹⁹⁸ First, the Committee makes sure that an interference occurred.¹⁹⁹ Second, it establishes whether such interference was arbitrary and/or unlawful.²⁰⁰ Third, it determines whether the interference is proportionate to a legitimate aim.²⁰¹ The HRC had the opportunity to confirm, for instance, that ‘preventing the commission of further crimes’ and ‘protecting the public’ were legitimate objectives,²⁰² as well as the preservation of ‘national security, public order (ordre public), public health or morals or the rights and freedoms of others’.²⁰³

The breach of Article 8 ECHR would be influenced by the context of the recording or surveillance, and the location where it occurs: a battlefield, a military base, the place of residence or even public space, when a member of the armed forces is not on duty. When soldiers are on the battlefield, it is not clear that resorting to a CT2WS-like device would give birth to an interference in the first place. In fact, the ECtHR decided that the mere monitoring of an individual in a public place, without any recording, does not give rise to an interference.²⁰⁴ In contrast, the Court decided that the ‘recording of data’ and the ‘systematic or permanent nature of the record’

¹⁹⁵ HRC, CCPR General Comment No 16: Article 17 (Right to Privacy), The Right to Respect of Privacy, Family, Home and Correspondence, and Protection of Honour and Reputation, para. 2 (1988).

¹⁹⁶ *Id.*, para. 3.

¹⁹⁷ *Id.*, para. 4. The HRC emphasized that ‘[t]he notion of “arbitrariness” is not to be equated with “against the law” but must be interpreted more broadly to include elements of inappropriateness, injustice, lack of predictability and due process of law, as well as elements of reasonableness, necessity and proportionality’. See: HRC, General Comment No 35: Article 9 (Liberty and security of person), CCPR/C/GC/35, para. 12 (2014).

¹⁹⁸ For a general view about Article 17, see, NOWAK’S CCPR COMMENTARY, *supra* note 116, at 463.

¹⁹⁹ HRC, *AB v. Canada*, CCPR/C/117/D/2387/2014, para. 8.7 (2017).

²⁰⁰ *Id.*

²⁰¹ *Id.*, para. 8.11.

²⁰² *Id.*

²⁰³ HRC, *Ilyasov v. Kazakhstan*, CCPR/C/111/D/2009/2010, para. 7.7 (2014). See also: NOWAK’S CCPR COMMENTARY, *supra* note 116, at 463.

²⁰⁴ *Peck v the UK*, 36 EHRR 41, para. 59 (ECtHR, 2003).

could do so.²⁰⁵ Assuming that battlefield may be described as a ‘public space’, different scenarios may be contemplated. If the activities of a soldier are merely monitored, without any form of recording, then no interference would occur. If they are recorded, then an interference with Article 8 would exist. However – provided that legal provisions related to such recording exist – it will surely pass the last step of the test. The success of the mission and the need for protecting soldiers’ life appear as legitimate aims, which would justify interferences of this nature with a soldier’s right to privacy. The military base may be viewed as the ‘workplace’ of members of the armed forces. The ECtHR made clear that both covert and non-covert surveillance of employees in their workplace give rise to an interference – albeit recording also occurred in the situations at stake.²⁰⁶ Assuming that legal provisions related to such surveillance exist, how would proportionality be assessed? In the *López Ribalda* decision, the Court had the opportunity to clarify this aspect, and to define a 6-phase test. This test is based on the notification given to the employees (i), the extent of the monitoring and the degree of intrusion (ii), the provision of a legitimate reason for such monitoring (iii), the existence of less intrusive methods and measures (iv), the consequences of the monitoring for the employee subjected to it (v), and the existence of appropriate safeguards for the employee (vi).²⁰⁷ It thus appears that soldiers must be notified that surveillance may occur, a condition which is likely to be met when soldiers are equipped with electrodes or implants. With respect to the second criterion, the Court found it ‘necessary to distinguish [...] the various places in which the monitoring was carried out, in the light of the protection of privacy that an employee could reasonably expect’. According to the ECtHR, ‘[t]hat expectation is very high in places which are private by nature, such as toilets or cloakrooms, where heightened protection, or even a complete ban on video-surveillance, is justified’, it ‘remains high in closed working areas such as offices’, and ‘it is manifestly lower in places that are visible or accessible to colleagues or [...] to the general public’.²⁰⁸ This means that surveillance and/or recording would not be admissible in dormitories and bathrooms, would be restricted in meeting and briefing rooms, but would be acceptable at the firing range or sport facilities. In terms of justification, it is admitted for instance that the ‘operational effectiveness’ of the armed forces is a legitimate reason for the restrictions of some rights protected by the ECHR.²⁰⁹ It would then be conceivable for a state to monitor the activities of soldiers to make sure that they acquire sufficient mastery of the devices. If monitoring the activities of a soldier is the *sine qua non* condition for the functioning of a CT2WS-like device, it is arguable that least intrusive methods would not be available. Surveillance in the private sphere, however, would

²⁰⁵ *Id.*

²⁰⁶ *Case of Antovic and Mirkovic v. Montenegro*, App. No. 70838/13, para. 44 (ECtHR, 2018).

²⁰⁷ *Case of López Ribalda and others v. Spain*, App. Nos. 1874/13 and 8567/13, para. 116 (ECtHR, 2019).

²⁰⁸ *Id.*, para. 125.

²⁰⁹ *Smith and Grady v. UK*, App. No. 33985/96 and 33986/96, para. 89 (ECtHR, 1999).

not be admissible, as it would prove to be too intrusive.²¹⁰ This means that there must a way to remove – or at least to turn off the device – when a member of the armed forces is in the private sphere. This might be the case when he/she is off-duty – even in a public space. In fact, video-surveillance has not been considered by the ECtHR as an interference, because it considers that ‘[a] person who walks down the street will, inevitably, be visible to any member of the public who is also present’, and that ‘[m]onitoring by technological means of the same public scene (for example, a security guard viewing through closed circuit television) is of a similar character’.²¹¹ However, to track a specific person – even in a public space – might appear as far more intrusive. Hence, the *prima facie* lawfulness of BCIs in the framework of the legal review of Article 36 would depend on the possibility to disable the surveillance system when the soldier is in the private sphere – at home, in some areas of the military base or even in the public space, when he/she is off-duty. It may also be mentioned that storing information is considered as an interference with Article 8 by the ECtHR,²¹² and that ‘domestic law must afford appropriate safeguards to prevent any such use of personal data as may be inconsistent with the guarantees of this Article’.²¹³ These requirements would apply whenever data is stored and used following the use of cybernetic devices.

If the ECtHR had the opportunity to develop consistent case-law with respect to monitoring and surveillance, such is not always the case for the HRC. However, it may be postulated that the monitoring of soldier’s activities on the battlefield (with or without recording) would comply with the ICCPR, provided that the state previously adopted a legislation pertaining to such use.²¹⁴ In fact, it would appear as neither arbitrary, nor disproportionate. Surveillance might indeed be justified at least by national security, and perhaps the protection of the public and the rights and freedoms

²¹⁰ For a similar view, see: Harrison Dinniss and Kleffner, *supra* note 14, at 464.

²¹¹ ECtHR, GUIDE ON ARTICLE 8 OF THE EUROPEAN CONVENTION ON HUMAN RIGHTS (August 31, 2020), para. 151, https://www.echr.coe.int/Documents/Guide_Art_8_ENG.pdf.

²¹² *Leander v. Sweden*, App. No. 9248/81 (ECtHR, 1987); *S and Marper v. UK*, App. No. 30562/04, para. 67 (ECtHR, 2008).

²¹³ In addition, ‘[t]he need for such safeguards is all the greater where the protection of personal data undergoing automatic processing is concerned, not least when such data are used for police purposes. The domestic law should notably ensure that such data are relevant and not excessive in relation to the purposes for which they are stored; and preserved in a form which permits identification of the data subjects for no longer than is required for the purpose for which those data are stored’. See, *S and Marper v. UK*, *supra* note 212, para. 103.

²¹⁴ States must ‘[e]nsure that any interference with the right to privacy, family, home or correspondence is authorized by laws that: (i) are publicly accessible; (ii) contain provisions that ensure that collection of, access to and use of communications data are tailored to specific legitimate aims; (iii) are sufficiently precise and specify in detail the precise circumstances in which any such interference may be permitted, the procedures for authorization, the categories of persons who may be placed under surveillance, the limit on the duration of surveillance; procedures for the use and storage of data collected; and (iv) provide for effective safeguards against abuse’. See: HRC, Concluding observations on the fourth periodic report of the United States of America, CCPR/C/USA/CO/4, para. 22 (2014).

of others. With respect to monitoring in the military base, it must be mentioned that the term ‘home’, that is mentioned in Article 17, ‘is to be understood to indicate the place where a person resides or carries out his usual occupation’.²¹⁵ To the extent that ‘[e]very invasion of that sphere [...] represents interference’,²¹⁶ monitoring in the base would need to comply with the test developed by the HRC. It seems that, in this situation, monitoring would only appear as reasonable (and thus, not arbitrary) if it is possible to remove or turn off the device when the soldiers are in private places, such as bathrooms or dormitories. In addition, it is doubtful that the protection of national security or the public would justify surveillance in such locations. For the same reasons, the possibility to monitor soldiers when they are in their places of residence – or even off-duty, in the public space – would be contrary to Article 17. It may be noted that, in recent concluding observations, the HRC was very suspicious about the ‘excessively broad, highly intrusive surveillance powers’ of French intelligence agencies, and demanded France to comply with Article 17.²¹⁷ The *prima facie* lawfulness of BCIs on the occasion of the legal review would thus also depend on the possibility to disable the recording system in the private sphere. It may be mentioned that in the framework of the ICCPR, the capture, collection and retention of communications data may be viewed as an interference with privacy, ‘whether or not those data are subsequently consulted or used’.²¹⁸

The various situations in which BCIs would comply (or not) with the frameworks of IHL and IHRL was subject to an important analysis. Yet, it is a matter for states to confirm whether a given technology is legal or not. The final part of this article would thus determine when the legal review is triggered, and what difficulties specific to the development of BCIs might obscure this aspect.

III. A TRIGGERING OF THE LEGAL REVIEW OBSCURED BY THE OVERLAP BETWEEN THERAPEUTIC AND MILITARY TECHNOLOGIES

During the drafting of the Additional Protocol I, states rejected the creation of a centralized mechanism of control. In fact, they have to carry out the legal review themselves. If some situations obviously require (or not) a legal review at first sight (**A**), the likeliness of this scenario tends to diminish. The emergence of BCIs indeed illustrates new challenges related to the start of this legal review, which essentially resides in the increasing porosity between civilian and military research (**B**).

²¹⁵ HRC, CCPR General Comment No 16, *supra* note 195, para. 5.

²¹⁶ NOWAK’S CCPR COMMENTARY, *supra* note 116, at 486.

²¹⁷ HRC, Concluding observations on the fifth periodic report of France, CCPR/C/FRA/CO/5, para. 12 (2015). For an overview of the activities of the HRC in the field of on-line surveillance, see, Yuval Shany, *On-Line Surveillance in the case-law of the UN Human Rights Committee*, CSRCL (July 17, 2017), <https://csrcl.huji.ac.il/people/line-surveillance-case-law-un-human-rights-committee>.

²¹⁸ HRC, The right to privacy in the digital age, A/HRC/27/37, para. 20 (2014).

B. The Persistence of Situations in Clear Need of a Legal Review

In some situations, the intentions behind a given project are not a mystery, and clearly aim at military enhancement. Such is for instance the case of the N3 program, which is intended to ‘broaden the applicability of neural interfaces to the able-bodied warfighter’.²¹⁹ If the BCI is developed in conjunction with a weapon system, and in the light of what was said in the first part of this article, there is a clear need for legal review in this situation. Submitting ‘human-machine interaction’ to legal review has for instance been contemplated by the United States.²²⁰

In contrast, the fact that a given technology is developed by the army does not justify by itself the necessity of a legal review. Some projects are, at least in their early lives, exclusively therapeutic. For instance, DARPA sponsored a program called ‘Revolutionizing Prosthetics’, the goal of which was to allow ‘an individual to experience the sensation of touch directly in the brain through a neural interface system connected to a robotic arm’.²²¹ In this process, the subject – who suffered from quadriplegia – had four implants in the brain, but there was no need for a review since it did not qualify as means or methods of warfare.

In the two situations analyzed above, whether a legal review was required clearly appeared. However, this might not constitute the majority of cases when it comes to some BCIs. Some controversial situations are highlighted below.

C. An Increasing Porosity Between Civilian and Military Research

A first challenging situation is when dual-use equipment is developed by the army. The HAND program, which was previously mentioned, is an illustration. From the outset, its goal was to ‘develop the scientific foundation for novel concepts that will improve performance on the battlefield as well as technologies for enhancing the

²¹⁹ Accordingly, ‘[t]he promise of efficient warfighter multitasking and intuitive interaction with autonomous and semi-autonomous systems point to the need to develop technologies targeted at enriching human-machine interaction’: DARPA, *Broad Agency Announcement - Next-Generation Non-Surgical Neurotechnology (N3)*, GRANTS (2018), at 4, at <https://www.grants.gov/web/grants/view-opportunity.html?oppId=302121>.

²²⁰ United States, *Human-Machine Interaction in the Development, Deployment and Use of Emerging Technologies in the Area of Lethal Autonomous Weapons Systems*, CCW/GGE.2/2018/WP.4, at 5 (2018).

²²¹ DARPA, *DARPA Helps Paralyzed Man Feel Again Using a Brain-Controlled Robotic Arm*, DARPA (October 13, 2013), at <https://www.darpa.mil/news-events/2016-10-13>; Al Emondi, ‘Revolutionizing Prosthetics’, DARPA <https://www.darpa.mil/program/revolutionizing-prosthetics> (visited August 20, 2019); Amy Ellis Nutt, *In a medical first, brain implant allows paralyzed man to feel again*, WASHINGTON POST (October 13, 2016), at https://www.washingtonpost.com/news/to-your-health/wp/2016/10/13/in-a-medical-first-brain-implant-allows-paralyzed-man-to-feel-again/?noredirect=on&utm_term=.e0c7171d7a8b

quality of life of paralyzed veterans’.²²² The initial subjects were experiencing disabilities, and the research had the potential to improve their quality of life. Yet, the nature of the experiments carried out leans more and more toward enhancement, as the patient – a paralyzed woman – first succeeded in piloting a Cessna on a flight simulator, then a F-35 fighter, and finally three aircraft at once. If William Boothby is correct, then ‘[a] distinction [...] can usefully be drawn between the study of a technology that would be potentially capable of weaponisation and the actual study of a weapon’, which ‘leads one to conclude that the obligation to review first arises when the use of a technology as a weapon or method of warfare is being actively evaluated’.²²³ In this situation, the need for a legal review might actually occur when the experimental phase is over and the army decides to equip its soldiers with these devices.

A second challenging situation is when a therapeutic device is developed by the civilian sector, then ‘diverted’ by the army for the purpose of enhancement. This scenario happened with pharmaceutical enhancers, such as modafinil,²²⁴ and it is conceivable that BCIs developed by the civil industry could be acquired by the army in the future. In this case, it seems logical to proceed with the legal review when the army contemplates the acquisition of the BCIs to use them in conjunction with a weapon system or – if they were previously acquired – when the army considers using them in conjunction with a weapon system. As a matter of fact, this practice is reflected in American and Swiss official publications. In the United States, the Judge Advocate General will ‘[e]nsure all weapons being developed, bought, built, modified or otherwise being acquired [...] are reviewed for legality under LOAC, domestic law and international law prior to their possible acquisition for use in a conflict or other military operation.’²²⁵ In Switzerland, ‘compliance with international law’ should be assessed at the phase of ‘acquisition’, ‘modification’ or ‘use for other purposes’ – and before the ‘conception’, ‘realisation’ or ‘deployment’.²²⁶

A third challenging situation is when dual-use or military equipment is developed in cooperation with the civilian sector. In this situation, the development of the device is ‘subcontracted’ to a private actor, which is not a ‘High Contracting Party’. Such is for instance the case for the CT2WS, which is developed by HRL Laboratories

²²² Department of Defense (United States), *Fiscal Year (FY) 2007 Budget Estimates*, at 11 (2006), available at [www.darpa.mil/attachments/\(2G10\)%20Global%20Nav%20-%20About%20Us%20-%20Budget%20-%20Budget%20Entries%20-%20FY2007%20\(Approved\).pdf](http://www.darpa.mil/attachments/(2G10)%20Global%20Nav%20-%20About%20Us%20-%20Budget%20-%20Budget%20Entries%20-%20FY2007%20(Approved).pdf)

²²³ Boothby, *How Will Weapons Reviews Address the Challenges Posed by New Technologies*, *supra* note 14, at 39.

²²⁴ JA Caldwell et al., *Modafinil's effects on simulator performance and mood in pilots during 37 h without sleep*, 75(9) AVIAT SPACE ENVIRON MED 777, abstract (2004).

²²⁵ Department of the Air Force (United States), *Legal Reviews of Weapons and Cyber Capabilities* (2011), available at <https://nsarchive2.gwu.edu/NSAEBB/NSAEBB424/docs/Cyber-053.pdf>.

²²⁶ Federal Department of Defence, Civil Protection and Sport (Switzerland), *Ordonnance du DDPS sur 'acquisition, l'utilisation et la mise hors service du matériel*, No. 514.20, Art. 11 (2018).

LLC and funded by DARPA.²²⁷ Here, a possible solution would be to carry out the legal review when the funds are attributed by a public entity to a private actor. This is actually how Australia and the United Kingdom might proceed.

When does Australia conduct an Article 36 Review? Article 36 Reviews commence once a request is made by those responsible for the study, development, acquisition or adoption of a new weapon, or the adaptation or modification of an existing one. Article 36 Reviews are undertaken early in the capability development process, primarily to avoid wasting capability development resources and government funds on projects where the Article 36 Review may lead to a negative outcome or to the imposition of significant operational restrictions. To ensure that those responsible for the various methods of developing capability are aware of Article 36 Reviews, DOSL [Directorate of Operations and Security Law] actively informs/educates capability developers, scientists and managers on their responsibilities consistent with Article 36 and Australia's international legal obligations.²²⁸

In the UK, legal reviews 'take place at key milestones in the procurement process of a piece of equipment'.²²⁹ These are, 'broadly', at 'MOD's decision to commit funds to developing a specific capability (known as "Initial Gate"); MOD's decision to commit fully to the procurement of a particular piece of equipment or weapon (known as "Main Gate"); and at the date the finalised equipment enters service'.²³⁰

In any case, the new weapons, means and methods of warfare must necessarily be subject to legal review before their use on the battlefield.²³¹

IV. CONCLUSION

The emergence of BCIs could trigger a new phenomenon: battlefields where warfighters progressively give up their capacity to decide whether using their weapons or not, and become a 'biological component' of a given weapon system. If BCIs per se or the connected warfighters may only be viewed as weapons under extreme circumstances, they may well be considered as means of warfare – or part of a method of warfare – which gives rise, for states, to the obligation to proceed with the legal review required by article 36 of Additional Protocol I.

²²⁷ HRL, *HRL Laboratories to Continue Work on Groundbreaking Bio-Inspired Cognitive Technology Threat Warning System*, HRL (August 28, 2009), at www.hrl.com/hrlDocs/pressreleases/2009/prsRls_090828.html.

²²⁸ Australia, *The Australian Article 36 Review Process*, *supra* note 16, at 3.

²²⁹ Ministry of Defence (UK), *UK Weapons Review* (2016), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/507_319/20160308-UK_weapon_reviews.pdf.

²³⁰ *Id.*

²³¹ Federal Ministry of Defence (Germany), *Prüfung neuer Waffen, Mittel und Methoden der Kriegführung*, *supra* note 17, at 38.

Technological progress might have positive effects. Far from the stress of battlefield, the external or automatic operator in charge of firing could be more accurate than the warfighter holding the weapon. By allowing a better differentiation between soldiers and civilians, compliance with the rule of distinction could be increased. By allowing a better differentiation between enemies and allies, friendly- fires might be avoided. At the same time, ‘telepresence’ will decrease the likelihood of being killed for connected soldiers.

Yet, adverse impacts are not ruled out, even if most of them would not be an issue in the framework of Article 36 reviews. BCIs might increase weapon accuracy, and one may witness the emergence of systems designed to render soldiers hors-de- combat by shooting in the hand or the leg. But the opposite might also be true, with an increased accuracy used to shoot soldiers in the head or the chest. This potential for higher mortality would not necessarily reveal a *prima facie* incompatibility with the rule of superfluous injury or unnecessary suffering, as the act of killing may be required by military necessity at least in some circumstances. At the end of the day, it is not granted that new technologies will make war more ‘humane’. This could be the case if battles only occur between remotely-controlled avatars. It would not necessarily be the case if an ‘army A’ resorts to telepresence, is more efficient in killing soldiers of an ‘army B’. It would not necessarily be the case either if members of ‘army B’ are pushed toward hacking the neural interfaces of the soldiers of ‘army A’.

There might be good intentions behind the choice, by the army, to resort to BCIs – and sparing the lives of its soldiers is not the least. On the occasion of Article 36 reviews, the decision to use neural interfaces should not be a problem as regards the right to life (Article 2 ECHR and Article 6(1) ICCPR). However, *prima facie* compliance with the prohibition of torture or CIDT is more problematic. At first sight, it seems that the ICCPR and the ECHR find a balanced solution, by taking soldiers’ will into account. If they consent to be equipped with a BCI – and regardless of the inconvenience experienced – Article 7 ICCPR or Article 3 ECHR are not breached. A breach of Article 7 ICCPR or Article 3 ECHR occurs, however, if they are coerced into being enhanced or into doing something they would not have done on their own, then experience pain or humiliation in the process. A breach of Article 3 ECHR also occurs if a soldier is coerced into being enhanced or into doing something he would not have done on his own, but does not feel pain or humiliation in the process. As a matter of fact, it would qualify as ‘degrading treatment’, as the soldier is driven to act ‘against his will or conscience’. Unfortunately, it seems that the ICCPR ignores this situation. As to the UNCAT, it seems particularly unsuitable to answer new changes in warfare. In fact, it seems that consent to pain or humiliation is never taken into account in this framework. A ‘proportionality test’ is favored, and it is conceivable that a CIDT may occur whenever the soldier experiences more than simple annoyance. Then, BCIs that read soldiers’ thoughts and have the potential to influence their beliefs and feelings would also pass Article 36 reviews. But in their use, states will need to obtain soldiers’ consent, at the risk of breaching Article 18 ICCPR or Article 9 ECHR. As to the *prima facie* compliance of devices that record what the soldier sees with Article 17 ICCPR and Article 8 ECHR, it will depend on the capacity to disable the monitoring system – including when he is in the private sphere.

In some situations, it is clear that a given technology must be submitted to legal review. Such is the case, for instance, when a BCI is developed in conjunction with a weapon system. In contrast, new therapeutic techniques do not call for an Article 36 review, even if they are developed by the army. However, the R&D landscape is now characterized by an increasing porosity between the development of military and civilian

technologies. For instance, dual-use equipment may be developed by the army, or in cooperation with the civilian industry, while therapeutic techniques may be used for the unintended purpose of military enhancement. In those different situations, Article 36 reviews must be carried out when the army decides to equip soldiers with the new devices, when public funds are allocated to a given project or when the use/acquisition of the therapeutic technique in question is contemplated for the purpose of military enhancement.