Motorcycle Identification Options

ITS and Visual variations

Report for **VicRoads**

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Abstract.

Vehicle identification is valuable for a range of official and personal purposes: registration, theft recovery and speed enforcement are the major ones. A range of alternatives to conventional rear number plates are considered, with special reference to bicycles and motorcycles. RFID, IRID, barcodes and GPS/GSM approaches are considered and discussed. While it is still premature to move to automated remote ID systems, barcodes and short range RFID systems alone or in combination offer genuine advantages for vulnerable road users, especially for theft protection, and to the Police for identity verification. Trials of the latter hybrid methods in combination are suggested, and careful consideration of the trust and surveillance aspects of potentially continuous tracking system be consulted widely before progress can be made on the deployment of widespread automated remote ID.

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Front Cover notes

The front cover picture is of a vintage early 1900's BSA motorcycle with an old style number plate in front of a modern machine. Taken at the annual MRA Toy Run for Children in Hospitals in Melbourne in December 2001.

EXECUTIVE SUMMARY

Reliable and consistent identification of motorcycles would be useful for a range of purposes from theft recovery and toll collection to enforcement. The use of front number plates was essentially abandoned world wide about 20 years ago, and front visual identification is not required for cars either in some US States.

The enforcement processes developed using cameras have been highly successful using rear plates all across the world, but the increasing demands for traffic management now require a broader and more consistent. The approach developed must however avoid violating community trust and the perception that the system is designed for any form of surveillance, covert data linkage or privacy invasion.

A variety of different forms of identification have been considered, and appropriate ITS methods for theft prevention, vehicle recovery, tolling, identification and enforcement have been covered and relevant technologies considered. These include RFID, Infrared, SmartCard, GPS/GSM, microdot, barcode and eTag techniques.

In most cases the technology is already available in a restricted form, but not yet ready for widespread deployment in a moving vehicle environment. Theft protection applications are probably the closest to a practical and commercial viable state for widespread deployment.

Enforcement applications using identification through ITS techniques is available using optical character recognition and RF systems such as eTags, but the applications to motorcycles still need further development.

Hybrid applications, incorporating barcodes, conventional number plates and RFID, will be the first to become widely available at an economic cost. This approach is potentially available for all types of vehicles, as the combination of barcode and passive RFID device requires no power and little space.

Combined systems show promise for the near future, and formal specifications for them should now be developed as their technical and economic feasibility is now imminent.

Singapore's ability to develop a two-part eTag tolling device for motorcycles offers a potential solution to eTag use on motorcycles in Australia, if the mounting and positioning issues can be resolved.

Consultation confirms that unless surveillance and privacy issues are effectively addressed, that public acceptance will be very difficult to achieve. Motorcycle users in particular express strong opposition not so much to identification *per se*, but rather to forms of identification and data gathering that allow detailed active and retrospective surveillance.

THE BRIEF

Oxford Systematics was commissioned by VicRoads and Transport SA to research options for vehicle identification suitable for all types of vehicles. Consultation was required with motorcycle users, industry and other stakeholders.

A complementary report (Wigan, 2002) considers visual methods for motorcycle frontal identification for speed camera capture and identification.

This report considers the alternative options becoming available for motorcycles, even if not immediately economic, as part of the context for the proposed reintroduction of visually readable front number plates.

INTRODUCTION AND CONTEXT

Vehicle identifiers can serve a number of purposes that encompass:

- Theft deterrence and prevention
- Regulatory reasons such as registration and the enforcement of road laws
- Access and security
- Commercially-driven activities such as tolling and paid parking

This project has been focussed primarily on the regulatory aspects of vehicle identifiers, and in particular the enforcement-related capabilities of Intelligent Transport Systems (ITS) based systems.

Vehicle identification issues underpin enforcement through the links between camera shots and the legal final link in the chain; owner onus legislation.

There is a range of options that show potential for extending the identification of vehicles which are presently problematical. The most difficult vehicles to fit identification system to are at present bicycles and other small-wheeled vehicles of often-ambiguous status. These vehicles use road space but are causing a wide range of difficulties in treatment and management on and of road due to the inability to identify the vehicle. These include motor-powered small scooters (of the variety normally propelled by one foot while the other is on the flat board of the scooter), and a variety of other novel types of personal transport, including the Segway autobalancing solo person platform. These are but a few of the new types of personal mobility vehicles now emerging.

Figure 1. Segway 20km/h gyroscopically balanced powered mobility platform

Motorcycles fitted solely with a rear number plate (currently standard throughout the world) are just one aspect of this more general problem of flexible identification in a wide range of circumstances. Of the range of smaller vehicles they are perhaps the least problematic as they are already successfully subjected in most countries to both automated and manual identification methods relying on the registration number being read from a plate in a near-vertical rear position. However, recent experience by the Police in several Australian States suggests that a rear number plate may not be sufficient for current enforcement objectives and procedures.

The inability to enforce existing vehicle legislation on bicycles and electric powered light vehicles of up to 200 Watts has long presented a problem (Wigan and Smith, 1997). A significant safety gain can be expected as a result of bringing these and related vulnerable vehicles into a regime where enforcement becomes both economic and practical.

Theft is also an important reason for working on improved vehicle identification, and is an area where the public are prepared to trade off privacy and surveillance concerns

to a trusted party to gain the benefits of auto-disablement, auto-location and other remote services.

Theft prevention has also been a major reason that bicycle registration programs have been accepted (Van Kesteren and Homburg 1995) in the areas where they have been implemented. Theft premiums are now becoming a major fraction of comprehensive motorcycle insurance in many countries, and good quality identification can be a material benefit. The Theft Council of Australia is currently promoting the fitment of microdots which adhere permanently to vehicle components and provide secure identification if a vehicle is stolen and broken up for spares. Riders overseas have proved to be willing to pay for this form of identification, and microdots have already become reasonably successful in the UK motorcycle market.

Identification is a link to the owner in theft protection. Identity is linked to a rider at a specific time as the basis for enforcement, although owner-onus breaks this nexus and allows vehicle identification as distinct from rider identification to be sufficient to secure enforcement penalties. The newest major area is charging a rider for using a specified facility at a specific time – and being certain that

1. This occurred, and
2. The correct party was charged.

The rising importance of private road and bridge infrastructure has generated a fresh need for rapid and accurate vehicle identification for charging purposes. This process has involved careful measures to minimise public concerns over privacy, surveillance

and enforcement issues. This has not been secured without difficulties, but workable results have been achieved. Motorcycles interact with these different domains in different ways, and a single form of identity is not necessarily appropriate for all applications.

In a motorcycle context, the global standard for vehicle visual identity is the rear number plate since the use of front number plates was essentially abandoned world wide about 20 years ago. The enforcement processes developed using cameras have been highly successful using rear plates alone all across the world, but the new demands for traffic management are now beginning to require a broader, more consistent and efficient approach, applicable to all types of vehicles. The formal Australian requirement for vehicle identity is the VIN number (Vehicle Identification Number). This is must be placed securely on all motor vehicles, and uniquely identified that vehicle. There is no current requirement to have this number accessible by any form of transponder, or to be readable by a camera at a distance.

Any fundamental changes to the current identification standards or their means of implementation would require to be reliable and consistent and useful for a range of purposes, from theft recovery and toll collection to enforcement. It should also be achieved without violating community trust and expectations of appropriate measures that could involve (Wigan 1995) – or simply be perceived to involve (Daniel, Webber and Wigan, 1990) - enhanced or automated general surveillance, covert data linkage or privacy invasion (Wigan 1996).

Parking is another area where identification methods can be valuable (Sampson, 2001), and offer effective parking space management and security equitably and consistently to bicycle, motorcycles and cars. The additional flexibility that this would provide may well prove to be attractive to several stakeholders.

This is not the only application of identity (especially actively responsive forms of identification) to parked vehicles. A passive responder could allow a rapid non-contact check of parked vehicles for registration and ownership status, and assist in picking out unregistered and stolen vehicles of all types, powered and unpowered.

Consultation was carried out with a wide range of stakeholders from Government, the motorcycle and electronic industries and with motorcycle users and user groups. While motorcyclists did not object to identification *per se*, they expressed significant resistance to automated electronic methods, especially those that had to the potential to enable surveillance and real time and retrospective tracing of their whereabouts.

Unless these issues of privacy, surveillance and transparency of data handling and operational use of electronic identification systems is addressed at a societal level, universal electronic identification systems may prove to be very difficult to gain sufficient support to bring in. These comments apply mainly to speed and location detection, and not to theft protection, identity verification and recovery from theft.

It is likely that the latter applications will provide a pathway for the successful universal introduction of short distance (20-40cm) passive radio frequency identification (RFID) systems. Experience with these systems may then increase the

community confidence and trust in electronic speed enforcement using RF, smartcard and Infrared systems.

BASIC ISSUES OF IDENTITY AND IDENTIFICATION

The stimulus for this work was the renewed interest in vehicle identification specifically for speed enforcement on motorcycles. However careful assessment of the range of opportunities to deal with this requirement made it clear that visually recognisable registration numbers might not necessarily be the most effective route to follow over the medium term, and so VicRoads commissioned a short report on alternative methods of identification, with an eye to those where all vehicles could be covered rather than solely motorcycles. These methods are expected to be available for general use in a few years, in some cases perhaps even within the implementation period for the reintroduction of visual front number plates if this goes ahead.

Identification is not a single concept. For speed enforcement all that is required is to link a vehicle and a speed event. The use of owner onus legislation does not require the Government to establish that the owner was the party who broke the law, only that they will have to prove that they were not and that some other party was: a reversal of the onus of proof that is inconsistent with the rest of the principles underlying Australia's legal system, and implemented primarily for administrative convenience and to transfer the costs incurred onto the owner of the vehicle.

It is often assumed that to charge someone that a formal connection would be needed to be established between the person using the service and the payment process. This is not the case, anonymous software tags can be allocated on a temporary basis to the record associated with the vehicle as it moves within electronic detection systems such that no record at all is kept unless a charge or a violation is incurred. Few systems are designed like this, partly for administrative convenience, partly as public

pressure to offer a truly anonymous means of using tolling facilities has not yet become strong enough to ensure that the option is implemented. However they are perfectly practical and have been implemented, but rely entirely on the software system that manages the data once it has been collected from the tags.

Nevertheless, some form of identification for this temporary tracing is still needed, and a form of eTag[1] is usually required. It is not true that the use of an eTag has also to include personal identification, or that personal identification is even needed to participate in a tolling system. Anonymous temporary tagging is perfectly practical.

Much of the resistance to electronic identity systems for vehicles is rooted in these poor privacy practices, as was predicted a decade ago (Daniels, Webber and Wigan 1990) as a major risk if more transparent and credible systems were not designed for charging applications. Unfortunately the philosophy of enforcement systems are intrinsically assumed to be derived from surveillance, where all parties implement systems capable of continuous or retrospective matching of significant populations.

However, they can equally well be designed from a standpoint of detection and recording only using just enough identification information. The difference may appear subtle but it is actually a complete reversal of the software system design, and fundamentally alters the nature of the records retained. These design decisions are not transparent to end users or the community, and so the reactions continue to emerge that systems potentially capable surveillance and retrospective monitoring are regarded as such even if these capabilities are not currently implemented or used.

[1] eTag is the name given to the device fitted to cars and trucks in Melbourne to interact with the non-contact tolling system employed for the CityLink toll-road system.

Such simple processes as checking a line of parked vehicles to ensure that they are all registered and not stolen is a valuable application of identification, and offers real benefits to the vehicle owners without necessarily having any link to the identity of the owner - and of course with no relationship at all to the operational requirements for speed enforcement. It is very important that the surveillance and other potentially negative aspects of identification technologies in transport be put firmly into appropriate contexts, or much of the real benefit to the community from ITS will become impossible to realise.

It is critical to have a numerate sense of perspective on the practical importance of retaining community trust in ITS and that it will not be used for prospective or retrospective surveillance or data matching purposes.

ITS technologies can offer (at a conservative estimate) a 10-20% reduction in overall transport system operating costs as well as simultaneous improvements in safety. Safety costs taken overall as a fraction of resource flows along roads musters between 3-7% of the resource costs including travel time, operating costs, maintenance, administration policing etc (Wigan, 1982). Even a massive 50% improvement in safety can therefore offer less than a third of the most conservative estimates of overall community costs that can be secured by ITS over the short and medium term.

Even if significant safety gains of as much as 10-20% were to be realised from intensive use of identification technologies, this would still be only 1% of total road flow resource costs. Consequently gains as little as 1% in capacity, travel time or operations would equal these gains, and far larger effects are realistically in prospect.

There are therefore very substantial benefits to be realised from comparatively modest gains from effective and trusted ITS, which will far exceed the community costs concerned solely with safety.

As a result the community cost of losing confidence in ITS techniques for enforcement surveillance still allow it to appear that there had been substantial successes in purely safety terms (say 50% savings) while costing the community several times as much due to avoidance or reduced takeup of the technologies in the same locations. This illustrates that the privacy/surveillance aspects of ITS should be deployed for enforcement only with extreme care, and with careful cost/effectiveness analyses that extend beyond solely the safety field to the full transportation movements and operations of which they are a small but significant part. Identification technologies in transport need to be used judiciously, carefully and with considerable finesse to secure community trust essential to permit their widespread deployment. They are extremely valuable to the community as a whole – but only if the community is prepared to let them be used widely (Wigan, 1995, 1966).

ITS developments are accelerating, and in the overall vehicle/road system many of the devices becoming economic under ITS initiatives in various areas rely upon some form of identification, however briefly a specific identity is attached to the specific vehicle, and whatever variation on the term ‘identification’ is adopted.

The present report considers the options currently available and the domains in which they already have a contribution to make to vehicle identity. Broad costings of present systems are also given, with the warning that developments are likely to reduce many

of these costs very soon, and increase the power of the systems that use them. For motorcycle use, as for all other vehicles, a mix of identity systems would appear to be appropriate: reflecting the value, variety of interpretations and uses of ‘identity’.

IMPLICATIONS OF ENHANCEMENTS TO REMOTE DETERMINATION OF VEHICLE IDENTITY

Speed enforcement is only one of the many applications of remote vehicle identification. There are already services that interact with vehicles remotely to disable the ignition in case of theft, to locate stolen vehicles, and to trace the movements of those with valuable cargos. These methods depend on a combination of Geographical Positioning Systems (GPS) with GSM telephone channel communications, or use Radio Frequency (RF) systems for communication with a set of company owned masts (TRL Library Services, 2002).

These are not the only uses of non-contact identity systems. RF tags can be very solidly attached to bicycles, motorcycles and similar environmentally difficult environments, and provide a fixed identity that can be read by a wand or radar. These tags can cost less than $3A and can be read from 10-40cm away. This is adequate to implement efficient parking, theft and other systems that rely upon non-obvious robustly connected and concealed devices that can survive hostile environments for a very long time.

There is a wide variety of high frequency ID tags, infrared tags, and combinations of smart cards and communications systems that are most commonly regarded as toll charging units. These are also intrinsically ID units, although the technology exists to ensure that this identity be attached to a vehicle solely for the transit of the toll system and the charging process, and not be retained (or on some cases even be retainable) to match to subsequent passes. This form of anonymity with identification complies with best practice for privacy and surveillance provisions worldwide, and is an elegant and

effective means of securing and retaining the essential community confidence on ITS systems.

SPEED ENFORCEMENT

There are several different technologies available for speed enforcement. The key distinct methods are:

- Optical Character Recognition
- Bar codes
- GPS/GSM methods
- Infra Red Identification
- Radio Frequency Identification (low and high frequency)

Appendixes 1 to 3 contain sample costings for a variety of possible systems using current technologies that might be considered.

Optical Character Recognition

The optical methods available include Optical Character Recognition methods which locate the number plate in the visual field and then work out how to read the numbers and letters. This approach is often termed AVI (Automatic Vehicle Identification) or, more specifically, as ANPR (Automatic Number Plate Recognition).

The issues here are

- The accuracy with which the numbers can be read
- The speed at which the capture device can secure the image
- The physical security of the device fitted to the vehicle

The objectives of the application become crucial. If toll charging is the objective, then there is a heavy emphasis applied to ensuring that the correct vehicle is charged, and that incorrect vehicles are not.

For enforcement purposes it is more critical that the audit trail from number plate image to final recognised registration number be defensible in court. This requirement renders automatic processes for adjusting colour, contrast and matching of the number images using –say – fuzzy logic or ANN (artificial neural network) techniques somewhat problematic, although they may well achieve the general levels of accuracy required for toll charging.

These two different applications show that different types of identification errors are important to different users, and that different systems requiring AVI need to take into account the need to choose between having a high degree of confidence that:

- The correct numbers are acted upon, even if a significant number of vehicles are not picked out for action

or

- All the vehicles of interest had been secured, even at the cost of including a significant fraction of vehicle numbers that should not have been included.

These trade-offs are intrinsic to systems that do not produce fully verified results, and are one reason that devices that transmit or respond with an identity code are used in toll roads to date, although this is now under investigation to see if visual methods can be uprated enough to allow automated verification solely from visual methods – at an

acceptable level of positive identification. London is committed to such a system, starting in 2003. The equipment is still a little bulky, and has a high current drain for portable devices – or indeed for vehicle mounted equipment.

Barcodes

The lowest current drain device is a bar code. This requires no current at all, and can be used as either support for existing number plates or as an ancillary support for different uses of the registration number. A good example of this is Mexico. Theft of cars and of number plates is such that the registration sticker has a bar code printed on it so that the vehicle can easily be identified from outside, even when the plates have been removed or changed.

Bar codes can be picked up by cameras fairly well, but the spacing and line width specifications have led to problems even with clean barcodes not covered in light road dirt to yield error rates that are far too high for general adoption in the field. When obscured in any way, error rates tend to be high.

Barcodes are also vulnerable to intentional interference, which has also been demonstrated to be a definite risk for truck applications. Even with good lenses and cameras, current experience suggests that 40-60 km/hr would be a practical current limit even if the barcodes were blown up to a width of 30 cm. The need to discriminate very narrow lines has proved to be more problematic in the field[2] than in the more readily controlled – and very successful- manufacturing and warehouse applications.

[2] CRS Systems specifically advised against using bar codes as a robust system for use on road for speed enforcement

Despite these limitations there are still many benefits in including a visible bar code encapsulating the VIN number on the vehicle visible at some point. This could well be redundant for new cars and other 4+ wheeled vehicles as the VIN number must now be readable from outside the vehicle, but a passive or active transponder encoded with the VIN number would offer many practical benefits in enforcement, theft protection and parking roles. Container movements are another application where barcodes do not suffice on their own, but in combination with optical character reading methods can be very effective (Radloff and Morin, 1999). A small optical character (OCR) reader is often all that is needed.

Barcodes in isolation have limited application in speed enforcement on motorcycles, but can have a valuable role as a supplementary means of identification for theft and other indentification (ID) verification purposes for all vehicles. Perhaps most of all, as one element in an enhanced overall vehicle identification strategy, they will have a valuable role to play in a number of applications.

GPS/GSM methods

Active and responsive GPS[3]/GSM systems with location detection and two way communication with a database system have much to offer truck operators in their operations. Several such systems have been in use for some time, using satellite communications before the recent ITS developments. Systems of this type are currently offered in Australia to private motorists by the National Road and Motorists Association (NRMA) and the Royal Automobile Club of Victoria (RACV).

[3] Geographical Positioning Systems

The services that they provide include remote unlocking and locking and location services as a measure to cut losses by theft. Such commercial systems are still hobbled by comparatively high current drains, and some complexities in picking up location under a number of adverse conditions. For active on-vehicle identification tags even a small current drain can drain a parked vehicles battery over a couple of weeks, and this current demand is a key parameter in determining what methods of identification are practical for motorcycles with their small battery systems.

A recent ruling by the US Federal Communications Commission (FCC) has meant that it will be possible to locate GSM mobile phones with a reasonable degree of accuracy. Since this ruling, the selective availability signals to the GPS satellites has been switched off, and the accuracy available from GPS has improved markedly. The combination of location determination via the movements between mobile phone cells and the GPS readings can be transmitted through the GSM chip. This combination of technologies is rapidly falling in price, and offers the identity of the GSM phone identity and the location facilities and communications required to monitor vehicles or their riders.

This is not strictly an enforcement technology, although the retrospective records held by telephone companies have been quite extensively used in Police work in many countries. In the vehicle and driver world to date, this GPS/GSM combination is associated with remote locking services and theft recovery work. Current drains on these chips are modest, but not modest enough even for cars on standby over a week or two. However this is within the tolerance of early adopters who are already taking up these services.

If such systems were to be mandated for enforcement purposes, these deficiencies would make this approach unworkable. It works at present because the users adapt involuntarily and are able to turn the system on or off as they need or wish to. Motorcycles have far smaller batteries, and the base load current drain of the GPS/GSM chips is still too high for this approach to be practical. Details of this sort of satellite tracking system are included in a series of technology costing summaries in Appendix 1.

The final link to personal identity is still thought to be possible using biometrics to link mobile phone or tracking devices to the driver. Biometric identification could in principle be secured from fingerprints, iris or facial characteristics, although this is still a controversial area where the results are not yet always very reliable. The social implications of using this approach for identification raises many serious questions, few of which have yet been resolved, in terms of retrospective tracing and other intrusive aspects of what would become effectively a population monitoring system. At this stage it is still unlikely that such a hybrid system (using eTags/ GPS/ GSM/ Biometric in various combinations) with high quality identification would be either economic or socially acceptable. Such approaches are therefore unlikely in the near future.

Infrared Systems

Long distance infrared systems also offer much promise. The infrared detectors need to be in line of sight, but can be detected and carry out data exchanges at speeds of up to 160 km/h at distances of up to 10m. There are no constraints on mounting directly onto metal, and the unit costs are currently around $75. These units are still too large

and unwieldy for motorcycle use, but the technology is well on its way to being a viable solution in one or perhaps two more design generations.

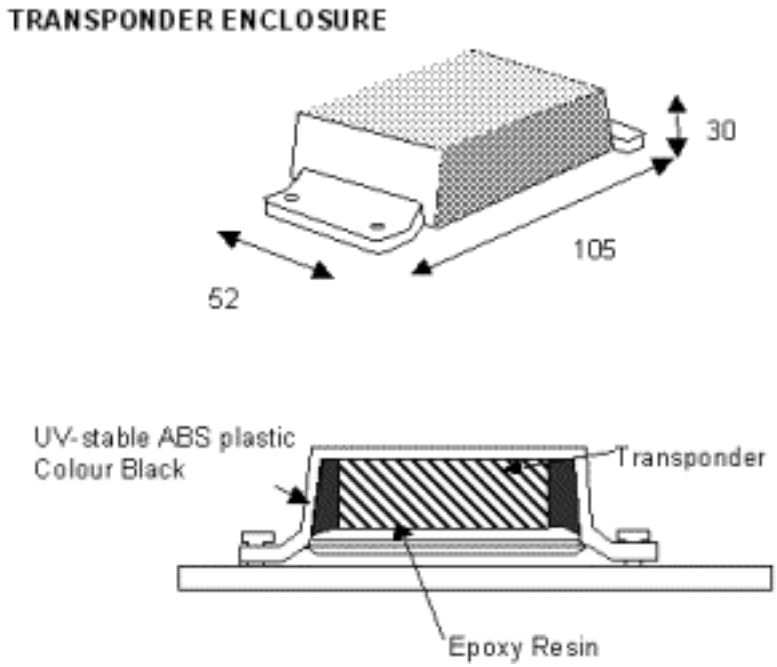

Figure.2 AMSKAN Long range IRID system unit

This approach offers excellent potential for overhead reading of vehicle identity, as gantry mounted detectors are a standard method of vehicle detection. This could possibly ease the motorcycle mounting problems. Certainly such infrared (IR) systems can detect multiple vehicles across lanes, but there are currently limits on the simultaneous detection processes required in heavy traffic.

Low range and passive RFID

Radio Frequency Identification (RFID) tags can be extremely effective in hostile environments. Motorcycles present a very difficult electronic and physical environment in which to secure, maintain and operate electronic equipment.

Manufacturing environments can demand tolerance to similarly robust physical environments, but with far better control of location for reading the tags. The latter is very important, as packaging-oriented tags are cheap, very robust and can be very solidly glued to packages and are tough enough for very poor environments. This would allow them to be glued to bicycle and motorcycle frames on a permanent basis.

These RFIDs are cheap, tough, robust and easily applied- but on the factory floor are limited to 30-40cm ranges. At $1-$2 each[4] the cost is not important, but the application domains are limited to identity verification, possible parking, certainly theft but not for enforcement at speed.

As a means of ensuring VIN number identity of motorcycles and ID numbers for bicycles for theft protection and quick verifications of identity this is an entirely appropriate basic technology. Rapid scans using a wand are all that is needed, as the devices are entirely passive and resistant to water and the other environmental hazards common to bicycles, mopeds and motorcycles.

A recent variant on short range RFID is the Bluetooth standard, now being built into PDAs, computers and mobile phones. The current drains of the chipsets currently available make this an option for some time in the future, by which time the costs will also have dropped and the question of adoption of the Bluetooth standard will have been settled. Currently, in spite of a number of very attractive features, Bluetooth based systems do not yet appear to be a sensible direction to pursue. If the rate of takeup of Bluetooth is rapid enough, lower current demand chips may yet appear. It

[4] The tagsys.net 13.56Mhz system for example.

would then become an attractive technology for several identification applications. Bluetooth communications are already appearing on PDA's, laptop computers and mobile telephones and the technology should be monitored closely.

Robust remote ID systems.

Systems capable of detecting up to 40 km/h at 15-30m have been available for many years[5]. The Flinders St Station train detection systems are of this type. Such units cost about $100 and have internal batteries that last 5-7 years, depending on the frequency of activation.

There are more recent Tagsys (A) systems[5] that offer 3-4m detection ranges at up to 180km/h. using 915Mhz communications. These are passive systems, and each have a 30bit ID embedded in them. The RF antennae and communication processes require that the units not be mounted on metals and require a 12-15mm standoff, usually secured by potting in plastic. This makes the positioning of antenna and unit somewhat more sensitive than it would otherwise be on a motorcycle. However the system would probably only work satisfactorily if the units were all mounted at a standard height and were offered to the detectors at broadly the same detection angles[5] This suggests that this type of device is not yet ready for use on the far-from-homogeneous Victorian motorcycle fleet.

eTag approaches

The CEN microwave standard for communications for tolling (and by implication at least temporary tag identity) is widely used across the world. The protocols used for

[5] Source Amskan Australia

the system in use vary from installation to installation, so, although CityLink operates CEN microwave frequency standard eTags, the actual protocols for transmitting and receiving information are proprietary to CityLink and not open for other users or systems to access.

Motorcycle fitment of eTags is currently problematic, however the enforcement cameras for the SAAB Combitech systems used are designed to pick up motorcycle number plates from the rear for automatic identification. It is only the fitting problems raised specifically by the eTags in the form in which they are currently supplied that have yet to be solved.

Motorcycle and bicycle mountings for these more sophisticated devices present a real security problem. Only Singapore currently has a working solution for motorcycle eTags, and they use a two part tag. A host device permanently mounted on the machine, and a slip in 'identity card' (essentially a smartcard) that is removed when the vehicle is not in use. It is difficult to mount devices securely on motorcycles so that they stay put and are not stolen. This separation of unit of value and identity is an appropriate route to pursue.

There are a wide variety of RF, IR and hybrid systems, some of which have excellent records in such hostile environments as mines. There is as yet no system that appears to meet with motorcycle – or indeed bicycle – speed or moving violation enforcement requirements, but a specification for such a system is becoming possible. It is still a generation away from appearing, but could well become economic within 1-3 years.

However, it is probably timely to develop formal specifications for such systems, as they will become economic and technically effective within a few years.

At a less ambitious scale than automated remote ID-based enforcement, the addition of a static or hybrid electronic identity system to the existing fleet is still attractive. For example a small RFID could be used to allow cameras to zero in on the visual rear number plate, thereby allowing a considerable improvement in the effective resolution of the shots for manual or AVRN review.

System Combinations

Although no single technology appears yet to be in a position to deliver all aspects of identification, combinations of different low cost technologies may be more attractive for the near future. Other options are to add a small barcode and a cheap minimal RFID to the license plate itself, thereby enabling all three approaches to improve identification for anti-theft and enforcement processes. Bicycles would use a barcode and an RFID, while motor vehicles would use all three options.

There are many more options, including GPS monitoring, but it is clear that combined technologies are likely to be the most cost effective route to improved vehicle identification (ID) for the diverse purposes for which ID is valuable, and single method solutions may not be an effective short term route to improved enforcement at this stage.

The civil liberties, surveillance and privacy issues are genuine, but the major issue at stake in the analysis in this report is the extremely high cost of losing an increased

takeup of ITS technologies through poor handling of the automated tracking and retrospective surveillance capacities of identification technologies and their supporting Information Technology and database systems.

It is important to note that this caveat applies just as well to fixed interval Optical Character Recognition (OCR) based camera installations as to advanced automated tag-based systems.

CONCLUSION

It still appears to be a somewhat premature to move to automated remote identification for all vehicle, but there are real benefits to be secured from mixing barcoding, low power RFID and conventional rear number plate numbers that are worth investigation. Trials should at this stage be limited to combined technologies short-range RF or IR ID tags on number plates with a weather proofed barcode as well as a proof of concept for motorcycles for identity verification in enforcement applications and antitheft measures, and using barcode and low power passive RFID units on bicycles for the same purposes.

It does not appear likely that a single identification system will meet all goals or suit all vehicles. Passive RFID tags have wide application to almost all types of vehicles and mobility devices, and offer the opportunity of having rapid response collection and verification of VIN numbers (or the equivalent for bicycles and low level mobility devices or even, in an extreme case, individuals themselves).

Combined systems show promise for the near future, and formal specifications for them should now be developed as their technical and economic feasibility is now imminent.

The specialised application of toll charging devices for motorcycles has been addressed in Singapore, but the equipment has not been set up to be tested in Australia for suitability with the CityLink systems, or to determine if the detector requirement, protocols and other factors are suitable for the CityLink transponder system.

The use of active transponders is currently essential for these applications, and the current drain issues make the mandatory use of active transponders for motorcycles a doubtful proposition for some time to come.

Careful development of community trust in electronic systems potentially capable of both real time and retrospective surveillance and location determination will be essential. Promotion of theft protection and recovery systems may provide the best pathway to achieve this.

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APPENDIX 1 COST STRUCTURES

Frequency Band	Characteristics	Typical Applications
Low 100-500 kHz <-- Read ranges limited	Short to Medium read range Inexpensive low reading speed	Access Control Animal Identification Inventory Control Car Immobiliser
Intermediate 10-15 MHz <-- Read ranges limited	Short to Medium read range potentially inexpensive medium reading range	Access Control Smart Cards
High 850-950 MHz 2.4-5.8 GHz <-- Read ranges up to 30+m	Long read range High reading speed Line of sight required Expensive	Railroad car monitoring Toll collection systems

Source:

"*Radio frequency identification. RFID. A basic primer*.", AIM Inc, 2002

Notes:

In order to detect and identify motorcycles under normal (moving) traffic conditions it is necessary to use systems in the High frequency band.

All systems using RFID type tags will have limited read ranges. ie. identification beyond 50m is generally not feasible.

Unless motorcycles are separated in space or time it will be difficult to distinguish which tag corresponds to which motorcycle. eg. Two motorcycles travelling beside each other will have both ID's read, but matching the ID to the specific bike would be problematic at speed.

Passive tags generally have low read ranges (<5m) due to the significant external power required (of the readers) to make them function.

Active tags, with multiple years battery lives, can be used with long read ranges and have the ability to be read and write. They are however larger in size (eg. 50-100mm in length) and more costly.

Infrared (IRID) systems are also available. However, they need line of sight. Hence probably too restricted for use on a motorcycle where alternative mounting (less obvious) may be required and/or desirable.

General

Over 230 manufacturers world wide develop RFID tags of one form or another

Many of them are constantly changing there product offerings.

Many also are able to alter their basic offerings to meet the specific needs of the client. eg. Specific adaptations for motorcycles can be arranged.

Many of the systems available also have the ability to be moulded or shaped to fit desired characteristics.

In order to be determine the type of system most appropriate it will be necessary to obtain specific desired attributes. This includes:

- the desired read range
- the desirable size of the device
- an indication of whether vehicle mounted and/or hand held readers are required.
- an indication of how tamper proof the devices should be

Subsystem/Unit Cost	Lifetime (years)	Capital Cost ($) Low	Capital Cost ($) High	O&M Cost ($/year) Low	O&M Cost ($/year) High	Notes
Passive Tag	5	$30	$50			Read range up to ~15m
		$2	$25			Low freq. Systems with read range < 5m
Active Tag	7	$40	$100		<$10	Read range up to ~30m+
Electronic Toll* Reader	10	$4,000	$10,000	$400	$1,000	
Toll* Administration Hardware	5	$20,000	$30,000	$2,000	$3,000	
Toll* Administration Software	10	$80,000	$160,000	$8,000	$16,000	
Electronic Toll* Collection Software	10	$10,000	$20,000			
Electronic Toll* Collection Structure	20	$20,000	$30,000			
GPS/DGPS	7	$500	$1,000		<$20	Utilised as a component of tracking systems.
3D Hologram stickers			<$10			Could be used in conjunction with tags to provide additional tamper proofing

Notes:

Costs have been converted from $US to $Aus

Toll systems are one of the most prevalent form of tag use for the high end frequency systems. Consequently prices for the tolling industry can be considered as a reasonable approximation to other tag based systems.

Sources:

ITS Unit Costs, ITS 2002

AIM Characteristics of RFID-Systems, AIM Frequency Forums, 2000

Baumer/Ident

Amskan

Appendix 2 Some Sample Systems

	Capital Cost ($) Low	High	Notes	Source
Sample System				
Tag		<$50	900MHz Read/write tags Ranges as below	Baumer/ Ident, 2001
Fixed/Portable Reader	$5,000	$10,000	Vehicle mounting. Up to 100m read range.	Baumer/ Ident, 2001
Handheld Reader	$2,000	$3,000	Palm Pilot type reader. Up to 10m read range	Baumer/ Ident, 2001

Notes:
This is an example of a combination system:
- vehicle mounted readers for high speed data transfer .eg. vehicles travelling at ~150km/h
- plus hand held devices (palm pilot size) that can be used in close proximity to the tag

	Capital Cost ($) Low	High	Notes	Source
Sample System				
Adhesive tags	$2	$4	5cm square	Amskan
Handheld Reader	$500	$9,000	Upto 800mm read range for more expensive reader	Amskan

Notes:
System allows multiple simultaneous reads. Mounted via self adhesive backing

	Capital Cost ($) Low	High	Notes	Source
Sample System				
Passive Tags (Ario type)	$2	$4	9-25mm diameter. 0.5 mm thick	Amskan
Fixed/Portable Reader	$1,200	$4,000	Read range 7-12 cm	Amskan
Handheld Reader	$500	$9,000	Read range 15-20 cm	Amskan

Notes:
Allows read and read/write combinations

	Capital Cost ($) Low	High	Notes	Source
Sample System				
Passive Tags	$20	$30	Size ~100mm x 75mm x 10 mm thick	Amskan
Fixed/Portable Reader		$4,000	Read range 4-5m	Amskan

Notes:
Can be mounted on windscreens
ID's are unique world wide, but would require a data base to cross reference against vehicle information.

	Capital Cost ($) Low	High	Notes	Source
Sample System				
Passive Tags		$6	Size ~100mm x 20mm x 3 mm thick	Amskan
Fixed/Portable Reader		$4,000	Read range 2-3m	Amskan

Notes:
ID's are unique world wide, but would require a data base to cross reference against vehicle information.

	Capital Cost ($) Low	High	Notes	Source
Sample System				
eTags	$40	$50	Dimensions would altered in order to change device for motorcycle use	Melbourne Citylink Auth.
Fixed/Portable Reader			Likely Costs as per general toll cost page	Melbourne Citylink Auth.

Notes:
Existing tags would need to be altered significantly in order to be appropriate for motorcycles
Integration with the City Link system offers some benefits in terms of aligning with existing tag system. ie. software, and hardware savings, and ability for toll collection. However, access would also be needed to the proprietary CityLink protocols

Satellite Based Tracking Systems		**Radio Based Tracking Systems**
Unit Cost + Installation: $2,830		Unit Cost: $1,276 Installation: $324
Monitoring: $359/year		Monitoring: $296/year
Size: Approximately 22x10x12 cm		Size: 22x10x12 cm (Too large for practical use on motorcycles). Proposed motorcycle version are to be approximately the size of a "cigarette packet"
System uses GPS and GSM Factory fitting options also exist which cost around $1,900 and include 3 years monitoring. (eg. Holden car assist).		System uses a spread spectrum radio system.
Accuracy: Stated as +/- 5m. But in a practical sense once moving the accuracy would be reduced.		Accuracy: Approximately 30m (in real time use)
Source: CarCom		**Source:** QuikTrak
Notes: Costs are associated with vehicles, not motorcycles. And costs vary depending on the type of the vehicle. Factory fitting options also exist which cost around $1,900 and include 3 years monitoring. (eg. Holden car assist). System is restricted to some extent. Coverage is limited to the GSM network footprint. In addition the satellite location requires line of sight. Hence in heavily built up areas buildings may obscure the signal, and areas such as internal car parks cannot be covered.		**Notes:** Costs are associated with vehicles, not motorcycles System is limited to the metropolitan area were tracking towers have been installed. Further extension of the system would require additional infrastructure development.

General comments about both systems
While the company offering this service has indicated that systems for motorcycles are currently being developed no release date has been given. Similar comments have been received from NetStar; the South African company that uses local beacons as the basis of their anti-theft and stolen vehicle recovery technology.

APPENDIX 3 SOME OF THE CONSULTATION PARTIES

Allen, Guy - individual response

Bailey, Mary - DoT Tasmania

Beresford-Wiley, Adrian – Director of Road Safety ATSB

Brooks, Chris – Research Director ATSB

Carey-Clinch, Craig - Director of Policy Motorcycle industry Council UK

Carroll, Ray - National Motor Vehicle Theft Reduction Task Force

Cercarelli, Dr Rina Deputy Director WA Injury Research Centre University of WA

Chapman, Rod - Australian Motorcycle News

Chaytor, Neil – Principal Policy Officer Licensing WA DoT

Chica, Franka - R&L VicRoads

Chiodo, Steve - VMAC & MD Peter Stevens Motorcycles retail & distribution group

Clarke, Fred – Director AMSKAN

Crackel, Linley – Principal Policy Officer DoT WA

Croker, Geoff – Managing Director, Graphics Computer Systems

Czajka, Michael - Road Safety Officer MRA Victoria

Daly, Peter – Chief Traffic Engineer, RACV

Donnelly, Tom - LMT Australia

Dunphy, Peter - Divisional manager VACC Motor Cycle Division

Fanciulli, Lisa Principal Licensing and Chair Motorcycle Reference Group WA DoT

Fisher, Craig – Senior Sergeant WA Police Camera Office

Galliano, Dr Frederico - Secretary General ACEM

Grey, Neville - Ulysses Club

Hutchinson, Trevor and Deb - ALERT Motorcycle Training Wa

Jack Haley - Senior Environment Specialist NRMA

Killen, Jennifer - individual response

Kirby, Gary - DoT WA

Lonergon, Tom - individual response

Luk, James - Associate Professor Nanyang University Singapore

Marsland, Craig – Divisional Manager Motor Trade Association of WA

McGoran, Ron – Registration Policy DoT SA

McInerney, Rob – Research at ARRB TR

Menon, Gopinath - Land Transport Government of Singapore

Mesnil, Jean - Moto Sport Suisse

Moormann, Bob - Acting Superintendent Traffic WA Police

Murison. Robert – Manager WA Motorcycle Division Honda MPE

Nankervis, Mark- individual response

O'Day, Bernie - TransUrban

O'Donoughue, Adrian - Harley-Davidson in Australia

Pearson, Rhod - Road Safety Officer MRA WA

Perhrson, Gordy - DoT Minnesota USA

Peter Keogh - Superintendent Victoria Police

Phillips, Mick - Bike UK

Prower, Steven - Research Officer BMF UK

Quincey, Ray – Director Ray Quincey Motorcycles Melbourne

Quinlan, David - ACT Government

Reeve, Bruce - Cycle New Zealand

Richardson, Dave - Chief Inspector Victoria Police

Roberts, Richard - individual response

Scott, Dick - RAC WA

Silver, Mike – Director, Computer Detection Systems (CDS)

Smith, Rob- VMAC

South, David - Road Safety VicRoads

Stafford, Brent – Executive Director ITS Australia

Standford, Guy – Vice President NSW Motorcycle Council

Strickland, Stuart – Senior Director Honda MPE

Syner, Joey – Safety Specialist NHTSA USA

Taylor, David - DoT State of Illinois

Thiollier, Eric - ACEM Association of European Motorcycle Constructors

Tierney, Paul – VMAc and Research Manager TAC

Trainor, Simon – Territory Manager-Motorcycles WA Honda MPE

Walker, Dr Conrad- Director Netstar South Africa

Williams, Clich – Amskan Australia

Wootton, Ken - Australian Motorcycle News

Zurzolo, Gino – Individual response

APPENDIX 3. A SELECTION OF THE NON FRONT NUMBER PLATE COMMENTS PROVIDED IN MORE GENERAL CONSULTATION RESPONSES

The following responses are edited to leave only the components relevant to non-visual front number plate approaches. The complete submissions are to be found in the complementary report (Wigan, 2002). The numbers of each submission have been left as in that report, and not renumbered, for ease of reference to the context of the comments made in the full submissions in the companion report.

1. Land Transport Government of Singapore

The information that you have requested for:-

Q6 Are electronic road pricing tags fitted to motorcycles? What is your experience in using them? In enforcing this? In stopping theft in the exposed motorcycle environment?

A Motorcycles are permanently fitted with water-proof In-vehicle Units (IU) for collecting Electronic Road Pricing (ERP) charges. It was a difficult exercise because motorcycles come in different shapes and sizes. There is no issue of stolen IUs as the IUs have unique identification numbers which are captured at the ERP gantry. Motorcycles fitted with stolen IUs will be detected and have their image taken. However, if the rider forgets to remove the CashCard (a prepaid stored value smart card for paying the ERP charge), this might be stolen. The riders are always advised to remove the CashCard at the end of each journey.

Gopinath_Menon Land Transport Authority

5. Motorcycle Industry Division of the VACC

The Motorcycle Industry Division (MID) at VACC represents employer retailers and repairers in Victoria and is affiliated with the Australian Motorcycle Industry Association (AMIA). VACC in turn is affiliated with the Motor Traders Association of Australia (MTAA).

We have surveyed our membership report as follows on the questions raised in your study:

1. General concerns about front number identification:

No in principle objection to front number identification on motorcycles if for the purpose of law enforcement and vehicle identification. Such policy would be consistent with other registered vehicles in use. Consideration of national uniformity is important for effectiveness.

5. Electronic identification:

* This seems to be the safest alternative and the technology is available. (See attachment "DataDots Go After-Market" Theft Torque, NMVTRC no. 10 January 2002) Standards would need to be established for the technology nominated. It should be a serviceable item, replaceable at minimum cost to motorcyclists and ideally fitted by distributors or suppliers before retail. The dealer would require the necessary hardware/software to activate the device.
* Motorcycles are used for road (commuters), recreational (motocross) and work (farming etc) applications and registration is required for most. A number plate/transponder etc would be subjected to harsh environmental conditions and given motorcycle low profiles to the ground, they are much more vulnerable to dirt, mud and other foreign items fouling any exposed areas. This would present a challenge for any form of technology depending on visual sighting (ie cameras) of front identification as fouling and dirt would obscure the plate, thus defeating the exercise. An electronic device would

eliminate this problem, but would this alone be sufficient evidence to mount a prosecution for any breaches of road rules?

Generally speaking VACC representing the motorcycling sales and repair industry is anxious to be party to any initiative to reduce road trauma on Victorian roads with motorcycle fatalities and serious injuries of particular interest. We are concerned therefore that VicRoads has instituted this review, given the clear benefit of hindsite as to why fitting of front metal number plates number plates was considered dangerous to vulnerable road users. That situation remains valid today. Electronic identification would not be resisted provided they are cost effective and efficient under all operating conditions and a satisfactory regulation regime could be introduced, to protect motorcyclists civil liberties, consistent with all road users.

The fitting of transparencies incorporating the motorcycle registration number etc would be well considered, depending once again on technology, a standard application procedure, durability and accessibility to replacements at minimum cost.

Finally, from our members perspective, if the major motivation is law enforcement through effective detection devices, we would question the economies of scale to effect universal change. The sheer size of existing motorcycle car park makes this a formidable task. An extensive media campaign supported by direct marketing would be recommended to support a retrofit campaign.
Based on practicalities, an amnesty period of up to 12 months should be considered, to enable owners to fit the approved system(s) before penalties are introduced. Manufacturers would need sufficient notice for in-production changes to new models and they should be consulted on this matter.

We would question whether the motivation for this proposal is strictly for law enforcement against a small proportion of offenders in the motorcycle population and if so can fixed camera technology be upgraded more cost effectively, to capture rear numbers, as opposed to alternatives under consideration.

VACC and its MID members welcome the opportunity to provide this feedback. We wish to participate in any initiatives to reduce road trauma amongst motorcyclists. If we can be of further assistance, please do not hesitate to call the writer on 03 9829 1146.

Peter Dunphy Manager Motorcycle Industry Division

7. FCAI Motorcycle Group

The Federal Chamber of Automotive Industries (FCAI) Motorcycle Group is the peak body representing the Australian Motorcycle Industry.

The FCAI Motorcycle Group comprises eight member companies - **Honda, Kawasaki, Suzuki, Yamaha, BMW, Harley-Davidson, Ducati and Aprilia**. This represents about 90% of the Australian Motorcycle Industry.

The Australian Motorcycle Market

Total imports of motorcycles into Australia for the past three years have been in the 60,000 to 70,000 units per annum while for the same period, registered motorcycles have been in the 30,000 to 33,000 units per annum. Many of the total units do not comply with ADR's and are not eligible for registration. Some examples of this are mini bikes (about 8,000 pa), ATV's (about 12,000 pa) and competition motorcycles (about 5,000 pa).

2. BARCODES, ETAGS OR OTHER TECHNOLOGIES

This part of the submission deals with the Industry's position on various forms of electronic frontal identification of motorcycles including barcodes, eTags, GPS or other technologies.

The use of electronic technologies in the frontal identification of motorcycles appears on face value to provide a much safer approach for riders and other unprotected road users and with far less potential damage or instability to the motorcycle.

However, because there are a number of possible technologies that may be selected and because detailed understanding of these technologies is largely unknown the ability to provide definitive comment is limited.

The FCAI Motorcycle Group acknowledges this option is preferable to that of fitting an adhesive flexible plastic plate and takes a position of supporting in principle the use of such technology for frontal identification. Before offering unqualified support however the Group requires further information / consultation from authorities on the type of technology proposed including the issues identified below.

Size / Shape of Device

As with the fitment of the flexible plastic plate, the barcode or transponder may be difficult to fix to the motorcycle in a position where it can be easily read. Assuming the device is considerably smaller than the adhesive plastic plate it should be capable of being fitted to a forward section of the body or frame. It is also assumed the device will not require a bracket or reasonably flat surface for mounting. Advice on the size and shape of the device is required.

Information Contained on the Device

There is potential with some such technologies for private information to be contained on the device for recognition and surveillance of certain persons by the authorities. For example, identifying the location of the motorcycle even when it is parked or stationary. The FCAI requires further advice in relation to this matter.

National Uniformity of the Device

Acknowledging the different approaches amongst the States to current forms of electronic monitoring on Toll Ways the FCAI requires advice on the use of a nationally uniform approach to the type and size of device to ensure that all motorcyclists will be treated equally in this matter.

Cost of Installation / Fitment

The costs identified for fitment of a plastic adhesive plate to all new motorcycles and to the total number of motorcycles in Australia were identified as significant and bordering on prohibitive. The FCAI requires advice as to the estimated cost of producing and fitting an electronic device to each motorcycle in order to judge the cost effectiveness of utilizing electronic technology for frontal identification of motorcycles. As with the proposal for adhesive flexible plastic plates the FCAI motorcycle Group is unable to bear any of the costs associated with the use of electronic technologies for the frontal identification of motorcycles.

Industry Position on Use of Electronic Technology

Based on the proposals as identified to date the FCAI Motorcycle Group offers support in principle to the use of electronic technologies in the frontal identification of motorcycles.

The FCAI looks forward to regular consultation regarding progress of this matter at both a State and National level.

Ray Newland FCAI Motorcycle Manager

8. Motorcycle Riders Association Western Australia Inc.

Let Those Who Ride Decide

The MRA WA is opposed to front number plates on the grounds of rider and pedestrian safety. We are not against identifying speeding riders. We cannot support those who knowingly break the law.

10. Harley Davidson

I represent Harley-Davidson in Australia. Our views are similar to BMW's and most likely the other manufacturers.

A suggestion would be for the government to use a barcode system or some type of transmitter system.

Adrian O'Donoughue Harley-Davidson Representative in Australia

12. Triumph

Being contracted to the Triumph Motorcycle Company (UK) to handle their local homologation in Australia I have sought the Company's advice on these key points and their response is as follows:-

5. Other methods of vehicle Ids are also possible. Does the Company have any views on this second stage approach to motorcycle ID?

Electronic data tagging is a common anti-theft technique in Europe that does not seem to offer any technical problems in respect of EMC etc. Although more costly to the owner, it would seem to be a solution that is more elegant and modern.

17 Individual response via email

I have no real problem with frontal identification. I do have a problem with having my machine stuffed up.

Guy Stanford NSW

22 Ulysses Club (South Australian Branch)

(This is a State branch of a national Club with approximately 15,000 members . Members are required to be over 50, junior members over 40)

We had a meeting with the SA Police last Thursday. In attendance were the AMC (covers Ulysses Club), The Motorcycle Riders Association of SA (MRASA),the Motorcycle Trade (MTA), Motorcycle Industry Association (MIAASA),Transport SA safety managers, RAA (Royal Automobile Association-equivalent to RACV),the Insurance Council of Australia (ICA) and various SAPOL representatives.

Frontal ID is now the catch cry. We do not have a problem with this, however just how this will be achieved is anybody's guess.

Frontal ID in the form of a transponder would be preferable as not only would rouge motorcyclists be rightly caught for speeding, but unregistered bikes could also be detected assuming that transponders would be issued when the bike is registered - no transponder equals no registration! With the proportion of unlicensed/ unregistered riders involved with fatalities now up to 30%, this could go a long way to improve the situation.

The technology apparently exists to detect numbers that are only 25mm high but at what distance was not divulged. The feasibility of a small mounted number plate was discussed. I am aware of the problems that Transurban had with Citylink in Melbourne but I guess it is now over to the authorities to

come up with a viable solution to the frontal ID quest. We have heard that a Melbourne Co. is looking into the problem, info is scarce on that topic.

Thursdays meeting ended on that note - the Police will be exploring all avenues to ascertain if such a device is available. Who pays for theses devices has not been talked about. I personally have 7 bikes registered - do I have to purchase 7 devices or just the one - there goes the unregistered bike ability! We are not going to rush around to find a suitable device - it's up to them! The authorities just have not done their homework and to avoid looking like fools, are resorting to placing 'stick-on' number plates to their Police motorcycles here in Adelaide.

Neville Grey SA

24. NRMA Comments on Motorcycle Identification Study brief

If a transponder or similar is envisaged that could be interrogated remotely, there would be equity and privacy considerations involved, as there would be for any type of private vehicle.

Jack Haley Senior Environmental Specialist

28. RACV

We understand that it is not normal practice anywhere in the world that modern motorcycles be required to have a front number plate. For this reason, given that most if not all motorcycles in use in Australia are imported, there would need to be an exceptionally strong reason why such a change should be made in this country alone. In particular, if the reason for proposing that motorcycles be fitted with a front number plate has to do with simplicity and convenience for enforcement authorities, then the proposal would not have our support. It is the responsibility of the enforcement authorities to tailor their enforcement to the technology and vehicles on the road, rather than the other way around.

We do not of course condone any road user, motorcyclist or other, breaking speed limits or committing any other traffic offence. It would be of concern to us, as I am sure it is to the responsible motorcycle community, that some motorcyclists may choose to break the law on the basis that they believe that they cannot or will not be detected because the machine does not have a front number plate. RACV believes that there is a need to reform the way in which roads are funded, by moving towards a road user charge. Under this system, road users would pay according to the cost they impose on infrastructure, together with recognition of unfunded costs of road crashes, environmental impact, and congestion.

We would expect that, if and as Australia moves towards such a system, motorcycles would be incorporated. Further to point 4 above, we would expect that there will be, not only in Australia but overseas, moves towards some form of inbuilt electronic vehicle identification, to facilitate real time road user charging. As we move towards this situation, the need for external number plates should disappear. I would envisage that this comment would apply to all road vehicles, including (but not especially) motorcycles.

Ken Ogden General Manager Public Policy

APPENDIX 4 RESPONSES SOLELY ON AUTOMATED ID

32. Direct response via email

Front electronic ID is a real threat to the motorcycle community though. Not because they will be able to fine and toll riders but because it is likely to be made a requirement of registration if front ID tags or bugs are made law for two-wheelers. The technology exists. The bug could conceivably be as small as the chip in your mobile phone.

If you had told the public in 1980 they would have to carry a communication device that would enable police and private firms to track your life there would have been an outcry. If you had told them in the 60s there would have been a riot. The Australian "public" today is older and more conservative. The young are generally political pussies and very apathetic when it comes to an individual's rights. The front ID tag/bug could be mounted inside the headlight shell or laminated onto the fairing or mudguard (almost invisible) under an Australian Design Rule (ADR) or State roadworthy requirement. It could be a part of the annual registration fee and tampering with it would carry heavy penalties.

Regardless of what authorities say the wiring may conceal other functions. High ranking police have made it clear in the media that they think a high enough percentage of riders are crims to warrant tracking our whole community. No wonder some of us who remember the abuses at Bathurst, Heathcote and elsewhere are worried. Authorities in Queensland have just announced that they want compulsory tags/bugs on all vehicles to help pay for that State's road network. Anyone who can read has to suspect some authorities in Victoria of being addicted to money from pokies and traffic fines.

The push for front ID for bikes has been developed for some 5 years in the Arrive Alive Road Safety Strategy. There was no consultation (in Vic. at least) with stakeholders in motorcycling. Personally I think this is a very dangerous time both from a civil liberties survival points of view. With this kind of technology they can tax motorbikes & scooters off our roads. I will not have a compulsory tag/bug on my bike. I have no problem if a person wants to fit one voluntarily but I won't have one. The only way I would even consider debating the issue with authorities is if the tag/bug was strictly controlled and proposed for **all** road vehicles, **especially bicycles**.

Damien Codognotto

38. Computer Detection Systems Pty

Comments embodied in the text

Mike Silver Director

39. Amscan Pty

Comments embodied in the text

Fred Clarke. Managing Director

APPENDIX 5. ABBREVIATIONS

ANN	Artificial Neural Networks
ANPR	Automatic Number Plate Recognition
AVL	Automatic Vehicle Location
AVI	Automatic Vehicle [Number] Identification
CEN	Committee for European Normalisation (a form of standard)
DGPS	Differential Geographical Positioning Systems
GPS	Geographical Positioning Systems
GSM	The major mobile telephone system technology used in Australia
ID	Identification
IR	InfraRed
PDA	Personal Data Access systems
IRID	Infrared Identification
IT	Information Technology
ITS	Intelligent Transport Systems
IU	In-Vehicle Units (Singapore Electronic Road Pricing Units)
NRMA	(the NSW) National Roads and Motoring Organisation
FCC	(the US) Federal Communications Commission
OCR	Optical Character Recognition
RACV	Royal Automobile Club of Victoria
RF	Radio Frequency
RFID	Radio Frequency Identification
VIN	(the Australian mandated) Vehicle Identification Number