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# Bradford Non-Lethal Weapons Research Project (BNLWRP)

## Research Report 1

November 1997

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## 1. Introduction

The NLW database illustrates the extensive and eclectic literature regarding NLWs which covers the last few decades. It currently contains over 250 entries. It is important to have access not only to the more recent material, but also to earlier sources since many of the general debates and controversies have already been rehearsed, and lessons learnt from them are still relevant today.

Yet, it is also vital to follow new developments of NLWs closely because rapidly changing technology is producing weapons whose implications for integration into military and civil police forces have yet to be clearly defined and understood. Of particular interest are not only NLW applications for war fighting, but opportunities for deployment in peace enforcement and peace keeping missions. These technologies span many bases including: psycho-chemicals; unmanned weapons platforms and delivery systems; biogenetics; acoustic and microwave weapons; biological and chemical weapons;

laser systems; kinetic energy ballistics; dual purpose (lethal/non-lethal) weapons; and, sprays and foams which inhibit movement. The database will keep up to date on these developments and future reports will highlight new issues and debates surrounding them.

With these rapid technological advances come a series of associated dangers and concerns including: the ethics of use; implications for weapons control and disarmament treaties; military doctrine; public accountability and guidelines; dangers of misuse and proliferation; and, research and development strategies.

Using the database, and drawing from military and non-military sources, this report will select the main current issues and debates within the non-lethal community. Bearing in mind that many operations undertaken by military forces are now more akin to policing actions (such as peace support operations) there are lessons to be learnt by military units from civil police experience. There still remains a tension between perceived benign and malign intent both in NLW operational use and non-lethal research and development.

## **Bibliographic Database**

### ***2.1 A bibliographic database using Access is being constructed, and will be regularly updated.***

**2.2** The database sources are diffuse, and as well as scanning the literature to keep up to date with recent events, we routinely search other databases (such as BIDS, US Patent Office, and Statewatch) and keep in contact with other researchers in this field. The Internet is playing an increasingly useful role in accessing sources and literature.

## **Operationalisation of Non-Lethal Technologies**

### ***3.1 Strategic implications***

Previous publications and literature have discussed NLWs within the strategic frameworks of the concepts of a Revolution in Military Affairs (RMA) and a Military Technical Revolution (MTR). Several recent articles have further refined the role of weapons technologies within what some military analysts see as the 'revolutionary transformation of the global security environment as the Cold War system transmutes'. **(1)** In Metz's excellent paper he notes "...robotics and other brilliant weapon platforms will become increasingly important. Long-range, stand-off strikes and reliance on nonlethal or less-lethal weapons (including weapons aimed at psychological incapacitation rather than physical harm) will be the norm" (p.25). In another paper Dunlap **(2)** asks the question - what will a given technology drive our adversaries to? - and points out that:

"As we look to the future we must continually remind ourselves-and our decision makers-that war, not withstanding its technology, will remain the savage clash that it has always been. We will face adversaries who will not play by our rules and, indeed, who see our values as vulnerabilities...Make no mistake about it, technology cannot transform war into a genteel electronic exchange as some hope" (p.35)

Nevertheless moves to integrate NLWs into NATO and US forces proceeds.

### **3.2 Non-Lethal Weapons in the United States**

**3.2.1** A memorandum from Paul Kaminski, Under-Secretary of Defence for Acquisition and Technology, in March 1996 named the USMC as the Executive Agent (EA) for the DoD's NLW programme.**(3)** The programmes were to be focused on the tactical level, and the EA oversight was not to extend to Service programmes whose primary purpose was to achieve wider military objectives, even though the systems may be non-lethal. The objective was "to field systems designed to give US military forces on the ground options for achieving their mission and defending themselves without having to resort to the use of lethal force". Specifically the memorandum directed the USMC to expand the demonstration of new non-lethal weapons in proposed advanced concept technology demonstrations such as in military operations in urban terrain.

**3.2.2** On 21 January 1997 a Non-Lethal Weapons Agreement **(4)** established a memorandum of agreement (MOA) between the services and the US Special Operations Command which spelt out how non-lethal programmes would make their way through the DoD's acquisition process (details of the MOA can be found in Inside The Navy, 17 March 1997, from which these notes were taken). The MOA also set up an integrated product team (IPT) to advise the USMC on NLW activities. The key functions of the IPT were to:

Recommend approval of the consolidated DoD NLW RDT & POM [programme objective memorandum];

Provide oversight to and review recommendations of the Joint Concepts/Requirements Group (JCRG) and the Joint Acquisitions Group (JAG) [two new bodies created by the MOA];

Review/resolve security, environmental, health and safety, and policy issues that may arise in the development of NLW programmes;

Be the final arbiter for service concerns.

The Inside The Navy report also notes that "while the groups set up under the terms of the MOA will have an oversight for the overall development and application of NLWs programmes, the individual services are being given certain responsibilities. Under the terms of the MOA, the services will develop their own unique operational requirements, carry out research, development, test and evaluation on non-lethal programmes, and identify requirements for non-lethal logistics.

**3.2.3** The confusing picture surrounding the funding of NLWs in the US continued. This reflected an apparent lack of cohesion between the many and varied interests of the Pentagon, White House, Congress and Senate, the Armed services, and research laboratories, and arguments over which budgets should be raided for NLW development. Disagreement was reported between National Security Council (NSC) and the Pentagon over the latter's NLW funding plan for the next five years. The NSC wanted the Department of Defense to put more money into NL programmes, releasing \$139 million which the Pentagon had told the US Army and Marines to allocate to these programmes from their existing budgets. **(5)** Whilst the NSC does not have a formal say in the Pentagon's budget, the fact that this pressure came from the White House was bound to put pressure on the DoD to increase NLW funding. This was the latest in a series of battles over NLW funding - in 1996 the Pentagon also tried to withhold \$37 million from the programme.

**3.2.4** Later in the year came news that many NL programmes were to be cancelled, and those that had dual application would receive priority. Paul Kaminiski allocated \$40 million to be spent over a two year period. NLWs which received development funding included pepper sprays delivered by UAVs, disabling foams for crowd control, speed bumps to slow down or disable vehicles, antipersonnel mines that could dispense non-penetrating pellets and 'still-to-be determined' methods of stopping boats without killing the crew. **(6)**

### **3.3 NATO**

**3.3.1** In September 1996 senior NATO officials discussed NLWs at a seminar in Pisa, Italy, conducted by the Alliance's Defence Research Group. "There was general consensus that non-lethal weapons will supplement rather than replace lethal devices. The shortfall in hard requirements, doctrine, policy, and training - not technology - was identified as the 'constraining factor' ". **(7)** A later report in November 1996 by NATO's Conference of National Armaments Directors (NAD) identified 10 broad categories of NLWs and 30 subcategories that were being researched and/or tested by NATO members.

**3.3.2** In May 1997 the NATO Advisory Group For Aerospace Research and Development (AGARD) published a report Minimizing Collateral Damage During Peace Support Operations. **(8)** The study was commissioned to explore innovative means to attack (both lethal and non-lethal), with minimal risk of collateral damage, discrete ground targets from airborne platforms supporting NATO Peace Support Operations. A basic set of 50 lethal, 11 non-lethal, and 4 UAV concepts were identified and analysed in relevant target situations. The study identified the primary missions for NLWs as likely to be:

Anti-personnel (barrier/area/crowd control)

Anti-material (inhibit mobility or mechanical functioning)

Deterrence (identify and warn)

The report noted that:

In the near term (assessed to be available within 1-3 years) non-lethal solutions are available [to reduce the collateral damage], but they are generally limited to missions requiring crowd control and anti-personnel tasks in benign air defence environments. While not in current inventories of NATO airforces, simple crop duster aircraft could provide an opportunity for area coverage with aqueous foams and irritants in support of ground operations. It is also possible to use non-lethal weapons designed for ground application, such as nets and acoustic systems, from helicopters. The study concluded that there are no lethal "super systems", nor are non-lethal weapons a panacea.

Other helicopter delivered NLWs envisioned included a 'modified rotating airfoil grenade (RAG)', flash-bang grenades, low energy laser, and a Gatling Gun low impact projectile. A future role for UAVs was clearly identified as a delivery platform.

**3.3.3** In September 1997 it was announced that a NATO group was to be formed to examine the legal, moral and ethical aspects of using NLWs, and to formulate policy and guidelines. **(9)** Part of the reason behind setting up the group was to pre-empt the controversies which erupted over laser weapons during 1995/96, because some NATO analysts feared similar reactions to other emerging NL technologies.

**3.3.4** Also in September 1997 a draft report 'Non-Lethal Weapons' by Lord Lyell was completed for the North Atlantic Assembly. Several excerpts from the report were given in an article in Defense News which commented:

While supporting a strict application of their use, the Lyell Report argues that nonlethal technologies raise a number of problems, namely that weapons based on chemical or biological agents would violate international treaties such as the Biological and Toxin Weapons Convention (BWC). "The use of biological agents to render fuels inert or destroy materials used in military equipment would not be permissible under the BWC even if the intent was nonlethal" it [Lyell's Report] says. As for chemical-based incapacitating agents, the report points to the Chemical Weapons Convention, which permits their use for domestic law enforcement but not for military purposes in a foreign peacekeeping mission. Such provisions "would almost certainly preclude the use of super-caustic agents or powerful acids" it notes. **(10)**

Lyell also cautioned that there could be no guarantees that NLWs will result in no casualties.

## **Implications of Deployment and Use of Non-Lethal Weapons**

### **4.1 *Limitations and Problems***

As the role of NLWs have been more closely examined problems and limitations associated with their operational use have been highlighted. Many military analysts do not envisage their widespread utility in war, and difficulties identified raised in the military journals have included: the danger to existing arms control and disarmament treaties, and that the use of some NLWs may violate the rules of war; that their availability may increase likelihood of early intervention and then escalation; that troops armed with NLWs will be in danger from ruthless opponents; that many of the NL technologies will prove to be too expensive; that they are environmentally unsafe; that they have not been adequately tested; that the programmes are not open to public scrutiny; that their use may invite future litigation; that it will be difficult, if not impossible to control proliferation; and, that once used the element of surprise has been lost and counter measures can be devised.

#### **4.2 Ethics - Oppression, Torture and Proliferation.**

Concerns and evidence about the misuse of NLWs continue to appear in the media.

'Trading in Torture' and 'The Stun Belt - A New Potential For Torture' **(11)** are illustrative of headlines appearing in the media. Most of the reports **(12)** and stories refer to NLWs such as high voltage electronic stun guns and batons, 'Taser' weapons, and stun belts, which are being made available to regimes known to use such devices for torture. They are 'popular' with such people not only because of the extreme pain they can inflict, but because they leave very little physical evidence of their use. Recently the Managing Director of ICL Technical Plastics pleaded guilty to possessing these electronic weapons, and of having supplied them to China and countries in Africa and the Middle East.**(13)** He was fined £5,000. However the MoD police did not pursue action against a British Aerospace salesman who was filmed attempting to sell these devices, and admitted to supplying 8,000 to Saudi Arabia. Whilst it is illegal to own or sell such weapons in Britain, it is not illegal to arrange for their sale in another country. There is a growing international market for 'self-defence' NLWs and they can be purchased in the US, Germany and France and are increasingly advertised on the Internet (see commercial section). Human rights groups argue that companies based in countries which have a domestic ban on electronic non-lethal technologies should not be allowed to export them.

#### **4.3 Home Office trials of CS**

In March 1996 the UK police service began a six-month period of operational trials of CS aerosol incapacitant.**(14)** In the trial 4,000 police officers in 16 forces were issued with the spray and monitored to assess the use made of the spray, the impact on injuries and assaults, and the views of the police officers and the general public.

#### **4.4 Medical evidence of the lethality of baton rounds**

A recent paper detailed further evidence of the lethal capability of 'non-lethal kinetic energy weapons'.**(15)** In December 1987 rubber and plastic bullets were introduced by the Israeli Defence Force to control and deter public disorders in Judea, Samaria and the Gaza Strip. The paper describes 20 deaths caused by this ammunition.

#### **4.5 Testing of NLWs on human subjects**

The Department of Justice/National Institute of Justice have funded a study at Sandia National Laboratory of a less-than-lethal sticky foam restraint system.**(16)** As part of the National Institute of Justice's programme on Less-Than-Lethal (LTL) technology development, Oak Ridge National Laboratory (ORNL) **(17)** is examining approaches based on known physiological responses to certain types of energetic stimuli relevant for civil law enforcement purposes. The project began in September 1993 and has already examined concepts for LTL weapons including a thermal gun and a magnetophosgene gun. A thermal gun would have the capacity of heating the human body to 105-107 degrees F. The magnetophosgene gun is designed around a biophysical mechanism which evokes a visual response and is thought to be centred on elements in the retina, known as magnetophosgenes. **(18)**

**4.6** The general consensus in law enforcement circles that less-than-lethal weapons are effective in reducing police-citizen killings has been challenged. An analysis by Bailey **(19)** produces no evidence that police killing rates are affected by the availability of less-than-lethal weapons.

### **Technology Developments**

**5.1** A recent article by Douglas Pasternak **(20)** indicated some of the future directions of non-lethal research. He mentions acoustic weapons which can be tuneable along a spectrum from mild non-lethal effects up to a lethal result. Scientific Applications and Research Associates (SARA) and the USMC at Camp Pendleton have tested prototype acoustic devices which have the ability to resonate internal organs causing discomfort and even death. SARA is also pursuing acoustic 'vortex' technology (originally developed by Nazi scientists in the 1940's) which manufactures sonic boomlike shocks capable of disabling or destroying personnel and equipment. Pasternak also reports work on short-range tactical radio frequency weapons and electro-magnetic devices, but notes that progress has been slower than for acoustic weapons because of problems with focussing, maintaining and directing the power of the beams. However research is continuing in this area. For example the US Air Forces Armstrong Laboratory at Brooks Air Force Base is spending \$110 million over the next six years

"to exploit less-than-lethal biological effects of electromagnetic radiation for Air Force security, peacekeeping, and war-fighting operations".

**5.2** Two Russian scientists, Babievsky and Rodionov **(21)** , report on a highly irritant non-lethal chemical agent with potential for lethal application. They argue that these irritant agents at present do not fall within the scope of the CW Convention when produced and used for 'non-military' objectives, such as riot control. CR gas (an organophosphorous agent - diterpene ester) is stated to be ten times as powerful as CS gas and affects the skin as well as eyes and respiratory organs. At the time of writing there were no protective masks which could block CR aerosols. As a result, victims would have to pull off protective masks (because of the choking and suffocating effect of the CR) thus exposing themselves to breathing in larger, and potentially lethal, amounts of the gas.

**5.3** The potential use of laser beams to deliver incapacitating stimuli continues to be explored. For example US Patent 5675103 (issued in October 1997) describes:

A non-lethal weapon for temporarily mobilizing a target subject by means of muscular tetanization in which the tetanization is produced by conducting a precisely-modulated electrical current through the target. Because the electrical is a close replication of the physiological neuroelectric impulses which control striated muscle, it tetanizes the subjects skeletal muscles without causing any perceptible sensation. The transmission of this current to the distant target is via two channels of electrically conductive air. The conductive channels are created by multi-photon and collisional ionization within the paths of two beams of coherent (laser) or columnated incoherent ultraviolet radiation directed to the target. A single beam may be used to tetanize a grounded target. The high voltage tetanizing current flows from electrodes at the origin of the beams along the channels of free electrons within them. **(22)**

#### **5.4 Unmanned Aerial Vehicles**

The use of UAVs and other remote delivery systems will receive increasing R&D resources. Such systems have broad utility for surveillance, intelligence gathering and as weapons platforms. Two articles by Sherman **(23)** and Goodman **(24)** indicate the attention being paid to UAV programmes.

#### **5.5 Chemical and Biological Weapons**

**5.5.1** Classical biological weapons included both lethal (eg.anthrax) and non-lethal (eg VEE virus) agents.**(25)** Thus it should have been no surprise that Iraq's biological weapons programme included both types of agent.**(26)** The potential deterrent effect even of deployment of non-lethal biological agents have been pointed out in discussions of the possible causes of Gulf War Syndrome.**(27)** Such discussions raise questions about the form that future non-lethal biological weapons might take. In several reports the US Secretary of State for Defence has pointed to a variety of impacts that modern biotechnology might have on biological weapons development.**(28)** Of particular interest here are suggestions of a variety of ways in which bioregulators might be used to attack personnel.**(29)**

**5.5.2** Such concerns must be enhanced by the lack of a clear understanding of Soviet work on incapacitants. **(30)** A careful watch on such developments, particularly if it becomes possible to target specific 'ethnic groups' **(31)**, is obviously required.

### **Commercial Exploitation**

Outside of the UK, NLWs are becoming widely available on the open market under the label of self-defence and personal security weapons. Many of these are non-regulated and need no permit. Within the UK NLWs can be ordered via the Internet. Examples include -

(a) The Pneu-Gun Ballistic Baton which fires rubber balls or 'shot-bags' -  
<http://www.janrix.com/nkfa/nkaoba.htm>

(b) 300,000 volt Stun Guns and Air Tasers - <http://www.freeman-mkt.com/homepage.htm>

(c) BodyGuard Plus based on oleoresin capsicum (pepper spray) which causes choking, coughing, burning sensations and swelling of respiratory mucous membranes, and temporary blindness.

### **The Non-Lethal Community**

#### **7.1 Meetings and Conferences**

24/25 October 1997- Non-Lethal Weapons and the Law of Armed Conflict, Mannheim, Germany.  
Organised by: International Society for Military Law and the Law of War, Brussels.

20/21 November 1997 - Non-Lethal Weapons and Systems, Gloucester Hotel, London Organised by:  
Jane's Information Group.

24/26 February 1998 - Non-Lethal Defence III, John's Hopkins Applied Physics Laboratory, Maryland, US. Organised by: ADPA/NSIA/US DoD etc.

### **Bradford Non-Lethal Weapons Research Project (BNLWRP)**

#### **8.1**

**8.1.1** Much of the first six months has been taken up with researching and retrieving information and literature, analysing and entering this data into the Access Database. We have also continued to build links with other researchers. In the short term we will continue with this process (as in 8.1.1), but with a greater focus on non-lethal research and development in Europe and NATO. In the medium term we will publish a Research Working Papers Series which will analyse and summarise key issues, technologies and debates. The series will include contributions both from NLWRP researchers and

invited contributions from other individuals and institutions. In the long term (5 years) we will feed into the vital debate concerning preventive arms control, to try and ensure that weapons which contravene, or have the potential to contravene, international conventions and treaties are banned or controlled.

**8.1.2** Internet Website has been started at <http://www.brad.ac.uk/acad/nlw>. We see development of this facility as a valuable conduit for networking, exchange of information and possible dissemination of project publications. Details of meetings and conferences will also be posted.

**8.2** Our assessment is that interest in NLWs will continue and gather momentum within the context of (a) responses military forces have to make in post Cold-War type conflicts - with reference to the impact that NLWs will have on doctrine, policy and operations, and, (b) demand from civil law enforcement agencies. This activity is reflected in the number of conferences and seminars being organised (see 7.1), the interest of the media **(32)**, resources allocated to research and development, an increasing number of requests from military units for NLWs, and the attention non-lethality is receiving from military academics and analysts.

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17. ORNL. Principal Investigator Dr Clay Easterly. Tel: (615) 576-6254.
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