Conclusions and Recommendations

I. Guiding Principles

It was affirmed that

1. International humanitarian law continues to apply fully to the use of all weapons systems, including any lethal autonomous weapons systems.

2. Human agency for decisions on the use of lethal force should be retained since accountability cannot be transferred to a machine, computer program or other autonomous system.

3. Accountability for developing, deploying and using any lethal autonomous weapons system must be ensured in accordance with applicable international law, including through the subordination of such systems to the chain of human command and control.

4. In the study, development, acquisition, or adoption of a new weapon, means or method of warfare, and as applicable, determination must be made whether its employment would, in some or all circumstances, be prohibited by international law.

5. When developing or acquiring new weapons systems based on intelligent autonomous technologies, appropriate safeguards (against hacking or data-spoofing), security, the risk of proliferation, auditability, explainability, and the complexity of human-machine interfaces should be considered.

6. To mitigate risks and unintended consequences, risk assessments and mitigation measures should be part of the design, development and deployment cycle of emerging technologies in weapons systems and rigorous testing must be carried out under realistic conditions.

7. Consideration should be given to benefits of the use of emerging technologies in the area of intelligent autonomous systems to promote and uphold compliance with IHL principles and other applicable international legal obligations, autonomy being seen in this regard as a way of extending human control beyond the time a munition is deployed.

8. Experience-sharing in national policies and practices in the development and deployment of emerging technologies in the area of intelligent autonomous systems should be fostered without prejudice to national security or commercial proprietary information.

9. In crafting policy measures, emerging technologies in the area of intelligent autonomous systems should neither be anthropomorphized nor seen as stand-alone physical objects.

10. Policy measures taken within the context of the CCW should not hamper progress in or access to beneficial uses of intelligent autonomous technologies.
II. Characterization of the systems under consideration in order to promote a common understanding on concepts and characteristics relevant to the objectives and purposes of the Convention

Having examined different conceptual approaches to characterization and considered sets of specific characteristics relevant to the objectives and purposes of the Convention, and without prejudice to any future understanding on characterization, it was affirmed that:

1. Definition of lethal autonomous weapons systems is not a precondition for making progress within the CCW. Characterization, or working definitions, should neither predetermine nor prejudice policy choices; they should be universally understood by stakeholders.

2. The four possible approaches to characterization - separative, cumulative, accountability, and effect-based - were not mutually exclusive and characteristics could be combined to best fit the CCW context.

3. Purely technical characteristics such as physical performance, endurance or sophistication in targeting acquisition and engagement would alone not be sufficient to characterize lethal autonomous weapons systems, especially in view of rapid evolution in technology. Likewise, technical characteristics related to self-learning (without externally-fed training data) and self-evolution (without human design inputs) do not yet lend themselves to characterization given the lack of use-cases.

4. Similarly, attempting to define a threshold level of autonomy would pose difficulty as autonomy is a spectrum and its understanding shifts with shifts in the technology frontier. At the upper end of the spectrum, it is difficult to separate technically "fully" autonomous systems from autonomous systems while at the lower end consideration must be given to exclusion of tele-operated or other forms of legacy automated systems.

5. Lethality is a characteristic made explicit in the mandate of the GGE even though its interface with non-lethal autonomous systems such as decision-support systems might need to be examined further. In this regard, a focus on lethality does not prejudice the triggering of IHL obligations with regard to the use of force with possible lethal consequences.

6. Narrowing autonomy's focus on the military targeting and engagement cycle is challenging as autonomy can exist throughout or during parts of the targeting cycle and could start to be applied increasingly in other contexts such as close combat. Further, semi-autonomous machines could have highly autonomous targeting acquisition and engagement functions while highly autonomous machines could have no autonomy in such so-called critical functions.

7. In the context of the CCW, a focus on characteristics related to the human element, in particular characteristics that bring out accountability and responsibility for the use of force, is useful. In elaborating characteristics related to the human element, care should be taken to avoid notions that compare subjective human cognitive capabilities such as intention and judgment to machine performance.

8. Going forward, and in light of the foregoing it would be useful to focus the characterization discussion on systems, attributes and interpretations listed at page 3 of the Chair's summary of the April 2018 meeting.
III. Human element in the use of lethal force; aspects of human-machine interaction in the development, deployment and use of emerging technologies in the area of lethal autonomous weapons systems

In the context of the objectives and purposes of the CCW, it was affirmed that the nature and quality of the human-machine interface is critical to addressing concerns related to the development, deployment and use of emerging technologies in the area of lethal autonomous weapons systems. There is, however, no single touch point or notion, for instance ‘human in the loop’, that can fully describe the role of humans in supervising the development, deployment and use of weapons system. Instead a cumulative effect must be sought through a number of touch points without diluting human responsibility. In line with the Chair’s ‘sunrise slide’, the following touch points in the human-machine interface were considered for the exercise of human intervention and control: 0) political direction in the pre-development phase; 1) research and development; 2) testing, evaluation and certification; 3) deployment, training, command and control; 4) use and abort; 5) post-use assessment. It was underlined that:

1. Accountability threads together these various human-machine touch points in the context of the CCW. Humans should at all times remain accountable for decisions or actions related to the use of force performed by machines, computer programmes or another autonomous system during the full duration of deployment.

2. Inter-disciplinary perspectives should be integrated in research and development, including, where feasible through independent ethics reviews.

3. Developers should seek to establish in the design phase itself that any autonomous weapons system is receptive to human intervention, judgement and control.

4. Weapons systems under development, or modification where computational features are employed that significantly change the use of existing weapons systems, should be reviewed to ensure compliance with IHL and other applicable international law.

5. Verifiability and certification procedures against all possible use scenarios should be developed, and where feasible, the experience of applying such procedures should be shared.

6. Accountability for lethal action in armed conflict in accordance with applicable international law should be ensured, including through the subordination of weapons systems to the chain of command and control.

7. Human control over the use of force and for aborting weapons systems in use should be retained.

8. In the post-use assessment of the systems under consideration, it should be considered how their use complied with IHL and other applicable international legal obligations and if there were difficulties in exercising human intervention, judgement and control.

9. Necessary investments in human resources and training should be made in parallel with investments in technology.

10. Keeping in view some of the examples of measures listed above, it would be useful to focus on reaching shared understandings on the extent and quality of human intervention, judgement and control required to be exerted in the various human-machine touch points.
IV. Review of potential military applications of related technologies in the context of the Group’s work

The valuable contribution of experts from the tech community, industry, academia and civil society to building awareness and understanding of the potential military applications of related technologies in the context of the Group’s work was recognised. These inputs have been channeled mainly through experts participating in national delegations, panels put together at the invitation of the Chair, expert events and open calls for contributions on the CCW website. They have ensured that the Group’s policy consideration advances in step with broader developments in the technology field and a minimum degree of transparency regarding potential military applications is built up.

The value of initiatives by industry, the science and technology community, academia and other organizations to develop technical standards, and a common scientific and policy vernacular across the globe was also recognized.

Moving forward, ways and means to preserve this momentum and cross-fertilization of knowledge through dialogue in the context of the CCW need to be found.

Potential ways and means include a technology lighthouse mechanism for addressing the humanitarian and international security challenges posed by related technologies, or another platform that provides a continued opportunity for High Contracting Parties to share how technology development and deployment is proceeding in the context of the objectives and purposes of the CCW while allowing other stakeholders to provide inputs. Regardless of the choice made, the enhanced participation of technical experts in delegations attending CCW meetings would be crucial in ensuring that the Convention’s consideration of the issue stays in step with the fast pace of technology.
V. Possible options for addressing the humanitarian and international security challenges posed by emerging technologies in the area of lethal autonomous weapons systems in the context of the objectives and purposes of the Convention

In the context of the CCW, the main challenge posed by lethal autonomous weapons systems is loss of human control resulting in harm to civilians and combatants in armed conflict in contravention of IHL. An equal challenge is exacerbation of regional and international security dilemmas through arms races and the possible lowering of the threshold for the use of force. Proliferation to and use by non-State actors, vulnerability of intelligent autonomous systems to hacking and interference, and the possible undermining of confidence in the civilian uses of these technologies are other major concerns.

Delegations presented different options to address these challenges in the context of the CCW. Their pros and cons were discussed under three broad categories: a legally-binding instrument, a political declaration, clarity on and enhanced implementation of existing obligations under international law, in particular IHL. A proposal for a legally-binding instrument stipulating prohibitions and regulations on lethal autonomous weapons systems as well as a proposal for a legally-binding requirement for exercising human control on the critical functions of lethal autonomous weapons systems were made under the first category. Under the second category, a proposal for a politically-binding declaration with elements of transparency and technology review was made. Proposals were also made for clarifying how human control and intervention could be better applied under existing international legal obligations, including Article 36 weapons reviews.

It was felt that regardless of the option pursued, the work carried out so far in the GGE on principles, characterization, human-machine interface and review of potential military applications of emerging technology in the area of lethal autonomous weapons systems offered useful building blocks for future work. Existing understandings need to be consolidated, open questions clarified and further common-ground built on the basis of consensus.

The Group emphasized that the CCW offers an appropriate framework for dealing with the issue of emerging technologies in the area of lethal autonomous weapons systems. Within the context of the broader policy work internationally necessitated by the combinatorial effects of emerging technologies, the Convention’s modular and evolutionary character, the balance it seeks to strike between humanitarian considerations and military necessity as well as the opportunity it offers to engage multiple stakeholders make it an ideal platform for focused and participative discussions for reaching common understandings on the subject.

Recommendation

In the light of the foregoing conclusions, the Group recommends that,

The Group of Governmental Experts related to emerging technologies in the area of lethal autonomous weapons systems (LAWS) in the context of the objectives and purposes of the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons shall meet for a duration of ten days in 2019 in Geneva in accordance with Decision 1 of the Fifth Review Conference of the High Contracting Parties to the Convention (CCW/CONF.V/10), consistent with CCW/CONF.V/2.

The Rules of Procedure of the Review Conference shall apply mutatis mutandis to the Group. The Group shall conduct its work and adopt its report by consensus which shall be submitted to the 2019 Meeting of the High Contracting Parties to the Convention. The widest possible participation of all High Contracting Parties is to be promoted in accordance with the goals of the CCW Sponsorship Programme.