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IMPLEMENTING ARTICLE 36 WEAPON REVIEWS IN THE LIGHT OF INCREASING AUTONOMY IN WEAPON SYSTEMS*

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SUMMARY

● Article 36 of Additional Protocol I of the 1949 Geneva Conventions requires states to conduct legal reviews of all new weapons, means and methods of warfare in order to determine whether their use is prohibited by international law. However, reviewing the legality of weapons with automated and autonomous features presents a number of technical challenges. Such reviews demand complex procedures to test weapon performance and to evaluate the risks associated with unintended loss of control. As such assessments require significant technical and financial resources, there is a strong incentive for deepening cooperation and information sharing between states in the area of weapon reviews. Increased interaction can facilitate the identification of best practices and solutions to reduce costs associated with test and evaluation procedures.

I. Introduction

Since 2013, lethal autonomous weapon systems (LAWS) have been discussed under the framework of the 1980 United Nations Convention on Certain Conventional Weapons (CCW).[1] Thus far, discussion has remained at the informal level. Two informal meetings of experts have been convened to 'discuss questions related to emerging technologies in the area of lethal autonomous weapons systems, in the context of the objective and the purpose of the convention'.[2] The mandate of these meetings gave no indication of what the outcome of the discussion should be, beyond creating an opportunity to deepen the understanding on these weapon systems. The Campaign to Stop Killer Robots, a non-governmental organization (NGO) coalition, is pushing states parties to negotiate and adopt a pre-emptive ban on the development, production and use of LAWS, but only a few states have expressed their readiness to discuss this possibility so far.[3] Most states are still in the process of understanding the issues at stake and determining their positions.

It was generally agreed, however, that the use of autonomous weapon systems that cannot comply with international law should be prevented. In that regard, the importance of Article 36 of the 1977 Additional Protocol I to the 1949 Geneva Conventions (Additional Protocol I) was repeatedly stressed

[1] 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 Convention, or 'Inhumane Weapons' Convention), with protocols I, II and III, opened for signature on 10 Apr. 1981, entered into force on 2 Dec. 1983, <http://treaties.un.org/Pages/CTCTreaties.aspx?id=26>.

[2] Anthony, I. and Holland, C., 'The governance of autonomous weapons', *SIPRI Yearbook 2014: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2014). The informal meetings of experts on lethal autonomous weapons (LAWS) took place in Apr. 2014 and Apr. 2015.

[3] Bolivia, Cuba, Ecuador, Egypt, Ghana, the Holy See, Pakistan and Palestine have expressed clear support for a ban on LAWS. Croatia, Ireland and Sri Lanka were open to considering a ban.

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in the discussions.[4] Article 36 of Additional Protocol I requires states to conduct a legal review of all new weapons, means and methods of warfare in order to determine whether their employment is prohibited by international law.[5] Autonomous weapon systems should, like any other weapon systems, be subject to such a legal review. Article 36 reviews, however, are national procedures beyond any kind of international oversight, and there are no established standards with regard to how they should be conducted. Some states may be less willing or less able than others to review the lawfulness of weapons that contain autonomous features—and the vast majority do not have a weapon review procedure (despite the fact that this is a requirement as a matter of law) and would have to develop one from scratch. A number of states and civil society organizations have stressed the need for greater cooperation and information-sharing in the area of weapon reviews.[6] It may be in the interests of states parties to the CCW to share their views on how national review processes might best tackle the challenges emerging from the increasing autonomy of weapon systems.

To make a step in that direction, the Stockholm International Peace Research Institute (SIPRI) convened an expert seminar in Stockholm on 29–30 September 2015 with financial support from the Federal Foreign Office of Germany. The objective of the seminar was to provide a platform for interested states parties to share their experience of conducting legal reviews of weapons, and discuss under the Chatham House Rule the challenges associated with the review of weapons that contain automated or autonomous features.[7]

This SIPRI Insight Paper presents the author's key takeaways from the seminar. It provides an overview of the challenges that arise for weapon review processes as the level of autonomy in weapon systems increases.[8] Section II provides a brief introduction to Article 36 of Additional Protocol I. Section III discusses the challenges associated with the review of weapons that contain automated or autonomous features and identifies elements of possible best practice. Section IV presents the conclusions. Annex A presents, by way of illustration, different national review mechanisms that comply with the requirements of Article 36 of Additional Protocol I.

[4] Protocol I Additional to the 1949 Geneva Conventions, and Relating to the Protection of Victims of International Armed Conflicts, opened for signature 12 Dec. 1977, entered into force 7 Dec. 1978.

[5] Arguably, this obligation applies to all states regardless of whether they are parties to Additional Protocol I. International Committee of the Red Cross (ICRC), *A Guide to the Legal Review of Weapons, Means and Methods of Warfare* (ICRC: Geneva, 2006), p. 4.

[6] States that discussed Article 36 included Germany, Greece, Switzerland, Sweden, the United Kingdom and the United States. A number of organizations discussed transparency in relation to weapon reviews: Article 36, Geneva Center for Security Policy, the ICRC and SIPRI.

[7] The participating states were France, Germany, Sweden, Switzerland, the UK and the USA. The discussions were facilitated by experts from the ICRC, SIPRI, the Swedish Defence Research Agency, the Swedish Defence University and the Swedish Red Cross.

[8] This paper is the sole responsibility of its author. It is not intended to provide an exhaustive account of the discussions, but as a reflection on the key points made by speakers and participants. The views expressed in the report do not necessarily reflect those of the participants in the seminar, the funder, the Federal Foreign Office of Germany, or of anyone that provided input or comments on this document.

II. Back to basics: a brief introduction to Article 36 reviews

Purpose and objective

Article 36 of Additional Protocol I states 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.

This article imposes a practical obligation on states to prevent the use of weapons that violate international law by employing a mechanism, colloquially referred to as a 'weapon review', a 'legal review' or simply an 'Article 36 review', that can determine the lawfulness of any new weapon or means or method of warfare before it is used in an armed conflict. This obligation derives from the basic rules set out in article 35 of Additional Protocol I, which state that the right of states to choose means and methods of warfare is not unlimited. International law includes both general rules and treaty law that prohibit or restrict specific effects or types of weapons, means and methods of warfare. As a general rule, international humanitarian law prohibits the use of weapons, means or methods of warfare that cause superfluous injury or unnecessary suffering, or damage military objectives and civilians or civilian objects without distinction. There are also a number of rules under treaty and customary law that ban specific types of weapons, such as biological and chemical weapons or blinding laser weapons, or restrict the way in which they can be used, such as the 1907 Convention relative to the Laying of Automatic Submarine Contact Mines.[9] These prohibitions and restrictions are intended to set minimum standards of humanity during armed conflict. Article 36 should be understood as a complement to and reinforcement of the existing limitations in international law. Conducting legal reviews is a necessary step to ensure that a state's armed forces are capable of conducting hostilities in accordance with its international obligations.

Article 36 of Additional Protocol I requires states to conduct a legal review of all new weapons, means and methods of warfare in order to determine whether their employment is prohibited by international law

Scope of application

Terms of reference

Article 36 specifically refers to 'new weapons, means and methods of warfare'. These terms are not defined, however, and can therefore be subject to different interpretations. McClelland notes that the meaning of the term 'weapon' is fairly straightforward, as it 'connotes an offensive capability that can be applied to a military object or enemy combatant'.[10] There are, however, different understandings of what types of weapon are covered. For the International Committee of the Red Cross (ICRC) and most of the states that conduct weapon reviews, the term refers to 'weapons of all types—be they

[9] For a detailed list see ICRC (note 5).

[10] McClelland, J., 'The review of weapons in accordance with Article 36 of Additional Protocol I', *International Review of the Red Cross,* vol. 85, no. 850 (June 2003), p. 404.

anti-personnel or anti-materiel, "lethal" or "non-lethal"—weapons systems'.[11] When ratifying Additional Protocol I, however, some states added reservations to exempt certain types of weapon from the scope of application of Article 36. Germany, for example, applies the rules introduced by Additional Protocol I exclusively to conventional weapons.[12] Equipment of a dual-use nature is not subject to review unless it can be determined that it directly contributes to the conduct of warfare. In that regard, the extent to which the development or acquisition of cyber-technologies should be subject to legal review is open to debate.[13] According to the ICRC, states that are developing or acquiring new cyber-warfare capabilities, whether for offensive or defensive purposes, should reassess their review mechanisms.[14]

What constitutes a means of warfare is more difficult to determine. According to McClelland, the concept refers to military equipment that is not a weapon per se but 'nonetheless has an impact on the offensive capability of the force to which it belongs'.[15] To assess whether a piece of military equipment counts as a means of warfare, it is therefore necessary to understand how it works and how it may be used on the battlefield. For instance, a surveillance system will be subject to a review if it can be established that it collects and processes information used in the targeting process.

The terms 'means' and 'methods of warfare' must therefore be read together. The ICRC guide to weapon reviews explains that it is necessary to examine not only the design and the purpose of the equipment, but also the way in which it is expected to be used on the battlefield—the method of warfare.[16] A weapon or means of warfare may be lawful or illegal depending on the manner and circumstances in which it is used. That is the reason why Article 36 spells out the need to determine whether the employment of weapons, means and methods of warfare would, 'in some or all circumstances' be prohibited by international law. It is however generally accepted that the examination should focus on the 'normal or expected use' of a weapon, means or method of warfare. The ICRC's commentary acknowledges that 'a state is not required to foresee or analyse all possible misuses of weapons, for almost any weapon can be misused in ways that would be prohibited'.[17]

A weapon or means of warfare may be lawful or illegal depending on the manner and circumstances in which it is used

Article 36 provides that the requirement to review applies throughout the different phases of the procurement process: 'in the study, development and adoption' of a new weapon, means or method of warfare. Weapons acquired for the first time from another state should be subject to a review. Weapons

[11] ICRC (note 5).

[12] According to an interpretative declaration dated 14 Feb. 1991, made by Germany on deposit of its instrument of ratification of Additional Protocol I.

[13] Brown, G. and Metcalf, A., 'Easier said than done: legal reviews of cyber weapons', *Journal of National Security Law and Policy*, vol. 7, no. 115 (2014).

[14] ICRC, 'International humanitarian law and the challenges of contemporary armed conflicts', Oct. 2015, Report 32IC/15/11 for the 32nd International Conference of the Red Cross and Red Crescent, Geneva, 8–10 Dec. 2015, pp. 39–40.

[15] McClelland (note 10), p.405.

[16] ICRC (note 5), p. 10.

[17] ICRC commentary on Additional Protocol I, paragraph 1469. The ICRC Commentary of 1987 can be accessed alongside the text of Additional Protocol I at <https://www.icrc.org/applic/ihl/ihl.nsf/Treaty.xsp?action=openDocument&documentId=D9E6B6264D7723C3C12563CD002D6CE4>.

acquired by a country before its ratification of Additional Protocol I are, in theory, excluded from the scope of application of Article 36. However, it is generally acknowledged that all modifications to the design or use of a weapon or means of warfare that might affect that weapon's capability and effect should trigger a review process.

Review criteria

Article 36 requires states to consider the general provisions of international humanitarian law and any other international law applicable to that state, including in particular rules prohibiting specific weapons and means of warfare or restricting the method by which they can be used. Typically, the legal assessment can be broken down into three steps.[18]

Step 1 is the initial determination that a state has to make about whether the use of the weapon or means of warfare under review and the method by which it is to be used is already prohibited or restricted by a treaty to which it is a party or by customary international law.[19]

In Step 2, if the weapon or means of warfare under review or the method by which it is to be used is not subject to any specific prohibition or restriction, the state must examine it in the light of the general rules found in Additional Protocol I and other treaties that bind the state, or in customary international law. These include:

(*a*) the prohibition on using weapons, means and methods of warfare of a nature to cause superfluous injury or unnecessary suffering;[20]

(*b*) the prohibition on employing indiscriminate weapons, means and methods of warfare (i.e. weapons, means and methods of warfare of a nature to strike military objectives and civilians or civilian objects without distinction);[21] and

(*c*) the prohibition on using weapons, means and methods of warfare which are intended or may be expected to cause widespread, long-term and severe damage to the natural environment.[22]

In addition, with regard to autonomous weapon systems, reviews should take into account whether the system can comply with other rules relating to the conduct of hostilities (e.g. distinction, proportionality and precaution).[23]

As these prohibitions are largely context dependent, the state conducting the review will have to take into consideration the environment in which the weapon is intended to be used. The use of a weapon may be lawful in one context but unlawful in another. Such an assessment could lead to the definition of conditions that can be integrated into the rules of engagement or operating procedures associated with this weapon.[24]

In step 3, should there be no relevant treaty or customary rules, the state must consider the weapon in the light of the 'Martens Clause' and examine

[18] ICRC (note 5), p. 11.
[19] ICRC (note 5), pp. 11–13.
[20] Article 35 of Additional Protocol I.
[21] Article 51 of Additional Protocol I.
[22] Articles 35 and 55 of Additional Protocol I.
[23] See Section III of this paper.
[24] ICRC (note 5), p. 15.

whether the weapon, means or method of warfare is of a nature that contravenes 'the principles of humanity' or 'the dictates of public conscience'.[25]

It remains debatable whether a state should give consideration to international human rights law in the review process, as there are different views on whether international humanitarian law displaces international human rights law entirely in the area of armed conflict, or whether international humanitarian law and international human rights law are both complementary and applicable in armed conflict.[26] Some states, such as Sweden, Switzerland and the United Kingdom, see a value in considering international human rights law in the review of military weapons because military personnel may in some situations (e.g. peacekeeping missions) use the weapon to conduct law enforcement missions.[27] The fundamental rights most relevant to an Article 36 review are:

(*a*) the right to life, which prohibits a state from arbitrarily depriving a person of his or her life;

(*b*) the right to freedom from torture and other forms of cruel, inhuman or degrading treatment; and

(c) the right to health, understood as the right to enjoyment of the highest attainable standards of physical and mental health.[28]

Although it is not required by Article 36, some states, such as Sweden or the UK, consider it useful to give consideration to future development of the law as this can avoid the consequences of approving and procuring a weapon, means or method of warfare that is likely to be restricted or prohibited in the future.[29]

Setting up and conducting a review mechanism

The ICRC's guide to legal reviews of weapons, means and methods of warfare notes that: 'Article 36 of Additional Protocol I does not specify how a determination of the legality of weapons, means and methods of warfare is to be carried out'.[30] It implies an obligation on states to establish internal procedures but does not provide any details on how these should be set up.

[25] The Martens Clause is found in international humanitarian law treaties dating back to 1899; its primary modern iteration is in Article 1(2) of Additional Protocol I, which states that: 'In cases not covered by this Protocol or by other international agreements, civilians and combatants remain under the protection and authority of the principles of international law derived from established custom, from the principles of humanity and from dictates of public conscience.' The interpretation and application of the Martens Clause is a matter of debate: while some consider that it imposes a test for the lawfulness of new weapons, others believe it provides guidelines for the evolution of customary or treaty law. Ticehurst, R., 'The Martens Clause and the laws of armed conflict', *International Review of the Red Cross*, vol. 37, no. 317 (Apr. 1997), pp. 125–134.

[26] Hathaway, O. et al., 'Which law governs during armed conflict? The relationship between international humanitarian law and human rights law in armed conflicts', *Minnesota Law Review*, vol. 96, no. 6 (June 2012), pp. 1883–1944.

[27] The 1990 United Nations Basic Principles on the Use of Force and Firearms by Law Enforcement Officials encourage states to review less-lethal weapons used for law enforcement purposes: 'Government and law enforcement agencies should develop a range of means as broad as possible and equip law enforcement officials with various types of weapons and ammunition that would allow for a differentiated use of force and firearms', paragraph 2. For further commentary see Casey-Maslen, S., Corney, N. and Dymond-Bass A., 'The review of weapons under international humanitarian law and human rights law', ed. S. Casey-Maslen, *Weapons Under International Human Rights Law* (Cambridge University Press: Cambridge, 2014).

[28] Casey-Maslen, Corney and Dymond-Bass (note 27).

[29] ICRC (note 5), p. 11.

[30] ICRC (note 5), p. 5.

Consequently, the legal review mechanism may differ from country to country in terms of format, method of working, mandate or level of authority (see Annex A). For Parks and McClelland, however, there cannot be a single model of compliance.[31] States have different needs as well as different human and financial resources to conduct reviews of weapons, means and methods of warfare. McClelland argues that imposing a uniform system would undermine the ability of a state to integrate the legal review process into its own weapon acquisition process.[32] Each state should, according to this argument, be able to determine what type of review mechanism is best suited to its needs. Parks concludes that 'establishing and maintaining a weapon review programme is more important than the form it takes'.[33]

As technology evolves and grows in complexity, the process of conducting a legal review becomes more challenging

It can nonetheless be useful to identify elements of best practice that could help states set up or reform their own weapon review mechanisms. In that regard, the ICRC produced its own guide in 2006.[34] Drawing on existing practice, it suggests the types of weapons that should be subject to legal review, a legal framework for the review of new weapons, means and methods of warfare and the types of empirical data to be considered by the review. It makes suggestions about how the review mechanism should be established, structured and composed, and under whose authority it might be placed. It also describes how a review body might operate and take decisions. Practitioners from various countries have also made recommendations on how to conduct or improve weapon review procedures.[35] Their key recommendations are to:

(*a*) start the review process as early as possible in the procurement process, and if possible incorporate legal reviews into the acquisition process at pivotal decision points;

(*b*) take a multidisciplinary approach, seeking input from various fields of expertise (legal, operational, medical and technical); and

(*c*) examine the empirical evidence provided by the manufacturer and intended end-user, and if necessary conduct tests and evaluations to assess the weapon's performance and the possible risks associated with its use.

III. Reviewing the legality of weapons with automated and autonomous features

The importance of conducting weapon reviews is widely recognized and is increasingly stressed in the light of ongoing developments in civilian and military technology.[36] Rapid innovations in the fields of information

[31] Parks, W. H. 'Conventional weapons and weapons reviews', eds T. Gill et al., *Yearbook of International Humanitarian Law*, vol. 8 (T.M.C. Asser Press/Springer: The Hague: 2005), p. 107; and McClelland (note 10), p. 414.

[32] McClelland (note 10), p. 414.

[33] Parks (note 31), p. 107.

[34] ICRC (note 5), p. 15.

[35] Parks (note 31), pp. 55–142; McClelland (note 10); and Boothby, W., *Weapons and the Law of Armed Conflict* (Oxford University Press: Oxford, 2009).

[36] The Declaration and Agenda for Humanitarian Action adopted in Resolution I of the 28th International Conference of the Red Cross and Red Crescent, Geneva, 2–6 Dec. 2003 states that: 'In light of the rapid development of weapons technology and in order to protect civilians from the indiscriminate effect of weapons and combatants from unnecessary suffering and prohibited

and communication technologies, nanotechnology and synthetic biology will result in weapon advances that may transform the conduct of modern warfare. It is therefore essential to determine whether these new possibilities offered by new technologies could cause any significant concerns from a humanitarian perspective. However, as technology evolves and grows in complexity, the process of conducting a legal review becomes more challenging. New technologies make the review process fundamentally more complex, as they may pose specific risks, and require new and specific methods to assess them. This section discusses the extent to which one key trend in military technology—increasing autonomy in weapon systems—poses significant and even unique challenges for weapon reviews.[37]

Autonomy in weapon systems

As a prelude it might be useful to examine what automation and autonomy in weapon systems entail in practice. Automation is a trend linked to developments in the field of robotics whereby a machine is designed or programmed to execute a predefined task with little or no input from a human operator. The level of human involvement as well as the ability of the system or a system feature to adapt its functioning to the context of its use usually determine whether a system or a feature falls into the category of remotely controlled, automated or autonomous.

These categories are often considered in a spectrum moving from a remotely controlled system at one end to a fully autonomous system at the other.[38] Full autonomy means that a system or a system's function has an adaptive capacity to make contingent discretionary decisions, that is, it is able to learn and to adapt its functioning in response to changing circumstances in the environment in which it is deployed.[39] Full autonomy does not mean, however, that a system can define its goals and actions freely—it always operates within the constraints or bounds of its human-designed programming and software.[40]

Determining whether a weapon should be classified as automated or autonomous is often a matter of contention. States and civil society organizations have different understandings of the capabilities required for a system to be considered autonomous, and accordingly they may not agree on the classification of existing systems (e.g. the United States' Phalanx anti-ship missile close-in weapon system and the UK's Brimstone fire-and-forget anti-tank missile) as either autonomous weapons or automated weapons (see box 1).[41]

weapons, all new weapons, means and methods of warfare should be subject to rigorous and multidisciplinary review.'

[37] This paper focuses on the implications of increasing autonomy in weapon systems. Developments in technologies such as cyber- or nanotechnologies are therefore not considered. These also deserve attention as they raise similar questions to those raised by increased autonomy in weapon systems.

[38] United Nations Institute for Disarmament Research (UNIDIR), *Framing Discussions on the Weaponization of Increasingly Autonomous Technologies,* UNIDIR Resources no. 1 (UNIDIR: Geneva, 2014).

[39] ICRC, *Autonomous Weapon Systems: Technical, Military, Legal and Humanitarian Aspects*, Expert Meeting Report (ICRC: Geneva, 2014), p. 62.

[40] ICRC (note 39), p. 64.

[41] On whether these systems could be considered autonomous weapon systems see Marsh, N., 'Defining the scope of autonomy: issues for the Campaign to Stop Killer Robots', Oslo Peace Research

Box 1. Examples of existing definitions of autonomous weapons

For the **International Committee of the Red Cross** (ICRC), 'autonomy is an umbrella term that would encompass any type of weapons with autonomy in its "critical functions", meaning a weapon that can select (i.e. search for, detect, identify, track or select) and attack (i.e. use force against neutralize, damage or destroy) targets without human intervention. After initial activation, it is the weapon system itself—using sensors, programming and weapons(s)—that takes on the targeting process and actions that are ordinarily controlled directly by humans'. (See ICRC, 'International humanitarian law and the challenges of contemporary armed conflicts', Oct. 2015, Report 32IC/15/11 for the 32nd International Conference of the Red Cross and Red Crescent, Geneva, 8–10 Dec. 2015, pp. 39–40.)

According to the United Nation's **Special Rapporteur** on extrajudicial, summary or arbitrary executions, Christof Heyns, autonomous weapons are 'robotic weapons systems that once activated, can select and engage targets without further intervention by a human operator. The important element is that the robot has autonomous choice regarding the target and the use of force'. For Heyns, '"autonomous" needs to be distinguished from "automatic" or "automated". Automatic systems, such as household appliances, operate within a structured and predictable environment. Autonomous systems can function in an open environment under unstructured and dynamic circumstances'. (See United Nations, General Assembly, 'Report of the Special Rapporteur on extrajudicial, summary or arbitrary executions, Christof Heyns', A/HRC/23/47, 9 Apr. 2013.)

For the **United Kingdom**, 'autonomous systems will in effect be self-aware . . . As such they must be capable of achieving the same level of situation understanding as a human . . . As long as it can be shown that the systems logically follow a set of rules or instructions and are not capable of human levels of situation understanding, they should only be considered automated'. (See British Ministry of Defence (MOD) Development, Concepts and Doctrine Centre (DCDC), *Joint Doctrine Note 2/11: The UK Approach to Unmanned Aircraft Systems* (MOD DCDC: Shrivenham, 30 Mar. 2011).)

For the **United States**, autonomous weapons are 'weapons that, once activated, can select and engage targets without further intervention by a human operator. This includes human supervised weapons systems that are designed to allow human operation to override operation of the weapons systems, but can select and engage targets without further human input after activation'. (See US Department of Defense (USDOD) Directive 3000.09 on Autonomy in Weapon Systems, 21 Nov. 2012.)

Pursuant to the UK definition, no autonomous weapons exist as yet, while according to the definitions proposed by Heyns, the ICRC and the USA, a number of existing systems could be classified as autonomous.

Where weapon reviews are concerned, the definition of autonomous weapons as a fixed class of items is not relevant but can be useful. Should a state have specific policy on autonomy in weapon systems, a clear definition would help the reviewing authority to assess when the requirements set out in this policy need be taken into consideration in the legal review of a weapon.[42]

The ICRC and the UN Institute for Disarmament Research (UNIDIR) both note that it would be more relevant to study automation in relation to specific functions in weapon systems rather than autonomy as an overall feature of a weapon system.[43] Automation is increasingly present in military equipment not only in support of operational functions, such as navigation or reconnaissance, but also in the targeting process—from target acquisition to target tracking, target selection and weapon release.[44] A weapon review must therefore determine whether the use of automation in relation to such functions can be done in accordance with international law.

Institute (PRIO), Policy Brief, no. 2 (2014).

[42] A US Department of Defense (USDOD) directive defines specific requirements for the development, production, fielding and use of autonomous systems. USDOD, Directive 3000.09 on Autonomy in Weapon Systems, 21 Nov. 2012.

[43] ICRC (note 39), p.62; and Davidson, N., 'Characteristics of autonomous weapons systems', CCW Informal Meeting of Experts on Lethal Autonomous Weapons Systems (LAWS), Geneva, 14 Apr. 2015.

[44] For the ICRC, it is more specifically autonomy in the critical functions that generally distinguishes autonomous weapon systems from all other weapon systems, including armed drones in which critical functions are controlled remotely by a human operator. ICRC (note 14).

Determining the lawfulness of weapons and means of warfare that contain automated or autonomous features

This section reviews the legal issues associated with the multiplication of automated or autonomous features in weapons and considers how such issues may be factored into the review process.[45]

Legal issues raised by increasing autonomy in weapon systems

The discussions at the two informal meetings of experts on LAWS in the framework of the CCW highlighted that the most fundamental concerns from a legal perspective arise when automation supports the targeting process.[46]

The targeting process requires a complex qualitative and quantitative assessment to ensure that an attack is in accordance with the fundamental rules and principles of international humanitarian law in the conduct of hostilities: distinction, proportion and precaution in attack.[47] The rule of distinction requires a determination as to whether the target is lawful and hence not a civilian or civilian object or a person *hors de combat*. The rule of proportionality prohibits an attack which may be expected to cause incidental loss of life, injury to civilians, damage to civilians objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated. The rule of proportionality is closely linked to the obligation to take precautions, which stipulates that those who plan or decide upon an attack shall (*a*) do everything feasible to verify that the objectives to be attacked are military in nature and are not subject to special protections, civilians or civilian objects, and (*b*) take all feasible precaution in the choice of means and methods of attack with a view to avoiding or minimizing injury to civilians and damage to civilian objects.

It is essential to maintain an appropriate level of human judgment or meaningful human control over the decision action in the targeting process

Compliance with these rules is dependent on reliable information about the target and its surroundings, and must be kept under constant review, as changes to the operational context and the immediate environment might alter the parameters of the distinction, proportionality and precautionary assessment and render a previously lawful attack unlawful.

To comply with international humanitarian law, a truly autonomous weapon system would have to be capable of following these key rules, particularly proportionality, which generally raises the most concern. While some weapon systems can already distinguish between simple target types (e.g. tanks, radar or missiles) autonomously, no existing weapon systems have a sufficient level of situational awareness to autonomously evaluate military advantage and balance it against expected collateral damage. It is debatable

[45] The review is in the context of armed conflict. Legal issues raised by the use of weapon systems that contain autonomous features for law enforcement purposes are not considered in detail in this paper. For further discussion on this topic see Geneva Academy, *Autonomy in Weapon Systems Under International Law*, Academy Briefing no. 8 (Geneva Academy: Geneva, Nov. 2014), pp. 11–12.

[46] The ICRC has identified 4 critical functions in the targeting process: target acquisition, target tracking, target selection and target engagement (or weapon release). ICRC (note 39).

[47] On the rules on distinction see Articles 41, 48, 50 and 52 of Additional Protocol I; on proportionality see Article 51(2); and on precaution see Article 57(2).

whether such situational awareness will ever be technically possible.[48] Based on the current level of technology, weapon systems cannot make the kind of qualitative assessment necessary to determine when an attack is proportionate or excessive in relation to the military advantage anticipated. Therefore, the targeting process remains, for the time being, under the supervision and responsibility of the military command.

Automated target recognition is, however, a common feature of modern weapon systems. Such a function may be used to identify, acquire, track, cue or prioritize targets for a human operator. Some weapon systems even have the ability to independently verify or detect a target and then fire or detonate. These include: automated sentry guns, such as South Korea's Samsung SGR-1; sensor-fused munitions, such as Sweden's Bonus System; and some types of anti-vehicle landmines or naval mines and loitering munitions, such as the USA's Low Cost Autonomous Ammunition System (LOCAAS). Humans deploy these systems, but they can fire at targets or detonate automatically on the basis of predetermined parameters.[49]

The key legal issues raised by automated target recognition in existing systems are:

(*a*) the ability of the weapon to discriminate between lawful targets and civilian targets and civilians;[50]

(*b*) the risk of incidental injury to civilians and damage to civilian objects; and

(*c*) the ability of a human operator to understand the system and to verify that it can operate in compliance with international humanitarian law.[51]

As is the case for any weapon, the system can malfunction. This can be related to a design flaw (the algorithm is poorly designed) or manufacturing errors (a number of bugs remain in the programming, which can lead to a systems failure). However, unlike a rifle or a sword, the lawful or unlawful target of which is determined by the human combatant user, in the case of an automated weapon system, it is primarily the ability of that system to function in accordance with the rules of targeting that will determine the combatant's lawful use of the weapon. It is essential to assess as part of the review process whether the automated target recognition system works

[48] Docherty, B., *Losing Humanity: The Case Against Killer Robots* (Human Rights Watch/International Human Rights Clinic: Washington, DC, 2012); Sharkey, N., 'Towards a principle for the human supervisory control of robot weapons', *Politica & Società* no. 2 (May–Aug. 2014), pp. 305–24; and Sharkey, N., 'Saying "no!" to lethal autonomous targeting', *Journal of Military Ethics*, vol. 9, no. 4 (2010).

[49] ICRC, 'International humanitarian law and the challenges of contemporary armed conflicts', Report 31IC/11/5.1.2, 31st International Conference of the Red Cross and Red Crescent, Geneva, 28 Nov.–1 Dec. 2011, p. 39.

[50] Automated target recognition in existing weapons is currently still rudimentary. Weapon systems can only identify simple, predefined target types. An automated sentry gun would not be able to distinguish between a combatant and a civilian. Sensor-fused munitions can only recognize objects based on their geometry. Landmines detonate when a set weight is applied. None of these systems is able to determine whether the expected effect will be proportionate. For these reasons, the use of such systems is considered lawful only in certain circumstances, usually in simple, uncluttered environments where the presence of civilians or civilian objects is unlikely. ICRC (note 14).

[51] At the two informal meetings of experts on LAWS this requirement was related to the discussion on 'meaningful human control', a concept originally coined by an NGO called Article 36 but which has emerged in discussions as a possible normative framework for discussing the governance of autonomous weapon systems. See UNIDIR, *The Weaponization of Increasingly Autonomous Technologies: Considering How Meaningful Human Control Might Move the Discussion Forward*, UNIDIR Resources no. 2 (UNIDIR: Geneva, 2014).

as intended and anticipated, and whether it is accurate and reliable in the environment in which it is to be deployed. Failure to do so may mean that the weapon engages unlawful targets, superfluously injures civilians or damages civilian objects.

It is also important to determine the weapon system's relationship with the human operator, as well as the type and level of human supervisory control. Is the targeting process dependent on real-time command by a human in the loop; or is the targeting process conducted independently by the system under human supervision—with the ability to override robotic decision? It has been established that when a weapon automatically acquires and cues a target for a human operator, there is a risk of 'automation bias', whereby 'the human operators come to accept computer generated solutions as correct and disregard or don't search for contradictory information'.[52] Automation bias is a well-known phenomenon that can lull the operator into engaging in an unlawful attack by taking action against the wrong target. It is therefore generally accepted that it is essential to maintain an appropriate level of human judgment or meaningful human control over the decision action in the targeting process.

It is also important to factor in the risks of unintended harm in the case of a system malfunction or unintended loss of control, caused, for instance, by a cyber-attack or a programming error.[53] This concern is not limited to the automation of the targeting process. A systems error or a cyber-attack leading to failure in the automated or autonomous flight control mechanism of a loitering munition, for example, could lead to a crash in a populated area and cause incidental injury to civilians or damage to civilian objects.[54]

Thus far, automated targeted recognition has been used in simple, predictable and more remote environments. Weapons with automated target recognition systems are usually used against simple, predefined materiel targets such as tanks and radar. The use of automated target recognition in more complex and cluttered environments (e.g. urban and populated areas) and against a larger set of targets, including human targets, will depend on future progress in the areas of detection, systems integration (systems of systems) and artificial intelligence.

As automated target recognition becomes more sophisticated and moves up along the autonomy spectrum, a crucial concern from the perspective of weapon reviews will be to maintain the predictability of a weapon's compliance with international law. As the systems and the environment of use grow in complexity, the risk that the systems will react in unforeseen ways could dramatically increase. Autonomy in weapon systems is enabled by software programs that have been designed based on assumptions that are themselves based on a model of the world. If that model is not realistic enough to encompass all likely events, the system could react to unforeseen

[52] Sharkey, 2014 (note 48).

[53] Automation and autonomy are enabled at the software level. The system's ability to perform the task it has been assigned—in this case targeting but also other operational tasks such as take-off, landing or flight control—will depend on the quality of its computer code. The more complex the task, the more complex the defining algorithm will have to be. As the code and algorithm increase in complexity, the risk grows of a programming error that could lead to a systems failure or provide adversaries with a vulnerability to exploit during cyber-offensive operations.

[54] States also have a strategic interest in ensuring that if a system fails it will 'fail safe'—so that opposing forces will not be able to take control of it and reuse it for hostile purposes.

events in an unexpected way, leading to unanticipated consequences. The issue of unpredictability is particularly problematic as it could create an accountability gap in case of violations of international law. Who would be responsible in terms of individual criminal responsibility if the system's unforeseen actions led to the death of civilians? Would it be the programmers, the manufacturers or the military commander?

A crucial concern from the perspective of weapon reviews will be to maintain the predictability of a weapon's compliance with international law

The question of whether full autonomy in the targeting process might be considered unacceptable in the light of the principles of humanity and the dictates of public conscience is also a contentious one. For Human Rights Watch 'any review of fully autonomous systems should recognize that for many people these weapons are unacceptable under the principles laid out in the Martens Clause'. Others argue that fully autonomous weapons do not necessarily violate international humanitarian norms, and such assessments should be made on a case-by-case basis.[55]

In the context of law enforcement, the use of autonomous systems could potentially affect a number of human rights, including the right to life, the right to dignity, the rights to liberty and security, or the prohibition of torture and other forms of cruel, inhuman or degrading treatment.[56] According to the 1990 UN Basic Principles on the Use of Force and Firearms by Law Enforcement Officials, the use of force in the course of law enforcement must meet the principles of necessity, proportionality and precaution.[57] To comply with these principles, and in particular with the principle of necessity, an autonomous weapon system used in a law enforcement context would have to be able to evaluate the degree to which life is at risk and be able to select alternatives to lethal force, such as negotiation or capture.[58] Should it fail to implement these principles, the system could end up conducting an arbitrary killing in violation of the right to life, degrading measures in violation of the right dignity or an arrest in violation of the freedom from arbitrary arrest and detention.

Checklist for the review of weapons that include automated and autonomous features

The key questions to be considered in a legal review of a weapon that includes automated or autonomous features can be summarized as follows:

1. With regard to its technical characteristics, capabilities and intended effects in normal and planned conditions of use, can it be established that the weapon system is capable of compliance with international law? (*a*) Could the weapon or its use in normal conditions cause unnecessary suffering or superfluous injury to combatants, injure or damage lawful targets, civil-

[55] Docherty (note 48), p. 36; and Schmitt, M., 'Autonomous weapon systems and international humanitarian law: a reply to critics', *Harvard Law School National Security Journal*, Online content, 5 Feb. 2013, p. 8.

[56] Heyns, C., United Nations Special Rapporteur on extrajudical, summary or arbitrary executions, Comment to the CCW Informal Meeting of Experts on Lethal Autonomous Weapons Systems (LAWS), Panel on human rights and LAWS, Geneva, 16 Apr. 2015, <http://www.unog.ch/80256EDD006B8954/(httpAssets)/1869331AFF45728BC1257E2D0050EFE0/$file/2015_LAWS_MX_Heyns_Transcript.pdf>.

[57] UN Basic Principles on the Use of Force and Firearms by Law Enforcement Officials (note 27); and Geneva Academy (note 45).

[58] Geneva Academy (note 45).

ians or civilian objects indiscriminately, or cause long-term, widespread or severe damage to the natural environment? (*b*) If the weapon can select and fire at a target autonomously, can it comply with the principles of distinction, proportionality and precaution in attack? (*i*) If not, what restrictions can be placed on the use of the weapon? (*ii*) If yes, to what extent does automation improve distinction, proportionality and precaution in the application of force in contrast to existing weapons?

2. If the weapon can select and fire at a target autonomously, could the use of this system: (*a*) constitute a violation of the right to life or the right to dignity of the target; (*b*) be considered unacceptable under the principles of humanity and the dictates of public conscience; or (*c*) create a responsibility gap in case of a violation of international law?

3. Is it likely that the system will be prohibited or restricted by future developments in international law?

Depending on the response to these questions, the body conducting the review could place restrictions, or make recommendations, on the use of the system, which could be integrated into the Rules of Engagement and into training programmes.

Tests and evaluations: a central challenge for the review of weapons with automated and autonomous features

The above questions cannot be addressed without a thorough examination of the empirical evidence. This includes:

(*a*) documentation from the manufacturer on the characteristics and performance of the systems;

(*b*) documentation on the concept of use, or the manner in which the end-user intends to use and incorporate the weapon into the battlefield toolset; and

(*c*) reports of independent and unbiased operational, medical and technical tests and evaluations.[59]

Tests and evaluations are of fundamental importance. Most notably, they can determine whether:

(*a*) the weapon system has been adequately programmed to respect the requirements of international law;

(*b*) the system performs as anticipated and intended in normal conditions—that is, it is capable, effective, reliable and suitable for the task assigned;

(*c*) the intended effect of the weapon does not cause indiscriminate damage, unnecessary suffering or superfluous injury, or have a long-term, widespread or severe impact on the environment;

(*d*) the weapon includes safety or anti-tamper mechanisms that will minimize the probability or consequences of unintended loss of control due to system failure or cyber-attack;

(*e*) the probability of system failure of critical and non-critical functions is at the required or acceptable level;

(*f*) the system will remain under adequate/meaningful human control—that is, it is understandable to trained operators, it can provide traceable feedback on its status, and an operator can activate or deactivate system functions or override decisions; and

[59] McClelland (note 10), p. 411.

(*g*) the potential consequences of accidental misuse, loss of control, systems failure or cyber-attack are foreseeable

Conducting these tests and evaluations, however, presents a number of challenges. First and foremost, constant and rapid developments in technology are a major hindrance to the definition of universal standards for tests and evaluations. Methodologies for such tests and evaluations must be regularly adapted and reviewed.

In addition, the increasing sophistication of weapon systems, enabled by the integration of hardware and software, makes it increasingly complex and therefore costly to assess their reliability.[60] To test and evaluate the performance of automated or autonomous systems, it is necessary to conduct separate verification and validation procedures on the hardware parts—principally the sensors—and the software parts, and then conduct testing and evaluation of the system as whole. Assessing the performance of the systems can be further complicated by the fact that they are to be used within a system-of-systems. In such cases, performance will be affected by the performance of other systems such as satellites and ground radar. To evaluate the performance and risks associated with the use of the system under review, it might be necessary to analyse a multitude of scenarios in which the different parts of the system-of-systems fail to function.

Testing and evaluation of the system at the software level pose additional practical challenges. Complex software has millions of lines of code, making it extremely difficult for the expert in charge of the legal review to assess retrospectively the functionality of all the systems. In some cases, the software code in weapon systems can be so long and complex that it has to be tested by a dedicated team of engineers while it is still under development.

More importantly, a reliable method of testing and evaluating the performance of weapon systems with advanced autonomous features is still to be found. Existing methods reportedly have their limitations when it comes to assessing the performance of complex, adaptive and non-linear systems. A report by the Office of the US Air Force Chief Scientist notes that: 'It is possible to develop systems having high levels of autonomy, but it is the lack of suitable V&V [validation and verification] methods that prevents all but relatively low levels of autonomy from being certified for use'.[61]

Constant and rapid developments in technology are a major hindrance to the definition of universal standards for tests and evaluations

A related challenge is the question of standards of acceptance with regard to systems failure. As Backstrom and Henderson explain, 'quantifying reliability is not a "yes" or "no" proposition, nor can it be achieved by a single pass/fail test, but rather it is subject to statistical confidence bounds'.[62] A test may indicate that a weapon with an automated target recognition function recognizes a lawful target 30, 80 or 100 per cent of the time. Determining the data-match acceptance criterion is uncontestably a sensitive issue. Should it

[60] Backstrom, A. and Henderson, I., 'New capabilities in warfare: an overview of contemporary technological developments and the associated legal and engineering issues in Article 36 weapon reviews', *International Review of the Red Cross*, vol. 94, no. 886 (Summer 2012).

[61] Office of the US Air Force Chief Scientist, *Technology Horizons: A Vision for Air Force Science and Technology 2010–30*, vol. 1, AF/ST-TR-10-01 (Air University Press/Air Force Research Institute: Maxwell AFB, AL, Sep. 2011), p. xx.

[62] Backstrom and Henderson (note 60).

be 100 per cent? Would it be sufficient if the system could identify the correct target 80 per cent of the time? Such a determination can only be made on a case-by-case basis, as it will depend on the intended use, the type of target, the expected effect of the weapon and the environment in which it is used.

Perhaps the most fundamental obstacle to testing and evaluation is the economic one. Conducting testing and evaluation is particularly expensive, and costs increase with the complexity of the weapon system. States might not always have the resources to fund, or the expertise to conduct, the necessary types of testing and evaluation. This is particularly the case for states that acquire their military equipment off-the-shelf. One way to reduce the cost is to outsource the testing to the systems manufacturer under agreed conditions. The USA, for instance, sends a military adviser to the manufacturer to ensure that the testing and evaluation is carried out to the agreed standard. A complementary option would be to rely on computer simulations that can test the performance of the systems in a series of operational scenarios. International cooperation in the field of testing and evaluation could certainly help to rationalize costs—but states might be reluctant to disclose highly sensitive technical information about their weapon systems. They may also be reluctant to share the results of their own testing to avoid liability. It should be noted that programming code in autonomous weapons will likely remain highly classified for obvious strategic and security reasons.

Elements of best practice

Determining the lawfulness of weapons that include automated or autonomous features is in many respects a technical and financial challenge. Most of the above-mentioned issues are still to be resolved, but some general elements of best practice should be considered in future reviews of weapons that contain automated or autonomous features:

1. The review process should be started as early as possible, even as early as during the study for a new weapon project. It should preferably be incorporated into the procurement process at a key decision point, and continue until the weapon is fielded and used. It will be important to keep a written record of the review so that possible restrictions or recommendations are not ignored.

2. A legal review is a multidisciplinary process. It is essential to include in the process, either formally or informally, input from various fields of expertise, such as legal, operational, medical and technical. Operational and technical expertise can contribute an understanding of what a weapon is supposed to do and whether it does so in accordance with the set criteria.

3. The military lawyers involved in the review processes should receive some technical training, which would improve their understanding of the trends in technology development. It is also important to inform engineers and systems developers about the requirements of international law, so they can factor these into the design of weapons.

4. Examining the empirical evidence provided by the manufacturer and intended end-user, and conducting tests and evaluations to assess the performance of weapons and the possible risks associated with their use are crucial aspects of the review process. These tests can be done in cooperation with the manufacturer and the procurement agency. Increased interaction between lawyers, systems developers, technical experts and end-users

throughout the review process will be instrumental to enhancing all parties' understanding of how testing and evaluation procedures must be developed and interpreted. As these tests and evaluations are expensive due to growing systems complexity, the possibility of enhancing cooperation in the framework of military alliances could be investigated. Cooperation could support the identification of methods and procedures for testing autonomous features.

5. When automation supports the targeting process, it is essential to assess technical and operational performance of the systems, and define restrictions on their use accordingly. These restrictions could relate to the context of deployment (time frame of the action of the weapon and environment in which it is being used) and the types of targets (materiel or personnel).[63]

IV. Conclusions

The discussions at the two informal meetings of experts on LAWS in the framework of the CCW reignited interest in weapon reviews as they raised questions about whether Article 36 reviews can ever be an effective tool for ensuring that weapons with automated or autonomous features are developed, produced, fielded and used in compliance with the requirements of international law.

Increased transparency on weapon review procedures could become a virtuous circle in many respects

This paper has established that reviewing the legality of weapons with automated or autonomous features is primarily a technical challenge that requires significant technical and financial resources. Reviewing weapons with automated or autonomous features necessitates complex procedures capable not only of assessing how a weapon will perform in the environment in which it is intended to be deployed, but also of evaluating the potential risks associated with an unintended loss of control due to systems failure, a cyber-attack or an unforeseen reaction by the system. Currently, only a limited number of states can afford to conduct these types of assessment on their own.

This problem is not unrelated to the greater challenge: that the vast majority of states do not have laws or processes in place to review the legality of weapons. The ability of Article 36 reviews to control the emergence of LAWS is seriously undermined by the fact that of the 174 states parties to Additional Protocol I, only a limited number of states (12 to 15) are known to have a weapon review mechanism in place. It is therefore essential to create the conditions for more widespread compliance with the requirement of Article 36 of Additional Protocol I.[64]

A first step in this direction would be to identify the reasons as to why many states do not conduct formal weapon reviews. Some countries may be unaware or lack understanding of the requirement, while others may point to their lack of resources (i.e. funds, legal expertise or training) and technical expertise. Some may argue that they have no arms industry, and that they trust that the states from which they acquire the weapons have already determined their lawfulness. Understanding the rationale behind the lack

[63] ICRC (note 39).
[64] ICRC (note 5), p. 4.

of adherence to Article 36 is key and can help to better calibrate compliance initiatives in the area of weapon reviews.

The information-sharing initiatives proposed within the framework of the CCW should therefore be supported. While states might not wish to reveal information on individual reviews, they could share details about their review mechanisms, thereby showing their commitment to legal compliance and providing support to states that are seeking to set up or improve their mechanisms.

Increased transparency on weapon review procedures could become a virtuous circle in many respects. It could contribute to the development of interpretative points of guidance on the implementation of Article 36 and consequently strengthen international confidence in the mechanism. The exchange of lessons learned could also support the identification of elements of best practice and of possible standards that could be useful for the review of weapons that contain automated or autonomous features.

The identification of the best practices or guidelines on how to implement Article 36 should not discourage states with limited technical and financial capacities from establishing weapon review mechanisms. It is important to stress that there is not a 'one-size-fits-all' model.[65]

[65] By way of illustration, Annex A presents different national weapon review mechanisms that comply with the requirements of Article 36.

Annex A

Germany

Format and responsibilities

To support its implementation of the obligation under Article 36 of the 1977 Additional Protocol I to the 1949 Geneva Conventions, Germany established in March 2005 a permanent Steering Group within the German Federal Ministry of Defence (MOD) under the title Review of New Weapons and Methods of Warfare. The weapon reviews undertaken before 2005 used a different format.

The Steering Group is under the responsibility of the Directorate-General for Legal Affairs' International and Operational Law Branch. Representatives of all other competent Directorates-General of the MOD—such as the Directorates-General for Security and Defence Policy; Equipment, Information Technology and In-Service Support; Planning; Forces Policy; and Strategy and Operations—are convened in the Steering Group in order to synergize the in-house knowledge of all experts, ranging from political to technical or operational expertise.

The representatives of the Directorates-General within the Steering Group are primarily points of contact for the Directorate-General for Legal Affairs through whom further subject matter expertise for a weapon review can be introduced. They may also bring in projects for review on behalf of their Directorate-General.

The Steering Group is a permanent structure. The representatives of the competent Directorates-General may differ depending on the matter under review.

The Steering Group assesses under Article 36 of Additional Protocol I whether the employment of the weapon, means or method of warfare under review would, in some or all circumstances, be prohibited by Additional Protocol I or by any other rule of international law applicable to Germany. The Steering Group's assessment is a recommendation within the development and procurement process, and not a final decision about the introduction of a weapon, means or method of warfare. Thus, it has neither a binding character as such nor can it be appealed through a specific procedure. The review results in a finding and the recommendations are recorded. Questions of accessibility are decided on a case-by-case basis pursuant to applicable domestic law.

Scope of application

Definitions. The German Government—as is the case with the governments of several other states—is of the opinion that the regulations introduced by Additional Protocol I apply only to conventional weapons; accordingly, it made an interpretative declaration to that effect upon ratification of Additional Protocol I. Thus, as a matter of international law, dual-use systems fall outside the scope of application of Article 36 of Additional Protocol I. However, they may be considered for review, if it can be established that their intended use clearly contributes to the conduct of warfare. The assess-

ment of whether a system or device should be subject to a review is made on a case-by-case basis.

Legal criteria. The primary legal criterion used for the review is international humanitarian law as applicable to Germany. The introduction of a new weapon, weapon system or method of warfare will—in view of the relevant requirements—be ultimately dependent upon the existence of a sufficiently broad range of meaningful operational scenarios for its use in compliance with international law.

Method

Time frame. Weapon reviews should be initiated at the earliest possible stage of a new weapons project. Depending on the complexity of the subject, the review process may be phased in accordance with respective development steps. The Steering Group has the ability to intervene in the procurement process to make further considerations concerning the legal conformity or lawfulness of the procurement of a new weapon.

Empirical evidence. The Steering Group does not merely rely on information provided by the industry. If it requires more information it may at any time ask for additional expertise from inside or outside the armed forces by asking the respective instance to provide additional information or its assessment. Tests and evaluations are conducted throughout the procurement process, which is supervised by an Integrated Project Team (IPT) that is created and maintained for the entire life cycle of the product. The IPT's role is to ensure the continuous availability of know-how, and uninterrupted and smooth cooperation of all parties involved in the procurement and in-service process at the MOD. Once a new product has been validated for procurement, the Directorate-General for Equipment, Information Technology and In-Service Support appoints a project manager as head of the IPT. The project manager represents the project externally, for example by producing reports for the committees of the German Bundestag, the Federal Audit Office, or other institutions or steering boards, and is notably responsible for integrated compliance demonstrations, including operational testing.

Expertise. The review process regularly requires recourse to subject matter expertise of subordinate levels of command and also from outside the MOD and the armed forces, for example regarding medical and further impact analysis as well as operational knowledge.

The representation of all competent Directorates-General in the Steering Group aims to increase awareness within the MOD of the requirements and criteria of the legal review.

Sweden

Format and responsibilities

Sweden established its formal weapon review mechanism—the Swedish Delegation for International Law Monitoring of Arms Projects—in 1974. It is currently regulated through the Swedish Ordinance on International Law Review of Arms Projects (*Förordning* (2007:936) *om folkrättslig granskning av vapenprojekt*, Swedish Code of Statutes 2007:936), which requires the Swedish Armed Forces, the Swedish Defence Materiel Administration, the

Swedish Defence Research Agency and other agencies to report all weapon projects to the delegation.

The Swedish Government elects the members of the delegation. The delegation is an independent body with a status equivalent to a government authority and is not part of the government. Currently, the delegation conducts around two or three weapon reviews annually. The delegation has to present once a year a report on its activities to the government.

The delegation issues approval or non-approval decisions. If a weapon project assessed by the delegation does not meet international law requirements, the delegation shall encourage the authority that submitted the matter for examination to take appropriate measures to bring the weapon in line with the requirements of international law (e.g. modification of the design or limitation of use).

The delegation does not issue legally binding decisions. It can only advise the authority that submitted the matter for review or the government on how to proceed in accordance with international law. The authority that requested the review can appeal the decision of the delegation to the Swedish Government.

Under the Swedish principle of public access to official documents, it is possible to request access to the record of decisions and to official documents that are not classified.

Scope of application

Definitions. The delegation monitors planned purchases or modifications of all types of weapons (including non-lethal weapons) by all Swedish authorities (e.g. the Swedish Armed Forces, the Swedish Coast Guard and the Swedish Police Authority). It also reviews new military means and methods of warfare.

Legal criteria. The delegation monitors planned purchases or modifications of weapons under existing international law (primarily international humanitarian law, but also international human rights law and disarmament law).

Method

Time frame. The delegation encourages an early review of the weapon, but the review is triggered by request.

Empirical evidence. The delegation relies on documentation provided by the requesting authority, which has the responsibility to ensure that relevant tests and evaluations have been made.

The delegation may request additional information if it believes that the test results do not meet scientific criteria or are difficult to interpret.

Expertise. The delegation consists of experts in international and national law as well as arms technology, medical and military experts. The experts in arms technology are from the Swedish Defence Materiel Administration and the Swedish Defence Research Agency.

Switzerland

Format and responsibilities

Legal reviews of weapons have been a formal requirement under Swiss law since 2007. They are based on an ordinance at Swiss MOD level, enshrining a requirement to legally review weapons before acquisition, and a directive at Chief of Defence level, regulating the process.[66] The latter mandates the Law of Armed Conflict Section within the MOD with the reviews. Prior to 2007, legal reviews were not conducted on a systematic basis.

Scope of application

Definitions. There are no formal definitions indicating the types of weapons that are eligible for review, apart from the general determination that reviews shall apply to all 'new' weapons. In addition, a review process shall be conducted if modifications of an existing weapon alter the weapon's performance or intended use. The legal review process also covers methods of warfare.
Legal criteria. The review considers treaties to which Switzerland is a party as well as customary international law. International human rights law may be taken into consideration when a weapon may be used for law enforcement purposes.

Method

Time frame. Legal reviews are conducted throughout the entire procurement process and begin with the drafting of the system specifications during project planning. Weapons can be legally reviewed again after the decision for a specific model/manufacturer has been made, and a final decision for procurement requires a positive confirmation of compliance with international law.
Empirical evidence. Documentation shall be provided by the manufacturer. As part of the acquisition process, Switzerland conducts, if necessary, its own tests and evaluations.
Expertise. As part of the review process, the Law of Armed Conflict Section has the possibility to consult with experts from various fields (e.g. chemistry, medicine or physics).

United Kingdom

Format and responsibilities

The UK ratified Additional Protocol I of the 1949 Geneva Conventions in 1998 and a formal review system was implemented at that time. The review process was previously carried out in the British MOD, but is now conducted by

[66] Ordonnance du Département fédéral de la défense, de la protection de la population et des sports (DDPS) sur le matériel de l'armée (OMat) [Ordinance of the Swiss Federal Department of Defence, Civil Protection and Sport (DDPS) on the equipment of the armed forces], Law no. 514.20, 6 Dec. 2007, <https://www.admin.ch/opc/fr/classified-compilation/20071623/index.html>; and Weisungen über das Armeematerial (WAMAT) [Directive on the equipment of the armed forces], 4 Mar. 2009, <http://www.vtg.admin.ch/internet/vtg/de/home/themen/zsham.parsysre-rated1.39473.downloadList.89318.DownloadFile.tmp/wamat.pdf>.

a satellite office, the Development, Concepts and Doctrine Centre (DCDC), where a team of military lawyers from the air force, the army and the navy conducts reviews for the MOD.

Generally, the legal review leads to formal written legal advice. The military lawyers sign the review, but the process has joint ownership: parties involved in the review process—in particular, the experts consulted during the process—have to confirm before it is signed that all the information reported in the written legal advice is correct. The written legal advice is then peer-reviewed by another lawyer within DCDC.

Scope of application

Definitions. The UK conducts legal reviews of all new weapons, means and methods of warfare. The term 'weapon' is defined in its broadest sense. All new weapons are reviewed, as well as weapons that are modified for a different use. Weapons are reviewed with regard to their design and intended use.

Nuclear weapons are a notable exception to the review process. Upon ratification of Additional Protocol I, the UK introduced a national reservation, indicating that, in the case of the UK, the rule of the protocol shall not apply to nuclear weapons. Nuclear weapons, therefore, fall outside the scope of Article 36 reviews.

Legal criteria. For the UK, international humanitarian law and the law of armed conflict are the applicable legal frameworks for the assessment and use of all weapon systems in armed conflict. Distinction, proportionality and military necessity and humanity are fundamental to compliance with international humanitarian law. International humanitarian law is, however, just one component. Reviews consider any international conventions to which the UK is party and any related obligations. Reviews also consider any applicable human rights law.

Method

Time frame. The time frame of the review is completely context dependent. Reviews can be fast-tracked when an expedited decision is needed (e.g. modification of weapons based on urgent operational needs), but a weapon review can last as long as the actual weapon development cycle.

Empirical evidence. The reviewers consider all pertinent documentation provided by the manufacturer and the armed forces. This documentation will vary from case to case and may include information gathered from multiple consultations with relevant experts (see below). The MOD may conduct additional (and independent) tests and evaluations to verify the information supplied by the manufacturer of the weapon.

Expertise. Reviews are conducted in consultation with, among others, equipment project and procurement teams, medical experts, government scientists, armed forces experts environmental specialists, and commercial and engineering companies that design and build the relevant equipment. A review can call upon any expert that may be required for that particular review. Each process is tailored to the specific weapon and the review requirements of that weapon.

United States

Format and responsibilities

The USA is not a party to Additional Protocol I to the 1949 Geneva Conventions, however, as set forth in the recently published US Department of Defense's (USDOD) *Law of War Manual*, the USDOD's long-standing policy requires a legal review of the intended acquisition of a weapon system to ensure its development and use is consistent with international humanitarian law.[67] This policy, which dates back to 1974, predates general adoption of Additional Protocol I by other states.[68] Each of the military services has issued regulations implementing this policy.[69]

The responsibility to conduct reviews resides within the USDOD. Each of the military services—air force, army and navy—is responsible for conducting the review for its department. Since the Marine Corps and navy are two separate services within the Department of the Navy, the Judge Advocate General of the Navy, in collaboration with the Staff Judge Advocate to the Commandant of the Marine Corps, conduct the legal reviews for all weapons acquired by the Marine Corps and the navy.

The military service lawyers may work with the USDOD's Law of War Working Group to ensure consistency in approach and interpretation, avoiding the possibility of conflict in legal interpretation between offices.

Should there be precedent on file or similar weapons, the appropriate military service lawyer may conduct the review on his own and may often complete the review in a shorter time period. For more complex weapon systems, the reviewer will need to meet with the weapon programme manager and, potentially, outside experts. Such a review can, therefore, take a longer period.

The legal review may approve, approve with conditions or disapprove the weapon. In the latter case, the review can indicate that a favourable legal review may be possible on reconsideration provided corrective actions identified in the review can be met.[70]

All the reviews are documented but the records are classified as they contain proprietary data and classified information. When the system is exported to another country, some information from the review can be provided.

Scope of application

Definitions. The USDOD *Law of War Manual* makes a clear distinction between means of warfare and methods of warfare. 'Means of warfare' refers to the intended effect of weapons in their normal and expected use

[67] USDOD, Office of the General Counsel, *Law of War Manual*, (USDOD: Washington, DC, June 2015), paragraph 6.2.

[68] USDOD (note 67), paragraph 6.2.3.

[69] Department of the Army, 'Review of legality of weapons under international law', Army Regulation 27-53, 1 Jan. 1979; Department of the Navy, Secretary of the Navy, 'Department of the Navy implementation and operation of the defense acquisition system and the joint capabilities integration and development system', Instruction 5000.2E, 1 Sep. 2011; and Department of the Air Force, 'Legal reviews of weapons and cyber capabilities', Instruction 51-402, 27 July 2011.

[70] Parks (note 31), p. 133.

against combatants, while 'methods of warfare' refers to the employment of weapons in a broader sense.[71]

Legal criteria. The review of the acquisition or procurement of a weapon for consistency with US law of war obligations should consider three questions to determine whether the acquisition or procurement of the weapon is prohibited. The first question to be answered is whether there is a specific rule of law, whether as a treaty obligation or as customary international law, prohibiting or restricting the use of the weapon. Second, if there is no specific prohibition or restriction, then the review should determine whether the weapon's intended use is calculated to cause superfluous injury. Finally, the third question is whether the weapon is inherently indiscriminate.[72] Part of the calculus of such a weapon review is to delineate whether there are legal restrictions on the weapon's use that are particular to that type of weapon or whether other practical measures are needed, such as training or rules of engagement specific to the weapon.

Method

Time frame. The legal review process is intertwined with the acquisition process. An initial review of each developmental weapon or weapon system is made after the formal request for review is placed, and before entering into formal development. A final legal review must be made prior to the award of the initial contract for production to determine whether the weapon or weapon system or its intended use in combat is consistent with international law.

The weapon review process is ongoing throughout requirement identification, weapon system development, testing and evaluation, fielding, and employment. The review may take into account feedback from users once the weapon has been deployed. Users may be dissatisfied with certain features and ask for modifications, which may require an additional legal review.

Empirical evidence. Information required to conduct the various reviews throughout the acquisition process is gathered in a variety of ways. USDOD officials conducting reviews are often physically present at the locations where testing is happening, particularly when the weapon is being developed by private industry. The USDOD may conduct independent testing and evaluation of a weapon in addition to assessing information provided by private industry to satisfy some types of review requirements.

Expertise. Due to the size of the USDOD, most weapon review functions are not conducted by personnel at department or headquarters level. Many of the military services have safety centres or safety organizations within commands that provide expertise to subordinate commands and private industry under contract to the USDOD. Because of the USDOD's multidisciplinary approach to reviews, there is significant coordination between the reviewing authority, the weapon providers, the procurement agency and the end-user. Types of people who may participate in the reviews include safety officers, software developers, lawyers and engineers.

[71] USDOD (note 67), paragraph 5.1.1.

[72] USDOD (note 67), paragraph 6.2.2; and Department of the Air Force (note 69), paragraph 3.1.

Abbreviations

CCW	United Nations Convention on Certain Conventional Weapons
DCDC	Development, Concepts and Doctrine Centre
ICRC	International Committee of the Red Cross
IPT	Integrated Project Team
LAWS	Lethal autonomous weapon systems
LOCAAS	Low Cost Autonomous Ammunition System
MOD	Ministry of Defence
NGO	Non-governmental organization
SIPRI	Stockholm International Peace Research Institute
UNIDIR	United Nations Institute for Disarmament Research
USDOD	United States Department of Defense

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VINCENT BOULANIN

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