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So-Called Non-lethal Weapons in the light of IHL

Introduction

There are many misconceptions regarding non-lethal weapons: Some believe that they offer the choice of bloodless war, while some look upon them as means of enslavement of the occupied (or even the domestic) population. Others fear that they can be used to facilitate killing of combatants incapable of defense. Still others point out the excessive pain and suffering such devices can cause, and fear of escalation of conflicts in which such weapons are used.¹

First of all, before I try to provide an overview this very complex and not enough discussed topic, there are some terminology and basic concepts to be made clear.

As usual with new and quickly evolving technological advancements, there is no agreed terminology for this class of weapons, even less there is an agreed definition – in fact, there is not even a common name, accepted by everyone; Some call it “low lethal”, some “non-lethal”, while others “mission kill”, “soft kill”, or “less than lethal.”² While it is true that the phrase “non-lethal” hides the fact that these systems indeed can be lethal, and these fatalities are inherently caused by their design,³ “non-lethal” is so widely used and accepted, that I will use it throughout this paper.

While there is no agreed definition to cover these systems, there are several common elements of the definitions trying to circumscribe what this category of equipment should cover. Since there are too many technologies involved, it is impossible to coin a definition from the technical viewpoint – instead we should approach the problem from the intention of the user and the result generated by use of such weapons. Hence we find definitions like “the application of technology that allows force to be projected while minimizing the potential lethal consequence,”⁴ or as the US Department of Defense (DoD) Directive 3000 puts it: “Non-lethal weapons that are explicitly designed and primarily employed so as to incapacitate

¹ See for example: 28-05-2003 Audio Collection Coping with the weapons of tomorrow: LSE 2003 debate, <http://www.icrc.org/Web/eng/siteeng0.nsf/iwpList74/FF565EEA7979351AC1256D3400525EEF>

² LtCol Alan W. Debban: Disabling Systems – War-Fighting Option for the Future, in: Airpower Journal – Spring 1993.

³ 28-05-2003 Audio Collection Coping with the weapons of tomorrow: LSE 2003 debate, <http://www.icrc.org/Web/eng/siteeng0.nsf/iwpList74/FF565EEA7979351AC1256D3400525EEF>, the arguments made by Robin Coupland

⁴ John B. Alexander: Putting Non-Lethal Weapons in Perspective, <http://www.dtic.mil/ndia/nld4/alexander.pdf>

personnel or materiel, while minimizing fatalities, permanent injuries to personnel, and undesired damage to property and the environment.”⁵

To analyze such weapons from the legal standpoint, we have to answer two fundamental questions relating to their use: First, is their usage in conformity with principles of the law of armed conflict,⁶ namely, proportionality, the principle of distinction and specific treaty law, forbidding or restricting the use of certain means and methods of warfare?

The second cluster of questions involve political and military problems associated with non-lethal weapons: Namely, whether they help saving lives or reducing suffering in combat, or to the contrary, they open up Pandora’s box by easing legal prohibitions on certain classes of weapons, ultimately leading to more inhumane and more violent ways of conducting a conflict.

But before I would venture to answer these questions it is necessary to give an overview of the technologies currently used or being developed, in order to understand the problems associated with them. Since as I pointed out actual systems are rather divergent in their nature, I will address the abovementioned questions for each category separately, and focusing on effects of these systems rather than the technology incorporated into them. It is clear by looking at them that there are both tactical and strategic use of these non-lethal weapons, and many of them can be used both in a legal but also in an illegal way.

Then I will examine the existing legal framework: While it is true that so far (except maybe a protocol on blinding laser weapons) there has been no treaty specifically aimed at so-called non-lethal weapons, existing treaties contain several provisions that have an effect on these weapons systems.

Finally I will try to apply the legal framework to some of the existing or planned weapons systems to analyze whether they are legal, and if they are, under what circumstances they can be applied.

⁵ Defense Joint Non-Lethal Weapons Program Home Page, <http://iis.marcorsyscom.usmc.mil/jnlwd/>

⁶ Throughout this paper I will use both „international humanitarian law” and „law of armed conflict” as interchangeable terms.

Categorizing non-lethal weapons

Non-lethal weapons can be classified by either their functions or technology. This study is focused on the functional elements of the non-lethal weapons arsenal, since its intent is more to give a practical overview of these new technologies, assessing legality and utility, rather than a technical approach.

There are six functional areas established by the U.S. Joint Concept for Non-Lethal Weapons, divided into two categories: counter-personnel and counter-materiel.⁷

Capabilities	
Counter Personnel	Counter Materiel
1.Crowd Control	5.Area Denial to Vehicles
2.Incapacitation of Personnel	6.Disabling Vehicles, Vessels, and Facilities
3.Area Denial to Personnel	.
4.Clearing Facilities of Personnel	

These two major categories and the six functions are described below, together with descriptions major systems planned or designed to cover the capability.⁸

Counter-Personnel Capabilities

Non-lethal counter-personnel capabilities allow the use of military force while reducing the risk of casualties among non-combatants or -in some cases- amongst enemy forces.

1. Crowd Control

This capability will consist of the means to influence the behavior of a potentially hostile crowd, as well as the capability to control a rioting mob, two scenarios widely encountered.

2. Incapacitation of Personnel

This capability is intended to provide for a mean to capture specified individuals, such as those hiding in a crowd without harming the individuals nearby. "Incapacitation" is achieved if weapon effects result in either physical inability (real or perceived) or mental disinclination to act in a hostile manner. The effects should be reversible, in accordance with the guiding principles. They should be able to be directed either at a group or at individuals.

3. Area Denial to Personnel

This capability can include physical barriers or systems which cause discomfort (or pain) to those who enter the denied area. It may provide alternatives to anti-personnel landmines.⁹ However, their drawbacks seem similar to those very mines as they do not distinguish between

⁷ Joint Concept for Non-Lethal Weapons, January 1998, page 7, at <http://iis.marcorsyscom.usmc.mil/jnlwd/Documents/JointConceptforNLWJan98.PDF>

⁸ In light of the Non-Lethal Weapons Multi-Service Procedure for The Tactical Employment of Non-Lethal Weapons, Army, Marine Corps, Navy, FM 90-40. At <http://carlisle-www.army.mil/usacsl/divisions/pki/referenc/fm90-40/fm90-40.htm>

⁹ James F. McNulty, A Non-Lethal Alternative to Anti-Personnel Land Mines, Non-Lethal Defense III, Johns Hopkins Applied Physics Laboratory, February 25-26 1998. At <http://www.dtic.mil/stinet/ndia/NLD3/nulty.pdf>

civilians and combatants either – and as it will be clear later, they are also probably not as completely harmless as they developers claim.

4. Clearing Facilities of Personnel

This could facilitate military operations in urban terrain (MOUT) by reducing the risks of non-combatants casualties and collateral damage while simultaneously minimizing the advantages accruing to an enemy defending a built-up area.

If we look at the actual technologies that are available to provide the effects above, then we find the following – some of it already exists, some of them are close to be realized, while others are rather in the domain of science fiction than actual field use by militaries.

Counter-Personnel Non-Lethal Weapons

TECHNOLOGY	DESCRIPTION
<i>Acoustics</i>	
Audible sound	Low level annoying sounds to disperse crowds.
Infrasound	Incapacitation, disorientation, nausea, vomiting, bowel spasms; effects stop when generator is turned off, no lingering physical damages. ¹⁰
Infrasound from non-linear superposition of two ultrasound beams (tested by the UK)	Intolerable sensations.
Very Low Frequency noise	Disorientation, vomiting fits, bowel spasms, uncontrollable defecation.
<i>Biologicals</i>	
Neural inhibitors	Incapacitates personnel, paralysing synaptic pathways. Induces reversible crippling effects
<i>Chemicals</i>	
Adhesive agents	Quick-setting polymer foams. Immobilize targets and require special solvents to remove. Mainly sticky foams.
Barriers	Dense, rapidly expanding aqueous bubbles. Isolates and immobilizes to control evacuation or escape. May be used with odours, dyes, etc. ¹¹
Calmative agents	Temporarily incapacitate personnel.
Hallucinogens	Narcotics that disorient, confuse and incapacitate.
Irritants	Pepper spray, gases, etc. Causes temporarily but intense and debilitating pain. ¹²
Lubricants	Turns dirt into chemical mud and makes surfaces slippery.
Neuroblockers	Tranquilizers darts and anesthetic bullets. Causes

¹⁰ H. Edwin Boesch, Christian G. Reiff, Bruce T. Benwell: A Prototype High-Infrasonic Test Chamber, <http://www.dtic.mil/ndia/nld4/boesch.pdf>

¹¹ Larry Bickford: Odorous Substances for Non Lethal Applications, <http://www.dtic.mil/ndia/nld4/bickford.pdf>

¹² Robert J. Kaminski, Steven M. Edwards, James W. Johnson: Assessing the Incapacitative and Deterrent Effects of Oleoresin Capsicum During Resistive Encounters with Police, <http://www.dtic.mil/ndia/nld4/kamin.pdf>

	incapacitation.
Neuro-inhibitors	Loss of neurological control. The nervous system “overheats” and gets out of control.
Taggants	Tracks personnel
<i>Electromagnetics</i>	
Electronic rifles	Includes taser, dart and stun guns. Debilitates central nervous system, short-circuiting human synoptic pathways. Causes incapacitation. ¹³
Pulsed High Power Microwaves (HPM)	Induces confusion, stupor or coma.
<i>Kinetics</i>	
Entanglement munitions	Mainly nets.
Non-penetrating projectiles	Stinger grenades, wax, wood and plastic bullets.
Water cannons	May be used with chemical additives.
<i>Optics</i>	
Low energy lasers	May be used to temporarily blind personnel. ¹⁴
Optical munitions	Flash bang grenades, pulsing light, etc.
Obscurants	Inhibits observation.
Strobe lights	Pulsed high-intensity light. Disorients.

Counter-Material Capabilities

Non-lethal counter-materiel capabilities would enhance operations by reducing or eliminating the enemy's ability to use his equipment. It will be less destructive than conventional weapons and more productive. The risk of personnel casualties will be lowered. Consequently legal and political risks will be minimized.

5. Area Denial to Vehicles

This capability will mainly be used so as to deny land areas to vehicles. It applies to wheeled, tracked, and surface-effects vehicles, and may include physical barriers, systems which reduce the transcrossability of the terrain, or systems that render vehicles temporarily inoperable within a zone of influence. They could also be applied to air-space or sea-space, however, non-lethality is very dubious regarding aircraft.

6. Disabling Vehicles, Vessels and Facilities

This capability covers a wide range of technologies, including systems that alter the combustion properties of a carburant, the viscosity of a lubricant, the ability of vehicles to gain traction. Other technologies may attack rubber, tires, and insulation. Some non-lethal devices may act as adhesives, others may offer the possibility to burn out or shut down vehicles, vessels, aircraft electrical systems, fuse the metal parts in key equipment.

¹³ M26 Less-Lethal EMD Weapon, <http://www.dtic.mil/ndia/nld4/smith.pdf>

¹⁴ However, see Louise Doswald-Beck (ed.) : Blinding Weapons, International Committee of the Red Cross, Geneva, 1993. p. 22-23.

Counter-materiel non-lethal weapons

TECHNOLOGY	DESCRIPTION
<i>Acoustics</i>	
Infrasound	Disrupts metallic and composite materials ¹⁵
<i>Biologicals</i>	
Biodeteriorative microbes	Degrades roads and bridges' surfaces, turns aviation fuel into jelly, "eats" rubber of vehicle wheels.
<i>Chemicals</i>	
Adhesive agents	Quick-setting polymer foams. Immobilize targets and require special solvents to remove.
Super-caustics	Acids that corrode or degrade structural materials.
Contaminators	Additives that cause fuel to gel or solidify making it unusable. ¹⁶
Liquid metals Embrittlement agents	Agents that change the molecular structure of base metals or alloys, significantly reducing their strength. Could be used to attack critical metal structures, aircrafts, ships, trucks, metal treads.
Lubricants	Substances that cause lack of traction. Delivery by aircrafts. Can render roads, ramps, railroads unusable for limited time. ¹⁷
Taggants	Tracks equipment, materiel.
<i>Electromagnetics</i>	
Conductive particles	Any variety of particles that can induce short circuits in electrical or electronic equipment.
Directed energy/Particle beams	Destroys electronic systems. Changes molecular structure of weapons rendering them useless.
Non-nuclear electromagnetic pulse (EMP)	Pulse generators producing gigawatts of power could be used to explode ammunition dumps or paralyze electronic systems. Vulnerable systems include electronic ignition systems, radars, communications, data processing, navigation, and electronic triggers of explosive devices.
Pulsed High Power Microwaves (HPM)	Disrupt and neutralizes electronics. Shuts down engines, explode ammunition.
<i>Kinetics</i>	
Ceramic shreds	Damages aircraft engines and degrades air vehicle stealthiness.
Entanglement munitions	Nets, meshes, cables, chains, etc. Disables treads,

¹⁵ H. Edwin Boesch, Christian G. Reiff, Bruce T. Benwell: A Prototype High-Infrasonic Test Chamber, <http://www.dtic.mil/ndia/nld4/boesch.pdf>

¹⁶ Kenneth R. Collins – Donald R. Bowie: A History of Engine Defeat Through Chemical Means, <http://www.dtic.mil/ndia/nld4/collins2.pdf>

¹⁷ Kenneth R. Collins, Ronald J. Mathis, William A. Mallow: Non-lethal Applications of Slippery Substances, <http://www.dtic.mil/ndia/nld4/collins.pdf>

	propellers, rotor-blades, and axles trapping targets. ¹⁸
<i>Optics</i>	
High energy lasers	Destroy optical sensors
Low energy lasers	Includes laser rifles and anti-air laser canons. Overloads and disables electro-optical sensors.
Optical munitions	Anti-sensor munitions.
Obscurants	Inhibits observation.

This paper will not elaborate on all of the technologies above, especially because there is very little or no data available on some of them, and many of them would probably never see actual combat service, owing to practical problems (portability, sensitivity to weather etc.) associated with their working mechanisms. Therefore I will only pick some examples to demonstrate what legal problems nations or others will face should they decide to develop and field such systems.

But before doing so is also necessary to examine today's legal framework, namely, the part of humanitarian law dealing with armament issues, imposing limits on means and methods of warfare. It is necessary to note, that most of these rules are a legacy of the international system of the Cold War, designed principally with a large-scale all-out war in mind, but nevertheless they continue to be binding in the new international context of today's world as well.

¹⁸ Portable Vehicle Arresting Barrier M1, <http://www.dtic.mil/ndia/nld4/buonodono.pdf>

The Legal Framework

Article 36 of *Additional Protocol I to the Geneva Conventions* stipulates that High Contracting parties have the obligation to assess the legality of weapons systems before their introduction.

“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.”

Article 35 formulates the maxim, existing long ago as customary rule of IHL that arms which cause unnecessary suffering or superfluous injury are prohibited.

“(1) In any armed conflict, the right of the Parties to the conflict to choose methods or means of warfare is not unlimited.

(2) It is prohibited to employ weapons, projectiles and material and methods of warfare of a nature to cause superfluous injury or unnecessary suffering.”

Even the United States – which unfortunately did not ratify additional protocols – recognizes this as part of the customary law of armed conflict.¹⁹ The *International Court of Justice* has also confirmed this in its advisory opinion on nuclear weapons.²⁰ Needless to say, these principles date back to the 1868 *St. Petersburg Declaration*,²¹ and were present in most of what is called the Hague Law, including the *Hague Regulations of 1907*.²²

The other important rule we have to bear in mind is that of distinction. This forbids the use of weapons that do not discriminate between legitimate military objectives and civilian personnel or property – it means, that strikes can only be directed against specific military objectives, and the nature of the attack can not treat military and civilian persons or objects alike.²³

As for international legal instruments, we have to take into account five treaties that can play a role in establishing the legality of a weapon:

- *The Treaty relating to the Use of Submarines and Noxious Gases in Warfare*, and the *Geneva Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous, or Other Gases, and of Bacteriological Warfare*, of 17 June 1925.
- *Biological Weapons Convention of 10 April 1972*.
- *Environmental Modification Convention of 18 May 1977*.

¹⁹ Chapter 7, 'The Law of War, serving as a framework for U.S. Judge Advocates. <http://ogc4.hq.dla.mil/html/practice/contingency/manual/chap07.htm>

²⁰ Legality of the Threat or Use of Nuclear Weapons, General List N° 95, Advisory Opinion of the International Court of Justice, 8 July 1996, para. 78-79, 35 I.L.M. 809 [1996]

²¹ Declaration Renouncing the Use, in Time of War, of certain Explosive Projectiles. Saint Petersburg, 29 November/11 December 1868.

²² Convention (IV) Respecting the Laws and Customs of War on Land, Oct. 18, 1907, Art. 22.

²³ AP I, Para. 4.

- *Nairobi International Telecommunications Convention of 10 January 1986.*
- *Chemical Weapons Convention of 13 January 1993.*

The 1922 *Washington Treaty relating to the Use of Submarines and Noxious Gases in Warfare*, and the 1925 *Geneva Protocol* was generally understood as a prohibition on the first use of the named weapons. However it does not prohibit the development and stockpiling of such agents and their means of delivery. The *Biological Weapons Convention* goes much further, banning virtually all activities associated with such programmes – what is important is that it makes no difference whether the intent of the user is lethal or not.²⁴ The *Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction of 13 January 1993*. (Chemical Weapons Convention – CWC) prohibits “under any circumstances” the above activities.²⁵ Prohibited agents are those are “specifically designed to cause death or other harm,” resulting in “death, temporary incapacitation or permanent harms to humans and animals.” Again, it makes no distinction on the basis of the intent of the user.

The *Convention of the Prohibition of Military or any Other Hostile Use of Environmental Modification Techniques* (Environmental Modification or ENMOD Convention) defines environmental modification techniques as “changing through deliberate manipulation of natural processes the dynamics, composition, or structure of the Earth, including its biota, lithosphere, hydrosphere, and atmosphere, or of outer space.”²⁶ The treaty prohibits methods which are widespread and long-lasting or severe, with significant disruption or harm to human life, natural and economic resources or other assets.²⁷

The *Nairobi Convention*²⁸ is a bit outside of the scope of our investigation as it specifically states that its rules do not apply in wartime – however, Article 35 of this legal instrument prohibits harmful interference of any kind, therefore it makes the argument against certain kinds of non-lethal weapons, operating with electromagnetic pulses, or otherwise interfering with telecommunications equipment. This claim is especially serious in relation of the principle of discrimination, because some of the non-lethal concepts do not make it possible to limit the effects of these weapons. (For example, the use of carbon-fibers to short-circuit electronic devices may harm other states, depending on wind conditions.) While it is also a valid counter-argument that the U.S. is not a party to this Convention, most of its prohibitions are incorporated into U.S. domestic legislation (47 U.S. Code 502).²⁹

Finally, the greatest legal obstacle in front of developing the greatest majority of non-lethal weapons concept is the *Convention on the prohibition of the development, production, stockpiling and use of chemical weapons and on their destruction, signed in Paris 13 January 1993*. This instrument is similar to the BW Convention in the sense, that it prohibits practically all activities related to an offensive chemical weapons program, again, making no distinction on the basis of subjective criteria, such as intended use. According to its definition, “toxic chemicals” are not only lethal ones,

²⁴ BWC, Art. 1.

²⁵ CWC, Art. 1. para. 1.

²⁶ ENMOD Convention Art. 2.

²⁷ ENMOD Convention, Art 1. para 1.

²⁸ Australian Treaty Series 1984 No35, International Telecommunication Protocol, Final Protocol, Additional Protocols I-VII, Optional Additional Protocol Additional Protocols <http://www.austlii.edu.au/au/other/dfat/treaties/1984/35.html>

²⁹ Lt.Col. Margaret-Anne Coppernoll: The Nonlethal Weapons Debate, <http://www.aquafoam.com/papers/Coppernoll.pdf>

but also “those that which through its chemical action on life processes can cause ..., temporary incapacitation or permanent harm to humans or animals.”³⁰ Moreover, Each State Party undertakes not to use riot control agents as a method of warfare.³¹ Its restrictions are therefore twofold, regarding non-lethal weapons: Not only they prohibit incapacitating agents, but riot control agents must also not be used in direct combat.

³⁰ CWC, Art 2. para 2.

³¹ CWC, Art. 1. para 5.

Examination of different weapons systems in the light of IHL

Weapons systems, throughout the world have to undergo legal review before being fielded³² – at least this is one of the obligations Parties to the *First Additional Protocol to the Geneva Conventions* undertook.³³ A U.S. Defense Department regulation requires that any new weapon undergo a legal review by the Judge Advocate General (J.A.G.) of the military department involved to ensure that the weapon's intended use is consistent with the "obligations assumed by the United States Government under all applicable treaties, with customary international law, and, in particular, with the laws of war."³⁴ Further, the acquisition and procurement of weapons must be consistent with all applicable treaties and customary international law;³⁵ each service of the U.S. armed forces is also to ensure that any planned activities that could reasonably generate questions concerning compliance with arms control agreements to which the United States is a party must first be cleared by the Under Secretary of Defense for Acquisition and Technology, in coordination with the Office of the Secretary of Defense General Counsel and the Under Secretary of Defense (Policy). According to rules, a legal review must take place before the award of the engineering and manufacturing development contract and again before the award of the initial production contract.³⁶

There are already several "non-lethal" weapons systems that has been examined in the above procedure, including stinger grenades, "bean bags" (shotgun ammunition that folds out after leaving the barrel, thus making the surface of impact much bigger, avoiding penetration of the body), rubber pellets, foam-rubber; sticky and restraining foam; barrier foam; 40 mm M781 practice grenade fuse modified for foam-rubber ball.³⁷ All these have been found as in line with legal requirements. However, the texts of these assessments are not available to the public, therefore their reasoning can not be known, so while in my opinion most of the abovementioned devices are probably legal (given that they used in the their intended way, which is not always likely in combat) doubt arises at least in one question, namely, barrier foam. This is (because of its ingredients) prohibited under the CWC, therefore it may not be used against combatants in armed conflict – it may see other legal uses in the hand of a occupying army, but, giving weapons that are illegal to be used in some situations offers an almost irresistible temptation in those very situations.

³² New weapons and the law, ICRC News 01/05
<http://www.icrc.org/Web/Eng/siteeng0.nsf/iwpList74/E452B60D56294122C1256B66005F50DD>

³³ AP I, Art. 36.

³⁴ Army Regulation 27-53, Review of Legality of Weapons Under International Law, <http://www.fas.org/irp/doddir/army/ar27-53.pdf>

³⁵ Isabelle Daoust, Robin Coupland and Rikke Ishoy: New wars, new weapons? The obligation of States to assess the legality of means and methods of warfare International Review of the Red Cross No. 846, p. 345-363

³⁶ The Department of the Navy Judge Advocate General (JAG) conducts this review of NLW's for the Navy and the Marine Corps.

³⁷ U.S. Navy Dept., Judge Advocate General [hereafter JAG], memoranda: "Legal Review of Stinger Grenades," 25 January 1995; "Legal Review of 12 Gauge Shotgun Bean Bag/Rubber Pellet/Wood Baton Rounds," 30 January 1995; "Legal Review of 40 mm Rubber Pellet/Foam Rubber Multiple Baton/Bean Bag/Wood Multiple Baton Rounds," 30 January 1995; "Legal Review of Sticky/Restraining Foam," 6 February 1995; "Legal Review of Barrier Foam," 6 February 1995; and "Legal Review of 40 mm Practice M781 Round Modified with Foam Rubber Projectile," 7 February 1995. For the M781 see "Mortar Systems Information (M931)," FSAC Mortar Office Home Page, http://www.pica.army.mil/orgs/fsac/aif_mo/xm931/html

The easiest way to assess the legality of present and future weapons systems is by considering their effects. By doing so, we have to take into account the diversity of targets (size, weight, gender, age, health) especially in the case of weapons that do not let the user picking individual targets, only groups of people.

It is impossible to review all the systems one-by-one, not only because of the length it would take, but also because information on many of them is not public, or not satisfactory to decide on their legality. The following pages I will only examine the systems that are the most advanced in their development, and the most likely to see military use in the coming years.

Acoustical Weapons

Acoustic weapons are close to becoming a reality, both on the battlefield and elsewhere. The idea to use such weapons is not new; as far as back in the 1940s Germany was experimenting with such instruments. Today the United States is building two prototype acoustic weapons, is field testing weapons of at least two companies, and may move from research and development to production soon. Other nations reported to be (or to have been) involved in research on acoustic weapons include Russia, China, France, United Kingdom, and Israel. Sweden, Japan, Poland, Yugoslavia, and Denmark are reported to have acoustic weapons effects research programs.³⁸

Their effects are mostly psychological, disturbing concentration, and making the target feel uncomfortable. However, some infrasound emissions might have deafening effects as well, causing permanent injury to senses.³⁹

Given the current paucity of information available, it is an open question if some or all acoustic weapons (or acoustic weapons' uses) could be considered inhumane and illegal under international humanitarian law, due to:

- their potential to cause unnecessary suffering to combatants and non-combatants;
- their potentially excessively injurious character;⁴⁰
- their potential for indiscriminateness, that is, inability to be restricted to military targets; and
- their potentially disproportionate impact on civilians compared to their military utility.

With the banning of blinding laser weapons by the international community in 1995,⁴¹ acoustic weapons are the next new antipersonnel weapon to emerge based upon novel and/or unconventional physical principles. While analogy can be drawn with blinding laser weapons,

³⁸ Arms Division of Human Rights Watch December 16, 1999 <http://www.geocities.com/Area51/Shadowlands/6583/project456.html>

³⁹ Michael R. Murphy: Biological Effects of Non-Lethal Weapons: Issues and Solutions, Directed Energy Bioeffects Division, Human Effectiveness Directorate, Air Force Research Laboratory, Brooks Air Force Base, Texas. <http://www.dtic.mil/ndia/NLD3/murp.pdf>

⁴⁰ As an example to give concrete meaning to superfluous injury and unnecessary suffering, see: Robin M. Coupland - Peter Herby: Review of the legality of weapons : a new approach The SIrUS Project International Review of the Red Cross No. 835, p. 583-592

⁴¹ Protocol on Blinding Laser Weapons (Protocol IV to the 1980 Convention), 13 October 1995

even the effect of causing deafness can not be compared to the multiple disadvantages caused by blindness.⁴² Nevertheless, the indiscriminate nature of these systems is very troubling, and it can be the greatest legal obstacle before fielding such weapons.

Microbes

Microbes can be used, as it is shown above in many ways. Not all of these are antipersonnel, there are ample opportunities of anti-materiel use as well, including agents that degrade fuel, making it impossible to use in vehicles to the ones that destroy insulating materials, causing problems in many commodities of modern industrialized life. While discrimination is also an issue here, BWC is the prevailing argument against these uses. It not only prohibits use of such weapons, but also development, production and stockpiling of them. Even the US Deputy Assistant Judge Advocate General did not approve such means of warfare.⁴³ As long as the BWC is accepted (and politically it would next to impossible in the near future to even weaken its current provisions) the hostile use of such agents is clearly out of question, at least in an open manner. The greatest weakness of the treaty is that – despite efforts of international actors, including the ICRC – it does not have a verification mechanism, therefore it is impossible to know exactly whether states abide by it. In the U.S. under development is at least one clear violation of BWC rules, the new rifle-grenade recently patented, developed for chemical and biological munitions.⁴⁴ Development of such weaponry is clearly prohibited under the BWC, whatever the intended payload is.

Chemicals

The issue of using chemical agents as non-lethal weapons is probably the most complicated issue of all: Not only because there are many ways to employ chemicals on the battlefield, that many of these uses are perfectly legal (explosives, for example), but precisely because of this there is no general ban as in the case of microbes.⁴⁵ There are certain – if very narrow – loopholes in the CWC that allows for at least considering some possible uses. American interpretation of the prohibition of weapons “*which can produce rapidly in humans sensory irritation or disabling physical effects which disappear within a short time following termination of exposure*” – which defines riot control agents not specifically listed in a Schedule – seems very lax, allowing for neuro-inhibitors, for example.⁴⁶

⁴² Blinding Weapons, ed: Louise Doswald-Beck, International Committee of the Red Cross, Geneva 1993. p. 258-306.

⁴³ U.S. Navy Dept., Deputy Assistant JAG, "Legal Review of Proposed Chemical Based Nonlethal Weapons," proposal 10 March 1997, final review and approval 30 November 1997. Cited in Lt Margaret-Anne Coppennoll, "The Non-Lethal Weapons Debate"

⁴⁴ <http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PALL&p=1&u=/netathtml/srchnum.htm&r=1&f=G&l=50&s1=6523478.WKU&OS=PN/6523478&RS=PN/6523478>

⁴⁵ Peter Herby: Chemical Weapons Convention enters into force, International Review of the Red Cross no 317, p.208-209

⁴⁶ Tradoc Pamphlet 525-73, Military Operations: Concept for Nonlethal Capabilities in Army Operations, Appendix C.

The following sub-categories (that we have information of) can be set up here.

-*Barrier foam*: As it was told, it is considered a riot control agent under the *CWC*, therefore in may not be used against combatants. However, for crowd control it might be used. The problem here is the availability and temptation to expand its use to other situations.⁴⁷

-*Sticky foam*: Unlike barrier foam, sticky foam does not rely on toxicity but on its physical properties to constrain the enemy. Therefore it does not fall under the *CWC*. Not known are its delayed effects – one of its components, butadine was shown to be a carcinogen in animals.⁴⁸ Similar to the problem of depleted uranium, it could not only lead to political problems but likely would violate the “no unnecessary suffering/superfluous injury” rule of IHL. Proper use is also necessary, as it can lead to suffocation when sprayed onto the face of the victim, turning it into a lethal weapon. (And we can all imagine a stressed soldier unable to aim as coolly and precisely as on a shooting range.) Current version of sticky foam also poses a question to environmental law: 30% of its material is Freon-12, one of the substances virtually outlawed by the *Montreal Protocol on Substances that Deplete the Ozone Layer*.⁴⁹ It is to be seen whether a substitute would be found.

-*Pepper spray*: The main ingredient of this substance is oleorescin capsicum (OC), the same natural chemical found in chili pepper. It has similar effects to old-fashioned tear gases (CN and CS-1 -2), but on a higher level. Tested on animals, even prolonged whole body exposure did not result in death. Nevertheless, as it is a riot control agent by its effects, its use only legal in non-combat situations.⁵⁰

-*Neuro-inhibitors*: These agents have similar effects to anesthetics, blocking the signals between nerve cells. The problem with their use is similar to anesthetics as well – proper dosage is a must, otherwise they may not function, or have lethal consequences. Considerations of personal differences come into play, and in a crowd control situation it might be impossible to administer a dose that fits everyone’s endurance. This was amply demonstrated in the Moscow theatre hostage drama.⁵¹

Legal problems also arise, as they act as “temporary incapacitants,” therefore fall under the forbidden methods of warfare according to the *CWC*.⁵² Contrary to this, the US legal review only found vomiting agents contrary to international law. As details of these reviews are classified, it is impossible to tell on what basis they decided so.

Directed-energy weapons

The U.S. Marine Corps has developed a non-lethal weapon that uses electromagnetic energy to heat but not permanently burn human skin. The weapon could help soldiers control unruly crowds and defend airfields and ships.

⁴⁷ Ltc Margaret-Anne Coppennoll, Legal and Ethical Guiding Principles and Constraints Concerning Non-Lethal Weapons Technology and Employment, Defense Manpower Center, DoD Center-Monterey Bay. <http://www.dtic.mil/ndia/NLD3/copp.pdf>

⁴⁸ Michael R. Murphy, Biological Effects of Non-Lethal Weapons: Issues and Solutions www.stormingmedia.us/94/9441/A944153.html

⁴⁹ <http://www.unep.org/ozone/Montreal-Protocol/Montreal-Protocol2000.shtml>

⁵⁰ David K. Dubay, Health Risk Analysis of First Defense(r) Pepper Spray Using an Acute Whole Body Inhalation Exposure, Defense Technology Corporation. At <http://www.dtic.mil/ndia/NLD3/dubay.pdf>

⁵¹ Daniel Kimmage: Moscow Hostage Drama – The Cruellest Question, CDI Russia Weekly, <http://www.cdi.org/russia/242-15.cfm>

⁵² Ltc Margaret-Anne Coppennoll, Legal and Ethical Guiding Principles and Constraints Concerning Non-Lethal Weapons Technology and Employment.

The weapon concentrates energy into a beam of micro-millimeter waves that penetrate clothes to rapidly heat moisture particles in the outermost layer of flesh, supposedly without going deep enough to damage organs. The device is claimed not to cause permanent damage to the body or to electronic devices such as pacemakers.

Called the Vehicle-Mounted Active Denial System, detailed information about the weapon's design remain classified, but it is stated that the weapon would heat a target's skin to approximately 130 degrees Fahrenheit in about two seconds. Humans start to feel pain at 113 degrees. Soldiers could fire the weapon from distances exceeding 750 meters (2,250 feet) from their target -- a range that would allow them to remain outside the reach of most aimed small arms fire, but would also make it very difficult, if not impossible, to distinguish between targets. The weapon could be mounted atop a military vehicle or on an aircraft.⁵³

This device raises some very important questions: First, would it be possible to differentiate between targets in a crowd? If not, then certainly the principle of distinction would be violated. It is also not clear what effect this device would have on senses such as the eye – it might be possible that while not injuring the skin, it could cause permanent damage to the eye. If so, would certainly be analogous with blinding lasers, and although the *Protocol IV. to the CCW Convention* only mentions laser weapons, it is obvious that the aim was to protect vision of combatants (and non-combatants), therefore it would certainly be at least problematic. The general question that is raised concerning non-lethal weapons, namely whether they are capable of causing more serious injuries than intended, depending on the target's features is certainly a valid one here – it is almost sure that permanent burns would be created on persons that are more sensitive than the average, or who, for some reasons can not escape the radius of the weapon in time. For example such a device would be dangerous when turned on to personnel *hors de combat*, whose mobility is likely limited. It would clearly violate a number of IHL regulations, including *Art. 3 Common to the Geneva Conventions, Paragraph 1* („Persons taking no active part in the hostilities, including ... those placed ' hors de combat ' ... shall in all circumstances be treated humanely ...”) one of the most fundamental of all IHL provisions.

⁵³ Kelly Hearn: New Non-Lethal Energy Weapon Heats Skin, United Press International, February 26, 2001 <http://www.vny.com/cf/News/upidetail.cfm?QID=163207>

Conclusion

I believe, that while it is clear that there is no definite answer to the problems posed by non-lethal weapons, especially when we consider the variety of proposed principles and mechanisms, some of them are already under development, some of them existing only as ideas for the future, it was amply demonstrated that this issue will require a lot of attention in the future.

There is a great chance that developed nations will resort to such systems in their conflicts with less developed adversaries, hoping for a “politically correct” outcome, both in term of casualties as well as other political considerations. While there is certainly some chance that these systems mitigate suffering by offering a grade in the escalation of violence between no use of force and use of certainly lethal force, the risks shown in this paper outweigh these uncertain gains. Nevertheless, I am afraid that before realizing this we will have to witness the proliferation of such systems.

To illustrate this currently the US is undertaking one of the most sophisticated non-lethal weapons program in the world, apparently, with the view of arming its forces with the entire spectrum of such weapons.⁵⁴ These include not only agents to be used in a non-lethal role, but also devices to carry them. Some of these, under development are in clear violations of IHL treaty rules, such as the new rifle-grenade recently patented, developed for chemical and biological munitions.⁵⁵ Development of such weaponry is clearly prohibited under the *BWC*, whatever the intended payload is.

The danger of these steps is that it generally undermines the effectiveness of these prohibitions, and may tempt other states to develop similar equipment, but with more deadly intentions. The very reason for these absolute bans is that otherwise the temptation is too great and it is too hard to verify developments – this is what makes using riot control agents as a method of warfare unacceptable: The opposing side might overreact, and turn the exchange into a WMD attack.

Development of these devices might bring great changes in the way battles are waged, and especially in the way they are perceived by society. In today’s asymmetric conflicts Western powers can capitalize politically on the achievement that there is no longer a need to cause mass casualties to reach objectives, while they can disarm political opposition usually fueled by casualties, friendly and hostile alike. Nevertheless, exactly be “revolutionizing” warfare in this way then can not only open the way for much easier and careless use of armed force, but they may also diminish the very principles guiding warfare today – if there is no unreparable damage, then there is no need for regulations to avoid mistakes. In the end, it can easily negate

⁵⁴ A good collection of related documents can be found at <http://www.sunshineproject.org>

⁵⁵ <http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HTOFF&d=PAII&p=1&u=/netahtml/srchnum.htm&r=1&f=G&l=50&s1=6523478.WKU.&OS=PN/6523478&RS=PN/6523478>

the famous words said by Confederate General Robert E. Lee: “*It is well that war is so terrible – we should grow too fond of it.*”⁵⁶

⁵⁶The Quotations’ Page, http://www.quotationspage.com/quotes/Robert_E._Lee/

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