

Discussion Forum 2

Non-lethal kinetic energy systems - technological challenges

Chaired by: Pascal Paulissen (TNO Defense, Security and Safety, Rijswijk, The Netherlands)

The discussion forum preceded the 4th European Symposium on non-lethal weapons. The forum constitutes a new way of sharing insights on issues regarding NLW. The topic of Forum II was non-lethal Kinetic Energy (KE) systems. The chairman opened the discussion with a short overview of some technological challenges regarding the design of such systems. The audience was subsequently invited to respond to a number of statements. Highlights of the discussion are posted on the website of the EWG-NLW.

Overview by the chairman

The demand for non-lethal KE systems is well-established with military and police forces. But the corresponding requirements vary considerably from case to case. At present, there are several quite different KE systems fielded, together with several quite different means of employment. At the first glance, non-lethal KE systems are low-tech in appearance. Nevertheless, it seems that there is not a single set of non-lethal KE design requirements that the (potential) user community can agree to. The objective of the Forum II discussion was to explore if such a set of design requirements is indeed feasible.

From a technological perspective, the challenges regarding the design of non-lethal KE systems can be related to the delivery of the effect (launcher and munition), the effect on the target (intended and unintended), and the effect on the environment ('anything else'). Regarding the delivery it is observed that in many cases existing launching systems for lethal munitions are used or slightly modified, with the exception of a few dedicated systems. By consequence, the issues involved with delivery are more or less similar. Suggested issues in this area are the range to target, aim point, dispersion and rate of fire. Regarding the effect it is observed that people mean different things when asking for effects. From a biomechanical perspective one can talk about elastic, viscous and inertial effects in the target. But one can also look at pain as the prime effect of non-lethal KE impacts. The operational user may see incapacitation, distraction or repulsion of the target as the effect of KE. By consequence, there are also several types of effect criteria. Some try to connect the operational effect directly to the munition (e.g. X Joules incapacitates target Y). Others describe the relationship between impacts and injuries on selected bodyparts in great detail. But every criterion seems to come with a specific manual for use.

Statement 1

"t is impossible to get a non-lethal KE projectile beyond 75 metres"

The audience responded that the distance does not necessarily constitute a problem, provided the problem is adequately specified. Launching systems, hand-held or otherwise, can be made to fit. The problem lies more with properties of the target-to-be-hit. One delivers a certain effect out to the specified distance and this effect should be more or less constant. So, the statement is considered somewhat misleading. The problem is not so much to deliver an effect to a certain distance, but to maintain that effect from the muzzle out to that distance! It is possible to design a constant energy impact projectile by means of a launcher with a controllable muzzle velocity, or through other means.

Statement 2

“There exists a way to quantify the desired effects”

The audience took the term effect mainly from an operational perspective. The notional flow schematic introduced by the chairman (mechanical load leads to biomechanical response, leads to injury mechanism) was extended with ‘leads to behavioural response’. The operational user primarily tries to induce, and indeed observes, a change in the behaviour of the target. The non-lethal KE effect criteria need to be used to the purpose of describing or predicting behavioural change. Furthermore, the manner of employment is important to the issue of producing desired effects. A presently used practice is to not only deliver the KE effect but to also send a message across, almost like a form of communication with the target. This can be done both verbally and non-verbally (e.g. by posture or showing restraint). One can imagine that other technologies can support the dialogue with the target. Finally, it was duely noted that for lethal weapon systems it is a generally accepted practice to work with probabilities (e.g. missile X has a Y% probability of killing the target). Some years ago there was a tendency to demand certain guaranteed effects from NLW. The audience considers this to be unrealistic, since some sources of uncertainty are the same compared with lethal systems. Also, for NLW the range of possible behavioural responses is considered more extensive than for lethal systems.

Statement 3

“There exists a way to control the undesired effects”

This statement prompted the audience to point out that the human target has a very rapid learning curve. A desired outcome of an engagement may quickly turn into the opposite once the target has adapted to the threat. The term ‘control’ in the statement is considered too strong of a word. It is more realistic to strive for risk mitigation instead of control.

Statement 4

“There is a magic bullet out there”

The magic bullet can be made, provided there is enough time and money. In practice, the design will allways be a compromise of partly conflicting demands. Perhaps there is not even a demand for an actual magic bullet. The potential user is primarily interested in acquiring a means for producing the desired effects while mitigating the undesired effects. This may be achievable by non-lethal KE impact alone, or by KE with a supporting technology. In fact, it may be possible that KE impact is too limited in its application to be a solution at all. So, the ‘magic’ has not so much to do with the technology, as it has to do with a high probability for the desired effect.

In summary it is fair to say that next to an extensive problem space there exists an equally extensive solution space. Driven by the desired effect there are solutions bound to be found. If there is a magic bullet, then it must be the knowledge that lets us find it!