Conclusions

1. The Group reaffirmed the guiding principles agreed by the Group in 2018, as contained in paragraph 21 of CCW/GGE.1/2018/3 and Annex I of this report, and used the principles as a framework for guiding their work in 2019. In order to further elaborate the guiding principles, the Group focused on various potential additional principles, based on its four agenda items, as follows.

2. On the agenda item “An exploration of the potential challenges posed by emerging technologies in the area of lethal autonomous weapons systems to international humanitarian law” the Group concluded as follows:

   a. The potential use of emerging technologies in the area of lethal autonomous weapons systems must be conducted in accordance with applicable international law, in particular IHL and its requirements, including *inter alia* distinction, proportionality and precautions in attack.

   b. IHL imposes obligations on States, parties to armed conflict and individuals, not machines.

   c. States, parties to armed conflict and individuals remain at all times responsible for adhering to their obligations under applicable law, including IHL. States must also ensure individual accountability for decisions regarding the use of emerging technologies in the area of lethal autonomous weapons systems.

   d. The IHL requirements of distinction, proportionality and precautions apply, through a chain of responsible command, to the human operators and human commanders who plan, decide upon or carry out attacks, including any attacks involving emerging technologies in the area of lethal autonomous weapons systems.

   e. IHL requires that humans, through a responsible chain of command and control, make judgments on the use of force in the conduct of hostilities, including the conduct of hostilities using emerging technologies in the area of lethal autonomous weapons systems.

   f. Human judgement is essential in order to ensure that the use of emerging technologies in the area of lethal autonomous weapons systems is in compliance with international law, and in particular IHL.

   g. Parties to armed conflict, in their potential use of emerging technologies in the area of lethal autonomous weapons systems, must comply with the IHL principle of humanity, as well as to the requirements of distinction, proportionality and precaution, which require that human beings make certain judgements in good faith based on their assessment of the information available to them at the time, including, *inter alia*, information about the operational context.

   h. In cases not covered by the CCW and its annexed Protocols or by other international agreements, including such cases involving emerging technologies in the area of lethal autonomous weapons systems, the civilian population and the combatants shall at all times remain under the protection and authority of the principles of international law derived from established custom, from the principles of humanity and from the dictates of public conscience.
i. Any weapons system, including a weapon system based on emerging
technologies in the area of lethal autonomous weapons systems, must not be
employed if it is of a nature to cause superfluous injury or unnecessary suffering,
or if it is indiscriminate, that is, incapable of being used in accordance with the
principles of distinction and proportionality, or is otherwise incapable of being
used in accordance with the principles and rules of IHL.

j. Legal review at the national level of the study, development, acquisition or
adoption of a new weapons system is required to assess whether weapons,
including potential weapons systems based on emerging technologies in the
area of lethal autonomous weapons systems, can be used in compliance with
international law, including IHL. States are free to independently determine the
mechanism to conduct legal reviews although the voluntary exchange of best
practices could be beneficial, bearing in mind national security considerations
or commercial restrictions on proprietary information. As with all weapons,
such legal reviews should include an understanding of the characteristics of the
weapons system, its intended and expected use, and whether there are one or
more circumstances in which an operator can employ the weapons system in
conformity with the rules of IHL.

k. Weapons systems under development, or modification must be reviewed as
applicable to ensure that the weapons can be used consistent with IHL.

3. Under the same da item, the Group recognized the need for further work on the
following aspects:

a. Ethical and moral perspectives continue to guide the work of the Group,
although there are different views on the meaning of the Martens Clause.

b. Apart from IHL, there are a range of views on the relevance to the discussions
of the Group of other legal regimes, notably International Human Rights Law and
International Criminal Law, where applicable.

c. Delegations differed as to whether current IHL could address the challenges
relating to emerging technologies in the area of lethal autonomous weapons
systems or if further regulations, rules or clarifications were needed.

d. Further work is needed to build shared understanding on the role of operational
constraints regarding tasks, target profiles, time-frame of operation, and scope
of movement over an area and operating environment. There was not shared
understanding on how constraints and capabilities could assist with compliance
with IHL.

4. On the agenda item “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” the Group concluded as follows:

a. Autonomy in the identification, selection or engagement of a target is a central
characteristic of weapons systems of core interest to the Group.

b. Identifying and reaching a common understanding among High Contracting
Parties on the concepts and characteristics relevant to lethal autonomous
weapons systems could aid consideration of the most suitable response for
addressing the humanitarian and international security challenges posed by emerging technologies in the area of lethal autonomous weapons systems, but characteristics should not be identified in a way that prejudices policy decisions.

5. Under the same agenda item, the Group recognized the need for further work on the following aspects:
   a. Questions were raised concerning data bias including the possibility that the data sets used in algorithm-based programming relevant to emerging technologies in the area of lethal autonomous weapons systems may diminish, perpetuate or amplify social biases, including gender and racial bias, with potential implications for compliance with IHL by a party to a conflict.
   b. Various views were raised on different potential characteristics of emerging technologies in the area of lethal autonomous weapons systems, including: self-adaptation; predictability; explainability; reliability; ability to be subject to intervention; ability to redefine or modify objectives or goals or otherwise adapt to the environment; and ability to self-initiate.

6. On the agenda item “Further consideration of the 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” the Group concluded as follows:
   a. Human responsibility for the use of force can be exercised in various ways, including but not limited to through strategic direction in the pre-development stage and across the life-cycle of the weapon system.
   b. Human involvement at the development stage of a weapon system based on emerging technologies in the area of lethal autonomous weapons system may not be sufficient to ensure compliance with IHL for attacks in armed conflict under all circumstances given the variable and unpredictable nature of real-world operational environments.
   c. Human-machine interaction, which may take various forms and be implemented at various stages of the life cycle of a weapon, must ensure that the potential use of emerging technologies in the area of lethal autonomous weapons systems is in compliance with applicable international law, in particular IHL. In determining the necessary quality and extent of human-machine interaction, a range of factors should be considered including the operational context, the characteristics and capabilities of the weapon system and the performance and reliability of specific functions in the weapon system.

7. Under the same agenda item, the Group recognized the need for further work on the following aspects:
   a. Although there is agreement on the centrality of the human element in the use of force, further work would be needed to develop shared understandings of this concept and its application.
   b. Divergent views were expressed on the type and degree of human-machine interaction required, including elements of control and judgement, including at different stages of a weapon’s life cycle, in order to ensure compliance with IHL
in relation to the use of weapons systems based on emerging technologies in the area of lethal autonomous weapons systems.

c. There were different views on the necessity of a human decision being reasonably temporally proximate to an attack to remain valid. Further exploration of the concept of “reasonably temporally proximate,” which is likely to be context-dependent, was suggested by some.

d. There were divergent views on the need for real-time supervision during the operation of a weapons system. Some delegations consider that many existing weapons systems do not allow for real-time supervision during their operation. Some delegations called for direct human control, both through design and in use.

e. There was disagreement over whether and to what extent an ability to intervene in the operation of a weapon, once activated or launched, would be necessary to ensure compliance with IHL.

8. On the agenda item “Review of potential military applications of related technologies in the context of the Group’s work” the Group concluded as follows:

a. During the design, development, testing and deployment of potential weapons systems based on emerging technologies in the area of lethal autonomous weapons systems, the risks of unlawful casualties, as well as precautions to help minimize the risk of incidental loss of life, injuries to persons protected under IHL and damage to objects protected under IHL must be considered. Other types of risks should be considered, as appropriate, including but not limited to the risk of unintended engagements, risk of loss of control of the system to unauthorized parties, risk of proliferation, risk of acquisition by terrorist groups, and potential effects on international peace and security.

b. Risk mitigation measures can include: rigorous testing of systems, legal reviews, readily understandable human-machine interfaces and controls, training personnel, establishing doctrine and procedures, and circumscribing weapons use through appropriate rules of engagement.

c. Consideration should be given to the possible effects of emerging technologies in the area of lethal autonomous weapons systems on national, regional and global security and stability, including thresholds for engaging in armed conflicts and risks of an arms race. Throughout further work of the Group, a balance should be struck between military necessity and humanitarian considerations.

d. Research and development of autonomous technologies should not be restricted based on the sole rationale that such technologies could be used for weapons systems. At the same time, given the dual use nature of the underlying technologies in the area of lethal autonomous weapons systems, it is important to promote responsible innovation and use of such technologies.

9. Under the same agenda item, the Group recognized the need for further work on the following aspects:
a. Some delegations argued that emerging technologies in the area of lethal autonomous weapons systems could aid the human operator in complex combat environments, and that a range of precautionary measures, including testing of the system, training and established procedures, could allow the use of the system in accordance with IHL. Other delegations expressed doubts that in complex operational environments, autonomous systems would perform tasks as expected or be capable of being used in accordance with IHL principles and rules requiring human judgement and context-based assessments.

b. There were divergent views on whether autonomy in critical functions challenged the maintenance and attribution of combatant and commander responsibility.
Recommendations

10. The Group recommends that:

   a. High Contracting Parties, at their 2019 Meeting, endorse the guiding principles agreed by the Group in 2018, as contained in paragraph 21 of CCW/GGE.1/2018/3 and in Annex I of this report, and encourage High Contracting Parties to incorporate the guiding principles into national practices and policies as appropriate.

   b. The Group of Governmental Experts related to emerging technologies in the area of lethal autonomous weapons systems in the context of the objectives and purposes of the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons shall meet in three sessions of five days each in both 2020 and 2021 (for a total of thirty days over the two-year period) 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(s) by consensus. The widest possible participation of all High Contracting Parties is to be promoted in accordance with the goals of the CCW Sponsorship Programme. High Contracting Parties in a position to do so are encouraged to consider providing funding to assist other High Contracting Parties in bringing relevant technical experts to participate in the work of the Group.

In this period, the Group shall seek to elaborate the guiding principles, including by pursuing the following work streams:

**Legal:** to examine, inter alia, the areas for further work identified in paragraph 3 above, including by compiling existing applicable international law and clarifying how it applies to emerging technologies in the area of lethal autonomous weapons systems, in the context of the objectives and purposes of the Convention. The Chair of the Group is encouraged to make particular efforts to incorporate legal expertise in this aspect of the Group’s work.

**Technical:** to examine, inter alia, the areas for further work identified in paragraphs 5 and 7a above. The Chair of the Group is encouraged to make particular efforts to incorporate academic and private sector technical expertise in this aspect of the Group’s work.

**Military:** to examine, inter alia, the areas for further work identified in paragraphs 7b-e and 9 above, drawing on national practice, including with respect to the implementation of legal weapons reviews. High Contracting Parties should make every possible effort to involve military personnel in this work stream.

The Group shall consider (i) the guiding principles, which it may further develop and elaborate; (ii) the outputs of the three work streams, and (iii) the agreed conclusions of the Group, as reflected in its reports of 2017, 2018 and 2019, and
use these as a basis for its report for the consideration of the 2021 Sixth Review Conference, with a view to developing a normative framework on emerging technologies in the area of lethal autonomous weapons systems.
Annex I — Guiding Principles:

It was affirmed that international law, in particular the United Nations Charter and international humanitarian law (IHL) as well as relevant ethical perspectives, should guide the continued work of the Group. Noting the potential challenges posed by emerging technologies in the area of lethal autonomous weapons systems to IHL, the following were affirmed, without prejudice to the result of future discussions:

a. International humanitarian law continues to apply fully to all weapons systems, including the potential development and use of lethal autonomous weapons systems.

b. Human responsibility for decisions on the use of weapons systems must be retained since accountability cannot be transferred to machines. This should be considered across the entire life cycle of the weapons system.

c. Accountability for developing, deploying and using any emerging weapons system in the framework of the CCW must be ensured in accordance with applicable international law, including through the operation of such systems within a responsible chain of human command and control.

d. In accordance with States’ obligations under international law, in the study, development, acquisition, or adoption of a new weapon, means or method of warfare, determination must be made whether its employment would, in some or all circumstances, be prohibited by international law.

e. When developing or acquiring new weapons systems based on emerging technologies in the area of lethal autonomous weapons systems, physical security, appropriate non-physical safeguards (including cyber-security against hacking or data spoofing), the risk of acquisition by terrorist groups and the risk of proliferation should be considered.

f. Risk assessments and mitigation measures should be part of the design, development, testing and deployment cycle of emerging technologies in any weapons systems.

g. Consideration should be given to the use of emerging technologies in the area of lethal autonomous weapons systems in upholding compliance with IHL and other applicable international legal obligations.

h. In crafting potential policy measures, emerging technologies in the area of lethal autonomous weapons systems should not be anthropomorphized.

i. Discussions and any potential policy measures taken within the context of the CCW should not hamper progress in or access to peaceful uses of intelligent autonomous technologies.

j. 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 objectives and purposes of the Convention, which seeks to strike a balance between military necessity and humanitarian considerations.

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1 In accordance with the decision as recommended in paragraph 10 above.