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Tasers

A brief overview of the research literature

DISCLAIMER: This paper presents a review of the Australian and international research literature on Tasers and, as such, does not necessarily reflect the views of the Crime and Misconduct Commission.

Introduction

Taser is a registered brand name that refers to a type of hand-held conducted energy device (CED),[1] which is generally used to immobilise people or induce pain. This paper aims to provide a summary of Australian and international research to inform public debate in Queensland about the use of Tasers by operational police.

This literature review has been prompted by the progressive roll-out of Tasers to first response police officers across Australia over the last two years. In Queensland, a 12-month trial of the use of Tasers by the Queensland Police Service (QPS) was concluded on 30 June 2008. Since the trial, the police minister has announced that Tasers will be made available to operational police in every district throughout the state by June 2009. This follows the recent roll-outs of Tasers to first response officers in Western Australia (2007) and the Northern Territory (2008), and the announcement in May 2008 of a planned roll-out in New South Wales (NSW).[2]

Despite the increasing availability of Tasers to our operational police, very little research has been published in Australasia regarding the effectiveness and safety of Tasers. To date, most of the available literature has focused on the technical aspects of Tasers, anecdotal stories about the device and its utility in operational policing incidents, and newspaper articles and opinion pieces surrounding the introduction of Tasers by various police services.

For the purposes of this report, therefore, we also included overseas research studies and publications. This research included analysis of field use or Taser incident data provided by law enforcement agencies; medical or scientific research examining the physiological effects of Tasers; reports and views from human rights organisations; and reviews of existing literature and research. A considerable part of the currently available research can be linked to or involves TASER International in some way — either through the funding of research, the provision of data, or some other association.

Because of the range of medical and other scientific disciplines involved, this literature review does not assess the scientific rigour of the studies referred to, nor does it critically analyse the claims or conclusions made by their authors. Rather, it aims to highlight some of the issues relating to Taser use, including concerns about its safety.

The review has six sections. Following this introduction, the first section describes what a Taser is and how the device works. The second briefly outlines the history of Taser use overseas and in Australasia. The third outlines some of the operational benefits Tasers afford police, especially when compared to other use of force measures,

1 Taser is a registered trademark of TASER International (Arizona, USA). The term 'Taser' has been selected for use in this paper for two reasons: Taser is the specific device that has been chosen by the QPS, and 'Taser' is a more widely recognised and understood term within the community than 'conducted energy device'. Conducted energy devices are also known as conducted energy weapons (CEWs), electronic control devices (ECDs), neuromuscular incapacitation (NMI) devices and electromuscular disruption (EMD) devices. These terms have been used interchangeably in this review.

2 On 18 May 2008, NSW Police Force issued a press release stating that general duties officers working as duty officers and supervisors will be trained to use a Taser. See <www.police.nsw.gov.au/news/media_release_Archive>.

and the fourth identifies the most common injury risks to people who may be tasered.

The fifth section examines the primary concern with the device — can it cause death? It highlights the lack of consensus among the medical community regarding the device's safety and the repeated calls for independent and more rigorous research on Taser use, especially in relation to its effects on vulnerable or at-risk populations.

The final section addresses public concerns regarding the safety of Tasers, including its potential risks in some circumstances and the potential for misuse by officers. It includes findings of a citizen survey in New Zealand about Taser use and an overview of the current debate in Canada following a high-profile Taser-related death. This is followed by a summary of the research literature.

What is a Taser?

The first Taser — an acronym for Thomas A. Swift's Electric Rifle — was designed in the late 1960s by NASA scientist Jack Cover. Patented in 1974, the Taser was initially a device for causing pain. It has since undergone substantial modifications to become a device that also interferes with a person's voluntary muscle control. As a result, Tasers now combine the pain function of traditional stun guns with the incapacitation function of CEDs.[3]

A Taser can be used in two modes — probe mode and drive stun mode.

A Taser can be operated in two modes — probe mode and drive stun mode. In probe mode, two probes connected to the Taser by insulated wires are fired into a person's skin or clothing. The successful deployment of the probes completes an electrical circuit, allowing a high voltage, low amperage electrical current to pass from the Taser to the person. This causes uncontrollable muscle contractions resulting in the immediate loss of neuromuscular control, thereby immobilising the person. It also causes considerable pain. The immobilisation and pain caused by the Taser cease as soon as the device is deactivated. The device automatically deactivates after a five-second cycle; alternatively, the user may manually deactivate the Taser by putting its safety mechanism on.

In drive stun mode, the Taser works much like a traditional stun gun. The probes are not usually fired, but instead the Taser is applied or pushed directly onto a person's skin or clothing. When used in this way, the Taser does not affect a person's motor functions and does not immobilise them. Rather, it inflicts acute pain in the area where the Taser is applied. Drive stun mode can also be used to complete an immobilisation circuit if the probe mode fails.

As a police use of force measure, the device is promoted as a means of dealing with violent or aggressive people, especially those who may not respond to other uses of force.

Overview of Taser use overseas and in Australasia

With the establishment of TASER International in 1993, Tasers were initially sold in the United States to civilians. In 1999, TASER International began supplying Tasers to law enforcement agencies.[4] Currently, Tasers are used by over 13 000 agencies (such as law enforcement agencies, correctional agencies and military agencies) in 44 countries around the world including the United States, Canada, the United Kingdom (UK), France, New Zealand and Australia (TASER International 2008). More than 4700 of these agencies deploy Tasers to all of their patrol officers.

Until recently, the use of Tasers in Australia was restricted in all state and territory police services to tactical or specialist response groups. However, as mentioned previously, Tasers are now available to first response officers in Western Australia and the Northern Territory, with plans for similar roll-outs in Queensland and NSW. In New Zealand, it has recently been announced that police officers across the country will be issued Tasers in 2009. This follows a 12-month trial of the use of Tasers in general policing that concluded in August 2007.

With the widespread use of Tasers by police agencies overseas, a number of trial evaluations and reviews have been conducted to examine the effectiveness and safety of the device. These include:

- an independent evaluation by PricewaterhouseCoopers (PwC 2004) of the UK Taser trial commissioned by the Association of Chief Police Officers (ACPO)
- an evaluation of Taser devices conducted by the UK Home Office (Donnelly et al. 2002)
- three reports on the medical implications of Tasers prepared by the Defense Scientific Advisory Council Sub-committee on the Medical Implications of Less-lethal Weapons (DOMILL) in the UK (2002, 2004, 2005)
- a report on CEDs published by the Department of Justice in Nova Scotia, Canada (Nova Scotia Department of Justice 2008)

3 The Taser X26 is the latest hand-held CED on the market. This model is lighter and smaller and has a greater incapacitating power compared to its predecessor, the Advanced Taser M26. For more information about the history of Taser, see <www.taser.com/research/Science/Pages/historyofTASERDevices.aspx>.

4 CEDs had been supplied to law enforcement agencies prior to the establishment of TASER International by other manufacturers such as Tasertron.

- a review of Tasers completed by the Office of the Police Complaint Commissioner in British Columbia, Canada (Battershill et al. 2004)
- a review of CEDs completed by the Canadian Police Research Centre (CPRC) (2005)
- a review of CED use by the Royal Canadian Mounted Police (RCMP) conducted by the Commission for Public Complaints Against the RCMP (CPC–RCMP) (2007, 2008)
- an analysis of the effectiveness and risks of Tasers conducted by the Joint Non-lethal Weapons Human Effects Center of Excellence (HECOE) (2005) in the United States.

In Australasia, the available research is generally limited to an evaluation of the recent New Zealand Police Taser trial (New Zealand Police 2008), and a qualitative report by the Australian Federal Police (AFP) (2007) summarising the Taser-related incidents that occurred during the Australian Capital Territory (ACT) trial. Electrical safety analyses of the Taser have also been conducted by the biomedical engineering department of the Alfred Hospital in Melbourne (Southwell 2003, 2004). Recently, the NSW Ombudsman released a review of the use of Tasers by NSW Police Force (NSW Ombudsman 2008). Separate research by Monash University is currently in progress.[5]

Potential operational benefits of Tasers

Comparison with other use-of-force options

Tasers are not a replacement for firearms. The device is currently labelled by various law enforcement agencies as a 'non-lethal', 'less-lethal' or 'less-than-lethal' weapon and is considered an *additional* use of force option for police. As described by the Chairman of TASER International, 'It's giving [officers] another tool in the tool box' (Smith 2008a, p. 12).

Tasers are not a substitute for firearms — rather they provide officers with another use of force option.

Given the particular benefits that each use of force option can provide to an operational situation, it is often difficult to compare their respective merits. However, users of Tasers have identified several advantages of the Taser compared to batons and oleoresin capsicum (OC) spray (also known as capsicum spray).

First, batons and OC spray (which are both pain compliance measures) may be ineffective against suspects who do not feel pain or are unaffected by it (Donaldson 2005, Mesloh et al. 2005, Rose 2005). This can include people who are particularly motivated, extremely aggressive, or under the influence of drugs or alcohol. In the case of OC spray, suspects have been known to be unaffected by it, fight through the initial stages of the spray, or protect their face and eyes. In contrast, the effects of a Taser are instantaneous. It can immediately immobilise a person regardless of their size, strength, mental condition or pain threshold.

Second, Tasers are also less likely, compared to batons, to cause serious injuries to suspects and officers. For example, Meyer (1992) found that no injuries were sustained by suspects or police officers in the 102 Taser-related incidents examined. By contrast, the use of batons resulted in moderate or major injuries (including lacerations, bruises, breaks, concussions, sprains and strains) to 61 per cent of suspects and 16 per cent of police officers.

Third, Tasers may provide for more targeted deployments on suspects. With OC spray, there is a risk of secondary exposure or cross-contamination, whereby officers or bystanders in close proximity to the deployment may also be exposed to the irritant effects of the spray (AFP 2007, Donaldson 2005, Mesloh et al. 2005). This is less likely to occur with a Taser deployment as the device is fired directly at the suspect, enabling officers to isolate individual suspects and minimise injuries to others.[6]

Finally, Tasers afford officers an efficient use of force option that usually requires no post-treatment. In most cases, those who are subject to a Taser exposure immediately recover and require minimal, if any, aftercare. This compares to the use of OC spray which may leave a person with skin irritation, shortness of breath, and burning sensations in the eyes and nose. Furthermore, the effects of OC spray may last for up to an hour, and require considerable aftercare by officers (see Bozeman & Winslow 2005).

Effectiveness in managing suspects

Tasers can be highly effective in enabling police to defuse potentially violent situations and manage aggressive suspects. Various police departments in Australia and overseas have reported that suspects frequently become compliant with police instructions on presentation alone of the Taser — i.e. without the device being activated in either probe or drive stun modes.

In a study commissioned by ACPO in the United Kingdom, it was found that of the 58 incidents examined as part of a trial by five police forces, 12.1 per cent of situations were successfully resolved by the officer simply aiming the Taser

5 A PhD student is currently undertaking research on the affects of sub-lethal weapons including Tasers on vulnerable people.

6 Injury to a third person may arise if a person touches the wires or probes during deployment.

at the suspect (PwC 2004). In a further 44.8 per cent of cases, suspect compliance was gained from aiming the Taser and its laser at the suspect.[7] The authors of the study subsequently concluded that 'Taser appears to have a high visual deterrent value which can enable officers to de-escalate possibly violent situations relatively quickly and easily' (PwC 2004, p. 26). Similar findings were also reported in the ACT and New Zealand. In the ACT, officers only had to draw or aim the Taser at a suspect in 12 of the 20 incidents to gain compliance (AFP 2007). In New Zealand, most incidents were resolved through presentation alone of the Taser; of 114 incidents involving a Taser, only 17 per cent resulted in the device being discharged (New Zealand Police 2008).

Tasers have a high deterrent effect — some situations can be resolved simply by presentation of the Taser.

While compliance through the presentation alone of a Taser has resulted in successful outcomes for law enforcement, the activation of a Taser in probe mode also seems to have resulted in successful outcomes — i.e. the Taser has been an effective tool in controlling and restraining suspects who come into contact with police. Overseas research has found that firing the Taser produces successful outcomes in between 78 and 100 per cent of cases (Donnelly et al. 2002); for example, the Los Angeles Sheriff's Department reported that the Taser was effective in 92 per cent of cases, while the Victoria Police Department in Canada reported success in 89 per cent of cases. In the UK trial, the suspect was successfully arrested in all 13 cases where Tasers were used in probe mode, with only two of these requiring more than one cartridge to be discharged (PwC 2004).

Potential to reduce risk of injury

Tasers are often promoted as a use of force option that may reduce the risk of injury to police officers and suspects. This claim generally stems from several perceived benefits of the device including:

- it can be fired from a distance, reducing the need for officers to come into close physical contact with suspects
- it can be used to de-escalate a situation before it poses a heightened threat or risk
- it can assist police to restrain aggressive individuals who would otherwise be hard to control (PwC 2004).

Consistent with this, numerous research reports have found that the introduction of Tasers has been associated with a decrease in the number of injuries sustained by police and suspects during arrests (CPRC 2005). For example, Smith et al. (2007) reported that the use of Tasers by the Miami-Dade Police Department significantly reduced the likelihood of suspects and officers sustaining both minor and major injuries. In Phoenix, there was a reported reduction of more than 60 per cent in the number of suspects injured during arrest after Tasers were introduced (Battershill et al. 2004). In Cincinnati, a 30 per cent reduction in suspect injuries and a 70 per cent reduction in the number of assaults on police (Rose 2005) were reported by the police department.

Potential to reduce use of lethal force

Notwithstanding that Tasers are not a substitute for lethal force, some overseas law enforcement agencies have reported a decrease in the number of police shootings following the introduction of Tasers (CPRC 2005). For example, in Phoenix there was a 54 per cent reduction in the use of lethal force while in Orange County a 78 per cent reduction in lethal force was reported (TASER International 2006). The Metropolitan Police Authority (2004) also cited fewer police shootings after Tasers were introduced into the service.

Qualitative reviews of Tasers indicate that the device has been deployed in situations that may have required deadly force if not for the availability of a Taser (Mesloh et al. 2005, Metropolitan Police Authority 2004). The authors of these reports assert that a substantial number of deaths have been avoided, thus reducing not only the personal tragedy of such events but the need for police inquiries and investigations and the costs associated with human resource support offered to officers, families and communities adversely affected by police shootings.

In March 2008, the potential for Tasers to reduce the need for lethal force was acknowledged by Queensland's State Coroner in his report on the inquest into the fatal shootings of four men by Queensland police officers (Barnes 2008). While recognising the controversial nature of the device, the coroner said: 'It is likely that if the officers in the four incidents had access to a Taser gun they would have been deployed. If it had occurred, such deployment may have resulted in each of the incidents being resolved without anyone being killed' (p. 139).

Potential injury risks of Tasers

Direct injuries

According to various research studies (Bozeman & Winslow 2005, Donnelly et al. 2002, HECOE 2005), a range of direct injuries may result from the use of Tasers. These include:

- minor skin irritation, redness and blistering where the probes make contact with the suspect's skin
- facial lacerations

7 The Taser has a laser sight to assist officers in aiming the device. This laser can be turned on and off by the officer, and often produces compliance when pointed at the suspect. This is sometimes called 'red dotting' or 'laser painting'.

- groin lacerations
- eye injuries.

In an extensive risk analysis, HECOE estimated the likelihood of a range of Taser-related injuries to suspects who are hit with the Taser's probes. Based on data reported by US police departments to TASER International, HECOE (2005) concluded that the more serious the injury, the less likely it was to occur. Specifically, HECOE estimated the risk of minor burns and lacerations to be no more than 81 per cent and 87 per cent, respectively. With regards to potentially more serious injuries such as facial and groin lacerations, the risks were estimated to be no more than 1 per cent and 3 per cent, respectively. And the risk of eye injuries was estimated to be extremely low — 0.04 per cent.

Field use statistics indicate that the majority of people exposed to Tasers sustain no serious injuries (Battershill et al. 2004). For example, the Portland Bureau of Police reported that 63 per cent of suspects had no documented injuries (CPRC 2005); of those who did, 76 per cent experienced minor injuries like lacerations and bruises, while the remainder had injuries that were self-inflicted or unrelated to the use of the Taser. The Seattle Police Department reported that 68 per cent of incidents involving a Taser resulted in either no injury to the suspect or only small lacerations where the probes had punctured the skin (Donnelly et al. 2002). Similarly, evaluations from the UK, New Zealand and the ACT found that in all situations in which the Taser was deployed, no serious injuries were sustained by officers or suspects (AFP 2007, New Zealand Police 2008, PwC 2004).

Secondary injuries

Subjects who are hit by a Taser in probe mode often fall as a result of electricity-induced muscle contractions. There is some risk, therefore, of subjects suffering serious head injuries if their head makes contact with a hard surface, according to Bozeman and Winslow (2005), Donnelly et al. (2002) and DOMILL (2005).

This risk is heightened if the suspect is standing on a heightened platform such as the top of a staircase, on a roof or on a balcony (Donnelly et al. 2002). Although DOMILL (2002, 2005) has concluded that the risk of serious head injuries following the application of a Taser is generally low, it is widely accepted that Tasers should not be used on suspects who are in locations that would render them vulnerable (Donnelly et al. 2002).

There are also risks of ignition in some situations. Experimental studies show that the use of a Taser can ignite subjects who are covered in a flammable substance (Donnelly et al. 2002), and this has been reported in two operational experiences. Donnelly et al. indicate that there may also be a risk of ignition in environments like petrol stations where flammable vapours are present.

These findings suggest that the use of Tasers may be limited in some operational settings due to a number of environmental and situational factors. These should be considered by officers before deploying a Taser.

Can Tasers cause death?

While the majority of injuries resulting from Tasers appear to be relatively minor, a number of deaths are reported to have occurred following the use of a Taser. This has resulted in considerable debate surrounding the use of Tasers by law enforcement officers, including whether the labelling of Tasers as non-lethal devices is appropriate and, in particular, whether Tasers can cause death.

Research has not identified a causal link between Tasers and death — however, there is no consensus in the medical community regarding the safety of Tasers.

To date, research has not identified a direct causal relationship between the application of a Taser and the death of the person concerned. However, there is no consensus in the medical community regarding the safety of these devices (Dennis et al. 2007). This lack of consensus generally stems from conflicting or mixed research findings, the lack of independent and rigorous research, and the scarcity of studies that have adequately tested the device on human subjects.

Medical and other scientific research on the effects of Tasers is largely limited by ethical or legal concerns that make it very difficult for researchers to reproduce scenarios that will occur 'on the ground' or reflect real-life policing situations (Synyshyn 2008). Some of these research limitations include the following:

- human subjects cannot be tested with illegal drugs or substances
- research cannot be conducted on people suffering mental illness or excited delirium[8]
- most testing of Tasers is done on animal subjects (usually swine)
- only fit and healthy subjects (usually police officers) are selected for testing

8 Excited delirium is defined as 'a state of extreme mental and physiological excitement, characterised by extreme agitation, hyperthermia, epiphoria, hostility, exceptional strength and endurance without apparent fatigue' (Morrison & Sadler 2001 cited in CPRC 2005, p. 36). It is discussed further on pp. 7–8 of this paper.

- the duration and application of the Taser is controlled in research situations (generally shorter exposures which are fixed to and not fired into a person)
- in research situations, human subjects are targeted in areas away from the heart — i.e. the back.

Medical research results

Research that has sought to examine the physiological effects of Tasers has primarily focused on how discharges from neuromuscular incapacitation (NMI) devices like the Taser affect the heart, especially in terms of the likelihood of cardiac arrhythmias[9] or ventricular fibrillation.[10]

A key study conducted by the Alfred Hospital in Australia found that the 50 amp current delivered by the Taser X26 is only around a third of the 140 amp current actually required to induce ventricular fibrillation (Southwell 2004).[11] Similarly, McDaniel and his colleagues found that the discharge required to induce ventricular fibrillation in pigs was 15 to 42 times greater than the discharge from a standard NMI device (McDaniel et al. 2005). Consistent with this, no cardiac arrhythmias in animal subjects were reported by Valentino et al. (2007), Stratbucker et al. (2003 cited in Vilke & Chan 2007), and Lakkireddy et al. (2006). Nanthakumar et al. (2006) also reported no cardiac arrhythmias in subjects when discharges were delivered away from the heart.

While these studies tend to suggest that CEDs may be safe, somewhat conflicting results have also been reported. For example, Dennis et al. (2007) reported a study in which two of the eight swine died from ventricular fibrillation following exposure to Taser discharges. Nanthakumar et al. (2006) also reported an episode of ventricular fibrillation in one of their animal subjects when NMI discharges were delivered across the chest (i.e. close to the heart). Most recently, Walter et al. (2008) reported that Taser discharges administered with a transcardiac discharge vector — that is, so that the current between the two Taser probes passes through the heart — have dramatic effects on myocardial function including rhythm capture, ventricular tachycardia or ventricular flutter, and sometimes fatal ventricular fibrillation.

Given the differences in research findings and the tendency for such research to be carried out on animal subjects, it is difficult to extrapolate these results to situations involving humans. However, in a review of medical studies that examined the direct effect of Taser discharges on the heart, it was concluded by Nanthakumar et al. (2008, p. 1456) that it would be 'inappropriate to conclude that stun gun discharges cannot lead to adverse cardiac consequences in all real world settings'. The review also concluded that 'additional research studies *involving people* will help to resolve conflicting theoretical and experimental findings, and could lead to the design of devices with electrical pulses that cannot stimulate the heart' (p. 1457).

Of those studies that have been conducted on human volunteers (albeit with the limitations noted above), research has not identified any cases of ventricular fibrillation (DOMILL 2002, HECOE 2005). Similarly, two more recent experimental studies reported no changes to participants' electrocardiogram readings after exposure to a Taser (Ho 2007), and Levine et al. (2006) reported no cardiac dysrhythmias in 67 people exposed to Taser shocks during police training. In addition to these experimental findings, the National Institute of Justice reported that field experience indicates that CED use is safe in the majority of cases and that there is no medical evidence to suggest that exposure to CED produces abnormal cardiac rhythms in normal healthy adults (2008). Consistent with this, various police agencies have reported no deaths proximal to Taser use in the field (Battershill et al. 2004, White & Ready 2007).

Although the research in this area is quite technical and complex, it tends to suggest overall that the risk of Tasers causing cardiac harm and death is relatively low — at least in healthy subjects.

Consistent with these indications in the research, advocates of Tasers have repeatedly argued that no reported deaths in the field have been explicitly and solely attributed to the application of a Taser (Donnelly et al. 2002, McBride & Tedder 2005).[12] Instead, they argue that other factors like drug use and pre-existing heart defects are almost always implicated (CPRC 2005, McBride & Tedder 2005).

Potential risks of Taser use in the presence of drug use or health problems

The potential danger of using a Taser where subjects are drug affected or have health problems was highlighted in a report published by Amnesty International in 2006 on the

9 Cardiac arrhythmias are abnormal heart rhythms, including heartbeats that are too fast, too slow, or otherwise irregular.

10 Ventricular fibrillation is a life-threatening cardiac rhythm disturbance characterised by a lack of coordination in the contraction of heart muscle cells.

11 Southwell (2003) also conducted a safety analysis of the previous Taser model, the Advanced Taser M-26.

12 On 6 June 2008, TASER International was ordered to pay $US6.2 million in damages following the death of a Californian man who was shocked multiple times with a Taser. While the jury attributed 15 per cent of the man's death to exposure to the Taser and 85 per cent to the man's own actions, it found that TASER International 'failed to warn police in Salinas, California, that prolonged exposure to electric shock from the device could cause a risk of cardiac arrest'. The police officers were not found liable. This case represents the first time TASER International has lost a liability suit. See <www.theglobeandmail.com/servlet/Page/document/v5/content/subscribe?user_URL=http://www.theglobeandmail.com%2Fservlet%2Fstory%2FLAC.20080610.RTASER10%2FTPStory%2FBusiness&ord=5808948&brand=theglobeandmail&force_login=true>.

use of Tasers by law enforcement agencies in the United States.[13] The report expressed concern over a perceived increase in Taser-related deaths in recent years — there were three reported deaths in 2001 and 61 in 2005 — and examined the circumstances surrounding 152 deaths that followed the use of a Taser.[14] From its analysis of available media, police and medical reports, Amnesty International (2006) identified a number of factors that were common to most of the Taser-related deaths it examined. These included pre-existing or underlying health problems such as heart conditions and mental illness, and being under the influence of drugs.

It has been suggested that people with these characteristics may comprise 'physically vulnerable populations', and may be at greater risk of injury or death following exposure to a Taser. Other physically vulnerable populations that have been identified include pregnant women, children, the elderly, and people with implanted electrical devices (see Amnesty International 2006, HECOE 2005, Schlosberg 2005). However, very little research has been carried out on the effects of Tasers on these different groups.

With regards to the apparent susceptibility of drug users to Taser discharges, one study has investigated the effects of cocaine on the likelihood of ventricular fibrillation in pigs (Lakkireddy et al. 2006). While it was hypothesised that cocaine would increase this risk, no cardiac arrhythmias were produced in any animal with or without cocaine, even when the NMI device was discharged close to the heart (Lakkireddy et al. 2006). Despite the absence of empirical evidence, case data and the known effects of certain drugs on the heart led DOMILL (2002, 2005) to warn that drug-affected individuals may be more likely than normal subjects to experience adverse consequences after being struck by a Taser. DOMILL also concluded that individuals with heart disease and other cardiac defects may be similarly susceptible.

With regards to other possible vulnerabilities, animal studies suggest that subjects with a smaller body mass like children are somewhat more likely to experience ventricular fibrillation than larger subjects (McDaniel et al. 2005). In contrast, the risk of Tasers damaging and disrupting implanted electrical devices is considered to be very low, although further research is required (DOMILL 2004, Southwell 2004).

13 In 2004, Amnesty International released a similar report which also examined the circumstances surrounding over 70 deaths following the use of a Taser in the United States and Canada. See <www.amnesty.org/en/library/asset/AMR51/139/2004/en/dom-AMR511392004en.pdf>.

14 Most recently, in 2008 Amnesty International reported that nearly 300 deaths had occurred in the United States following the use of Tasers. See <www.amnesty.ca/take_action/actions/canada_taser_action.php>.

Other potential risks

In addition to the possible influence of certain subject characteristics, Amnesty International's 2006 report identified two other factors common to many of the Taser-related deaths it examined. These were repeated or prolonged applications of the Taser, and the use of the Taser accompanied by the use of restraints and/or chemical incapacitant sprays.

Prolonged or multiple applications of Tasers or using them on physically vulnerable people may increase the risk of injury and death.

Again, very little research has examined the implications of these factors. Scientists have suggested, however, that multiple Taser applications can increase the chance of an electrical discharge hitting the heart in 'a vulnerable period' of the heart rhythm, thereby increasing the risk of death (Schlosberg 2005). Repeated applications may also lead to important physiological changes in the heart that increase the likelihood of ventricular fibrillation and death (Schlosberg 2005). It is thought that prolonged Taser discharges may similarly affect an individual's respiratory and cardiac functioning (HECOE 2005), which offers a plausible theory on the possible connection between deaths, the application of Tasers, and people experiencing excited delirium (CPRC 2005). This is explained more fully below.

The condition known as 'excited delirium' is one of the most widely cited causes of death following the use of a Taser (Amnesty International 2006, CPRC 2005, Synyshyn 2008, Talvi 2007). While not a recognised medical or clinical condition, excited delirium is used to describe a set of extreme behaviours, and is often cited by TASER International as the cause of the majority of deaths proximal to Taser use. Specifically, excited delirium is defined as 'a state of extreme mental and physiological excitement, characterised by extreme agitation, hyperthermia,[15] epiphoria,[16] hostility, exceptional strength and endurance without apparent fatigue' (Morrison & Sadler 2001 cited in CPRC 2005, p. 36). Recognised widely in law enforcement circles, people exhibiting signs of excited delirium are generally considered in need of immediate medical treatment and need to be managed accordingly.

In a recent review of the use of Tasers by the Royal Canadian Mounted Police (RCMP), the Commission for Public Complaints Against the Royal Canadian Mounted Police (CPC-RCMP 2007) cautioned against the use of

15 Abnormally high body temperature.

16 Watering of the eyes.

Tasers on people demonstrating symptoms of excited delirium. The commission noted a distinct lack of research thoroughly examining the connection between Tasers, excited delirium and death, and called for a more conservative approach with respect to the use of Tasers on vulnerable people. It argued that available research suggests that these people have a higher likelihood of death, not necessarily because of the force that may be used by police to restrain them, but because of the mental or medical condition of the person at the time of police intervention.[17]

Overall, Amnesty International's report and the available research on physically vulnerable populations, multiple Taser applications and excited delirium suggests that Tasers may elevate the risk of death for certain subjects and in certain circumstances.[18] Further research is needed into these issues. This has been emphasised by Amnesty International, which has called for a ban on the use of Tasers pending independent and rigorous research on its use and effects. At the very least, Amnesty International has argued for Tasers to be restricted to situations in which the alternative would be lethal force (Amnesty International 2006).

Emerging public concerns about the use of Tasers

In addition to the concern about the potential of this device to cause death or injury to subjects in some circumstances, there has been community unease in some jurisdictions about the way in which Tasers have been used by police officers. These dual concerns have led a number of individuals and organisations to call for stricter policies or guidelines governing the deployment of the device.

Potential misuse of Tasers by police

The potential for Tasers to be misused or abused by police officers emerged as a key public concern in, for example, research in New Zealand in which 1200 citizens were surveyed about their views on the device as part of the Taser trial evaluation. Ten (10) per cent of respondents were opposed to the police using Tasers (New Zealand Police 2008). Along with the potential for the device to cause injury or death, the predominant concern identified by those respondents was that Tasers would be used excessively by police (mentioned by 36 per cent of respondents). Similar concerns that police would use Tasers discriminatorily, inappropriately or excessively were raised by 29 of the 71 people who either made Official Information Act requests or corresponded with the Minister or Commissioner of Police about the Taser trial (New Zealand Police 2008).

'Taser creep' refers to the tendency for police officers to use Tasers in situations for which they were not intended.

Amnesty International has also repeatedly expressed concern about the use of multiple Taser deployments by law enforcement officers. The organisation also claims that Tasers have been used against individuals who posed no threat of violence, who were not armed or did not appear to present an imminent threat of death or serious injury, or who were already handcuffed and restrained by police (Amnesty International 2006, Amnesty International Canada 2007).

Reflecting on the Canadian experience

Although evident elsewhere, concerns about the way in which Tasers may be used by police have been especially prominent in Canada. In particular, three Canadian reports released in 2007 and 2008 have recommended that the use of Tasers be restricted following a high-profile Taser-related death.[19]

On 14 October 2007, Mr Robert Dziekanski, a 40-year-old Polish immigrant, died at Vancouver International Airport after a Taser was deployed by the RCMP. Police were called to the terminal after airport security reported that Mr Dziekanski was behaving in an agitated and erratic manner. A video which captured the incident shows that RCMP officers tasered Mr Dziekanski within seconds of coming into contact with him. Mr Dziekanski did not speak English and had been waiting at the airport for nine hours.

The death of Mr Dziekanski sparked world-wide media attention and led to the establishment of at least six federal and provincial Taser-related inquiries in Canada — including inquiries by the RCMP, the CPC-RCMP, the Canadian House of Commons Standing Committee on Public Safety and National Security, the British Columbia Coroner, and British Columbia's Attorney General.[20] The incident also marked the 18th Taser-related death in Canada since 2003, which was followed by two more deaths a month later.

17 The commission was also mindful of literature which suggests that people experiencing excited delirium are in need of urgent medical treatment. However, the commission considers that a CEW is not a medical tool for dealing with these people and its use should be restricted.

18 This is consistent with the conclusion of the Compliance Strategy Group in its review of the RCMP's policies and procedures relating to CEW use. It recommended that these apparent risk factors and their potential implications for CEW use be clearly dealt with in the RCMP's operational manual and training program.

19 Two of these reports were prepared by the Commission for Public Complaints Against the Royal Canadian Mounted Police.

20 The Attorney General of British Columbia announced two inquiries to be headed by Thomas R Braidwood QC (see <www.braidwoodinquiry.ca>). For the House of Commons inquiry see <http://cmte.parl.gc.ca/cmte/CommitteeList.aspx?Lang=1&PARLSES=392&JNT=0&SELID=e21_&COM=13205>. For the CPC-RCMP inquiry see <www.cpc-cpp.gc.ca/DefaultSite/Investigations/index_e.aspx?articleid=1692>.

While many of the inquiries established following the Vancouver Airport incident have yet to be finalised, the two that have been finalised drew similar conclusions about the use of Tasers by law enforcement officers. For example, in its interim report on CEW use by the RCMP, the CPC–RCMP recommended that CEWs be reclassified as an 'impact weapon' and be used only in those situations where an individual was 'combative' or posing a risk of 'death or grievous bodily harm' to the officer, themselves or the general public (CPC–RCMP 2007, p. 4). A second recommendation reinforced this directive in relation to individuals experiencing excited delirium.

The CPC-RCMP recommendation to restrict the use of CEWs followed the commission's view that its use had expanded to include situations not intended for CEW use — in other words, there was evidence of 'usage creep'. Under the current RCMP policy CEWs are labelled as intermediate devices and are in the same category as oleoresin capsicum spray.[21] However, the commission's view was that this classification 'authorises deployment of the weapon earlier than reasonable' and moves away from the original purpose which was 'to subdue individual suspects who resisted arrest, were combative or who were suicidal' (CPC-RCMP 2007, p. 41). This recommendation was repeated in the final report of the commission (CPC-RCMP 2008).

Three recent Canadian reports have recommended that Tasers be reclassified on the use of force continuum and their use be restricted.

The Canadian House of Commons Standing Committee on Public Safety and National Security (2008) also recommended that Tasers be reclassified as an 'impact weapon' and be restricted to situations where a subject is displaying 'assaultive behaviour or presents a threat of death or grievous bodily harm'. The committee asserted that 'this restriction should not be lifted before independent research has indicated that use of the Taser gun poses not unreasonable risk for the subject'. Furthermore, the committee resolved to introduce a motion in the House of Commons calling for an immediate moratorium on the use of Tasers by the RCMP if this restriction was not implemented by 15 December 2008.

In reasoning the need to restrict the use of Tasers, the committee put the view that such a policy shift was 'necessary given the persisting uncertainty about the effects of CEW technology on the health and safety of persons subjected to it, and the scarcity of independent, peer-reviewed research in this regard' (Canadian House of Commons 2008, p. 2). The committee also considered such a measure was essential to restoring public confidence in the RCMP's use of Tasers.

Notwithstanding that the other Canadian inquiries have yet to be finalised, several issues raised during the examinations to date are relevant to the use of Tasers in Australia. For example:

- where CEDs should be placed on the use of force continuum or situational use of force models — i.e. when should Tasers be used?
- whether or not Tasers are safe and appropriate to use, particularly with reference to vulnerable people
- the risk of police using Tasers as a 'first resort' (i.e. over-reliance on the device)
- the risk of Tasers being used in situations for which they were not intended (i.e. Taser creep)
- the risk of multiple or prolonged Taser deployments.

These issues will not be explored further in this review. Rather, they are identified to stimulate thinking and further discussion about the introduction of Tasers by Australian police agencies.

Summary of the research literature

Tasers provide police officers with another use of force option for dealing with combative and physically aggressive people. Its popularity with law enforcement agencies is increasing, with a growing number of agencies adopting the technology in Australia and overseas. This is not surprising given the operational benefits afforded to police, which include high deterrent value, immediate incapacitation, the ability to deploy at a safe distance, and limited or no aftercare in most situations.

However, the safety of Tasers has been questioned in the wake of reports of deaths following Taser use. While research has not identified a direct causal relationship between the application of a Taser and the death of the person, it does indicate that Tasers may pose a risk of serious injury or death for certain subjects and in certain circumstances — e.g. where subjects are drug affected or have underlying health problems such as heart disease or mental illness, or where discharges are excessive.

Nevertheless, the academic and medical community remains very divided on the safety of Tasers — this lack of consensus arising from conflicting research findings and the scarcity of studies that have adequately tested the device on human subjects. As such, there have been repeated calls for

21 The RCMP uses an Incident Management/Intervention Model (IM/IM) to determine the appropriate level of force, if any, required to preserve public and officer safety in relation to a police incident. The model defines a range of behaviour classifications (categories of resistance) and levels of intervention available to officers.

independent and more rigorous research on the effects of Tasers, particularly on vulnerable populations and at-risk groups who may be more likely to come into contact with police.

There is also considerable public concern in some jurisdictions about the potential misuse of Tasers by police officers following reports that Tasers have been used in situations for which the device was not intended, too early in interactions, and on people who posed no threat of violence or risk of serious injury.

This range of concerns has led a number of organisations and agencies to call for stricter policies or guidelines to govern the deployment of the device. Issues that have been raised in overseas forums and are relevant to the use of Tasers in Australia include their placement on a use of force model and definition of the circumstances in which they can be used, the degree of risk of using them on vulnerable populations, and the possible risks associated with multiple, simultaneous or prolonged deployments.

While the relevant research in Australia is limited, there is much to be learnt from the experiences of international law enforcement agencies and the findings of research to date. The key for policy makers is to balance the protection and safety of officers and offenders with community concerns about the possible risks associated with this device and the importance of appropriate policies and practices to guide police in using Tasers.

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Acronyms

ACPO	Association of Chief Police Officers
ACT	Australian Capital Territory
AFP	Australian Federal Police
CED	conducted energy device
CEW	conducted energy weapon
CPC–RCMP	Commission for Public Complaints Against the Royal Canadian Mounted Police
CPRC	Canadian Police Research Centre
DOMILL	Defense Scientific Advisory Council Sub-committee on the Medical Implications of Less-lethal Weapons
HECOE	Joint Non-lethal Weapons Human Effects Center of Excellence
NMI	neuromuscular incapacitation
NSW	New South Wales
OC	oleoresin capsicum
PwC	PricewaterhouseCoopers
QPS	Queensland Police Service
RCMP	Royal Canadian Mounted Police
UK	United Kingdom