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Role of science and technology in the context of international security and disarmament

Current developments in science and technology and their potential impact on international security and disarmament efforts

Report of the Secretary-General

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* A/74/50.



I. Introduction

1. In paragraph 4 of its resolution [73/32](#), on the role of science and technology in the context of international security and disarmament, the General Assembly requested the Secretary-General to submit to the Assembly at its seventy-fourth session an updated report on recent developments in science and technology and their potential impact on international security and disarmament efforts, with an annex containing submissions from Member States giving their views on the matter. The present report contains an update on developments in relevant intergovernmental forums since the previous report on the topic ([A/73/177](#)).

2. Pursuant to that request, a note verbale was sent to Member States on 31 January 2019 inviting them to provide information on the subject. The replies received are set out in sections II and III of the present report. Any views received after 15 May 2019 will be posted on the website of the Office for Disarmament Affairs in the language of submission. No addenda will be issued.

Autonomous technologies

3. The Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapon Systems, established at the Fifth Review Conference of 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, met in two sessions, in April and August 2018. The Group adopted a report ([CCW/GGE.1/2018/3](#)) containing 10 “possible guiding principles”, as well as conclusions under each of its four agenda items: (a) characterization of the systems under consideration in order to promote a common understanding on concepts and characteristics relevant to the objectives and purposes of the Convention; (b) consideration of the human element in the use of lethal force; aspects of human-machine interaction in the development, deployment and use of emerging technologies in the area of lethal autonomous weapons systems; (c) review of potential military applications of related technologies in the context of the Group’s work; and (d) possible options for addressing the humanitarian and international security challenges posed by emerging technologies in the area of lethal autonomous weapons systems in the context of the objectives and purposes of the Convention. While the Group recommended in 2018 that it meet for 10 days in 2019 ([CCW/GGE.1/2018/3](#)), the High Contracting Parties decided that the Group should meet for 7 days ([CCW/MSP/2018/11](#)).

4. The Group met for five days in March 2019, further narrowing areas of convergence and divergence and also exploring ways for the Group to build upon the possible guiding principles. The Group will meet again for two days in August.

Uncrewed aerial vehicles

5. On armed uncrewed aerial vehicles, the United States of America continued to lead consultations in 2018 on the elaboration of guidelines on the basis of the Joint Declaration for the Export and Subsequent Use of Armed or Strike-Enabled Unmanned Aerial Vehicles, and the United Nations Institute for Disarmament Research (UNIDIR) completed the second phase of its work on increasing transparency, accountability and oversight of armed uncrewed aerial vehicles, building on its 2017 study. Under that project, the Institute prepared a series of research briefs on topics including the expanding development, transfer and use of such vehicles; disruptive developments in vehicle technology; and the relationship between the vehicles and international stability. It also convened a tabletop exercise to explore decision-making processes relevant to the use of such vehicles in order to

encourage States to consider whether the low-risk nature of the deployment of such vehicles might lower the political threshold for the use of force and demonstrate the importance of transparency, oversight and accountability for their use.

6. From 20 to 22 February 2019, the Office for Disarmament Affairs, with financial support from Germany, convened an informal high-level meeting at the Greentree Estate in Manhasset, New York, to develop common objectives and understandings on the priority issues under the “disarmament that saves lives” pillar of the Secretary-General’s Agenda for Disarmament. The meeting addressed, inter alia, enhancing transparency, accountability and oversight with respect to armed uncrewed aerial vehicles. Participants expressed concerns, including regarding the need to ensure respect for international humanitarian law and international human rights law, cross-border use and international stability, proliferation and use of such vehicles by non-State actors. The interface between international humanitarian and human rights law was seen as a particular challenge, as some participants argued that the unique characteristics of the vehicles were driving some actors to reinterpret the law. It was noted that the United States-led process, centred on the Joint Declaration, would produce guidelines in 2019, that it was focused on export controls and that key manufacturers and users of uncrewed aerial vehicles were not participating. There was support for addressing other objectives identified in the Agenda, including the development of common standards for the transfer, holding and use of such vehicles in order to ensure accountability, transparency and oversight. Various ideas for dialogue were discussed, among them the establishment of a new group of governmental experts and the seeking of informal discussion on a new agenda item during the next cycle of the Disarmament Commission, due to begin in 2021.

Biology and chemistry

7. Both the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction and the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction have provisions for review conferences every five years, a major function of which is the review of relevant scientific and technological developments. The Eighth Review Conference of the States Parties to the Biological Weapons Convention was held in November 2016 and the Fourth Special Session of the Conference of the States Parties to Review the Operation of the Chemical Weapons Convention was held in November 2018.

8. The Scientific Advisory Board of the Organisation for the Prohibition of Chemical Weapons (OPCW) continued to monitor and provide advice on new developments in its report to the Fourth Review Conference,¹ and the Director General provided his views on the advice of the Board for the consideration of States parties.²

9. As described by the Board, convergence across scientific disciplines that have an impact on chemistry and biology, especially regarding information technology and digitalization, is expanding. As a result, the review of science and technology benefits from transdisciplinary approaches that seek to identify enabling capabilities for strengthening treaty implementation, including capabilities to recognize unusual biochemical phenomena in order to trigger mitigation and response.

10. Experts from States parties to the Biological Weapons Convention met in Geneva on 9 and 10 August 2018 in the format of the new Meeting of Experts on

¹ See OPCW document RC-4/DG.1 at www.opcw.org/sites/default/files/documents/CSP/RC-4/en/rc4dg01_e_.pdf.

² See OPCW document RC-4/DG.2 at www.opcw.org/sites/default/files/documents/CSP/RC-4/en/rc4dg02_e_.pdf.

review of developments in the field of science and technology related to the Convention. The meeting, chaired by Pedro Luiz Dalcero of Brazil, addressed the following topics, as agreed at the 2017 Meeting of States Parties:

(a) Review of science and technology developments relevant to the Convention, including with respect to the enhanced implementation of all articles of the Convention and the identification of potential benefits and risks, with particular attention to positive implications;

(b) Biological risk assessment and management;

(c) Development of a voluntary model code of conduct for biological scientists and all relevant personnel and of biosecurity education, drawing on the work already done in the context of the Convention, to be adaptable to national requirements;

(d) Genome editing, with consideration of the issues identified above, as appropriate;

(e) Any other scientific and technological developments of relevance to the Convention and to the activities of relevant multilateral organizations, such as the World Health Organization, the World Organization for Animal Health, the Food and Agriculture Organization of the United Nations, the International Plant Protection Convention and OPCW.

11. The report of the Meeting of Experts is available as document [BWC/MSP/2018/MX.2/3](#). The 2019 Meeting of Experts will be held in Geneva on 31 July and 2 August.

12. With funding under Council of the European Union decision (CFSP) 2016/51 in support of the Biological Weapons Convention, the Office for Disarmament Affairs organized a series of five regional workshops on the implications of advances in science and technology for the Convention. They were held in Kyiv (September 2017), Mexico City (April 2018), Amman (July 2018), Pretoria (July 2018) and Manila (November 2018). Participants directly addressed the need raised in the Agenda for Disarmament to explore in greater detail the scientific and technological dimensions of disarmament.

13. In the workshops, convergences among participants on some topics were highlighted, most of which centred on the rapid advances in the life sciences and on the risks and benefits those advances were perceived to pose under the Convention. There was also consensus on the biosafety and biosecurity challenges currently being witnessed by many States parties to the Convention, including disease outbreaks and the threats posed by non-State actors in some regions. It was also pointed out that biosafety and biosecurity awareness and preparedness varied widely within regions, and that States with low biosecurity preparedness could represent a global vulnerability. The need to develop a culture of ethical use of science and technology among scientists at the global level, possibly through the development of a code of conduct, was emphasized frequently. There was also a consensus on the potential offered by scientific advances in relation to public health, agriculture, environmental sustainability and the achievement of the Sustainable Development Goals. Participants in the workshops therefore advised that a careful balance was necessary between the requirement to regulate the life sciences and the imperative to enable their application in the regions most in need of those technologies. In August 2019, under Council of the European Union decision (CFSP) 2019/97 in support of the Biological Weapons Convention, the Office for Disarmament Affairs will organize a workshop on biosecurity diplomacy for young scientists, in particular women, from countries of the global South.

Advanced missile technologies

14. The Advisory Board on Disarmament Matters considered hypersonic weapons in 2016, recommending further study on the topic. To that end, the Office for Disarmament Affairs and UNIDIR hosted a “track 1.5” meeting on hypersonic weapons on 12 and 13 November 2018 in Geneva. Held under the Chatham House Rule of confidentiality, the meeting was attended by a small number of invited government officials and non-governmental experts. Its purpose was threefold: (a) to raise awareness about hypersonic weapons and their possible implications; (b) to promote intergovernmental discussion; and (c) to gather views to inform a study being prepared by the hosts. The meeting demonstrated that States had significant interest in learning more about those technologies and continuing discussions on the associated risks, implications and possible strategies for their management. The study, entitled “Hypersonic weapons: a challenge and opportunity for strategic arms control”, was published in February 2019.

Space-based technologies

15. In 2017, the General Assembly, in its resolution [72/250](#), established a group of governmental experts to consider and make recommendations on substantial elements of an international legally binding instrument on the prevention of an arms race in outer space, including on the prevention of the placement of weapons in outer space. The Group of Governmental Experts on further practical measures for the prevention of an arms race in outer space met in two sessions at the United Nations Office at Geneva, the first from 6 to 17 August 2018 and the second from 18 to 29 March 2019. Prior to its first session, the Group benefited from an international workshop on the prevention of an arms race in outer space, which was convened in Beijing in July 2018 by the Office for Disarmament Affairs, together with the Ministry of Foreign Affairs of China and the Ministry of Foreign Affairs of the Russian Federation. In accordance with resolution [72/250](#), the Chair of the Group convened a two-day open-ended intersessional informal consultative meeting, on 31 January and 1 February 2019 in New York, so that all Member States could engage in interactive discussions and share their views on a report on the work of the Group, provided by the Chair in his own capacity. Pursuant to that mandate, participants discussed: (a) the international security situation in outer space; (b) the existing legal regime applicable to the prevention of an arms race in outer space; (c) the application of the right to self-defence in outer space; (d) general principles; (e) general obligations; (f) definitions; (g) monitoring, verification, and transparency and confidence-building measures; (h) international cooperation; and (i) final provisions, including institutional arrangements. Having considered several drafts of a substantive report, the Group reached no consensus on a final report ([A/74/77](#)).

16. In 2018, the Disarmament Commission agreed to add to its agenda for the 2018–2020 cycle the following item: “In accordance with the recommendations contained in the report of the Group of Governmental Experts on Transparency and Confidence-building Measures in Outer Space Activities ([A/68/189](#)), preparation of recommendations to promote the practical implementation of transparency and confidence-building measures in outer space activities with the goal of preventing an arms race in outer space”. The Working Group met in April 2018, and informal consultations on the topic were held in April 2019.

17. In 2016, the Committee on the Peaceful Uses of Outer Space agreed that consensus had been reached on the text of the first set of 12 guidelines on the long-term sustainability of outer space activities and that negotiations on the guidelines had been conducted and concluded. The Committee continued its deliberations in 2017 and 2018 on the preamble and the text of other guidelines through the Working

Group on the Long-term Sustainability of Outer Space Activities of the Scientific and Technical Subcommittee. In 2018, the Working Group confirmed that consensus had been reached on the preamble and on the text of nine additional guidelines.

Materials technologies

18. At the Third United Nations Conference to Review Progress Made in the Implementation of the Programme of Action to Prevent, Combat and Eradicate the Illicit Trade in Small Arms and Light Weapons in All Its Aspects, held from 18 to 29 June in New York, States acknowledged that recent developments in small arms and light weapons manufacturing, technology and design, including modularity and the use of new materials, had implications for both the Programme of Action and the International Tracing Instrument. States considered the possible risks of recent developments in relation to effective weapons tracing under the Instrument, as well as opportunities for strengthening weapons marking and stockpile management. States encouraged strengthened cooperation and dialogue with the private sector and industry in responding to challenges and leveraging opportunities. As part of its follow-up actions, Conference participants requested the Secretary-General to seek the views of Member States on recent developments in the manufacturing, technology and design of small arms and light weapons, in particular polymer and modular weapons, including associated opportunities and challenges, as well as on the impact of those developments on the effective implementation of the Instrument, and to make recommendations on ways of addressing the developments in his report to the General Assembly. That mandate was reiterated in Assembly resolution [73/69](#) on the illicit trade in small arms and light weapons in all its aspects, in which the Secretary-General was also requested to take into account the views of Member States in his report to the Assembly at its seventy-fourth session.

Information and communications technologies

19. Under General Assembly resolution [73/27](#), on developments in the field of information and telecommunications in the context of international security, the Assembly established an open-ended working group open to all Member States. The group will convene for the first time in 2019 and report to the Assembly in 2020 at its seventy-fifth session. The mandate of the group also includes the possibility of holding, from within voluntary contributions, intersessional consultative meetings with interested parties, namely, representatives of business, non-governmental organizations and academia, to share views on issues within the group's mandate. Ambassador Jürg Lauber of Switzerland has been elected to chair the group.

20. The General Assembly also established a new group of governmental experts under resolution [73/266](#), on advancing responsible behaviour in cyberspace in the context of international security. The group will hold its first meeting in 2019 and submit its final report to the Assembly at its seventy-sixth session, in 2021. The group will comprise 25 members and be based on equitable geographical distribution. Two of its meetings will be held in Geneva and two in New York. As indicated in its mandate, two of its meetings will be preceded by two-day informal consultations with all Member States. The group's mandate also includes a series of consultations on the subject to be held with regional organizations. Ambassador Guilherme de Aguiar Patriota of Brazil has been elected to chair the group.

Non-technology-specific discussions

21. In February 2018, the Conference on Disarmament established five subsidiary bodies to start a gradual process encompassing all substantive agenda items, as well as emerging and other issues relevant to the substantive work of the Conference in accordance with decision CD/2119. Following the appointment of coordinators for

each of the five subsidiary bodies (CD/2126), the fifth subsidiary body addressed, inter alia, developments in science and technology, information and communications technologies and cybersecurity, and the weaponization of artificial intelligence (CD/2141).

22. The Advisory Board on Disarmament Matters had an item entitled “Current developments in science and technology and their potential impact on international security and disarmament” on its agenda for 2018 ([A/73/259](#)).

23. At the 2018 Meeting 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, delegations considered technological developments of possible relevance to the Convention under the agenda item entitled “Emerging issues in the context of the objectives and purposes of the Convention”. Meeting participants agreed to retain the agenda item and encouraged the high contracting parties to submit working papers on developments in science and technology relevant to that item ([CCW/MSP/2018/11](#)).

24. Member States continue to draw attention to the potential role of legal weapons reviews in managing emerging means and methods of warfare, including through greater transparency and consistency in the implementation of such reviews.

II. Replies received from Governments

Austria

[Original: English]

[15 May 2019]

The continuous advances in science and technology increasingly influence our everyday lives and have the potential to support our efforts for international security and disarmament. However, in seeking the benefits from these developments, it is important to be aware of the possible impacts of non-civilian use of emerging technologies, specifically in the area of artificial intelligence and autonomous systems, on international security and disarmament.

The potential development and use of autonomy in the critical functions of weapons systems presents numerous ethical, moral, legal and security-related concerns, which Austria believes the international community must address pre-emptively instead of reacting in retrospect to already-existing circumstances.

When developing new technologies, States must ensure that any potential weapon would be capable of respecting basic principles, such as distinction, proportionality and precaution, in an attack. The human element is critical in safeguarding compliance with international humanitarian law. Such compliance is highly context dependent, which is particularly sensitive when it comes to emerging technologies with autonomy in their critical functions. Contextual legal assessment is deeply human, and accountability is not possible when decisions are taken by machines. Therefore, Austria maintains its position that there should not be any autonomous weapons system that can act independently of meaningful human control when applying lethal force. In the view of Austria, the development and use of such systems could have regional and global destabilizing effects, result in a new type of warfare and lead to an arms race, as States will try to avoid comparative disadvantages, lower the threshold for the use of force as the human factor is removed from armed conflict, and contribute to regional and international instability.

The fact that the concerns raised by the potential development of lethal autonomous weapons systems are being discussed at the level of a Group of

Governmental Experts under the Convention on Certain Conventional Weapons speaks to the urgency of the matter. Austria welcomes the positive progress made at the meeting of the Group in 2018, as all States affirmed, inter alia, that:

(a) International law, in particular the Charter of the United Nations and international humanitarian law, as well as relevant ethical principles, should guide the work of the Group;

(b) International humanitarian law fully applies to autonomous weapon systems, and human responsibility for decisions on the use of weapon systems must be retained, since accountability cannot be transferred to machines;

(c) Effective and meaningful human control has to be retained.

These very important points indicate that there are restrictions to the means of warfare, which should be spelled out more clearly. Given the complexity, breadth and ever-evolving nature of the topic, however, there are still different interpretations concerning the precise definition of lethal autonomous weapons systems, the exact degree of human control and the critical functions over which human control must be maintained at all times.

Austria considers that these issues could be best clarified in negotiations on a regulatory framework to be introduced, which is needed to provide a clear common understanding. Austria therefore supports the establishment of a legally binding instrument in order to prohibit autonomous weapons systems whose critical functions are not under meaningful and effective human control. Therefore, Austria, together with Brazil and Chile, submitted a proposal on a mandate to negotiate a legally binding instrument that addresses the legal, humanitarian and ethical concerns posed by emerging technologies in the area of lethal autonomous weapons systems in August 2018. Having actively participated in the meeting of the Group in March 2019, Austria will do so again in August 2019.

Cuba

[Original: Spanish]

[26 April 2019]

Scientific and technical development and its civilian applications should not be hindered by alleged international security and disarmament considerations. The imposition of selective and discriminatory restrictions on access to materials, equipment and technology required by less developed countries is a serious impediment to the application of the inalienable right of all States to the development of science and technology, including in the telecommunications, nuclear, chemical and biological fields, for peaceful purposes.

At the same time, developing States cannot be compelled, on the pretext of humanitarian reasons, to use specific scientific and technical advances to modernize or employ their weapons. In this regard, the characteristics, particularities and capacities of each State must be taken into account; as must the necessary balance between humanitarian and national security considerations.

Without neglecting other priority aspects of international security, such as non-proliferation, the international community should redouble its efforts to condemn the hostile use of information and telecommunications technologies with the declared or covert aim of subverting the legal and political order of States, a violation of internationally recognized standards in this area. The international community must condemn any unilateral action that is not consistent with the purposes and principles of the Charter of the United Nations, the Universal Declaration of Human Rights and international law, including actions aimed at undermining societies or provoking

conflict among States. Access to the information or telecommunications systems of another State should be in line with the international cooperation agreements concluded and should be based on the principle of consent of the State concerned. The nature and scope of exchanges must respect the laws of the State which is granting access.

Cuba has a solid body of legislation and procedures that governs all the activities of the various national bodies and institutions whose work relates to the technological, information, communications, nuclear, chemical, biological and biotechnological fields. These regulations make it possible to exercise effective control over the transfer of arms, military equipment and dual-use goods and technology, while ensuring that such legislation, regulations and procedures are consistent with the obligations assumed in the international treaties to which the country is a party.

Those treaties include the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction; the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction; 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 Effect; the Convention on Cluster Munitions; the Treaty on the Non-Proliferation of Nuclear Weapons; the Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (Treaty of Tlatelolco); the Treaty on the Prohibition of Nuclear Weapons and treaties on outer space and telecommunications.

Morocco

[Original: French]
[15 May 2019]

The Kingdom of Morocco contributes actively to United Nations peace and security efforts by participating in the various activities conducted by the United Nations Office for Disarmament Affairs at Geneva and Vienna in the field of disarmament and the non-proliferation of weapons of all kinds.

With regard to science and technology, Morocco monitors and uses technological developments in compliance with its commitments under United Nations conventions, treaties, agreements and other decisions.

In accordance with the national regulatory arsenal, the relevant Moroccan authorities have made contributions in the following areas:

- Border control
- Fight against illicit trafficking of all kinds
- Security and monitoring of sensitive points
- Demilitarization and the destruction of obsolete weapons and unusable munitions
- Communications and cyberspace security
- Monitoring of dual-use goods
- Participation of experts and contingents in United Nations missions

South Sudan

[Original: English]

[30 April 2019]

The Government of the Republic of South Sudan supports General Assembly resolution 73/32 and believes that the global effort to fight the nuclear, biological and chemical weapons scourge is important and affects the lives of South Sudanese at home and especially in the diaspora. However, South Sudan has specific concerns that are more limited and urgent, namely, the threats posed by the continued proliferation of small arms and their inadequate control and destruction.

South Sudan needs direct support from the Office for Disarmament Affairs and its Regional Centre for Peace and Disarmament in Africa, which has so far not reached out to us as a Government in need of assistance. The national commission on disarmament, demobilization and reintegration has always found this surprising. South Sudan faces many embargoes relating to arms, but it was not aware of an ideas embargo.

Specifically, South Sudan would like the role of science and technology to be:

- (a) To assist South Sudan in collating weapons for proper control of arms and their management;
- (b) To educate the public on the danger of weapons and their proliferation;
- (c) To assist in building the capacity of the Ministry of Interior and local administrators to provide law and order, which must lead to the end of the proliferation of small arms;
- (d) To sign international treaties and commit to them in letter and spirit;
- (e) To help South Sudan to build bilateral and international relationships with neighbouring countries and sort out issues of rebellions and the arms trade;
- (f) To support the acquisition and use of the most advanced technologies currently used by other countries in order for South Sudan to catch up with the rest of the world in handling global issues competently;
- (g) To assist the regulation of small arms in South Sudan, which pose a clear and present threat to the population.

Spain

[Original: Spanish]

[15 May 2019]

In 2016, the Group of Governmental Experts was created to address, in the context of the objectives and aims of 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, the issue of emerging technologies in the area of lethal autonomous weapons systems. Spain is active in the Group.

The weapons systems currently used by the Spanish armed forces always allow for the attribution of responsibility to a human operator whenever weapons are activated. There are no autonomous systems capable of producing lethal effects for which full responsibility cannot be attributed to a human operator.

Air defence systems used in the armed forces do not run on an autonomous mode that may result in lethal actions being taken without human input.

Missiles are only ever used on what might be considered autonomous (fire-and-forget) modes by the prior decision of a person who assesses whether the objective is legitimate and complies with the international law of armed conflict.

Self-protection systems in use are not designed to have lethal effects on third parties, only to react once an attack has occurred.

The autonomy of weapons systems in use in the Spanish armed forces does not compromise the ability of combatants to apply the international law of armed conflict.

The autonomy of weapons systems in the Spanish armed forces does not compromise the responsibility of the combatants to make decisions concerning the use of force, regulated by the command in the rules of engagement.

Moreover, international humanitarian law requires parties to comply with certain standards for new types of armaments. Article 36 of the (1977) Protocol I additional to the Geneva Conventions of 1949 underscores that “in the study, development, acquisition or adoption of a new weapon, means or method of warfare, a High Contracting Party is under an obligation to determine whether its employment would, in some or all circumstances, be prohibited by this Protocol or by any other rule of international law applicable to the High Contracting Party”.

In Spain, this legal review is under way, with instruction 67/2011 of 15 September issued by the Secretary of State for Defence, which regulates the procedure for obtaining material resources, being amended. Thus, a legal examination of weapons systems will be included in the conceptual phase of the procedure, specifically at the operational pre-feasibility stage, in the Staff Objectives document.

Meaningful human control over the use of weapons and their effects is essential to ensure that the use of a weapon is ethically justifiable and legal. Such control is also needed to provide a basis for accountability for the consequences of the use of force.

In order to show that control can be exercised in this manner, States must demonstrate that they understand the process by which specific systems identify individual-target objects and understand the context, in space and time, in which force may be used.

For human control to be meaningful, technology must be predictable, and the user must have relevant information; in addition, there must be an opportunity for timely human judgement and intervention.

It is the responsibility of the State to ensure that the deployment of any weapons system meets the requirements of international law.

III. Reply received from the European Union

[Original: English]
[15 May 2019]

The European Union is mindful of the rapid development of life sciences and biotechnology and their impact, both positive and negative, on all aspects of the effective implementation of the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction. In order to manage the risks and benefits and ensure a more coordinated approach, there is a need to better involve non-governmental experts, notably scientists, professional associations and industry, in the implementation of the Convention, as well as in relevant discussions within its framework. For that reason, the European Union has consistently supported, including at the Eighth

Review Conference of the States Parties to the Convention, in 2016, and the Meeting of States Parties, in 2017, the inclusion of a structured science and technology review process in the intersessional programme of work and the strengthening of the relevant capacities of the Biological Weapons Convention Implementation Support Unit. Council of the European Union decision (CFSP) 2016/51 in support of the Convention includes a project to foster better informed and more efficient interactions on science and technology among non-governmental experts at the national and regional levels. In that framework, five European Union-funded regional workshops have been organized by the Implementation Support Unit, in Ukraine on 21 and 22 September 2017 for Eastern Europe and Central Asia; in Mexico on 16 and 17 April 2018 for Latin America and the Caribbean; in Jordan on 11 and 12 July 2018 for the Middle East and North Africa; in South Africa on 25 and 26 July 2018 for Sub-Saharan Africa; and in the Philippines on 21 and 22 November 2018 for Asia.

On 21 January 2019, the Council of the European Union adopted decision (CFSP) 2019/97 in support of the Convention to provide essential follow-up to the activities undertaken throughout the 2016–2018 period in the framework of its decision (CFSP) 2016/51, including in the field of science and technology. Its decision (CFSP) 2019/97 envisages the organization of an international science and technology conference to be held in Geneva, targeting governmental experts, non-governmental organizations, civil society organizations and members of industry in order to incorporate their views into the discussions that will feed into the programme of the Ninth Review Conference of the Convention.

The European Union supports substantially and consistently the activities of the Organisation for the Prohibition of Chemical Weapons (OPCW), promoting the full implementation of the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction, including the ability of OPCW to adapt to developments in the field of science and technology. One of the projects financed through Council decision (CFSP) 2015/259 in support of OPCW was dedicated to enabling the Director General of OPCW to provide advice and recommendations to the Conference of the States Parties to the Convention, to the OPCW Executive Council or to the States parties on areas of science and technology relevant to the Convention. For that purpose, the European Union has provided targeted financial support for relevant OPCW activities in the areas of chemical informatics to facilitate international collaboration; assessment of developments in science and technology, including a series of expert workshops; multiple uses of chemistry; understanding the security aspects of technology developments, including a series of workshops for regional centres of excellence and university departments involved in security issues related to weapons of mass destruction; the development of standardized methods for the analysis of biological toxins; and support for the temporary working groups of the OPCW Scientific Advisory Board.

On 1 April 2019, the Council of the European Union extended its support of OPCW for the following three-year period by adopting decision (CFSP) 2019/538, which renews European Union support for OPCW efforts to adapt to developments in the field of science and technology and envisages the funding of relevant projects, such as the plant biomarker challenge, as well as continued support of the temporary working groups of the Scientific Advisory Board. The decision provides substantial financial support for upgrading the OPCW laboratory and equipment store into a new centre for chemistry and technology. The centre will play a critical role in supporting the implementation of the Convention, in particular by helping OPCW to keep pace with current threats and relevant scientific and technological developments.

The European Union supports the International Atomic Energy Agency (IAEA) in enabling the safe, secure and peaceful use of nuclear technology. It acknowledges

the strong contribution of IAEA to the implementation of the Treaty on the Non-Proliferation of Nuclear Weapons. The Agency's work on nuclear science and technology and their applications underpins the right of States parties to the Treaty to use nuclear energy for peaceful purposes, in accordance with article IV of the Treaty. The responsible use of nuclear science and technology and their applications for peaceful purposes can be widely acceptable only if they are carried out to the highest standards in terms of safeguards, nuclear and radiation safety and nuclear security.

The long-standing and successful collaboration between the European Commission Joint Research Centre and IAEA has been reinforced by a practical arrangement on cooperation in nuclear science and applications for sustainable development. The IAEA technical cooperation programme, as well as its other delivery mechanisms, plays a key role in the delivery and transfer of nuclear technologies. In that regard, the European Union and its member States continue to be strong supporters of the programme, including through the Technical Cooperation Fund and other extrabudgetary contributions, such as the Peaceful Uses Initiative. The effective application of IAEA safety standards and security guidance in the course of the implementation of technical cooperation projects that involve the peaceful uses of nuclear and other radiological material is necessary for ensuring that they are used safely, remain secure and thereby contribute to building the required public trust and confidence in the use of nuclear energy applications.

The European Union and its member States continue to promote the preservation of a safe, secure and sustainable space environment and the peaceful use of outer space. The European Union recognizes outer space as a global common good, to be used for the benefit of all. Strengthening the safety, security, sustainability and peaceful nature of outer space activities is best achieved through a multilateral approach and international cooperation. Space is an important driver of economic growth, innovation and development for the benefit of all people. Space science, activities and technologies contribute to tackling major challenges such as climate change, disaster management, food security, transport development and the protection of the environment and scarce resources. The European Union and its member States stress the importance of transparency and confidence-building measures, which provide an important contribution to the security, safety and sustainability of activities in outer space, and the importance of promoting principles of responsible behaviour in outer space in the framework of the United Nations and other appropriate multilateral forums.

The European Union and its member States remain strongly committed to the prevention of an arms race in outer space. Preventing an arms race in outer space and preventing outer space from becoming an area of conflict are essential for strengthening strategic stability and safeguarding the long-term use of the space environment for peaceful purposes. The European Union underlines that the 1967 Outer Space Treaty and other elements of international law as developed in the framework of the United Nations constitute the cornerstone of the global governance of outer space. The European Union remains concerned about the continued development of all anti-satellite weapons and capabilities, in particular those that are terrestrially based, and underlines the importance of addressing such developments promptly and as part of international efforts to prevent the threat to objects in outer space.

Technological innovation, including advancements in artificial intelligence, is likely to have an impact on the future battlefield. That prospect underscores the importance of processes and structures to ensure that any weapons system is developed, deployed and used in compliance with international humanitarian law. The new technologies have given rise to a broad debate in our societies as to the ethical and legal questions that arise with regard to the possible military applications of

emerging technologies in the area of lethal autonomous weapons systems, including artificial intelligence. The European Union and its member States actively participate in the work of the open-ended Group of Governmental Experts on lethal autonomous weapons systems within 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. The European Union welcomes the progress made during the 2018 meetings of the Group, notably the agreement on the 10 possible guiding principles, which reaffirm that international law, in particular international humanitarian law, fully applies to existing and emerging weapons systems and that States remain responsible and accountable for their development, deployment and use in situations of armed conflict. The guiding principles provide a good basis to strive for further progress in 2019. At the level of the European Union, the High Representative of the Union for Foreign Affairs and Security Policy, with the support of the European Commission, is continuing her consultations with the United Nations, the Global Tech Panel that she has set up and other multilateral actors in order to help to find solutions to these complex security challenges.
