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Non-Lethal Weapons: Towards Clean War?

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« The best war policy is to take a state intact; a policy inferior to this would be to ruin it. It is better that the enemy's army be taken prisoner than destroyed. »

Sun Tzu, Chinese General, 5th Century BC [1].

Summary

Starting in the nineteen sixties, strategic doctrine gradually saw the advent of so-called "non-lethal" weapons, first as a concept, then as a highly promising area for advanced technologies. Authors of this article provide a synthesis of "non-lethal" weapons and then examine the "clean war" hypothesis. The article sheds light on technical and legal aspects, as well as strategy and policy implications.

Introduction

Much like the invention of gunpowder, rifles, machine guns, tanks, airplanes and nuclear fire, "non-lethal" technology could potentially overturn traditional defense, security and safety systems. In contrast to above-mentioned weapons, all based on the principle of destruction, so-called "non-lethal" weapons are designed to disable targets while avoiding the risk of irreversible damage, including to the environment. They currently are one of the most promising fields of advanced technology. Substantial budgets are allocated to research and development (R&D) in all areas of non-lethal technology[2]. This frenzy is indicative of a relentless race among an inner circle of the most affluent, with throwbacks to the nuclear races of the last century. Concurrently, a doctrinal effervescence is building up, attempting to better incorporate "non-lethality" into the continuum of forces. Proponents of "non-lethal" consider above all its rheostatic nature, allowing for a gradual increase in the intensity of forces deployed. Skeptics, on the other hand, hypothetically decry the liberticidal potential of non-lethal technology.

1. SUN TZU, « L'art de la guerre », Ed. Champs Classiques, 2008, p. 11.

2. The US budget for non-lethal weapons programs is evaluated at around $260 billion per year, according to Steve Wright in his article entitled "Hypocrisy of Non-Lethal Weapons" published by Le Monde Diplomatique in December 1999.

On the face of it, these technologies are also a boon to armed forces operating in peacekeeping operations (PKOs) or in low-intensity asymmetric contexts. These technologies could be useful to security and law enforcement forces, including in the fight against criminal activity and organized crime, as well as in the protection of critical locations. Business and industry are also interested. This interest stems from the vulnerability of entire swathes of their value chains (installations, resources and other movable and immovable assets), which, in the absence of effective protection at an acceptable cost, are likely to undermine corporate survival or competitiveness.

Hence, it is timely to explore the debate surrounding non-lethal weapons, focusing on conceptual substance and classification, to then examine legal ramifications, and conclude with the analysis of strategic implications.

I. Non-Lethal Weapons: Unfinished Conceptualization

1.1. Non-lethal, but still deadly!

Strategic doctrine began to see the gradual rise of so-called "non-lethal" weapons starting in the 1960s. This was especially the case in the United States, at a time of growing protest, both in defense of civil rights and, a little later, in relation to the Vietnam War. Yet, a degree of ambiguity still shrouds the consistency of the notion of "non-lethality". The search for semantic nuance for the "non-lethal weapon" referent is still ongoing in theoretical debates.

Despite initial technological stutters, pioneering theorists, such as Joseph F. Coates, spoke of a conceptual blur[3] surrounding the safety of non-lethal weapons and tactical implications for military and law enforcement operations. Among the caveats, still relevant today, is that all weapons, no matter how benign, carry an inherent and unavoidable risk of causing death or permanent injury under certain circumstances. So much so, that the risk seems obvious and it is naturally comfortable to agree with Coates in noting that "even a pellet fired from a toy gun into a gaping mouth could cause strangulation"[4].

The central dichotomy here, is design intent versus use intent. Consequently, "non-lethal" does not have the unequivocal meaning of non-killer. In fact, any object could cause death if used in a way that differs from the purpose for which it was designed. One need only recall that airliners became cruise missiles on September 11, 2001, to realize this. This explains the abundance of terms expanding the lexical range of "non-lethal", to include "less-than-lethal", "reduced lethality", "attenuated lethality", "non-mortal", "pre-lethal", "sub-lethal", "non-destructive", "neutralizing" and "incapacitating".

A number of official definitions therefore ostensibly endorse the conceptual blur, while retaining the oxymoronic term "non-lethal weapons" for weapons "specifically designed and developed to disable or repel personnel, with a low probability of fatal outcome or permanent injury, or disable equipment, with minimal unintended damage or environmental impact"[5]. In practice, this approach to definition brings in two subtleties. On one hand, "zero lethality" is placed into perspective by accepting low occurrence of fatality and irreversible damage potential, and on the other hand, "non-lethality" is completely subordinated to design intent (purpose) and not to user intent (use).

In addition to cautioning against essentialist understandings of "non-lethality", it is also wise to rid it of any irenic notions. In this respect, no one can claim that non-lethal weapons can supplant lethal force, especially in an era where "asymmetry is a dominant conflict paradigm…non-lethal…operates as a 'orce multiplier[6]". The North Atlantic Treaty Organization (NATO) Policy on Non-Lethal Weapons of 13 October 1999 makes this clear: "Non-lethal weapons may be used in conjunction with lethal weapons systems to enhance the effectiveness of the latter across the full spectrum of military operations[7]."

3. J. Coates, « Nonlethal and Nondestructive Combat in Cities Overseas », Institute For Defense Analyses, Virginia, 1970.

4. Ibid. at 3 (emphasis added).

5. NATO Policy on Non-Lethal Weapons of 13 October 1999, Chapter. II Point. 3, [online], accessed 21.02.2021, URL: www.nato.int/docu/pr/1999/p991013f.htm

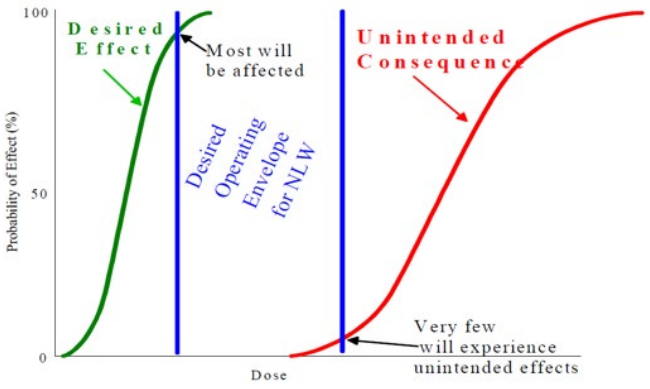
6. Georges-Henri B. des Vallons, "L'arme non-létale dans la stratégie militaire des Etats-Unis : imaginaire stratégique et genèse de l'armement", Cultures & Conflits [On line], 67 | 04 January 2010, accessed on 19 February 2021. URL: http://journals.openedition.org/conflits/3116, p. 70. (Our underlining).

7. NATO Policy on Non-Lethal Weapons, op. cit. Chapter. III, Item. 9.

1.2. Hybrid weapons for defense and security forces

In any event, zero lethality is impossible to guarantee due to the complexity of dosing intended effects. Accordingly, effect produced depends primarily on target physiological vulnerability. In fact, a weapon could be "non-lethal", or even completely without impact, on a healthy adult; yet at the same time, "fatal" on a sick, elderly or younger person. A range of circumstances could also negate this effect or amplify its' lethal potential. Such conditions include distance (target too far or close), small operating area, ventilation, density of target population, recurrence of the effect, post-intervention medical management, etc. The tragic use of an incapacitating gas to stop a terrorist attack in a Moscow theater in October 2002 is worth recalling. Fentanyl was used and approximately 130 of the 830 hostages died[8]. In short, zero lethality is not assured indefinitely, as illustrated by the diagram in Figure 1, relating effect dosage to lethality.

Figure.1: Lethality spectrum of non-lethal weapons [9]



This shift in lexical semantics has not gone unnoticed, particularly in the field of law enforcement. This is precisely why US police forces prefer to use the less restrictive term "less-than-lethal". It is reported that the "less-than-lethal designation affords clearer legal protection to police officers, because it acknowledges the possibility of a result that weapon design is unable to exclude[10]". Similarly, international institutions favor the term "less-than-lethal" over "non-lethal", as is illustrated, for example, by the title of a document passed by the Office of the United Nations High Commissioner for Human Rights (OHCHR) in 2020. The OHCHR further characterizes non-lethal weapons as "weapons designed or intended for use against individuals or groups of individuals, which, when used as intended or as reasonably foreseeable, present a lower risk of death or serious injury than firearms"[11].

We shall distinguish between the term "non-lethal weapons", for military operations, in view of the acceptance of this designation across a wide range of doctrines,[12] and the term "less-than-lethal" weapons for law enforcement agencies, in line with the position of the Office of the United Nations High Commissioner for Human Rights. This utilitarian distinction between "non-lethal weapons" and "low lethality weapons" later allows for a clear understanding of both operational and legal implications. However, the term non-lethal weapon, abbreviated as (NLW), is hereafter used generically to cover both acceptances (law enforcement and military operations), and is only be qualified if there is a need for precision by the use of "non-lethal" or "reduced lethality".

II. Non-Lethality: Technological and Operational Classification

The classification of NLWs can be done along at least two dimensions. The first is technical, based on technology used in weapon development. The second is functional, based on operational capabilities. Some theorists advocate a legal approach to classifying NLWs according to compatibility with international legal instruments, but, with the exception of biological and chemical weapons, the bulk of NLW categories falls beyond the reach of international law and/or in grey areas. We therefore chose to use the functional and technological classification categories.

8. David. P. Fidler, " The significance of the Moscow events: "non-lethal" weapons and international law at the dawn of the 21st century ", International Review of the Red Cross, Vol. 87, No. 859, September 2005, pp. 525-552.

9. Source: Joint Non-Lethal Weapons Program, [Online], accessed on 24.02.2021, URL: www.dtic.mil/ndia/tech.ppt

10. Humair D., Perron C., « Les armes non-létales », Annuaire français des relations internationales, vol. 6, 2005, p.729.

11. UN human rights-based guidelines on the use of less than lethal weapons in law enforcement, issued in 2020 by the OHCHR.

12. One can refer to the Western doctrines, i.e. NATO and its major powers, notably the United States, France, the United Kingdom as well as other powers such as Russia, China and India.

2.1. Sustained, eclectic technological advances

The range of non-lethal weapons technology has shifted continually over the past forty years, reflecting technological advances and increasingly precise operational requirements. An abundance of publications creates the illusion that comprehensive and objective information on current and emerging technologies is available. However, caution is advised in the face of fantasies fueled by elaborate marketing strategies: "the bulk of non-lethal weapon programs remains in reality shrouded in "black operations" with large budgetary appropriations, beyond any scrutiny"[13].

Despite this information blackout, specialized literature nevertheless identifies four main technological fields: mechanical, electrical, electromagnetic and bio-chemical[14].

Mechanical energy

This technology principally combines shock effects using kinetic energy (ammunition-sticks) with personnel and material anti-mobility effects using nets and entanglement or retention barriers.

Conventional kinetic energy devices consist of blunt projectiles (sticks, balls and rubber pellets). Notwithstanding their long history, these devices are limited in range and accuracy and do carry disproportionate trauma. Most recent advances involve highly sophisticated water cannons, such as one Israeli model launching water "bullets", tiny quantities of very highly pressurized water. A range of configurations are available; some recently developed options allow for ultra-cold water blasts, or electrified blasts. Dye or chemical irritant can be added to the water to help identify rioters[15].

Systems for stopping, slowing down and immobilizing vehicles and individuals come in many configurations and have been successfully implemented, for example, in Haiti. These systems are also used in marine environments. The US Coast Guard uses the RGES (Running Gear Entanglement System) net to block propellers to intercept and arrest boats that refuse to comply, and to protect ports[16].

Electrical energy

There list of electric weapons is extensive. Examples include electric batons, electric grenades and mines, electrified water jets, incapacitating bracelets, and, above all, the electric pulse gun known to the general public as Taser[17]. Taser affects a target's motor skills by means of an incapacitating electrical discharge through two electrodes fired at the target, attaching to clothing or skin. Wireless prototypes[18], have been developed to overcome range limitations. The risk of striking vulnerable body areas however increases with improved weapon range and its opposite effect on accuracy.

Chemical and biological agents

A number of biologically or synthetically derived (chemical) substances are used as riot control agents provoking temporary incapacitation via "eye irritation (lacrimation and blepharospasm), causing them to shut, and irritation of the upper respiratory tract. Often referred to as irritants and harassment agents, the general public usually refers to them as tear gas[19]. Riot control products include malodorous agents with foul-smelling chemical components. It is however important to distinguish between riot control agents, acting locally by irritating the eyes and other mucous membranes, and incapacitating agents acting centrally. The latter act on central nervous system cell receptors and produce a variety of effects ranging from sedation and disorientation to unconsciousness and death[20].

Electromagnetic energy (also called directed energy)

Several so-called directed energy weapons are based on varying types of electromagnetic energy, including

13. Luc Mampaey, " Les armes non-létales, une nouvelle course aux armements ", GRIP, Report 99/1.

14. Illustrative examples are provided in the Appendix.

15. N. Lewer and N. Davison, "An Overview of Non-Lethal Technologies," Disarmament Forum. - No. 1 2005 (UNIDIR/DF/2004/5), p. 44.

16. U.S. Department of Defense Non-Lethal Weapons Program. Cf. URL : https://jnlwp.defense.gov

17. Thomas A. Swift's Electric Rifle (TASER) was invented by a NASA engineer in 1970. The Thomas Swift in question is none other than a character from a series of fictional novels introduced in 1910. For more information, see François-Bernard Huyghe, "Les armes non-létales", PUF, Que sais-je series, P.38.

18. The practical range of a Taser is generally limited to 6 meters, which does not provide sufficient safety distance for police or military personnel.

19. Textbook of Military Medicine: Medical Aspects of Chemical and Biological Warfare, Department of the Army, [en ligne], Consulté le 27.02.2021, URL: https://www.hsdl.org/?view&did=1018 , Chapter 12 : Riot Control Agents.

20. N. Lewer et N. Davison, op. cit. p. 48.

millimeter waves, ultra high-powered microwaves, low-power diode lasers and high-power lasers. Directed energy weapons hold one key advantage over other NLWs. Their rheostatic capability, allows users to switch from "non-lethal mode" to "lethal mode" at the touch of a selector button. Thus, the same weapon proportions effect according to threat magnitude: deliver warning summons (suspicious target), produce an inhibiting shock (recalcitrant target) or apply a lethal effect (imminent and characterized threat).

The list of such devices includes:

- **ADT** (Active Denial Technology) based on millimeter waves, at a 95 Gigahertz frequency, provokes a painful burning sensation by overheating water molecules in the epidermal layers (1/64th inch of the skin). The technical data sheet for these systems indicates the sensation stops immediately when the individual instinctively moves or when the operator turns off the beam[21].
- **E-Bomb** (Electronic bombs) use high-powered microwaves to damage unprotected electronic circuits and devices with relatively low radio frequency pulses (up to tens of joules per pulse). Electronic bombs can radiate over a wide spectrum or be directed at specific targets[22]. This type of weapon is potentially formidable against drones and other systems with high levels of embedded computing (avionics, navigation satellites, etc.). E Bombs can prove decisive in a cyber-war context by targeting information system infrastructure and material layers.
- **PEP** (Pulsed Energy Projectile) uses pulsed deuterium fluoride (DF) laser designed to produce an ionized plasma on the target's surface. The plasma in turn produces an ultrasonic pressure wave that passes through a target's body, stimulating dermal nerves in the skin to produce pain and induce temporary paralysis. PEP achieves this at extended distances[23].
- **Illuminators/ Dazzlers**: use a low-power diode laser designed to temporarily blind or blur vision.
- **LRAD** (Long Range Acoustic Device) and HIDA (High Intensity Directed Acoustic Devices) are guns that fire infrasound or ultrasound "acoustic bullets". LRAD for instance, delivers sounds of 120dB at 60 meters with a peak of 130dB. These levels of performance border on human tolerance thresholds, notably hearing loss as well as side effects including nausea, disorientation, intestinal spasms, migraine and loss of balance[24].

Acoustic weapons have been deployed in Iraq and Afghanistan. They have also demonstrated civilian sector investment potential[25]. LRAD proved its combat effectiveness in the Seabourn Spirit case. Furthermore, this non-lethal technology seems to hold great promise, especially in the area of merchant fleet protection, as long as the International Maritime Organization (IMO) refuses to allow firearms on board civilian vessels, while terrorist and piracy acts continue to make navigation impractical in the Straits of Malacca and the Horn of Africa.

2.2. Dual "anti-personnel" and "anti-material" operational function

Functionally, two main capabilities stand out: "anti-personnel" and "anti-material". John Alexander[26], a leading US NLW expert, suggests the following three functions - anti-personnel, anti-system, and anti-infrastructure. The latter two, however, overlap fundamentally. Hence, our choice of the two primary functions of anti-personnel and anti-material, as adopted by the US Department of Defense[27]. Five operational uses stand out under these two functional capabilities.

Anti-personnel capabilities

- **Crowd control**: An operational function typically incumbent on police forces as part of prerogatives to maintain public order and security. It increasingly extends to armed forces contributing to peacekeeping

21. ADT Fact Sheet, Joint Non-Lethal Weapons Program, [online], accessed 27.02.2021, URL: www.jnlwp.defense.gov/Portals/50/Documents/Press_Room/Fact_Sheets/ADT_Fact_Sheet_May_2016.pdf

22. Michael Abrams, « The Dawn of the E-Bomb », 2003, IEEE Spectrum Online, consulté le 27.02.2021, URL : http://ece-research.unm.edu/schamiloglu/EdlPDF/SpectrumArticle.pdf

23. Ronald D. Taylor. et al., « An Assessment of Non-lethal Weapons Science and Technology », National Academies Press, Washington, DC, 2003, p.30.

24. Annual report of the securities exchange act, september 30, 2004, [en ligne], accessed on 28.02.2021, URL : https://www.sec.gov/Archives/edgar/data/924383/000101968704002933/atc_10k-093004.htm

25. Cruise ship Seabourn Spirit repelled pirate attackers in October 2005 using an LRAD system developed by American Technology Corp. after the attack on USS Cole.

26. John B. Alexander, « Future War – Non-Lethal Weapons in Twenty-First-Century Warfare », ST. MARTIN'S GRIFFIN, New York, November 2000, p.513.

27. Joint Concept for Non-Lethal Weapons [1998], accessed on 22.02.2021, URL : www.fas.org/man/dod-101/sys/land/docs/NONLETH.HTM

operations, refugee management in traditional armed conflicts, or auxiliary forces within a national territory.

- **Control of individuals**: A critical function in preventing the escalation of violence. Scenarios range from apprehending rioting mob leaders, individuals defying the law, offenders refusing to comply, or suspected terrorists. Arrest and/or extraction of live targets is a boon for intelligence services.
- **Perimeter control**: Allows for both denial of access and forced evacuation of a structure or area. In peacetime, securing sensitive locations, structures or areas requires considerable human and material resources. Budgetary restrictions, along with security and defense force professionalization policies, further complicate this task, particularly as it is often difficult to outsource. In wartime, perimeter denial creates a tactical advantage in urban combat (snipers, human shields, systematic clearance, etc.), in the absence of adequate intelligence and fire support. It also helps reduce collateral damage, allowing for re-use of hospitals, bridges, airports, and so on, thereby relieving pressure on post-conflict reconstruction.

Anti-material capabilities

- **Denial of mobility or overflight**: Has multiple applications in defense and security. Overflight interdiction, including drone-enforced no-fly zones, provides decisive edge in joint operations. Another decisive application is combating organized crime, notably transnational crime, by restricting vehicles access to key areas.
- **Denial of use of means or structures**: Is a better alternative to attrition by kinetic weapons which, in destroying targets, inevitably leads to death of operators and/or occupants and, sometimes, causes significant collateral damage. Effects to be applied could depend on mission constraints and imperatives. Effects could include complete shutdown or momentary incapacitation. This function can be interwoven with perimeter control targeting personnel and occupants.

III. Non-Lethality: an Incomplete Legal Framework

There are no legal instruments specifically designed for NLWs, viewed generically. The theoretical definition of NLWs does nevertheless meet principles of military necessity, humanity (limiting destruction) and proportionality, matching forces with desired military advantage.

However, aside from chemical, biological, blinding laser, and environmentally-impactful weapons, a number of non-lethal weapons technologies fall outside the radar of international law and/or into gray areas. It is therefore incumbent on States to examine the legality of such technologies within the meaning of Protocol I (1977)[28]. The examination of legality, however, is not limited to norms of said Protocol. It also extends "to all international instruments to which the High Contracting Party is a party"[29].

3.1. Legality of NLWs under International Humanitarian Law

Legality of NLWs under international humanitarian law
The freedom of combatants in means and methods of warfare is not unlimited under international humanitarian law (IHL). This principle is stipulated both in the Hague Regulations of 1907 on the Laws and Customs of War on Land (Article. 22) and in Protocol I of 1977 supplementing the Geneva Convention of 1949 (Article. 35, §1). There is thus an express prohibition on "the use of weapons, projectiles, substances and methods of warfare likely to cause superfluous injury or suffering"[30].

Article 36 of Additional Protocol I (1977) to the Geneva Convention (1949) obligates States to examine the legality of new weapons or methods of combat, irrespective of stage development reached (be it design, development

28. Article 36 (new weapons) of Protocol I supplementing the Geneva Conventions (1949), relating to the protection of victims of international armed conflicts

29. Ibid.

30. Convention (IV) Relative to the Laws and Customs of War on Land and its Annex: Regulations Respecting the Laws and Customs of War on Land. The Hague, 18 October 1907, article 23.e.

or acquisition). This provision, however, does not specify how the review of legality should be carried out. It was only in 2005 that the International Committee of the Red Cross (ICRC) published a Guide drawing attention to procedural and substantive issues to be considered when establishing legal review mechanisms[31].

The ICRC guide cited above states that IHL prohibits means of warfare that cause superfluous injury to combatants. While there is unanimous agreement on the validity of this rule, there is substantial disagreement on the parameters for measuring potential superfluity of suffering caused by a weapon or method of combat. Prevailing interpretations are that superfluous suffering is that which does not serve a military purpose. "Many states point out that the rule requires a balance to be struck between military necessity, on the one hand, and injury or suffering that is expected to be inflicted on a person, on the other[32]".

Ethics dictate we recognize that a weapon can be inhumane while not necessarily lethal. Ati-personnel mines, that maim more than actually kill, are an unfortunate example of this. This raises a "fundamental problem facing manufacturers of non-lethal weapons [which] is the predictability of effects on humans. Practical human trials are evidently particularly difficult to undertake"[33].

3.2. Legality of NLWs: Special Cases of Bio-Chemical Agents

The examination of NLW legality extends to international instruments to which the High Contracting Party is a party. It is interesting to take a look at two of these instruments. One is the Convention on the Prohibition of Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction (BTWC) of 10 April 1972, and the other is the Convention on the Prohibition of Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction (CWC) of 13 January 1993.

Although the BTWC was drafted when NLWs were not as prominent as they are today, it leaves "no room for the development of biological non-lethal weapons"[34]. Article 1 provides for an absolute prohibition. "States Parties to the Convention undertake to never, under any circumstances, develop, produce, stockpile or otherwise acquire or retain: microbiological or other biological agents, as well as toxins irrespective of origin or method of production, of types and in quantities that are not intended for prophylactic, protective or other peaceful purposes; weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or for armed conflict."

The CWC prohibits the use of non-lethal weapons with chemical incapacitating agents as a means of warfare. Article 1.5 of the CWC states that "Each State Party undertakes not to use riot control agents as a method of warfare". According to Malcolm Dandon, "the problem is, in large part, that one purpose not prohibited by the Convention is that of maintaining law and order, including domestic riot control". The question remains as to where the notion of law enforcement ends and the notion of warfare begins. One interpretation most often cited, attributed to the Clinton Administration, considers the use of riot control agents permissible when a crowd becomes riotous in the absence of enemy combatants[35].

IV. Strategic Implications of Non-Lethal Weapons

4.1. A response to state strategic expectations

Famed political scientist Carl Von Clausewitz established a hierarchy between politics and war in the 19th century, making the latter one of the means of the former: "War is only a continuation of politics by other means"[36]. It follows that the political objective is an "end" and the

31. ICRC, "Guide to the review of the legality of new weapons, means and methods of warfare", 2005, [online], accessed 28.02.2021, URL : www.icrc.org

32. Ibid, p.20.

33. David Humair, op. cit. p. 730.

34. Cf. R. Houdaigui and A. El Ouazzane, " Rétrospective stratégique de la menace biologique à l'aune des incertitudes post Covid-19 ", Policy Brief, May 2020, p.7. [online], URL : https://www.policycenter.ma/

35. Department of the Army, Concept for Non-Lethal Capabilities in Army Operations, TRADOC Pamphlet 525-73, 1er décembre. 1996, [en ligne], consulté le 28.02.2021, URL : www.fas.org/man/dod-101/sys/land/docs/p525-73.htm

36. Clausewitz, C., « De la guerre », Ed. Perrin, 1999, p. 46.

military act is a "means". The means is used to impose one's own will on an adversary by placing him/her "in a position of greater inconvenience than the sacrifice we demand of him/her"[37]. In the same vein, Clausewitz considers that as long as an adversary is not an inert mass, dialectics can shift, in theory at least, to "absolute war" along the lines of a logic of "rising extremes". The entropy of real war, where numerous factors come into play, including friction[38] and the "fog of war,"[39] attenuates this ideal type (total war). This is why "war is a true chameleon, mutating with each individual case".[40]

The industrial revolution has fueled warfare with a range of lethal technologies, some of which are termed conventional[41], while others are not[42]. This industrialized version of warfare has flourished since the Napoleonic Wars. It culminated in the use of nuclear weapons (apocalyptic lethality) against Japan during the Second World War. Paradoxically, nuclear fire dissuaded the rise to extremes at the risk of assured mutual destruction. However, it unleashed other conflictual dynamics of lesser intensity. These atavistic forms of warfare pit States against irregular groups, seeking to gain the upper hand through asymmetrical action (guerrilla warfare and terrorism), rendering inoperative the capability superiority of the strongest. We prefer using the terms crisis, conflict or revolution instead of war in this context, the latter having become unrecognizable.

In this new geostrategic environment, encircled by hypothetical nuclear apocalypse and inhibited by asymmetric syndromes (Vietnam 1975 and Afghanistan 1989), skeptical theory abounds, embedded in atypical formulas of "impotence of power". Defeats for States refusing to adapt to new forms of "wars within populations" number in the dozens[43]. The logic of attrition, along Western chivalric orthodoxy (Clausewitz), has been replaced by a new logic of paralysis of Confucian and Far Eastern essence (Sun Tzu). Paralysis results from the often uncomfortable dilemma of choosing between counterproductive use of lethal force and improbable diplomatic compromise.

The Information Revolution (web 2.0), along with a proliferation of asymmetric success stories, have created a new so-called hybrid strategy that combines asymmetric logic with conventional and/or nuclear deterrence (Ukraine 2014). The media (CNN effect) and social networks play a decisive role in the (de)mobilization of a public opinion, increasingly aware of its preponderance in the notorious Clausewitzian trinity[44].

This development leads to a growing need for adequate means and methods to maintain peace, manage public disorder and riots, demonstrations, hostage-taking, terrorist actions, and curb organized crime in its different forms. Lethal weapons and so-called less-than-lethal weapons more or less meet this strategic need by broadening the continuum of "legitimate" violence.

4.2. A Continuum of Force for Peacekeeping

The case for NLWs is based on bridging the gap between unfulfilled diplomacy and lethal force. NLWs are a panacea to paralysis (asymmetric and hybrid) by expanding the range of available options. Policymakers can commit military or police forces in non-lethal mode to create the conditions for peace before a situation escalates. Also, escalation (lethal), through NLW rheostatic capability, adjusts required levels of force to accomplish a humanitarian or internal order restoration mission.

In fact, NLWs provide a broader continuum of options and enhance flexibility of operational deployment. A tactical three-way tradeoff, however, needs to be managed. The military or security force leader in any engagement must balance his or her imperative to accomplish the mission with constraints of protecting troops and limiting collateral damage. Mismanagement of this balance leads, in the best of cases, to military success offset by

37. Ibid.

38. Clausewitz used the term "friction" to describe the difference between what is planned and what actually happens due to endogenous and exogenous factors.

39. Insufficient intelligence

40. Clausewitz, C, op. cit., p. 48.

41. Conventional technologies include explosive powder, rifle, machine gun, tank and aircraft.

42. Unconventional technologies relate to weapons of mass destruction including chemical and biological weapons.

43. R. Smith, "The Utility of Force - The Art of War Today", Ed. Economica, 2007. P. 257 and subsequent.

44. Clausewitz states: "war is made up of a marvelous trinity [...] the first axis is that of the people, the second that of the general and his army, the third is that of the state", Clausewitz, op. cit.

political defeat. The Vietnam War (1964-1975) is a case in point.

UN Operation Restore Hope and UNSOM II (1992-1993) illustrate the complexity of this three-way trade-off in an asymmetric or hybrid context against a foe disseminated among an urbanized (willing) population: open fire using lethal means and kill non-combatants - which is contrary to Rules of Engagement (ROE)[45] – or refrain from doing so and jeopardize troop survival and mission success. NLWs such as those listed above would have contributed to mission success without incurring disproportionate risks in troop safety and loss of civilian life.

The use of NLWs requires adherence to a number of principles of engagement, taking into account functional performance, operational capability, and the inherent potential for lethality. David Humair cites three such principles: "First, engagement of non-lethal weapons must be part of a use-of-force continuum, i.e., proportional to threat. Second, possession of non-lethal weapons must not limit military commanders' inherent freedom to use whatever means are necessary to accomplish the mission: they provide a choice of complementary means. Finally, use of non-lethal weapons is not limited to peacekeeping missions: it covers the entire spectrum of military operations"[46].

Conclusion

Non-lethal weapons have seen significant progress in terms of R&D and investment by a number of powers over the last four decades. This progress is now turning into a massive boom because of changing geopolitical, security and strategic landscapes, along with improved operational capabilities. NLWs allow policy makers and operational leaders the famous third way between blunt use of lethal force or tactical pat[47] for an incremental gradation of force in proportion to situational complexity. Lethal force is thus resorted to only as ultima ratio.
Along with operational opportunities outlined in point two, expandable as technology and warfighting ingenuity develop, one should also consider the advantage of smaller logistical footprints compared to lethal weapons systems. They provide a special opportunity to certain States, particularly in Africa, afflicted with porous borders, violation of national spaces, particularly by drones, or use of infiltration tunnels. The different anti-personnel and anti-material (anti-system and anti-infrastructure) capabilities described above can be combined to strengthen the territorial integrity of nations by enabling them to render borders true no-man's lands. However, this euphoria may suffer setbacks, particularly the risk of proliferation, non-lethal arms races and misappropriation for asymmetric use (terrorism and criminal predation activities). Conversely, NLWs will eventually submit to the eternal law of sword-and-shield rivalry; lethal defense could never be far behind.

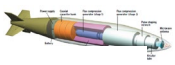
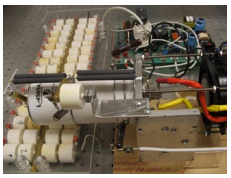
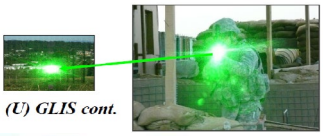
Finally, it is appropriate to reconsider the timeless nature of the Clausewitzian paradigm in the face of impending 5th generation warfare, where the ideal type of "absolute war" seems to be almost attainable, without recourse to nuclear fire, and this thanks to autonomous variable lethality weapon systems (AVLAS), centralized connectivity thanks to 5G, augmented artificial intelligence, ...

45. Since this is a humanitarian intervention, Rules of Engagement (ROE) limit the use of lethal force to situations of self-defense or against individuals openly carrying a weapon.

46. D. Humair and C. Perron, op. cit. p. 735.

47. In chess, said of the king who, without being in check, cannot move without being caught.

Annex: Illustrative Examples of Non-Lethal Weapons

Energy	Technology	Description	Illustration
Mechanical	**Kinetic effect**	Weapons firing blunt projectiles (sticks, bullets and rubber pellets). These devices have the disadvantages of limited range and accuracy and the attendant disproportionate trauma.	
	Counter-mobility	Systems for halting, braking and immobilizing vehicles and individuals come in a variety of configurations and have been successfully implemented. These systems are also used in marine environments.	
Electrical	**Taser**	Taser targets motor skills by delivering an incapacitating electrical discharge through two electrodes launched at the target individual and attached to clothing or skin.	
Chemical	**Incapacitants**	There are two types of agents: riot control agents that act locally by irritating the eyes and other mucous membranes, and incapacitating agents that act centrally. The latter act on central nervous system cell receptors and produce a variety of effects including sedation, disorientation, unconsciousness or death.	
Electro-magnetic	**ADT (Active Denial Technology)**	Device based on millimeter waves, pulsed at a frequency of 95 Gigahertz, provoking painful burning sensation by overheating water molecules in the epidermal layers (1/64th inch of the skin).	
	E-Bomb	High-powered microwave bomb that damages unprotected electronic circuits and devices via low-level bursts of radio frequency pulses.	 
	PEP (Pulsed Energy Projectile)	A pulsed deuterium fluoride (DF) laser-based weapon designed to produce an ionized plasma on the target's surface. The plasma in turn produces an ultrasonic pressure wave that passes through the body, stimulating the cutaneous nerves in the skin to produce pain and induce temporary paralysis.	
	Illumantors/ Dazzlers	A low-power diode laser weapon designed to temporarily blind or blur vision.	
	LRAD (Long Range Acoustic Device)	Gun firing "acoustic bullets", based on infrasound or ultrasound, of 120dB jsq 136dB. Causes nausea, disorientation, intestinal spasms, migraine and loss of balance.	

Source : US Joint Non-lethal Weapons Directorate [48]

48. "Non-Lethal Weapons Reference Book", accessed on 10.03.2021, URL: https://info.publicintelligence.net/DoD-NLW.pdf

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