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**Promotion and protection of human rights: human rights questions, including alternative approaches for improving the effective enjoyment of human rights and fundamental freedoms**

## Note by the Secretary-General

The Secretary-General has the honour to transmit to the members of the General Assembly the interim report of the Special Rapporteur of the Human Rights Council on extrajudicial, summary or arbitrary executions, Philip Alston, submitted in accordance with Assembly resolution 63/182.

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# Interim report of the Special Rapporteur on extrajudicial, summary or arbitrary executions

*Summary*

The present report of the Special Rapporteur on extrajudicial, summary or arbitrary executions focuses especially on the relevance of new technologies in tackling the challenge of extrajudicial executions and the rampant impunity that attaches to the phenomenon. The report notes that it is a cliché that new technologies, especially in the domains of information, communications, and weaponry, have transformed the world of the twenty-first century. In contrast, however, the human rights community often seems determined to remain firmly rooted in the twentieth century. It has failed to take adequate advantage of the opportunities offered by new technologies whether for fact-finding, monitoring or supervision of States' obligations. And it has been remarkably slow in coming to grips with the implications of new technologies in areas such as robotics. In the report, the Special Rapporteur examines (a) new technologies and human rights fact-finding; (b) targeted killings and accountability; and (c) extrajudicial executions and robotic technologies. He recommends the creation of two expert groups. One would examine the more effective use of emerging information and communication technology for human rights monitoring and protection, and the other would examine proactive steps to be taken to ensure that robotic technologies are optimized in terms of their capacity to promote more effective compliance with international human rights and humanitarian law.

## Contents

# I. Introduction

1. This is the final report submitted to the General Assembly by Philip Alston in his capacity as Special Rapporteur on extrajudicial, summary or arbitrary executions. The report examines (a) new technologies and human rights fact-finding; (b) targeted killings and accountability; and (c) extrajudicial executions and robotic technologies, and concludes with specific recommendations for action.

2. In the preparation of the present report, I am deeply grateful for their superb research and expertise to Sarah Knuckey and Hina Shamsi of the Project on Extrajudicial Executions at New York University School of Law. Valuable research assistance was also provided by Sascha Bollag, Anna de Courcy Wheeler, Katy Gabel, Danielle Moubarak, and Rebecca Pendleton.

# II. New technologies and human rights fact-finding

3. Even in situations involving large-scale extrajudicial executions, major difficulties arise in efforts to gather accurate information on the events in question. This is partly because some Governments are becoming both more determined and more skilled in blocking access to information, but it is also because human rights groups, as a whole, have not yet moved in a sufficiently sustained or systematic fashion to take advantage of the enormous potential provided by new information and communication technologies to enhance their fact-finding capacities.

4. International human rights fact-finding currently relies heavily on witness testimony, usually gathered through lengthy in-person interviews by experienced investigators and advocates. International fact-finders spend weeks or months at a time investigating incidents and searching for witnesses, sometimes relying on trusted local organizations, media accounts, or word of mouth for contacts. The number of individual incidents that can be recorded depends in large part on the size of the fact-finding team, the amount of time its members can spend in-country, and the availability of funding. Fact-finding can be impeded or sometimes rendered impossible where investigators are unable, for security reasons or because of other obstacles, to access to meet with potential witnesses or examine the sites of alleged abuse. In such cases, grave abuses, including massacres, may be unknown to outsiders for months or longer, delaying potentially life-saving reporting and intervention.[1] In other cases, heavy reliance on witness testimony which is not supported by additional information of a more objective nature may leave findings open to challenge by Governments or alleged perpetrators. The long written reports that generally detail the results of a fact-finding mission may not make it easy to fully explain the complexities of a situation, or may fail to engage a broad audience.

5. New technologies offer a great many potential solutions to some of these problems, and offer significant improvements in existing fact-finding methodologies. Surprisingly, however, there remains an enormous gap between the human rights and information and communications technology fields. Little sustained work has been undertaken by the human rights community as a whole to apply existing technologies or to study their potential uses and problems, and far too

[1] See A/HRC/14/24/Add.3, paras. 26-30 (describing massacres that took place in the Democratic Republic of the Congo in April and August 2009, but that were not reported until months later).

little attention has been given to the research and development of information and communications technologies with human rights applications. As a result, the use of information and communications technologies in human rights work is only at a nascent stage.[2] Nevertheless, as the examples discussed below illustrate, some efforts are already under way to exploit new technologies to increase public participation in the monitoring and reporting of abuses. Some may enable the reporting of abuses in real time, thereby increasing awareness of incidents and speeding up responsiveness and, potentially, prevention; some provide human rights investigators access to new types of data which may provide important supporting evidence of human rights abuses; and others present new advocacy opportunities.

6. New social media, social networking sites, user-generated content sites or platforms, and a range of other information and communications technologies enable any person with access to the necessary technology to share and report information relating to killings or other human rights violations in real time, for example, through Facebook, Twitter, or crowdsourcing technologies[3] such as Ushahidi. The Ushahidi platform, for example, originally developed largely by Kenyans during their country's 2007-2008 post-election violence, allows users to submit reports of human rights abuses by text message (SMS), smart phone application, Twitter, e-mail or the Web. Information, such as the time, location, nature of a human rights abuse, and pictures and video footage, can then be geo-tagged and plotted on a map or timeline. The platform has since been used in a range of situations, including in the Democratic Republic of the Congo, South Africa, Gaza, India, the Sudan, Afghanistan, Burundi, and following the January 2010 Haiti earthquake. The possibilities for increasing the speed, depth, and scope of human rights monitoring with crowdsourcing and SMS reporting platforms (such as Frontline SMS) are readily apparent. With hundreds or thousands of users, the platform can be used as an early warning system, or to track patterns of violence or the effects of a natural disaster, or to facilitate rapid response or service delivery. Crisis mapping[4] can provide important visual representation of events, facilitating more effective strategic planning or advocacy. Cell-phone based reporting systems have also been harnessed to improve the provision of health and humanitarian

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[2] There is also a large gap between the humanitarian and information and communications technology (ICT) communities, but it is narrowing, particularly since the Haiti earthquake. See Diane Coyle and Patrick Meier, "New technologies in Emergencies and Conflicts: The Role of Information and Social Networks" (United Nations Foundation-Vodafone Foundation Partnership, 2009); PG Greenough et al, "Applied Technologies in Humanitarian Assistance: Report of the 2009 Applied Technology Working Group", 24 *Prehospital and Disaster Medicine*, Suppl. 2 (2009); Hillary Rodham Clinton, United States Secretary of State, "Remarks on Internet Freedom" (21 January 2010).

[3] In general terms, crowdsourcing is an open invitation to a population to provide information and ideas. More specifically, the term is often used to refer to crowdsourcing via web 2.0 technologies. See generally: Ankit Sharma, "Crowdsourcing Critical Success Factor Model" Working Paper (2010), and sources cited therein; Karthika Muthukumaraswamy, "When the Media Meet Crowds of Wisdom", 4 *Journalism Practice* (24 July 2009); Jeff Howe, "The Rise of Crowdsourcing", at www.wired.com (2006); and Anand Giridharadas, "Africa's Gift to Silicon Valley: How to Track a Crisis", *The New York Times* (12 March 2010).

[4] See http://www.crisismappers.net/; http://irevolution.wordpress.com/2009/08/08/proposing-crisis-mapping/; http://hhi.harvard.edu/programs-and-research/crisis-mapping-and-early-warning. See also the United Nations Development Programme's Threat and Risk Mapping Analysis in the Sudan, at http://www.sd.undp.org/projects/dg13.htm.

assistance, and environmental conservation.[5] The technologies may also allow users to get around biases in mainstream media or Government censorship, as the use of Twitter in the Islamic Republic of Iran famously demonstrated, enable reporting from areas where fact-finders cannot themselves physically access, and generally increase public participation in human rights advocacy.[6] A range of wikis and user-generated content or collaborative websites, such as Wikileaks, OpenStreetMap (an editable street map of the world), YouTube,[7] and the Hub[8] can serve similar functions.

7. But there are also significant obstacles to effective human rights applications of these technologies. Credibility and reliability of information are primary concerns in fact-finding. The reporting and advocacy that follow human rights investigations are open to challenge and can readily be impugned where the "facts" themselves were gathered through unreliable methodologies, or by inexperienced, or biased fact-finders. Crowdsourcing, for example, potentially creates "a tsunami of unverified reporting".[9] Because of the very real concern that crowdsourced information could contain erroneous or falsified data,[10] at this stage, it would be difficult to conceive of a human rights report based solely on crowdsourced information. But crowdsourcing could certainly be used by organizations (e.g. national human rights institutions, ombudsmen, non-governmental organizations) to receive notifications of alleged abuses which could then be tracked and investigated, or crowdsourced platforms could be bounded so that only certain trusted sources (e.g. United Nations or other designated local field investigators) could provide

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[5] For example, the United Nations Children's Fund (UNICEF) has used cell-phone reporting systems in the provision of humanitarian aid. In Ethiopia, UNICEF used RapidSMS to better distribute food supplies. See "Preventing Famine with a Mobile" (21 December 2008) at www.mobileactive.org. See also See Sheila Kinkade and Katrin Verclas, "Wireless Technology for Social Change: Trends in Mobile Use by NGOs", United Nations Foundation-Vodafone Group Foundation Partnership (2008).

[6] See Molly Beutz Land, "Networked Activism", 22 *Harvard Human Rights Journal* (2009) 205; Geoffrey A. Fowler, "'Citizen Journalists' Evade Blackout on Myanmar News", *The Wall Street Journal* (28 September 2007).

[7] See Larry Diamond, "Liberation Technology", 21 *Journal of Democracy* (2010) 76 (referring to a range of "liberation" and "accountability" technologies, and giving YouTube as an example of a tool "for transparency and monitoring": "Enter 'human rights abuses' into YouTube's search box and you will get roughly ten thousand videos showing everything from cotton-growers' working conditions in Uzbekistan, to mining practices in the Philippines, to human-organ harvesting in China …").

[8] The Hub is a project of the international organization WITNESS. WITNESS provides training and equipment on using video technologies to record human rights abuses. The Hub is a website where human rights videos can be shared.

[9] See United States Department of State, "Haiti Earthquake: Breaking New Ground in the Humanitarian Information Landscape" (July 2010), p. 4.

[10] See Anahi Ayala Iacucci, "Ushahidi-Chile: an example of crowdsourcing verification of information" at http://crisismapper.wordpress.com/2010/06/28/ushahidi-chile-an-example-of-crowd-sourcing-verification-of-information/ (discussing false reports made following the Chile Earthquake); Peter Smith, "Cellphone and Internet access helps — and hinders — accurate reporting in Kenya", at www.csmonitor.com (31 January 2008) (discussing false information and rumours).

information to it.[11] Some programmes are also being developed to address reliability and accuracy concerns — SwiftRiver, for example, uses natural language computation, machine learning, and veracity algorithms to aggregate, filter, and triangulate information from online news, blogs, Twitter, SMS, and other sources.[12]

8. Crowdsourcing can also raise privacy and security concerns for those reporting abuses. Such concerns demand careful consideration before the technology is deployed in sensitive environments. For example, a repressive Government might monitor text messages sent to a platform, or require the registration of personal information by those involved.[13] Other problems can arise with coordination and information-sharing. Thus in the aftermath of the Haiti earthquake it was observed that each system was an island of information, leading to unnecessary duplication, fragmentation and significant frustration.[14] Other important concerns include uneven access to technologies (which may result in distorted findings or advocacy focus), sustainability (especially after the urgency of a particular crisis appears to fade), the expense and reliability of cell networks or Internet connections, and potential users' training and knowledge. The humanitarian, disaster relief, and ICT communities are presently engaged in an important discussion of these problems,[15] much of which is relevant to human rights actors.

9. Geospatial technologies also have enormous potential to aid in human rights work, and some organizations are beginning to use them in their investigations and advocacy.[16] Amnesty International, for example, as part of its "Science for Human Rights" programme (together with the American Association for the Advancement of Science[17]), is using mapping and satellite imagery to provide supporting evidence to witness accounts and to document abuses (such as the destruction of homes or villages), and to provide interactive visual information in its advocacy

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[11] See, for example, Peter van der Windt, "Voix des Kivus (Ushahidi in the Democratic Republic of the Congo)", talk given at the International Conference on Crisis Mapping (2009) (discussing a pilot project on the eastern Democratic Republic of the Congo, providing cell phones to village leaders to report abuses via SMS).

[12] See http://swift.ushahidi.com.

[13] See Patrick Meier, "How to Communicate Securely in Repressive Environments" (15 July 2009) at http://irevolution.wordpress.com/2009/06/15/digital-security/.

[14] ICT for Peace Foundation, "Haiti and beyond: Getting it right in Crisis Information Management" (March 2010).

[15] See the work of Patrick Meier at http://irevolution.wordpress.com/; compare http://www.humanitarian.info/2009/03/30/correcting-crowdsourcing-in-a-crisis/. See also "Breaking New Ground in the Humanitarian Information Landscape", footnote 9 above.

[16] See International Crisis Group, "War Crimes in Sri Lanka" (17 May 2010) (referring to satellite imagery providing evidence of abuses); Human Rights Watch, "Georgia/Russia: Use of Cluster Munitions in August 2008" (9 April 2009) (providing maps and satellite images of the location of cluster munitions use); Human Rights Watch, "Israel/Gaza: Satellite Imagery of White Phosphorous Use" (25 March 2009). See also, the World Food Programme's use of satellite imagery: http://www.wfp.org/our-work/our-competences/being-ready/technology-helping-wfp. See also: David Talbot, "Satellite Images Catch Human-Rights Violations in Burma", *Technology Review* (28 September 2007). For uses of Google Earth, see: MapAction, "Google Earth and its potential in the humanitarian sector: a briefing paper" (April 2008).

[17] The AAAS has a dedicated "Science and Human Rights Program", including a "Geospatial Technologies and Human Rights Project". See AAAS, "What can geospatial technologies do for the human rights community?" at http://shr.aaas.org/geotech/whatcanGISdo.shtml. See also Tactical Technology Collective, "Maps for advocacy: An introduction to Geographical Mapping Techniques" (September 2008).

work.[18] Satellite imagery, however, can be very expensive to purchase, may need to be obtained from Governments, and can be limited by factors such as time lag and cloud interference. In response, some have suggested or begun to develop unmanned aerial vehicles or other aerial photography mechanisms for humanitarian purposes (which could similarly be used in the human rights field), although the actual use of these are currently inhibited by problems of insurance and regulation issues for the civilian use of unmanned aerial vehicle.[19]

10. Other technologies, including artificial intelligence,[20] robotics,[21] Photosynth,[22] and hyperspectral imagery[23] also have potential but largely unexplored human rights applications.

# III. Targeted killings and accountability

11. In June 2010, the Special Rapporteur presented a thematic report to the Human Rights Council analysing the human rights and humanitarian law applicable to targeted killings, and the legal issues raised by such practices.[24] The report highlighted the extent to which such practices have spread and warned that they pose a significant and rapidly growing challenge to the international rule of law. In recent years, the United States of America, Israel and the Russian Federation, have asserted the legality of targeted killings in excessively broad circumstances, outside the limited permissible context of armed conflict, while at the same time failing to demonstrate that their use of targeted killings complied with the applicable rules. In the report, the Special Rapporteur cautioned that the overly expansive interpretation

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[18] For example, Amnesty International's "Eyes on Darfur" project brings together satellite imagery, witness accounts, and ground photos to evidence and illustrate abuses in Darfur. The satellite images show villages before and after destruction. See http://www.eyesondarfur.org/about.html. The "Eyes on Pakistan" project uses interactive maps to show the locations of attacks on civilians: http://www.eyesonpakistan.org/.

[19] See H. Bendea et al, "Low Cost UAV for Post-Disaster Assessment", *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Science*, Vol. XXXVII (2008) (describing the development of low cost UAVs for early impact analysis of humanitarian disasters, and their advantages); Bendea et al, "New Technologies for Mobile Mapping", paper presented at the fifth International Symposium on Mobile Mapping Technology (2007).

[20] See, for example, Artificial Intelligence for Development, at http://ai-d.org/index.html.

[21] See e.g. John G. Blitch, "Artificial Intelligence Technologies for Robot Assisted Urban Search and Rescue", 11 *Expert Systems With Applications* (1996) (discussing the use of mobile robots to rescue individuals trapped in collapsed structures). See also: IRIN, "Bots without borders" (22 June 2009) at http://www.irinnews.org/Report.aspx?ReportId=84933 (discussing the potential for automated humanitarian relief); http://www.humanitarianfutures.org/main/content/science-panel; http://crasar.org/.

[22] Photosynth allows users to create a three dimensional model of a series of photographs uploaded to the site. If, for example, a number of users took photos at the scene of an alleged human rights violation, the photos could all be "stitched" together to create a compilation of many images taken from different perspectives; this could be an important evidence gathering tool. See http://photosynth.net/about.aspx; Sanjana Hattotuwa, "Information visualization through Microsoft Photosyth: Potential for human rights documentation?" (31 July 2008) at http://ict4peace.wordpress.com.

[23] See Margaret E. Kalacska et al, "The Application of Remote Sensing for Detecting Mass Graves: An Experimental Animal Case Study from Costa Rica", 54 *Journal of Forensic Sciences* (2008) 159.

[24] A/HRC/14/24/Add.6.

of the law by those States today would inevitably be followed by other States in the future, and that without transparency and accountability for targeted killings, grave damage would be done to the legal framework that the international community has so painstakingly constructed in order to protect the right to life. The United States has chosen not to respond substantively to the report, while Israel and the Russian Federation have ignored it.

12. The report, as well as the Special Rapporteur's statement to the Human Rights Council attached particular importance to the role of the United States because it is the most enthusiastic and prolific proponent of targeted killings carried out in circumstances which sometimes appear to violate the applicable international law. The Special Rapporteur urged the United States Government to disclose the legal basis for its targeted killing policy, as well as the number of individuals killed pursuant to that policy, including civilians, and the accountability mechanisms in place. He expressed particular concern in relation to the United States Central Intelligence Agency's targeted killing programme because of its complete lack of public accountability and transparency, including the Central Intelligence Agency's refusal to disclose its justifications for reportedly killing many hundreds of people.[25]

13. With respect to targeted killings, the response of the United States Government has consisted of three elements. The first has been to effectively refuse to engage with the Human Rights Council or its Special Rapporteur in any direct way, thus undermining the legitimate monitoring role played by the Council, a role which has been strongly supported by the United States in relation to the conduct of many other States. The second has been a vigorous, but largely anonymous, defence of the policy in the media, in which officials have insisted that the targeted killings are highly effective, have involved only a handful of civilian casualties, and are entirely legal.[26] The third element has been a consistent refusal to support the general assurances given by officials with any concrete information addressing the key concerns. This is best illustrated by statements provided by Central Intelligence Agency spokespersons indicating that they can neither confirm nor deny that targeted killing programmes are conducted by the Agency, but at the same time insisting that any such programmes have led to no more than 40 or 50 civilian casualties and that they are governed by strong domestic accountability arrangements.[27] The bottom line is that no concrete information has yet been provided in relation to any of the basic questions raised in the Special Rapporteur's report. These include: when and where the Government considers itself authorized to kill; who may be killed; the safeguards in place to protect civilians; and the applicable accountability mechanisms. Even the figures given by spokespersons for civilian casualties remain entirely anecdotal and are not supported by any further explanation.

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[25] Statement of the Special Rapporteur to the Human Rights Council, 3 June 2010, available at http://www.extrajudicialexecutions.org/application/media/Statement-Alston1.pdf.

[26] Frank Jordans, "UN Expert: 'Targeted Killings' by U.S., Israel, Russia May Be War Crimes", Associated Press, 2 June 2010; Charlie Savage, "U.N. Report Highly Critical of U.S. Drone Attacks", *The New York Times*, 2 June 2010.

[27] See, for example, Peter Finn, "U.N. Official Urges U.S. to Stop CIA Drone Attacks on al-Qaeda and Taliban", *Washington Post*, 3 June 2010; David Cloud, "U.N. Report Faults Prolific Use of Drone Strikes by U.S.", *L.A. Times*, 3 June 2010; Jonathan Adams, "US Defends Unmanned Drone Attacks After Harsh UN Report", *Christian Science Monitor*, 3 June 2010.

14. The continuing refusal of the United States to provide the international community with the information that would satisfy its obligations in relation to transparency and accountability has gone hand in hand with a continuing expansion of its targeted killings programme. In the two months (up to the end of July 2010) since the Special Rapporteur's report was submitted to the Human Rights Council, ten United States drone strikes have been reported in the border region of Pakistan and Afghanistan. These strikes are estimated to have killed between 64 and 112 alleged "militants", but the number of civilians killed, if any, is unknown.[28] Reports on the numbers killed and claims about whether the dead are civilians or individuals who may be legally targeted continue to be impossible to verify — as they have been since the inception of the United States targeted killing policy in or around 2002. The reason is primarily because the United States Government has refused to disclose (except through highly selective leaks) who it has targeted for killing and whether there have been civilian casualties, and also because human rights monitors and independent media have not had access to the affected areas. The British Broadcasting Corporation (BBC), for example, reported that, although more than 700 people were killed in drone attacks between January 2009 and June 2010, "positive identification of the victims, either by Pakistani or United States authorities, has been made in fewer than a dozen instances."[29]

15. In addition to concerns about Central Intelligence Agency activities, new and disturbing information has come to light concerning targeted killing operations in Afghanistan led by United States Special Forces, belonging to the United States military. In the Special Rapporteur's report on his May 2008 mission to Afghanistan, concern was expressed about the lack of transparency and accountability with respect to covert United States-led missions to capture or kill alleged suspects in Afghanistan, as well as about the poor intelligence upon which the missions all too often seemed to be based.[30] Newly available United States Government documents covering the 2004-2009 period show the extent to which such concerns were justified. These documents indicate that a United States Special Forces unit, Task Force 373 (TF-373), was used to deal with the capture or killing of Taliban and al-Qaida leaders, who were included on a joint prioritized effects list of some 2,000 names. The documents also raise concerns about the involvement of the Government of Germany in the United States targeted killings policy, as members of TF-373 were based at a German base in Afghanistan. The documents indicate that civilians, including women and children, may have been wrongly killed by TF-373, and that TF-373 may have unlawfully chosen to kill individuals, rather than capture and detain them,[31] It is not clear from the documents how individuals were chosen to be included on the kill/capture list, how one might get off the list, or on what basis individuals have been killed, rather than captured. The General Assembly should call upon the United States and any other Government involved to provide

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[28] Peter Bergen and Katherine Tiedemann, An Analysis of U.S. Drone Strikes in Pakistan, 2004-2010, New America Foundation, database available at http://counterterrorism.newamerica.net/drones.

[29] BBC News, "Mapping US Drone and Islamic Militant Attacks in Pakistan", 22 July 2010, http://www.bbc.co.uk/news/world-south-asia-10648909.

[30] See A/HRC/11/2/Add.4.

[31] Nick Davies, "Afghanistan War Logs: Task Force 373", *The Guardian*, 25 July 2010; CNN, "Wikileaks Shines Spotlight on Mysterious Task Force 373", 26 July 2010. See Wikileaks Afghanistan War Dairy, Reference ID AFG20070617n853 (describing the attempted targeting of Abu Laith al-Libi by rockets, which led instead to the deaths of seven children).

full disclosure of the legal justification for these operations, their outcome, and steps taken to punish wrongdoing and provide compensation to victims.

16. Meeting the legal requirements of transparency and accountability for targeted killing need not impose an onerous burden upon the States concerned. The minimum requirements are: disclosure of the legal criteria for who can be targeted and killed; the legal justification for where in the world, and when, such killings are permitted to occur; the precautions in place to ensure that the killings are legal; and what follow-up there is when civilians are illegally killed.[32] Too often, the response given by Government officials or their surrogates in the media suggests that disclosure of such information would necessarily involve revealing intelligence sources and methods. But that is not the case. Disclosure of the legal analysis on the basis of which a targeted killing policy has been established does not require the revelation of any State secrets. Similarly, disclosure of the generic procedural safeguards put in place to ensure that the right person has been targeted does not cause intelligence to be revealed, and nor does a report that wrongdoing is being investigated and remedied, or that victims have been compensated. On the other hand, a failure to provide such disclosure has the effect of replacing public legal accountability, to both the national and international communities, with unverifiable Government assertions of legality, and thereby undermining the rule of law.

# IV. Extrajudicial executions and robotic technologies

## A. Introduction

17. Over the past decade, the number and type of unmanned or robotic systems developed for, and deployed in, armed conflict and law-enforcement contexts has grown at an astonishing pace. The speed, reach, capabilities and automation of robotic systems are all rapidly increasing. Unmanned technologies already in use or in later stages of development — including unmanned airplanes, helicopters, aquatic and ground vehicles — can be controlled remotely to carry out a wide array of tasks: surveillance, reconnaissance, checkpoint security, neutralization of an improvised explosive device, biological or chemical weapon sensing, removal of debris, search and rescue, street patrols, and more. They can also be equipped with weapons to be used against targets or in self-defence. Some of these technologies are semi-automated, and can, for example, land, take off, fly, or patrol without human control. Robotic sentries, including towers equipped with surveillance capacity and machine guns, are in use at the borders of some countries. In the foreseeable future, the technology will exist to create robots capable of targeting and killing with minimal human involvement or without the need for direct human control or authorization.

18. Some of this technology is either unambiguously beneficial or can be used to clearly positive effect, including, most importantly, saving the lives of civilians and limiting military personnel casualties. However, the rapid growth of these technologies, especially those with lethal capacities and those with decreased levels of human control, raise serious concerns that have been almost entirely unexamined by human rights or humanitarian actors, although some military lawyers,

[32] See A/HRC/14/24/Add.6.

philosophers, ethicists and roboticists have begun to do so.[33] The general lack of international attention to this issue is understandable. Other humanitarian or human rights issues — disastrous floods in Pakistan, killing and sexual violence in the Democratic Republic of the Congo, or gang killings in Mexico — seem far more immediately pressing, and resources, time, and staffing capacities in the United Nations, non-governmental organizations and think tanks are always stretched. In addition, anything that smacks of science fiction seems more at home in an Asimov novel or Terminator film rather than in a human rights report.

19. Various factors explain why the human rights community continues to see advances in robotics as an exotic topic that does not need to be addressed until the relevant technologies are actually in use. First, much of the information about these developments remains confined to military research establishments and specialist scientific literature. Second, understanding the technologies requires expertise beyond that of most human rights experts. Third, the attractions of greater use of robotic technologies greatly overshadow, in the public mind, the potential disadvantages. And finally, there is a North-South dimension, in that the North has the money and the technical know-how to develop the technologies, while many of the negative consequences of their use will fall much more heavily on poorer countries in the South.

20. The analysis that follows is predicated on two principal assumptions. The first is that the new robotic technologies have very important ramifications in terms of the right to life and the fight against extrajudicial executions, and that they raise issues that need to be addressed now, rather than later. The second is that, although a large part of the research and technological innovation currently being undertaken is driven by military and related concerns, there is no inherent reason why human rights and humanitarian law considerations cannot be proactively factored into the design and operationalization of the new technologies. But this will not happen unless and until the human rights community presses the key public and private actors to make sure it does; and because the human rights dimensions cannot be addressed in isolation, the international community urgently needs to address the legal, political, ethical and moral implications of the development of lethal robotic technologies.

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[33] See, for example, Summary of Harvard Executive Session of June 2008, *Unmanned and Robotic Warfare: Issues, Options And Futures*, at 14; http://www.lnwprogram.org/publicfiles/download/Future+of+Unmanned+and+Robotic+Warfare?file_id=505283 (“2008 Harvard Session”); Ronald Arkin, *Governing Lethal Behaviour in Autonomous Robots* (2009); Peter Asaro, “How Just Could a Robot War Be?”, in Philip Brey, Adam Briggle & Katinka Waelbers (eds.), *Current Issues in Computing And Philosophy* (2009); William H. Boothby, *Weapons and the Law of Armed Conflict* (2009); Jason Borenstein, “The Ethics of Autonomous Military Robots”, 2 *Studies in Ethics, Law and Technology* (2008) available at http://www.bepress.com/selt/vol2/iss1/art2; Charles J. Dunlap, Jr., “Technology: Recomplicating Moral Life for the Nation’s Defenders”, 24 *Parameters: US Army War College Quarterly* (2009); Noel Sharkey, “Automated Killers and the Computing Profession”, *Computer Journal* (2007); Noel Sharkey, “Death Strikes from the Sky: The Calculus of Proportionality”, 28 *IEEE Technology and Society* 16-19 (2009); Robert Sparrow, “Robotic Weapons and the Future of War”, in Jessica Wolfendale and Paolo Tripodi (eds), *New Wars and New Soldiers: Military Ethics in the Contemporary World*, (forthcoming); Robert Sparrow, “Predators or Plowshares? Arms Control of Robotic Weapons” 28 *IEEE Technology and Society* 25 (2009); Patrick Lin, George Bekey, & Keith Abney, *Autonomous Military Robotics: Risk, Ethics, and Design* (2008), available at http://ethics.calpoly.edu/ONR_report.pdf (report prepared for the United States Department of the Navy).

## B. Trends in the development of lethal robotic technology

21. While the use of lethal robots in the context of war is not unprecedented,[34] their development and use has dramatically increased since the attacks of 11 September 2001, the Afghanistan and Iraq conflicts, and the enormous growth in military research and development that the conflicts precipitated. Military experts have noted that the two conflicts are serving as real-time laboratories of "extraordinary development" for "robotic warfare".[35]

22. The primary user of this technology is the United States. Between 2000 and 2008, the number of United States unmanned aircraft systems increased from less than 50 to over 6,000.[36] Similarly, the number of unmanned ground vehicles deployed by the United States Department of Defense increased from less than 100 in 2001 to nearly 4,400 by 2007.[37] Other States, including Australia, Canada, France, Germany, Israel, the Republic of Korea and the United Kingdom of Great Britain and Northern Ireland have also developed or are developing unmanned systems.[38]

23. At present, the robotic weapons technologies most in use are systems that are remotely, but directly, operated by a human being. A well-known example is the "BomBot", a vehicle which can be driven by remote control to an improvised explosive device, drop an explosive charge on the device, and then be driven away before the charge is detonated.[39] Another example is the Special Weapons Observation Reconnaissance Detection System (SWORDS) and its successor, the Modular Advanced Armed Robotic System (MAARS). SWORDS is a small robot that can be mounted with almost any weapon that weighs less than 300 pounds, including machine guns, rifles, grenade launchers and rocket launchers, and can

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[34] As long ago as the Second World War, for example, Germany used bombs attached to tank treads which were detonated by remote control, while the United States used radio-piloted bomber aircraft packed with explosives. See Steve Featherstone, "The Coming Robot Army", Harpers, February 2007; P. W. Singer, *Wired for War* (2009) (discussing historical development of unmanned or robotics technology).

[35] 2008 Harvard Session, footnote 33 above, at p. 2.

[36] See Government Accountability Office, Report to the Subcommittee on Air and Land Forces, Committee on Armed Services, House of Representatives, *Unmanned Aircraft Systems: Additional Actions Needed to Improve Management and Integration of DOD Efforts to Support Warfighter Needs*, November 2008, available at http://www.gao.gov/new.items/d09175.pdf.

[37] Department of Defense, Report to Congress: *Development and Utilization of Robotics and Unmanned Ground Vehicles* 11 (October 2006), available at http://www.jointrobotics.com/Activities/congressdocs/UGV%20Congressional%20Report%20-%20Final%20%28October%202006%29.pdf. U.S. law requires that, by 2015, one third of US operational ground combat vehicles be unmanned. Ibid; at p. 45. Office of the Secretary of Defense, *Unmanned Systems Roadmap 2007-2032* (2007), available at http://auvac.org/research/publications/files/2007/unmanned_systems_roadmap_2007-2032.pdf. For fiscal year 2010, the US Department of Defense sought a budget of $5.4 billion for unmanned systems (including systems for use on land, in the air, and at sea), an increase of 37.5 per cent over the past two years. "Pentagon's Unmanned Systems Spending Tops $5.4 billion in FY2010", *Defense Update*, 14 June 2009, available at http://defense-update.com/newscast/0609/ news/pentagon_uas_140609.html.

[38] See *Development and Utilization of Robotics and Unmanned Ground Vehicles*, footnote 37, at p. 47 (describing research and development activities directed towards developing military capabilities for robotics and unmanned ground vehicles of United States allies).

[39] Ibid., at p. 12.

travel in a variety of terrains.[40] It can be operated by remote control and video cameras from up to two miles away, and be used for street patrols and checkpoint security as well as to guard posts. MAARS is similar, but can carry more powerful weapons and can also be mounted with less-than-lethal weapons, such as tear gas.[41]

24. The level of automation that generally exists in currently deployed systems is limited to the ability of, for example, an unmanned combat aerial vehicle or a laser-guided bomb to be programmed to take off, navigate or de-ice by itself, or with only human monitoring (as opposed to control). In June 2010, trials were held in which helicopters had carried out fully autonomous flights.[42] Sentry systems also exist which can patrol automatically around a sensitive storage facility or a base. The Mobile Detection Assessment and Response System (MDARS), for example, is a small robotic patrol force on wheels designed to relieve personnel of the repetitive and sometimes dangerous task of patrolling exterior areas and which can autonomously perform random patrols.[43] For currently existing systems that have lethal capability, the choice of target and the decision to fire the weapon is made by human beings, and it is a human being who actually fires the weapon, albeit by remote control. With such weapons systems, there is, in military terminology, a "man in the loop", so that the determination to use lethal force, as with any other kind of weapon, lies with the operator and the chain of command. Examples of such semi-automated weapons systems currently in use include Predator and Reaper drones[44] deployed in the conflicts in Iraq and Afghanistan by the United States and the United Kingdom, and Israeli Harpy drones. Systems that would replace this generation of technology include the Sky Warrior, an unmanned aircraft system capable of taking off and landing automatically, with the capacity to carry and fire four Hellfire missiles.[45]

25. "Swarm" technologies are also being developed to enable a small number of military personnel to control a large number of machines remotely. One system under development envisions that a single operator will monitor a group of semi-autonomous aerial robotic weapons systems through a wireless network that connects each robot to others and to the operator. Each robot within a "swarm" would fly autonomously to a designated area, and "detect" threats and targets through the use of artificial intelligence, sensory information and image processing.[46]

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[40] *Wired for War*, footnote 34 above, pp. 29-32.

[41] Id.; see also Seth Porges, Real Life Transformer Could Be First Robot to Fire in Combat, Popular Mechanics, 1 Oct. 2009, available at http://www.popularmechanics.com/technology/military/4230309.

[42] Olivia Koski, "In a First, Full-Sized Robo-Copter Flies With No Human Help", *Wired* (14 July 2010).

[43] "MDARS — 21st Century Robotic Sentry System", General Dynamics Robotics Systems, at http://www.gdrs.com/about/profile/pdfs/0206MDARSBrochure.pdf.

[44] United States Air Force, United States Air Force Unmanned Aircraft Systems Flight Plan 2009-2047 at 26, available at http://www.fas.org/irp/program/collect/uas_2009.pdf.

[45] See descriptions at General Atomics Aeronautical, http://www.ga-asi.com/products/aircraft/er-mp-uas.php; Defense Update, Sky Warrior Goes into Production to Equip U.S. Army ER/MP Program, 9 July 2010, http://www.defence-update.net/wordpress/20100709_sky_warrior_lrip.html.

[46] *Unmanned Aircraft Systems Flight Plan 2009-2047*, footnote 44 above, pp. 33-34. A group of European firms, lead by Dassault, is developing similar technology for the European market. Erik Sofge, "Top 5 Bomb-Packing, Gun-Toting War Bots the U.S. Doesn't Have", Popular

26. Robotic technology is also becoming faster and more capable of increasingly rapid response. Military strategic documents predict the development of technology that speeds up the time needed for machines to respond to a perceived threat with lethal force to micro or nanoseconds. Increasingly humans will no longer be "in the loop" but rather "on the loop" — monitoring the execution of certain decisions.[47] The speed of the envisioned technology would be enhanced by networking among unmanned machines which would be able to "perceive and act" faster than humans can.

27. To date, armed robotic systems operating on any more than a semi-automated basis have not been used against targets. The military representatives of some States indicate that humans will, for the foreseeable future, remain in the loop on any decisions to use lethal force.[48] The United States Department of Defense, for example, has stated that for a significant period into the future, the decision to pull the trigger or launch a missile from an unmanned system will not be fully automated, but notes that many aspects of the firing sequence will, even if the final decision to fire will not likely be fully automated until legal, rules of engagement, and safety concerns have all been thoroughly examined and resolved.[49] However, some roboticists note that the advent of autonomous lethal robotic systems is well under way and that it is a simple matter of time before autonomous engagements of targets are present on the battlefield.[50] A number of countries are already reportedly deploying or developing systems with the capacity to take humans out of the lethal decision-making loop. For example:

- Since approximately 2007, Israel has deployed remote-controlled 7.62 mm machine-guns mounted on watchtowers every few hundred yards along its border with Gaza as part of its "Sentry Tech" weapons system, also known as "Spot and Shoot" or in Hebrew, "Roeh-Yoreh" (Sees-Fires).[51] This "robotic sniper" system locates potential targets through sensors, transmits information to an operations command centre where a soldier can locate and track the target and shoot to kill.[52] Dozens of alleged "terrorists" have been shot with the Sentry Tech system.[53] The first reported killing of an individual with Sentry Tech appears to have taken place during Operation Cast Lead in

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Mechanics, 1 October 2009, available at http://www.popularmechanics.com/technology/military/4249209.

[47] *Unmanned Aircraft Systems Flight Plan 2009-2047*, footnote 44 above, p. 41.

[48] British Air Marshal Steve Hillier sees an enduring requirement for a human in the loop for decision-making. When you get to attack, you need someone to exercise judgement. http://www.flightglobal.com/articles/2010/07/13/344077/farnborough-uk-unmanned-air-vehicles.html.

[49] United States Department of Defense, *FY 2009–2034 Unmanned Systems Integrated Roadmap*, 6 April 2009, available at http://jointrobotics.com/documents/library/UMS%20Integrated%20Roadmap%202009.pdf.

[50] Ronald C. Arkin, Alan R. Wager and Brittany Duncan, "Responsibility and Lethality for Unmanned Systems: Ethical Pre-mission Responsibility Advisement", GVU Technical Report GIT-GVU-09-01, GVU Center, Georgia Institute of Technology, 2009.

[51] Robin Hughes and Alon Ben-David, "IDF Deploys Sentry Tech on Gaza Border", Jane's Defence Weekly, 6 June 2007.

[52] Noah Schachtman, Robo-Snipers, "Auto Kill Zones" to Protect Israeli Borders, *Wired*, 4 June 2007, http://www.wired.com/dangerroom/2007/06/for_years_and_y/.

[53] Anshell Pfeffer, "IDF's Newest Heroes: Women Spotters on Gaza's Borders", *Haaretz*, 3 March 2010, available at http://www.haaretz.com/print-edition/news/idf-s-newest-heroes-women-spotters-on-gaza-border-1.264024.

December 2008.[54] Two alleged "terrorists" were killed using the system in December 2009,[55] and another person was killed and four injured by Sentry Tech in March 2010; according to media accounts it is unclear whether the dead and injured were farmers or gunmen.[56] Future plans envision a "closed loop" system, in which no human intervention would be required in the identification, targeting and kill process.[57]

- The Republic of Korea has developed the SGR-1, an unmanned gun tower that, beginning in July 2010, is performing sentry duty on an experimental basis in the demilitarized zone between the Democratic People's Republic of Korea and the Republic of Korea.[58] The SGR-1 uses heat and motion detectors and pattern recognition algorithms to sense possible intruders; it can alert remotely located command centre operators who can use the SGR-1's audio and video communications system to assess the threat and make the decision to fire the robot's 5.5 millimetre machine gun.[59] Media accounts indicate that, although the decision to use lethal force is made now by human commanders, the robot has been equipped with the capacity to fire on its own.[60]

28. Such automated technologies are becoming increasingly sophisticated, and artificial intelligence reasoning and decision-making abilities are actively being researched and receive significant funding. States' militaries and defence industry developers are working to develop "fully autonomous capability", such that technological advances in artificial intelligence will enable unmanned aerial vehicles to make and execute complex decisions, including the identification of human targets and the ability to kill them.[61] A 2003 study commissioned by the United States Joint Forces Command reportedly predicted the development of artificial intelligence and automatic target recognition that will give robots the ability to hunt down and kill the enemy with limited human supervision by 2015.[62] Among the envisioned uses for fully automated weapons systems are: non-lethal through lethal crowd control; dismounted offensive operations; and armed

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[54] *Israeli War-Room "Look-Out" Girls Use New "See-Shoot" Remote Control*, BBC Monitoring Middle East, 9 January 2009.

[55] Yaakov Katz, "IDF Unveils Upgrades to Gaza Fence", *Jerusalem Post*, 3 March 2010, available at http://www.jpost.com/Israel/Article.aspx?id=170041.

[56] Ali Waked, "Palestinians: 1 Dead, 4 Injured From IDF Fire in Gaza", 1 March 2010, available at http://www.ynetnews.com/articles/0,7340,L-3856218,00.html.

[57] "Remotely Controlled Mechanical Watchtowers Guard Hostile Borders", *Homeland Security Newswire*, 19 July 2010, at http://homelandsecuritynewswire.com/remotely-controlled-mechanical-watch-towers-guard-hostile-borders; Noah Schachtman, "Robo-Snipers, 'Auto Kill Zones' to Protect Israeli Borders", *Wired*, 4 June 2007, http://www.wired.com/dangerroom/2007/06/for_years_and_y/; Jonathan Cook, "Israel Paves the Way for Killing by Remote Control", *The National*, 13 July 2010.

[58] "Army Tests Machine-gun Sentry Robots in DMZ", Yonhap News Agency, 13 July 2010, available at http://english.yonhapnews.co.kr/national/2010/07/13/14/0301000000AEN20100713007800315F.HTML.

[59] Ibid.; "Machine gun-toting robots deployed on DMZ", *Stars and Stripes* 12 July 2010, available at http://www.stripes.com/news/pacific/korea/machine-gun-toting-robots-deployed-on-dmz-1.110809.

[60] Top 5 Bomb-Packing, footnote 46 above.

[61] *Unmanned Aircraft Systems Flight Plan 2009-2047*, footnote 44 above, p. 50.

[62] Steve Featherstone, "The Coming Robot Army", Harpers, February 2007, available at http://www.wesjones.com/robot.htm.

reconnaissance and assault operations.[63] One already developed ground robot, the Guardium UGV, is a high-speed vehicle that can be weaponized and used for combat support as well as border patrols and other security missions, such as perimeter security at airports and power plants.[64]

## C. Concerns

29. Although robotic or unmanned weapons technology has developed at astonishing rates, the public debate over the legal, ethical and moral issues arising from its use is at a very early stage, and very little consideration has been given to the international legal framework necessary for dealing with the resulting issues.

30. There are many possible advantages flowing from the use of existing and developing technologies.[65] They may be able to act as "force multipliers", greatly expanding the capacity or reach of a military, and robots may be sacrificed or sent into hazardous situations that are too risky for human soldiers. They may be less economically costly than deploying humans, and, indeed, their destruction does not result in the ending of irreplaceable human life. As stated in a United States Government report, more and more robots are being destroyed or damaged in combat instead of Servicemen and women being killed or wounded, and this is the preferred outcome.[66] Robots may be able to use lethal force more conservatively than humans (because they do not need to have self-preservation as a foremost drive[67]), and their actions and responses may be faster, based on information processed from more sources, and more accurate, enabling them to reduce collateral damage and other mistakes made by humans. They may also be able to avoid mistakes or harm resulting from human emotions or states, such as fear, tiredness, and the desire for revenge, and, to the extent that machines are equipped with the ability to record operations and monitor compliance with legal requirements, they may increase military transparency and accountability.

31. But these hypothetical advantages may not necessarily be reflected in the design or programming of actual technologies. And the reality, to date, is that technological developments have far outpaced even discussions of the humanitarian and human rights implications of the deployment of lethal robotic technologies. The following concerns are among those that require in-depth examination.[68]

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[63] *FY 2009-2034 Unmanned Systems Integrated Roadmap*, footnote 49 above, p. 10.

[64] GNIUS Unmanned Ground Systems, Guardian UGV, described at http://www.g-nius.co.il/unmanned-ground-systems/guardium-ugv.html and http://www.defense-update.com/products/g/guardium.htm.

[65] For more discussion of these arguments, see Ronald Arkin, *Governing Lethal Behaviour in Autonomous Robots* (2009); Autonomous Military Robotics: Risk, footnote 33 above.

[66] United States Department of Defense, Report to Congress, Development and Utilization of Robotics and Unmanned Ground Vehicles, October 2006, at p. 9, available at http://www.ndia.org/Divisions/Divisions/Robotics/Documents/Content/ContentGroups/Divisions1/Robotics/JGRE_UGV_FY06_Congressional_Report.pdf. See also *FY 2009-2034 Unmanned Systems Integrated Roadmap*, footnote 49 above.

[67] Ronald C. Arkin, "Ethical Robots in Warfare", p. 2.

[68] For more discussion of these arguments, see e.g., Peter Asaro, How Just Could a Robot War Be? in Philip Brey, Adam Briggle and Katinka Waelbers (eds.), Current Issues in Computing And Philosophy (2009); Jason Borenstein, The Ethics of Autonomous Military Robots, 2 Studies in Ethics, Law and Technology (2008) available at http://www.bepress.com/selt/vol2/iss1/art2;

32. **Definitions**. An initial hurdle in addressing the legal and ethical ramifications of these technologies concerns the lack of a uniform set of definitions of key terms such as "autonomous", "autonomy" or "robots". Uses of these terms vary significantly among the militaries of different States, as well as among defence industry personnel, academics and civilians.[69] Confusion can result, for example, from differences over whether "autonomous" describes the ability of a machine to act in accordance with moral and ethical reasoning ability, or whether it might simply refer to the ability to take action independent of human control (e.g. a programmed drone that can take off and land without human direction; a thermometer that registers temperatures).[70] As the international community begins to debate robotic technologies, it will need to at least seek a shared understanding of the systems and their characteristics.

33. **International and criminal responsibility**. One of the most important issues flowing from increased automation is the question of responsibility for civilian casualties or other harm or violations of the laws of war. As analysed at length in various prior reports by the Special Rapporteur,[71] international human rights and humanitarian law, as applied in the context of armed conflict or law enforcement, set standards that are designed to protect or minimize harm to civilians, and set limits on the use of force by States' militaries, police or other armed forces. When these limits are violated, States may be internationally responsible for the wrongs committed, and officials or others may bear individual criminal responsibility. Both the international human rights and humanitarian law frameworks are predicated on the fundamental premise that they bind States and individuals, and seek to hold them to account. Where robots are operated by remote control and the ultimate decision to use lethal force is made by humans, individual and command responsibility for any resulting harm is generally readily determinable.

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Noel Sharkey, Automated killers and the computing profession, *Computer Journal* (2007); Noel Sharkey, Death strikes from the sky: the calculus of proportionality, 28 IEEE Technology and Society 16-19 (2009); Sparrow, "Robotic Weapons and the Future of War", footnote 33 above; Sparrow, "Predators or Plowshares?", footnote 33 above.

[69] The rapid, at times almost chaotic, development of unmanned aircraft systems over the past 10 years has led to a range of terminology appearing in both military and civilian environments. As a result, some legacy terminology has become obsolete, while differing national viewpoints have made it difficult to achieve standardization on new terms ... Similarly, unmanned aircraft (UA)-related concepts such as autonomous and automated suffer from widely differing definitions, even within the United Kingdom. All of these areas have the potential to cause confusion or misunderstanding when unmanned aircraft issues are discussed between military, industrial and academic audiences. (UK Ministry of Defence, Joint Doctrine Note 3/10, *Unmanned Aircraft Systems: Terminology, Definitions and Classification, March 2010*) available at http://www.mod.uk/NR/rdonlyres/FBC33DD1-C111-4ABD-9518-A255FE8FCC5B/0/JDN310Amendedweb28May10.pdf. See also http://www.jointrobotics.com/documents/masterplan/2005%20JRP%20Master%20Plan.pdf; *Autonomous Military Robotics*, footnote 33 above; Singer, Wired for War 67 (defining "robot").

[70] Compare, for example, definitions of "autonomous", "semi-autonomous" and "automation" at United States Department of Defense, *Out Front in Harm's Way, Joint Robotic Program, Master Plan, FY 2005*, available at http://www.jointrobotics.com/documents/masterplan/2005%20JRP%20Master%20Plan.pdf and UK Ministry of Defence, Joint Doctrine Note 3/10, *Unmanned Aircraft Systems: Terminology, Definitions and Classification, March 2010* available at http://www.mod.uk/NR/rdonlyres/FBC33DD1-C111-4ABD-9518-A255FE8FCC5B/0/JDN310Amendedweb28May10.pdf.

[71] See, for example, E/CN.4/2005/7; A/61/311; and A/HRC/14/24/Add.6.

34. However, as automation increases, the frameworks of State and individual responsibility become increasingly difficult to apply. Who is responsible if a robot kills civilians in violation of applicable international law? The programmer who designed the program governing the robot's actions, any military officials who may have approved the programming, a human commander assigned responsibility for that robot, a soldier who might have exercised oversight but opted not to do so? What if the killing is attributed to a malfunction of some sort? Is the Government which deployed the robot responsible, or the principal engineer or manufacturer, or the individual who bore ultimate responsibility for programming, or someone else? What level of supervision does a human need to exercise over a robot in order to be responsible for its actions? Are circumstances conceivable in which robots could legitimately be programmed to act in violation of the relevant international law, or conversely, could they be programmed to automatically override instructions that they consider, under the circumstances, to be a violation of that law? Are there situations in which it would be appropriate to conclude that no individual should be held accountable, despite the clear fact that unlawful actions have led to civilian or other deaths?

35. Some argue that robots should never be fully autonomous — that it would be unethical to permit robots to autonomously kill, because no human would clearly be responsible, and the entire framework of accountability would break down. Others, such as Ronald Arkin, argue that it will be possible to design ethical systems of responsibility.[72] In his view, robots could be better ethical decision-makers than humans because they lack emotion and fear, and could be programmed to ensure compliance with humanitarian law standards and applicable rules of engagement. Still others respond that such thinking is predicated on unproven assumptions about the nature of rules and how robots may be programmed to understand them, and that it underestimates the extent to which value systems and ethics inform the application of the rules in ways that robots cannot replicate.[73] In order to understand how to apportion responsibility for violations of the law, say some ethicists, more research needs to be done both to understand how and why humans themselves decide to follow the law and ethical rules, as well as the extent to which robotic programming mimics or differs from human decision-making.

36. To the extent that unmanned systems are not being designed to support investigation, they raise additional transparency and accountability concerns. Perhaps most troublingly from an international law perspective, some have indicated that unmanned systems are not designed to support investigation. They do not archive information. They leave open the possibility of soldiers pointing to the machine, declaring, "I'm not responsible — the machine is".[74] In order to comport with States' international law obligation to provide accountability for the use of lethal force, any unmanned weapons system, regardless of the degree of automation,

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[72] *Responsibility and Lethality for Unmanned Systems*, footnote 50 above; Ronald C. Arkin, Patrick Ulam and Brittany Duncan, "An Ethical Governor for Constraining Lethal Action in an Autonomous System", GVU Technical Report GIT-GVU-09-02, GVU Center, Georgia Institute of Technology, 2009.

[73] For example, Peter Asaro, "Modeling the Moral User", 28 *IEEE Technology and Society* 20-24 (2009); Noel Sharkey, "Death Strikes from the Sky: The Calculus of Proportionality", 28 *IEEE Technology and Society* 16-19 (2009); Sparrow, "Robotic Weapons and the Future of War", footnote 33 above.

[74] 2008 Harvard Session, footnote 33 above, p. 8.

must not hinder — and indeed should facilitate — States' ability to investigate wrongful conduct.

37. **Safeguards and standards for deployment**. Another significant problem concerns the ability of robots to comply with human rights and humanitarian law, and the standards relevant to programming and the development of technology for deployment. What standards or testing must be conducted before armed machines are able to conduct crowd control, patrol in civilian populated areas, or be enabled to decide to target an alleged combatant? While any kind of technology has the potential to malfunction and result in lethal error, the particular concern with the rapid development of robotic weapons is whether — and the extent to which — technical safeguards are built into the systems to prevent the inadvertent or otherwise wrongful or mistaken use of lethal force. What programming or other technical safeguards have been and should be put in place to ensure that the precautions required by international humanitarian law are taken? What programming safeguards would international humanitarian law require?

38. Troublingly, military and civilian experts acknowledge that robotic development in general is being driven by the defence industry, and that few systems in the field have been subjected to rigorous or standardized testing or experimentation.[75] The United States military, for example, admits that in the interests of saving military lives in the conflicts in Iraq and Afghanistan, robotic systems may be deployed without the requisite testing for whether those systems are, in fact, reliable.[76]

39. In the context of armed conflict generally, and especially in urban areas, military personnel often have difficulty discriminating between those who may be lawfully targeted — combatants or those directly participating in hostilities — and civilians, who may not. Such decision-making requires the exercise of judgement, sometimes in rapidly changing circumstances and in a context which is not readily susceptible of categorization, as to whether the applicable legal requirements of necessity and proportionality are met, and whether all appropriate precautions have been taken. It is not clear what criteria would be used to determine whether a robot is ever capable of making such decisions in the manner required, or how to evaluate the programs that might purport to have integrated all such considerations into a given set of instructions to guide a robotic technology.

40. In addition, there is the concern that the development of lethal capacity has outpaced the development both of safeguards against technical or communications error. For example, military strategic planning documents caution that it "may be technically feasible" for unmanned aerial systems to have nuclear strike capability before safeguards are developed for the systems, and that ethical discussions and policy decisions must take place in the near term in order to guide the development

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[75] 2008 Harvard Session, footnote 33 above, p. 2.

[76] *FY 2009-2034 Unmanned Systems Integrated Roadmap*, note 49 above, 39-40 ("The current commitment of combat forces has seen a number of unmanned systems fielded quickly without the establishment of the required reliability and maintainability infrastructure that normally would be established prior to and during the fielding of a system. This was justifiably done as a conscious decision to save Warfighter's lives at the risk of reliability and maintainability issues with the equipment fielded.").

of future unmanned aerial systems capabilities, rather than allowing the development to take its own path.[77]

41. There are also questions about how and when the benefits of speedy processing of intelligence and other data is outweighed by the risks posed by hasty decision-making. Man-on-the-loop systems, for instance, raise the concern that technology is being developed that is beyond humans' capacity to supervise effectively and in accordance with applicable law. With respect to swarm technologies, some research has found that human operators' performance levels are reduced by an average of 50 per cent when they control even two unmanned aircraft systems at a time.[78] The research suggests that the possibility of lethal error rises as humans play a "supervisory" role over a larger number of machines. Unless adequate precautions are taken and built into systems, the likelihood increases that mistakes will be made which will amount to clear violations of the applicable laws.

42. A related concern is what safeguards should or must be put in place to prevent ultimate human control of robots from being circumvented, and what safeguards can be implemented to prevent lethal robots from being hacked or used by, for example, insurgent or terrorist groups.

43. **Civilian support**. An important political consideration is whether the widespread use of robots in civilian settings, such as for law enforcement in cities, or in counter-insurgency operations, would alienate the very populations they were meant to assist. Over-reliance on technology increases the risk that policymakers and commanders will focus on the relatively easy use of armed or lethal tactics to the detriment of all the other elements necessary to end a conflict, including winning hearts and minds, and that policymakers will overestimate the ability of new technologies to achieve sustainable peace. In addition, while robots may have the benefit of not acting based on emotion, they also do not have the kind of sympathy, remorse or empathy that often appropriately tempers and informs the conduct of fighters and their commanders.

44. **Use of force threshold and jus ad bellum considerations**. To the extent that decisions about whether to go to war are limited by the prospect of the loss of the lives of military personnel, and the high economic cost of warfare, robotic armies may make it easier for policymakers to choose to enter into an armed conflict, increasing the potential for violating jus ad bellum requirements. This may be particularly the case where the other side lacks the same level of technology. Similarly, within the context of armed conflict, insofar as robots are remotely controlled by humans who are themselves in no physical danger, there is the concern that an operator's location far from the battlefield will encourage a Playstation mentality to fighting and killing, and the threshold at which, for example, drone operators would be willing to use force could potentially decrease. Thus, the international community should consider whether and when reduced risk to a States' armed forces resulting from the extensive use of robotic technologies might unacceptably increase the risk to civilian populations on the opposing side.

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[77] *Unmanned Aircraft Systems Flight Plan 2009-2047*, footnote 44 above, p. 41.

[78] P. W. Singer, "Robots at War: The New Battlefield", *Wilson Quarterly*, Winter 2009; see also Jessie Y. C. Chen, et al., Human-Robot Interface: Issues in Operator Performance, Interface Design, and Technologies, United States Army Research Laboratory, ARL-TR-3834, July 2006, http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA451379 (discussing research findings on benefits and drawbacks of automation).

# V. Conclusions and recommendations

45. **It is a cliché to say that new technologies, especially in the domains of information, communications, and weaponry, have transformed the world of the twenty-first century. In contrast, however, the human rights community often seems determined to remain firmly rooted in the twentieth century. It has often failed to take adequate advantage of the opportunities offered by new technologies whether for fact-finding, monitoring or supervision of States' obligations. It has also been remarkably slow in coming to grips with the implications of new technologies in areas such as robotics. This reticence, or neglect, has serious consequences in terms of its ability to reduce extrajudicial executions and diminish the rampant impunity that continues to attach to such killings in so many parts of the world.**

46. **Human rights methodologies have tended to be dominated by a catch-up mentality. The assumption often seems to be that new approaches should be considered only after it has become patently obvious that existing approaches are no longer adequate. This needs to change and the United Nations, as well as Governments and civil society groups, should adopt a much more proactive approach. In this spirit, two major recommendations emerge.**

47. **The Office of the United Nations High Commissioner for Human Rights should convene an expert group of information and communication technology experts, humanitarian and human rights actors with experience using new technologies, and relevant private sector representatives to discuss the current and potential human rights applications of new technologies and the obstacles to their effective use. The group should also address: how to protect the security of those reporting abuses (e.g. location tracking; protected data transmission technologies); how to improve access to and use of satellite and other aerial imagery; the use by human rights actors of crowdsourcing platforms to receive allegations of abuses; how to promote the use of new technologies and outreach to local communities; how to measure the impact of ICT on the promotion of human rights; and what type of new international standards, if any, should be developed in this area.**

48. **Urgent consideration needs to be given to the legal, ethical and moral implications of the development and use of robotic technologies, especially but not limited to uses for warfare. The emphasis should be not only on the challenges posed by such technological advances, but also on the ways in which proactive steps can be taken to ensure that such technologies are optimized in terms of their capacity to promote more effective compliance with international human rights and humanitarian law. For this purpose, the Secretary-General should convene a group of military and civilian representatives from States, leading authorities in human rights and humanitarian law, applied philosophers and ethicists, scientists and developers to advise on measures and guidelines designed to promote that goal. The group should consider what approaches might be adopted to ensure that such technologies will comply with applicable human rights and humanitarian law requirements, including:**

(a) **That any unmanned or robotic weapons system have the same, or better, safety standards as a comparable manned system;**

(b) **Requirements for testing the reliability and performance of the technology before its deployment; and**

(c) I**nclusion of recording systems and other technology that would permit effective investigation of and accountability for alleged wrongful uses of force.**

49. **In its work, the group could address the need for greater definitional uniformity in relation to the types of technology being developed, the need for empirical studies to better understand the human rights implications of the technologies, and the fundamental question of whether lethal force should ever be permitted to be fully automated.**