

**Draft**

**Report of the 2016 Informal Meeting of Experts on Lethal Autonomous Weapons Systems (LAWS)**

Submitted by the Chairperson of the Informal Meeting of Experts

1. The 2015 Meeting of the High Contracting Parties to the Convention held on 12 and 13 November 2015 in Geneva decided, as contained in paragraph 35 of its final report (CCW/MSP/2015/9), "to convene an informal meeting of experts of up to five days during the week of 11 to 15 April 2016 to discuss further the questions related to emerging technologies in the area of lethal autonomous weapons systems (LAWS), in the context of the objectives and purposes of the Convention. The Chairperson of the meeting of experts will submit a report in his personal capacity to the 2016 Fifth Review Conference of the High Contracting Parties to the Convention. The meeting of experts may agree by consensus on recommendations for further work for consideration by the 2016 Fifth Review Conference." The Meeting further decided, in paragraph 36, that "following consultations conducted by the Chairperson, taking into account the principle of geographical rotation, the Meeting decided to designate Mr. Michael Biontino, Ambassador of Germany, as Chairperson of the 2016 Meeting of Experts on LAWS and adopted the estimated costs (CCW/MSP/2015/7)" and he was confirmed as Chairperson of the Meeting of Experts by acclamation.
2. The following High Contracting Parties to the Convention participated in the work of the meeting: Albania, Algeria, Argentina, Australia, Austria, Belarus, Belgium, Bosnia and Herzegovina, Brazil, Bulgaria, Cambodia, Cameroon, Canada, Chile, China, Colombia, Croatia, Costa Rica, Cuba, Cyprus, Czech Republic, Djibouti, Dominican Republic, Ecuador, El Salvador, Estonia, Finland, France, Georgia, Germany, Greece, Holy See, Honduras, Hungary, India, Iraq, Ireland, Israel, Italy, Japan, Jordan, Kazakhstan, Kuwait, Lao People's Democratic Republic, Latvia, Lithuania, Mexico, Mongolia, Montenegro, Morocco, Netherlands, New Zealand, Norway, Pakistan, Panama, Peru, Philippines, Poland, Portugal, Qatar, Republic of Korea, Romania, Russian Federation, Saudi Arabia, Serbia, Sierra Leone, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Tunisia, Turkey, Uganda, Ukraine, Uruguay, United Kingdom of Great Britain and Northern Ireland, United States of America, Venezuela (Bolivarian Republic of) and Zambia.
3. The following Signatory State to the Convention participated in the work of the meeting: Egypt.
4. The following States not parties to the Convention participated as observers: Ghana, Indonesia, Iran (Islamic Republic of), Lebanon, Malaysia, Myanmar, Oman, Singapore, Thailand, Yemen and Zimbabwe.
5. The representatives of the United Nations Institute for Disarmament Research (UNIDIR), United Nations Interregional Crime and Justice Research Institute (UNICRI), United Nations Office for Disarmament Affairs (UNODA), European Union, International Committee of the Red Cross (ICRC), International Federation of Red Cross and Red Crescent Societies (IFRC) and Geneva International Centre for Humanitarian Demining (GICHD) participated in the work of the meeting.
6. The representatives of the following non-governmental organizations participated in the work of the meeting: Campaign to Stop Killer Robots [Amnesty International, Article 36, Association for Aid and Relief, Japan, Facing Finance, Human Rights Watch, International Committee for Robot

Arms Control (ICRAC), Mines Action Canada, Nobel Women's Initiative, Nonviolence International, Norges Fredslag (Norwegian Peace Association), PAX, Project Ploughshares (Canada), Pugwash Conferences on Science and World Affairs, Seguridad Humana en Latino América y el Caribe (SEHLAC), Women's International League for Peace and Freedom], Centre for a New American Security, Human Rights Now, Human Rights Watch, and International Campaign to Ban Landmines – Cluster Munitions Coalition (ICBL–CMC).

7. The representatives of the following entities also participated in the work of the meeting: Ben Gurion University, Cambridge University, Carnegie Mellon University, Geneva Academy, General Atomics Aeronautical Systems, German Institute for International Security Affairs (SWP), Harvard Law School, Harvard Sussex Programme – University of Sussex, Hiroshima Peace Institute, Institute for Peace Research and Security Policy at the University of Hamburg (IFSH), International Institute for Strategic Studies (IISS), International Law and Policy Institute (ILPI), King's College London, Lancaster University, Leiden University, Mercator Kolleg für Internationale Aufgaben, Nanyang Technological University, National Center for Scientific Research (CNRS), National University of Ireland, Netherlands Organisation for Applied Scientific Research (TNO), Radzyner Law School, PIR Center for Policy Studies, SMU Dedman School of Law, Stockholm International Peace Research Institute (SIPRI), Universidad de los Andes, University College London (UCL), University of Barcelona, University of Glasgow, University of Minnesota, University of New South Wales, University of Oxford, University of Tampere, VU University Amsterdam and Yale University.

8. On Monday, 11 April 2016, the meeting was opened by Ms. Tehmina Janjua, Ambassador of Pakistan, as President-designate of the 2016 Fifth Review Conference of the High Contracting Parties to the Convention.

9. In accordance with its programme of work, as contained in the annex, the Meeting of Experts had interactive exchanges on the following issues: Towards a working definition of LAWS, Challenges to International Humanitarian Law, Human rights and ethical issues, and Security issues. The Meeting of Experts commenced with a general exchange of views.

10. Serving as Friends of the Chair were Mr. Kim Inchul, Ambassador of the Republic of Korea, and Ms. Beatriz Londono Soto, Ambassador of Colombia, on Towards a working definition of LAWS; Mr. Urs Schmid, Ambassador of Switzerland, and Ms. Päivi Kairamo, Ambassador of Finland, on Challenges to International Humanitarian Law; Ms. Marta Maurás, Ambassador of Chile, on Human rights and ethical issues; Ms. Yvette Stevens, Ambassador of Sierra Leone, and Mr. Ravinatha Aryasinha, on Security issues. The Chairperson presided over the concluding discussions.

### **General Debate**

11. During the general debate, a large number of delegations underlined the importance of addressing the issue of lethal autonomous weapon systems (LAWS). The involvement of civil society and non-governmental organizations and their substantive contributions were welcomed.

12. There was a general understanding that fully autonomous weapons systems do not yet exist and there were diverging views as to whether these weapons might be developed in the near or

long-term future, or not at all. A number of delegations stressed that they had no intention of developing such systems.

13. A large number of delegations emphasized the need for a better understanding of LAWS. In this regard, delegations stressed the need for a working definition at this stage, while others noted that this endeavour is problematic given that LAWS do not yet exist. In addition, some delegations indicated the need for further discussion on elements within the definition.

14. A number of delegations proposed considering LAWS in relation to human involvement. The concept of meaningful human control was proposed in relation to legal, moral and ethical questions. Although there was broad interest in this concept, it was noted that there would be difficulties in identifying its scope. Others suggested that meaningful human control should be considered at different stages of the use of LAWS, such as in weapon selection and deployment, or target selection and attack. However, some raised criticism of the subjective nature of "meaningful human control" and an expressed preference for "appropriate human judgement" instead.

15. There was general consensus on the importance of the application of international law, in particular of international humanitarian law (IHL) and international human rights law. Concerning the application of IHL, there were calls for strict compliance with its fundamental principles of distinction, proportionality and precautions in attack. While a number of delegations stated that the current IHL rules were sufficient in regulating the use of any type of weapon, including LAWS, other delegations questioned whether this would be the case. A number of delegations emphasized the importance of legal weapons review processes to ensure compliance with IHL. In relation to this, some delegations highlighted that existing legal weapons reviews are insufficient to address the potential challenges posed by LAWS.

16. The issue of responsibility and accountability with respect to LAWS was raised by a number of delegations. There was a widely shared understanding that the responsibility for the development, production and deployment of LAWS rests with the operating State. However, some delegations stated that individuals could be held responsible under the relevant bodies of international law. The importance of ensuring an unequivocal accountability chain in the deployment of a weapon system was underlined.

17. Tasking machines to make decisions on the life and death of a human being without any human intervention was raised by many delegations and considered to be ethically unacceptable. Several made the point that they had no intention of developing or acquiring weapon systems of this nature.

18. Many delegations pointed towards challenges and potential threats arising from the development and use of LAWS. For example, such delegations considered there to be a risk of proliferation, including LAWS being obtained by non-state actors. Some delegations raised serious security concerns, including the possibility of an arms race, potential for lowering of the threshold for the use of force, and exacerbation of global and regional instability. The point was made that the military utility of LAWS might not be the same in symmetric conflicts. The gap between technologically advanced countries with the ability to develop, procure and deploy LAWS and countries without these capabilities would amplify the asymmetric character of armed conflicts in the future.

19. Concerning general options for the way ahead, a number of delegations called for the development of transparency and confidence-building measures and stressed the importance of information sharing, particularly in the area of legal weapons reviews. On this last point, there were calls for the establishment of best practices and benchmarks.

20. A number of delegations proposed a preventive approach, calling for a prohibition on the development, acquisition, trade, deployment and use of LAWS. Some also called for a moratorium for ongoing development and production processes. Protocol IV of the CCW was noted as an example showing the possibility of banning a future weapon category without curtailing research and development in the civilian sphere.

21. The dual-use character and benefits of civilian applications of autonomously operating technology was highlighted by a number of delegations. There was a widely shared view that legitimate developments in the civilian sphere should not be hampered by regulatory measures taken with regard to LAWS.

22. The CCW was widely affirmed as the appropriate forum for the discussion of LAWS. Many delegations emphasized its inclusiveness and noted its proven ability to strike the right balance between humanitarian and security concerns. Some delegations noted that the CCW's work does not preclude discussions in other relevant fora, including, for example, the Human Rights Council.

23. The adoption of consensus recommendations to the Fifth Review Conference was widely welcomed and seen as a positive way of achieving further progress on LAWS. Many delegations stressed the need for substantive and meaningful recommendations. Some delegations suggested that such recommendations could reaffirm important principles of international law and IHL. A large number of delegations supported the establishment of a group of governmental experts (GGE). Proposals for the group's mandate included work on possible definitions, the consideration of

instruments for transparency and confidence-building measures, and building on the legal principles applicable to LAWS.

### **Session – “Mapping Autonomy”**

24. The panel on “Mapping Autonomy” featured presentations by six experts. The goal of the session was to take stock of the current situation and to try, if possible, to identify a trend for the coming years. Mr. Vincent Boulanin, from the Stockholm International Peace research Institute (SIPRI), described the development of autonomy in the military sphere. Dr. Heather M. Roff, Senior Research Fellow, Department of Politics and International Relations, University of Oxford and Research Scientist, Global Security Initiative, Arizona State University presented data on autonomy in existing weapon systems. Dr. Markus Höpfinger from the Swiss Federal Department of Defense Population Protection and Sports presented issues related to mobile autonomous systems. Dr. Leon Kester from the Netherlands Organisation for Applied Scientific Research presented insights in the topic of Development, Application and Ethics of Autonomy. Dr. David Hyunchul Shim from the Intelligent UAV National Defense Laboratory, Department of Aerospace Engineering at KAIST University of the Republic of Korea presented issues related to autonomous vehicle systems in the civilian sphere. Dr. Didier Danet from the French Military Academy Saint Cyr Coetquidan highlighted recent developments of autonomous technologies.

25. The présentations focused on both civilian and military aspects, given that the technologies involved are dual-use. The presentations addressed different types of systems being developed in the context of land, sea and air operations.

26. All the panelists agreed that, even though we may be familiar with the latest developments in terms of autonomy, there are still a large number of unknowns with regard to: 1) what could be achieved in the future and 2) the timescale involved. Even if we could determine a trend and chart the areas in which research and development is focused, we would not be able to predict what the results would be or when they might be achieved.

27. The presentations were based on the characteristics of a number of existing systems (missiles, drones, land vehicles, mine hunting) which are used in an operational context but not classed as LAWS, in order to evaluate the areas in which the most progress had been made. Some panelists stressed that although some existing systems were automatic (e.g. automatic target recognition, although still limited), and researchers were working on refining this aspect, that did not make them autonomous. A clear distinction was made between teleoperated, automated and autonomous systems. The presentations highlighted the main challenges facing existing systems and stressed the importance of resolving them so that these systems could be classed as fully autonomous. The experts pointed out that all existing systems still rely on human supervision, particularly in view of their technical limitations. For this reason it is important to work on improving them, particularly with regard to the interface between human and machine. In this context, various challenges were noted by the experts. For example, concerning the reliability and comprehensiveness of communications with the human operator, the risks of interference and detectability, the delay in calculating algorithms in complex situations, the consideration of system or machine failures, and mobility in a complex environment unfamiliar to the system.



28. The session also highlighted the main limitations encountered during research, which are related both to the systems themselves (e.g. their inability to handle an unexpected situation, their weaknesses with regard to situational awareness and assessment, the need for faster processors able to deal quickly with complex algorithms), as well as to military culture (reluctance to lose control of a deployed system, lack of confidence in the capabilities of technologically complex systems) and also limitations with respect to the process of acquisition and authorization of such systems.

29. To assess what could reasonably be expected in the future, several experts put forward the idea of plotting a trajectory of autonomy or trends to chart the course of technological progress. Several presentations focused on possible methods for charting the progress of autonomy and various potential approaches: according to functions, and according to system capabilities (mobility, target identification, target prioritisation, communication, training, formalisation of primary and secondary goals, etc.).

30. The experts tried to identify a number of areas in which research and development is currently taking place: mobility, cooperation between a large number of players (ability of systems to cooperate and interact with one another) and situational awareness (ability of the system to collect and analyse data on which to base a decision). They viewed mobility as the area in which the fastest progress had been made, particularly in the air (navigational autonomy). They felt that research in other areas was still in its infancy, given the complexity of the environments concerned.

31. Some experts pointed out that a purely technical approach to autonomy was not sufficient and that additional factors needed to be taken into account. The majority of experts specifically mentioned the research, still in its early stages, on the concepts of machine learning, self-learning (online or offline), self-determination, self-assessment and artificial intelligence to underscore the complexity of potential LAWS. Some experts also stressed the idea that in future the systems could have self-training capacities, which would free them from pre-programmed criteria. Finally, some experts expressed their scepticism about the idea that completely autonomous systems could one day become a reality and questioned the possibility of linear development in the area of robotics.

32. In the subsequent discussions, delegations sought to clarify the notions used by experts in their presentations, namely autonomy and critical functions. Whilst autonomy was considered a central characteristic of LAWS, it appeared difficult to understand this concept in absolute terms. One delegate therefore suggested that a focus on the functions of a system would provide a better understanding of autonomy in weapon systems. Another intervention suggested to simplify concepts being discussed and stated that it is sufficient to understand autonomy in weapon systems merely as a "lack of human control".

33. Further questions were related to the military necessity of LAWS. Difficulties arise due to the fact that 'autonomy' is used to describe the desirable characteristics of a weapon system, for example increased capacities in the field of target selection, which offer advantages in terms of avoiding collateral damages. This last aspect is increasingly pursued by developers. At the same time, 'autonomy' is used to describe the lack of predictability of a system, which some claim is the reason why military commanders would be reluctant to use LAWS. Another delegate suggested, therefore, that it would be preferable to understand the military utility of such systems in terms of their reliability or capacity, rather than their level of autonomy per se. Alternatively, it was proposed to

consider autonomy as a necessary response to the increasing complexity of a weapon system and, in that sense, as a support of the human operator. Another concern raised related to the increasing speed of technological development and the concern that artificial intelligence would potentially override human decisions.

### **Session – “Towards a working definition”**

34. The first panel on “towards a working definition” focused on different ways to define LAWS by their technical features. Against this background, Dr. Gro Nystuen, Senior Partner and Director of the Center on International Humanitarian Law at the International Law and Policy Institute in Oslo, spoke about the challenges of identifying and agreeing on a definition of a weapon system within a multilateral forum. Mr. Chris Jenks, Director of the Criminal Justice Clinic and Assistant Professor of Law at SMU Dedman School of Law in Dallas, presented the concept of “critical functions” of a weapon system as a way to provide more clarity on what is an autonomous weapon system. Professor Lucy Suchman, Chair in the Anthropology of Science and Technology at Lancaster University and President of the International Society for Social Studies of Science, spoke on “autonomy as self-directed action”. Mr. Wendell Wallach, Yale Interdisciplinary Center for Bioethics, elaborated in his presentation on the concept of “predictability” and how this can assist our understanding of the potential challenges raised by autonomous weapons systems. The second panel focused on the exploration of alternative approaches that define an autonomous weapon in relation to the human operator and the level of control or influence that an operator has over a particular system. Ms. Anja Dahlmann, Research Assistant at Stiftung Wissenschaft und Politik (SWP), presented an approach to classify the issue of human control in increasingly autonomous weapons systems. Mr. Richard Moyes, Managing Partner and Co-Founder of the non-governmental organisation - Article 36, spoke on the concept of “meaningful human control”. Ms. Merel Ekelhoff, PhD researcher at the Free University of Amsterdam, outlined the current targeting process, what checks and balances this process includes and how these insights could shape our approach to LAWS. Mr. Dan Saxon, Prof. of International Law at Leiden University College in The Hague, spoke on the matter of “human judgment” and LAWS as an issue encompassed in the relationship between international law and the changing technology of armed conflict.

35. There was a widely shared view that a working definition or conceptual understanding of the characteristics of LAWS is necessary to frame and progress the discussions. It was underlined that without such a common understanding, it would not be possible to consider the implications of LAWS. Further, some delegations noted that as LAWS do not yet exist, a working definition may overcome the challenge of discussing this issue in the abstract. Many delegations stressed that a widely accepted definition of LAWS was not a necessary prerequisite for proceeding with substantial work and it was noted that it would be unusual to agree on a definition at this stage.

36. Some delegations pointed to the general difficulty or even impossibility to define what are LAWS as they argued that these systems do not yet exist and that technology is continuing to evolve. As a result, a number of delegations highlighted that a definition would need to be sufficiently broad to encompass future developments in technology. A further challenge identified was that the

question of definition is a political one and that this should not be used as a tool to prejudge the outcomes. Also, a definition should not seek to draw the line between acceptable and unacceptable systems. In this context, a CCW specific definition was proposed that would take due account of the context of the objectives and purposes of the CCW as a treaty regime.

37. Different proposals were put forward for working definitions. A central element of the discussion was the relationship between the human operator and the machine. A number of states proposed that human control must be maintained over weapon systems, regardless of whether this should be considered as appropriate, meaningful or effective. It was argued that human control over weapons systems was understood to be a key ethical imperative and necessary to ensure compliance with IHL. "Meaningful human control" was proposed as a framework to help advance an understanding around a threshold delineating acceptable or necessary levels of human control from those that are clearly beyond this threshold. In this context, it was noted that the necessary level of human control may depend on the system and the environment in which the weapon system is used. Others were sceptical towards this approach as they conceived it as being too subjective and difficult to identify. An alternative suggestion was the "appropriate level of human judgment" that would be required to ensure that a weapon functions as expected.

38. Rather than focusing on the relationship between the operator and machine, some delegations preferred to focus on particular characteristics of LAWS. In this context, the element of "autonomy" was suggested to be of particular importance for the debate. It was proposed to consider systems as autonomous when they operate without human supervision from the moment of their activation. Other delegations questioned the usefulness of this term to move discussions forward. There were differing views as to whether autonomy should be considered as a continuum or to distinguish autonomous systems from "fully autonomous" or "automated" systems. In this context, it was questioned whether full autonomy was even possible. There were differing views as to whether semi-autonomous weapons systems and existing systems should be considered. A number of delegations suggested to focus exclusively on autonomy in the "critical functions" of a weapon system, such as the selection and engagement of a target. It was noted that autonomy in other functions would be outside the CCW's mandate which deals with weapons exclusively.

39. The issue of the predictability of autonomous weapons systems was another important aspect of the debate. It was often framed by the notions of risk, reliability and possible differences between human fallibility and malfunctions of machines. In this context, several delegations expressed concern at the prospect of weapons systems that could act unpredictably. It was further argued that the control over a system by military commanders is a core capability for the military and the value of such systems. The point was made that the possibility of autonomous "swarms" would mean that such systems would be inherently unpredictable.



40. The question was raised as to whether the attribute of lethality was required and that instead it would be more constructive to focus on the use of force. The proposal to understand LAWS more inclusively, covering also means and methods of warfare that do not necessarily inflict death was received with widespread support. Others argued that only the lethal use of weapons is relevant in regard to IHL.

41. Several delegations welcomed the progress made on the conceptual understanding of LAWS. Nonetheless, there was a widespread agreement that further work was needed on the issue. In this regard, it was repeatedly stated that a Group of Governmental Experts, established by the Fifth Review Conference, would be an appropriate body to deal with exploring a possible working definition.

#### **Session – Challenges to International Humanitarian Law,**

42. The two sessions on International Humanitarian Law focused on the importance of legal weapons reviews and considered the question of accountability with regard to LAWS. Dr. Gilles Giacca, Legal Advisor for the ICRC, provided an overview of the legal requirements of a weapons review process. Lieutenant Colonel Christopher Ford, Professor at the Stockton Center for the Study of International Law at the United States Naval War College, focused on the rules of distinction and proportionality. Dr. Kimberley Trapp, Senior Lecturer in Public International Law at the University College London, spoke on the challenges of testing autonomous weapons systems. Dr. Neha Jain, Associate Professor of Law at the University of Minnesota in the United States of America, spoke about how differing degrees of autonomy may affect human-machine interaction, and potentially the political and legal responsibility for actions of autonomous systems. Professor Robin Geiß, International Law and Security at the University of Glasgow in the United Kingdom, made remarks on the possible risks raised by LAWS in the context of international law and focused on the notion of due diligence. Dr. Cecile Hellestveit, Senior Legal Advisor at the International Law and Policy Institute (ILPI) in Oslo, elaborated on accountability under IHL and specifically addressed the challenges that LAWS may pose to the principle of distinction and the prohibition against unnecessary suffering and superfluous injury. Dr. Roberta Arnold, former legal adviser on the Laws of Armed Conflict, Swiss Federal Attorney General's Office, presented an overview of national and international criminal law and how these would address violations of IHL by autonomous weapons. Dr. Martin Hagstrøm, Deputy Research Director at the Swedish Defence Research Agency (FOI), spoke on the technical issues related to the transparency of an autonomous weapon system.

43. It was of common understanding that, as with all weapon systems, the rules of international humanitarian law are fully applicable to LAWS. However, many delegations questioned whether weapons systems that select and attack targets autonomously would be able to comply with the rules of IHL.

44. A number of delegations argued that human judgment was necessary in order to assess the fundamental principles of proportionality, distinction and precautions in attack. For this reason, it

was recognized that a human operator should always be involved in the application of force. Many delegations questioned if it would be possible to programme a legal assessment into a machine prior to its deployment. Given the rapidly changing circumstances in a conflict, it was not perceived to be possible to predetermine the necessary ability for LAWS to distinguish lawful targets. For example, it was not clear how LAWS could be programmed to recognize the surrender of a combatant, or how a machine could take feasible precautions in attack. Additionally, it was noted that a potential target may alter its behavior in order to deliberately confuse assessments made by a machine.

45. Some delegations framed their concerns in terms of predictability and risk. For example, in complex environments it might be impossible to predict or rely on the action of a machine without some form of human oversight. However, others noted that this unpredictability was also present in human behavior. This raised the question as to whether such an associated risk could be comparable between human and machine judgement. Most delegations maintained that machines are simply unequipped for executing legal judgements as required by IHL, especially in complex and cluttered environments typical in conflict scenarios.

46. Several delegations stated that the current rules of IHL are adequate and capable of addressing all issues arising from LAWS and saw no need for further regulatory measures. In contrast, a number of delegations drew attention to the apparent disagreements on the implications of IHL on LAWS. Other delegations argued that even if LAWS could be used in compliance with IHL, there would remain an ethical dilemma over delegating decisions on human life to machines. It was also noted that the wider consequences of using LAWS use were not addressed. For example, the risk of escalation when such systems are used by more than one party to an armed conflict.

47. Legal weapons reviews were highlighted as a central tool to ensure new weapon systems can be used in conformity with IHL. The debate was enriched by the contributions of several states that presented national procedures for their legal weapons review processes. Among the presented processes, reviews are commonly conducted by members of the respective ministries of defence and foreign affairs as well as members of the armed forces. Some delegations noted that there was the possibility of an independent review process. Most of the presented processes favoured a multi-disciplinary assessment, relying on experts with legal, military, political, technological or medical backgrounds. Whilst some review processes are directly conducted by a multi-disciplinary team, other processes rely on expertise by way of consultation where necessary. It was apparent that the outcomes of most review procedures have advisory status, although some are directly linked to procurement decisions. The findings of weapon reviews may therefore result in modification of system requirements or the formulation of operational directives that prescribe or restrict how a weapon system would be used. Findings may also lead to the introduction of training and education processes.

48. Review processes cover weapons as well as methods and means of warfare. Weapons that are assessed in a legal review processes were generally described as systems that had not been previously deployed or after having been substantially modified. A number of legal weapons review procedures were centered around the core questions of whether a weapon would be inherently indiscriminate, or to cause superfluous injury or unnecessary suffering, or as to whether it falls within a category of weapons that have been specifically prohibited or otherwise restricted by international law. In most cases, reviews were conducted at an early stage of the development or acquisition process.

49. The point was made by some delegations that weapon review processes are not sufficient to address LAWS. Several delegations noted that such reviews are implemented by relatively few States, notwithstanding their obligation to do so under customary international humanitarian law, and that little information was available on these processes. There was also concern that some states might consider these purely national review processes as a means to legitimize their weapons, rather than to filter unlawful systems. In this context, it was noted that there was limited value to such national processes in the absence of common standards at the international level. Furthermore, the point was made that discussions on LAWS could not be about weapons review processes per se.

50. Several delegations pointed to the possibility of developing a guide that clarifies the legal landscape, possibly compiling a list of best practices. The development and conduct of weapon review processes would be helpful to establish consistent, transparent and comprehensive standards and thereby strengthen the confidence of all CCW delegations in these processes. Many delegations welcomed the possibility of further information on national review processes being made available by states. This was considered as an important step to increase transparency and confidence building in this area.

51. Accountability was highlighted as a central element of IHL. Doubts were raised on the question of whether the required standards of accountability and responsibility for the use of force and its effects could be upheld with the deployment of LAWS. Several delegations argued that it might not be clear as to who would be held accountable in the case of an IHL violation by LAWS. In such an incident, it was uncertain as to who would be held accountable within the chain of command or responsibility, such as the commander, programmer, or operator. As a result, it was argued by some, legal grey zones could emerge, which in turn might be deliberately exploited and foster impunity. Others noted that this would not be the case, but that evidentiary issues may arise. It was proposed that there might be a requirement for LAWS to keep records of their operations. Other delegations responded that if LAWS can be used in compliance with IHL there would not be an accountability gap as these would be addressed by international criminal law and the law of state responsibility.

## Session – Human Rights and Ethical Issues

52. This session considered the human rights and ethical concerns potentially raised by LAWS. Professor Christof Heyns, United Nations Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions, addressed the question of whether life and death decisions should be delegated to machines. Dr. Eliav Lieblich, Assistant Professor at the Interdisciplinary Center at Radzyner Law School in Herzliya, Israel, presented a case study on the matter of discretion in international law and how this relates to LAWS. Dr. Danièle Bourcier, Head of Research at the Centre for Studies in Administration and Political Science Research in France illustrated how legal judgements could be integrated into a machine. Dr. Pablo Kalmanovitz, Associate Professor of Political Science at the Universidad de los Andes in Bogotá, Colombia, addressed how the development of autonomous weapons could foster the dynamics of asymmetrical warfare.

53. Given that international human rights law applies to situations of armed conflict and has to be taken into account in all decisions over the use of force, the importance of human rights and ethical concerns were highlighted by many delegations. It was an area of common understanding that human rights and ethical standards need to be fully observed, regardless of the weapons used, and many delegations welcomed the serious consideration of these issues in the context of the LAWS discussion at the CCW. It was generally understood that this does not preclude consideration of such issues in other fora, for example, by the Human Rights Council.

54. Concerns were raised by a number of delegations that the use of LAWS might severely impact human rights, in particular human dignity, the right to life, the right to physical integrity, the right to a fair trial and due process, and the right to peaceful assembly. Importance was also attached to the question of whether delegating the decision over life and death would violate human dignity and the right to life. Several delegations highlighted that the lawful use of force under international human rights law is limited to strict conditions, for example, to defend an imminent threat to life.

55. Ethical concerns took a prominent place in the debate and there was a common understanding that moral acceptability of LAWS is critical. Many delegations stated that delegating the decision over life and death of a human being to a machine would be unacceptable. In fact, it emerged as an area of common understanding that critical decisions over life and death should not be left to a machine. It was noted, for example, that machines cannot die and should therefore not decide over the life and death of humans. However, it was argued that LAWS should not be categorized as “good” or “bad” per se.

56. A number of delegations highlighted the need to consider the potential benefits of autonomous systems and other emerging technologies, such as the potential use of autonomous technologies in hazardous environments and for search and rescue operations. It was further noted

that compliance with IHL might be enhanced through the use of LAWS. For example, when assisting a human operator, to filter large amounts of data, LAWS could improve human sensor capabilities and increase precision in the delivery of force.

57. Many delegations emphasized that ethical discussions might assist in determining a minimum threshold of human involvement. In this context, the concept of “meaningful human control” was suggested by several delegations as an appropriate frame to develop such an ethical standard. In light of the fact that many delegations felt it premature to commit to regulating LAWS at the international level, the suggestion was made to develop a moratorium. It was noted that such a mechanism would limit the potential harmful consequences of LAWS development until sufficient clarity had been generated supporting the development of a more comprehensive regulatory framework.

58. Another issue of discussion was the relationship between law and ethics. It was suggested that distinguishing between moral values and legal requirements was important in order to avoid unnecessary confusion. Others recognized that both concerns cannot be fully separated and noted that ethical questions are unavoidable in situations where the law itself is not entirely clear. It was noted that ethical considerations are necessary to give meaning to the open-ended principles contained in many rules and, thus, ultimately aid in determining the normative core of the law. This was underlined with regard to the Marten’s Clause, the principles of “humanity” and “dictates of the public conscience” contained therein.

59. Different views were expressed on the effectiveness of ethical and moral standards being programmed into a machine. Many delegations maintained that it was impossible to translate qualitative value judgements and proportionality assessments into software code, whereas other delegations considered this to be a possibility.

60. The notion of a human-machine “intelligent partnership” was introduced to describe a scenario in which a human decision-making process would be enhanced by machine generated data. It was noted that it might be inappropriate to consider an autonomous system separately from the human agent who relies on it for his or her decision making. It was suggested that such a view might have a far-reaching impact on the notion of compliance. Another point made in this context suggested that the human could in fact become the “weak link” in the system. For example, when given too little time to override a proposed machine suggestion, or when beginning to ‘over-trust’ the system.

61. Several questions addressed the use of LAWS in restricted environments, such as maritime or desert areas, which present a less complex, easier to assess environment. It was discussed



whether autonomous systems would be better able to fulfill the requirements of IHL and hence whether the acceptability of their deployment would be less ambiguous in such cases. It was noted that the absence of civilians would simplify the task of distinction, but also that other complex legal assessments remain.

62. The importance to exercise discretion was acknowledged in several statements. The requirement to exercise discretion in any decision taken in a situation of conflict, and the question of whether discretion could be exercised by LAWS was taken up by several delegations. Some found it useful to consider modern warfare as a form of governance in which an executive takes authoritative decisions over humans, and takes into account relevant principles from administrative law. It was suggested that considering whether there is a qualitative difference between human and machine judgement might guide further thinking on the issue.

63. Several delegations expressed concern about the potential use of LAWS in law-enforcement, some expressing concern about the increasing militarization of respective agencies. It was recommended to consider the use of non-lethal force, which is likely to be deployed in law enforcement operations. However, it was noted that such situations are beyond the mandate of the CCW. New terminology was suggested for describing autonomous systems as the tendency to equate machines with humans led to confusion.

### **Session – Security Issues**

64. The session about security issues examined questions concerning possible regional and global destabilization against the background of the potential development of LAWS. H.E. Jayantha Dhanapala, President of the Nobel Peace Prize-winning Pugwash Conferences on Science and World Affairs and former United Nations Under-Secretary-General for Disarmament Affairs, illustrated how LAWS could destabilize international security. Dr. Vadim Kozyulin, Senior Research Fellow at the Center for Political Studies (PIR) in Moscow, spoke about the global and regional security implications of LAWS from a Russian perspective. Dr. Denise Garcia, Associate Professor in the Department of Political Science and the International Affairs Program at Northeastern University in Boston, addressed how potential challenges posed by LAWS to international law could ultimately undermine peace and security. Dr. Eneken Tikk-Ringas, Senior Fellow for Cyber Security at the International Institute for Strategic Studies, presented other emerging technologies such as cyber capacities and their correlation with LAWS. Dr. Jai Galliot, Research Fellow in Indo-Pacific Defence at the University of New South Wales in Sydney, Australia spoke on the military value of employing autonomous systems. Dr. Katrine Nørgaard, Institute of Leadership and Organization, Royal Danish Defense College, elaborated on “Autonomous Weapons Systems and Risk Management in Hybrid Warfare”. Mr. Collin Koh Swee Lean, Associate Research

Fellow at Nanyang Technological University in Singapore, gave a presentation on the potential deployment of LAWS in the maritime domain. Dr. John Borrie, Chief of Research at UNIDIR, He focused on the challenges for the security and safety of LAWS and related risks.

65. Different risk scenarios associated with LAWS were raised during the session. It was noted that some risks are related to the technology itself and that, in relation to LAWS, these related risks might be exacerbated as they are likely to be characterized by high degrees of sophistication necessary to allow for autonomous operation in complex environments. For this reason, LAWS are likely to be complex in ways that are not necessarily visible to those operating or deploying such machines. It was noted that this would always create risks that are unforeseen by the human operator. Further, that such risks might be exacerbated when different systems or programs are combined as well as by the speed at which systems or codes interact. These factors may hamper a commander or operator's ability to predict the actions of a LAWS. Additionally, this risk could be exacerbated by machine learning capabilities.

66. The operational concept of swarming was addressed by several delegations. It was noted that in future scenarios it would be very unlikely that offensive measures will consist of single LAWS. Instead, swarms of such systems with complementary capabilities might carry out attacks. It was noted that in scenarios where swarms of LAWS act as force multipliers it would not be clear how meaningful human control could be maintained over the use of force. It was retained that it would be possible that these systems might be under the command of a single human operator in theory. However, it would be difficult to see how human control would be meaningfully exercised in practice, as the available time frame for human intervention would likely be very restricted. Especially so when increasing speed becomes a motivation to deploy such systems in the first place.

67. Several delegations commented on the specific risks posed by the availability or deployment of LAWS in maritime scenarios. It was stated that due to the immense economic importance of shipping lines, militaries attach great value to their ability to ensure safe passage, and the most important platform performing this tasks remains the warship. However, the introduction of LAWS might further accentuate the trend towards the use of asymmetric countermeasures, which provide the operating state with the capability of destroying ships with a fraction of the resources. The importance of warships and the need for split-second reactions would lead the operators of a warship, when confronted with a threat, to be more sensitive and to increasingly resort to pre-emptive action. These scenarios might lead to situations of accelerated, or even unintended, escalation. Further, it was noted that in complex combat scenarios highly specialized communication would be required in order to allow for a greater level of situational awareness. The question arose, whether there is a possibility of making a distinction between legitimate defensive applications and offensive systems that should be subject to further regulation.

68. Due to the complex design of LAWS, several delegations noted that these systems would be inherently unpredictable and would not be able to comply with IHL. It was noted that the underlying computer programmes are kept secret in order to conceal their vulnerabilities to cyber-attacks. Therefore, the unpredictability of LAWS could be exacerbated in situations where multiple systems or swarms of systems interact.

69. Several delegations emphasized the risk of an arms race fueled by the emerging development and eventual procurement of LAWS. Given that these systems are associated with specific military advantages, regional instabilities might arise or exacerbate when these trends shift sensitive power balances. Whilst these systems might be available to technologically advanced countries in an initial phase, it is likely that they will proliferate. An expert noted that terrorists are in fact actively seeking such systems. Illegal transfers might mean that LAWS would become available to non-state actors. It was noted there may be no incentive for such actors to abide by international norms and this may further increase global or regional destabilisation.

70. Given the analogies to other revolutionary changes to warfare brought about by gun powder and nuclear weapons, the point was made that LAWS would have a major impact on the conduct of future armed conflicts. In light of the unpredictable and potentially harmful consequences of such developments, several delegations reiterated their call for a pre-emptive ban. It was also recognized, however, that some delegations are hesitant regarding possible regulation of such systems given the lack of certainty about the nature of LAWS and that they do not yet exist. In response, it was noted that the inexistence of LAWS in itself does not preclude the development of precautionary measures. Further, it was argued that if there are reasons to believe that these systems would be harmful, then preventative measures should be taken until further clarity can be reached regarding the security concerns.

71. It was also highlighted that due to the inherent dual-use character of many robotic technologies, many systems originally intended for civilian purposes could easily be modified to serve military functions. This would not only increase the risk of proliferation but also create accountability problems.