The Road Safety Implications of Automatic Number Plate Recognition Technology (ANPR)

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Contents

1. Introduction

1.1 Background

This submission has been prepared in response to the Parliamentary Travelsafe Committee's *Inquiry into Automatic Number Plate Recognition Technology*. This submission will outline how automatic number plate recognition (ANPR) works, its history and application, as well as some key privacy and data management issues. After outlining evaluations that have been undertaken of ANPR and highlighting some limitations, the submission will examine the implications of the technology for road safety.

The primary focus of this submission is on the potential of ANPR to both detect and deter a range of illegal road user behaviours including unlicensed driving, the driving of unregistered and uninsured vehicles, speeding, and the noncompliance of heavy vehicle drivers with driving hour regulations and novice drivers with provisional licence requirements. To this end, the submission will review different options for deploying ANPR, the risks associated with these different approaches, and how the likely road safety benefits of the technology could be maximised. To assist in this process, a set of principles is presented that can be used to assess the potential road safety benefits of ANPR technology.

1.2 Scope of the submission

While it is acknowledged that ANPR can be used to detect and prevent a wide range of criminal behaviour, this submission will primarily be limited to the road safety applications of this technology. This focus is in keeping with the research interests and expertise of the authors.

Nonetheless, it is important to consider some of the broader implications of ANPR, particularly as it relates to privacy requirements and the likely public acceptance of its use, since this may impact on the overall benefits to road safety that can be gained from the technology.

2. ANPR technology

2.1 Description of technology

As Constant (2003) mentions, ANPR technology is based upon the same idea as Optical Character Recognition (OCR) used in document scanning technology. A document scanner merely makes an image of a document which can be stored on a computer. This, however, does not allow manipulation of the document's contents. It is the use of OCR software that allows the scanned document to be converted into a document that can be altered using a word processing programme. Essentially, ANPR is the software that makes it possible to convert an image of a number plate (into a string of letters and number) which can then be used to search a database in order to determine whether the number plate appears within that database. Information such as who owns the vehicle, whether the vehicle is registered, insured, stolen, or is registered to an unlicensed driver can be stored within the database. Naturally a plethora of information about the vehicle's owner can be included in the database.

The ANPR software is one part of an interconnected system. A camera is required to capture the image and, as Constant (2003) states, to ensure the maximum utilisation of the ANPR technology, an infrared camera should be used, so that number plate images can be captured in low light, and at night time. The image is then either stored at the camera's site for later retrieval, or automatically sent to the ANPR system for conversion and then to the database for information retrieval. Any number plates that match the predetermined criteria (e.g. the vehicle is uninsured, or the owner is unlicensed) are then flagged for attention.

Constant (2003) stresses the importance of both investing in good quality technology and in taking the time and effort to ensure that the entire system is configured for optimal image capture. These factors include, but are not limited to, assessing the level of illumination, the camera angle, and the shutter speed. Constant (2003) claims that he has experienced instances where number plate recognition rates have leapt from 30%-40% to nearly 100% when the camera angle has been adjusted. This factor must be taken into consideration, particularly if the use of existing enforcement cameras is contemplated.

It should also be noted that there are some strong similarities and differences between ANPR technology and conventional speed cameras. Among the similarities, both technologies rely on the recognition of number plates to identify vehicles of interest. Furthermore, both technologies involve capturing images of vehicles that are potentially involved in illegal activity, without specifically identifying the driver of the vehicle. As such, the default position regarding the offender is that they are the owner of the vehicle, as recorded in the relevant database. However, there are also some important differences between the two technologies. In the case of speed cameras, the images are only collected and stored for those vehicles which exceed a predetermined speed threshold. However, ANPR technology involves the collection of images for all vehicles in the traffic stream, which are then used to cross-reference with other databases to identify vehicles of interest. As discussed below, this raises particular issues for privacy and data management and may influence the public acceptability of ANPR technology.

Moreover, these similarities and differences between ANPR technology and speed cameras highlight the need for the technology to be assessed in the context of existing enforcement strategies, rather than in isolation. It is important to consider what benefits ANPR can offer, over and above current approaches or modification to current approaches, to ensure that the best mix of enforcement activities is being used to reduce illegal road user behaviours and related road trauma.

2.2 History and application

ANPR is used most widely in Great Britain and was first used as a covert measure against terrorism (Shaw, Corden, Stallworthy & Dean 2004). It has since become used for policing and road safety purposes and is now so endemic that it has been claimed that every car movement throughout Great Britain is tracked 24 hours a day, 7 days a week through the use of ANPR, and its movement history stored in a database (Connor, 2005a). Initially this information was stored for two years (Shaw et al., 2004), but is now stored for five years (Evans-Pughe, 2006).

ANPR was quickly adopted as a wider crime fighting tool by British Police Forces. In January 1999 there were 15 Forces using ANPR, with another 8 Forces trialling the technology (Shaw et al., 2004). As of July 2002, all Forces throughout England and Wales were using ANPR as an essential tool in their armoury (Shaw et al., 2004). Part of the reason the system was able to be adopted so quickly was that the Police Forces were able to convert their already extensive network of closed-circuit television cameras (CCTV) to be compatible with the ANPR technology.

It was in 2002 that the police forces in Britain trialled the use of dedicated ANPR intercept teams (Home Office, 2004). Generally the intercept teams involved six police officers who either used a system which was able to make use of the existing fixed CCTVs in the area, or used a mobile ANPR unit (Home Office, 2002). These operations typically involve one team of Officers stationed at a point in the road and uses their ANPR unit to record the number plates of all passing vehicles. If a vehicle of interest is recognised by the system the intercept team stationed further down the road is able to pull them over. This process takes a matter of seconds (Home Office, 2002).

After the six month trial in 2002 the intercept team concept was reviewed and found to have been extremely effective in terms of arrest rates (Home Office, 2004). It was only when it became clear that there was no funding to enable a wider roll-out of the ANPR intercept teams that another manner of funding the teams was suggested. The revenue gathered by the teams for apprehending drivers with, what the report calls ‘documentation offences’, and by fines issued by the teams for other offences, would be used to fund the ANPR intercept teams (Home Office, 2004). This required permission from Her Majesty’s Treasury, which was conditionally granted (Home Office, 2004).

In addition to Britain, ANPR technology is increasingly being used in other countries, including France, New Zealand and Australia. Information provided by the Deputy Director of the organisation responsible for the roll-out of ANPR in France, Frédéric Greggio highlights that the ANPR technology is not without its problems (Personal Communication, 26 November, 2007). The French ANPR system utilises two different ‘engines’ to translate number plate images into numbers and characters that can be recognised in a searchable database. Before the database(s) can be searched however, a match must be achieved by the two engines. This, according to Greggio occurs only 30% of the time, leaving the other 70% to be identified by personnel. Some of the problems contributing to the low match rates are motorcycles being photographed from the front (as they only have a rear plate), dirty number plates, damaged number plates, foreign number plates, and vehicles passing one another at the time the image is captured (Personal Communication, 26 November, 2007). While the overall number of images that are being captured per day was not reported, 50 staff are currently required to adjudicate on the 70% of images that are not successfully matched by the two ANPR engines.

To date, the application of ANPR in Australia and New Zealand has not progressed as far as in either Great Britain or France. While trials of this technology are underway in New Zealand, the Australian situation is more varied (Travelsafe, 2007). Tasmania, for example, has been using

ANPR since August 2004, while the ACT is only now looking at the issue (Travelsafe, 2007). The Federal Government is currently determining how to most effectively allow information sharing between the States in order to maximise the tracking abilities of ANPR (Travelsafe, 2007).

2.3 Privacy and data management issues

The issue of invasion of privacy was not directly addressed when ANPR was introduced as a counter terrorist measure, as it was exempt based upon the rationale that it was in the interests of National Security (Shaw et al., 2004). Privacy issues came to the fore when the technology experienced “function creep” (a term used by Wigan & Clarke, 2006) and started to be used as a law enforcement aid.

Naturally there are issues regarding an individuals’ right to privacy which had to be addressed as ANPR databases contain, not only a large amount of personal information, but the vast majority of information pertains to people of no interest to the Police Force. This is a very large tool being used to monitor a very small percentage of the population, whilst containing a great deal of information about every person in the country.

The British Police Force were able to avoid violating peoples rights by referring to Article 8 of the European Convention of Human Rights which states that privacy may legally be violated if it is deemed lawful and necessary to maintain the safety of people, or the nation (Shaw et al., 2004). Therefore, the Police in Britain may use the ANPR database to investigate and/or track individuals, if-and-only-if, they suspect someone of unlawful behaviour (Shaw et al., 2004). In other words, they may not go data mining. That is, have a program that sifts through the data looking for patterns of information deemed to indicate suspicious activity. They must only track people who have been identified by the police, based on hard evidence, not patterns in the data.

Nor, according to Shaw et al. (2004), is data about people to be held for an indefinite period based on the premise that it may provide useful information about another matter in the future. Hence, the ANPR database has to purge information that is more than two years old, unless the information pertains to a major crime (Shaw et al., 2004). This has now been extended to five years (Evans-Pughe, 2006). Another safeguard Shaw et al. (2004) refer to, is that the ANPR database can be freely searched for the first 90 days after the data is collected, thereafter a special application to a Superintendent must be made to access the information. If the data is between 2 and 5 years old the special application for information is made to a Chief Officer.

It is worth noting that, while in theory, every Police Officer throughout Great Britain is able to search the ANPR database for the first 90 days that, according to John Dean, National ANPR Co-ordinator for the Association of Chief Police Officers (Ballard, 2006), in actuality it has been found that the computer system becomes very slow if too many people try to access information on the database. Therefore, in practice, queries are usually placed through specialised database operating staff.

Some of the databases to which the ANPR system has access in Great Britain are the Police National Computer, the Driver and Vehicle Licensing Agency (which has records of all registered vehicles, and notes which owners have not paid vehicle excise duty), and car insurance databases (Home Office & Association of Chief Police Officers, 2004). Some insurance company databases are linked to the system, and some send in regular information updates. It should be noted that nobody, other than Police Officers, and the British Police Force’s administrative staff have access to the ANPR database.

2.4 Evaluations

As explained earlier, in 2002 some British Police Forces trialled the use of ANPR intercept teams. Once permission was gained from Her Majesty's Treasury to use the revenue from road safety infringement fines to fund a much larger trial the British Police Force was able to roll out 'Laser 2'. This consisted of twenty three ANPR-enabled intercept teams from the British Police Forces, whose Officers were involved for a period of thirteen months. The number of person hours dedicated to the trial was 192 Full Time Equivalents.

The ANPR intercept teams stopped a total of 180,543 vehicles. From these stops, the intercept officers:

- arrested 13,499 persons, including:
  - 2,263 arrests for theft and burglary
  - 3,324 arrests for driving offences (for example driving whilst disqualified)
  - 1,107 arrests for drugs offences
  - 1,386 arrests for auto crime (theft from and of vehicles);

- recovered or seized property, including:
  - 1,152 stolen vehicles (valued at over £7.5 million)
  - 266 offensive weapons and 13 firearms
  - drugs worth over £380,000 from 740 vehicles
  - stolen goods worth over £640,000 from 430 vehicle;

- issued fixed penalty notices, including:
  - 22,825 tickets for failing to display Vehicle Excise Duty (VED)
  - 6,299 for no insurance
  - 1,496 for no MOT
  - 20,290 for a variety of offences, including not wearing a seat belt, using a mobile telephone whilst driving (Home Office, 2004p. 6).

One particular benefit of using ANPR intercept teams was that the Officers were found to spend 77% of their time on-task (including travelling to and from intercept sites). This compared with 57% of time on-task for regular Police Officers (Home Office, 2004). Additionally, a report on this trial at the nine month mark showed that the number of arrests made by ANPR intercept teams was ten times higher than figures for the national average arrest rate (Home Office, 2002). Another benefit of the ANPR system is that the intercept teams were able to make informed decisions about which vehicles to pull over, rather than relying on luck, following a 'hunch', or based upon stereotypes (e.g. a young person driving a powerful car might be pulled over just based on the fact that this is a 'hoons' type of car, rather then because it has no registration)(Policing Bureaucracy Taskforce, 2002; ACPO ANPR Steering Group, 2005).

2.5 Limitations and potential risks

The available evidence regarding the operation of ANPR in Britain and France highlights a number of limitations that can reduce the operational efficiency of the technology and its potential benefits for road safety. These are discussed below.

2.5.1 Technical considerations

Careful consideration must be given to purchasing good quality equipment (both hardware and software), and ensuring that it is set-up correctly. As noted previously these two factors have a significant effect on the capture rate, and correct identification of the licence plate number (Constant, 2003). It is also important to investigate the accuracy of data in any database which is being considered for use as part of the ANPR system. The Home Office report, Driving Crime Down (2004), identified this as a significant weakness in the system, and highlighted that inaccuracies cause two problems. The first is the waste of police resources, and the second (which would also negatively affect the general public's perception of the new technology) was that law-abiding citizens were being pulled over and unnecessarily inconvenienced. In addition, it may result in increased punishment avoidance by law breakers. (The concept of punishment avoidance is discussed in more detail in section 3.1.2. In brief, however, it relates to instances where offenders fail to be detected or are able to evade punishment, when they should otherwise have been apprehended and punished. There is a growing body of evidence suggesting that experiences of punishment avoidance can encourage further offending.)

Another technical issue, as noted by Travelsafe (2007) in their call for this submission, is whether the ANPR software can be configured to capture off-centre and a-typical licence plates. While the number plates on the front of vehicles are highly likely to be placed in the centre of the bumper bar, the case is more variable with rear number plate placement. Vehicles such as four wheel drives that have a spare tyre mounted on the rear, and vehicles with towbars have off-centre placement of their rear number plate.

It is also possible that a trade-off may need to be made between the safeguards inherent in an ANPR system to protect against incorrect identifications and the overall costs of running the system. For example, as noted earlier, the French ANPR system utilises two engines, which presumably improves the accuracy of the automated identification process. However, an upshot of this is that over 70% of the images currently recorded are not successfully matched by the engines and thus require human adjudication (see section 2.2).

2.5.2 Potential for punishment avoidance

Besides the technical problems identified above, there are other potential constraints that may reduce the efficiency of ANPR operations in punishing those offenders who are initially identified by the technology. Firstly, according to the Policing Bureaucracy Taskforce's (2002) analysis of an intercept team trial, of all the vehicles flagged by the ANPR system as being of interest to the police, only 2.8% of these vehicles were actually pulled over as there were not enough Officers available to query all flagged vehicles. In the thirteen month trial undertaken by 23 of the British Police Forces, the rate of pulling over flagged vehicles was less than 10% (Home Office, 2004). This is arguably analogous to a speed camera 'recognising' that 100 of the vehicles which passed it were exceeding the speed limit, but the camera only recording a picture of 3 to 9 (i.e. 2.8% to less than 10%) of these vehicles.

Secondly, the use of ANPR technology to identify offenders remotely, and to subsequently send them fines in the mail, relies on the accuracy of the address details in relevant databases. This is particularly problematic in the case of recidivist offenders who often lead dysfunctional lives and regularly change addresses (see Watson, 2004a for a discussion of this issue in relation to unlicensed drivers).

Together, these potential inefficiencies may lead to relatively high levels of punishment avoidance among offenders, which could seriously undermine the deterrent value of ANPR technology (see section 3.1.2 for more discussion of this issue).

2.5.3 Ability to detect other offences

While Home Office reports (e.g. 2004) mention that ANPR can be used to detect those who drive while using a handheld cell phone and those who fail to wear a seatbelt, capturing these people is incidental at best. The technology, at this stage, is unlikely to be able to be configured to automatically recognise these incidents. It is only through human intervention, either by ANPR intercept team members, or by somebody laboriously going through each image captured by the camera, that these offenders would be identified and caught. The image of the vehicle caught by the camera, however, would provide proof that is likely to reduce potential appeals and/or to assist with prosecutions.

2.5.4 Fine recovery rates and potential for self-funding

Overseas experience suggests that the introduction of ANPR is associated with a general upsurge in the number of traffic offences issued. However, based on the experiences in Great Britain, not all of these fines will be paid by offenders. Indeed, only 14% of fines issued using ANPR information in Britain, were subsequently paid (Home Office, 2004). As such, the possibility of using revenue from fines to fund the roll-out of ANPR technology and to cover the associated policing and administration costs, could be problematic.

Moreover, the problems associated with fine recovery are likely to be exacerbated in cases where ANPR technology is used to target recidivist offenders. A range of studies have shown that recidivist offenders, particularly repeat drink drivers and unlicensed drivers, are more likely to engage in illegal and antisocial behaviours (Watson, 2004a). As such, these offenders may be less likely to pay fines and, thus, perceive ANPR operations as less threatening. This has a direct bearing on the issue of specific deterrence, which is discussed further in section 3.1.2.

2.5.5 Factors impacting on public acceptance of ANPR technology

As already noted in section 2.3, there are important privacy and data management issues that need to be considered to ensure that the public accepts ANPR technology and has confidence in its application. However, overseas experience suggests there are a number of technical problems that can also undermine public confidence in ANPR. Firstly, a means of avoiding detection that emerged in Great Britain is the use of number plate cloning (Mathieson, 2007). As the term 'cloning' suggests, to avoid detection the number plate of a law-abiding person's vehicle, that is similar to the criminal's, is either illegally purchased or copied and attached to the criminal's vehicle. Not only does cloning make it difficult to catch the offender, but it can inconvenience the innocent. If the offender breaks a traffic law (e.g. speeds, or enters a toll paying area and exits without paying) the innocent car owner will receive the fine. While it is not completely clear why number plate cloning appears to be more common in response to ANPR technology than speed cameras, it may in part be due to the stronger focus of ANPR in Britain on broader criminal activity.

One theme that emerged in the British news articles relating to cloning was that the law-abiding citizens inadvertently fined in these cases often experienced difficulties in getting the police to take the matter seriously and/or having the fines cancelled (e.g. BBC, Inside Out, 2005). In addition, some were reported to have received court summonses as the matter was not rectified by police immediately, while others were pulled over by the Police who thought they were offenders (BBC, Inside Out, 2005). While it is acknowledged that this may be a small, and self-selected, sample of people who were willing (or angry enough) to tell their story to the press, these experiences nevertheless could affect public confidence in the system.

Another factor which may potentially undermine public acceptance of ANPR technology is 'function creep'. For example, it appears that the historical development of ANPR technology in Britain was in part driven by self-funding imperatives. When ANPR was first introduced it was primarily involved the use of remote fixed-site cameras to identify and track known criminals. However, once the use of mobile intercept teams were trialled and found to be successful, a need was created to fund these more costly operations, which appears to have contributed to the decision to more specifically focus on traffic offences (Home Office, 2004). However it appears that function creep may account for the high levels of criminal detections that subsequently characterised the intercept operations.

Another instance of function creep that may undermine public confidence in ANPR is the possibility of applying data mining techniques to the information collected by the technology. While some commentators in Britain (including Police) have warned against the practice of data mining on privacy grounds (Shaw et al., 2004), others have advocated its use as a general crime fighting tool. For example, Frank Whiteley (Chief Constable of Hertfordshire, Chair of the ACPO ANPR Steering Group) has promoted the value of data mining as a means of building a picture of a person's (ie. offender's) habits and lifestyle. The risk in this approach, however, is that profiles of non-offenders can also be derived from ANPR databases using data mining techniques.

3. Road safety implications of ANPR

In order to establish the likely road safety benefits of ANPR it is important to consider the role of traffic law enforcement and how its effectiveness may be enhanced by the use of the technology. Accordingly, the following section will briefly review the role of traffic law enforcement in road safety, drawing on the available evidence and relevant theory. This will be followed by a discussion of the particular 'problem' offenders that could be targeted by ANPR, including unlicensed, unregistered and uninsured drivers and fine defaulters. This section will conclude with a discussion of the best way to optimise the likely road safety benefits of ANPR.

3.1 Role of traffic law enforcement in road safety

Over recent decades, a growing body of literature has emerged indicating that traffic policing programs, particularly in conjunction with publicity campaigns, can prove very cost-effective in reducing road trauma. Indeed, Australia has attracted international attention for the success of policing programs such as:

- Random Breath Testing (RBT) (eg. Homel, 1988; Watson, Fraine & Mitchell, 1994; Henstridge, Homel & Mackay, 1997);
- red light cameras (eg. Queensland Transport, 1995);
- speed cameras (eg. Cameron, Cavallo & Gilbert, 1992; Delaney, Diamantopoulou & Cameron, 2003); and
- randomly scheduled traffic policing (eg. Newstead, Cameron & Leggett, 2001).

A key feature of successful traffic policing programs is their capacity to increase the population's perceived risk of being apprehended for breaking the road rules (Homel, 1986, 1988; Zaal, 1994). In this regard, South (1998, p.76) has argued that the: "*reduction in the road toll . . . has arguably been the most successful example of public action to minimise a social problem in Australia, and there is solid evidence that general deterrence programs have played a major role.*"

Drawing on the work of Homel (1993), it has been argued that traffic law enforcement operations are most effective when they are:

- unpredictable in their timing and location;
- deployed in a widespread (ubiquitous) manner to ensure a broad coverage of the road network; and
- difficult for drivers to avoid when encountered (Watson et al., 1994, 1996).

Before examining how traffic law enforcement operations can most effectively achieve the above conditions, it is useful to review a number of key theoretical issues that assist in understanding the influence of these programs on driver behaviour.

3.1.1 Deterrence theory

Deterrence theory is a criminological perspective that has been used extensively in Australia and other countries to guide the development of many road safety countermeasures, particularly in the area of drink driving (eg. Ross, 1982; Homel, 1988). It has underpinned the design of traffic law enforcement programs such as RBT and speed cameras (Watson, 2004a). Deterrence theory focuses on explaining the conditions under which criminal acts are omitted or curtailed in response to the perceived risk and fear of legal punishment (Gibbs, 1975; Homel, 1986). The traditional or classical form of this theory asserts that the effectiveness of a legal threat is related to the perceived certainty, severity and swiftness of punishment (Homel, 1986; Vingilis, 1990). In other words, legal threats are most effective when people perceive that there is a strong likelihood of detection, arrest, prosecution, conviction and punishment, when the eventual penalty is considered to be certain and severe, and when it is administered relatively quickly (Vingilis, 1990).

An important distinction that is made in deterrence theory is between specific and general deterrence (Homel, 1986; Akers, 1994). Traditionally, specific deterrence has been conceptualised as the process by which an offender is deterred from reoffending through direct exposure to sanctions, while general deterrence concerns the deterring of the general community through the threat of sanctions (Homel, 1986). Consequently, through the process of general deterrence, it is proposed that legal sanctions have the capacity to influence community-wide behaviour.

The available road safety evidence suggests that specific deterrence is best achieved by policies that increase the certainty and swiftness of punishment, rather than those based on increasing the severity of punishment (Nichols & Ross, 1990; Watson et al., 1996). For example, a study by Vingilis, Mann, Gavin, Adalf and Anglin (1990) comparing the specific deterrent effect of different drink driving penalties, found that licence suspensions were consistently related to road safety benefits. In contrast, more severe penalties in the form of higher fines (for first offenders) and more days in jail, and not being placed in a temporary absence program (for multiple offenders), were associated with more crashes and convictions. In the case of general deterrence, the policies that appear the most effective are those that increase the public's perceived risk of detection, apprehension and punishment (Nichols & Ross, 1990; Watson et al., 1996). For example, the success of RBT in Australia is generally attributed to its general deterrent effect, principally achieved through increasing the perceived risk of apprehension for drink driving (Homel, 1986; Watson et al., 1996).

Homel (1988) has argued, however, that deterrence is a dynamic, unstable process that is continually undermined by experiences such as lack of exposure to enforcement, successful episodes of law breaking, and peer pressure. In this regard, recent conceptualisations of deterrence theory have highlighted how experiences of punishment avoidance can influence behaviour more strongly than experiences of punishment in certain circumstances. For example, Stafford and Warr (1993, p.125) have argued:

> *". . it is possible that punishment avoidance does more to encourage crime than punishment does to discourage it. Offenders whose experience is limited largely to avoiding punishment may come to believe that they are immune from punishment, even in the face of occasional evidence to the contrary".*

Support for Stafford and Warr's perspective has been obtained by Piquero and Paternoster (1998) in a study examining drink driving behaviour. They found that intentions to drink and drive were affected by both the experience of punishment, and punishment avoidance. More recently, a number of studies conducted in Queensland have confirmed that experiences of punishment avoidance are a significant predictor of the frequency of unlicensed driving (Watson, 2004a,b), speeding (Fleiter & Watson, 2006) and drug driving (Armstrong, Wills & Watson, 2005).

3.1.2 Hallmarks of successful traffic law enforcement operations

Drawing on the available evidence and the deterrence concepts discussed above, the following section reviews the hallmarks of successful traffic law enforcement operations.

3.1.2.1 General vs. specific deterrence policing practices

The success of RBT confirms the value of a general deterrence-based approach to traffic policing. This program involves the sustained use of highly visible, marked police vehicles to maximise drivers' exposure to the threat of apprehension (Homel, 1986; Fildes & Lee, 1993). As such, it can be argued that RBT is essentially a communication tool, designed to influence community-wide behaviour (Watson et al., 1994).

In contrast, there is little documented evidence that traditional apprehension-based policing programs (e.g. those using concealed or camouflaged police operations) are effective in encouraging widespread, sustained compliance with the law (Fildes & Lee, 1993). Generally these programs can only achieve a specific, rather than a more widespread general, deterrent effect, due to their non-visible nature. Therefore, the pool of drivers being influenced is relatively small (Watson et al., 1996).

However, an evaluation of the Victorian speed camera program indicated that the crash reductions associated with the program were linked to both general and specific deterrent mechanisms (Cameron et al., 1992; Rogerson, Newstead & Cameron, 1994). In particular, the results suggested that the receipt of a speed camera traffic infringement notice (a specific deterrent mechanism) was consistently associated with the observed crash reductions. This result is not surprising given that the Victorian program featured a large number of cameras, generally operated in a non-visible way. However, it remains to be seen whether it will be possible to sustain such a specific deterrent effect over time, particularly if the number of camera-related infringements were to decline (Watson et al., 1996).

3.1.2.2 High levels of surveillance

Zaal (1994) has argued that the primary means of heightening the driving public's perceived risk of apprehension is to increase the overall level of traffic surveillance. This argument is consistent with the findings of both RBT and speed camera evaluations. The RBT programs in NSW, Tasmania and Queensland have featured a level of activity equivalent to at least one licensed driver in three being breath tested each year (Homel, 1990; Watson et al., 1994). Similarly, the introduction of speed cameras in Victoria resulted in a substantial increase in the number of speeding infringement notices issued, a factor which appears to have contributed to the success of the program (Rogerson et al., 1994).

3.1.2.3 Resource deployment practices

Evidence suggests that the randomised deployment of policing resources serves to establish and maintain the perception among drivers that a police vehicle could be located somewhere along a road at any time, whilst maintaining uncertainty about the exact location (Watson et al., 1996; Newstead et al., 2001). In effect, drivers exposed to such enforcement will become vigilant and alert, even if they see no police vehicles, in the expectancy that the police could be `just around the corner' (Leggett, 1988). Hence, the deployment of operations according to a random scheduling methodology offers a means of increasing the perceived unpredictability and ubiquity of traffic policing.

3.1.2.4 Minimising punishment avoidance

As noted in section 3.1.1, the experiencing of punishment avoidance appears to undermine the deterrent effect of traffic law enforcement operations. Consequently, it is important that operations are conducted in an efficient and rigorous manner that minimises the possibility for offenders to evade detection.
Furthermore, research by Homel (1986) has shown that convicted drink driving offenders are more fearful of RBT than those who have never been caught. This illustrates the deterrent value of strategies which maximise the arrest rate, particularly among high risk offenders. More recent research, has suggested that the effectiveness of RBT in Queensland is linked to not only maintaining high levels of testing, but also to maximising the detection of drink drivers (Watson et al, 2005).

To maximise arrest rates among drink drivers, it has been argued that highly visible stationary RBT operations need to be complemented by more targeted policing to detect persistent offenders and drivers attempting to evade detection (Homel, 1990; Watson et al, 2005). However, highly visible operations should remain the primary method for RBT to ensure that the general deterrent effect is not undermined.

3.1.3.5 The need to educate police about the role of deterrence

Homel (1990) has highlighted the need for continuous feedback to police concerning the goals and effectiveness of RBT. This is necessary to clearly establish the principles and validity of RBT as a general deterrence-based preventive policy and counter "the inevitable trend toward an apprehension-based policy" (Homel, 1986, p. 143). More recently, a Queensland study has suggested that some operational police do not fully appreciate the deterrence principles underpinning RBT, while many are not aware of the overall road safety benefits associated with the program (Watson et al, 2005; Watson, Freeman & Hart, in press).

3.1.3.6 The reinforcing role of publicity

Available evidence indicates that a key feature of many successful traffic policing programs has been the use of publicity to reinforce the public's perceived risk of apprehension (Zaal, 1994; Elliott, 1993). A strong feature of effective RBT programs in Australia has been the use of publicity to highlight the high risk of apprehension associated with the program (Homel, 1986, 1988; Elliott, 1993). As already noted, Cameron et al. (1992) found links between the levels of the TAC publicity supporting speed and alcohol enforcement programs and reductions in casualty crashes in Victoria. Therefore, it appears that enforcement and publicity campaigns can achieve a synergistic effect, if they are complementary and well co-ordinated (Watson et al., 1996).

3.2 Relevant ‘target’ behaviours for ANPR

As noted in section 2.2, ANPR technology is increasingly being used in other jurisdictions to target illegal behaviours such as unlicensed driving, unregistered and uninsured driving and traffic fine defaulting. In addition, the Travelsafe Committee (2007) has identified the potential for ANPR to target speeding, fatigue offences among heavy vehicle drivers, and the non-compliance of provisional drivers with relevant restrictions. The following section reviews the road safety implications of these behaviours and the potential role of ANPR technology in improving both the detection and deterrence of the behaviours. Special attention is given to the issue of unlicensed driving, since this is a behaviour that has been extensively studied at CARRS-Q.

3.2.1 Unlicensed drivers

Unlicensed driving remains a serious problem in many countries, despite ongoing improvements in traffic law enforcement practices and technology (Sweedler & Stewart, in press; Watson, 2004a). In the USA, over 10% of the drivers involved in fatal crashes do not hold a valid licence, while approximately 20% of all fatal crashes involve at least one of these drivers (Griffin & DeLaZerda, 2000). In Australia, unlicensed drivers represent over 5% of the drivers involved in fatal crashes, while crashes involving unlicensed drivers and riders account for almost 10% of the national road toll (FORS, 1997).

Unlicensed driving represents a major problem for road safety in two respects. Firstly, it undermines the effectiveness of driver licensing systems by preventing the allocation of demerit points and reducing the impact of licence loss, which has otherwise been demonstrated to be a very effective deterrent to illegal behaviour (Watson 2004a, 2004b). Secondly, there is a growing body of evidence linking unlicensed driving to a cluster of high-risk behaviours including drink driving, speeding, failure to wear seat belts and motorcycle use (Harrison, 1997; Griffin & DeLaZerda, 2000; Watson, 1997, 2004a).

Consistent with the above findings, Watson (2004c) utilised a quasi-induced exposure method to estimate that unlicensed drivers in Queensland were almost three times more likely to be involved in a reported crash than licensed drivers. In the event of a crash, those involving unlicensed drivers were twice as likely to result in a fatality or serious injury. A particular subgroup of concern is those drivers who are disqualified, not currently licensed or have never been licensed. A follow-up study in Queensland has demonstrated that these offenders represent a particularly deviant subgroup who report higher levels of prior criminal offending, alcohol misuse and self-reported drink driving (Watson, 2002, 2004a).

A number of studies have indicated that a major contributing factor to unlicensed driving is the low perceived risk of apprehension associated with the offence (Nichols & Ross, 1990; Ross, 1991; Watson et al., 1996). In addition, the Queensland studies have highlighted that many unlicensed drivers experience episodes of punishment avoidance (Watson, 2002, 2004a). For example, of 309 convicted unlicensed drivers interviewed after leaving the Brisbane Central Magistrates Court in the study, 97 (31.4% of the total sample) reported that they had been pulled over by RBT when driving while unlicensed, but didn't have their licence checked. Indeed, of these offenders, 58 (18.8% of total) failed to have their licence checked at RBT on two or more occasions. In addition, a small number of offenders cited cases where they were pulled over for speeding or another offence and did not have their licence checked (8 and 11 offenders, respectively). Finally, 11 offenders reported that they were able to evade a speed camera ticket for which they were responsible. (In these cases the offenders were driving either another person's car or a work vehicle, and hence were able to avoid the allocation of the penalty.) In total, 113 offenders (representing 36.6% of the sample) were able to evade detection from the police on one or more occasions when they could otherwise have been identified. Of these offenders, 67 (21.7% of sample) evaded detection on two or more occasions. Most importantly, whether an offender evaded detection or not was found to be a significant predictor of their frequency of unlicensed driving.

These findings largely reflect the difficulties that police have historically experienced in detecting unlicensed drivers. The first difficulty for the police is that, in practice, many drivers in Queensland are not required to carry their driver's licence. For example, while the police have the power to randomly check licences in Queensland, only learner and provisional licence holders are actually required to carry their licence. Open licence holders are given a grace period of 48 hours to present their licence to a police station (Travelsafe, 1998). As a result, the police are generally reluctant to systematically check licences. Within Australia, New South Wales is the only jurisdiction that currently requires all drivers to carry their licence, which facilitates the checking of licences at RBT operations in that state (Watson et al., 1996). Consequently, many researchers have called for the introduction of compulsory carriage of licence throughout Australia and the more widespread checking of driver's licences (Job, Lee & Prabhakar, 1994; Watson et al., 1996; Staysafe, 1997; Watson, 1998, 2004a). Similarly, the Travelsafe Committee has recommended the introduction of compulsory carriage of licence for all licence holders on a number of occasions.

The second difficulty faced by the police is confirming the validity of a licence, even when it is carried by a driver. For example, without some means of checking the available records, it can be difficult for the police to identify fraudulent licences or cases where the licence has been cancelled or suspended. Consequently, researchers have repeatedly noted the need to improve the roadside technology used by police to ensure the rapid identification of drivers who are unlicensed (eg. Smith, 1976; Job et al., 1994).

Over recent years, the Queensland Police Service have equipped many of their vehicles with the ability to remotely access Queensland Transport's licensing and registration databases, which has overcome the inevitable time delays historically involved in making radio-based inquiries (Watson et al., 1996). While evaluations have indicated that this technology has assisted in improving detection rates, it still relies on the Police to visually identify vehicles of interest.

As such, the potential exists to improve the detection of unlicensed drivers by utilising ANPR to identify those vehicles on the road that are either:

i) owned by driver who is unlicensed at the time (by linking to licensing and registration databases); or

ii) is a 'vehicle of interest' that is suspected of being driven by an unlicensed driver (by linking to a database recording 'vehicles of interest').

Based on these methods, it is likely that the use of ANPR would assist in identifying some unlicensed drivers who may not otherwise be detected. However, as noted in section 2.5, the successful detection of offenders using this approach is subject to a number of limitations, including the possibility that the potential offender is not the one driving the vehicle at the time, that Police may not have the necessary resources to pull-over all 'flagged' vehicles at the time, and that the address details for offenders may not be accurate if attempts are made to follow-up the offender later.

With regard to the first of the above limitations, the survey of unlicensed drivers recently conducted in Queensland provides some interesting information. Of the 309 unlicensed driving offenders interviewed in the study, a total of 290 provided ownership details for the vehicle they were driving at the time they were detected (Watson, 2004a). The majority of these offenders were driving a vehicle owned by themselves (62.5%), followed by a friend (21.4%), a family member (11.4%) or someone else (typically work vehicles) (4.6%). However, the proportion of offenders driving a vehicle that they owned (and thus presumably registered under their name) was not consistent across different types of offenders. In particular, the suspended drivers were more likely to be driving a vehicle that they owned (72.2%), whereas the least likely were those who had never been licensed (32.0%). This latter result is still surprising, since it indicates that almost one-third of the never licensed drivers actually owned a vehicle.

Over and above these considerations, the limitations discussed above do pose a particular threat to the road safety value of ANPR. Depending on how visible the ANPR operations are, there is a possibility that unlicensed drivers who fail to be subsequently apprehended after passing an operation will be aware that they have successfully evaded detection and, hence, may be more tempted to drive unlicensed in the future. These issues are further discussed below in section 3.3.

3.2.2 The driving of unregistered vehicles

As identified by the Travelsafe Committee (1999, 2007), the driving of unregistered vehicles poses a number of problems for road safety, including the possibility that such vehicles do not meet relevant safety standards, that it undermines the identification of vehicle owners as a means of managing driver behaviour (eg. through owner-onus legislation) that it reduces the revenue available to the government to maintain the road system, and that such vehicles are not covered by compulsory third party insurance.

In addition, there is some evidence that the driving of unregistered vehicles is associated with a cluster of other high risk behaviours, which provides further justification for targeting these vehicles. For example, in the aforementioned survey of unlicensed drivers conducted in Queensland, 13% of the offenders reported that they were also convicted of driving an unregistered or uninsured vehicle at the same time they were convicted of unlicensed driving (Watson, 2003).

The use of ANPR to detect unregistered vehicles overcomes some of the limitations associated with targeting unlicensed driving. In particular, no assumptions need necessarily be made about the licence status of the driver, since the driver will (knowingly or otherwise) be responsible for the offence. However, some of the other limitations regarding the capacity of police to either intercept offenders at the time or to follow them up using available address details still remain. Hence, depending on the efficiency of the operations, it is possible that some drivers will be able to avoid being punished for driving an unregistered vehicle, even if it is 'flagged' by an ANPR operation.

3.2.3 Speeding and driver fatigue

Excessive speed has been identified as a long-standing and significant contributing factor to death and injury on the road in motorised nations worldwide (Fleiter & Watson, 2006). The consequences of speeding, in terms of both crash incidence and severity, are well documented and include: increased crash risk due to reduced reaction time of the driver, increased risk of the severity of the crash, greater difficulty with vehicle control, increased stopping distance after application of brakes, greater impact forces in the event of a crash, and decreased reaction times for other road users (Fildes, Langford, Andrea, & Scully, 2005; Kloeden, Ponte, & McLean, 2001; Zaal, 1994).

Despite the success of speed enforcement initiatives, particularly speed cameras (see section 3.1.1), the prevalence of speeding remains high, and the behaviour remains pervasive, and arguably socially acceptable (Corbett, 2000; McKenna & Waylen, 2002; Pennay, 2005; Fleiter & Watson, 2006). Hence, there is a need to enhance existing speed enforcement countermeasures and develop new methods of both detecting and deterring speeding behaviour. In this regard, there is value in determining whether the use of ANPR can effectively augment or replace the current speed enforcement tools being used in Queensland. However, as already noted, this assessment should not solely be based on the ability of the technology to detect some offenders who may not be detected otherwise. Firstly, it would be important to consider whether the devices would be as relatively efficient in detecting offenders as compared to alternative methods. For example, the failure of an on-road intercept team to pull-over all the vehicles in the traffic stream detected as speeding by ANPR would be analogous to a speeding driver passing a mobile radar operation and not being pulled over. Secondly, it would be important to consider whether ANPR operations could achieve the same level of general deterrence achieved by highly visible speed radar or camera operations. A final consideration is whether ANPR operations would be perceived as an acceptable speed-reduction tool by the general community, compared to other methods of speed enforcement. Based on the experience of speed cameras, public perceptions in this regard would not only be influenced by the perceived accuracy of the devices but also the manner in which they are implemented (eg. overt vs. covert).

As noted by Travelsafe (2007), ANPR technology is also being used in Queensland and some other jurisdictions to monitor heavy vehicle driving hours, as a means of reducing driver fatigue (Travelsafe, 2007). Consistent with the above argument, to establish the full potential value of ANPR as a countermeasure in this area, in would be necessary to compare its relative effectiveness in both detecting and deterring non-compliance with driving hour regulations with other relevant countermeasures.

3.2.4 Provisional drivers and riders

A final potential target group for ANPR operations identified by Travelsafe (2007) are those provisional drivers and motorcycle riders recently subjected to special restrictions relating to the number of peer passengers they can carry, the type of vehicle they can drive or whether they are able to drive late at night (a restriction currently applied to repeat offenders only, but one which could be extended to other novice drivers in the future). As noted by Travelsafe (2007), provisional drivers are over-represented in crashes and these new restrictions are based on research evidence from other jurisdictions. Consequently, it is important that these new restrictions are enforced as effectively as possible.

However, a key issue that may reduce the potential value of ANPR in enforcing these restrictions is the proportion of the target group who may not be detected because they are not driving a vehicle they own (but rather one owned by a parent or friend). To off-set this problem, it may be possible to adapt the ANPR technology to identify P plates. However, this would still not overcome the potential problem of punishment avoidance among drivers who choose not to display their P plates.

3.3 Optimising the effectiveness of ANPR

The following section will review different options for deploying ANPR in Queensland, in order to identify the approach that would most likely optimise the road safety effectiveness of the technology (based on the available evidence). Drawing on the material presented in this submission, a number of principles will be used to guide this review including the capacity of ANPR operations to:

- enhance the detection of ‘target’ illegal road user behaviours in a manner that is cost-effective relative to current enforcement approaches;

- enhance the specific deterrent effect of existing sanctions, by both improving detection rates and minimising opportunities for punishment avoidance among offenders compared with current approaches;

- enhance general deterrence by discouraging the general driving population from engaging in the ‘target’ illegal behaviours;
- not divert resources from other more effective enforcement activities; and
- maintain public confidence in traffic law enforcement and road safety efforts.

3.3.1 Remote vs. intercept operations

As noted in section 2.2, Great Britain was able to use its sizeable infrastructure of CCTV equipment to roll-out its remote ANPR system. Without such an existing infrastructure, it would be much more costly in Queensland to implement a large-scale remote ANPR system. In addition, while the ongoing maintenance costs for a remote system may be relatively low, the overall administration costs would be highly dependent on the accuracy of the technology and the degree of human involvement required for adjudication purposes. As shown by the French experience, considerable human resources may be required to maintain the integrity of the identification process (see section 2.2).

A remote ANPR system also raises a number of potential privacy and integrity problems, which may limit the overall effectiveness of the system and undermine public confidence. Firstly, the operation of a remote system would require the use of an ANPR database to record the identified vehicles of interest. Given that this opens up the possibility of the database being searched for a variety of purposes, procedures would need to put in place to protect the privacy of the public. The nature and extent of these procedures would need to be consistent with current legislation and, presumably subject to considerable public consultation. Over and above these issues, procedures would need to put in place to deal with illegal behaviours such as number plate cloning (see section 2.5.4), which could otherwise undermine public confidence in the system.

Finally, while a remote ANPR system may increase the detection rates of certain illegal behaviours that are currently difficult to identify (eg. unlicensed driving and the driving of unregistered vehicles), it is possible that such a system would still feature high levels of punishment avoidance. For example, some offenders could avoid detection and/or the receiving of fines by driving vehicles owned by other drivers, or by failing to renew their driver’s licence or vehicle registration address details. These strategies could not only undermine the specific deterrent effect of penalties but reduce public confidence in the system.

In contrast, many of the above problems can be overcome or mitigated through the use of intercept-based ANPR operations. Firstly, many of the potential privacy problems are overcome since intercept operations only involve the ‘live’ checking of existing databases, without the need for recording details of all passing vehicles. Secondly, the experience of being pulled over by the police would generally represent a more salutary experience than receiving a fine in the mail, which may enhance the specific deterrent impact of the operations. Thirdly, some of the opportunities for punishment avoidance would be minimised since the police would be able to check the licence and address details of the drivers they pull over and issue the relevant fine on the spot. Finally, the process of intercepting potential offenders may provide an opportunity to identify other traffic offences, such as failure to wear a seat belt, which would not otherwise be possible.

Nonetheless, intercept-based operations still feature a number of potential drawbacks. Firstly, opportunities still exist for punishment avoidance where offenders drive the vehicles of others or the police do not have sufficient resources to pull over all ‘flagged’ vehicles. As noted in section 2.5.2, the documented trials conducted in Britain featured fairly low interception rates (relative to the number of vehicles ‘flagged’ as being of interest). Secondly, intercept-based ANPR programs require an ongoing investment of police resources that may impact on other traffic law enforcement operations (see section 3.3.4 for further discussion of this issue).

Therefore, on balance intercept-based ANPR operations would currently appear to represent a better option for enhancing road safety than remote systems, but sufficient resources would need to be allocated to the operations to ensure their efficient operation and to reduce the potential for punishment avoidance. This raises the potential for ANPR to detract from other successful policing strategies (such as RBT and speed cameras) if adequate resources are not provided to support the introduction of the technology.

3.3.2 Overt vs. covert operations

As noted in section 3.1.2, covert traffic law enforcement operations are generally characterised by high detection rates, which can serve to increase specific deterrence among offenders. However, the major drawback of such operations is that the public is generally unaware of the level of police activity and, thus, they contribute little to general deterrence.

In contrast, the use of highly visible operations can not only serve to detect offenders, but can also act as a ‘communication tool’ to influence community-wide behaviour. As such, ANPR operations would be much more likely to influence community driver behaviour if they were highly visible. This is particularly relevant for behaviours such as unlicensed driving, for which the perceive risk of apprehension is currently quite low (see section 3.2.1). In other words, while highly visible operations may not detect as many unlicensed drivers at any one point in time as covert operations, they would be much more likely to deter someone driving unlicensed in the first place. Moreover, highly visible operations can still minimise the possibility of punishment avoidance if they are conducted in a rigorous manner (eg. by monitoring escape routes etc).

A final benefit of highly visible operations is that they tend to be more acceptable to the driving public than covert operations. Inevitably, covert operations tend to be criticised on the grounds of revenue raising and entrapment. While highly visible operations are not immune from these criticisms, the strong public approval for RBT illustrates the public acceptance of such approaches (Watson et al., 2005).

3.3.3 The use of random deployment methods

A major challenge for general deterrence-based operations is to convince the driving public that enforcement can be encountered anywhere and at anytime on the road network. As noted in section 3.1.2.3, the available evidence suggests that random deployment methodologies offer an effective means of enhancing the perceived unpredictability and ubiquity of traffic policing. In addition, the use of random deployment methods could off-set potential criticisms that ANPR technology is being used to unfairly target certain places (such as lower socio-economic areas) or certain types of offenders.

3.3.3 The use of supporting public education

The available evidence suggests that public education, such as mass media advertising, can enhance the general deterrent effect of traffic law enforcement operations by heightening the public’s perceived risk of apprehension (see section 3.1.3.6). As noted by Elliott (1993), mass media education can also be used to explain the rationale for a new enforcement program to the public and to ‘signpost’ the need for drivers to change their behaviour. Accordingly, the effectiveness of a general deterrence oriented ANPR program would likely be enhanced by running a supporting public education campaign.

In addition, it would be important to educate operational police about the goals of an ANPR program, particularly of it was a general deterrence oriented program featuring the random deployment of operations. This would be necessary to ensure that operational police understood the deterrence principles underpinning the program and to reduce the 'inevitable drift towards apprehension' previously found with RBT operations (see section 3.1.3.5).

3.3.4 Resourcing ANPR operations

Previous research has suggested that general deterrence programs are most effective when implemented in a 'boots and all' fashion, characterised by high levels of police surveillance (Homel, 1990; Watson et al., 1994). This approach appears to contribute to a major shift in community perceptions regarding the likelihood of detection, which enhances the deterrent impact of the new program. This suggests that a general deterrence oriented ANPR program would be most effective if it was introduced (and publicised) in a high intensity manner. Alternatively, if the resources for implementing ANPR are limited in nature, it may still be feasible to promote a general deterrent effect through the managed use of high-intensity ANPR blitzes.

However, it is critical from a road safety perspective, that resources are not diverted from other effective traffic law enforcement programs, such as RBT or speed cameras, to facilitate the introduction or maintenance of ANPR technology. In the short term, it is likely that a special allocation of funds would be required to introduce ANPR, particularly if implemented in a high intensity manner. In the medium term, it may be feasible to use the fine revenue generated by ANPR to run the program (similar to the Queensland Speed Camera Program). However, as noted in section 2.5.3, the fine revenue generated by the program may not be as great as expected (particularly if recidivist offenders are targeted) due to low fine recovery rates. Indeed, a recent report in the Courier Mail revealed that nearly half a billion dollars in fines remain unpaid in Queensland, $150 million of which are for speeding (Burke, 2008). In the longer-term it would be essential to undertake evaluations of the cost-effectiveness of ANPR operations, so that informed decisions could be made about the allocation of funds across different traffic law enforcement operations.

3.3.5 Flow on effects to the policing of other criminal activities

While this submission has primarily focussed on the potential road safety benefits of ANPR technology, it is recognised that decisions regarding its deployment will inevitably be influenced by broader policing imperatives and objectives. In this respect, it could be argued that the British experience suggests that remote (and possibly less visible) ANPR operations offer the greatest potential for preventing and deterring general criminal activity, due to the pervasiveness of the technology. While this may be true in the context of Britain where there is an extensive remote ANPR system in place, it remains to be seen whether such an approach is feasible or likely to be publicly supported in Australia.

Moreover, while intercept-based operations may be less pervasive than remote operations, they still appear to be highly effective in detecting criminal activities, as demonstrated by the British trials (see section 2.4) and appear to represent fewer challenges for managing the privacy of drivers. As such, implementing an ANPR system in a manner that most benefits road safety may not necessarily undermine the broader applications of the technology to the management of general crime.

4. Conclusion

4.1 The current state of play with ANPR technology

ANPR is a relatively new technology that appears to offer considerable potential to detect and, possibly, deter a wide range of illegal behaviours, including traffic offences. Like most new tools, however, the effectiveness of this technology appears to be determined by the way it is applied (not due to some inherent quality of the technology). In-keeping with this, this submission has explored the feasibility of applying ANPR to enhance road safety in Queensland and various strategies for optimising its potential benefits.

Unfortunately, no rigorous evaluations of ANPR appear to have been undertaken around the world to date. Indeed, the majority of the information available in the public domain has been derived from a limited number of trials that have been conducted, primarily in Britain. Moreover, these trials have adopted a general policing perspective to ANPR, rather than a specific road safety perspective. Accordingly, caution needs to be exercised when reviewing the available evidence and extrapolating the findings to other jurisdictions.

Nonetheless, some tentative conclusions can be drawn from the available evidence. Firstly, the trials conducted to date do suggest that ANPR can enhance detection rates for a range of criminal and traffic offences, compared to traditional policing methods. Among the traffic offences that are typically detected in the British context are driving whilst disqualified and the driving of unregistered and uninsured vehicles. However, the efficiency of ANPR technology remains unclear. For example, in British trials it was only possible for intercept teams to pull over upwards of 10% of the vehicles that were ‘flagged’ by ANPR as being of interest. This has important implications for deterrence (as discussed below) and is analogous to a speed camera only being able to photograph 10% of the speeding vehicles passing by. Similarly, discussions with French experts have identified that their remote ANPR scheme fails to automatically identify upwards of 70% of the vehicles of interest, with substantial human resources required to adjudicate on these cases.

Secondly, it is apparent that the use of ANPR technology raises a range of potential privacy problems, particularly when it is used in a remote mode. In these cases, the details of all vehicles passing an ANPR camera are recorded in a database for cross-referencing with other databases. This raises the potential for further interrogation of the ANPR database, including the use of data mining techniques. While the use of ANPR intercept teams overcomes some of these privacy problems, the likely acceptance of widespread ANPR operations in Australia remains unclear. More particularly, the widespread use of ANPR would require procedures to be put in place to protect the privacy of the public. The nature and extent of these procedures would need to be consistent with current legislation and, presumably subject to considerable public consultation.

Thirdly, a number of limitations and potential risks associated with ANPR technology have emerged, including:

- the quality an nature of the equipment used can have a strong bearing on the efficiency of ANPR systems (see section 2.5.1);

- for a variety of reasons many offenders passing ANPR operations can currently avoid being either detected or subsequently punished, which could seriously undermine the deterrent value of ANPR (see section 2.5.2);

- while it appears that the use of ANPR in Britain has enabled in the detection of a range of other traffic offences, including driving while using a handheld mobile phone and failure to wear a seatbelt, the this appears to occur in an incidental way and only when the technology is utilised by intercept teams (see section 2.5.3);

- the fine revenue generated by ANPR operations in Britain has been lower than expected, with only 14% of the fines issued using the technology be subsequently paid in one of their trials, and may reflect the inherent difficulties involved in recovering fines from recidivist offenders (see section 2.5.4); and

- a number of factors can undermine public confidence in ANPR technology, including the practice of number plate 'cloning' (where offenders attach illegal copies of other number plates to their cars), and the tendency for 'function creep' to occur where the technology is gradually applied to different aspects of policing (see section 2.5.2).

4.2 Potential applications of ANPR in Queensland

Over recent decades, a growing body of evidence has emerged confirming that traffic policing programs, particularly in conjunction with publicity campaigns, can prove very cost-effective in reducing road trauma. Indeed, Australia has attracted international attention for the success of policing programs such as RBT, speed cameras and randomly scheduled traffic policing. A key feature of successful traffic policing programs appears to be their capacity to not only deter those offenders detected (ie. specific deterrence), but to deter the general driving population from breaking the road rules (ie. general deterrence) (see section 3.1).

Despite the general success of existing traffic law enforcement programs, scope exists to utilise new technologies like ANPR to target particular types of offenders. Indeed, Travelsafe (2007) has recently identified a range of illegal road user behaviours that could be potentially targeted by ANPR including unlicensed driving, the driving of unregistered and uninsured vehicles, speeding, and the non-compliance of heavy vehicle drivers with driving hour regulations and novice drivers with provisional licence requirements. A review of these behaviours suggests that:

- considerable scope exists to apply ANPR technology to unlicensed driving, since a number of barriers currently exist to the effective detection of this behaviour (most notably the lack of compulsory carriage of licence requirements for open licence holders in the state), resulting in offenders experiencing relatively high rates of punishment avoidance (see section 3.2.1);

- considerable scope also exists to apply ANPR technology to the detection of unregistered/uninsured driving, although the full road safety implications of this behaviour remain unclear (see section 3.2.2);

- while the use of ANPR technology to target speeding drivers and heavy vehicle drivers who don't comply with driving hours regulations is already occurring, the cost-effectiveness of these operations need to be compared with more conventional methods of detecting these behaviours (see section 3.2.3); and

- while the application of ANPR technology to detect provisional drivers who contravene licensing restrictions (such as peer passenger and late night driving restrictions) would appear problematic, given that many of these drivers will drive vehicles they do not own, this issue warrants further investigation (see section 3.2.4).

4.3 Recommendations for optimising the likely road safety benefits of ANPR

Based on the literature reviewed in this submission, a number of guiding principles were identified that could be used to determine the best way to optimise the likely road safety benefits of ANPR. It is proposed that policy developments in this area should be guided by the capacity of ANPR operations to:

- enhance the detection of ‘target’ illegal road user behaviours in a manner that is cost-effective relative to current enforcement approaches;
- enhance the specific deterrent effect of existing sanctions, by both improving detection rates and minimising opportunities for punishment avoidance among offenders compared with current approaches;
- enhance general deterrence by discouraging the general driving population from engaging in the ‘target’ illegal behaviours;
- not divert resources from other more effective enforcement activities; and
- maintain public confidence in traffic law enforcement and road safety efforts.

Based on these guidelines, the following recommendations are made.

Rec.1: *Prior to any widespread implementation of ANPR technology in Queensland, further investigation is required into a ‘best practice’ approach for its implementation that would maximise its likely road safety benefits. This research should compare the efficacy of different approaches, both in terms of their impact on offenders and the general driving population. Priority matters to be considered in this research include:*
- *which illegal behaviours can be most effectively targeted by ANPR operations;*
- *the relative effectiveness of different deployment strategies including remote vs. intercept operations, overt vs. covert operations, and different random scheduling methods;*
- *appropriate models for funding ANPR that will ensure that resources are not diverted from other effective traffic policing programs, such as RBT or speed cameras;*
- *the most effective ways of harnessing public education to enhance the effectiveness of the technology; and*
- *identifying issues that could potentially undermine public acceptance of the technology, including privacy and data management considerations and the need for procedures to deal with punishment avoidance strategies like number plate ‘cloning’.*

Rec.2 Pending the finalisation of the above program of research, preliminary trialling of ANPR technology should focus on its capacity to act as a general deterrent to illegal driving, as well as a means of detecting offenders. This could involve the random deployment of highly visible intercept teams in discrete geographic areas, supported by locally targeted public education.

Rec.3 Efforts should continue to enhance the effectiveness of existing enforcement programs targeting key illegal high-risk behaviours such as drink/drug driving, speeding and failure to wear seat belts. In the case of unlicensed driving, further consideration should be given to the introduction of compulsory carriage of licence for open licence holders in Queensland, to facilitate more routine licence checking.

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