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***THE INFLUENCE OF DEVELOPMENT AND  
USE OF ROBOTIC TECHNOLOGIES ON  
REGULATIONS OF INTERNATIONAL  
HUMANITARIAN LAW  
(IN THE LIGHT OF PROTECTION OF CIVILIANS)***

Things which a while ago were science fiction are now turning to reality. Robotic technologies are being heavily used in battlefields nowadays, consequently questioning the adequacy of IHL rules for addressing the challenges of modern warfare.

In terms of further discussion it is important to distinguish between unmanned vehicles not designed to deliver kinetic force against the belligerent and those which are capable of doing so. The latter type of robots will be in the focus of this article. The reason is that robots which cannot deliver kinetic force are per se not capable of causing death or injury to civilians. They are usually used on the ground for surveillance, or in order to make it easier using a weapon in a more discriminate way<sup>1</sup>. While the employment of unmanned combat vehicles (“UCV”), which can carry weapons and direct them to the target raises major problematic questions relating IHL regulations on development of weaponry in the light of protection of civilians during armed conflicts. UCVs have been described as “unmanned air, land, or maritime vehicles of any size which either carry and deliver force, lethal or non-lethal; or which can use on-board technology to direct such force, which may have been deployed from another platform, to a target.”<sup>2</sup>

Unmanned aerial combat vehicle (UCAV/drone) is the type of UCVs the legality of which has been most debated recently. UCAVs are “unmanned military aircrafts of any size which carries and launches a weapon, or which can use on-board technology to direct such a weapon to a target.”<sup>3</sup> UCAVs can be operated remotely by a pilot comfortably seated in a quiet room far away from the actual combat zone<sup>4</sup>. UCAVs give states a chance to get military advantage by providing for safety to many of their warriors. UCAV operations remind computer games. However, they are said to have a high psychological pressure on the pilot despite his disconnectedness from

actual combat zone<sup>5</sup>. The U.S. Air force undertook operational control of the first Predator drone system in 1996 and since then the number of drones used in armed conflicts has dramatically increased<sup>6</sup>. According to estimations the U.S. arsenal will soon have more drones than manned aerial vehicles<sup>7</sup>. More than 40 states nowadays have combat drones, and many non-state actors also may have been possessing drones<sup>8</sup>. Hezbollah, for example, had already flown four different drones against Israel by April 2009<sup>9</sup>.

Robotic technologies have flooded battlefields and they can be used by both states and non-state actors for good and/or evil purposes, endangering the civilians’ lives. The statistics on civilian deaths is controversial. The number of civilian casualties caused by inaccurate strikes of robotic technologies varies according to different sources from hundreds to thousands deaths of civilians<sup>10</sup>. A noticeable lack of transparency exists with regard to the effects of drones: “no one appears to know with any measure of certainty the loss of civilian lives, injury to civilians and damage to civilian infrastructure that has been caused by drone attacks.”<sup>11</sup> Not surprisingly, the legality of UCAVs has been recently widely debated<sup>12</sup>. Remotely operated UCAVs are not completely autonomous. There are communication links between UCAV and the control station, which are designed to determine UCAV’s flight path and the way it operates. In its turn the control station receives imagery via UCAV sensors. A man-operator then uses transmitted information in order to determine the enemy and to target. “In the absence of human eyes on board”, UCAVs raise the question of whether they are capable of being used in compliance with the IHL principle of distinction<sup>13</sup>. Another problematic issue is assigning responsibility for indiscriminate attacks. “It may be—it may be; I’m not expressing a view; that unmanned drones that fall on a house full of civilians is a weapon the internation-

al community should decide should not be used.<sup>14,</sup>

Drone perceives humans as a scientific schema and then transmits that perception into a patterned sequence of zeros and ones, forming a digital code. The human coded as “pattern of life” then forms anonymous imagery which gets transmitted across the screen and after which he can be effectively targeted by the operator<sup>15</sup>. One of the most disputed issues with regard to legality of UCAVs is their capability of automatically selecting targets. According to Boutruche “[i]t remains to be proven that the discriminative capability of UCAV computers is reliable and accurate, let alone the capability to assess potential collateral damage under the principle of proportionality.<sup>16,</sup>” Robots do not have the same situational awareness and analytical capabilities as humans<sup>17</sup>. The capability of drones to transfer the necessary amount of sufficient and reliable information to the operator in order to enable him to assess proportionality and decide on precautionary measures to be taken also raises many debatable questions<sup>18</sup>. “In determining whether an attack was proportionate it is necessary to examine whether a reasonably well-informed person in the circumstances of the actual perpetrator, making reasonable use of information available to him [...], could have expected excessive civilian casualties to result from the attack.<sup>19,</sup>” Daraz Khan’s incident is a good example for illustration of possible drone strike failures due to unreliability of information. In February 2002 an operator of a Predator Drone had determined a villager from Lalazha - Daraz and his friends as suspicious because they were in suspicious area, plus Daraz was significantly taller than his friends, as bin Laden was thought to be. From a far distance this determination was as good as it could be. So the operator, thinking that he was targeting bin Laden, killed Daraz and his friends<sup>20</sup>. Pentagon spokesman commented on the incident: “We’re convinced it was an appropriate target.<sup>21,</sup>”

Concerns have been expressed also with regards to the professional competency of pilot-operators, in terms of their IHL knowledge<sup>22</sup>. These operators may know nothing about capabilities of robots and the necessary adequate reaction in cases of possible fallacy of robotic system, just as computer-users usually do not know much about how their computer works and how to react in case if it gets out of control. “Computers and humans do not compete together anymore; computers win.<sup>23,</sup>”

Another problematic and this time a more psychological aspect is that those who fight on distance are likely to expand the interpretation of military objectives. “The greater concern with drones is that

because they make it easier to kill without risk to State’s forces, policy makers and commanders will be tempted to interpret legal limitations on who can be killed, and under what circumstances, too expansively.<sup>24,</sup>” The USA, for example, keeps expanding their understanding of high-value targets in Pakistan. Obama Administration has been inclined to give the President Asif Ali Zardari the right to nominate targets, granting him the control over making decisions concerning the objects to be targeted in Pakistan<sup>25</sup>.

Even though the mentioned concerns have sound grounds, however, they are usually a result of accidents, mistakes or, in some cases, policy of the conflicting party. It should be fairly admitted that unpleasant incidents and unlawfulness may happen during war with robotic warfare just as much as with other means of warfare. If existing robotic technologies were used with due professionalism, they would not raise the question of their legality per se. Some may argue that the characteristics of drones create risks, making them more likely to be used in an indiscriminate way than other types of weapons. However, even if it were so, that would not make drones illegal as such. In any case, drones are not indiscriminate by their nature so long as they have necessary technological equipments, such as: cameras, sensors, and laser facilities, enabling drones to guide missile towards precise targets<sup>26</sup>. The conclusion would be that drones are not inherently indiscriminate, but they surely can be used in an indiscriminate way<sup>27</sup>.

At the same time positive characteristics of drones should not go unnoticed as well. Thus robots are fearless and they are not afraid of taking risks<sup>28</sup>, which makes them less dangerous for civilians<sup>29</sup>. Some of their technical capabilities, like capability to target for days before attacking, enable the operator to choose the correct time and place for the attack, enhancing the precision of the attack, and helping to minimize civilian casualties<sup>30</sup>. With advanced sensors and processing power drones can “fly over the target and send precise GPS coordinates and live video back to the operators. ... [and also] the possibility of using an AI simulation to predict how many civilians might be killed...<sup>31,</sup>”

Eventually, it could be concluded that existing generation of robotic technologies is not inherently indiscriminate and should not be prohibited. At present applicable IHL regulations are sufficient for adequately regulating the matter. The main problem remains not in the unmanned vehicles as such but rather in the level of their autonomy. Thus, it is important to distinguish between “remotely-controlled, semi-autonomous, or completely autonomous designs.<sup>32,</sup>” Drones discussed supra, are not fully autonomous. Operators and ana-

lysts involved in the drone-operation have the responsibility to ensure the compliance of the operation with IHL rules<sup>33</sup>. The “so-called ‘man in the loop’ is strictly necessary for ... complex decision[s].”<sup>34</sup> Present generation of UCVs usually require at least authorization to target by the operator<sup>35</sup>. Fully autonomous robots currently exist only within the framework of experiments but they seem so “real” that they have already raised debates over their legality in case of existence in near future. Fully autonomous robots will operate without human input, being capable of assessing the situation, finding solutions and making decisions, identifying the targets and using lethal force<sup>36</sup>. Autonomous robots may affect not only the “how” of the war-fighting, but also the “who” the war is fought by<sup>37</sup>. Development and use of autonomous robots raises many questions concerning specifically the protection of civilians.

Within a myriad of questions two problems require specific attention: a) the loss of human participation in the process of employment of UCVs could result in an increase of indiscriminate attacks; b) autonomous robots will put the responsibility rules under question, challenging effective application of IHL regulations<sup>38</sup>.

“The quite unpredictable and therefore uncontrollable behaviour of robots with cognitive abilities makes them potentially dangerous and therefore unsafe for military purposes.”<sup>39</sup> It is unclear whether robots will be able to comply with the principle of distinction. In this context autonomous robots should be designed in a way to be capable of distinguishing combatants from civilians. With this regards Reisner has mentioned three characteristics which would help robots to make distinction between civilians and combatants, namely: - physical appearance (uniform, carrying arms, etc.); - the type of movement (movement towards as if preparing to attack, running, scrolling, etc.); - geographical picture (nearby existence of military targets, etc.). Specialists assert that technologically it is possible to create robots capable of assessing all above-mentioned characteristics of an object cumulatively and reacting adequately<sup>40</sup>. But quite often during armed conflicts status of the object is not clear<sup>41</sup>. Additionally in some cases explicit situational behaviour and assessment of specific circumstances might be required on top of assessing the above-mentioned criteria.

Even, if robots were capable of distinguishing combatants from civilians, the next challenge would be acting in compliance with the proportionality principle. Is it possible to design autonomous robots, which can calculate proportionality and make assessments on precautions, if there is no specific and universal formula

for calculating and assessing proportionality in IHL? Proportionality principle requires balancing between collateral damage and military advantage. Compliance with this principle, its interpretation and application is extremely challenging even for humans. Qualified specialists in the field cannot state any exact proportionality assessment formula, despite that they often have to make such assessments in their everyday work. In order for robots to comply with the principle of proportionality, it will be necessary to work out a single formula for proportionality assessment<sup>42</sup>, which, in its turn, seems impossible, given that in reality assessment of proportionality is very much situational.

Even if technological magic happened and autonomous robots were designed so that they were capable of distinguishing between civilians and non-civilians, and were able to properly assess proportionality, robots would still endanger the safety of civilians. Combat robots, just like any computer system, are not guaranteed from facing system failures. Any such failure/misconduct by robots will raise the problem of responsibility. Who should be held responsible for the activities, which were entirely carried out by an autonomous robot? And eventually, even if autonomous robots don't face failures in targeting, they will still challenge the adequacy of IHL, its applicability and enforceability<sup>43</sup>, taking into consideration that initially IHL rules and regulations had been designed “by men for men” and not for robots<sup>44</sup>.

It appears that there are many questions and few answers. One thing is obvious: new developments with robotic technologies may have a revolutionary impact on IHL. This raises the question whether the law should be adapted to modern warfare or whether it should be changed in order to impose a total ban on the use of certain types of robots with high level of autonomy.

Development of new weaponry has often led to formulation of new international-legal regulations. Development of anti-personnel mines, for example, has resulted in elaboration of new conventional provisions, prohibiting their use<sup>45</sup>. This was triggered by the fact that they cannot be used in compliance with the principle of distinction. High risk of indiscriminate attacks by cluster munitions led to their conventional ban<sup>46</sup>.

The fact that “technology develops faster than a humanitarian consensus”<sup>47</sup> dictates the necessity of some type of regulation of development and use of the prima facie science-fictional robotic “creatures”. However, legal regulations have not adopted specific provisions concerning recent advancement and the possible future development of military technologies

thus far. Consequently, their development and use is covered by existing principles and regulations of IHL. It should be kept in mind, however, that IHL principles appeared long before the fantastic technological development we experience today. It has been stated that major codes on IHL “are so old that they almost qualify for Medicare.”<sup>48</sup> The nature of many IHL principles of necessity and proportionality, precautionary considerations, and even principle of distinction, demonstrate that IHL regulations were created having in mind human-fighters with specific capabilities to assess and evaluate situation, make situational decisions. Thus autonomous robotic technologies indeed challenge the adequacy of existing IHL regulations. Elaboration of new IHL rules adapted to autonomous combat robots could be one of the solutions. Bouttruche suggests another possible solution: namely clarification of interpretations of certain IHL rules by taking into consideration the challenges imposed by development and use of specific types of advanced technology<sup>49</sup>. Reisner, on the other hand, suggests an idea of creating legal categories of robots according to their level of autonomy and capabilities to properly comply with the principle of distinction. He then suggests imposing new regulations on the use of robotic technologies based on that categorization. For example, ‘category A’ robots with limited capabilities to properly distinguish combatants from non-combatants could be required to be used explicitly in combat zones with no civilians. “Category C” robots with exceptional artificial intelligence and advanced capabilities to comply with the principle of distinction due to their accuracy could be used in areas where civilians are also present. Under such regulations it would be illegal to use “category A” robots in places where only “category C” robots could be employed<sup>50</sup>. However, this creative solution is highly challenging in terms of proper implementation during

armed conflicts, because it seems nearly impossible to ensure control over methods of the use of certain categories of robots. It would be unrealistic to assume that it can be ensured that the robots operate in a proper and permitted area. The problematic issue of identifying responsible people in case of unexpected system fallacy is also left open within Reisner’s model of solution.

Another possible solution seems to us elaboration of legal regulations imposing rules on using certain types of robots for certain types of operations. Thus Reisner’s solution with regard to the use of certain categories of robots was based on “territorial” factor, while alternative solution could be based on “functional” criteria. But this scenario would raise the same problematic questions as the solution suggested by Reisner.

Total ban on fully autonomous robots could be considered as another variant of solution. Speaking realistically, the international community most likely will not reach consensus on complete ban of all types of autonomous robots, however, consensus could be reached with regard to prohibition of certain “species” of robots or development of their certain features<sup>51</sup>.

It is worth mentioning that at this point it seems early to identify the best solution. Nevertheless, whatever the solution would be, the fantastically rapid developments of technologies make it obvious that now is the very time for discussion of the issue, negotiations between interested parties and concrete steps for improvement of legal framework on the development and use of robotic technologies. Otherwise, if “intelligent and ethical” combat robots be created and employed they may soon simply replace combatants, reminding of a movie war scenario of robots fighting against enemy robots, with all, possibly disastrous, consequences for human beings...

<sup>1</sup> William Boothby, *Weapons and the law of Armed Conflict*, (OSO 2009) 230

<sup>2</sup> *Ibid.* (footnote omitted from the citation)

<sup>3</sup> Manual on International Law Applicable to Air and Missile Warfare, HPCR at Harvard University (2009) 6

<sup>4</sup> Mary O’Connell, “Remarks: The Resort to Drones under International Law” (2010-2011) *Denv.J.Int’l L. & Pol’y* 585

<sup>5</sup> P.W. Singer, “Robots at War: The New Battlefield” (2008) *Wilson Q* 30, 34

<sup>6</sup> Sebastian Wuschka, “The Use of Combat Drones in Current Conflicts - A Legal Issue or a Political Problem?” (2011) *Goettingen J.Int’l L.* 891, 892

<sup>7</sup> O’Connell, *supra* n.4, 586

<sup>8</sup> Philip Alston, “Study on Targeted Killings” (28.05.2008) UN A/HRC/14/24/Add.6 para.27

<sup>9</sup> P.W. Singer “Military Robots and the Future of War” TED talk (2009) at:

[http://www.ted.com/talks/lang/en/pw\\_singer\\_on\\_robots\\_of\\_war.html](http://www.ted.com/talks/lang/en/pw_singer_on_robots_of_war.html)

<sup>10</sup> Blank, “After “Top Gun”: How Drone Strikes Impact the Law of War” (2011-2012) *U.Pa.J. Int’l L.* 675, 676

<sup>11</sup> Philip Spoerri, Conclusions of the 34th Round Table on Current Issues of IHL, “IHL and New Weapon Technologies” (Sept. 2011) 3

<sup>12</sup> Robotic warfare has raised legal, ethical, moral, socio-psychological, economic, and political debates. See generally: P.W. Singer, “Wired for War” (2009) Penguin Press. Current paper focuses on controversies raised in the legal domain.

<sup>13</sup> Theo Boutruche, “Current Challenges in the Legal Regulation of the Methods of Warfare” Bruges Colloquium (2011) 21, 25

<sup>14</sup> Lord Bingham Interview (transcript) with Joshua Rozenberg on “Rule of Law” (2009) 2, at:

[http://www.biicl.org/files/4422\\_bingham\\_int\\_transcript.pdf](http://www.biicl.org/files/4422_bingham_int_transcript.pdf)

<sup>15</sup> Joseph Pugliese, “Prosthetics of Law and the Anomic Violence of Drones” (2011) Griffith L.Rev. 931, 943

<sup>16</sup> Boutruche, *supra n.13*, 25

<sup>17</sup> Daniel Reisner, “Autonomous Weapons Systems and the Application of IHL”, Bruges Colloquium (2011) 71, 74

<sup>18</sup> Boutruche, *supra n.13*, 26

<sup>19</sup> *Prosecutor v. Stanislav Galik*, Case No. IT-98-29-T (2003) para.58

<sup>20</sup> Singer, *supra n.12*, 397

<sup>21</sup> Eric Rosenberg, “Pentagon Defends attacks / It says Predator Drone Bombed an “Appropriate Target”” (12.02.2002)

Hearst Newspapers A3, at: <http://www.sfgate.com/news/article/Pentagon-Defends-attacks-It-says-Predator-drone-2875445.php>

<sup>22</sup> Ryan Vogel, “Drone Warfare and the Law of Armed Conflict” (2010-2011) DJILP 101, 136

<sup>23</sup> Reisner, *supra n.17*, 75

<sup>24</sup> Alston, *supra n.24*, 24

<sup>25</sup> Jane Mayer, “The Predator War. What are the risks of the C.I.A.’s covert drone program?” (26.10.2009)1, 8

<sup>26</sup> Wuschka, *supra n.6*, 896; Boothby, *supra n.1*, 226

<sup>27</sup> Boothby, *supra n.1*, 231; Wuschka, *supra n.6*, 905; Michael Schmitt, “Drone Attacks Under the Jus ad Bellum and Jus in Bello: Clearing the ‘Fog of Law’” (2011) YIHL 2, at: [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1801179](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1801179);

Boutruche, *supra n.13*, 26

<sup>28</sup> Erik Sofge, “America’s Robot Army: Are Unmanned Fighters Ready for Combat?” (2009) 2 at: <http://www.popularmechanics.com/technology/military/robots/4252643>

<sup>29</sup> *Ibid.*

<sup>30</sup> Blank, *supra n.10*, 687

<sup>31</sup> Singer, *supra n.12*, 398

<sup>32</sup> Boutruche, *supra n.13*, 25

<sup>33</sup> Blank, *supra n.10*, 701

<sup>34</sup> Wuschka, *supra n.6*, 896

<sup>35</sup> Boutruche, *supra n.13*, 25

<sup>36</sup> Armin Krishnan, *Killer Robots: Legality and Ethicality of Autonomous Weapons*, (2009)APL 45

<sup>37</sup> Singer, *supra n.9*

<sup>38</sup> Vik Kanwar, Review Essay “Post-human Humanitarian Law: The Law of War in the Age of Robotic Weapons” (2011)

Harv.Nat’l Sec.J. 616, 620

<sup>39</sup> Krishnan, *supra n.36*, 45

<sup>40</sup> Reisner, *supra n.17*, 75

<sup>41</sup> According to the 1977 Additional Protocol Article 50.1 “[i]n case of doubt whether a person is a civilian, that person shall be considered to be a civilian.”

<sup>42</sup> Reisner, *supra n.17*, 75

<sup>43</sup> Kanwar, *supra n.38*, 620

<sup>44</sup> Reisner, *supra n.17*, 109

<sup>45</sup> Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction, (1997),160 state-parties, 2 state signatories, at: <http://www.icrc.org/ihl.nsf/INTRO?OpenView>

The Convention is not considered customary law, being applicable to state-parties.

<sup>46</sup> Convention on Cluster Munitions (2008),75 state parties, 36 state signatories, at:

<http://www.icrc.org/ihl.nsf/INTRO?OpenView>

<sup>47</sup> Matthew Bolton, *Thomas Nash and Richard Moyes*, “Ban Autonomous Armed Robots”(05.032012)Article 36, at:

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[robots/?fb\\_action\\_ids=10151980908290314&fb\\_action\\_types=og.likes&fb\\_source=aggregation&fb\\_aggregation\\_id=246965925417366](http://www.article36.org/statements/ban-autonomous-armed-robots/?fb_action_ids=10151980908290314&fb_action_types=og.likes&fb_source=aggregation&fb_aggregation_id=246965925417366)

<sup>48</sup> Singer, *supra n.12*,407

<sup>49</sup> Boutruche, *supra n.13*, 28

<sup>50</sup> Reisner, *supra n.17*, 76

<sup>51</sup> Singer, *supra n.12*, 412

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26. Vik Kanwar, Review Essay “Post-human Humanitarian Law: The Law of War in the Age of Robotic Weapons” (2011) Harv.Nat’l Sec.J. 616

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**ԱՄՓՈՓԱԳԻՐ**

***Ռոբոտացված տեխնոլոգիաների զարգացման ու կիրառման ազդեցությունը միջազգային հումանիտար իրավունքի կարգավորումների վրա (քաղաքացիական բնակչության պաշտպանության տեսանկյունից)***

Ժամանակակից զինված ընդհարումներում հաճախ կիրառվում են ռոբոտացված տեխնոլոգիաներ՝ հարցականի տակ դնելով զենքերի զարգացման և կիրառման վերաբերող միջազգային-իրավական կարգավորումների արդյունավետությունը քաղաքացիական բնակչության պաշտպանության տեսանկյունից: Հիմնական խնդիրը, սակայն, վերաբերում է ոչ թե ինքնին ռոբոտներին, այլ դրանց ինքնավարության աստիճանին, որն առաջ է բերում առկա իրավական կարգավորումների փոփոխման կամ դրանք ժամանակակից զինված ընդհարումների մարտահրավերներին համապատասխանեցնելու հիմնահարցը:

**РЕЗЮМЕ**

***Влияние разработки и применения роботизированных технологий на регуляции международного гуманитарного права (с точки зрения защиты гражданского населения)***

В современных вооруженных конфликтах часто применяются роботизированные технологии, ставя под вопрос эффективность международно-правового регулирования разработки и применения вооружений с точки зрения защиты гражданского населения. Основная правовая проблема, однако, заключается не в роботах как таковых, а в степени их автономии. В связи с применением в вооруженных конфликтах роботов, обладающих высокой степенью автономии, возникает вопрос о необходимости внесения изменений в правовое регулирование или адаптации существующих регуляций к современным вооруженным конфликтам.