

Proposals Related to Emerging Technologies in the Area of Lethal Autonomous Weapons Systems

A Resource Paper

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ABBREVIATIONS AND ACRONYMS

AI	artificial intelligence
CCW	Convention on Certain Conventional Weapons
GGE	Group of Governmental Experts
IHL	international humanitarian law
IHRL	international human rights law
ICL	international criminal law
LAWS	lethal autonomous weapon systems



The Sixth Review Conference of the High Contracting Parties to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects (CCW), held in Geneva 13–17 December 2021, decided that the open-ended Group of Governmental Experts related to emerging technologies in the area of lethal autonomous weapon systems (GGE on LAWS) is to continue its work under the following mandate:

Decision 1:

In the context of the objectives and purpose of the Convention, the Group is to consider proposals and elaborate, by consensus, possible measures, including taking into account the example of existing protocols within the Convention, and other options related to the normative and operational framework on emerging technologies in the area of lethal autonomous weapon systems, building upon the recommendations and conclusions of the Group of Governmental Experts related to emerging technologies in the area of lethal autonomous weapon systems, and bringing in expertise on legal, military, and technological aspects.¹

In line with this mandate, in the first meeting of the 2022 session of the GGE on LAWS that took place 7–11 March 2022, several States submitted new proposals while others reinstated their positions or proposals submitted in other recent sessions of the Group. States also discussed various aspects of the submitted proposals through which areas of common ground and issues that require further consideration began to emerge.

The purpose of this resource paper is to offer an initial comparative analysis of the different proposals presented by States with a view to identifying both common views and areas requiring further discussion. An earlier version of this paper was prepared to serve as a supporting document for a roundtable discussion organized by UNIDIR on 30 May 2022.²

1 Final document of the CCW Sixth Review Conference, [CCW/CONFVI/11](#), 10 January 2022.

2 The workshop was sponsored by the governments of New Zealand and Switzerland and provided an informal forum for constructive discussions on various aspects of the submitted proposals.

METHODOLOGY AND STRUCTURE

To conduct the comparative analysis of the proposals, the resource paper adopted the following approach:

- i. Ten thematic areas that cover the key elements of the six proposals and the Group's discussions over the past years were identified. These include: (1) application of international humanitarian law (IHL); (2) weapons prohibitions and other regulations/restrictions; (3) application of international human rights law (IHRL) and international criminal law (ICL); (4) characterization; (5) general requirements regarding human-machine interaction and human control; (6) responsibility and accountability; (7) legal reviews; (8) risk mitigation; (9) ethical considerations; (10) peaceful uses of artificial intelligence (AI).
- ii. The content of the proposals was then organized by theme in tabular format—a table was developed for each of the ten themes including the language on or relevant to that theme from each of the six proposals (see Annex A).
- iii. A content analysis of the text in the tables was conducted through which common language, similarities in views, differences and issues that require further consideration were identified.

IMPORTANT CAVEATS CONCERNING THE METHODOLOGY AND ANALYSIS THAT MUST BE TAKEN INTO CONSIDERATION:

- We recognize that in the GGE there are differences in the understanding of what 'emerging technologies' in the area of LAWS refer to and that proposals have been written in the context of those understandings. In light of the differences, throughout the analysis we have used the GGE framing of *weapons systems based on emerging technologies in the areas of LAWS*.
- The analysis conducted is based entirely on the content of the proposals and is descriptive in nature, meant to guide States in their efforts to identify commonalities and to address differences among the submitted proposals with a view to agreeing on a path forward for the work of the Group. It does not intend to be prescriptive or to make any value judgement on any of the six proposals submitted to the GGE on LAWS.
- The submitted proposals differ in approach, purpose, scope, and proposed outcome, and consequently in structure and length. For example, some proposals elaborate more than others on certain themes. Such differences presented challenges in conducting a one-to-one comparison to identify commonalities and differences in views.
- Since various aspects of the identified themes are interrelated, there are cases in which, where relevant, the same text is analysed under more than one theme. Additionally, there are also cases in which certain text in the proposals reflects views on more than one identified theme, in these instances as well the same text is analysed under more than one theme.
- We note that two of the proposals analysed were submitted under a previous mandate. However, they were referred to in the discussions during the 7–11 March session due to their relevance to the 2022 mandate of the GGE on LAWS.

THE RESOURCE PAPER HAS THE FOLLOWING STRUCTURE:

- I. **Summary of Current Proposals.** The first section provides a summary of each of the six proposals with respect to their scope and views on intended implementation or outcome.
- II. **Thematic Analysis.** This section provides a description of the common language, similarities in views, differences and issues that require further consideration found during the comparative analysis conducted for each of the ten themes.
- III. **Issues for Further Consideration.** Based on the analysis, the resource paper identifies a list of key questions that require further elaboration and can guide States in their preparation of, and discussions during, the upcoming July session of the GGE on LAWS.
- IV. **Annex A.** The annex contains a table for each theme in which the language on or relevant to that theme is provided for each of the six proposals. These tables can aid the reader in reflecting on the Thematic Analysis section as they break down the content of the proposals and assign the relevant text to relevant themes in a format in which the language from each of the proposals can be compared.

PART I: SUMMARY OF PROPOSALS

Title: Elements for a Future Normative Framework Conducive to a Legally Binding Instrument to Address the Ethical Humanitarian and Legal Concerns Posed by Emerging Technologies in the Area of (Lethal) Autonomous Weapons (LAWS)

[referred to as the *Elements* in the analysis]

Submitted by: Brazil, Chile, and Mexico

Date: June 2021

Scope: The *Elements* provides recommendations towards a normative framework on emerging technologies in the area of (lethal) autonomous weapons, including recommendations on prohibitions and regulations. The *Elements* suggests that the normative framework is the priority as the operational framework would derive from the application of existing and future norms of conduct.

Intended Outcome/Implementation: The *Elements* recommends the negotiation of a normative framework for emerging technologies in the area of LAWS that should be conducive to a legally binding instrument.

Title: Outline for a Normative and Operational Framework on Emerging Technologies in the Area of LAWS

[referred to as the *Outline* in the analysis]

Submitted by: France and Germany

Date: September 2022

Scope: The *Outline* includes a normative and operational framework to be expanded and developed by the Group. The normative framework includes a number of principles for the development and use of weapons systems in the area of LAWS, building on the 11 Guiding Principles and elaborating further on human-machine interaction. The operational framework aims to operationalize the principles laid out in the normative framework.

Intended Outcome/Implementation: The *Outline* proposes a framework of measures and policies that States can implement at the national level. The final framework would include two main sections: the normative framework section, and the operational framework section.

Title: Principles and Good Practices on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems

[referred to as the *Principles and Good Practices* in the analysis]

Submitted by: Australia, Canada, Japan, the Republic of Korea, the United Kingdom, and the United States

Date: March 2022

Scope: The *Principles and Good Practices* lays out relevant IHL requirements, as well as non-binding principles and good practices to be considered by States throughout the life cycle of weapons systems based on emerging technologies in the area of LAWS, including when designing, developing, deploying and using such systems. The *Principles and Good Practices* builds on prior conclusions of the GGE and is intended to provide a basis for further international discussion and work, to strengthen the implementation of IHL, and to promote responsible behaviour with regard to emerging technologies in the area of LAWS.

Intended Outcome/Implementation: The *Principles and Good Practices* suggests that the existing rules, non-binding principles and good practices can be implemented as appropriate within each Party's respective national system. Further, States Parties can share their national policies and experiences relevant to the implementation of the rules, principles and good practices on a voluntary basis. Furthermore, the *Principles and Good Practices* suggests that the principles and good practices should be kept under review and elaborated as appropriate by consensus, while also considering other possible measures and options related to the normative and operational framework.

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Title: Roadmap towards New Protocol on Autonomous Weapons Systems

[referred to as the *Roadmap* in the analysis]

Submitted by: Argentina, Costa Rica, Guatemala, Kazakhstan, Nigeria, Panama, Philippines, Sierra Leone, State of Palestine, Uruguay

Date: March 2022

Scope: The *Roadmap* recommends the negotiation of a legally binding new Protocol to the CCW. To that effect, the document starts by recognizing the common grounds in the GGE's deliberations, followed by a provisional outline to elaborate these common grounds in the form of a report to the Meeting of High Contracting Parties.

Intended Outcome/Implementation: The *Roadmap* recommends that the next GGE be mandated to initiate open-ended negotiation on a legally binding instrument within the framework of the CCW.

Title: United Kingdom Proposal for a GGE Document on the Application of International Humanitarian Law to Emerging Technologies in the Area of Lethal Autonomous Weapon Systems (LAWS)

[referred to as the *IHL Document* in the analysis]

Submitted by: the United Kingdom

Date: March 2022

Scope: Without prejudice to other proposals, the *IHL Document* invites the GGE to commission a document that sets out guidelines, advice, and best practices on how States should approach the development and use of emerging technologies in the area of LAWS, at each stage of the life cycle. The proposed document would include assessments on characteristics that are necessary for compliance with IHL and those that are incompatible with IHL.

Intended Outcome/Implementation: The *IHL Document* proposes the elaboration of a document or manual on the application of IHL and agreed practice, inspired by, and modelled on, documents such as the Montreux Document, Tallin Manual, and San Remo Manual. It is therefore not legally binding but meant to assist States in putting high-level principles into practice.

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Title: Working Paper Submitted to the 2022 Chair of the Group of Governmental Experts (GGE) on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems (LAWS)

Note: also known as the Signpost Paper

[referred to as the *Working Paper* in the analysis]

Submitted by: Argentina, Austria, Belgium, Chile, Costa Rica, Ecuador, Guatemala, Ireland, Kazakhstan, Liechtenstein, Luxembourg, Malta, Mexico, New Zealand, Nigeria, Panama, Peru, the Philippines, Sierra Leone, Sri Lanka, State of Palestine, Switzerland, and Uruguay

Date: April 2022

Scope: The *Working Paper* sets out 14 considerations and elements for the future work of the Group.

Intended Outcome/Implementation: The *Working Paper* suggests that the deliberations of the Group must result in a substantive outcome. In this regard, the *Working Paper* states that the Group should commit to work collaboratively to prohibit autonomous weapon systems that do not meet legal requirements and to address ethical imperatives. To uphold the rules of IHL, the *Working Paper* also states that the Group should work collaboratively to identify and agree on limits and other regulations for other types of autonomous weapon systems.

PART II: THEMATIC ANALYSIS

IN THE ANALYSIS, THE SIX PROPOSALS ARE REFERRED TO AS FOLLOWS:

Full Title	
Elements for a Future Normative Framework Conducive to a Legally Binding Instrument to Address the Ethical Humanitarian and Legal Concerns Posed by Emerging Technologies in the Area of (Lethal) Autonomous Weapons (LAWS)	<i>Elements</i>
Outline for a Normative and Operational Framework on Emerging Technologies in the Area of LAWS	<i>Outline</i>
Principles and Good Practices on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems	<i>Principles and Good Practices</i>
Roadmap Towards New Protocol on Autonomous Weapons Systems	<i>Roadmap</i>
United Kingdom Proposal for a GGE Document on the Application of International Humanitarian Law to Emerging Technologies in the Area of Lethal Autonomous Weapon Systems (LAWS)	<i>IHL Document</i>
Working Paper Submitted to the 2022 Chair of the Group of Governmental Experts (GGE) on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems (LAWS)	<i>Working Paper</i>

1. APPLICATION OF INTERNATIONAL HUMANITARIAN LAW (IHL)

There is an **explicit or inferred recognition in all proposals that IHL applies fully** with respect to weapons systems based on emerging technologies in the area of LAWS, and therefore the potential use of such weapons systems must be in compliance with requirements and principles of IHL.

Furthermore, the *Principles and Good Practices* and the *IHL Document* explicitly acknowledge that the right of parties to armed conflict to choose means or methods of warfare, including weapons systems based on emerging technologies in the area of LAWS, is not unlimited. Furthermore, the *IHL Document* provides that no such advanced method of warfare permits the derogation or relaxation of the rules of IHL, and that States and parties to armed conflict must ensure that their conduct is in compliance with the requirements of IHL regardless of what means or methods of warfare are adopted.

On the requirements and principles of IHL, the *Elements*, the *Principles and Good Practices* and the *IHL Document* refer to and elaborate notably on distinction, proportionality, and precautions in attack.

Distinction. All three proposals affirm that distinction must at all times be made between civilians and combatants and civilian objects and military objectives. Civilians and civilian objects must not be made the object of attacks involving the use of weapons systems based on emerging technologies in the area of LAWS, and such attacks may only be directed against military objectives. The *Elements* and the *IHL Document* also specify that the principle of distinction applies also to hors de combat—distinction must be made between active combatants and hors de combat. Further, the *IHL Document* elaborates on the requirements for the exercise of distinction, including the ability to observe, recognize and exercise situational judgement, and states that deployment of weapons systems based on emerging technologies in the area of LAWS in a manner that does not adhere to these requirements is unlawful.

Proportionality. All three proposals affirm that possible attacks, including those involving weapons systems based on emerging technologies in the area of LAWS, which may be expected to cause incidental harm to civilians including civilian casualties, injury to civilians, and damage to civilian objects that is excessive in relation to the concrete and direct military advantage anticipated, are prohibited. Further, the *IHL Document* elaborates on the requirements for the application of the principle of proportionality, including that qualitative, subjective, and strategic appreciation of the military advantage and the expected impact of the attack are essential for the exercise of proportionality.

Precaution in attack/feasible precautions. Both the *Principles and Good Practices* and the *IHL Document* affirm that feasible precautions must be taken in the conduct of military operations, including in planning and conducting attacks involving the use of weapons systems based on emerging technologies in the area of LAWS, to spare civilians and civilian objects from the incidental loss of civilian life, civilian injury, and damage to civilian objects. Further, the *Principles and Good Practices* states that feasible precautions are those that are practicable or practically possible, taking into account all circumstances ruling at the time, including humanitarian and military considerations. Further, the *IHL Document* provides that the obligation to take all feasible precautions falls on persons who plan or decide upon an attack, while weapons systems based on emerging technologies in the area

of LAWS may be engaged in realizing this obligation, the obligation cannot be divested onto the system. Meanwhile, referring to the requirements of the rules on precautions in attack, the *Elements* states that an attack should be cancelled or suspended if it becomes apparent that the target is not a military objective or is subject to special protection, or that the attack may be expected to violate the rule of proportionality.

Meanwhile, the *Outline*, under its operational framework provides that a set of measures during the use of weapons systems based on emerging technologies in the area of LAWS should be taken to enable human operators to assess and ensure compliance with IHL—in particular principles of distinction, proportionality and precautions in attack. Such measures during operation may include human approval for any substantial modification of the mission's parameters, communication links and the ability to de-activate the system if and when necessary, unless technically not feasible.

On the scope of the application of the principles of distinction, proportionality and precaution in attack, the *Elements* states that these core obligations of IHL are of a universal nature and therefore shall be respected in the conduct of hostilities, including those involving weapons systems based on emerging technologies in the area of LAWS. Similarly, the *IHL Document* states that these principles and rules have general and continuous application in relation to the behaviour of parties to armed conflict. Meanwhile, the *Principles and Good Practices* states that these IHL requirements and principles must be applied through a chain of responsible command and control by the human operators and commanders who use weapons systems based on emerging technologies in the area of LAWS.

The *Elements*, the *Principles and Good Practices*, the *Roadmap*, and the *IHL Document* all **emphasize the application of the Martens clause**, that 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, including in cases involving weapons systems based on emerging technologies in the area of LAWS not covered by the CCW or by other international agreements.

Concerning the human element in the compliance with the principles and requirements of IHL the *Principles and Good Practices* and the *Roadmap* provide that context-based human judgement is essential in the potential use of weapons systems based on emerging technologies in the area of LAWS. In this regard, the *Principles and Good Practices* also specifies that the judgements are made in good faith based on their assessment of the information available at the time. Meanwhile, the *Roadmap* and the *Working Paper* provide that human control over the weapons systems in question is essential to ensure compliance with IHL. In this regard, the *Working Paper* also specifies that human beings must make the decisions with regard to the use of force. Similarly, the *Outline* provides that appropriate/sufficient human control must be retained during the whole life cycle of the weapon systems in question by ensuring that humans will still be in a position to exercise their judgement with regard to compliance with IHL in the framework and context of an attack, and thus take critical decisions over the use of force.

On the requirements and principles of IHL, **the *IHL Document* also refers to and elaborates on the principles of necessity and humanity**. In addition, the *IHL Document* provides a possible outline of the IHL manual it proposes, in which it provides questions regarding how compliance can be best assured for different stages of the life cycle of a weapons system based on emerging technologies in the area of LAWS.

2. WEAPONS PROHIBITIONS AND REGULATIONS/RESTRICTIONS

Weapons Prohibitions

There is common ground among the *Elements*, the *Outline*, the *Principles and Good Practices*, the *Roadmap*, and the *Working Paper* that weapons systems based on emerging technologies in the area of **LAWS that cannot be used in accordance IHL must not be developed and are prohibited from use** in all circumstances. In this regard, the *Principles and Good Practices* specifies that such weapons systems should not be developed if they could not, under any circumstances, be used in compliance with IHL.

Elaborating on which weapons systems based on emerging technologies in the area of LAWS cannot be used in accordance with IHL, the *Elements*, the *Principles and Good Practices* and the *Roadmap* all specify that such weapons systems include those that cause superfluous injury or unnecessary suffering, are inherently indiscriminate, or are otherwise incapable of being used in accordance with the requirements and principles of IHL. In this context, the *Roadmap* also includes that such weapons systems would not be in compliance with the dictates of public conscience.

Further, in this context, the *Roadmap* and the *Working Paper* specify the need for States to work collaboratively to **prohibit or regulate weapons systems based on emerging technologies in the area of LAWS that are not sufficiently predictable or controllable** to meet legal requirements and in a manner that sufficiently addresses relevant ethical perspectives. Similarly, the *Elements* calls for the prohibition of weapons systems based on emerging technologies in the area of LAWS that have effects that cannot be limited as required by IHL and whose effects cannot be sufficiently understood, predicted or explained. The *Principles and Good Practices* includes this in the form of a positive obligation that weapons systems are to be developed such that their effects in attacks can be anticipated and controlled in accordance with the requirements of the principles of distinction and proportionality and such that attacks conducted with reliance upon their autonomous functions will be the responsibility of the human command under which the system was used.

Further on prohibitions related to weapons systems based on emerging technologies in the area of LAWS, there is common ground between the *Elements*, the *Roadmap* and the *Working Paper* that weapons systems based on emerging technologies in the area of **LAWS that would select and engage targets without any human control would be unlawful**. The *Roadmap* and the *Working Paper* further state that such weapons systems would also be questionable from an ethical point of view, particularly with regard to human dignity. In line with this, the *Elements*, the *Outline* and the *Roadmap* explicitly call for the prohibition of those weapons systems based on emerging technologies in the area of LAWS that operate outside of a responsible human chain of command and control. However, it is important to note that with regard to prohibitions, the *Elements*, the *Roadmap* and the *Working Paper* refer to systems that select and engage targets without human control. On the other hand, the *Outline* accepts to delegate a certain number of decisional calculations in the process of identification up to the point of engagement. **The *Elements* also calls for prohibitions with regard to responsibility and accountability**, providing that States shall prohibit the development and the use of weapons systems based on emerging technologies in the area of LAWS that preclude attribution of State and individual legal responsibilities for the consequences of their use.

Additionally on the prevention of the development of weapons systems based on emerging technologies in the area of LAWS, the *Principles and Good Practices* and the *Roadmap* both recognize the need to prevent the development of such weapon systems that cannot be used in compliance with IHL by ensuring that:

- weapons systems are not designed to be used to conduct attacks against the civilian population, including attacks to terrorize the civilian population;
- weapons systems must not be designed to cause incidental loss of civilian life, injury to civilians, and damage to civilian objects that would invariably be excessive in relation to the concrete and direct military advantage expected to be gained; and
- the autonomous functions in weapons systems must not be designed to be used to conduct attacks that would not be the responsibility of the human command under which the weapon system would be used.

Scope of Prohibitions: There are differences between proposals in the scope of the application of weapons prohibitions they put forward (outlined above). The *Elements* and *Principles and Good Practices* discuss weapons prohibitions with respect to the development and use of weapons systems based on emerging technologies in the area of LAWS. On the other hand, the *Roadmap* calls for prohibitions not only on the development and use, but also on the production, possession, acquisition, deployment and transfer of such weapons systems. Similarly, the *Outline* proposes prohibitions on the development, production, acquisition, deployment, or use. The *Working Paper* calls for prohibitions on the development, deployment or use.

Regulations/Restrictions

To uphold the rules of IHL and to address the risks and challenges posed by the integration of autonomy in weapons systems, the *Elements*, the *Roadmap* and the *Working Paper* emphasize the **need to identify and agree on limits, rules and other regulations** on other types of weapons systems based on emerging technologies in the area of LAWS that do not fall under prohibitions. The *Roadmap* also states that such regulations are needed to ensure that all weapon systems incorporating autonomy are used with meaningful human control.

In line with this, the *Roadmap* and the *Working Paper* explicitly state that voluntary measures such as the sharing of national policies and standards and good practice guidance can act as confidence-building measures that complement, but are not a replacement for, and without prejudice to, international rules and regulations on weapons systems based on emerging technologies in the area of LAWS. In this regard, the *Roadmap* also puts forward recalling the objectives and purposes of the CCW, in particular the need to codify and progressively develop rules of international law applicable in armed conflict, and specifies that legally binding rules and principles are needed to safeguard against risks and challenges posed by emerging technologies in the area of LAWS. Similarly, the *Elements* calls for a legally binding instrument to address the ethical, humanitarian, and legal concerns posed by emerging technologies in the area of LAWS. On the other hand, the *Principles and Good Practices* provides that the principles and good practices it affirms are non-binding and can be implemented as appropriate within each Party's respective national system.

Furthermore, the *Working Paper* elaborates on **what these limits and rules could entail**, which include:

- limits on the type of target;
- limits on the duration, geographical scope, and scale of use;
- requirements for human-machine interaction/human control to ensure effective oversight of a weapon system and allow for timely intervention and deactivation; and
- clear procedures to ensure that human operators are informed and empowered to effect or control weapons systems based on emerging technologies in the area of LAWS.

Meanwhile, the *Elements* calls for developing positive obligations in the form of regulations to ensure sufficient human control is exercised over critical functions (identification, selection, and engagement) throughout the development and use of weapons systems based on emerging technologies in the area of LAWS, in line with IHL obligations and ethical requirements. In this regard, while recognizing that the nature and degree of human control may vary across all or different stages of the development and use of weapons systems based on emerging technologies in the area of LAWS, the *Elements* provides actions a human agent shall take:

- be certain that there are adequate environmental limits in place, including spatial and temporal limits (similar to the *Working Paper*);
- have sufficient situational awareness to approve any decision on determining the operational context (similar to the *Working Paper*);
- be certain of the reliability and predictability of the critical functions;
- take necessary precautions during the conduct of operations; and
- allow constant human supervision and ensure intervention where necessary (similar to the *Working Paper*).

Similarly, the *Outline* calls for an agreement by the High Contracting Parties that weapons systems based on emerging technologies in the area of LAWS must only be developed, produced, acquired, modified, deployed and used in accordance with certain provisions, including to:

- ensure compliance with international law;
- across the entire life cycle which requires spatial and temporal limits on weapons systems based on emerging technologies in the area of LAWS that may vary according to the situation or context of their employment (similar to the *Elements*, the *Working Paper*);
- retain appropriate or sufficient human control during the whole life cycle of the weapon system (in this context, the *Outline* lists actions that humans shall still be able to take to retain appropriate or sufficient human control, similar to the *Elements*, the *Working Paper*); and
- commit to adopt and implement tailored risk-mitigation measures and appropriate safeguards regarding safety and security.

On the other hand, the *Principles and Good Practices* lays down the requirements and principles of IHL, including distinction, proportionality and precautions in attack as other prohibitions or restrictions on the use of weapons systems based on emerging technologies in the area of LAWS. Further, it discusses limits on the types of targets, duration, geographical scope, and scale of the operation as possible risk-mitigation measures that can be taken across the life cycle of weapons systems based on emerging technologies in the area of LAWS to prevent unintended engagement.

There are key differences in views on what other regulations/restrictions on weapons systems based on emerging technologies in the area of LAWS should entail, and therefore this issue requires further deliberation.

3. APPLICATION OF INTERNATIONAL HUMAN RIGHTS LAW (IHRL) AND INTERNATIONAL CRIMINAL LAW (ICL)

The *Roadmap* and the *Elements* explicitly acknowledge the application of IHRL and ICL to emerging technologies in the area of LAWS. **The discussions of the Group have shown that this requires further consideration.**

4. CHARACTERIZATION

Among three proposals that expressed views on this issue, namely the *Principles and Good Practices*, the *Roadmap* and the *Elements*, **there seems to be common ground that purely technical characteristics may alone not be sufficient to characterize** emerging technologies in the area of LAWS in view of rapid evolution in technology and **that characterization should focus on the human element** and its interface with machines as this is a necessary aspect for addressing accountability/attribution and responsibility. In this regard, the *Roadmap* and *Principles and Good Practices* also acknowledge that autonomy exists on a spectrum.

However, across the six proposals **there are differences in the understanding of what weapons systems based on emerging technologies in the area of LAWS refers to.** There are commonalities between the *Roadmap*, the *Elements* and the *Working Paper* that a weapon system that selects and engages to apply force against targets without direct human intervention may be characterized as an autonomous weapon system. On the other hand, the *Principles and Good Practices* provides an understanding of weapons systems based on emerging technologies in the area of LAWS, in the use of which the principles and good practices would be particularly relevant, to include those in which autonomous functions select and engage targets with lethal force and the system operator, before activation, does not identify specific targets for intended engagement. Meanwhile, in context of weapons prohibitions, the *Outline* uses fully autonomous *lethal* weapons systems to refer to those operating completely outside of a human chain of command and control.

The *Outline* accepts to delegate a certain number of decisional calculations in the process of identification, up to the point of engagement. Another key issue of note here is whether lethality is an intrinsic characteristic of a weapons system. The *Roadmap* explicitly calls for affirming that lethality is not an intrinsic characteristic but an effect or manner of use and any weapon system can contradict international law regardless of whether it is lethal or not. On the other hand, understandings of weapons systems based on emerging technologies in the area of LAWS provided in the *Outline* and the *Principles and Good Practices* include the aspect of lethal force.

Other views on characterization provided in the proposals:

- The *Principles and Good Practices* acknowledges that:
 - the role and impacts of autonomous functions in the identification, selection, or engagement of a target are among the essential characteristics of weapons systems based on emerging technologies in the area of LAWS;
 - emerging technologies in the area of LAWS can include novel advancements in the field of AI; and
 - characterization, or working definitions, should neither predetermine nor prejudice policy choices; they should be universally understood by stakeholders.
- The *Roadmap* includes a recognition that a working characterization is a useful starting point.

5. HUMAN-MACHINE INTERACTION/HUMAN CONTROL

This is a key theme across all proposals. Generally, there is common ground across proposals, which derives from the Guiding Principles, and which stress that human-machine interaction in the context of weapons systems based on emerging technologies in the area of LAWS should ensure that the use of such weapons is in compliance with international law, in particular IHL, that human responsibility cannot be transferred to machines, and that the operation of such systems must remain within a responsible chain of human control.

The views on how exactly to characterize the quality and extent of human-machine interaction reveal, however, some differences across the proposals.

Some proposals refer to the term “**human control**” (the *Working Paper*, the *IHL Document*), while others qualify it in more specific detail: “**appropriate/sufficient human control**” (the *Outline*), “**sufficient control**” (the *Elements*), and “**meaningful human control**” (the *Elements*, the *Roadmap*). The *Principles and Good Practices* refers to “**control**” and “**human command and control**”.

Considerations related to human control also reflect views on weapons prohibitions, where there are some differences:

- The *Outline* calls for prohibitions on weapons systems based on emerging technologies in the area of LAWS that operate outside of a human chain of command and control. The *Principles and Good Practices* and the Roadmap refer to prohibitions on weapons whose autonomous functions are designed to be used to conduct attacks outside the responsibility of the human command. The *Working Paper* refers to a ban on weapons systems based on emerging technologies in the area of LAWS that select and engage targets without any human control.
- The *Working Paper* refers in broader terms to prohibitions on all weapons that are not sufficiently controllable to meet legal requirements; the *Principles and Good Practices* further refers to the development of weapons systems such that their effects in attacks can be anticipated and controlled, as may be required, in the circumstances of their use, by the principles of distinction and proportionality and such that attacks conducted with reliance upon their autonomous functions will be the responsibility of the human command under which the system was used.

The framing of human control and of requirements of human-machine interaction include provisions such as the following:

- Requirements on “**human understanding**”. The *Outline* states that humans must be in a position to understand their roles and levels of responsibility, and the system’s way of operating, effects and likely interaction with the environment.
 - On “human understanding”, the *IHL Document* invites clarification on what levels of “human understanding” are acceptable, and how to measure and assess it, if an end user could understand the concept for use, and what level of understanding is required by each individual within the authority chain of weapon deployment.
- Requirements on training. The *Outline* calls for training decision makers and operators to understand the system’s effect and its likely interaction with its environment, and the *Principles and Good Practices* lists the training of personnel, such as training that enables operators and commanders to understand the functioning, capabilities, and limitations of the system’s autonomy in realistic operational environments, as a good practice related to human-machine interaction.
 - The *IHL Document* raises some points for clarification. For example, how is best training developed? How do varying levels of autonomy change this at both individual and collective levels? How does training prepare the force for the use of AI-enabled systems in highly stressful scenarios?
- On the **contextual nature of human control**. The *Roadmap* contends that meaningful human control is context-based, dynamic, multidimensional and situation-dependent, and must ensure that humans can make moral and legal judgments over the acceptability of the effects of an attack and that there is a human user who is legally and morally responsible for the effects of an attack; the *Elements* states that human control may vary throughout the stages of a weapon’s development and use.
- Other requirements are framed in the form of effective **oversight**, which would allow for timely intervention and deactivation (the *Working Paper*; the *Elements*, in the form of positive obligations).

- On this point, the *IHL Document* inquires, for example, how are operational limits or parameters best defined, and how might commanders abort the use of such systems? What considerations should be taken into account? How should this be handled in practice?
- There are some considerations **linked to design and testing**: ensuring that humans are in a position to evaluate and monitor the reliability of the systems, validate the usability/serviceability of the systems (the *Outline*), and conduct rigorous testing and evaluation of systems to ensure they function as anticipated (the *Principles and Good Practices*); to define and validate rules of use and rules of engagement (the *Outline*, the *Principles and Good Practices*); to define and validate a precise framework for the mission assigned to the system (objective, type of targets, restrictions in time and space etc.) (the *Outline*), and circumscribing weapons use through appropriate measures to mitigate the risks of unintended engagements (the *Principles and Good Practices*; the *Roadmap* also refers to risks of unintended engagements in the section on Risk Mitigation). Among the good practices identified by the *Principles and Good Practices* are the incorporation of readily understandable human-machine interfaces and controls, reporting incidents that may involve violations, and ensuring domestic legal frameworks under which a State can hold its personnel accountable.
 - The *IHL Document* invites clarification on several of these points. For example, what kind of testing is needed? What is an acceptable fail rate? How might varying levels of autonomy affect target identification, the application of rules of engagement and the assessment of proportionality? How are necessary constraints identified and implemented?
- The *Elements* calls for **positive obligations**, in the form of regulations, on some of these aspects of human control over weapons systems based on emerging technologies in the area of LAWS, including insuring that sufficient human control is exercised over critical functions of target selection and application of force throughout the development and use of the weapon; that adequate environmental, spatial and temporal limits are in place; that human agents are fully aware and approve any decision on determining the operational context through a sufficient level of situational awareness; that humans are certain of the reliability and predictability in the identification, selection and engagement of targets; that they take precautions to ensure that a weapons system is not able to change mission parameters without human validation; and that humans exercise constant supervision and ensure intervention where necessary to interrupt and deactivate the weapon, and verify that auto-deactivation functions as intended. A final provision in this section is that it is the responsibility of commanders and operators to ensure that they can comply with their legal obligations in the deployment and use of weapons systems based on emerging technologies in the area of LAWS.
 - The *IHL Document* raises the question on how situational understanding is passed between human and system.
- The *Elements* states that choices made exclusively by algorithms integrated in weapons systems based on emerging technologies in the area of LAWS with regard to the selection of targets and the use of force shall never be considered tantamount to human control.

Two documents refer in particular to machine learning. The *IHL document* asks for clarification on how might machine learning “in the wild” impact testing and evaluation; the *Roadmap* document affirms that the application of machine learning could have implications on the maintenance of meaningful human control.

6. RESPONSIBILITY AND ACCOUNTABILITY

There are common views on certain general aspects concerning principles related to accountability and responsibility among the five proposals that explicitly express views on the issue, namely the *Elements*, the *Outline*, the *Principles and Good Practices*, the *Roadmap*, and the *Working Paper*. These aspects that should be considered across the entire life cycle of weapons systems based on emerging technologies in the area of LAWS include that:

- Humans shall at all times remain accountable for decisions on the use of force.
- Human responsibility for decisions on the use of force must be retained.
- Human responsibility and accountability cannot be transferred to machines.

On the principles of State responsibility, both the *Principles and Good Practices* and the *Roadmap* state that:

- every internationally wrongful act of a State, including such conduct involving the use of weapons systems based on emerging technologies in the area of LAWS, entails the international responsibility of that State; and
- the conduct of a State's organs such as its agents and all persons forming part of its armed forces, is attributable to the State. Such conduct includes any such acts and omissions involving the use of a weapons system based on emerging technologies in the area of LAWS.

On individual responsibility, the *Elements*, the *Outline* and the *Principles and Good Practices* recognize that States and individuals at all times remain responsible for acting in compliance with their obligations under applicable international law, including IHL. Other than States and individuals, the *Principles and Good Practices* specifies that such responsibility is applicable to parties to armed conflict, and as well includes that States must ensure individual responsibility for the potential use of weapons systems based on emerging technologies in the area of LAWS in accordance with their IHL obligations.

With regard to the scope of the application of principles of State and individual responsibility, proposals including the *Principles and Good Practices* and the *Roadmap* focus on internationally wrongful acts conducted during the use of weapons systems based on emerging technologies in the area of LAWS. On the other hand, the *Elements* explicitly provides that States and individuals remain responsible for violations of international law, including IHL, incurred not just during the use of weapons systems based on emerging technologies in the area of LAWS, but also during the development of such weapons systems. It further states that measures shall be taken to ensure that responsibility can be attributed to States and individuals throughout development and use—from the definition of military, strategic and operational-level objectives, to the research and development, design, manufacturing, deployment, and use.

With regard to measures for ensuring State and individual responsibilities and accountability, the *Elements* provides that, to comply with States' obligations under international law to prosecute and punish crimes, States should ensure means to conduct effective investigations, prosecution and punishment for violations involving the use of weapons systems based on emerging technologies in the area of LAWS. The *Outline* also enlists similar measures to ensure accountability in the event of IHL violations, including mechanisms for after-action review of the weapons system, reporting violations, conducting investigations, disciplinary procedures, and prosecution as appropriate.

Other views on responsibility and accountability provided in the proposals are as follows:

- The *Outline* states that preserving human responsibility and accountability at all times across the entire life cycle requires spatial and temporal limits on weapons systems based on emerging technologies in the area of LAWS that may vary according to the situation or context of their employment. In addition, the *Outline* provides measures and policies to operationalize the general provision related to preserving human responsibility and accountability, to be implemented at the national level.
- With regard to ensuring accountability, the *Elements* provides that decisions on the use of weapons systems based on emerging technologies in the area of LAWS shall be made within an established chain of human command and control to allow for legal assessments regarding conduct, intent and causality, before, during and after the use of such weapons systems.

7. LEGAL REVIEWS

This is a subject covered in all proposals. There is common ground across all proposals about the importance of legal reviews at the national level.

One **difference** resides in the fact that the *Working Paper*, the *Outline* and the *IHL Document* (indirectly, under the heading 'Article 36 Weapon Reviews') tie this obligation to Additional Protocol I, while the *Elements* and the *Roadmap* refer to this as an obligation under international law, and the *Principles and Good Practices* refers to obligations under international law and agreed language in the GGE, namely Guiding Principle (e), and the 2019 GGE Report and the 2018 GGE Report.

Several proposals encourage a range of **good practices** on this matter, such as an encouragement to exchange of information and good practices (the *Outline*, the *Working Paper*; the latter does not explicitly list this under the paragraph on Legal Reviews but in the context of confidence-building measures to complement international rules), to consider if the use of the weapon is subject to other CCW Protocols or other applicable rules (the *Principles and Good Practices*), and to consider other measures that may assist in ensuring compliance with IHL, including good practices linked to human-machine interaction (the *Principles and Good Practices*).

Several proposals raise the point about **possible limitations of weapons reviews** mechanisms in the context of weapons systems based on emerging technologies in the area of LAWS. The *Working Paper* deems weapons reviews insufficient though playing an important complementary role, and the *Elements* notes the complexity of weapons reviews in the context of weapons involving techniques or tools related to AI.

The *Elements* also includes a list of regulations on the review of weapons systems based on emerging technologies in the area of LAWS, which should include assessments on their attributes and effects (e.g., design and characteristics, technical performance, intended use, etc.), and recommends a precautionary approach. The *Roadmap* calls for the integration of interdisciplinary perspectives in research and development. The *IHL Document* raises several questions for further clarification, such as on the information and level of understanding necessary to inform weapons reviews in the context of autonomous systems, and whether machine learning necessitates re-review and authorization.

8. RISK MITIGATION

There is, generally speaking, a high degree of similarity across proposals about defining and addressing risks of weapons systems based on emerging technologies in the area of LAWS. Three proposals, namely the *Roadmap*, the *Principles and Good Practices*, and the *Outline*, have distinct sections on risks assessments, risks mitigation, and safeguards. A significant part of the language on risks draws on **agreed language**, especially Guiding Principles (f) and (g).

Assessments of **risks** in the area of weapons systems based on emerging technologies in the area of LAWS include considerations related to the design, development, testing and deployment cycle; risks of proliferation; risks of acquisition by terrorist groups (the *Principles and Good Practices*, the *Roadmap*); resilience against cyberattacks (the *Outline* and the *Roadmap*; the *Principles and Good Practices* refers to cyber security safeguards in the section Good Practices Related to Human–Machine Interaction); and against hacking and data spoofing (the *Roadmap*, the *Principles and Good Practices*).

Two Proposals (the *Roadmap*, the *Principles and Good Practices*) discuss the **risk of unintended engagements** (the *Principles and Good Practices* refers to this in the section Good Practices Related to Human–Machine Interaction), and other risks such as to civilians and civilian objects. Some proposed **mitigation measures** include limits on types of targets; limits on geographical scope (the *Principles and Good Practices*, the *Roadmap*); efforts to reduce automation bias (the *Principles and Good Practices*); incorporation of self-destruct, self-deactivation, or self-neutralization mechanisms (the *Roadmap*, the *Principles and Good Practices*, the *Outline*); procedures for a human operator to deactivate the system, “unless technically not feasible” (the *Outline*); and other mechanisms to enhance control or improve decision-making, such as through measures related to timing, precision, and accuracy (the *Principles and Good Practices*). The *IHL Document* raises several points for further clarification, including on how risk is best calculated, and what constitutes best practice in identifying and implementing appropriate constraints.

The explicit reference to risks in the *Elements* is in the Conclusions, where the document refers to risks generated by hardware and software and the risks linked to why and how they are used.

9. ETHICAL CONSIDERATIONS

Ethical consideration feature across the proposals, although there are some differences in how references to ethical considerations are conceptualized and how they are tied to other policy or legal requirements. There is an explicit connection between ethics and human dignity in three proposals, namely the *Working Paper*, the *Elements*, the *Roadmap*, and two proposals make a connection between **ethics and human agency**, namely the *Roadmap* and the *Elements*.

Two proposals refer to ethics in the preambular section. The *Outline* calls for a reference to “**relevant ethical perspectives**”, and the *Principles and Good Practices* refers to “relevant ethical perspectives”, as one source to guide continued consideration and elaboration of possible measures and options related to the normative and operational framework on weapons systems based on emerging technologies in the area of LAWS. The latter document refers to the integration of **independent ethics reviews** in research and development, drawing on the 2018 GGE Report.

The *Working Paper* ties the reference to ethical considerations to the lack of human control, affirming that autonomous systems that can select and engage targets without any human control are both unlawful and questionable from an ethical point of view, particularly with regard to human dignity (a point also raised by the *Elements*).

The *Roadmap* highlights three main ethical concerns related to 1) possible loss of human dignity; 2) possible loss of human agency in decisions about the use of force (also raised by the *Elements*); and 3) the erosion of moral responsibility and accountability. In a separate point, it recalls the relevance of the Martens clause, which brings together law and ethics. In the section National Weapons Review it also calls for independent ethics reviews. The *Principles and Good Practices* also refers to carrying out independent ethics reviews as a possible risk assessment and mitigation measure, drawing on the 2018 GGE Report.

The *Elements* flags several ethical concerns related to weapons systems based on emerging technologies in the area of LAWS, such as issues of predictability and reliability, and contends that ethical perspectives should guide the work of the GGE on retaining human agency and intent in the decision to use force, ensuring State responsibility and individual accountability, and upholding the principles of humanity and human dignity. Ethical considerations are subsequently included in the section on Recommendations on prohibitions and regulations. Here the document makes the case for certain prohibitions as a matter of compliance with both legal obligations and ethical precepts (for example, of weapons systems based on emerging technologies in the area of LAWS that cannot be controlled by humans) and it calls for certain positive obligations (such as, for example, on ensuring sufficient human control) in line with obligations under IHL and ethical requirements.

The *IHL Document* contends that questions of ethics be addressed in an applied and context-appropriate manner so as to prevent the ‘ethics issue’ becoming an intangible catch-all which defies inclusion in either consideration of the legal framework or as a matter of practice, and that best practice guidelines need to be developed both for ethical concerns in research methodology and ethical concerns in relation to command accountability.

10. PEACEFUL USES OF AI

The Outline and the *Roadmap* explicitly call for a **recognition of the necessity to ensure progress in or access to peaceful uses of AI** technologies. This has been affirmed by the High Contracting Parties in Guiding Principle (j). Therefore, other proposals including the *Principles and Good Practices* and the *Working Paper* affirm this in recalling the eleven Guiding Principles.

The *Roadmap* further calls for the elaboration of Guiding Principle (j) to include an agreement that any discussion and **policy measure taken within the context of the CCW should not hinder** the right of each High Contracting Party to access, develop, research, produce and use AI technologies for peaceful purposes without discrimination.

PART III: ISSUES FOR FURTHER CONSIDERATION

The thematic analysis of the proposals reveals that there is some common ground among States on key issues. Nevertheless, there remain important differences and open questions that need to be addressed and clarified by the Group to achieve progress towards a substantive outcome that accounts for the complexity of weapons systems based on emerging technologies in the area of LAWS, particularly in light of rapid advances in AI and machine learning.

The list of questions below, while not exhaustive, reflects key areas for further work to reach shared understandings on aspects related to the application of IHL; weapons prohibitions and other regulations/restrictions; application of IHRL and ICL; characterization; general requirements regarding human-machine interaction and human control; responsibility and accountability through legal reviews; risk mitigation; ethical considerations; and peaceful uses of AI. These open questions are meant to stimulate in-depth and constructive exchanges to facilitate progress in the work of the Group.

Theme	Issues for Further Consideration
1. Application of International Humanitarian Law (IHL)	<ul style="list-style-type: none"> • How could the exercise of distinction, proportionality, and precaution be ensured during the use of weapons systems based on emerging technologies in the area of LAWS? • What does the implementation of the Martens clause entail in the context of the use of weapons systems based on emerging technologies in the area of LAWS? • Elaborate on the human element with respect to compliance with the principles and requirements of IHL.
2. Weapons Prohibitions and Regulations/Restrictions	<ul style="list-style-type: none"> • What criteria qualify a weapons system based on emerging technologies in the area of LAWS to be prohibited in all circumstances? • What is the scope of prohibitions? • What other regulations or restrictions should be imposed?
3. Application of International Human Rights Law (IHRL) and International Criminal Law (ICL)	<ul style="list-style-type: none"> • What are the IHRL and ICL elements that are relevant to the discussions on emerging tech in the areas of LAWS?
4. Characterization	<ul style="list-style-type: none"> • What does the characterization of emerging technologies in the area of LAWS <u>with a focus on the human element</u> entail? • What is the scope of characterization of weapons systems based on emerging technologies in the area of LAWS?

Theme	Issues for Further Consideration
5. Human–Machine Interaction/Human Control	<ul style="list-style-type: none"> • What requirements and criteria for human control are necessary for IHL compliance, taking into account advances in AI and machine learning? • How does the understanding that ‘autonomy exists on a spectrum’ impact considerations of human–machine interaction and human control?
6. Responsibility and Accountability	<ul style="list-style-type: none"> • How do the principles of State and individual responsibility apply in context of weapons systems based on emerging technologies in the area of LAWS? • What measures need to be taken to ensure State and individual responsibility?
7. Legal Reviews	<ul style="list-style-type: none"> • How would legal reviews be conducted effectively for weapons systems based on emerging technologies in the area of LAWS that have varying levels of autonomy, and which use AI, machine learning, or other subfields of AI? <ul style="list-style-type: none"> ◦ Are there additional challenges that need to be considered? How does the level of autonomy impact the conduct of legal reviews?
8. Risk Mitigation	<ul style="list-style-type: none"> • How can risk mitigation standards be developed specific to the types of systems and operational contexts of their use?
9. Ethical Considerations	<ul style="list-style-type: none"> • How would ethical considerations, including the principles of humanity and dictates of public conscience determine the applicability of, and limits on, the use of weapons systems based on emerging technologies in the area of LAWS?
10. Peaceful Uses of AI	<ul style="list-style-type: none"> • How can the principle of ensuring progress in or access to peaceful uses of AI—see Guiding Principle (j)—be taken into account in discussions on weapons prohibitions and regulations/restrictions?

PROPOSALS
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