

Chapter 4 – MEDICAL ISSUES FOR NLT

4.1 GENERAL CONSIDERATIONS

To date, non-lethal technologies have seen some, but limited, effective use. For example, pepper spray has been employed to disperse angry mobs in domestic riot situations and rubber baton rounds have been used in the Bosnian peacekeeping missions. Non-lethal technologies are often used by law enforcement and correctional agencies to end domestic violence conflicts, prevent suicides, and to intervene in other threatening situations. However, there is still a strong and growing demand for improved yet simple, effective technologies and weapons that provide a safe alternative to deadly force.

4.2 ENABLING A SPECTRUM OF RESPONSE

In a terrorist/hostage situation, it is conceivable that the use of riot control agents, directed energy, or flash-bang devices could quickly and temporarily disorient or disable all people in the crisis, allowing for the capture of the belligerents and safe recovery of hostages and innocents. Likewise, during a potential suicide crisis or threat, use of a blunt impact projectile or an electrical stun device could quickly and temporarily incapacitate the individual, preventing both the suicide and potential harm to law enforcement officers and bystanders.

A broad spectrum of non-lethal responses are needed for law enforcement, peacekeeping, counter-proliferation, anti-terrorism (both domestic and international), and the management of relations with rogue nations at all levels of conflict (<http://www.unh.edu/ntic/>).

The variety of situations in which NLW may be needed and the wide spectrum of techniques that may be used make it very difficult to predict all possible medical effects of the NLW systems. It seems fair to assume that medical effects of NLW in general must be mild compared to the lethal alternatives. However, it is possible that the threshold for use may be lower for NLW. For a safe use of NLW it is important to analyze the possible medical effects before the introduction of a new system. This ideal has not been achieved in most cases. The millimetre wave project of the US Air Force is an interesting exception to this role, since this system has been carefully evaluated in animal experiments and with human volunteers, and dose-response data provide a good background for safety-regulations.

Safety regulations: For other systems, predictions of medical effects can partly be made from case reports and experience with similar systems. Such data may also have been developed for setting safety-regulations. Safety-regulations are important to prevent a NLW from becoming a lethal weapon, e.g., as might occur with the inhalation of sedatives (see Annex M).

Reports on medical effects of NLW are hard to find in medical databases. A search of the website <http://www.ncbi.nlm.nih.gov/PubMed/> on Nov 30, 2003 found 155 articles on blunt injury, 105 articles on weapons, and no articles on non-lethal weapons during the preceding 150 days.

4.3 SPECIAL ISSUES: MICROWAVE AND RADIO FREQUENCY (RF) SYSTEMS

The effects of human exposure to microwaves range from direct thermal effects causing pain to the untested possible effects of microwaves used in anti-materiel systems. The possible medical effects induced by the use

microwaves in non-lethal weapon systems are difficult to evaluate, in spite of extensive research and wide use of cell phones and wireless phones. The available scientific evidence does not show any health problems associated with using wireless phones, yet, as with the health effects of any agent, **absolute** safety can never be proven. Wireless phones emit low levels of radiofrequency energy (RF) in the microwave range while being used. They also emit very low levels of RF when in the stand-by mode. Whereas high levels of RF can produce health effects by heating tissue, exposure to low-level RF that does not produce heating effects causes no known adverse health effects. A more extensive discussion on possible effects of RF systems can be found in Annex J.

RF based non-lethal weapons include high power pulsed microwaves (HPM) and the 94GHz ADS system. The ADS system is based on biological thermal effects, while HPM systems have no known biological anti-personal effects. The ADS system has been extensively tested with regard to both desired and possible undesired effects. So far, no other weapon system has been tested with such a systematic approach in order to establish safety margins and rules for use.

HPM systems are being tested in several labs in different countries to identify possible biological side effects. No effects that could have health consequences have been revealed, so far, and the effects that have been claimed to occur at low levels (so-called non-thermal levels) have been difficult to replicate when adequate controls and accurate dosimetry are employed.

4.4 SPECIAL ISSUES: ELECTRICAL MUSCULAR DISRUPTION DEVICES (EMD)

Stun weapons from TASER Incorporated are used by a large number of police forces. A number of user reports have been published at the TASER website (www.taser.com). Currently, military use is not widespread. Medical risks include cardiovascular disturbances, penetration injuries (skin and eye), and fall injuries. Reported fatalities have been attributed to pre-existing drug abuse or cardiovascular illness. A few studies on experimental animals have been conducted. A more thorough consideration of the medical implications of EMD use for NLW is presented in Annex K.

4.5 SPECIAL ISSUES: BARRIER SYSTEMS

Barrier systems included Airbag Stoppers, Microwire Systems, Nets, Rapid Barriers, and Temporary Fences, and have proven very effective when emplaced at the right time. However, all barrier systems have the potential of confining movement in such a way that vehicles can crash into them, or people can be crushed between them and a moving crowd. Temporary barriers that are rapidly emplaced are a particular problem because people could be hit, thrown back, fall, or get entangled in them; such barriers can also appear in unexpected locations, making the issues of crowd pressure more likely.

4.6 SPECIAL ISSUES: ACOUSTIC SYSTEMS

Acoustic systems, known for centuries, have been analysed in detail and their effects described in narrative non-fiction and scientific literature. The human ear is sensitive between 20 – 20,000 Hz. Non-lethal actions using acoustics could range from loud sounds producing a temporary deafness to disagreeable sounds having a psychological effect. With low frequencies, additional effects can be obtained, in particular, loss of equilibrium. The aim of a directional multi-effects acoustic system is to generate different anti-personnel effects: targeted information/disinformation (psychological effect on selected people among a crowd),

continuous or interrupted unbearable acoustic stress (physical and psychological effects), loss of equilibrium by the use of low but audible frequencies (physiological effect on inner ear).

Most audible acoustic systems can be defeated with ear protection. When the effects of an NLW acoustic system depend on the loudness of the sound, there is usually a risk of permanent damage to hearing.

4.7 SPECIAL ISSUES: LASER SYSTEMS

Laser Systems are widely used in weapon systems for range finding, detecting, and pointing. Their frequencies are fixed and mostly well known, so that eye protection with special goggles is possible.

Laser weapons have been developed for use against sensor systems, anti-optical equipment and, at very high intensities, to burn metal structures and destroy weapon systems. They can easily affect the eyesight of persons. The need to pay attention to new laser weapons to be sure they do not violate international humanitarian law has already been codified in Article 36 of the 1977 First Additional Protocol to the 1949 Geneva Conventions. Current technology provides the possibility for small lightweight lasers that are dangerous for eyesight over distances of kilometres. Laser eye protection is frequency specific and because of easy to alter frequencies (tunable lasers) there is no fully effective protection that soldiers could wear. It should be emphasized that with repetitively pulsed laser weapons there is a high probability of multiple lesions induced in the victim's eyes. With very short-pulsed lasers (nanoseconds or less), haemorrhages may be large and thus visually important even if impacts are in the periphery. Immediate blinding, forcing mission abortion, and permanent blindness may be the result. Blindness is exceptionally debilitating, even when compared with the worst of other injuries. No cure is possible and even long-term prognosis with improvements of ophthalmic surgery is very poor. The awareness of blindness-causing weapons would establish fear, anxiety, and extreme mental problems in soldiers on the battlefield. Sudden blindness, most likely with no other injury, will be psychologically very disturbing for the victim as well as for his fellows. The soldier's morale will be affected. Even the rumour of that laser weapons may be used may result in inactivity, mission abortion, or desertion; people will not knowingly risk their eyes.

Protection measures. The need for adequate vision in a life-threatening situation is, of course, vital to the soldier. Avoidance of looking into a laser is not possible for physiological reasons. If some kind of light or flash might be noticed in darkness, the eyes automatically will try to focus the source. Closing the eyelids is too late to avoid the laser energy from immediately damaging the retina, the papillo-macular bundle, or the *fovea centralis* (the central area of vision) without causing pain. Observation of enemy positions by periscopes or other optical systems will not protect against laser radiation – indeed, it may actually increase the energy received by the retina. Technical or electronic high-speed shutters are too slow for laser pulses. Eye-safe goggle systems for soldiers and aircrews are possible only against known, fixed-frequency laser systems with near-monochromatic bands. For protection purposes, specially designed bandstop filters may be used without degrading visual performance significantly, but to be effective the threat wavelengths would need to be determined. However, tunable lasers can work at any wavelength and an effective filter would have no visible transmission and therefore completely impair vision.

4.8 SPECIAL ISSUES: BLUNT IMPACT (KINETIC) WEAPONS

There is little medical research on the human effects of blunt impact NLW. Some problems can be predicted from earlier experience and prevented by correct use. Data from studies on effects of Behind Armour Blunt Trauma (BABT) and in sports-incurred injuries may be relevant. Skin penetration, mild brain injury, eye

injuries, bleeding in internal organs, contusions, and shock can be anticipated, depending on the area and energy of the impact.

Unclear definitions make it difficult to compare effects of different types of non-lethal trauma. Repeated mild trauma is a current problem in several medical specialties, such as neurology and sports medicine. Some aspects of repeated mild trauma are discussed in Annex L. Additional information can be found in the report of HFM-024 (RTO-TM-022) “Blunt Trauma Induced by Non-Lethal Weapon Kinetic Projectiles” found through <http://www.rta.nato.int/Pubs/RDP>.

Descriptions of the experiences from use of kinetic weapons in riot control and law enforcement in Northern Ireland can be found at the Northern Ireland office web site. <http://www.nio.gov.uk/>. The North Ireland experience with impact weapons shows that it is possible to reduce the number of eye and head injuries with good training and well-defined safety regulations.

4.9 SPECIAL ISSUES: SEDATIVES

One of the most significant examples of the importance of medical issues for the use of non-lethal weapons is the 2002 hostage rescue from a Moscow theatre. This incident is fully discussed in Annex M.

4.10 COLLECTION OF AFTER-ACTION MEDICAL DATA

While laboratory data and models are useful in predicting the medical effects of NLT, there is no substitute for human effects data collected soon after an action in which NLT have been used. We suggest that NATO develop after-action data collection forms that are implemented along with new NLWs. After-action medical recording and reporting procedures should become an integral part of the fielding of any new NLW. Examples of After-Action medical forms for NLW operational use are provided in Annex N.

4.11 REFERENCES

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- 4.11.3 Blinding Weapons, Reports of the meetings of experts convened by the ICRC on Battlefield Laser Weapons, 1989-1991. Ed. Louise Doswald-Beck, Legal Adviser at the ICRC, Geneva.
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- 4.11.6 Patten Report. Recommendations 69 and 70 Relating to Public Order Equipment: A Research Programme into Alternative Policing Approaches Towards the Management of conflict. Report prepared by the Steering Group led by the Northern Ireland Office, in consultation with the Association of Chief Police Officers, December 2002. Available at: <http://www.serve.com/pfc/policing/plastic/phase3rp.pdf>