

Scientific Advisory Committee on the Medical Implications of Less-Lethal Weapons (SACMILL)

Interim Statement on the Medical Implications of Use of Vehicle-Mounted Water Cannon, with Special Reference to the Ziegler Wasserwerfer 9000

The Role of SACMILL

1. The Scientific Advisory Committee on the Medical Implications of Less-Lethal Weapons (SACMILL) is an advisory Non-Departmental Public Body that provides independent advice to Ministers of Her Majesty's Government on the medical aspects surrounding the use of less-lethal weapons (LLWs).
2. SACMILL took over this role in March 2012, when it assumed the responsibilities of its predecessor committee, DOMILL.¹
3. SACMILL is sponsored by the Surgeon General in the Ministry of Defence (MOD).
4. SACMILL is concerned with the safety of members of the public subjected to LLWs. In addressing this remit, SACMILL will consider aspects of a LLW system that have a bearing on the equipment's safe operational use. These aspects include developing an understanding of the effects on the person of the weapon's output, the quality of the user guidance and training, how the equipment will be stored and maintained, the manner in which the system will be deployed and used, monitoring and learning from adverse outcomes arising in operational use of LLWs in the UK and elsewhere, and assessing any implications of basic research into the medical effects of LLWs.
5. While recognising that the use of LLWs is unlikely ever to be entirely free of medical risk, SACMILL will seek to minimise residual risk by systematically evaluating all elements of a less-lethal system and advising Ministers and other stakeholders accordingly.

Background to the Present Medical Statement

6. The UK currently possesses a vehicle-mounted water cannon capability comprising Somati RCV 9000 vehicles (numbers 001-006).² These vehicles, which have been deployed and used in serious public disorder in Northern Ireland over the past 10 years, are owned, maintained and operated by the Police Service of Northern Ireland (PSNI).

¹ Defence Scientific Advisory Council Sub-Committee on the Medical Implications of Less-Lethal Weapons (DOMILL).

² The medical implications surrounding use of the Somati RCV 9000 vehicle-mounted water cannon were considered by DOMILL in 2004 (see : www.publications.parliament.uk/pa/ld200304/ldlwa/40316wa1.pdf; accessed 12th November 2013).

7. To permit a more timely response to serious public disorder incidents on the UK mainland, the Metropolitan Police Service (MPS) is considering purchase of three water cannon vehicles from the German police authorities. These vehicles, all of which are Ziegler Wasserwerfer 9000 models (commonly referred to as 'WaWe 9'), are more than 20-years-old. Although the engine performance of the WaWe 9 varies according to model, SACMILL has been advised that the water cannon functionality of the vehicles is comparable.
8. SACMILL has been tasked by the UK Less-Lethal Technologies and Systems Strategic Board to provide initial advice on the medical implications of the WaWe 9 water cannon system to inform the procurement process. This interim medical statement constitutes that advice.

Technical Approach

9. In forming an opinion on the WaWe 9 water cannon system, SACMILL considered the following:
 - a. A review of the medical implications of use of water cannon.
 - b. Preliminary technical data on the WaWe 9 vehicles.
 - c. Guidance and training documents relating to UK use of water cannon.
10. The Defence Science and Technology Laboratory (Dstl) reviewed the medical implications surrounding use of water cannon, collated the available technical data on the WaWe 9 and identified any initial issues around the User Guidance and Training.
11. A preliminary assessment of two of the WaWe 9 vehicles available from the German police authorities was made in early July 2013 during a visit to Germany by the Home Office Centre for Applied Science and Technology (CAST) and other UK stakeholders. A report of this visit was made available to SACMILL.
12. On the basis of its review of the above documentation, SACMILL offers the following preliminary opinion on the medical implications of the WaWe 9 vehicle-mounted water cannon system.

Conclusions

Review of the Medical Implications of Water Cannon

13. The review did not identify any novel mechanisms through which high pressure water jets can induce injury over and above those previously articulated in the 2004 DOMILL statement on the Somati RCV 9000 water cannon.² These injury mechanisms are as follows:
 - a. A predictable risk of *primary* injuries from a direct interaction of the water jet with the body. Anatomical ports of entry, such the nostrils, ears and mouth, place body tissues in these areas at greater risk of injury from the ingress of high pressure water jets. The risk of serious injury to the eye from a water jet is also a concern, and the risk may be increased by the impact of glass, plastic or other material from broken spectacles.

- b. A predictable risk of *secondary* injuries resulting from tissue damage produced by the impact of street furniture and debris energised by the water cannon jet. This could comprise penetrating or blunt trauma depending on the physical nature (mass, volume and geometry) of the impelled object.
 - c. A predictable risk of *tertiary* injuries (especially to the head and neck) sustained as a result of the body being propelled by the water cannon jets onto the ground or into rigid objects.
 - d. In vulnerable groups, such as children, pregnant, disabled or elderly people, or those under the influence of alcohol or drugs, the risk of injury may be higher.
 - e. There is a small risk of hypothermia when wet. Additional contributory factors that may increase this risk include low ambient temperature, wind chill, low body mass index and alcohol intoxication.
 - f. There may be a risk to the public from the vehicle itself. This may arise while the vehicle is manoeuvring and may be exacerbated by an inability to brake efficiently in wet conditions and by limited visibility from the cab. Toxic exhaust emissions may represent an exposure hazard.
14. An example of serious ocular trauma apparently sustained during civil protests in Stuttgart in 2010 underlines the ability of water cannon jets to produce serious primary injury to the eyes. Graphic images from recent civil unrest in Turkey further illustrate the potential of water cannon jets to cause primary and tertiary injuries. These examples highlight the need for fully developed guidance and training to control the operational use of water cannon, to ensure that this use is proportional, and to make sure that, wherever possible, medical assessment is undertaken or offered in order to document the nature of any injuries.
15. A review of the available PSNI water cannon use statistics indicated that the Somati RCV 9000 water cannon were used – that is, water jets activated – in civil disturbances 59 times between April 2008 and March 2013.³ Set against this level of use, the PSNI reported no injuries resulting from use of water cannon either during this period or since the Somati RCV 9000 was introduced into service in Northern Ireland. The PSNI identified an incident on 12th July 2013 in which a man was toppled from the roof of a police Land Rover by the force from a water cannon jet. Although the PSNI recorded no reported injuries resulting from the man's fall, the incident underlines one of the risks associated with water cannon use.

Preliminary Technical Data on the Candidate WaWe 9 Water Cannon Vehicles

16. SACMILL has reviewed the report emanating from the initial assessment of two of the WaWe 9 vehicles and has identified aspects having implications for the medical effects of this system. The areas of concern are highlighted in the recommendations made in this interim statement.

³ Statistics on Police Use of Force, PSNI. http://www.psni.police.uk/index/updates/updates_statistics/updates-statistics_on_police_use_of_force-2.htm (accessed 18th October 2013).

Review of the Guidance and Training Documentation

17. The documentation seen by SACMILL has not yet been updated to reflect the specific attributes and functionality of the WaWe 9 water cannon system. SACMILL has identified several aspects of concern and these are carried through into the recommendations.

Recommendations

The Ziegler WaWe 9 Water Cannon Vehicles

18. The peak forces and pressures developed by the WaWe 9 primary water cannon jets should be measured over a range of target engagement distances and at various pump pressure settings. These should be compared with equivalent measurements made on the in-service Somati RCV 9000 water cannon jets. The force and pressure measurements should be obtained using a range of appropriate force plate sizes. SACMILL has reviewed a draft outline proposal for the force and pressure testing of the WaWe 9 water cannon jets and looks forward to reviewing the final detailed technical plan when this becomes available.
19. Any substantive differences in performance between the Somati and WaWe 9 water cannon systems should be addressed by a combination of modifications to the WaWe 9 vehicles and implementation of appropriate training, tactics, techniques and procedures.
20. The water jets produced by the WaWe 9 are capable of engaging people at considerably closer distances (and potentially with greater force) than those produced by the Somati RCV 9000. Since close proximity to the jets is likely to increase the risk and severity of injury, it is recommended that the implications of this design difference are thoroughly characterised and understood.
21. Some general characteristics of the WaWe 9 vehicle itself should be established and compared to the Somati model. These include: determining the areas of restricted visibility from the cab, the turning circle, stopping distance of the vehicles in dry and wet conditions, and the effectiveness of any physical countermeasures designed to impede the ability of protesters to climb onto the vehicles.
22. The public address system of the WaWe 9 should be of comparable efficiency to, or better than, that of the Somati RCV 9000. This system is used to warn of the imminent use of water cannon and hence provides an opportunity for people to disperse voluntarily.
23. The peak forces and pressures developed by the WaWe 9 rear-mounted water cannon jet should be measured to provide an indication of the effects of this facility (which is absent from the Somati RCV 9000) and its operational role should be clarified.
24. A routine maintenance schedule for the WaWe 9 should be designed and implemented and should include both the main vehicle and the water delivery system.
25. A strategy should be developed for the sourcing of spare parts, especially those components whose ageing or failure may have medical implications for the public.

Guidance and Training

26. The existing User Guidance is currently specific to the Somati RCV 9000 system. Should a decision be made to acquire the WaWe 9 vehicles, these aspects should be developed to be applicable to both water cannon systems and the final documentation provided to SACMILL for review.
27. The User Training documentation is incomplete in its current form. The training should incorporate more content on injury mechanisms and draw on any lessons learnt in operational use of water cannon in serious disorder in Northern Ireland and elsewhere.
28. Both the User Guidance and User Training documentation, in their final, fully developed form, should be made available to SACMILL for review and endorsement prior to implementation of the WaWe 9 system as a new water cannon capability in the UK. SACMILL believes that it would be inappropriate to introduce the WaWe 9 as a public order capability given the current level of maturity of the documentation controlling the use of water cannon and the training given to users.
29. Consideration should be given to the ergonomics of the operating area, the working conditions of the crew and to the risk of injuring police officers standing close to the device when it is operated.
30. Any injuries occurring during training that are attributable to the WaWe 9 system should be reported to SACMILL so that the medical advice can be revised if necessary.

The WaWe 9 System Overall

31. No barriers to procurement of the WaWe 9 were identified during SACMILL's initial review of the medical implications of a water cannon system based on this vehicle. However, SACMILL advises that operational deployment and use of this system should not proceed until the present recommendations have been addressed and until the independent medical committee has reviewed the final system configuration (including the vehicles, guidance, training and other relevant material). The outcome of this review will be presented in the form of a final SACMILL medical statement on the WaWe 9 system, which will then supersede the present interim statement.

[signed on original]

Chairman of SACMILL