

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

A Resource Paper (updated)

Disclaimer

This Resource Paper is an updated version of the previous document UNIDIR released in July 2022, and includes the following additional submissions to the GGE on LAWS in 2022 that were not included in the previous version: *Elements for a Legally Binding Instrument to Address the Challenges Posed by Autonomy in Weapon Systems*; *Protocol VI*; *Working Paper* submitted by Finland, France, Germany, the Netherlands, Norway, Spain and Sweden; *Working Paper of the People's Republic of China on LAWS*, and *Working Paper of the Russian Federation 'Application of International Law to Lethal Autonomous Weapons Systems (LAWS)'*.

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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 weapons 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 (GGE) related to emerging technologies in the area of lethal autonomous weapon systems (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 2022 session of the GGE on LAWS, 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.

In 2022, following the meeting of the High Contracting Parties to the CCW, held in Geneva 16–18 November, it was decided:

32. [...] That the work of the open-ended Group of Governmental Experts related to emerging technologies in the area of lethal autonomous weapon systems established by Decision 1 of the Fifth Review Conference as contained in document CCW/CONFV/10, adhering to the agreed recommendations contained in document CCW/CONFV/2, is to continue, to strengthen the Convention. In the context of the objectives and purpose of the Convention, the Group is to intensify the consideration of 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.²

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

2 Final Report of the Meeting of the High Contracting Parties to the CCW, [CCW/MSP/2022/7](#), 24 November 2022.

This mandate essentially extended the previous mandate, with the added goal of ‘intensifying’ the consideration of proposals.

The purpose of this resource paper is to offer a comparative analysis of the different proposals presented by States with a view to identifying both common views and areas requiring further discussion. A draft version of this paper was prepared to serve as a supporting document for a roundtable discussion organized by UNIDIR on 30 May 2022.³

This Resource Paper is an updated version of the previous paper released in July 2022, and includes an updated analysis based on the following additional documents submitted to the GGE on LAWS in 2022: Elements for a legally binding instrument to address the challenges posed by autonomy in weapon systems; Protocol VI; Working Paper submitted by Finland, France, Germany, the Netherlands, Norway, Spain and Sweden; Working Paper of the People’s Republic of China on LAWS; and Working Paper of the Russian Federation “Application of International Law to Lethal Autonomous Weapons Systems (LAWS)”.

3 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

- I. To conduct the comparative analysis of the proposals, the resource paper adopted the following approach: eleven thematic areas that cover the key elements of the 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); and (11) potential benefits of autonomy in weapon systems.
- II. The content of the proposals was then organized by theme in tabular format – a table was developed for each of the 11 themes including the language on or relevant to that theme from each of the 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.

CAVEATS CONCERNING THE METHODOLOGY AND ANALYSIS

- We recognize that in the GGE there are different understandings of the term 'emerging technologies' in the area of LAWS and that proposals have been written in the context of those understandings. In light of these differences, throughout the analysis we have used the GGE framing of weapons systems based on emerging technologies in the area 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 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 passages in the proposals reflect views on more than one identified theme—in these instances the same passage is analysed under more than one theme.

THE RESOURCE PAPER HAS THE FOLLOWING STRUCTURE:

- I. **Summary of Current Proposals.** The first section provides a summary of each of the 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 11 themes..
- III. **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 proposals. The annex has been updated to include the additional submissions to the GGE on LAWS in 2022. 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 Legally Binding Instrument to Address the Challenges Posed by Autonomy in Weapon Systems

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

Submitted by: Chile and Mexico

Date: Originally introduced on 5 August 2021, and based on the previous contribution: “*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)”.

Scope: The *Elements* paper provides an overview of the debate on LAWS and argues for the need for a holistic and multidimensional understanding of the effects of incorporating autonomy in weapons systems. Drawing on these considerations, the paper proposes a draft text containing prohibitions and regulations that may be part of a legally binding instrument, and which derive, according to The *Elements*, from the substantive discussions within the GGE on LAWS.

Intended Outcome/Implementation: The *Elements* recommends the elaboration of a legally binding instrument on prohibitions and regulations for weapons which incorporate autonomous functionalities.

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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 2021

Scope: The *Outline* includes a normative and operational framework to be expanded and developed by the GGE. 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* suggest 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: Protocol VI

[referred to as the *Protocol VI* in the analysis]

Submitted by: Argentina, Ecuador, Costa Rica, Nigeria, Panama, Philippines, Sierra Leone and Uruguay

Date: July 2022

Scope: The *Protocol VI* provides a draft of a protocol to the Convention on Certain Conventional Weapons that shall apply to all emerging technologies in the area of autonomous weapons systems. It includes seven articles relating to General Provisions, Characterization, Prohibitions and Regulations, Review of Weapons, Risk Mitigation, Compliance and Consultations of High Contracting Parties.

Intended Outcome/Implementation: The *Protocol VI* provides that, in accordance with the Charter of the United Nations and of the rules of applicable international law, the High Contracting Parties shall agree to comply with the obligations specified in the Protocol to address the serious ethical, legal, humanitarian and security risks and challenges posed by the development of emerging autonomous weapon systems.

Under Articles 6, the *Protocol VI* includes provisions for compliance with respect to violations of the protocol by persons or on territory under a High Contracting Party's jurisdiction or control and resolving any problems that may arise regarding the interpretation and application of the provisions of, and to strengthen, the protocol.

Under Article 7, the *Protocol VI* includes that High Contracting Parties undertake to consult and cooperate with each other on all issues related to the operation of the Protocol. For this purpose, the *Protocol VI* provides that a conference of High Contracting Parties shall be held annually (participation in which shall be determined by their agreed Rules of Procedure), and that High Contracting Parties shall provide annual reports on their compliance with this Protocol and other relevant matters to the Implementation Support Unit, which shall circulate them among all the High Contracting Parties in advance of the conference.

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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.

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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: 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.

Title: Working Paper of the People’s Republic of China on Lethal Autonomous Weapons Systems

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

Submitted by: China

Date: July 2022

Scope: The *China Working Paper* provides China’s position on regulating military applications of AI, particularly LAWS. The Paper elaborates on the definition and categorization of LAWS, and on China’s suggested approach to classify autonomous weapons systems in two categories— unacceptable and acceptable— and to prohibit unacceptable systems and to regulate acceptable systems.

Intended Outcome/Implementation: The Paper calls for prohibiting unacceptable weapon systems and regulating the acceptable weapon systems. China welcomes positive feedback from all parties and further discussions based on this paper.

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Title: Working Paper of the Russian Federation “Application of International Law to Lethal Autonomous Weapons Systems (LAWS)”

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

Submitted by: Russian Federation

Date: July 2022

Scope: The *Russia Working Paper* reaffirms the full application of IHL in the context of LAWS, and provides an overview of the provisions for compliance with IHL obligations in the Russian Federation’s practice and law. It further elaborates on measures and mechanisms for ensuring compliance (e.g., adequate legal training), on responsibility, and on other measures that may help to increase IHL compliance in the process of LAWS development and use.

Intended Outcome/Implementation: The *Russia Working Paper* elaborates on the application of IHL to LAWS and outlines several measures to ensure IHL compliance.

Title: Working paper submitted by Finland, France, Germany, the Netherlands, Norway, Spain, and Sweden to the 2022 Chair of the Group of Governmental Experts (GGE) on emerging technologies in the area of lethal autonomous weapons systems (LAWS)

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

Submitted by: Finland, France, Germany, Netherlands, Norway, Spain, Sweden

Date: July 2022

Scope: The paper outlines a possible structure for measures related to the normative and operational framework on LAWS. The recommended structure includes first, a preambular part, and second, a part on the operationalization of the two-tier approach, which details suggested provisions for outlawing and regulating LAWS.

Intended Outcome/Implementation: The *Group Working Paper* recommends the GGE on LAWS to seek consensus on a two-tier approach.

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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)

[referred to as the *Signpost 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, Philippines, Sierra Leone, Sri Lanka, State of Palestine, Switzerland, Uruguay

Date: April 2022

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

Intended Outcome/Implementation: The *Signpost Paper* suggests that the deliberations of the Group must result in a substantive outcome. In this regard, the *Signpost 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. The *Signpost Paper* also states that, to uphold the rules of IHL, 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 PROPOSALS ARE REFERRED TO AS FOLLOWS:

| Full Title | |
|---|--------------------------------------|
| Elements for a Legally Binding Instrument to Address the Challenges Posed by Autonomy in Weapon Systems | <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> |
| Protocol VI | <i>Protocol VI</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 of the People's Republic of China on Lethal Autonomous Weapons Systems | <i>China Working Paper</i> |
| Working Paper of the Russian Federation "Application of International Law to Lethal Autonomous Weapons Systems (LAWS)" | <i>Russia Working Paper</i> |
| Working Paper submitted by Finland, France, Germany, the Netherlands, Norway, Spain, and Sweden to the 2022 Chair of the Group of Governmental Experts (GGE) on emerging technologies in the area of lethal autonomous weapons systems (LAWS) | <i>Group Working Paper</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>Signpost Paper</i> |

1. APPLICATION OF INTERNATIONAL HUMANITARIAN LAW

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 *IHL Document*, *Principles and Good Practices*, and *Russia Working Paper* 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*, *China Working Paper*, *Group Working Paper*, *IHL Document*, *Outline*, *Principles and Good Practices*, and *Russia Working Paper* all explicitly refer to distinction, proportionality, and precautions in attack.

Distinction. The *Elements*, *IHL Document* and *Principles and Good Practices* explicitly 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 *IHL Document* also specifies that the principle of distinction applies also *hors de combat*—distinction must be made between active combatants and those out of action. 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. The *IHL Document* and the *Principles and Good Practices* explicitly 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. Similarly, the *Russia Working Paper* states that precautions contained in Articles 57 and 58 of Protocol I Additional to the Geneva Conventions of 1949 are to be taken with respect to attacks, and that it is banned to use LAWS in prohibited ways (methods) of warfare listed in Section II of the International Humanitarian Law Manual for the Armed Forces of the Russian Federation. The said provisions are reproduced in the Section on Specificities of Conducting Field Operations of the International Humanitarian Law Manual for the Armed Forces of the Russian Federation of 8 August 2001.

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. The *IHL Document* additionally 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, 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 deactivate the system if and when necessary, unless technically not feasible.

On the requirements and principles of IHL, **the *Elements*, *IHL Document* and *Russia Working Paper* also refer to 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.

On the scope of the application of requirements and principles of IHL, 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 *Russia Working Paper*, which concerns the application of international law to weapons systems based on emerging technologies in the area of LAWS, provides that provisions of the working paper should be applied with due regard to the situation, while resolutely working to ensure the unconditional implementation of combat tasks in compliance with the IHL norms. On the other hand, the *Elements* states that autonomous functionalities in weapons systems call for a broader approach than the traditional scope of IHL—IHL would need to focus not only on use but also other aspects in the weapon's life cycle.

Further, the *Russia Working Paper* elaborates on measures for ensuring compliance with IHL by the personnel of the armed forces in the potential use of weapons systems based on emerging technologies in the area of LAWS. It provides that adequate legal training for the personnel of the armed forces is a key component of ensuring a high level of compliance with IHL while using LAWS. In this context, it further provides that in armed conflicts, including when carrying out missions of maintaining or restoring international peace and security, legal support for operations carried out by troops (forces) in these circumstances with a view to ensuring compliance with IHL is provided through:

- studying international humanitarian law by military personnel;
- conducting legal review of draft combat and other documents;
- advising commanders (senior officers) on issues of the application of IHL taking into account execution of specific combat tasks; and
- assisting commanders in establishing interaction with local authorities' bodies and humanitarian organizations working in the operational area of troops (forces).

The *Principles and Good Practices, Roadmap, and IHL Document* **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 *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 be made in good faith based on their assessment of the information available at the time. Meanwhile, the *Elements, Roadmap* and *Signpost Paper* provide that human control over the weapons systems in question is essential to ensure compliance with IHL. In this regard, the *Signpost 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 context of an attack, and thus take critical decisions over the use of force.

Of note, with regard to the application of IHL, the Elements states that while existing international law including IHL is applicable, it is insufficient because its fundamental rules regarding the use of force were designed when humans made value judgements notably vis-à-vis the principles of distinction, proportionality, precautions in attack and military necessity at the moment of the application of force. In light of this, it stresses the need to clarify, strengthen and advance IHL regarding the specific challenges posed by weapons systems based on emerging technologies in the area of LAWS.

2. WEAPONS PROHIBITIONS AND REGULATIONS/RESTRICTIONS

On the important issue of weapons prohibitions and regulations/restrictions, the so-called two-tier approach is gaining widespread support. This approach entails prohibiting autonomous weapon systems that cannot be used in compliance with IHL and regulating other types of autonomous weapon systems. However, there are divergent views on what form such weapons prohibitions and regulations/restrictions should take.

Weapons Prohibitions

There is common ground among all proposals 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. The *Group Working Paper* states that such weapon systems are de facto prohibited. However, this is also an important point of divergence as some are of the opinion that these are already prohibited under existing law, and therefore new law to specify this is not needed, while others are calling for new law (namely the *Elements*, *China Working Paper*, *Group Working Paper*, *Outline*, *Protocol VI*, *Roadmap*, and *Signpost Paper*), including in the form of a legally binding instrument. In this regard, the *Elements* explicitly asserts that the challenges posed by autonomy in weapon systems are of such nature that there is a clear need for a legally binding instrument because existing international law, including IHL, while still applicable, is insufficient as fundamental rules regarding the use of force were designed when humans made value judgements notably vis-à-vis the principles of distinction, proportionality, precautions in attack and military necessity at the moment of the application of force.

Meanwhile, in this context, the *Group Working Paper* comments that the States submitting the working paper should seek consensus on a two-tier approach, and that further work is needed to operationalize this commitment at the national level. Further in line with the two-tier approach, the *China Working Paper* proposes that Parties should consider classifying weapons systems based on emerging technologies in the area of LAWS into two categories—unacceptable and acceptable—and prohibit the unacceptable weapons systems and regulate the acceptable weapons systems in order to ensure relevant weapons systems are secure, reliable, manageable and in line with IHL and other applicable international law. It emphasizes that this classification will not hamper further discussions concerning definitions and should not exceed the mandate of the GGE. Explaining its proposal, the *China Working Paper* states that weapons systems with autonomous functions at certain links of the kill chain (observation, orientation, decision, action and other critical links) may not necessarily cause indiscriminate effects, therefore general prohibitions or restrictions may undermine the legitimate defence capabilities of States and even their rights to use relevant technologies peacefully.

Elaborating on which weapons systems based on emerging technologies in the area of LAWS cannot be used in accordance with IHL, the *Protocol VI*, *Principles and Good Practices* and *Roadmap* 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. Here, the *Protocol VI*

also specifies that prohibitions should include weapons systems based on emerging technologies in the area of LAWS that are incapable of distinguishing between civilians, enemy combatants and combatants hors de combats. Further, in this context, the *Protocol VI* and *Roadmap* state that such weapons systems would not be in compliance with the dictates of public conscience. Likewise, the *Elements* calls for prohibiting the development and the use of weapons which incorporate autonomous functionalities which cannot be directed at a specific military objective and cause superfluous injury or unnecessary suffering. Similarly, the *Russia Working Paper* also affirms that it is prohibited to use weapons and methods of warfare of a nature to cause superfluous injury or unnecessary suffering. It further provides that it is banned to use weapons systems based on emerging technologies in the area of LAWS in prohibited ways (methods) of warfare listed in Section II of the IHL Manual for the Armed Forces of the Russian Federation.

Further, in this context, the *Roadmap* and the *Signpost 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.

Proposals have also called for prohibitions on weapons systems based on emerging technologies in the area of LAWS based on the human element. There is common ground between the *Roadmap* and *Signpost 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 *Signpost Paper* further state that such weapons systems would also be questionable from an ethical point of view, particularly with regard to human dignity. Similarly, the *Protocol VI* includes prohibitions on weapons systems based on emerging technologies in the area of LAWS wherein their autonomous functions are designed to be used to conduct attacks outside meaningful human control. Likewise, the *Elements* provides that the development and use of weapons with autonomous functionalities that cannot be controlled by humans are subject to cognitive and epistemological limitations and should be prohibited. In line with this, the *Outline* and *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. Likewise, the *Group Working Paper* provides that weapons systems based on emerging technologies in the area of LAWS operating completely outside human control and a responsible chain of command are unlawful and should be prohibited. However, it is important to note that with regard to prohibitions, the *Roadmap* and *Signpost Paper* refer to systems that select and engage targets without human control. By contrast, the *Outline* accepts to delegate a certain number of decisional calculations in the process of identification up to the point of engagement.

On the other hand, **the China Working Paper outlines basic characteristics of unacceptable weapons systems** based on emerging technologies in the area of LAWS that it suggests should be prohibited. Of note, it specifies that such unacceptable weapon systems should include but are not limited to these characteristics. The basic characteristics include the following. First, lethality, meaning sufficient lethal payload (charge) and means. Second, autonomy, meaning absence of human intervention and control during the entire process of executing a task. Third, impossibility for termination, meaning that once started, there is no way to terminate the operation. Fourth, indiscriminate killing, meaning that the device will execute the mission of killing and maiming regardless of conditions, scenarios and targets. Fifth, evolution, meaning that through interaction with the environment, the device can learn autonomously, expand its functions and capabilities in a degree exceeding human expectations. It then affirms that weapons systems with all of the five characteristics have anti-human characteristics and significant humanitarian risks, and therefore the international community could work to reach a legal instrument to prohibit such weapons systems following the example of the Protocol on Blinding Laser Weapons.

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 of 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 (that specify it) on 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 *Protocol VI* and *Roadmap* call 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 *Group Working Paper* and *Outline* propose prohibitions on the development, production, acquisition, deployment, or use. Meanwhile, the *Signpost Paper* calls for prohibitions on the development, deployment or use. Finally, the *Russia Working Paper* refers to prohibitions only in context of 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*, *China Working Paper*, *Group Working Paper*, *Roadmap*, *Protocol VI* and *Signpost Paper* in line with the two-tier approach broadly recognize the **need for 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 weapons systems incorporating autonomy are used with meaningful human control.

In line with this, the *Roadmap* and *Signpost 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. The *Elements* and *Roadmap* also put 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 specify that a legally binding instrument is needed to safeguard against risks and challenges posed by emerging technologies in the area of LAWS. Further in this context, the *Elements* emphasizes that a fragmented approach through national measures gives leeway to dispersion and lack of homogeneity in the adopted measures which is contrary to the interest of having an international benchmark from which compatible national measures are implemented. 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. Similarly, the *China Working Paper*, in context of regulations for what it understands as acceptable weapons systems based on emerging technologies in the area of LAWS, includes that States should decide on their own specific measures and implementation mechanism based on their own national situation.

With respect to what these limits and rules could entail, the *Signpost Paper* elaborates:

- 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 to 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 humans exercise control in the use of weapons systems based on emerging technologies in the area of LAWS, in line with IHL obligations and ethical requirements (similar to the *Signpost Paper*). 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 human operator shall:

- be certain that there are adequate environmental limits in place, including spatial and temporal limits (similar to the *Signpost Paper*);
- be fully aware and approve any decision on determining the operational context through a sufficient level of situational awareness;
- be certain of the reliability and predictability in the identification, selection, and engagement of targets;
- take necessary precautions during the conduct of operations to ensure that a weapons system is not able to change mission parameters without human validation; and
- allow for constant human supervision and ensure intervention where necessary (similar to the *Signpost Paper*) as to be able to:
 - interrupt and deactivate the weapon during its operation phase; and
 - verify that auto-deactivation features operate as intended, in particular when required by the legal assessment of the user.

The draft legally binding instrument on prohibitions and regulations proposed in the *Elements* also includes that States should ensure that there are means to conduct effective investigations, prosecution and punishment for violations incurred during the use of weapons with autonomous functionalities to ensure individual responsibilities. It emphasizes 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 with autonomous functionalities. Further, the *Elements* also recognizes that given technological advancements which impact autonomy in weapons systems, States may need to identify additional recommendations guided by the principles of humanity and the dictates of public conscience which may include additional prohibitions and regulations, as well as voluntary measures and exchange of best practices.

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 (common in all proposals);
- 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* and *Signpost 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* and *Signpost Paper*); and
- commit to adopt and implement tailored risk-mitigation measures and appropriate safeguards regarding safety and security.

Likewise, to operationalize the two-tier approach, the *Group Working Paper* calls High Contracting Parties to commit to only develop, produce, acquire, modify, deploy, or use weapons systems based on emerging technologies in the area of LAWS when the following provisions are fulfilled:

- compliance with international law is ensured when studying, acquiring, adopting or modifying (legal review—see Guiding Principle e) and using lethal weapons systems featuring autonomy;
- appropriate human control is retained during the whole life cycle of the system (similar to the *Elements*, *Outline* and *Signpost Paper*) considered (see Guiding Principle c) by ensuring that humans will be in a position to:
 - **at all times:** have sufficient assurance that weapons systems, once activated, act in a foreseeable manner (similar to the *Elements*, *Outline* and *Signpost Paper*) in order to determine that their actions are entirely in conformity with applicable national and international law, rules of engagement, and the intentions of its commanders and operators. For this purpose, developers, commanders and operators—depending on their role and level of responsibilities—must have a sufficient understanding of the weapons systems’ way of operating, effect and likely interaction with its environment. This would enable the commanders and operators to predict (prospective focus) and explain (retrospective) the behaviour of the weapons systems;

- **during the development phase:** evaluate the reliability and predictability of the system (similar to the *Elements*), by applying appropriate testing and certification procedures, and assess compliance with IHL through legal reviews;
 - **during the deployment:** define and validate rules of use and rules of engagement as well as a precise framework for the mission assigned to the system (objective, type of targets etc.), in particular by setting spatial and temporal limits that may vary according to the situation and context, and monitor the reliability and usability of the system (similar to the *Elements, Outline and Signpost Paper*); and
 - **when using:** exercise their judgement with regard to compliance with rules and principles of IHL, in particular distinction, proportionality and precautions in attack, and thus take critical decisions over the use of force. This includes human approval for any substantial modification of the mission's parameters or its communication links, and the ability to deactivate the system if and when necessary, unless technically not feasible (similar to the *Elements, Outline and Signpost Paper*).
- human responsibility and accountability is preserved (see Guiding Principles b and d) at all times, in all circumstances and across the entire life cycle as basis for State and individual responsibility and can never be transferred to machines. The *Group Working Paper* also includes measures that shall be implemented to this end, which include:

on responsibility:

- doctrines and procedures for the use of lethal weapons systems featuring autonomy;
- adequate training for human decision makers and operators to understand the system's effect and its likely interaction with its environment; and
- operation of the system within a responsible chain of human command, including human responsibility for decisions to deploy and for the definition and validation of the rules of operation, use and engagement; and

on accountability:

- measures enabling an after action review of the system to assess compliance with IHL of a system, unless technically or operationally not feasible;
 - mechanisms to report violations, investigation by States of credible allegations of IHL violations by their armed forces, their nationals or on their territory (similar to the *Elements*); and
 - disciplinary procedures and prosecution of suspected perpetrators of grave breaches of IHL as appropriate (similar to the *Elements*).
- tailored risk mitigation measures and appropriate safeguards regarding safety and security (see Guiding Principles f and g) are adopted and implemented (similar to the *Outline*).

Furthermore, with regard to regulations, the *Protocol VI* includes the following provisions:

- Each High Contracting Party shall institute measures to ensure that meaningful human control is retained in the entire life cycle of any weapon system (similar to the *Elements, Outline, Group Working Paper* and *Signpost Paper*) incorporating autonomy, including by remote or controlled deactivation to reduce or limit unplanned damage.
- Each High Contracting Party shall ensure that weapon systems do not rely on data sets that can perpetuate or amplify social biases, including gender and racial bias.
- Each High Contracting Party shall ensure that weapon systems do not cause lasting environmental damage.
- Each High Contracting Party shall develop regulations for due registration, tracking and analysis of weapons systems based on emerging technologies in the area of LAWS, thus allowing for accountability for both all chain of command and fabrication and development.

Meanwhile, the *China Working Paper* proposes that the use of relevant weapons systems based on emerging technologies in the area of LAWS should be regulated specifically according to different scenarios and different degrees of autonomous capabilities. In line with this, it understands acceptable weapons systems based on emerging technologies in the area of LAWS as those that could have a high degree of autonomy but are always under human control (similar to the *Elements, Outline, Group Working Paper, Protocol VI* and *Signpost Paper*) in that they:

- can be used in a secure, credible, reliable and manageable manner;
- can be suspended by human beings at any time (similar to the *Elements, Outline, Group Working Paper* and *Signpost Paper*); and
- comply with basic principles of IHL in military operations, such as distinction, proportionality, and precaution (common in all proposals).

In terms of regulations for such acceptable weapons systems, the *China Working Paper* supports States to take necessary risk-mitigation measures and implement a tiered and categorized regulation in particular. It provides that States should decide on their own specific measures and implementation mechanism based on their own national situation and supports all Parties to conduct exchanges and cooperation on risk mitigation measures through case studies, scenario workshops, practice exchanges, etc., taking into account the inherent characteristics of weapons systems based on emerging technologies in the area of LAWS, the context of modern battlefields, and complex and open environments, among other factors.

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. But, like the *China Working Paper* that discusses risk-mitigation measures in context of regulations, the *Principles and Good Practices* 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 some commonalities but also 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 AND INTERNATIONAL CRIMINAL LAW

The *Roadmap* and *Elements* explicitly acknowledge the application of IHRL to emerging technologies in the area of LAWS. The *Elements* further states that it remains questionable whether weapons systems based on emerging technologies in the area of LAWS are able to be used in compliance with IHL and human rights law given the inherent uncertainties and complexities of wartime environments, and that there is an implicit requirement for meaningful human control imbedded in IHL and similar requirements are also the core of IHRL.

The *Roadmap* also explicitly acknowledges the application of ICL to emerging technologies in the area of LAWS.

This is an area of divergence among States and requires further consideration.

4. CHARACTERIZATION

Among two proposals that expressed views on this issue, namely the *Principles and Good Practices* and *Roadmap*, **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. Furthermore, the *China Working Paper* suggests that the GGE should distinguish between basic concepts such as remote-controlled weapons, automatic weapons and autonomous weapons, offensive autonomous weapons and defensive autonomous weapons, as well as anti-equipment autonomous weapons and anti-personnel autonomous weapons, explaining that this will make the GGE's discussions more scientific and accurate, and therefore allow for substantive progress.

However, across proposals **there are differences in the understanding of what is meant by 'weapons systems based on emerging technologies in the area of LAWS'**. In light of the differences, the *China Working Paper* comments that addressing the definition of weapons systems based on emerging technologies in the area of LAWS is the key to negotiating any practical control measures because given the dual-use nature of emerging technologies in the area of LAWS, as relevant discussions become broader, more concerns and divergencies will appear and it could be more difficult to get any outcome. There are commonalities between the *Roadmap*, *Elements* and *Signpost 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. Similarly, the *Protocol VI* provides that autonomous weapon systems refer to weapon systems that incorporate autonomy into their critical functions of selecting, targeting, and engaging to apply force without human intervention.

By contrast, 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. It accepts to delegate a certain number of decisional calculations in the process of identification, up to the point of engagement. Likewise, the *Group Working Paper* uses fully autonomous lethal weapons systems to refer to those operating completely outside human control and a responsible chain of command.

Furthermore, the *China Working Paper* suggests that Parties should consider classifying autonomous weapons systems into two categories—unacceptable and acceptable—and prohibit those that are unacceptable and regulate those that are acceptable in line with the two-tier approach. It outlines the basic characteristics of unacceptable autonomous weapons systems. They should include but not be limited to the following. First is lethality, meaning sufficient lethal payload (charge) and means. Second is autonomy, meaning absence of human intervention and control during the entire process of executing a task. Here the ‘process of executing a task’ seems to refer to the ‘killing chain of weapons systems’ discussed in the *China Working Paper*, which, as the paper states, includes observation, orientation, decision, action and other critical links. Similar to the *Outline* in some ways, the *China Working Paper* maintains that weapons systems with autonomous functions at certain links may not necessarily cause indiscriminate effects, and therefore may be permissible. The third characteristic is impossibility for termination, meaning that once started, there is no way to terminate the operation. Fourth is indiscriminate killing, meaning that the device will execute the mission of killing and maiming regardless of conditions, scenarios and targets. Fifth is evolution, meaning that through interaction with the environment, the device can learn autonomously, expand its functions and capabilities in a degree exceeding human expectations. Conversely, the *China Working Paper* defines acceptable autonomous weapons systems as those that could have a high degree of autonomy but are always under human control, and can be used in a secure, credible, reliable and manageable manner, be suspended by human beings at any time, and comply with basic principles of IHL in military operations, such as distinction, proportionality and precaution.

On the other hand, the *Russia Working Paper* affirms that there is no consensus definition of weapons systems based on emerging technologies in the area of LAWS in existing international law—the issue pertains to prospective types of weapons, therefore the definition should not be interpreted as limiting technological progress and detrimental to research on peaceful robotics and AI. It further provides that the definition of weapons systems based on emerging technologies in the area of LAWS should meet the following requirements:

- contain the description of the types of weapons that fall under the category of LAWS, conditions for their production and testing as well as their usage procedure;
- not be limited to the current understanding of LAWS, but also take into consideration the prospects for their future development; and
- be universal in terms of the understanding by the expert community comprising scientists, engineers, technicians, military personnel, lawyers and ethicists.

Nevertheless, the *Russia Working Paper* also provides a definition for weapons systems based on emerging technologies in the area of LAWS. It states that a lethal autonomous weapons system is a fully autonomous unmanned technical means other than ordnance that is intended for carrying out combat and support missions without any involvement of the operator. It further affirms that this definition does not extend to include unmanned aerial vehicles as well as existing highly automated military systems.

As reflected in the different understandings of weapons systems based on emerging technologies in the area of LAWS outlined above, **a key issue of note concerning characterization 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 *China Working Paper*, *Group Working Paper*, *Outline*, *Principles and Good Practices*, and *Russia Working Paper* include the aspect of lethal force. Further in this regard, the *China Working Paper* states that the CCW is not intended to prohibit all conventional weapons, and that discussions deviated from lethality would not only be contrary to the goal of the CCW but would also make it difficult to have objective and fair discussions on the impacts of AI and other emerging technologies. It also explicitly states China's view that the GGE should focus on weapons systems with autonomous killing capabilities, which means autonomous weapons platforms with a lethal mission payload.

Other views on characterization provided in the proposals are as follows.

- 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 prejudge policy choices—they should be universally understood by stakeholders (similar to the *Russia Working Paper*).
- The *Roadmap* includes recognition that a working characterization is a useful starting point.

5. HUMAN-MACHINE INTERACTION/HUMAN CONTROL

This is a key theme across 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 *Signpost Paper*, *IHL Document* and *China Working Paper*), while others qualify it in more specific detail: “**appropriate/sufficient human control**” (the *Outline*, *Group Working Paper*), “**sufficient control**” (the *Elements*), and “**meaningful human control**” (the *Elements*, *Roadmap* and *Protocol VI*). 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, and the *Protocol VI* calls for prohibitions if the autonomous functions are designed to be used to conduct attacks outside meaningful human control. Similarly, the *Elements* calls for the prohibition on the development and use of autonomous weapons “that cannot be controlled by humans”, and the *Group Working Paper* calls (in the context of the two-tier approach) for States’ commitment not to develop, produce, acquire, deploy or use fully autonomous weapons systems based on emerging technologies in the area of LAWS completely outside human control and a responsible chain of command.
- The *Principles and Good Practices* and *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 *Signpost 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. One of the basic characteristics of unacceptable autonomous weapons systems in the *China Working Paper* (which, according to the paper, are weapons systems that should be prohibited) is the absence of human intervention and control during the entire process of executing a task. The *Signpost 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 *Protocol VI* lays out provisions for prohibitions “under any circumstances” if the autonomous functions are designed to be used to conduct attacks outside meaningful human control.

Regulations, according to several proposals, should be developed to ensure that humans exercise control in line with their obligations under IHL and ethical requirements, including, for example, certainty about adequate environmental limits (the *Elements*), to ensure that “meaningful human control is retained” (the *Protocol VI*), and according to the *China Working Paper*, acceptable autonomous weapons systems based on emerging technologies in the area of LAWS could have a high degree of autonomy but will always remain “under human control”.

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. The *Elements* refers to a series of positive obligations (regulations) that should be developed and which would ensure a human operator has certainty about adequate environmental limits, is fully aware through a sufficient level of situational awareness when making a decision, and has certainty on the reliability and predictability on the identification, selection and engagement of targets. The *Group Working Paper* refers to “sufficient understanding of the weapons systems’ way of operating, effect and likely interaction with its 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 *China Working Paper* refers to the need for “comprehensive and systematic training” of personnel.

- The *IHL Document* raises some points for clarification. For example, how is training best 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?
- The *Russia Working Paper* refers to adequate legal training for the personnel of the armed forces though not explicitly in relation to human control but as a key element in “ensuring a high level of compliance with IHL”.

On human–AI interaction, the *Russia Working Paper* states that focus should be placed on ethical considerations. The *China Working Paper* refers to the need to implement necessary human–machine interaction throughout the life cycle of weapons systems based on emerging technologies in the area of LAWS.

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 during any stage 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 *Signpost Paper*; the *Elements*, in the form of positive obligations). The *Protocol VI* also refers to “remote or controlled deactivation” as one of the measures to ensure meaningful human control, which, according to the document, should be retained through the entire life cycle. According to the *China Working Paper*, “acceptable autonomous weapons systems” have a high degree of autonomy but are always under human control and can thus be used in a secure, credible, reliable and manageable manner and can be suspended by human beings at any time.

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, 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, Elements*), 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, and accounting for the fact that the nature and degree of human control may vary. Elements of human control include, according to the document, aspects such as certainty over adequate environmental, spatial and temporal limits; 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 features operate 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.

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 *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*, *Outline* and *Principles and Good Practices* recognize that States and individuals (the *Elements* refers explicitly to commanders and operators) at all times remain responsible for acting in compliance with their obligations under applicable international law, including IHL. The *Elements* further states that commanders and operators have the responsibility to ensure they are able to comply with their legal obligations during deployment and use. Similarly, the *Russia Working Paper* affirms that the responsibility for the use of weapons systems based on emerging technologies in the area of LAWS is with the person operating the robot system, "programming" and giving orders to use such systems. The Paper adds that responsibility rests with the relevant officer.

The *Protocol VI* also mentions responsibility and accountability in the definition of meaningful human control and in relation to the threshold of application of human judgment and intervention that is necessary when undertaking decisions regarding the use of weapons systems based on emerging technologies in the area of LAWS. The *China Working Paper* emphasizes that decisions on the use of force and control over weapons systems based on emerging technologies in the area of LAWS must be made by human beings, who remain accountable for their decisions.

Other than States and individuals, the *Principles and Good Practices* specifies that such responsibility is applicable to parties to armed conflict, and also 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. The *Protocol VI* also refers, additionally, to accountability in fabrication and development.

With regard to measures for ensuring State and individual responsibilities and accountability, the *Elements* provides that States must ensure that effective investigations, prosecution and punishment for violations can be carried out so as to ensure individual responsibilities. The *Protocol VI* mentions that High Contracting Parties shall develop regulations for due registration, tracking and analysis, which would allow for accountability both for the chain of command and control, and in fabrication and development.

The *Group Working Paper* mentions responsibility and accountability across the life cycle, and includes a series of provisions such as, on responsibility: doctrines and procedures for the use of weapons systems based on emerging technologies in the area of LAWS, adequate training for human decision makers and operators, operation within a responsible chain of human command (including for decisions to deploy, validation of rules of operation etc.); and on accountability, possible measures including after-action review to assess compliance with IHL (unless technically or operationally not feasible), mechanisms to report violations, investigation by States of credible allegations of IHL violations, disciplinary procedures and prosecution of suspected perpetrators of grave IHL breaches.

The *Outline* 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.

7. LEGAL REVIEWS

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

One **difference** resides in the fact that the *Signpost Paper*, *Outline*, *Russia Working Paper*, and *IHL Document* (the latter under the heading Article 36 Weapon Reviews) tie this obligation to Protocol I Additional to the Geneva Conventions of 1949; the *Elements* and *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 I, and the 2019 GGE Report and the 2018 GGE Report. The *Group Working Paper* also refers to compliance with international law and Guiding Principle (e).

Several proposals encourage a range of good practices on this matter, such as calling for the exchange of information and good practices (the *Outline* and *Signpost 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*).

Other 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 *Signpost Paper* deems weapons reviews insufficient though playing an important complementary role. The *Group Working Paper* considers legal reviews in relation to the operationalization of the two-tier approach and High Contracting Parties' commitment to only develop, produce, acquire, modify, deploy or use weapon systems based on emerging technologies in the area of LAWS that are in compliance with international law, as well as the commitment that "appropriate human control is retained", including during the development phase, which includes legal reviews to assess compliance with IHL (in addition to other measures).

The *Elements* also includes a list of necessary assessments for weapons that have autonomous capabilities, including 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. Similarly, the *Protocol VI* refers, more broadly, to the review of weapons, which would include insurance of their compliance with IHL, transparency about national processes, voluntary sharing of good practices, and an integration of interdisciplinary perspectives in the research and development of weapon systems based on emerging technologies in the area of LAWS.

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.

The *Russia Working Paper* refers to legal reviews in two sections: firstly (in section 2), by reaffirming the prohibitions under Article 36 of Protocol I Additional to the Geneva Conventions of 1949 and their reflection in relevant documents of the Russian Federation, and secondly (in section 4), by referring to practices and means of ensuring compliance, and which include, among others, "legal reviews of draft combat and other documents".

The *China Working Paper* does not have explicit references to legal reviews, but it mentions, in the context of regulations of military applications of AI, that States have the responsibility "to properly manage the [...] legal risks caused by AI".

8. RISK MITIGATION

There is, generally, a high degree of similarity across proposals about defining and addressing risks of weapons systems based on emerging technologies in the area of LAWS. Proposals such as the *Roadmap*, *Principles and Good Practices*, *Protocol VI* and *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 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*, *Roadmap* and *Protocol VI*); resilience against cyberattacks (the *Outline* and *Roadmap*; the *Principles and Good Practices* refers to cyber security safeguards in the section on good practices related to human-machine interaction); and against hacking and data spoofing (the *Roadmap*, *Principles and Good Practices* and *Protocol VI* in the framework of risk mitigations).

Two proposals (the *Roadmap* and *Principles and Good Practices*) discuss the risk of unintended engagements (the *Principles and Good Practices* refers to this in the section on good practices related to human-machine interaction), and other risks such as to civilians and civilian objects.

Other proposed mitigation measures include limits on types of targets; limits on geographical scope (the *Principles and Good Practices* and *Roadmap*); efforts to reduce automation bias (the *Principles and Good Practices*); incorporation of self-destruct, self-deactivation, or self-neutralization mechanisms (the *Roadmap*, *Principles and Good Practices* and *Outline*); procedures for a human operator to deactivate the system, “unless technically not feasible” (the *Outline*); tailored risk-mitigation measures and appropriate safeguards (the *Group Working Paper*); 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 *Russia Working Paper* emphasizes the need to strengthen efforts to enhance information security and strengthen cooperation among States, including through an international legal regime to guarantee security in information and communication technologies use.

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.

Notably, the *Protocol VI* also refers to regular provisions of “capacity-building activities covering risk mitigation”, and the *China Working Paper* expresses the State’s support for exchanges and cooperation on measures for risk mitigation such as case studies, scenario workshops and practice exchanges. The *Russia Working Paper* refers to a need to improve collective security and measures such as confidence-building measures.

The explicit reference to risks in the *Elements* is in its conclusions, where the document refers to inherent/built-in risks, thus questioning the viability of mitigation measures. Furthermore, as the same document continues, the most effective way to address risks is through “**prohibitions as risk avoidance measures**” and “**regulations as risk prevention/mitigations measures**”.

9. ETHICAL CONSIDERATIONS

Ethical considerations 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 *Signpost Paper*, *Elements* and *Roadmap*, and two proposals make a connection between **ethics and human agency**, namely the *Roadmap* and *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 *Signpost 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 *China Working Paper* also refers to the “dignity of mankind” and in the context of the responsibility to manage risks caused by AI, broadly.

The *Protocol VI* makes an explicit reference to the “serious ethical risks and challenges posed by autonomous weapon systems” in its article on general provisions, and the *Group Working Paper* suggests content for the preambular part that would refer to “relevant ethical perspective” guiding the work of High Contracting Parties. The *Russia Working Paper* mentions that the definition of LAWS should be universal in terms of understandings shared by expert communities, including ethicists.

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 its section on national weapons reviews 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. Ethical considerations are subsequently included in the section on the draft legally binding instrument on prohibitions and regulations. Here the document makes the case for certain prohibitions as a matter of compliance with legal obligations under IHL and ethical requirements (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.

In the framework of measures aimed at increasing compliance with IHL, the *Russia Working Paper* mentions ethical considerations as a focus of human–AI interaction. The *China Working Paper* refers to ethics both in the context of personnel developing and using such weapon systems, and who should observe ethics, and in the context of calls for the international community to formulate ethical norms as well as observe “national or regional ethical norms”.

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 *Group Working Paper, Protocol VI, Outline and Roadmap* explicitly **recognize 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 *Signpost Paper* affirm this in recalling the 11 Guiding Principles. Similarly, the *Russia Working Paper* provides that the definition of weapons systems based on emerging technologies in the area of LAWS should not be interpreted as limiting technological progress and detrimental to research on peaceful robotics and artificial intelligence.

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.

11. POTENTIAL BENEFITS OF AUTONOMY IN WEAPON SYSTEMS

The *Russia Working Paper* outlines potential spheres for the use of weapons systems based on emerging technologies in the area of LAWS, including:

- destruction of military objects;
- ensuring protection and security of strategic facilities (nuclear power plants, dams, bridges, etc.);
- elimination of terrorist groups; and
- protection of civilians.

Elaborating on the potential benefits of the use of weapons systems based on emerging technologies in the area of LAWS, the *Russia Working Paper* states that such systems can show more efficiency than a human operator when performing the assigned tasks and reduce error probabilities, and in the IHL context such systems are capable of considerably reducing the negative implications of the use of weapons related to the human operator's errors, his mental or physical state, and moral, religious, and ethical attitudes. It further asserts that as weapons systems based on emerging technologies in the area of LAWS are devoid of weaknesses inherent in human beings—they do not act out of revenge, panic, or exasperation, and they are immune to prejudice or fear—the use of highly automated technologies can ensure increased guidance accuracy of weapons targeting military assets and serve to reduce the risk of intentional strikes against civilians and civilian facilities.

Meanwhile, the *China Working Paper* explains that the main purpose of autonomy is to reduce the dependence on human and external resources in military operations, to improve the adaptability to complex dynamic environments and survivability on the battlefields, and thus to better accomplish the battlefield missions assigned by human beings. And in context of regulating military applications of AI, the *China Working Paper* states that military applications of AI should be conducive to improving the humanitarian situation on the modern battlefields by reducing combatant casualties, protecting civilians, and preventing escalation of unintended conflicts.

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