RESULTS OF THE NSW INTELLIGENT SPEED ADAPTATION TRIAL

Effects on road safety attitudes, behaviours and speeding

OCTOBER 2010
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Executive summary

Introduction
The NSW ISA Trial was the largest trial of intelligent road safety technology ever conducted by a government agency in Australia. The trial involved over 110 vehicles, including a mix of non-government fleet and private vehicles.

ISA refers to in-vehicle technology systems which assist drivers to keep to or below the speed limit. By using Global Positioning System (GPS) technology and on-board maps which are linked to a speed zone database, the ISA system ‘knows’ where the vehicle is and what the speed limit is for that road at all times. The ISA system warns drivers via visual and audible feedback if they exceed the speed limit, and/or prevents the vehicle from exceeding the speed limit. There are three different types of ISA systems:

- Advisory – this system warns the driver when the legal speed limit has been exceeded, by an audible alarm or message combined with visual feedback. This system allows the driver to make a decision on what action to take.
- Supportive – this system restricts the flow of fuel to the vehicle so it cannot exceed the speed limit. It allows the driver to override the system if necessary.
- Limiting – this system is similar to Supportive ISA systems, but it cannot be overridden by the driver.

Only Advisory ISA devices were installed in vehicles participating in the trial.

The overall aim of the NSW ISA Trial was to investigate the effectiveness of Advisory ISA devices in improving speed limit compliance of NSW drivers.

The objectives of the NSW ISA Trial were to:

- research the potential road safety benefits of Advisory ISA systems in NSW
- measure the economic effects of fuel consumption and travel times
- assess the acceptability of Advisory ISA systems to drivers and fleet managers.

Methodology
The trial area was located approximately 45 km south of Sydney within the Illawarra region of New South Wales, and included three Local Government Areas (Wollongong City, Shellharbour City and Kiama Municipality). The total length of the road network in this area is approximately 2,500 km and has a population of more than 263,000. Over 4,000 speed signs were located allowing 932 speed zones and 452 curve advisory signs to be mapped. The region has a wide variety of speed zones including 40 km/h high pedestrian zones, 40 km/h school zones, 50 km/h and 60 km/h urban areas, 80 km/h winding rural roads and 100 km/h freeways.

The trial began with 114 participating vehicles, of which 104 participated for the full duration of the trial. These vehicles consisted of:

- 38 non-government fleet vehicles driven by exclusive drivers
- 3 non-government fleet vehicles driven by shared drivers
- 63 private vehicles driven by exclusive drivers.
All exclusive drivers were the nominated driver of their vehicle for at least 80% of the time, and they drove 80% of their time in the Wollongong, Shellharbour and Kiama Local Government Areas.

The Advisory ISA devices selected for the trial were marketed as Speed Alert™, supplied by Smart Car Technologies (SCT) Pty Ltd. The ISA device was one of the few personal navigation devices currently available with an open software platform that enables the deployment of customised two-way telematic applications. This two way communication capability enabled the ISA device to be connected to a centralised computer server that allowed automatic speed zone changes to be sent to the device continuously.

To measure the baseline speed compliance of drivers before the ISA device was installed in their vehicle, a speed data recorder was fitted to their vehicle at least a month before the ISA device was installed. The speed data recorders captured over 7.5 million speed records by the end of the trial. Details of each vehicle’s journey were recorded in ten second intervals.

Unless otherwise specified, the speed data analysis results in this report used vehicle free speeds, defined as the speed of a vehicle when it travelled at least 75% of the speed limit.

In addition to the objective speed data that was collected during the trial, a number of attitudinal and behavioural research studies were completed at various stages throughout the trial by an independent social research company. This research provided a detailed exploration of the participants’ attitudes towards the ISA technology, including:

- their expectations of the technology
- their views on the acceptability of the technology
- their perceived benefits of and concerns about the technology
- their suggestions for improving and the marketability of the technology.

A repeated measures design was used, which included some unique questions appearing in each of the surveys. Results were analysed separately for drivers and fleet managers in order to capture the different roles they played in the trial and the different experiences they had with the ISA technology.

**Results – Speed data**

One hundred and fourteen vehicles were fitted with speed data recorders, of these 106 vehicles were considered to have sufficient data for analysis in the ‘Before ISA’ and ‘During ISA’ periods of the trial, and 101 of these vehicles had sufficient ‘After ISA’ data for analysis.

Four of the 106 vehicles had more than one driver during the trial. One hundred and two vehicles had an exclusive driver and therefore were able to be used for a more detailed analysis into individual driver characteristics and their influences on speed behaviour change.

When the ISA devices were installed in vehicles, 94 out of the 106 vehicles (89%) reduced the amount of time they spent exceeding the speed limit, compared to when the vehicles did not have an ISA device installed.

For the period when the ISA device was de-activated, speed data was successfully collected for 101 of the 106 vehicles. Eighty seven of the 101 vehicles (86%) spent more time driving above the speed limit, after the ISA device was de-activated, than when the device was installed.
The ISA devices substantially reduced the number of vehicles travelling more than one third of their time above the speed limit. Whilst the frequency of vehicles travelling more than one third of the time above the speed limit increased when the ISA device was removed, drivers did not appear to return to their levels of non-compliance seen at the start of the trial.

If a score was assigned to each vehicle, equal to the proportion of time it was speeding, then this could be considered as an estimate of the probability that it would be speeding in free speed conditions.

A reduction in speeding was observed in all speed limits when the ISA device was installed, compared to before it was installed. All mean and median speeds decreased and the percentage of vehicles speeding also decreased.

When the ISA devices were installed mean speeds decreased between 0.82 km/h (40 km/h non school zones) and 3.22 km/h in 110 km/h speed zones.

Driver characteristics such as age group and gender were analysed for 102 drivers of the 106 vehicles in the trial, as 102 vehicles had a driver who was exclusive to that vehicle. ISA technology was equally effective at reducing the percentage of time males and females spent speeding, when the ISA device was installed compared to before the device was installed (88% males, 89% females).

Younger drivers (25 years of age or less) were significantly less likely to reduce the percentage of time they spent speeding when the ISA device was installed than drivers over the age of 25 years. When the ISA devices were installed, 77% of drivers aged 25 years or less reduced the amount of time they spent speeding, compared to 93% of drivers over 25 years of age. Self reported responses from the attitudinal research revealed that drivers aged 25 years or less were also more likely to admit turning their ISA device off during the trial, which would obviously reduce its impact on speeding behaviour.

The ISA device also had a much smaller effect on the probability of speeding of younger drivers aged 25 years or less than drivers aged over 25 years. The mean probability of speeding of drivers aged 25 years or less was 18%, compared to 37% for drivers aged over 25 years. This difference between the mean probabilities of speeding was substantial and statistically significant.

Drivers were asked in the Stage 2 questionnaire how often they turned their ISA device off. Ten of the 100 (10%) exclusive drivers, who answered this question, reported that they turned their device off ‘on a fair proportion of trips’, these drivers have been classified as ‘turning off the ISA device regularly’. No one self reported turning their device off on ‘every trip’.

Those ten drivers who self reported ‘turning off the ISA device regularly’ were significantly less likely to decrease their probability of speeding than other drivers (mean 18% versus 34%). (p=0.03).

Eight of the ten drivers (80%) who self reported ‘turning the device off regularly’ were aged 25 years or under and one was in the 26 to 29 age group. These young drivers were less likely to decrease their probability of speeding. So there is a large overlap between the two groups.

A participant was classified as likely to ‘speed when unlikely to be caught’ if they self reported in the Stage 1 online questionnaire that they drive faster than the speed limit (an agreement rating of >5 on an 11 point scale) when ‘it is unlikely I’d get caught’. Of the 94 exclusive drivers who answered the relevant question, 42 were classified as likely to speed when they felt it was ‘unlikely they would be caught’. Sixty percent of drivers aged 25 years or under agreed they are likely to
speed when it is unlikely they will be caught, compared to 39% of drivers aged over 25 years. This does not meet conventional levels of statistical significance (Fisher exact test; p = 0.06). Nevertheless, it is of interest because of the other findings relating to young drivers in the ISA trial.

When the ISA device was installed the mean percentage of time spent speeding in each data collection period was higher for those who agreed they are likely to speed when it is ‘unlikely they would be caught’, however these differences are not statistically significant.

By employing Elvik’s (2009) power estimate for fatalities (3.87) and injuries (2.67) to a reduction in mean travel from 69.4 km/h ‘Before ISA’ to 67.9 km/h ‘During ISA’ (0.9775), it is estimated there would be an approximate 8.4% reduction in fatalities and 5.9% reduction in injuries within the Wollongong City, Shellharbour City and Kiama Local Government Areas. This equates to a projected saving of 6–7 persons killed and 265 persons injured over the next five years in Wollongong City, Shellharbour City and Kiama Local Government Areas. These casualties amount to an estimated community saving of between $39 million and $63 million (depending on whether willingness-to-pay or human capital methodology is employed).

**Results - Attitudinal research**

With the ISA technology installed in their vehicles, almost two in three (65%) drivers agreed with the notion that the technology was ‘of great use’ to them.

The most common benefit of the ISA technology mentioned in group discussions was that drivers felt they were always aware of the speed limit that applied to any given stretch of road.

> “It’s telling you what the speed zones were, you didn’t need to look for the speed signs so much, especially around school zones and stuff.” [Male, 25yrs+]

Generally, drivers expressed fewer concerns than benefits of having ISA in their vehicles. The main concern expressed in the group discussions was that the ISA technology was ‘unforgiving’, and it did not allow the driver leeway to travel a few kilometres per hour over the speed limit, before it started ‘beeping’. They felt it was unrealistic to expect people to stay on or below the speed limit at all times. This concern was quantified in the Stage 1 online survey, with 30% of drivers agreeing that ‘driving up to 5 km/h over the speed limit is not really speeding’.

In the Stage 2 online survey, just over half (54%) of the drivers agreed with the idea that driving with the ISA device had increased their frustration levels while driving.

The average level of agreement with the statement ‘the ISA technology would be wasted on drivers who speed intentionally because these drivers would ignore or override the warnings’ increased significantly between surveys. Indicatively from feedback in the group discussions, this response is likely influenced by the ability of the driver to turn the ISA device off.

Around one quarter of trial participants (27%) agreed with the idea that the ISA technology had distracted them from their driving. The most common reasons given for the technology being at least to some extent distracting were that the warning tones were too persistent (58%) and too loud (52%).

The group discussions suggested that some participants relied heavily on the ISA technology to advise them of the prevailing speed limit, by accelerating, without looking at their speedometer, until the ISA device beeped. However, more commonly, participants explained that they had used the device as a ‘back-up’ to advise them if they unwittingly exceeded the speed limit - either by accident, or they had been unaware of the prevailing speed limit.
Just under half (45%) felt that the audio warnings’ volume, pitch and persistency were inappropriate. In the group discussions a strong preference was expressed for the audio warnings to increase in frequency and volume as a driver persisted in exceeding the speed limit.

The numerical speed limit display and the red annulus around the speed limit value which appeared just before the audio warnings, were seen to be beneficial to those drivers whose device was installed where it could be seen out of the corner of their eye. The school zone audio warnings were particularly well received, as most recognised the importance of slowing down in these zones. The curve advisory warnings received mixed reviews. Some participants felt the voice warning was startling and that the number of warnings was excessive on very winding roads.

Trial participants were asked to rate the overall acceptability of the ISA technology. The majority of participants (61%) gave it a positive rating. Participants were more likely to have a positive view of the technology (in terms of overall performance, usability, functionality and acceptability) than be inclined to recommend the technology to others, or be interested in using the technology themselves.

Provisional licence holders (‘P-platers’) were most often nominated as a group that would particularly benefit from having the ISA technology in their vehicle (nominated by 92% of participants at Stage 1 and 82% of participants at Stage 2). Even 69% (11 out of 16) of provisional licence holders felt that the ISA technology would be particularly beneficial for people who hold a provisional licence. People who speed accidentally, people who have had their licence cancelled or suspended for speeding in the past, and younger drivers were also nominated by over 70% of participants. Comments made in the group discussions suggested that although many considered the technology as useful for all drivers, there was a tendency for individuals to view themselves as ‘good, safe drivers’ and as such, less in need of the technology for themselves.

The majority of fleet managers agreed that the ISA technology had:

- helped them to be better corporate citizens
- provided Occupational Health and Safety benefits
- resulted in fewer speeding fines and licence losses

Three of the seven fleet managers surveyed indicated that they had no concerns about having the technology in their fleet vehicles. However, some fleet managers expressed concerns about the ISA device affecting other electronic devices within the vehicle, and the non-acceptance of the ISA device by some staff.

A state wide survey of drivers undertaken as part of the trial found no significant differences in attitudes towards speeding between NSW drivers, Illawarra drivers and drivers participating in the trial, which bodes well for the confidence one can have about generalising the trial findings to the broader driving population.

Conclusions and discussion

The NSW ISA Trial has demonstrated that Advisory ISA technology has the potential to deliver considerable road safety benefits, by reducing the level and duration of speeding amongst the majority of participating drivers. Results from the attitudinal research showed that the Advisory ISA technology was generally well received and accepted by those participating in the trial.

During the time when the ISA device was installed in participants’ vehicles, most drivers were less likely to speed, with a substantial reduction (31.8%) in the median probability of speeding. There
was a reduction in the mean and median speeds in all speed zones, with the largest reductions tending to be in the 110 km/h and 90 km/h speed zones. The mean speed decreases appeared consistent with other field trials conducted around the world (Doecke and Woolley, 2010). Many drivers mentioned in the attitudinal research that the device was also particularly effective at ‘slowing them down’ in the lower speed zones.

When the ISA device was installed, 89% of vehicles reduced the amount of time they spent exceeding the speed limit. There is some evidence that after driving with the ISA device for three months, there was a ‘learning effect’ among some drivers. Despite 86% increasing the amount of time they spent driving in excess of the speed limit when the ISA device was de-activated, generally vehicle speeds increased in the ‘After ISA’ period, but not to the same level as speeds observed in the ‘Before ISA’ period. The median percentage of time spent speeding reduced in the ‘During ISA’ period from 36.3% to 24.1%, and increased in the ‘After ISA’ period to 30.5%.

A number of drivers in the trial reported relying on the device to inform them of the speed limit and when they were exceeding it. In some cases they reported using it almost like a form of cruise control. Consequently when the device was de-activated these drivers returned to their previous driving behaviour. The attitudinal research did not find any evidence of changes of attitudes towards speeding as a result of having used the ISA device. This finding reinforces the most effective aspect of the ISA technology - its visual and audio warnings, as opposed to the ISA device becoming an ‘educational tool’.

Advisory ISA was equally effective at reducing speeding amongst all driver demographics, including ‘repeat speeders’ and ‘deliberate speeders’, with the exception of younger drivers aged 25 years or less. More than half of the drivers who did not slow down during the trial were in this youngest age group. Self reported responses from the attitudinal research revealed that these drivers were also more likely to admit turning their ISA device off during the trial, which would obviously reduce its impact on their speeding behaviour.

The results from the attitudinal research indicated that the ISA technology was seen, overall, to have merit. The technology was seen as acceptable, even if trial participants wouldn’t necessarily recommend it to others or be interested in using it themselves. Many perceived it would be more useful for those who are the ‘real problem’ on the roads, that is, for other drivers. Based on the attitudinal research the ISA device seems to have been most useful in preventing “accidental” speeding and ensuring drivers were always aware of the speed limit.

The main concern expressed in group discussions was that the ISA device was ‘unforgiving’, that is, it did not allow the driver leeway to travel a few kilometres per hour over the speed limit before the audio warnings began. Several drivers found the device ‘beeping’ as soon as the speed limit was reached irritating and frustrating.

In a quantitative study of NSW drivers’ attitudes towards speeding conducted by the NSW Centre for Road Safety in 2009, it was found that low-level speeding had high levels of social acceptability and that there was a perception that tolerance bands existed in speed enforcement (Walker et al, 2009). It is likely that these attitudes contributed to the participating drivers’ frustrations with not being able to exceed the speed limit by a small margin without setting off the audible warnings. Many would either favour the technology incorporating some leeway or tolerance, such as the audio warnings commencing a few kilometres per hour above the prevailing speed limit, or else, more commonly, the initial warnings being subtle and increasing in intensity as the vehicle exceeded the speed limit.

Most vehicle speedometers over-read the true land speed of the vehicle. In order to overcome the disparity between a vehicle’s speedometer display and the ISA device, a 3% “over-read” error
factor was introduced into the ISA device. This meant that a driver would receive an audible warning for exceeding the speed limit when the vehicle reached a speed 3% below the legal speed limit. For example, in a 60 km/h speed zone the driver would receive a warning when the vehicle’s speedometer reached 58.2 km/h. Drivers were not informed of the introduced error factor. If the 3% error factor had not been introduced drivers would have been informed when they were travelling above the speed limit but it would have provided the perception of a ‘leeway’ and probably made it more palatable to drivers. Hypothetically, if this error rate had not been introduced into the trial, some feedback from drivers may have been more positive in this respect.

A significant challenge will be to slow people down in situations such as when they perceive they have a need to speed, for example if they are running late for an appointment. Prevention of low-level speeding is also a challenge. Many believe they won’t or can’t be issued an infringement by police for being a few kilometres per hour over the speed limit. Approximately three in five drivers agreed that they should not be booked for exceeding the speed limit by less than 5km/h. In situations such as this, many drivers may choose to switch the ISA device off when not participating in a trial.

Just over half of the participants agreed that driving with the ISA device had increased their frustration levels while driving. The technology was seen as 'necessarily annoying', due to the strong role the audio warnings played in deterring speeding behaviour. If the technology remained in its current form, which enables the driver to switch the device off, it seems likely that a considerable number of people would opt to do this at times, outside of a trial situation. This would be particularly true of those who choose to speed deliberately, or believe it is unlikely they would be caught and those drivers 25 years of age or less. It could therefore be hypothesised that those drivers who could benefit the most from the ISA technology would also be the most likely to switch the device off. An ISA device that could not be switched off would be more effective, but it is likely to be less acceptable to drivers. Volume control would make the technology more palatable and would likely limit the number of times the device was switched off. However this too may reduce its effectiveness.

While many would not mind having the technology in their vehicle, it seems unlikely that many would purposely buy the product, although it would be more marketable if it was combined with the vehicle’s satellite navigation system or incorporated into new vehicles. There is increased interest in the technology amongst those who have recently received an infringement for speeding. The mandatory use of ISA devices for some drivers is acceptable to most, assuming there is perceived fairness (if every driver has it or it is acquired through choice), with no covert surveillance coupled with the technology.

Provisional licence holders were most often nominated as a group that would particularly benefit from having the ISA technology in their vehicle. Even 69% of provisional licence holders in the trial felt that the ISA technology would be particularly beneficial to drivers who held a provisional licence. People who speed “accidentally”, people who have had their licence cancelled or suspended for speeding in the past and younger drivers were also nominated by a majority of trial participants.

One of the most significant challenges to deploying ISA technology in Australia, or anywhere in the world, is ensuring that the infrastructure required to support the technology is developed, implemented and maintained. ISA technology is unlikely to achieve widespread support until it can provide reliable and accurate advice on speed limits in all circumstances and throughout all states and territories. Driver acceptance and usability is another significant challenge for even the most technically advanced ISA system.
Young et al (2009) state that the long term benefits of ISA for Australia far outweigh the costs associated with its implementation. The AISAI group was formed to facilitate the uptake and improvement of ISA technology in Australia and New Zealand. Consumer and vehicle manufacturer demand and acceptability of ISA technology will obviously be impacted by the reliability and accuracy of the speed zone databases across the states and territories. For this reason the ISA Connect project has been established to agree upon a national speed zone data exchange format. Currently consumers can purchase a vehicle personal navigation device which includes an advisory speed warning functionality. Consumer education on the existence of such technology is required, and further research is also necessary on the quality of these personal navigation devices, including the accuracy and completeness of the speed zone databases they rely on.

By employing Nilson’s power model (Elvik, 2009; Nilsson, 1982) to the changes found in mean travel speeds obtained from the results of the trial (an overall reduction from 69.4 km/h ‘Before ISA’ to 67.9 km/h ‘During ISA’), it is estimated that there will be an 8.4% reduction in fatalities and 5.9% reduction in injuries. This equates to a projected saving of 35 persons killed and 1,455 persons injured in one year in NSW. Using the willingness-to-pay methodology, this results in an estimated community saving of about $370 million, using September 2009 values (RTA Economic Analysis Manual 2009). Attribution of these savings to Advisory ISA implementation is dependent upon the assumptions mentioned in the main body of the report.

It is likely that the voluntary implementation of Advisory ISA may not be fully successful at targeting those drivers who are most likely to benefit from it. Younger drivers and those who choose to speed in varying circumstances are probably the least likely to voluntarily adopt the technology, and if they do adopt it, they are probably the most likely to turn it off when they choose to speed. It is likely that results of the NSW ISA trial could be further improved upon if a reason or motivation could be created for drivers to keep their ISA device switched on at all times. This could range from a penalty policy regime or a rewards system as trialled in Denmark (Agerholm, 2009). Further research is required to determine ways to create a need for drivers with a desire or likelihood to speed, to keep the device switched on and thereby gain the full safety benefits that ISA technology can offer.

Further results on the NSW ISA Trial are to be reported in the following publication: *NSW ISA Trial report – Fuel consumption and travel time effects and modelling the effects of ISA on the wider NSW population.*
I. Introduction

Speeding is a significant road safety issue in Australia and worldwide. In New South Wales (NSW), almost 39% of all fatal crashes and 16% of all injury crashes have speeding as a contributing factor. On average, approximately 177 people die each year in NSW as a result of being involved in a speeding related crash. In addition to those killed, more than 4,200 people are injured in speeding related crashes each year. Aside from the tragic cost in human lives and suffering, it is estimated that the cost to the community of speeding related crashes is around $1.5 billion a year. This is the cost that the community is willing to pay or forgo in exchange for a reduction in the probability of speed related casualties and tow away crashes. Research indicates that even a small reduction in speed will yield substantial safety benefits (Kloeden et al 2002).

The NSW Centre for Road Safety (CRS) was established within the Roads and Traffic Authority (RTA) in July 2007. The RTA is a State Government agency responsible for improving road safety, testing and licensing of drivers, registering and inspecting vehicles and managing the road network which exceeds 20,000 km in length.

The RTA recognises that emerging technologies can play an important role in reducing speed, the largest contributor to crashes in NSW. Carsten and Tate (2005) suggest that the mandatory use of a Limiting Intelligent Speed Adaptation (ISA) system could bring about a reduction of serious crashes of up to 50%, while the voluntary use of an Advisory ISA system could result in a crash reduction of up to 10% across the network. This is consistent with similar estimated benefits of Supportive ISA from a Victorian study (Regan et al 2006).

Recognising these benefits, the CRS completed the largest field operational test of Advisory ISA technology ever conducted by a government agency in Australia to date. The purpose of the trial was to assess the benefits of ISA technology for NSW drivers. Over 110 vehicles, including a mix of private company fleets and privately owned vehicles participated in the trial.

ISA refers to in-vehicle technology systems which assist drivers to keep to or below the speed limit. By using Global Positioning System (GPS) technology and on-board maps which are linked to a speed zone database, the ISA system ‘knows’ where the vehicle is and what the speed limit is for that road at all times. The ISA system warns drivers via visual and audible feedback if they exceed the speed limit, and/or prevent the vehicle from exceeding the speed limit.

Recent research conducted by the Centre for Automotive Safety Research (CASR) suggests that the use of ISA technology across the road network could result in fatal crash risk reductions of between 11% for Advisory ISA and 28.3% for Limiting ISA (Doecke and Woolley, 2010). In addition to substantial road safety benefits, ISA offers the opportunity to save vehicle running costs, fuel and carbon emissions and to improve traffic flow (Regan et al, 2006; Servin, Boriboonsomsin & Barth, 2006).

The overall aim of the NSW ISA Trial was to investigate the effectiveness of Advisory ISA devices in improving speed limit compliance of NSW drivers.

The trial was built upon the experiences of other Australian ISA trials conducted in Western Australia and Victoria. Some of the distinctive enhancements of the NSW ISA Trial included:

- A larger sample size of over 110 vehicles which included participants from a broad range of ages (with an emphasis on under 25 year old drivers) genders and driving backgrounds, and included provisional licence holders.
- Highly accurate speed zone mapping.
• The inclusion of both non-government fleet drivers and private drivers.
• The collection of extensive data including speeds and speed zone compliance, speeding infringements received, fuel usage and user acceptance.

1.1 How ISA works
ISA is a generic term for an in-vehicle technology system which assists drivers to keep to or below the sign-posted speed limit on public roads at all times.

By using GPS technology and on-board maps which are linked to a speed zone database, the ISA system ‘knows’ where the vehicle is and what the speed limit is for that road at all times.

The Advisory ISA device uses a GPS receiver that continually tracks the location of the vehicle and calculates the vehicle's speed.

Figure 1: An Advisory ISA device installed in the RTA test vehicle.

Figure 2: An artist’s impression of GPS satellites used by the Advisory ISA system to determine a vehicle’s position and speed on the road network.
This vehicle’s speed is then compared to the speed zone database which includes the speed limit for that section of road. If the vehicle is travelling above the speed limit, the ISA device warns the driver using visual and audible alerts and depending on the type of ISA system being used, the driver can choose to reduce the vehicle’s speed or allow the vehicle to automatically reduce its speed to match the prevailing speed limit.

There are three different types of ISA systems:

- **Advisory** – this system warns the driver when the legal speed limit has been exceeded, by an audible alarm or message combined with visual feedback. This system allows the driver to make a decision on what action to take.
- **Supportive** – this system restricts the flow of fuel to the vehicle so it cannot exceed the speed limit. It allows the driver to override the system if necessary.
- **Limiting** – this system is similar to Supportive ISA systems, but it cannot be overridden by the driver.

The Advisory ISA system can be a stand-alone device and does not need to be wired into the vehicle’s systems. The most up-to-date maps can be accessed if the ISA device uses a digital speed limit map accessed by wireless link, rather than carrying an on-board map. Wireless access to digital speed limit maps also enables both temporary and recurrent changes to speed zones to be accommodated, such as roadwork and school zones.

1.2 Aims and objectives

The main aim of the NSW ISA Trial was to investigate the effectiveness of Advisory ISA technology in improving speed limit compliance of drivers.

The objectives of the NSW ISA Trial were to:

- research the potential road safety benefits of Advisory ISA systems in NSW
- measure the economic effects of fuel consumption and travel time
- assess the acceptability of Advisory ISA systems to drivers and fleet managers

The core issues that were investigated included:

- The effect of the Advisory ISA technology on actual speed behaviour.
- The impact of the Advisory ISA devices on attitudes to road safety, and self-reported speeding behaviour.
- The expectations of drivers, and usability and acceptability of Advisory ISA technology.
- The effect of Advisory ISA on fuel economy and the environment.
- The effect of Advisory ISA on travel time.
- The potential users of ISA.
- The potential applications of ISA.
- Modelling the wider NSW population to understand the:
  - likely and potential uptake of ISA
  - impacts of ISA devices on speed behaviour
  - impact of ISA on road trauma on NSW roads
  - impact of ISA on fuel efficiencies and the environment
  - impact on travel times
Initially it was intended to trial both Advisory and Supportive ISA technology. After an extensive search however a conforming supplier of Supportive ISA devices within Australia was not found. It was therefore decided to install only Advisory ISA devices in vehicles participating in the trial.

The trial aimed to engage participants from a broad range of occupations and age groups (with an emphasis on drivers aged under 25 years and Provisional licence holders), and to enable drivers to experience the ISA device in their own vehicles.

1.3 Structure of the ISA report

This report of the NSW ISA trial, includes results on the road safety effects of Advisory ISA, and the acceptability of Advisory ISA to drivers and fleet managers.

A review of ISA research and activities, including international and Australian trials is provided in Section 2. Section 3 provides an overview of the methodology employed in the trial and Section 4 overviews the project management and tools used to manage the trial. In Section 5 the driver speed compliance results are presented. The results of the attitudinal research are provided in Section 6. A discussion of the trial results is presented in Section 7.

Fuel consumption, travel time effects and modelling of the effects of ISA on the wider NSW population are contained in the NSW ISA Trial report – Fuel consumption and travel time effects and modelling the effects of ISA on the wider NSW population.
2. Review of Intelligent Speed Adaptation research and activities

ISA technology has been well researched internationally. A significant amount of this research has been conducted in Europe. In more recent years Australia and Canada have begun researching the potential road safety benefits of ISA.

CASR (Doecke & Woolley, 2010) reviewed Australian and international ISA research and determined that the research can be divided into three categories, namely:

- Changes in speed behaviour produced by ISA
- User reaction to and acceptance of ISA and
- Policy, planning and overcoming hurdles to implementation.

Some trials addressed more than one of these categories.

The ISA trials differed widely in their objectives, methodologies and how they presented the change in speed behaviour. Some of the variants included:

- Simulation and/or on-road trials.
- Different ISA systems; Advisory, Supportive and/or Limiting ISA.
- The sample size of vehicles and drivers involved in trials has varied, with many trials involving less than 30 vehicles. Many of the larger trials (over 100 vehicles) have predominantly been conducted in Sweden and Denmark.
- Vehicle types - ranged from heavy vehicles, private and government vehicles and motor cycles.
- Drivers - many trials have involved middle aged drivers, few involved younger drivers and/or private drivers experiencing ISA in their own vehicles.
- Long term versus short term studies.
- The ‘degree of tolerance’ before ISA alerts or limiting action activates.
- Measuring results – most trials have presented change in mean speed and some trials have also presented the change in the time spent above the speed limit of the 85th percentile speed.

An extensive list of trials and their key results are summarised in the Monash University Review of ISA (Young et al, 2009) and is contained in Appendix A.

2.1 International ISA Trials

Europe has trialled ISA over the past decade. Eleven European countries have carried out ISA trials: Austria, Belgium, Denmark, Finland, France, Hungary, The Netherlands, Norway, Spain, Sweden and the United Kingdom (ETSC, 2006).

Current international trials identified by CASR (Doecke and Woolley, 2010) include:

- London, United Kingdom – Supportive ISA devices will be fitted to 20 Transport for London vehicles, a London bus and potentially a taxi. The London speed limits produced for this project have been made available for public download onto a compatible navigation aid device. This project was announced in May 2009.
- Lancashire, United Kingdom – 550 Advisory ISA devices will be fitted to vehicles of volunteers. Young drivers are being targeted for participation in this study. The trial was due to commence in March 2010 and results are expected in the first half of 2011.
• Winnipeg, Canada – a four month field operational test of ISA was undertaken in Winnipeg to investigate the impact of influencing driving speed choice and behaviour through a reward-based process. Testing on 40 private vehicles was completed in November 2009 and a final report is due later this year.

2.2 ISA in Australia

2.2.1 Australian ISA Trials
Four trials of ISA have been completed in Australia (including the NSW ISA Trial), and a further trial is about to start in Victoria. All trials have differed considerably in their objectives and methodologies.

TAC Safecar Project
The TAC Safecar project was the first on-road trial of ISA in Australia and was conducted in 2006 by the Monash University Accident Research Centre (MUARC) in partnership with the Transport Accident Commission (TAC) and Ford Australia (Regan et al., 2006). This study investigated the impact of a range of Intelligent Transport Systems (ITS) technologies, including ISA, on driver performance, behaviour and acceptability. Fifteen Ford Falcons, called ‘SafeCars’ were sub-leased to nine public and private companies in and around Melbourne. The SafeCars were equipped with a Supportive ISA device, a following distance warning and a seatbelt reminder system. The 23 drivers in the trial included many key decision makers and were mostly middle aged men. Each participant drove a vehicle for at least 16,500 kilometres, during which time the ITS technologies turned on and off after a preset distance. The Supportive ISA system warned the driver if they travelled more than two km/h over the speed limit by exerting an upwards pressure on the accelerator pedal.

Regan et al (2006) concluded that the ISA system had a positive effect on speed compliance by reducing mean speeds up to 1.4 km/h, and reducing the amount of time drivers spent travelling 10 km/h or more above the speed limit by up to 65%. When the ISA device was de-activated, drivers tended to revert back to their previous driving habits quickly. Attitudinally, driver acceptance of the Supportive ISA system was reported to be generally high. The accuracy of the speed limit database was raised as a concern by many drivers.

Western Australian demonstration project
The intention of the Western Australian (WA) demonstration project was to create demand within the general community for ISA, to demonstrate that reliable ISA is technically possible (even on a large geographical scale) and to develop systems in government necessary to implement ISA (Crackel and Toster, 2007). The project was conducted in two phases. Phase 1 of the project commenced in late 2007 when a number of opinion leaders and stakeholders were invited to participate in the trial, and ISA units were installed in their vehicles. At the time of installation, each ISA unit was programmed with the most up to date digital information on speed zones for all public roads in WA. Changes to speed zones after installation of the ISA units required a manual update of the in-vehicle hardware. Phase 1 of the project was completed in late 2009. Participants revealed a very favourable response to the units and benefits of ISA, despite some occasional minor technical problems being experienced with the ISA units installed in some participants’ vehicles. Phase 2 of the project was designed to trial a new communications technology that would automatically transmit speed zone updates to the ISA units in each of the participants’ vehicles. What was envisaged when the project commenced was the installation of a number of fixed and mobile transmitters in the Perth metropolitan area which Main Roads Western Australia would then transmit speed zone updates to. Each transmitter would then, in turn, update any ISA-equipped vehicle which came within range. As a result of some technical
limitations, a decision was made not to involve the volunteer participants in Phase 2 and cease the Project (Crackel, personal communication, 16/09/2010).

**Victorian trial with heavy vehicles**

The Transport Accident Commission (TAC) in collaboration with the Victorian Transport Association (VTA), and with the cooperation of three heavy vehicle transport companies, conducted a small scale trial in an attempt to assess the relative merits of ISA on driver speed choice, acceptability and fuel consumption. The trial involved seven heavy vehicle drivers. Phase One analysis of the data indicated that the drivers found the ISA technology helpful in preventing them from speeding and the divergence of opinion with respect to driver acceptability and speed violations suggests the relationship between ISA effectiveness and user acceptability requires further investigation (Truong, personal communication, 08/09/2010).

**Victorian trial for recidivist speed offenders**

A Victorian trial with recidivist speed offenders was announced in January 2010 (Pallas, 2010). Drivers will be allocated to two separate groups; one group to be alerted of the speed limit via Advisory ISA, and the other group will undergo a speed awareness educational program. The trial will then examine changes in speed behaviour of these two groups.

**2.2.2 Australasian Intelligent Speed Assist Initiative (AISAI)**

The AISAI group, formed in 2007, is a partnership of state and territory road agencies seeking to stimulate, support and facilitate the uptake and improvement of ISA in Australia and New Zealand.

The group has established high-level agreement among Australian road agencies that ISA technology can significantly address the incidence of speed related crashes. Australian transport and road safety ministers, through the Australian Transport Council (ATC), are committed to further research on the potential of ISA technology to improve road safety outcomes and to inform government policy. The AISAI’s efforts are focussed on guiding the development of a national speed zone data set and building a policy framework for the implementation of ISA technology in Australia.

**2.2.3 ISA Connect**

Australian motorists expect their Personal Navigation Devices (PND) to operate on all roads across Australia seamlessly. It is reasonable to expect that there will be a similar expectation of ISA devices. Currently a number of road agencies across Australia have developed different speed zone recording and management systems to meet their individual operational requirements.

Australian road agencies, through the ISA Connect project, have agreed to collaborate and develop a national speed zone data exchange format to ensure consistency of ISA spatially referenced data set (digital maps) across Australia. The ISA Connect project is being lead by the CRS.

ISA systems currently available in Australia require detailed spatially referenced maps. By combining information from GPS satellites and on-board spatially referenced speed zone maps, ISA systems can warn drivers when they exceed the speed limit. PND can also provide similar warnings if they hold a spatially referenced speed zone data set.

The development of a national data exchange format for spatially referenced speed zone data will greatly improve the accessibility of national speed zone information to all Australian motorists. Without this national data exchange format, road users may need to physically change ISA devices.
or PNDs when they drive across state borders. Alternatively road users may simply fail to adopt ISA because of its inconsistency across states.

2.3 Road safety and other benefits of ISA identified by other ISA trials
The Monash University Review of ISA, Young et al (2009), concluded that ISA technology will have a range of benefits for Australia. The most significant benefit being the likely reduction in the incidence and severity of speeding related crashes. Other identified benefits of ISA include the reductions in fuel consumption and vehicle emissions associated with improved traffic flow on the road network. Supportive and Limiting ISA systems that can limit vehicle speed are expected to yield the most significant benefits.

Reductions in crashes
Estimates for crash reductions are generally lower for Advisory systems than for the Supportive and Limiting ISA systems that can limit the vehicle’s speed. Carsten and Tate (2005) suggest that the mandatory use of a Limiting ISA system could bring about a reduction of serious crashes of up to 50%, while the voluntary use of an Advisory ISA system could result in a crash reduction of up to 10%. This is consistent with a similar estimated benefit determined from a Victorian ISA study (Regan et al 2006).

Recent research conducted by the CASR suggests that the use of ISA across the national road network could result in fatal crash reductions of between 11% for Advisory ISA and 28.3% for Limiting ISA, (Doecke and Woolley, 2010). The CASR research suggests that full implementation of Advisory ISA could save $873 million per year on fatal, serious and minor crashes and full implementation of Limiting ISA could save $2.5 billion per year on fatal, serious and minor crashes.

Fuel emission and noise reductions
In addition to substantial road safety benefits, ISA offers the opportunity to reduce vehicle running costs, fuel and carbon emissions as well as improve traffic flow (Regal et al, 2006; Servin, Boriboonsomsin & Barth, 2006). Environmental benefits such as reductions in fuel consumption, carbon dioxide, and nitrogen oxide emissions, noxious dust, and noise are expected as a result of reductions in speed and consequently an improved traffic flow. Carsten et al (2008), using data from on-road trials and simulation modelling, predicted that in urban environments with speed limits below 70 mph (112 km/h), ISA will have little effect on emissions and fuel consumption. Limiting ISA was predicted however to produce fuel and emission savings of 3% for 70 mph (112 km/h) roads and motorways. The Australian SafeCar trial found a 4% reduction in fuel consumption and carbon dioxide emissions when ISA was trialled with following distance warning in 80 km/h zones (Regan et al, 2006).

2.4 Possible barriers to the introduction of ISA as identified by other trials
One of the most significant challenges to deploying ISA in Australia, or anywhere in the world, is ensuring that the infrastructure required to support ISA is developed, implemented and maintained. ISA is unlikely to achieve widespread support until it can provide reliable and accurate advice on speed limits in all circumstances and throughout all states and territories. Driver acceptance and usability is another significant challenge for even the most technically advanced ISA system.
In the Monash University Review of ISA, Young et al (2009) identified a number of challenges for ISA in the Australian context. These challenges included:

- Driver acceptance – any ISA implementation strategy will need to consider the importance of driver acceptance of ISA. Inaccurate advice on speed limits and any other technical issues will impact negatively on driver acceptance. Not all drivers are likely to be favourably disposed to using ISA.
- ISA functionality – a balance needs to be achieved between determining which ISA systems will yield the greatest safety and environmental benefits, and which systems will be acceptable to the general driving community.
- Tamper proofing and over-riding – the ability to tamper-proof the ISA device and identify any attempts to disengage or interfere with the ISA system needs to be determined.
- Infrastructure – the most appropriate ISA deployment solution for Australia needs to be determined, including a methodology to achieve accurate speed zone mapping and how updated speed zone and variable/dynamic speed zone information will be communicated to vehicles. This may need to be considered from a national and state perspective.
- Implementation – an appropriate ISA implementation strategy needs to be developed. This may also need to be considered from a national and state perspective.
- Legal and privacy issues – the validity of speeding fines might need to be dealt with, particularly in situations where the ISA speed limit database is inaccurate, as well as the ownership of and access to any data that may be recorded by ISA systems.

The Monash University Review of ISA, Young et al (2009) concluded that the long-term benefits of deploying ISA technology in Australia will far outweigh the costs and challenges of its development and implementation.
3. NSW ISA trial methodology

3.1 Summary of project activities and timeframes

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 2008</td>
<td>Speed limits mapped in trial area</td>
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<tr>
<td></td>
<td>Two ISA demonstration vehicles fitted with data recorder and ISA devices</td>
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<tr>
<td></td>
<td>Private and fleet volunteer participants recruited</td>
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<tr>
<td></td>
<td>Project management systems established</td>
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<td>Participant management &amp; insurances established</td>
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<td></td>
<td>Data recorders installed</td>
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<tr>
<td></td>
<td>ISA device supplier procured</td>
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<td></td>
<td>Driver commencement surveys completed</td>
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<td>September 2009</td>
<td>‘Before ISA’ speed data collected from vehicles</td>
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<td></td>
<td>‘Before ISA’ driver attitudinal research conducted</td>
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<td>Dec 2010</td>
<td>Advisory ISA devices installed in driver’s vehicles</td>
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<td></td>
<td>3 months of ‘During ISA’ speed data collected</td>
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<tr>
<td>February 2010</td>
<td>Driver attitudinal research on ISA conducted</td>
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<tr>
<td>April 2010</td>
<td>ISA devices de-activated</td>
</tr>
<tr>
<td>May 2010</td>
<td>Speed data recorders removed from vehicles</td>
</tr>
</tbody>
</table>
3.2 The trial area

The trial area was located approximately 45 km south of Sydney within the Illawarra Region of New South Wales, and included three Local Government Areas (Wollongong City, Shellharbour City and Kiama Municipality). The total length of the road network in this area is approximately 2,500 km and has a population of more than 263,000. Over 4,000 speed signs were located in the trial area allowing 932 speed zones and 452 curve advisory signs to be mapped.

The region includes a large workforce that commutes up to 80 km per day into Wollongong from the neighbouring Shellharbour and Kiama Local Government Areas. The trial area includes a broad variety of road types ranging from quiet single-lane rural roads to multi-laned freeways. The area has a wide variety of speed zones including 40 km/h high pedestrian zones, 40 km/h school zones, 50 km/h and 60 km/h urban areas, 80 km/h winding rural roads and 100 km/h freeways. The topology of the trial area is generally undulating and is bordered by the Tasman Sea (Pacific Ocean) on its eastern side and by the Great Dividing Range reaching up to 750m above sea level on its western side.
3.3 Participant recruitment and management

3.3.1 Introduction
A total of 114 participants commenced the trial. Sixty percent were male and the drivers’ ages ranged from 17 to over 70. A total of 19 provisional licence holders participated. Not all of the participants are included in the final data analysis and attitudinal research results, as some withdrew from the trial early, or did not complete all of the attitudinal research surveys. Sections Five and Six of this report give further details of the sample sizes relating to each analysis.

Participants fell broadly into two categories, non-government fleet drivers and private drivers. Fleet drivers comprised 40% of trial participants. They were staff members of companies that enrolled their fleet vehicles in the trial. Private drivers comprised 60% of participants and they owned the vehicle they drove in the trial. Initially, recruitment exclusively targeted fleet drivers, where the driver used a nominated vehicle at least 80% of the time for work purposes in the trial area. However, an analysis of the fleet drivers’ characteristics showed that drivers under the age of 25 years and over the age of 60 years were under-represented in the group. Most drivers who had agreed to participate in the trial also had a good driving record with only a few carrying demerit points for a speeding offence. The recruitment was expanded to include private drivers, with a booster which targeted drivers specifically under the age of 25 years and over the age of 60 years, and drivers who reported that they had incurred at least one speeding offence in the last three years.

3.3.2 Participant recruitment – Fleets
Companies from a diverse range of industries based in the trial area were approached and invited to participate. Fleet managers from each company were provided with information on the aims of the trial, a description of ISA technology and the potential benefits for their company if they participated. A total of nine companies agreed to participate. After securing agreement from fleet managers, information sessions were held at each workplace, where staff was invited to participate if they met the following criteria:

- they had exclusive use of a fleet vehicle at least 80% of the time (that is, the vehicle was not shared amongst a pool of drivers)
- they anticipated they would spend at least 80% of their driving time in the trial area
- they held a current provisional or full driver licence (not a learner licence)

Due to a lack of drivers who met the first criterion, it was later relaxed and four shared fleet vehicles were included in the trial.

Anecdotal evidence based on observations from information sessions with fleet managers indicated that they often expressed enthusiasm and interest in participating, but engaging their drivers posed a greater challenge. Some were concerned about potential ‘big brother’ aspects of the trial and the potential for using their speeding and location information to issue infringements or to pass this information onto their employer. These concerns were addressed by providing reassurance that their personal information would only be used for research purposes, explaining the relevant privacy legislation that was in place to protect their personal information and providing them with signed documentation that outlined the responsibilities of the CRS in relation to privacy.

3.3.3 Participant recruitment – Private drivers
Private drivers were selected to join the trial from a broad range of genders, occupations and residential post codes in the trial area. These drivers had to meet the following criteria:
• They had to own their vehicle and be the exclusive driver of their vehicle at least 80% of the time.
• They anticipated that they would spend at least 80% of their driving time in the trial area.
• They anticipated that they would drive at least five hours per week.
• They had to hold a current provisional or full driver licence (not a learner licence).

The recruitment of private drivers included a booster which targeted drivers specifically under the age of 25 years and over the age of 60 years, and drivers who reported they had incurred at least one speeding offence in the prior three years.

Private drivers were recruited by a market research agency, which primarily used an online panel to provide a short list of potential participants who met the criteria and expressed an interest in participating in the trial. Information sessions were held for potential private drivers to provide them with detailed information about the trial, requirements of participants and provided them with the opportunity to ask questions.

**Legal agreements**

Fleet and private drivers were required to complete legal agreements to participate in the trial. These agreements included giving the CRS access to their driving record (Appendix B) to use their personal information (Appendix C) and a deed outlining the roles and responsibilities of both parties (Appendix D). Participating companies were also required to sign a deed.

### 3.3.4 Participant Management

**Support and assistance**

An ISA trial project team member was assigned to be the central point of contact for all drivers and fleet managers; from the recruitment stage to the conclusion of the trial. This helped to create rapport and build relationships with individual participants. It also ensured continuity when resolving ongoing queries and issues.

A number of communication channels were established between the ISA trial team and participants, including:

- An ISA Trial Support Line (ph. 1300 NSW ISA / 1300 679 472) to manage participant enquiries and emergencies. The number was connected to an answering service available 24 hours a day, seven days a week.
- A Short Message Service (SMS) were often used to communicate with participants. This communication channel was very effective for contacting a large number of participants simultaneously and especially successful in reaching younger participants.
- A Dedicated email address (isa_trial@rta.nsw.gov.au)
- A monthly ISA trial newsletter which was emailed to all participants and provided them with updates on the trial and other important information about their involvement.

Participants were encouraged to contact the project team throughout the trial, for general enquiries, to provide feedback and to report an issue. Over the course of the trial the ISA Trial Support Line received 237 telephone calls and 307 emails were sent to the dedicated email address. Many calls and emails were made directly to the project team representative.
Incentives
Incentives were offered to participants for giving their time and effort in the trial. Comprehensive motor vehicle insurance was provided to all drivers which offered substantial savings to private drivers and to participating companies. It also served as a risk countermeasure should an incident involving an ISA device occur. Each private driver received fuel vouchers to the value of $400, consisting of one $200 fuel voucher at the commencement of the trial and another $200 voucher at the end of the trial, to compensate them for their fuel usage whilst trialing the ISA device. Each driver was also given a First Aid kit to keep in their vehicle which had the ISA Trial Support Line telephone number boldly printed on it in case of an emergency.

Free roadside assistance was provided for all participants in the trial. In the case of a crash, vehicle breakdown or ISA device malfunction, participants could call the ISA Trial Support Line to be connected to the roadside assistance service or the insurer.

Training
All participants were invited to attend training sessions to receive instruction on how to use the ISA device and how to respond to error messages which may appear on the device’s screen.

A twelve page user manual and trouble shooting guide for the ISA device was also provided to all drivers. The manual described the user interface associated with the device as well as trouble shooting information and how to contact the ISA Trial Support Line (See Appendix E).

An eight minute training DVD for drivers and other people who were identified as potential drivers of the ISA equipped vehicles was also prepared and issued to each driver.

The training DVD outlined:
- the general operation of the ISA device
- the conditions placed upon drivers participating in the trial
- trouble shooting assistance
- how to contact the RTA for advice on the operation of the device or to report a technical problem

3.4 Speed zone mapping
Over 4,000 speed limit signs encapsulating over 950 speed zones were mapped within the trial area by Roads and Traffic Authority (RTA) personnel. This information was stored in the Authority’s Speed Zone Management System (SZMS). If any speed zones were changed during the trial the SZMS was updated accordingly within several days. A project priority was ensuring that the speed zone information was accurate and current. To achieve this, routine auditing and inspection of the road network within the trial area was conducted throughout the trial. Participating drivers were also encouraged to report any differences they noted with sign-posted speed zones and the speed limit displayed on their ISA device. These speed zone anomalies were investigated by the ISA trial project team and corrected. The spatial speed zone maps were also regularly scrutinised by the project team to detect any speed zoning anomalies.

Speed zone updates were downloaded to each trial vehicle’s on-board speed zone database via wireless General Packet Radio Service (GPRS) mobile phone network. This technology eliminated the need to manually replace each vehicle’s on-board speed zone map database and so significantly expedited the updating process of the onboard maps.
Sections of the road network within the trial area that experienced frequent speed zone changes, such as intermittent road works sites, were excluded from the final speed zone dataset to avoid compromising the analysis of the speed compliance data.

3.5 Data collection

3.5.1 Speed compliance data reporting

Speed data recorders
To measure the baseline speed compliance of drivers before the ISA device was installed in their vehicle, a speed data recorder was fitted to their vehicle at least a month before the ISA device was installed. The speed data recorder provided an independent source of driver speeds. It was the speed information from the speed data recorder (and not the ISA device) that was used to measure the effect of the ISA technology.

The speed data recorder was installed discretely under the dashboard of each participating vehicle. The device captured the vehicle’s position, instantaneous speed, bearing, date and time using GPS technology and then transmitted this information to a data storage company via GPRS. The data was captured and transmitted every ten seconds whenever the vehicle was in motion. A data report was submitted to the project team on a weekly basis.

The speed data recording system enabled the development of a speed limit compliance profile for each vehicle in the trial, as well as ‘Before ISA’, ‘During ISA’ and ‘After ISA’ driver behaviour profiles. A photo of a speed data recorder is shown below.

Figure 4: Speed data recorder.
Management and installation of speed data recorders

An independent company was engaged to supply the speed data recorders, install them in participant vehicles, and provide the data generated from each device to the ISA trial project team.

The speed data recorders were allocated a sequential number for use in the customised ISA Trial Knowledge Base (ISAT). They were labelled by the project team to facilitate their tracking between organisations and systems. As the devices use the mobile GPRS network to transmit data, a SIM card was also installed in each device. Each of the data recorders and SIM serial numbers were recorded and tracked, to ensure they were accurately installed to the trial vehicle, and so ensuring that analysis of speed behaviour could be applied to the appropriate driver.

Initially there were a number of faulty speed data recorders which did not transmit speed data. An inactivity alert system was established to flag a vehicle if it was inactive for four or more days. Upon receipt of an inactivity alert, the ISA trial project team contacted the participant to determine whether the inactivity was due to their vehicle not being driven or because the speed data recorder was not transmitting data. If a speed data recorder was faulty, the installer was scheduled to replace it with an operable unit as soon as possible.

Speed data reporting

Each vehicle in the trial was allocated a unique and sequential vehicle number for anonymous vehicle identification (for example V001 and V002). Only the vehicle number and the speed data recorder number (for example DR001 and DR002 etc) in combination were provided to the speed data recorder supplier when tracking the satellite data in their systems, thus helping to maintain the privacy of individual drivers.

The established procedure for procuring speed data from speed data recorders is to access real time information via the supplier’s website, and then manually download the relevant reports. Due to privacy requirements, the ISA trial project team was not permitted to access real time participant movements, and instead established a reporting format, in consultation with the speed data recorder supplier, which provided the necessary data at the end of each week.

The details of each vehicle’s journey were provided in the following format:

<table>
<thead>
<tr>
<th>DataRecorderNo</th>
<th>ISAVehicleNo</th>
<th>Date</th>
<th>Time</th>
<th>Address</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Heading</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>DR090</td>
<td>V078</td>
<td>2002/02/06</td>
<td>7:57:59</td>
<td>96 Keira St Wollongong, 2500 NSW Australia</td>
<td>-34.42137</td>
<td>150.89378</td>
<td>141</td>
<td>9.66</td>
</tr>
<tr>
<td>DR090</td>
<td>V078</td>
<td>2002/02/06</td>
<td>7:58:09</td>
<td>121 60 Wollongong, 2500 NSW Australia</td>
<td>-34.42205</td>
<td>150.89377</td>
<td>190</td>
<td>38.62</td>
</tr>
<tr>
<td>DR090</td>
<td>V078</td>
<td>2002/02/06</td>
<td>7:58:19</td>
<td>161 60 Wollongong, 2500 NSW Australia</td>
<td>-34.42316</td>
<td>150.89351</td>
<td>192</td>
<td>45.06</td>
</tr>
<tr>
<td>DR090</td>
<td>V078</td>
<td>2002/02/06</td>
<td>7:58:29</td>
<td>192 60 Wollongong, 2500 NSW Australia</td>
<td>-34.42437</td>
<td>150.89325</td>
<td>186</td>
<td>46.67</td>
</tr>
<tr>
<td>DR090</td>
<td>V078</td>
<td>2002/02/06</td>
<td>7:58:39</td>
<td>227 60 Wollongong, 2500 NSW Australia</td>
<td>-34.42493</td>
<td>150.89278</td>
<td>260</td>
<td>35.41</td>
</tr>
<tr>
<td>DR090</td>
<td>V078</td>
<td>2002/02/06</td>
<td>7:58:49</td>
<td>269 60 Wollongong, 2500 NSW Australia</td>
<td>-34.42523</td>
<td>150.89162</td>
<td>245</td>
<td>38.62</td>
</tr>
<tr>
<td>DR090</td>
<td>V078</td>
<td>2002/02/06</td>
<td>7:59:19</td>
<td>2 Atchison St Wollongong, 2500 NSW Australia</td>
<td>-34.42526</td>
<td>150.89099</td>
<td>190</td>
<td>22.53</td>
</tr>
<tr>
<td>DR090</td>
<td>V078</td>
<td>2002/02/06</td>
<td>7:59:30</td>
<td>Burelli St Wollongong, 2500 NSW Australia</td>
<td>-34.42594</td>
<td>150.89125</td>
<td>84</td>
<td>24.14</td>
</tr>
<tr>
<td>DR090</td>
<td>V078</td>
<td>2002/02/06</td>
<td>7:59:40</td>
<td>Burelli St Wollongong, 2500 NSW Australia</td>
<td>-34.42591</td>
<td>150.89218</td>
<td>97</td>
<td>37.01</td>
</tr>
<tr>
<td>DR090</td>
<td>V078</td>
<td>2002/02/06</td>
<td>7:59:50</td>
<td>Burelli St Wollongong, 2500 NSW Australia</td>
<td>-34.42609</td>
<td>150.89333</td>
<td>98</td>
<td>33.8</td>
</tr>
<tr>
<td>DR090</td>
<td>V078</td>
<td>2002/02/06</td>
<td>8:00:00</td>
<td>Burelli St Wollongong, 2500 NSW Australia</td>
<td>-34.42619</td>
<td>150.89401</td>
<td>98</td>
<td>22.53</td>
</tr>
</tbody>
</table>

Figure 5: Snapshot of speed data recorder weekly reporting format
In Figure 5 above:

- DataRecorderNo – a unique data recorder number assigned to each unit for efficient tracking purposes.
- ISAVehicleNo – a unique vehicle number assigned to each vehicle for clear and private tracking purposes.
- Date – the date the vehicle was in use
- Time – the time in Coordinated Universal Time the vehicle was in use
- Address – calculated by the supplier from GPS coordinates
- Latitude and longitude – spatially referenced GPS coordinates
- Heading – the bearing where the vehicle is pointing compared to the angle of True North.
- Speed – vehicle speed in kilometres per hour at the time of each data recording

3.5.2 Speed data collection periods

The speed data recorders captured over 7.5 million speed records by the end of the trial. Details of each vehicle’s journey (see above) were continually recorded in ten second intervals. The speed data recorders provided baseline data on driver behaviour and speed compliance, tracked speeding patterns during the period the ISA devices were in the vehicles, and provided a measure of ‘After ISA’ device driver behaviour and speed compliance. This enabled any objective changes in driver behaviour and speed compliance to be measured. Speed data from the ISA devices was not used in the trial.

The NSW ISA trial consisted of three distinct periods of speed data collection to measure the effects of driving with an ISA device: ‘Before ISA’, ‘During ISA’ and ‘After ISA’.  

<table>
<thead>
<tr>
<th>‘Before ISA’ period</th>
<th>‘During ISA’ period</th>
<th>‘After ISA’ period</th>
</tr>
</thead>
<tbody>
<tr>
<td>(average 1.5 months)</td>
<td>(3 months)</td>
<td>(2 months)</td>
</tr>
</tbody>
</table>

Figure 6: ISA trial data collection periods

- ‘Before ISA’ period: At least one month before the ISA device was installed in each vehicle a speed data recorder was fitted (to independently of the ISA device) record spatially referenced vehicle location and speed data. Some vehicles from November 2008 to October 2009, (on average, the ‘Before ISA’ period was approximately 1.5 months)
- ‘During ISA’ period: The ISA devices were installed and once deemed fully operational, were in use for at least three months. [December 2009 to February 2010]
- ‘After ISA’ period: The ISA devices were de-activated. The speed data recorders continued recording for two months after the ISA device was de-activated. [March to April 2010]. The ISA device and the speed data recorders were removed from the vehicle simultaneously.
The ‘During ISA’ period of at least three months was necessary to allow the potential novelty effect of the ISA device to cease, as this effect is likely to diminish as drivers got used to using the new technology.

The ‘After ISA’ period of two months was introduced to enable the in-depth analysis of any possible learning effects drivers may have experienced after experiencing ISA, from a speed behaviour, as well as an attitudinal perspective.

**Speed limit layering**

Raw data provided to the ISA trial project team by the speed data recorder supplier was checked and then processed internally by the RTA’s Spatial Information Systems section. This process involved overlaying speed limit information including speed zone type, speed limit, the difference between the speed limit and the vehicle’s speed, a ‘corrected’ speed limit to adjust for errors in sequencing and interpreting GPS positioning. The data was stored as a ‘file geodatabase’ using ArcGIS software.

Only speed data from inside the trial area was included in this dataset, as the trial area was consistently and reliably mapped. The total number of data records collected and processed from April 2009 to the end of April 2010 (the end of the trial) was 7.5 million.

Random audits and record counts were undertaken by the project team to track the consistency of data processing, and to highlight anomalies.

Due to a processing error, one week of data in the ‘After ISA’ data collection period (1-7 March 2010) was not processed in time for inclusion in the final analysis. There remains 54 calendar days of data that was collected and processed in the ‘After ISA’ period.

**3.5.3 Driving records**

Each driver agreed to the release of a portion of their driving record to assist in the interpretation and analysis of their speeding behaviour changes. The following five year history was procured from the RTA’s driver registration and licensing system for each driver.

- number of speed related offences
- number of demerit points accumulated
- number of demerit points as at the date of the search
- number of disqualifications
- reason for disqualification (if any)

This data was used to aid the profiling of exclusive drivers for segmentation and analysis purposes at the completion of the trial.

**3.5.4 Fleet fuel records**

To be eligible for the trial, fleet managers were required to provide fuel records for each of their fleet vehicles participating in the trial. The purpose of collecting fleet fuel records was to establish changes in fuel efficiency over the course of the trial. The records however, procured from fleets were of varying quality, and some companies had not kept any fuel records at all. Some fleet fuel records had no odometer readings; others had a single record for multiple vehicles. In order to be able to establish changes in participating vehicle’s fuel efficiency, kilometres travelled (based on raw GPS data) were calculated for each vehicle in the trial.
The trial’s fuel efficiency results will be presented in the “NSW ISA Trial – Fuel consumption and travel time effects and modelling effects of ISA on wider NSW population” report.

3.5.5 Participant reported issues

Drivers were encouraged to report any issues they had relating to the trial, such as a malfunction of the ISA device or an incorrectly displayed speed zone, by contacting the ISA Trial Support Line or using the ISA Trial email address. All reported issues were logged in an Issues Register which was stored in the ISAT database. Issues were linked to individual drivers, which made for easy monitoring and follow-up to ensure they were quickly addressed and completed.

Over the course of the trial, 134 issues were reported by drivers. The majority of issues were related to malfunctions of the ISA device, such as loss of signal or power. The majority of issues were reported at the beginning of the trial and declined in frequency as the trial progressed. It is important to note that often several drivers reported the same issue and so the number of issues does not represent unique events.

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISA Device malfunction</td>
<td>117</td>
</tr>
<tr>
<td>Speed Zone error</td>
<td>13</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>134</strong></td>
</tr>
</tbody>
</table>

Table 1: Number of issues reported by issue category

3.5.6 Speed data analysis

Participating drivers gave their consent for their driver licence records (including any history of offences) to be reviewed. This information, combined with the driver’s journey details gathered by the speed data recorders, and a selection of self-reported responses collected in the attitudinal research component of the trial, enabled the creation of behaviour profiles for each driver.

In order to determine how effective the ISA devices were on a driver’s choice of speed (that is, the driver’s ‘free speed’), it was important to remove as much as possible those instances where the vehicle’s speed was influenced by the road environment, for example, slowing for intersections, or congested traffic. Free speed is defined for the purposes of this trial as any vehicle travelling at least 75% of the speed limit. Unless otherwise specified, the speed data analysis results in this report investigates free speeds.

Nilsson’s power model (Elvik, 2009; Nilsson, 1981) was used to calculate the theoretical percentage change in casualty numbers based on the change in mean vehicle speeds when the Advisory ISA devices were installed in the trial vehicles. The calculated percentage change in casualty numbers was then applied to historical road toll figures.
3.6 Attitudinal research with drivers and fleet managers

In addition to the objective speed data that was collected during the trial period, a number of attitudinal and behavioural research studies were completed at various stages throughout the Trial. These research studies were conducted by an independent social research company.

3.6.1 Qualitative and quantitative research

A combination of qualitative and quantitative research was conducted with drivers and fleet managers.

![Figure 7: Qualitative and quantitative market research timeline](image)

**Driver commencement questionnaire**

Drivers completed a ‘Driver Commencement Questionnaire’ (Appendix F) either online or in paper format when they joined the trial. The questionnaire collected information on drivers’ demographics and their driving patterns.

**‘Stage 1’ surveys – prior to ISA devices being installed**

Surveys were conducted with drivers and fleet managers prior to the ISA devices being installed in vehicles. The surveys quantified driver and fleet manager attitudes prior to experiencing ISA technology. The fleet manager questionnaire was in the form of a short telephone interview. Interviews were conducted with eight of the nine organisations in the trial. The questionnaire for fleet and private drivers (Appendix G) was conducted online and was completed by 103 out of a possible 112 drivers.

**‘First impressions’ qualitative research**

Depth interviews and in-vehicle observations capturing drivers’ initial impressions of ISA were conducted after the drivers experienced the ISA technology for a week or two. In-vehicle observations were conducted with five private drivers. A researcher travelled as a passenger in each participant’s vehicle and observed the participant driving and interacting with the ISA device, and recorded any comments made by the driver relating to the technology. Cameras within the vehicle recorded footage of the journey. In addition to this, twelve depth interviews were conducted with fleet and private drivers. This research component captured drivers’ early experiences and their first impressions with the ISA device (Appendix H). These early results
were presented at the 2009 Intelligent Speed Adaptation Conference (Wall et. al. 2009) (Appendix I).

‘Stage 2’ surveys – prior to ISA devices being de-activated
Online surveys were conducted to quantify drivers’ and fleet managers’ attitudes after they had experienced ISA technology. These surveys were administered just prior to the ISA device being de-activated. The questionnaire for fleet and private drivers was administered online and was completed by 92 drivers, which represented 87% of drivers in the trial. Fleet managers from seven of the nine participating organisations completed the questionnaire, primarily over the telephone (Appendix G).

‘Stage 2’ qualitative research – prior to ISA devices being de-activated
Group discussions were conducted to complement the quantitative results gained from the ‘Stage 2’ surveys and to allow in-depth and flexible exploration of some key topics. Four mini group discussions were conducted with private drivers, divided by age and gender. Two mini group discussions were conducted with fleet drivers and a final mini group discussion was conducted with fleet managers (Appendix G).

NSW Driver Comparison online survey
The NSW Driver Comparison online survey measured the attitudes and self-reported driving behaviours of NSW drivers (residing both within and outside of the Illawarra region). This survey measured the awareness of, attitudes towards, as well as potential support for ISA in the broader NSW driving community. The survey also examined the extent to which trial drivers differed from the broader NSW driving community. The survey was administered online with a sample size of 1,145 NSW drivers. Of these, 107 drivers were based in the Illawarra. This over sampling of the region was to ensure robust comparisons between trial participants and non-trial Illawarra drivers. The remaining 1,038 drivers were from other regions of NSW. Quotas were set to ensure the sample was broadly representative of NSW licence holders. Weightings were applied to ensure the research sample was even more representative of licence holders on key demographic criteria such as age, gender, license type and location (Appendix J).

‘Stage 3’ survey – after ISA devices were de-activated
An online survey was conducted with drivers to quantify their attitudes after the end of the trial, to measure any lasting attitudes towards speeding, learning effects, and self-reported speeding behaviour as a result of their experience with ISA, and determining whether drivers felt differently about the ISA device after they were no longer able to use it. Fleet and private drivers completed an online survey approximately two months after the ISA devices had been de-activated (Appendix G).

3.6.2 Attitudinal research data analysis

Stage 1, 2 and 3 surveys data analysis
A repeated measures design was used, which included some unique questions appearing in each of the online surveys. Results were analysed separately for drivers and fleet managers in order to capture the different roles they played in the trial and the different experience they had with the ISA technology.

Data analysis included both within-subject (comparing how drivers responded to different questions, including whether their responses changed between surveys) and between-subject comparisons (comparing how different groups of drivers responded to the same questions to reveal, for example, whether there were any demographic differences in responses to a particular question). Significance testing was applied at the 95% confidence level. Arrows have been used
in charts to illustrate statistically significant increases or decreases in either mean rating (for continuous variables) or proportions (nominal or ordinal variables) between survey stages.

**NSW Driver comparison data analysis**

Data analysis included between-subject comparisons (comparing how different groups of participants responded to the same questions to reveal, for example, whether there were any demographic differences in responses to a particular question), as well as within-subjects comparisons (for example whether responses to one question tended to be associated with particular responses on a different question). Significance testing has been applied throughout the report at the 95% confidence level.

Analysis of covariance (ANCOVA) was also conducted. This technique is a general linear model with one continuous outcome variable (generally referred to as the Dependent Variable – an example would be the level of agreement on an 11-point scale) and one or more factor variables (generally referred to as the Independent Variables – in this case, whether or not the research participant had participated in the ISA Trial). ANCOVA is a merger of ANOVA and regression for continuous variables. ANCOVA tests whether certain factors have an effect on the outcome variable after removing the variance for which quantitative predictors (generally referred to as covariates) account. In this case, covariates included gender, age, main reason for driving (work versus other) and, in the case of comparisons between trial drivers and non-participating NSW drivers, location (Illawarra versus the rest of NSW). ANCOVA was used to examine the effect that participation in the trial had on responses to survey questions and to ‘parcel out’ the variance caused by differences in these other demographic characteristics. The inclusion of covariates can increase statistical power because it accounts for some of the variability.

Significance testing was applied at the 95% confidence level. On charts that compare the mean ratings for trial drivers with mean ratings for all NSW research participants (not participating in the trial), and with Illawarra research participants (not participating in the Trial), arrows were included to illustrate whether the mean rating for that group (all research participants or Illawarra research participants) was significantly higher (up arrow) or significantly lower (down arrow) than the mean rating for trial drivers.

**3.7 ISA devices**

**3.7.1 Device supplier and functionality**

The Advisory ISA devices selected for the trial were supplied by Smart Car Technologies Pty Ltd (SCT P/L) of Sydney, Australia. The Dreevo2 model was manufactured by Mobile Devices in France and was a combined personal navigation and telematics device. Each device was customised for the project by SCT P/L to run the Java based Speed Alert™ ISA application and included an in-built GPS receiver (SiRF Star 111) and mobile phone modem (Quad Band GSM/GPRS), which allowed the devices to calculate their position using GPS, as well as receive and transmit speed zone information.

The ISA device was one of the few personal navigation devices currently available with an open software platform that enables the deployment of customised two-way telematic applications. This two way communication capability enabled the ISA device to be connected to a centralised computer server that allowed automatic speed zone changes to be sent to the device continuously.
Installation of the ISA device
The ISA devices were mounted in the trial vehicles on a fixed bracket attached to the dashboard below windscreen level to avoid obstructing the driver’s view. The devices were able to be removed from the mounting bracket by the driver if the driver had concerns about the security of their vehicle. The devices were powered by a permanent connection between the device’s mounting bracket and the vehicle’s electrical system.

![Typical mounting position of the ISA device in vehicles](image)

The Dreevo2 device was configured to turn on when the vehicle’s ignition system was activated, and to power down approximately 20 seconds after the vehicle was turned off. If drivers were requested by the device supplier to reset their device, drivers simply pressed the on-off power button located on the top of the device.

The ISA device was not calibrated to each vehicle’s speedometer due to the large number of vehicles used in the trial. The project team discovered in the lead up to the trial that most vehicle speedometers over-read the true speed of the vehicle. For example, a vehicle travelling at a true speed of 60 km/h (as measured using GPS) often showed a speed of 63 km/h on the vehicle’s speedometer. GPS systems can display the true land speed of a vehicle to an accuracy of around 1 km/h (Al-Gaadi 2005). This presented an issue for the project team as drivers’ baseline speed compliance data was based on the driver using the vehicle’s speedometer to determine an appropriate speed. Once the ISA device was installed the driver could possibly use the ISA device instead to determine an appropriate speed thereby, lifting vehicle speeds by at least 3 km/h in 60 km/h speed zones. In order to overcome the disparity between speedometer display and the ISA device, a 3% “over-read” error rate was introduced into the ISA device. This now meant that a driver would receive an audible warning for exceeding the speed limit when the vehicle reached a speed three percent below the legal speed limit. For example, in a 60 km/h speed zone the driver would receive a warning when the vehicle reached 58.2 km/h. Drivers were not informed of the introduced error rate. Interestingly, very few drivers complained about the ISA device’s ability to match the speed indicated on their vehicle’s speedometer.

Visual and audible warnings
Although capable of displaying maps and other personal navigation applications the ISA device was configured to only operate the Speed Alert™ application. The default on-screen display selected for the device was a standard regulatory speed zone sign (black numeral surrounded by a red annulus). In addition, drivers would also see a curve advisory speed warning sign (displayed as
black text on a yellow rectangle) when approaching a sign-posted curve warning sign (as shown in the picture below).

![Figure 9: The Dreevo2 device showing a speed limit of 70 km/h and a curve advisory speed warning of 55 km/h.](image)

The illustrations below show some of the typical ISA screen displays that drivers would have seen during the trial.

![Figure 10: Dreevo2 device showing vehicle travelling in an active school zone below 40 km/h](image)
Figure 11: Dreevo2 device showing vehicle exceeding a 60km/h speed limit

Figure 12: Dreevo2 device showing night mode display (6 pm - 6 am daily)
In addition to the visual displays, the device also provided audible warnings to drivers. When the vehicle entered a new speed zone the device would emit a soft tone to indicate to the driver that the vehicle had entered a changed speed zone. If the vehicle exceeded the speed limit by 3 km/h the driver would receive a single high pitched warning tone. If the vehicle exceeded the speed limit by 5 km/h the tone would change to a rapid three tone audible warning.

Drivers were also audibly warned of an approaching curve in the roadway by a voice message that stated "curve warning ahead".
3.7.2 Procurement of ISA devices

The procurement of new road safety technologies always presents significant challenges. The ISA project team faced several, including:

- the absence of model procurement documentation
- a limited ISA supplier market
- the absence of existing ISA technical standards

The absence of model procurement documentation

As the ISA trial was the first complex and large-scale field operation test of its kind in Australia, the existing RTA procurement documentation could not accommodate the broad range of project-specific requirements and risks associated with this new technology.

Procurement documentation from previous trials (including those by other Australian states) also proved inadequate for the purposes of this trial. Project-specific contract agreements were developed, after working very closely with RTA probity experts, insurance advisers and both internal and external legal experts. As each new risk emerged, the Request For Proposals (RFP) document had to be amended accordingly. The contract component; “Supply, Installation, Maintenance & Removal Agreement” (SIMRA) within the RFP document was the result of consolidated liaison with ISA / GPS technical experts and RTA legal advisers. The final RFP document now serves as model RTA procurement document which can thereby expedite the preparation of procurement documentation for future RTA’s projects involving non-generic goods and services.

Limited ISA supplier market

Prior to advertising for a supplier of 100 ISA devices, the ISA trial project team was aware of only one Australian manufacturer of Supportive ISA technology, and of two Australian suppliers of Advisory ISA technology. It was anticipated however, that other automotive telematic companies would emerge and provide the RTA with a broader choice of ISA suppliers. The project was to trial 60 Advisory ISA devices and 40 Supportive ISA devices.

The RFP process produced only one conforming supplier of Advisory ISA technology and no provider of Supportive ISA devices. The only Supportive ISA system proposal was found to be non-conforming with the RFP documentation. This meant that a Supportive ISA device supplier could not be engaged at the same time as an Advisory ISA supplier, thereby eliminating the planned fit-out of Supportive ISA devices. The only conforming Advisory ISA device supplier was accepted and approval was obtained from the RTA probity advisors to commence direct negotiations outside of the RFP process with other telematics companies to source a Supportive ISA device. Negotiations with two prospective Supportive ISA suppliers however, failed to secure a conforming Supportive ISA system in time for the trial. It was therefore decided to install only Advisory ISA systems in the trial vehicles.

The absence of existing ISA technical standards

Special care was required with the preparation of the RFP documents when articulating the technical specifications for the ISA devices, as no existing national or international standards for this technology were available as a reference criterion. The development of these specifications required a thorough examination and review of existing telematic standards, motor vehicle regulations and Australian Design Rules. Close and lengthy liaison was also required with RTA vehicle safety experts, RTA legal advisers, motor vehicle industry practitioners and inter-state government colleagues, to develop technical specifications that were unambiguous, realistic and yet capable of addressing all of the perceived safety risks for participating drivers and passengers.
4. Project management

4.1 Project management system

The European Commission’s Field Operational Trial Implementation Plan was adopted as a starting point for developing a methodology for the trial, but as the project’s scope expanded and became more complex the project team found it insufficient. In the early stages of the trial an experienced auditor and project manager was appointed to the ISA trial project team to develop management systems and conduct audits specifically focused on speed zone mapping and data. It was soon recognised that auditable systems needed to be developed for many aspects of the project and this was beyond the functionality of the existing project management software (Microsoft Project 2007) which was used at the time of planning the trial. The RTA’s conventional project management tool, which is based on the Project Management Body of Knowledge (PMBOK) also proved deficient and so the project methodology was expanded to incorporate other project management tools. This hybrid project management system incorporated several PRINCE2 (PRojects IN Controlled Environments) principles. This tool provided the necessary guidance for the management of information systems, which was a fundamental requirement of the ISA project.

4.2 Risk management

To facilitate achieving the project objectives, a risk management approach based on AS/NZS 4360 was adopted. Potential risks were identified during the early stages of the project and appropriate countermeasures were developed for each. Identified risks were monitored using a Risk Management Plan, with priority given to risks rated as high or moderate.

Some of the identified key risks included:

- Sourcing recognised Australian safety standards for the fitting of ISA devices to vehicles.
- Overcoming technical challenges for the innovative technology (limited number of conforming Australian ISA suppliers)
- Ensuring the safety of the participating drivers and passengers was not compromised by the installation of the ISA device in their vehicle (especially driver distraction and obscured views of the roadway).
- Meeting and maintaining the privacy of the drivers’ speed records throughout the trial, in accordance with NSW and federal privacy legislation.

A Risk Register was established to report, monitor and action identified risks. The register was updated and reviewed on a routine basis.

4.3 Insurances

Insurance played a critical role in managing the risks associated with participating drivers. Several forms of insurances were adopted for the trial on the advice of an RTA insurance advisor.

Comprehensive motor vehicle insurance was arranged for all participating vehicles. This ensured protection for drivers in the event of a crash occurring due to the ISA device. Full and accurate disclosure to the insurer ensured a claim would be honoured. All participating vehicles were required to have their own compulsory third party (CTP) insurance. This is a requirement of registration in the state of NSW.
The contractor supplying the ISA devices was required to hold the RTA standard contractor insurance provisions of Product Liability, Professional Indemnity and Workers Compensation insurance. In addition, Professional Indemnity Insurance and Public and Product Liability Insurance were employed by the RTA specifically for the trial to ensure coverage above and beyond the contractor’s insurance policies to offer better protection for the trial overall.

4.4 Intelligent speed adaptation trial (ISAT) knowledge base

Multiple people, documents, legal agreements and various forms of data needed to be tracked and managed during the trial. The complexities of the information and data relationships are demonstrated in the diagram below:

![Diagram of ISAT Knowledge Base](image)

**Figure 15:** Diagrammatic representation of the complexities of the information required for the trial

Due to the complexities of managing these numerous sources of information and data relationships, it became necessary to develop a customised knowledge management database in Microsoft Access. This knowledge base became known as ‘ISAT’. The following modules supported the project team in managing various components of the trial:

- **People** – for recording contact details of all people and organisations contacted in relation to the trial. These included participating drivers, research partners, suppliers, internal RTA units and other ISA industry professionals.
- **Contacts** – for recording all contacts and their communications for example phone conversations, email contacts and meetings.
- **Issues** – for logging issues with a link to the person the issue related to, with flagging for follow up and completion.
- **Participant management** – for tracking of paperwork, participant status and progress.
• Inventory – for recording all speed data recorders and ISA devices, including their serial numbers, suppliers and unique references allocated by the project team.
• Scheduling of installations and removals – for planning the dates, times, places, and details as well as producing schedules for installers of data recorders and ISA devices.
• Contract management – for tracking supplier progress payments for ISA devices and contract documentation status.
• Insurance lists – for trial vehicles covered by insurance
• Data recorder management – for reporting the installation status for data quality and billing

4.5 Media and communications

Media coverage
The ISA trial was the subject of substantial media attention beginning with the launch of the trial on 25 June 2008 at an ISA industry forum in Sydney, Australia.

The trial was jointly launched by the former Minister for Roads and the former Minister for the Illawarra. The launch was covered by all mainstream media organisations in Sydney and received airplay on most evening television news programs.

Figure 16: Former Minister for Illawarra, David Campbell and former Minister for Roads, Eric Roozendaal at the launch of the NSW ISA Trial on 25 June, 2008.

A key component of the trial launch was the development and use of two high profile demonstration vehicles fitted with Advisory and Supportive ISA systems. A four kilometre demonstration circuit was developed near the launch venue and the media were encouraged to travel and drive the vehicle around the demonstration route to experience the technology first hand.
Another media event with a new Minister for Roads was conducted in mid May 2009. This generated extensive print, television and web based media attention. An article also appeared on the United States iTWire web page.

A journalist and blogger with the Daily Telegraph newspaper in Sydney wrote about his experience driving the ISA demonstration vehicle in his on-line blog (Hildebrand 2009). A short video clip is also included in the blog. More than 112 readers commented on the blog article.

Early results from the trial were released on November 10, 2009 at the First International Conference on ISA held at the Sydney Convention Centre. The conference attracted over 165 delegates from ten countries and included five international speakers.

The conference resulted in a number of media enquiries from radio stations in Sydney and as far a field as Bundaberg in Queensland.

ABC television’s 7:30 Report followed up the conference with an in depth story on ISA technology that was aired on 25 November, 2009 (ABC 2009)

In April 2010 ABC Radio National ran a short segment about the ISA trial as part of a broader story on the Australian space industry (ABC 2010)

Communication resources.
A variety of communication resources was developed for the trial to inform the media and prospective participating drivers and organisations of the trial’s aims and objectives and how ISA technology operated.

The first multimedia communication resource developed was an animation which described in simple terms how ISA technology worked. This two minute animation was used at the launch of the project and was added to the RTA’s public web site. It was also used in presentations to business fleet managers during the recruitment process. The animation can be found on the RTA’s public web site (http://whome.rta.nsw.gov.au/roadsafety/speedandspeedcameras/isa.html, 23/08/2010).
A three and a half minute documentary was commissioned by the project team before the official launch of the project. The aim of the documentary was to explain in more detail the aims and objectives of the NSW ISA Trial and to promote the advantages for businesses and drivers of participating in the trial. A copy of the documentary can be found on the RTA’s public web site (http://whome.rta.nsw.gov.au/roadsafety/speedandspeedcameras/isa.html, 23/08/2010). Several other fact sheets (Appendices K and L) and a communication brochure (Appendix M) were developed at the beginning of the trial to assist with the recruitment of participating drivers and organisations and to provide an overview of the trial.
5. Results – Speeding behaviour

5.1 Data profile
The total number of speed data records collected and processed during the course of the trial amounted to 7.5 million.

During the trial 114 vehicles were fitted with speed data recorders. These recorders provided baseline data on driver behaviour and speed compliance, tracked speeding patterns during the period the ISA devices were in the vehicles, and provided a measure of ‘After ISA’ device driver behaviour and speed compliance. This data enabled any objective changes in driver behaviour and speed compliance to be measured.

Generally, vehicles driven by drivers that withdrew before the end of the trial were removed from the analysis. Some vehicles of drivers that withdrew towards the end of the trial, still had sufficient data to determine the driver’s speed behaviour before, during and after the ISA device, and were therefore kept in the analysis.

One hundred and six vehicles were considered to have sufficient data for analysis in the ‘Before ISA’ and ‘During ISA’ periods of the trial, and 101 of these vehicles had sufficient ‘After ISA’ data for analysis. Sufficient data either meant a driver had a sufficient number of driving days for inclusion, or a sufficient volume of driving completed in each of the data collection periods to paint a picture of their speed behaviour.

Four of the 106 vehicles had more than one driver during the course of the trial, 102 vehicles had an exclusive driver and therefore were available for a more detailed analysis exploring individual driver characteristics and their influences on speed behaviour change.

The total distance travelled by the 106 vehicles in the trial both inside and beyond the Illawarra trial area was 1.91 million kilometres. This was calculated from one month before the ISA device was installed in each vehicle and continued through to the end of the ‘After ISA’ device data collection period (two months after ISA device was de-activated).

Figure 18 shows the average kilometres travelled by trial vehicles, each week, and the count of vehicles in the trial each week. Numbers taper slightly in the vehicle count as some vehicles withdrew early (yet still had sufficient data for inclusion in the analysis).
ISA device inactivity

Drivers’ records were closely reviewed for ISA device in-activity, or days when the ISA device was not used. Inactivity may have been because the driver did not use their vehicle or because the driver chose to turn the ISA device off whilst driving.

A review of the ISA devices usage reports revealed that while the ISA devices were installed in the vehicles the devices were inactive for approximately 28 days on average. Some of the reasons for this inactivity were because drivers were on holidays or sick leave as well as because of technical issues with the devices. Other drivers also reported to the ISA trial project team that they simply forgot to turn the ISA device on after having turned it off.

A review of speed data recorder inactivity reports revealed that on average, drivers did not drive their vehicles for 20 days during the trial period when the ISA devices were installed. Figure 19 below shows unsurprisingly that these days were typically Sundays or during the Christmas holiday period.
Figure 19: Average number of days that vehicles were not driving during the trial (speed data recorder days where no activity was logged).

After taking into consideration technical reasons for some of the ISA devices to have inactive periods, there is still a discrepancy between ISA device and speed data recorder inactivity days, indicating that there were occasions when drivers chose to turn their ISA device off while driving. The attitudinal research revealed that some drivers self-reported turning the ISA device off (other than when their device wasn’t working properly): 11% turned their device off ‘on a fair proportion of trips’ and 47% turned the device off ‘just on the odd occasion’. The attitudinal research results are discussed further in Section 6.

Analysis of the speed data records showed that the level of ISA device inactivity did not have a significant influence on the overall results. However, depending upon the target market, the ISA device inactivity does highlight that it is necessary to create a need for drivers, particularly those with a desire or likelihood to speed, to keep the device switched on and thereby gain the full safety benefits that ISA technology can offer.

5.2 Percentage of driving time spent speeding

The main objective of the ISA device was to discourage drivers from speeding, therefore the first test was to determine whether there was a reduction in the percentage of time drivers spent speeding when the ISA device was installed.

A significant majority of vehicles spent less time speeding when the ISA device was installed, compared to before it was installed.

Results from measuring free speeds showed that when the ISA devices were installed in vehicles, 94 out of the 106 vehicles (89%) reduced the amount of time they spent exceeding the speed limit, compared to when the vehicles did not have an ISA device installed.

After the ISA devices were de-activated, the vehicles were more likely to speed than when the ISA device was installed.
For the period when the ISA device was de-activated, speed data was successfully collected for 101 of the 106 vehicles. Eighty seven of the 101 vehicles (86%) spent more time driving above the speed limit, after the ISA device was de-activated, than when the device was installed.

Figure 20: Change in percentage of time vehicles spent speeding ‘During ISA’ compared to ‘After ISA’
The ISA devices substantially reduced the number of vehicles travelling more than one third of their time above the speed limit. Whilst the frequency of vehicles travelling more than one third of the time above the speed limit increased when the ISA device was de-activated, drivers did not appear to return to the same percentages of time spent speeding at the start of the trial.

Figure 21: Number of vehicles by percentage of time spent exceeding the speed limit ‘Before ISA’, ‘During ISA’ and ‘After ISA’
The following figure shows the number of vehicles increasing, or reducing the percentage of time they spent speeding, when the ISA device was installed. The yellow bars indicate vehicles that reduced the percentage of time they spent speeding when the ISA device was installed, and the grey bars indicate vehicles that increased the percentage of time they spent speeding when the ISA device was installed.

As shown in Figure 22 approximately half of participating vehicles reduced the percentage of time they spent speeding in the order from 20% - 25% to 40% - 45%.

Figure 22: Number of vehicles by percentage of time increased or decreased speeding with ISA

5.3 Percentage of driving time spent speeding by 5 km/h or more

The significant majority of vehicles (84%) spent a lesser percentage of time exceeding the speed limit by 5 km/h or more when the ISA device was installed than before it was installed, showing that the ISA device was very effective at reducing the amount of time drivers spent travelling 5km/h or more above the speed limit.

When the ISA device was de-activated, 86 of the 101 vehicles (85%) spent a greater percentage of driving time exceeding the speed limit by 5 km/h or more after the ISA device was de-activated than while it had been installed.
5.4 Degree of speeding - mean

The following figures show the average degree of speeding by speed zone. For each of the speed zones represented, there is a clear reduction in the average percentage of time vehicles spent speeding up to 10 km/h over the speed limit - and up to 20 km/h over the speed limit when the ISA device was installed. These data also reflect the return to higher percentages of time speeding when the ISA device was de-activated, yet not to the same degree.

Across all vehicles in all speed zones, drivers spent around 1% of the time, speeding 20 km/h over the speed limit.
Figure 24: Average percentage of time speeding per vehicle in each speed range 'Before ISA', 'During ISA' and 'After ISA', across all speed zones.
Figure 25: Average percentage of time speeding per vehicle in each speed range ‘Before ISA’, ‘During ISA’ and ‘After ISA’; 40 km/h school zones

Figure 26: Average percentage of time speeding per vehicle in each speed range ‘Before ISA’, ‘During ISA’ and ‘After ISA’; 40 km/h zones (excluding school zones)
Figure 27: Average percentage of time speeding per vehicle in each speed range 'Before ISA', 'During ISA' and 'After ISA'; 50 km/h zones

Figure 28: Average percentage of time speeding per vehicle in each speed range 'Before ISA', 'During ISA' and 'After ISA'; 60 km/h zones
Figure 29: Average percentage of time speeding per vehicle in each speed range 'Before ISA', 'During ISA' and 'After ISA'; 80 km/h zones

Figure 30: Average percentage of time speeding per vehicle in each speed range 'Before ISA', 'During ISA' and 'After ISA'; 100 km/h school zones

5.5 Probability of speeding - median

The median probability of speeding can give a more central value than the mean, as it removes any distortion that may be present if there are unusually high or low speeds.

The median reduction in percentage probability of speeding was 31.8% when the ISA devices were installed.
**Determining probabilities**

When determining the probability of speeding, a score was assigned to each vehicle, equal to the percentage of time it was speeding. This is considered an estimate of the probability that it would be speeding in free speed conditions.

The median scores were used to determine the probability of speeding for each of the three periods of the trial.

The change in the probability of speeding in the ‘During ISA’ period of the trial was compared with the ‘Before ISA’ period. For example: if one vehicle had sped 36% of the time before the device was installed and 27% of the time during the time it was installed, then this would be a reduction of 25% in the probability of speeding, because $(36-27)/36 = 25\%$.

The overall change in probability of speeding used the median of all vehicles.

### 5.6 Median percentage of time speeding

Data from before ISA was installed showed that vehicles exceeded the speed limit for 22.7% of their total travel time. To determine the effect of ISA only ‘free’ travel times were used to remove any bias that could be caused by delays on the road network such as road works or unplanned incidents such as crashes. The median percentage of ‘free’ travel time that a vehicle was speeding reduced from 36.3% before ISA to 24.1% when ISA was operating. The median percentage of time that a vehicle was speeding increased in the ‘After ISA’ period to 30.5%. Therefore, the median percentage of time that a vehicle would speed did increase when the ISA device was de-activated, but not to the same levels as before the ISA device was installed.

The chart below shows the estimated probability of each vehicle to speed, in free speed conditions, in the three periods of the trial based on the median percentages of time speeding in free speed conditions.
Figure 31: Median percentage of time spent speeding in the ‘Before ISA’, ‘During ISA’ and ‘After ISA’ data collection periods

5.7 Percentage of speed records in each speed zone

The total number of speed data records collected and processed during the course of the trial amounted to 7.5 million.

The majority of free-speed data records occurred in the 50, 60, 80 and 100 km/h speed zones, with less occurrences of travel in the remaining speed zones. The distribution of free-speed records by speed zone is presented in Figure 32 and Table 2.
Figure 32: Percentage of speed records in each speed zone

<table>
<thead>
<tr>
<th>Speed zone</th>
<th>No. of speed records</th>
<th>% of speed records</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 km/h (school)</td>
<td>24,194</td>
<td>1.0%</td>
</tr>
<tr>
<td>40 km/h (other)</td>
<td>40,392</td>
<td>1.6%</td>
</tr>
<tr>
<td>50 km/h</td>
<td>606,737</td>
<td>24.0%</td>
</tr>
<tr>
<td>60 km/h</td>
<td>467,027</td>
<td>18.5%</td>
</tr>
<tr>
<td>70 km/h</td>
<td>229,212</td>
<td>9.1%</td>
</tr>
<tr>
<td>80 km/h</td>
<td>523,568</td>
<td>20.8%</td>
</tr>
<tr>
<td>90 km/h</td>
<td>95,443</td>
<td>3.8%</td>
</tr>
<tr>
<td>100 km/h</td>
<td>446,685</td>
<td>17.7%</td>
</tr>
<tr>
<td>110 km/h</td>
<td>89,844</td>
<td>3.6%</td>
</tr>
</tbody>
</table>

Table 2: Number and percentage of free speed records analysed in each speed zone

5.8 Speed parameters by speed limit
A reduction in speeding was observed in all speed limits when the ISA device was installed, compared with before it was installed. All mean and median speeds decreased and the percentage of vehicles speeding also decreased.
When the ISA devices were installed mean speeds decreased between 0.82 km/h (40 km/h non-school zones) and 3.22 km/h in 110 km/h speed zones. Because other Advisory ISA trials held in Australia and internationally had differing objectives and methodologies the results are not directly comparable, however these mean speed decreases are in line with other field trial results in the CASR report, which showed overall mean speed reductions of between 0.6 km/h and 6 km/h.
The lowest reductions in mean speed shown in the CASR report typically occurred in low speed zones and the larger reductions occurred in high speed zones (Doecke and Woolley, 2010).

The mean and median km/h decreases in speed by speed zone are presented in Table 3.

<table>
<thead>
<tr>
<th>Speed limit</th>
<th>Number of vehicles</th>
<th>Mean</th>
<th>Median</th>
<th>Percentage speeding less (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 km/h</td>
<td>90</td>
<td>1.53</td>
<td>1.79</td>
<td>71</td>
</tr>
<tr>
<td>40 km/h (school zone)</td>
<td>90</td>
<td>1.93</td>
<td>1.77</td>
<td>74</td>
</tr>
<tr>
<td>40 km/h (other)</td>
<td>82</td>
<td>0.82</td>
<td>1.27</td>
<td>57</td>
</tr>
<tr>
<td>50 km/h</td>
<td>106</td>
<td>0.91</td>
<td>1.00</td>
<td>91</td>
</tr>
<tr>
<td>60 km/h</td>
<td>105</td>
<td>1.07</td>
<td>1.27</td>
<td>84</td>
</tr>
<tr>
<td>70 km/h</td>
<td>90</td>
<td>1.84</td>
<td>1.68</td>
<td>88</td>
</tr>
<tr>
<td>80 km/h</td>
<td>104</td>
<td>1.62</td>
<td>1.40</td>
<td>81</td>
</tr>
<tr>
<td>90 km/h</td>
<td>81</td>
<td>2.34</td>
<td>2.21</td>
<td>78</td>
</tr>
<tr>
<td>100 km/h</td>
<td>94</td>
<td>1.87</td>
<td>1.90</td>
<td>85</td>
</tr>
<tr>
<td>110 km/h</td>
<td>47</td>
<td>3.22</td>
<td>2.89</td>
<td>78</td>
</tr>
</tbody>
</table>

Table 3: Number of vehicles, mean and median decrease in speed, percentage of vehicles speeding less when ISA was installed compared to before ISA was installed by speed zone

In Table 3 above:
- A number of the vehicles spent little or no time in a particular speed zone. A vehicle was not included in the analysis of a particular speed limit, unless it travelled at free-speed for at least five minutes in total in the ‘Before ISA’ period and five minutes in the ‘During ISA’ period, at a speed of at least 75% of the speed limit. A vehicle was required to travel for a total of one minute, for at least 75% of the speed limit in a 40 km/h school speed zone.
- The column headed ‘Number of vehicles’ represents the number of vehicles with at least five minutes of free-speed in that speed limit, or one minute in 40km/h school speed zone.
- For each vehicle, the mean speed before the ISA device was installed was calculated and the mean speed during the ISA device was installed was calculated. The difference between each was then found. This gave a score for each vehicle. A positive value meant the mean speed was reduced.
- The values in the ‘Mean’ column represent the change in vehicle scores, averaged over vehicles, for each speed zone.
- The values in the ‘Median’ column represent the medians of the vehicle scores, for each speed zone.
- The ‘Percentage speeding less’ column represents the percentage of the vehicles where the percentage of time speeding, in that speed limit, was less when the ISA device was installed than before the device was installed. In the 110 km/h speed limit, two of the 47 vehicles analysed did not speed at any time and so were not included in the ‘percentage speeding less’ calculations.
Determining mean speeds

The mean and median speeds by speed zone were calculated after determining the mean and median speeds for each vehicle, before determining the mean and median for the sample as a whole.

In determining the reduction in mean and median speed, the change in mean and median speed was determined for each vehicle before determining the mean and median for the sample as a whole, therefore each vehicle had equal standing in the final result.

School zones

NSW school zones operate on gazetted school days and most school zones operate between the hours of 8:00 am to 9:30 am, and 2:30 pm to 4:00 pm on week days. Of the time vehicles spent travelling in a 40 km/h speed zone, 38% was in a school zone during school zone operating times.

For a vehicle to be included in the analysis of speeding behaviour in 40 km/h school zones it had to travel for at least one minute in the school zone. This is a much shorter criterion than that used for other speed zones (which was five minutes). Unlike other speed zones, if a vehicle travels in a 40 km/h school speed zone for a total of one minute, for at least 75% of the speed limit (that is 30 km/h) this could represent a number of independent driving occasions.

Over 74% of vehicles (67 of the 90) who met the criteria for inclusion in the analysis sped for a lesser percentage of driving time in school zones in the ‘During ISA’ period.

The reduction in the probability of speeding in school zones was also calculated for each vehicle. The mean reduction was 15% and the median reduction was 22%. The decrease in the probability of speeding in 40 km/h school zones was larger than for 40 km/h zones generally, which included school zones.

5.9 Driver characteristics and changes in speed behaviour

Driver characteristics such as age group and gender were analysed for 102 drivers of the 106 vehicles in the trial, as 102 vehicles had a driver who was exclusive to that vehicle (defined as being the driver of that vehicle for 80% or more of the time).

Each exclusive driver’s demographic information and responses to attitudinal research surveys were linked to their vehicle’s speed data. Analysis was then performed to explore whether the effect of the ISA device was influenced by these variables.

The statistical power to detect effects in these analyses is limited because of two features of the other results.

1. The ISA device’s effect on speeding behaviour was strong for a large majority of drivers, therefore the range is limited.

2. Most of the relevant drivers fit into one category of the variable being investigated. For example, 86 of the 102 drivers attended training before the ISA device was installed, and 90 of the 102 drivers reduced the percentage of time they spent speeding, so the moderating effect of the driver having attended training on the ISA device effect has to be very large to be statistically significant.
It is encouraging that the ISA device’s main effect on speeding behaviour is large; however this makes it less likely that the effects of the moderating variables can be detected.

5.9.1 Gender

Percentage of time spent speeding

ISA technology was equally effective at reducing the percentage of time males and females spent speeding, when the ISA device was installed compared to before the device was installed (88% males, 89% females).

![Bar chart showing percentage of drivers reduced time spent speeding by gender](image)

Figure 35: Percentage of drivers reduced time spent speeding when ISA device installed by gender

<table>
<thead>
<tr>
<th></th>
<th>Reduced</th>
<th>Increased</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>51</td>
<td>7</td>
<td>58</td>
<td>88</td>
</tr>
<tr>
<td>Females</td>
<td>39</td>
<td>5</td>
<td>44</td>
<td>88</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>12</td>
<td>102</td>
<td>88</td>
</tr>
</tbody>
</table>

Table 4: Number of drivers by change in percentage of time spent speeding and percentage of drivers reduced time spent speeding by gender

Fisher’s exact test was employed to examine gender differences. The difference between males and females was not statistically significant at the .05 level.
Probability of speeding – mean and median

The impact of ISA on reducing the probability of speeding was larger for females than males (see Figure 36 and Table 5), however this difference was not statistically significant.

![Figure 36: Reduction in percentage probability of speeding when ISA device installed- mean and median; by gender](image)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (n=44)</td>
<td>36%</td>
<td>37%</td>
</tr>
<tr>
<td>Male (n=58)</td>
<td>28%</td>
<td>30%</td>
</tr>
<tr>
<td>Total (n=102)</td>
<td>32%</td>
<td>32%</td>
</tr>
</tbody>
</table>

Table 5: Reduction in percentage probability of speeding – mean and median; by gender

The difference between males and females was not statistically significant at the .05 level.

Working with reduced probabilities, the difference between the means was not statistically significant (t-test; p = 0.14). The non-parametric tests had the same result (medians test, p = 0.23; Mann-Whitney, p = 0.14).

5.9.2 Age

Younger drivers (25 years of age or less) were significantly less likely to reduce the percentage of time they spent speeding when the ISA device was installed than drivers over the age of 25 years (Fisher’s exact test gave p < 0.04 (two-sided)). Although less than a third of the drivers were in the youngest age group, more than half of the drivers who did not speed less were in that youngest age group.

When the ISA devices were installed, 77% of drivers aged 25 years or less reduced the amount of time they spent speeding, compared to 93% of drivers over 25 years of age.
Self reported responses from the attitudinal research, discussed further in Section 6, revealed that drivers aged 25 years or less were also more likely to admit turning their ISA device off during the trial, which would obviously reduce its impact on speeding behaviour.

![Figure 37: Percentage of drivers reduced time spent speeding when ISA device installed by age group](image)

<table>
<thead>
<tr>
<th>Age group</th>
<th>Reduced</th>
<th>Increased</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 or less</td>
<td>23</td>
<td>7</td>
<td>30</td>
<td>77</td>
</tr>
<tr>
<td>over 25 years</td>
<td>67</td>
<td>5</td>
<td>72</td>
<td>93</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>12</td>
<td>102</td>
<td>88</td>
</tr>
</tbody>
</table>

Table 6: Number of drivers by change in percentage of time spent speeding and percentage of drivers reduced time spent speeding by age group

The dependent variable was whether the driver spent a smaller percentage of driving time speeding in the ‘During ISA’ period, compared with the ‘Before ISA’ period, using the criterion of speed being 75% of the speed limit. The difference between the means is substantial and statistically significant (t-test; p= 0.001).

The ISA device also had a much smaller effect on the probability of speeding of younger drivers aged 25 years or less than drivers aged over 25 years. The mean probability of speeding of drivers aged 25 years or less was 18%, compared to 37% for drivers aged over 25 years. This difference between the mean probabilities of speeding was substantial and statistically significant.
Figure 38: Reduction in percentage probability of speeding when ISA device installed – mean and median; by age group

Table 7: Reduction in probability of speeding drivers by age group

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 years or under (n=30)</td>
<td>18%</td>
<td>20%</td>
</tr>
<tr>
<td>Over 25 years (n=72)</td>
<td>37%</td>
<td>36%</td>
</tr>
<tr>
<td>Total (n=102)</td>
<td>32%</td>
<td>32%</td>
</tr>
</tbody>
</table>

Results of the NSW Intelligent Speed Adaptation Trial
5.9.3 Fleet versus private drivers

Of the 102 exclusive drivers, 40 were fleet drivers. The ISA device was equally effective in reducing the percentage of time spent speeding amongst fleet drivers (93%) and private drivers (85%). The difference between the two groups was not found to be statistically significant (Fisher’s exact test; p=0.22, one-sided, p = 0.36, two-sided).

Figure 39: Percentage of drivers reduced time spent speeding when ISA device installed; Fleet versus Private

<table>
<thead>
<tr>
<th></th>
<th>Reduced</th>
<th>Increased</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleet</td>
<td>37</td>
<td>3</td>
<td>40</td>
<td>93</td>
</tr>
<tr>
<td>Private</td>
<td>53</td>
<td>9</td>
<td>62</td>
<td>85</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>12</td>
<td>102</td>
<td>88</td>
</tr>
</tbody>
</table>

Table 8: Number of drivers by change in percentage of time spent speeding and percentage of drivers reduced time spent speeding when ISA device installed; fleet versus private driver

Fleet and private drivers were found to have no difference in their reduction in speeding or probability of speeding.
There was also no statistically significant difference between fleet and private drivers in their probability of reducing speeding. The means are the same, and the medians did not differ statistically significantly. Medians test; p = 0.42; Mann-Whitney; p = 0.66).

5.9.4 Drivers who regularly switched off their ISA device

Drivers were asked the following question in the Stage 2 online questionnaire:

Question: “How often have you chosen to turn your ISA device off? Please exclude occasions on which the device was not working properly. [options presented from ‘never’, just on the odd occasion’, ‘on a fair proportion of trips’ to ‘every trip’].

Ten of the 100 (10%) exclusive drivers, who answered this question, reported that they turned their device off ‘on a fair proportion of trips’, these drivers have been classified as ‘turning off the ISA device regularly’. No one self reported turning their device off on ‘every trip’.

Eight out of 10 (80%) of the drivers classified as ‘turning off the ISA device regularly’ reduced the percentage of time they spent speeding, compared to 89% of other drivers, although the difference was not statistically significant (Fisher’s exact test; p = 0.34).
Figure 41: Percentage of drivers reduced time spent speeding with ISA device installed: self report ‘Turn the device off regularly’

<table>
<thead>
<tr>
<th>Turn device off regularly</th>
<th>Reduced (Number)</th>
<th>Increased (Number)</th>
<th>Total number of drivers</th>
<th>% Reduced time spent speeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>8</td>
<td>2</td>
<td>10</td>
<td>80</td>
</tr>
<tr>
<td>No</td>
<td>80</td>
<td>10</td>
<td>90</td>
<td>89</td>
</tr>
<tr>
<td>Total</td>
<td>88</td>
<td>12</td>
<td>100</td>
<td>88</td>
</tr>
</tbody>
</table>

Table 10: Number of drivers by change in percentage of time spent speeding and percentage of drivers reduced time spent speeding; driver self-report ‘turn the device off regularly’

Those ten drivers who self reported ‘turning off the ISA device regularly’ were significantly less likely to decrease their probability of speeding than other drivers (mean 18% versus 34%). The variance for the yes-group was half that of the no-group. The t-test was undertaken without the assumption of equal variances, and the difference was found to be statistically significant (p=0.03).

Although the group was small, those who self reported that they turned the ISA device off regularly were not surprisingly much less influenced by it.
Turn device off regularly

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (n=10)</td>
<td>18%</td>
<td>16%</td>
</tr>
<tr>
<td>No (n=90)</td>
<td>34%</td>
<td>34%</td>
</tr>
<tr>
<td>Total (n=100)</td>
<td>32%</td>
<td>32%</td>
</tr>
</tbody>
</table>

Table 11: Reduction in probability of speeding; self-report ‘turn device off regularly’

Eight of the ten drivers (80%) who self reported ‘turning the device off regularly’ was aged 25 years or under and one was in the 26 to 29 age group. These young drivers were less likely to decrease their probability of speeding. So there is a large overlap between the two groups.

5.9.5 Self reported behaviour change

Drivers were asked in the Stage 3 online survey how they felt they drove with the ISA device in their vehicle, compared to how they drove prior to the trial.

Question: ‘Which of the following is most true? Please answer in relation to how you drove with the ISA technology active in your vehicle, compared to how you drove prior to the trial’ [‘I drove no differently’, ‘I drove considerably slower’, ‘I drove a bit slower’, ‘I drove faster’]

As discussed further in Section 6, it appears that some drivers prior to experiencing ISA technology were unaware they sped, or they underestimated the degree to which they did speed. The ISA device was effective at advising drivers of the speed limit at all times and when they were speeding.

The changes demonstrated in the table below suggest that there is some congruence between the actual reductions in time spent speeding and the self reported behaviour, which suggests that
the drivers’ belief of how they were driving was correlated with their actual driving behaviour. The changes however were not statistically significant.

<table>
<thead>
<tr>
<th>Response to question</th>
<th>Reduced</th>
<th>Increased</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Considerably slower&quot;</td>
<td>11</td>
<td>0</td>
<td>11</td>
<td>100</td>
</tr>
<tr>
<td>&quot;Bit slower&quot;</td>
<td>51</td>
<td>9</td>
<td>60</td>
<td>85</td>
</tr>
<tr>
<td>&quot;No difference&quot;</td>
<td>10</td>
<td>3</td>
<td>13</td>
<td>77</td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
<td>12</td>
<td>84</td>
<td>86</td>
</tr>
</tbody>
</table>

Table 12: Number of drivers by change in percentage of time spent speeding (actual behaviour) and percentage of drivers reduced time spent speeding; self reported speed behaviour

A logistic regression was not statistically significant (p = 0.12). The limited range of answers and the limited differentiation in speeding behaviours (using this measure) made it less likely that a statistical relationship could be established.

5.9.6 Comfort with technology

In the Driver Commencement questionnaire, which the drivers completed when they were accepted into the trial, the drivers self reported how comfortable they felt adapting to new technology. This question was asked of drivers to determine whether those who self reported that they felt more comfortable adapting to new technology may be more accepting of ISA and/or more influenced by it.

Question: 'On a scale of 1 to 5 where 1 is not competent at all and 5 is extremely competent, how would you rate your competency with adapting to new technology (eg. new software on your computer; electronic gadgets at home, programming a new tv. figuring out a new mobile phone etc)'

Of the 100 exclusive drivers who answered this question, 45 drivers self reported being ‘extremely comfortable’ with adapting to new technology. These drivers were more likely to decrease the percentage of time they spent speeding than other drivers (91% decrease versus 85% decrease), however this decrease was not statistically significant.
Figure 43: Percentage of drivers reduced time spent speeding with ISA device installed; self reported as ‘extremely comfortable adapting to new technology’

The difference was not statistically significant (Fisher’s exact test; p=0.29, one sided, p=0.54, two sided).

There was no statistical difference between the mean or median probability of speed between drivers who self reported being extremely comfortable adapting to new technology and other drivers which indicates that the ISA device was as effective with drivers who were not ‘extremely’ comfortable adapting to new technology as with those who were.

<table>
<thead>
<tr>
<th></th>
<th>Drivers change in percentage of time spent speeding (Number)</th>
<th>Reduced time spent speeding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Extremely comfortable adapting to new technology</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Reduced</td>
<td>Increased</td>
</tr>
<tr>
<td></td>
<td>41</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Reduced</td>
<td>Increased</td>
</tr>
<tr>
<td></td>
<td>47</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>88</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>88</td>
<td></td>
</tr>
</tbody>
</table>

Table 13: Number of drivers by change in percentage of time spent speeding and percentage of drivers reduced time spent speeding; self report ‘extremely comfortable adapting to new technology’
5.9.7 Deliberate speeder

A participant was categorised as a ‘deliberate speeder’ if they self reported in the Stage 1 online questionnaire that they intentionally speed (an agreement rating of >5 on an 11 point scale) in the following circumstances:

- “I tend to drive faster than the speed limit on roads with which I’m familiar”
- “I feel comfortable driving faster than the speed limit because I know I’m still in complete control of my car”
- “I tend to drive faster than the speed limit on the open road where I can see well in front of me”
- “I feel comfortable driving faster than the speed limit because I know I’m an experienced driver”
- “I tend to drive faster than the speed limit when I’m running late”
- “I tend to drive faster than the speed limit when I know it’s unlikely I’ll get caught”

There was no statistical difference between the means (t test; p > 0.75) or the medians (medians test; p = 0.32; Mann-Whitney; p= 0.50).

Figure 44: Reduction in percentage probability of speeding with ISA device installed; self report extremely comfortable adapting to new technology
Table 14: Number of drivers by change in percentage of time spent speeding and percentage of drivers reduced time spent speeding: deliberate speeder

<table>
<thead>
<tr>
<th></th>
<th>Drivers change in percentage of time spent speeding (Number)</th>
<th>Reduced time spent speeding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reduced</td>
<td>Increased</td>
</tr>
<tr>
<td>Deliberate speeders</td>
<td>Yes</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>72</td>
</tr>
<tr>
<td>Total</td>
<td>82</td>
<td>12</td>
</tr>
</tbody>
</table>

The effects are the same for both groups. The percentage of drivers who reduced their time speeding was lower for the ‘deliberate speeders’ group (87%) than for other drivers (91%), however this difference was not statistically significant (Fisher’s exact test; p=1.00, two-sided). This demonstrates that the ISA device was as effective in reducing the percentage of time ‘deliberate speeders’ spent speeding as those who were not classified as ‘deliberate speeders’.

The ISA device was also just as effective with drivers classified as ‘deliberate speeders’ as with other drivers, at reducing the mean and median probability of speeding, as there was no significant difference between the two groups of drivers.
Figure 46: Reduction in the percentage probability of speeding with ISA device installed; drivers classified as ‘deliberate speeders’ and ‘not deliberate speeders’

<table>
<thead>
<tr>
<th>Deliberate speeders</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (n=11)</td>
<td>32%</td>
<td>35%</td>
</tr>
<tr>
<td>No (n=83)</td>
<td>32%</td>
<td>32%</td>
</tr>
<tr>
<td>Total (n=94)</td>
<td>32%</td>
<td>33%</td>
</tr>
</tbody>
</table>

Table 15: Reduction in percentage probability of speeding; drivers classified as ‘deliberate speeders’ and ‘not deliberate speeders’

The means are the same. The medians were not statistically significantly different (medians test; \( p = 0.34 \); Mann-Whitney; \( p = 0.89 \)).

5.9.8 Self report speed when unlikely to be caught

A participant was included in this category if they self reported in the Stage 1 online questionnaire that they drive faster than the speed limit (an agreement rating of >5 on an 11 point scale) when ‘it is unlikely I’d get caught’.

Of the 94 exclusive drivers who answered the relevant question, 42 were classified as likely to speed when they felt it was unlikely they would be caught.

During the period when the ISA device was installed in their vehicle there was no statistically significant difference between the changes in percentage of time those classified as ‘speeding when unlikely to be caught’ spent speeding (88%) compared to other drivers (87%).
Figure 47: Percentage of drivers reduced time spent speeding when ISA device installed; self report they 'speed when unlikely to be caught'

Table 16: Number of drivers by change in percentage of time spent speeding and percentage of drivers reduced time spent speeding; self report they 'speed when unlikely to be caught'

<table>
<thead>
<tr>
<th>Self report speed when 'unlikely to be caught'</th>
<th>Reduced</th>
<th>Increased</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>37</td>
<td>5</td>
<td>42</td>
<td>88</td>
</tr>
<tr>
<td>No</td>
<td>45</td>
<td>7</td>
<td>52</td>
<td>87</td>
</tr>
<tr>
<td>Total</td>
<td>82</td>
<td>12</td>
<td>94</td>
<td>87</td>
</tr>
</tbody>
</table>

The difference was not statistically significant (Fisher's exact test; p=0.54, one-sided, p = 1, two-sided).
Levene's test indicated that the variances of the two groups were not equal. In any case, with or without the equal variance assumption, the difference between the means was not statistically significant (t-test, p > 0.1).

On the other hand, both the medians test (p < 0.04) and the Mann-Whitney (p < 0.04) indicated a statistically significant result. The Mann-Whitney test relates to broader elements of the distribution, which is a concern because of the unequal variances. Nevertheless, closer examination of the data, and the differences in medians, indicates that this was more than a difference of variance. This indicates that those drivers classified as agreeing they are likely to speed when it is 'unlikely they would be caught', may have been less likely to reduce their probability of speeding (medians).

There is a possible relationship with the 25 years or less age group. As shown below the results for this driver category may be influenced by the number of drivers aged 25 years or less that fall into this category. As demonstrated in earlier sections drivers aged 25 years or less have been less influenced by the ISA device.
Also, 60% of drivers aged 25 years or under agreed they are likely to speed when it is unlikely they will be caught, compared to 39% of drivers aged over 25 years.

This does not meet conventional levels of statistical significance (Fisher exact test; $p = 0.06$). Nevertheless, it is of interest because of the other findings relating to young drivers in the ISA trial.

A further interesting finding is the relationship between answers to this question and the likelihood of speeding as those who agree that they are more likely to speed when they are unlikely to get caught, spend more of their driving time speeding. The following chart shows the percentage of time speeding, averaged over vehicles, for the two groups, in the ‘Before ISA’, ‘During ISA’ and ‘After ISA’ periods of the trial.

When the ISA device was installed both groups reduced the mean percentage of time they spent speeding. In the chart and table below it can be seen that the mean percentage of time spent speeding in each data collection period was higher for those who agreed they are likely to speed when they are unlikely to be caught, however these differences are not statistically significant.

![Figure 49: Percentage of drivers reduced time spent speeding in 3 data collection periods; self report 'speed when unlikely to be caught']
Table 18: Mean percentage of time speeding in each period; identified as ‘speed when unlikely to be caught’

<table>
<thead>
<tr>
<th>Self report speed when ‘unlikely to be caught’</th>
<th>Before</th>
<th>During</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>42%</td>
<td>30%</td>
<td>36%</td>
</tr>
<tr>
<td>No</td>
<td>31%</td>
<td>20%</td>
<td>26%</td>
</tr>
</tbody>
</table>

5.9.9 Attended ISA device training session

Before the Advisory ISA devices were installed in drivers’ vehicles, all drivers and fleet managers were encouraged to attend a face to face training session. Over 90% of drivers chose to attend the training session, where they were given a user manual for the ISA device.

Drivers were very likely to reduce the percentage of time spent speeding, even if they did not attend a training session prior to having an ISA device installed in their vehicle.

Whilst the chart below shows that those who did not attend training did not reduce their time spent speeding (87%) to the same degree as those who had attended training (91%), the difference was not statistically significant (Fisher’s exact test; p=0.28, one-sided, p = 0.40, two-sided). This is encouraging as it suggests that the ISA device was no less effective on the speeds of those who were unable or chose not to attend a face-to-face training session, as those who did attend a training session.

Figure 50: Percentage of drivers reduced time spent speeding when ISA device installed; attended ISA device training session
<table>
<thead>
<tr>
<th>Attended ISA device training</th>
<th>Decrement</th>
<th>Increment</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>77</td>
<td>9</td>
<td>86</td>
<td>90</td>
</tr>
<tr>
<td>No</td>
<td>13</td>
<td>3</td>
<td>16</td>
<td>81</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>12</td>
<td>102</td>
<td>88</td>
</tr>
</tbody>
</table>

Table 19: Number of drivers by change in percentage of time spent speeding and percentage of drivers reduced time spent speeding - whether the driver attended ISA device training session

Figure 51: Reduction in percentage probability of speeding when ISA device installed; those who attended ISA device training session and those who did not attend ISA device training session

<table>
<thead>
<tr>
<th>Attended ISA device training session</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (n=86)</td>
<td>32%</td>
<td>32%</td>
</tr>
<tr>
<td>No (n=16)</td>
<td>27%</td>
<td>32%</td>
</tr>
<tr>
<td>Total (n=102)</td>
<td>32%</td>
<td>32%</td>
</tr>
</tbody>
</table>

Table 20: Reduction in percentage probability of speeding when ISA installed; those who attended ISA device training session and those who did not attend ISA device training session
The difference between the means was not statistically significant (t-test; \( p = 0.49 \)).

### 5.9.10 Repeat speeder

The trial team defined a repeat speeder as a driver who was speeding at least 50% of driving time in the ‘Before ISA’ period (free travel speeds only analysed). Nineteen drivers were classified as repeat speeders.

It is important to note that because this group was defined as those drivers with the highest percentage of time speeding in the ‘Before ISA’ period, they had an increased probability of reducing their percentage of time speeding (as an example of regression to the mean). 95% of repeat speeders reduced the percentage of time they spent speeding when the ISA device was installed, compared to 87% of other drivers.

![Figure 52: Percentage of drivers reduced time spent speeding when ISA device installed; repeat speeder and not repeat speeder](image-url)
Table 21: Number of drivers by change in percentage of time spent speeding and percentage of drivers reduced time spent speeding; repeat speeder and not repeat speeder

As can be seen in Figure 53 and Table 22 below, those classified as repeat speeders were just as likely to reduce their probability of speeding when the ISA device was installed in their vehicles as other drivers.

Figure 53: Reduction in percentage probability of speeding; repeat speeder and not repeat speeder
<table>
<thead>
<tr>
<th>Repeat speeder</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (n=19)</td>
<td>37%</td>
<td>32%</td>
</tr>
<tr>
<td>No (n=83)</td>
<td>31%</td>
<td>31%</td>
</tr>
<tr>
<td>Total (n=102)</td>
<td>32%</td>
<td>32%</td>
</tr>
</tbody>
</table>

Table 22: Reduction in percentage probability of speeding; repeat speeder and not repeat speeder

5.9.11 Speed related offences

Of the 102 vehicles with exclusive drivers, 69 had no speeding offences recorded. Of the remaining 33 who had speeding offences, 22 had one offence, eight had two offences, and three had three offences.

Because of the small number of offences, the analysis was undertaken with the speeding offences variable being two-valued: some offences or none. The effect was not statistically significant (Fisher’s exact test, one-tailed; p > 0.3).

The effect on the reduction in probability of speeding was also considered, again with offences as a two-valued variable.

The mean and median decreases in probability of speeding for driving with some speeding offences was 30%, compared to a 34% reduction in mean and median probability of speeding amongst drivers with no speeding offences in the last 5 years. This difference was not statistically significant.
The difference between the group means was not statistically significant \((p = 0.2)\). Although the distributions are acceptably symmetrical and Levene’s test did not show a significant difference between the variances of the two groups, there was a large negative outlier in the no-offences group. Therefore, non-parametric tests were also attempted, but the differences remained not statistically significant either (medians test, \(p = 0.29\); Mann-Whitney, \(p = 0.16\)).

5.10 Mean, median, 85th percentile speed at each speed limit

The mean and median calculations in this section differ slightly to those detailed in Section 5.8 (Speed parameters by speed limit). The former result considered each vehicle separately and was calculated after measuring the change in means and medians for each vehicle, before determining the mean and median for the sample as a whole.
The following analysis considers speeds in each speed zone and in each data collection period of the trial, the mean speed, the median speed and the 85th percentile speed. Using the mean speed as an example, these results are based on taking the mean over all the time driven by all the vehicles (at each speed limit). Therefore the mean weights each vehicle’s mean speed by the amount of time it is driven. The estimate of the mean is influenced by how much each vehicle is driven and assumes that the same relationship between total amount of time driven and choice of speed would apply in the broader population. These results are effectively weighted toward vehicles in the sample with more driving time than others.

These values were calculated after applying the filter of the vehicle travelling at least 75% of the speed limit.

The general effect of the ISA devices was to reduce the amount of speeding across all speed zones. Speeding decreased in the ‘During ISA’ period then rose in the ‘After ISA’ period, but not to the level measured in the ‘Before ISA’ period. There seems to be some ‘carryover’ in terms of speeding being less in the ‘After ISA’ period than the ‘Before ISA’ period. Section 6 discusses whether drivers believed there had been any ‘learning effect’ from having used the ISA device for three months. Some drivers came to rely on the device to inform them of the speed limit, whilst many drivers commented that they were now more aware of the fact that they do speed and that this knowledge alone may have impacted their speeding behaviour.

![Figure 55: Mean speed by speed zone in the ‘Before ISA’, ‘During ISA’ and ‘After ISA’ periods](image-url)
### Table 24: Mean speed (km/h), and change in mean speed (km/h), in the 'Before ISA', 'During ISA' and 'After ISA' periods

<table>
<thead>
<tr>
<th>Speed zone</th>
<th>Before ISA</th>
<th>During ISA</th>
<th>After ISA</th>
<th>Before-During</th>
<th>After-During</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 School zone</td>
<td>41</td>
<td>39</td>
<td>41</td>
<td>1.8</td>
<td>1.2</td>
</tr>
<tr>
<td>40 Other</td>
<td>41</td>
<td>40</td>
<td>41</td>
<td>1.1</td>
<td>0.3</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>49</td>
<td>49</td>
<td>1.1</td>
<td>0.8</td>
</tr>
<tr>
<td>60</td>
<td>57</td>
<td>56</td>
<td>56</td>
<td>1.2</td>
<td>0.4</td>
</tr>
<tr>
<td>70</td>
<td>67</td>
<td>65</td>
<td>66</td>
<td>1.7</td>
<td>0.9</td>
</tr>
<tr>
<td>80</td>
<td>77</td>
<td>76</td>
<td>77</td>
<td>1.3</td>
<td>0.9</td>
</tr>
<tr>
<td>90</td>
<td>87</td>
<td>85</td>
<td>86</td>
<td>1.6</td>
<td>0.5</td>
</tr>
<tr>
<td>100</td>
<td>97</td>
<td>95</td>
<td>96</td>
<td>2.0</td>
<td>0.7</td>
</tr>
<tr>
<td>110</td>
<td>108</td>
<td>106</td>
<td>106</td>
<td>2.8</td>
<td>0.9</td>
</tr>
</tbody>
</table>

**Figure 56: Median speeds by speed zone in the ‘Before ISA’, ‘During ISA’, and ‘After ISA’ periods**

![Median speeds by speed zone](chart.png)
<table>
<thead>
<tr>
<th>Speed zone</th>
<th>Before ISA</th>
<th>During ISA</th>
<th>After ISA</th>
<th>Before-During</th>
<th>After-During</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 School zone</td>
<td>40</td>
<td>39</td>
<td>39</td>
<td>1.2</td>
<td>0.0</td>
</tr>
<tr>
<td>40 Other</td>
<td>41</td>
<td>39</td>
<td>39</td>
<td>1.9</td>
<td>0.0</td>
</tr>
<tr>
<td>50</td>
<td>49</td>
<td>47</td>
<td>48</td>
<td>1.9</td>
<td>1.6</td>
</tr>
<tr>
<td>60</td>
<td>56</td>
<td>55</td>
<td>55</td>
<td>1.6</td>
<td>0.0</td>
</tr>
<tr>
<td>70</td>
<td>66</td>
<td>64</td>
<td>66</td>
<td>2.1</td>
<td>1.6</td>
</tr>
<tr>
<td>80</td>
<td>77</td>
<td>76</td>
<td>76</td>
<td>1.4</td>
<td>0.0</td>
</tr>
<tr>
<td>90</td>
<td>86</td>
<td>85</td>
<td>85</td>
<td>1.0</td>
<td>0.0</td>
</tr>
<tr>
<td>100</td>
<td>97</td>
<td>95</td>
<td>97</td>
<td>2.5</td>
<td>1.6</td>
</tr>
<tr>
<td>110</td>
<td>109</td>
<td>106</td>
<td>108</td>
<td>3.1</td>
<td>1.6</td>
</tr>
</tbody>
</table>

Table 25: Median speed (km/h), and change in median speed, in the ‘Before ISA’, ‘During ISA’ and ‘After ISA’ periods.

Figure 57: 85th percentile speeds by speed zone in the ‘Before ISA’, ‘During ISA’ and ‘After ISA’ periods.
Table 26: 85th percentile speed (km/h), and change in 85th percentile speed, in the ‘Before ISA’, ‘During ISA’ and ‘After ISA’ periods of the trial

<table>
<thead>
<tr>
<th>Speed zone</th>
<th>Before ISA</th>
<th>During ISA</th>
<th>After ISA</th>
<th>Before-During</th>
<th>After-During</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 School zone</td>
<td>49</td>
<td>47</td>
<td>48</td>
<td>2.0</td>
<td>1.6</td>
</tr>
<tr>
<td>40 Other</td>
<td>50</td>
<td>48</td>
<td>48</td>
<td>1.6</td>
<td>0.0</td>
</tr>
<tr>
<td>50</td>
<td>58</td>
<td>56</td>
<td>56</td>
<td>1.6</td>
<td>0.0</td>
</tr>
<tr>
<td>60</td>
<td>65</td>
<td>63</td>
<td>64</td>
<td>1.9</td>
<td>1.6</td>
</tr>
<tr>
<td>70</td>
<td>74</td>
<td>71</td>
<td>72</td>
<td>3.2</td>
<td>1.6</td>
</tr>
<tr>
<td>80</td>
<td>85</td>
<td>84</td>
<td>85</td>
<td>1.7</td>
<td>1.6</td>
</tr>
<tr>
<td>90</td>
<td>85</td>
<td>84</td>
<td>85</td>
<td>1.7</td>
<td>1.6</td>
</tr>
<tr>
<td>100</td>
<td>106</td>
<td>101</td>
<td>103</td>
<td>4.2</td>
<td>1.6</td>
</tr>
<tr>
<td>110</td>
<td>116</td>
<td>113</td>
<td>114</td>
<td>3.3</td>
<td>1.6</td>
</tr>
</tbody>
</table>

Table 26: 85th percentile speed (km/h), and change in 85th percentile speed, in the ‘Before ISA’, ‘During ISA’ and ‘After ISA’ periods of the trial

5.1.1 Estimated casualty reductions in the Illawarra

Nilsson’s power model (Elvik, 2009; Nilsson, 1982) was used to calculate the theoretical percentage change in casualty numbers based on the change in mean vehicle speeds when the Advisory ISA devices were installed in the trial vehicles. The calculated percentage change was then applied to historical road toll figures to estimate the casualty reductions for the state of NSW.

Table 27 presents weighted mean speed data for vehicles included in the ISA speed analysis, by speed limit, for the ‘Before ISA’ and ‘During ISA’ data collection periods (as presented in Section 5.10). These weighted means take into account differential vehicle driving time observed within each speed limit. The analysis identified an overall weighted mean travel speed reduction from 69.4km/h ‘Before ISA’ to 67.9km/h ‘During ISA’.

Table 27: Weighted mean travel speed of vehicles, by speed limit and data collection period
Nilsson’s power model to calculate casualty benefits from changes in mean speeds

According to Nilsson (1982), there is an approximate fourth power relationship between changes in mean driving speeds and changes in road fatalities. Elvik, Christensen & Amundsen (2004) summarise the relationship as follows: if mean driving speed drops from 100km/h to 90km/h, the ratio of “After ISA’ driving speed/’Before ISA’ driving speed” (0.9) raised to the power of 4 (0.656) equates to an estimated reduction in fatalities of 0.656 times the initial number of fatalities; hence an estimated reduction of 34.4%.

Logically, power estimates employed to estimate total casualty reductions are lower than those employed to estimate fatality reductions, given the decrease in outcome severity. In recent meta-analyses of Nilsson’s power model (Cameron & Elvik, 2008; Elvik, 2009), separate power estimates have been calculated for fatalities and injuries, and for urban and rural road casualties, based on data from a range of relevant evaluation studies. According to the most recent analysis by Elvik (2009), the power estimate for fatalities on urban roads is 3.87. For injuries, the power estimate for unspecified injuries on all road types was employed (2.67), given that no estimate for unspecified injuries was provided specifically for urban roads.

Nilsson’s relationship is not the only method that can be used to estimate casualty reductions from mean travel speed changes, although it has been used often in the past and provides a more conservative estimate of change.

Estimated casualty reductions

By employing Elvik’s (2009) power estimate for fatalities (3.87) and injuries (2.67) to a reduction in mean travel from 69.4km/h ‘Before ISA’ to 67.9km/h ‘During ISA’ (0.9775), it is estimated there will be an approximate 8.4% reduction in fatalities and 5.9% reduction in injuries.

Between 2007 and 2009 there were 47 persons killed and 2,699 persons injured in the Wollongong City, Shellharbour City and Kiama Local Government Areas. By employing Elvik’s (2009) power estimates, it is estimated that 1.3 persons killed and up to 53 persons injured could be saved per year in these three Local Government Areas. These casualties amount to an estimated community saving of between $39 million and $63 million (depending on whether willingness-to-pay or human capital methodology is employed).

In the state of NSW between 2007 and 2009 there were 1,262 persons killed and 73,997 persons injured. By employing Elvik’s (2009) power estimates, it is estimated that 35 persons killed and up to 1,455 persons injured could be saved per year. These casualties amount to an estimated community saving of about $370 million in September 2009 values (RTA Economic Analysis Manual 2009) using the willingness to pay methodology.

Assumptions made in the analysis

These conclusions need to be treated with caution given the assumptions made in the analysis. The following assumptions were made for the purposes of the analysis:

- Participating trial drivers are representative of all drivers in New South Wales.
- Advisory ISA devices are installed and used in all vehicles at all time in the specified area and that implementation would result in comparable and complete levels of driver compliance.

Finally, note that Nilsson’s power model (1982) was originally formulated based on a large number of studies examining higher speed limit zones, and predominantly in rural areas. Nilsson (1982) noted that there had been very few crash investigations of urban speed limit changes, which has raised doubts regarding whether the model is equally applicable in lower speed limit zones, or in urban areas (see Elvik et al., 2004).
More comprehensive results from modeling the effects of Advisory ISA on the broader NSW population are presented in the *NSW ISA Trial report - Fuel consumption and travel time effects and modeling the effects of ISA on the wider NSW population.*
6. Results – Attitudinal research

6.1 Private and fleet drivers

6.1.1 Profile of participating drivers

Demographic profile

Drivers who completed the pre-trial (Stage 1) and Driver Commencement Questionnaire formed the attitudinal research sample, of which 36% were fleet drivers and 64% were private drivers. Sixty percent of the drivers were male. Figure 58 shows the age profile of the fleet drivers compared with private drivers and the gender breakdown within each age category. The fleet driver sample had an older age profile and was male-skewed. Targeted recruitment ensured that private drivers were roughly normally distributed in terms of age and gender but included a boost in the under 25 year age category.

![Participant profile – gender by age by driver type](image)

Three in five drivers (59%) had held a licence for at least 20 years (including 77% of fleet drivers and 48% of private drivers). Just under one in five (18%) had held a licence for less than five years (including 26% of private drivers but only 6% of fleet drivers). The research sample included a total of 16 provisional licence holders.

Attitudinal profile of participating drivers (pre-trial)

Drivers were provided with a list of attitudinal statements (presented in random order within a list that also included behavioural statements) and were asked the extent to which they agreed with each statement. Eight of these statements were done on a scale from zero to 10, where zero
meant they strongly disagreed and 10 meant they strongly agreed. Figure 59 shows responses on this 11-point scale re-coded into three semantic categories – ‘disagree’ (for responses of 0-4), ‘neither agree nor disagree’ (5), and ‘agree’ (6-10). Please note that for one of the statements – ‘driving up to 5km/hr over the speed limit is not really speeding’ which was included in the Driver Commencement Questionnaire – a 5-point scale with the semantic categories of ‘strongly disagree’, ‘disagree’, ‘neither agree nor disagree’, ‘disagree’ and ‘strongly disagree’ was used. Responses to these categories have also been re-coded (the first and last two categories combined) to simplify the picture for charting purposes.

Almost two in three drivers (64%) agreed with the statement that ‘there is no such thing as safe speeding’. At the same time, more than half (53%) agreed that you sometimes actually need to exceed the speed limit in order to be safe. Just under one third (30%) agreed with the statement ‘driving up to 5km/h over the speed limit is not really speeding’. Responses to this question revealed a number of other key attitudes that may explain their speeding behaviour. Two in five drivers (41%) agreed that they feel comfortable driving faster than the speed limit because they believe they are still in complete control of their car, while just over a quarter (27%) agreed they feel comfortable driving faster than the speed limit because they considered themselves to be an experienced driver. Just over one in three (35%) reported that they enjoyed driving fast.

Question: To what extent do you agree or disagree with each of the following statements about driving?

![Figure 59: Agreement with attitudinal statements (pre-trial)](image)

For two of the statements in Figure 59, a significant difference in level of agreement (at the 95% level of confidence) by gender was observed. Looking at mean responses on the full 11-point scale (from 0 to 10), it can be seen that:
- males were more likely than females to feel comfortable driving faster than the speed limit because they felt in control of their car (mean of 4.7 for males, compared with 3.7 for females; p=0.02)
- males were more likely than females to believe that it is less unsafe to speed in a car that has lots of safety features (mean of 2.5 for males, compared with 1.4 for females; p=0.02).

Drivers with at least one speeding offence in the last three years were more likely than others to report that they enjoyed driving fast (mean of 5.2, compared to 3.4 for those without an offence recorded against them; p<0.01), and to feel comfortable driving faster than the speed limit because they considered themselves an experienced driver (mean of 4.7, compared to 3.4; p=0.02).

Drivers who drove less than 20 hours per week were significantly more likely than those who drove more, to report that they feel comfortable driving faster than the speed limit because they feel in control of their car (mean of 4.8, compared to 3.2; p=0.02).

Agreement with the statement 'driving up to 5km/h over the speed limit is not really speeding' was negatively correlated with age, such that as driver age increased the level of agreement with this statement decreased (p=0.01).

In addition to the attitudinal statements, drivers were given a list of questions specifically dealing with their attitudes towards speed enforcement. They were also given a statement dealing with their understanding of the involvement of speed in the severity of injuries caused from motor vehicle crashes. Over four in five drivers (88%) agreed (rating the statement between 6 and 10) that even 'low level' speeding (exceeding the limit by less than 5km/h) can make a difference to the severity of injuries in a crash. However, over three in five (63%) agreed that drivers should not be booked for exceeding the speed limit by this same amount.

**Behavioural profile of participating drivers (pre-trial)**

Participating drivers were asked, in the Driver Commencement Questionnaire about the approximate number of hours they spent driving a car each week. They were asked to consider the amount of time spent driving on the weekends as well as during the working week.

On average, drivers included in the attitudinal research sample spent, prior to the commencement of the ISA trial, 13 hours driving a car each week. Just over one in three (35%) reported driving less than 10 hours each week while, on the other end of the spectrum, just under a quarter (24%) reported spending 20 or more hours on the roads.

As expected, the mean number of hours fleet drivers spent driving each week (16 hours) was significantly higher than the 11 hours spent by private drivers (p<0.01). Private drivers were more likely than fleet drivers to spend less than 10 hours per week driving (48% compared with only 14%) and less likely than fleet drivers to spend 20 hours or more driving (12% compared with 43%).

**Self reported frequency of exceeding the speed limit (pre-trial)**

In the Stage 1 online questionnaire, drivers were asked for an estimate of the frequency with which they exceeded the speed limit (by any margin). This provided a profile of the drivers’ speeding habits prior to driving with an ISA device in their vehicle. Drivers were provided with a number of response options ranging from ‘never’ to ‘every time you drive’.

40% of drivers reported exceeding the speed limit ‘some of the time’, and just under one in three (30%) reported exceeding it ‘mostly’. One in five reported exceeding it ‘every time they drive’ and
only one of the 94 drivers who answered the question reported they ‘never’ exceeded the speed limit, even by a small margin.

**Question:** How often would you say you exceed the speed limit, even if only by a few kilometres per hour? Would that be…? [6 response options]

<table>
<thead>
<tr>
<th>Frequency of speeding</th>
<th>% of participants (Pre-Trial)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every time you drive</td>
<td>20%</td>
</tr>
<tr>
<td>Mostly</td>
<td>30%</td>
</tr>
<tr>
<td>Some of the time</td>
<td>20%</td>
</tr>
<tr>
<td>Rarely</td>
<td>40%</td>
</tr>
<tr>
<td>Never</td>
<td>10%</td>
</tr>
<tr>
<td>Unsure/Prefer not to answer</td>
<td>1%</td>
</tr>
</tbody>
</table>

**Figure 60: Reported frequency of speeding (pre-trial)**

Provisional licence holders tended to report exceeding the speed limit on a more frequent basis than did full licence holders (p=0.03). Additionally, age was negatively correlated with reported frequency of speeding (p<0.01); as the age of the participant increased, the reported frequency of speeding decreased. Those under the age of 25 years were, for example, most likely to report exceeding the speed limit every time they drive (37%), compared with 25% of 25-39 year olds, and 13% of both 40-59 year olds and those aged 60 years and over, p=0.01).

The drivers who indicated they exceeded the speed limit at least some of the time (all but one participant) were asked to estimate by how many kilometres per hour they usually exceed the speed limit when they do speed. The most common margin, by which drivers reported exceeding the speed limit, prior to the commencement of the trial, was 5-9 km/h, accounting for 59% of drivers. Just under a quarter (24%) reported exceeding the speed limit by less than five km/h.

**Question:** When you are speeding, by how many kilometres per hour do you usually exceed the speed limit? [8 response options from 1-4 km/hr up to 30km/hr or more, plus “Unsure/don’t know”]

<table>
<thead>
<tr>
<th>Average margin</th>
<th>% of participants (September 2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4 km/hr</td>
<td>24%</td>
</tr>
<tr>
<td>5-9 km/hr</td>
<td>58%</td>
</tr>
<tr>
<td>10-14 km/hr</td>
<td></td>
</tr>
<tr>
<td>15-19 km/hr</td>
<td>12%</td>
</tr>
<tr>
<td>Unsure/Prefer not to answer</td>
<td>3%</td>
</tr>
</tbody>
</table>

**Figure 61: Average margin of speeding (pre-trial)**

Males and those who have received at least one speeding offence in the last three years tended to report exceeding the speed limit by a greater margin, when speeding, than females without any speeding offences recorded against them, respectively (p=0.01 and p=0.03).

**Situations when participating drivers inclined to speed**

Drivers were provided with a number of behavioural statements describing situations where drivers may be more inclined to speed as well as situations where they may be less inclined to
speed, and asked the extent to which they agreed with each one. Drivers responded on a scale from 0-10 were zero meant they strongly disagreed and 10 meant they strongly agreed with the statement.

Responses on the 11-point scale have been re-coded into three semantic categories – ‘disagree’ (0-4), ‘neither agree nor disagree’ (5) and ‘agree’ (6-10). At least four in five drivers each agreed that they always reduce their speed when driving on wet roads, and that they speed “accidentally”, not realising they’ve crept over the speed limit.

Question: To what extent do you agree or disagree with each of the following statements about driving? For each of these, please answer in relation to the way you usually drive the car into which the ISA device will be fitted. [11-point scale from 0 (strongly disagree) to 10 (strongly agree)]

![Figure 62: Agreement with behavioural statements (pre-trial)]](image)

A number of differences in level of agreement with these statements were observed between different sub-samples. These differences included:

- Private drivers and Provisional licence holders were more likely than fleet drivers and full licence holders to agree that they speed on familiar roads (mean of 6.6 compared to 5.4- p=0.04 and 6.9 compared to 4.8 – p<0.01 – respectively)

- Drivers with at least one speeding offence in the last three years tended to agree more strongly with four of the statements, compared with those who had not received a speeding offence in the last three years. They were more likely to admit to exceeding the speed limit:
  - “accidentally” (mean of 8.4, compared with 7.1; p<0.01);
  - when they’re running late (mean of 7.6, compared with 6.2; p=0.03)
  - when on the open road (mean of 7.0, compared with 5.5; p=0.01); and
  - when it’s unlikely they’ll get caught (mean of 4.7 compared with 4.0; p=0.02).
• For three statements, agreement was negatively correlated with age; as the age of the drivers increased, their tendency to agree with the statements decreased. The statements included those relating to speeding on familiar (p<0.01) or open (p=0.03) roads and speeding when running late (p=0.05).

**Competency adapting to new technology**

Drivers were asked to rate their competency with adapting to new technology using a scale from 1 to 5. The minimum rating given by any participant was 2 and the maximum rating was 5 out of 5. The mean rating was 4.3. Ratings of competency were negatively correlated with age such that the older the participant, the lower they tended to rate their competency with adapting to new technology (p<0.01).

**Comparison of trial participants profile to NSW drivers**

The NSW Driver comparison study was conducted by an independent market research company. One of the reasons for conducting this study was to establish the extent to which the ISA trial results could be generalised to the broader NSW driving population.

Demographically there were some differences in the sample of drivers in the ISA trial compared to the broader distribution of drivers in NSW. The ISA trial had an emphasis on recruiting younger male drivers, Provisional licence holders and those who had prior speeding offences. The majority of the demographic differences are explained by this trial sampling decision, as those participating in the trial were more likely than NSW drivers overall, to be young, male and members of a fleet.

After taking into account the demographic differences between the broader NSW driving population and the drivers participating in the ISA trial, the groups were relatively similar. There were no significant differences in attitudes towards speeding between NSW drivers overall, Illawarra drivers not participating in the ISA trial, and those drivers participating in the ISA trial, which bodes well for the confidence one can have about generalising the trial findings to the broader NSW driving population.

**6.1.2 Perceived benefits of the ISA Technology**

With the ISA technology installed in their vehicles, almost two in three (65%) drivers agreed with the notion that the technology was ‘of great use’ to them. The mean level of agreement with this notion was lower than it had been in the Stage 1 survey (dropping from a mean rating of 7.0 to 6.4) suggesting that although ISA technology was seen as useful, it was not as useful as they had anticipated when they signed up for the trial.

In the group discussions held with drivers, the most commonly mentioned benefit of the ISA technology was that the drivers were always aware of the speed limit that applied to any given stretch of road.

“It’s telling you what the speed zones were, you didn’t need to look for the speed signs so much, especially around school zones and stuff.” [Male, 25yrs+]

Other commonly articulated perceived benefits included that the ISA technology:

- alerted them when they “accidentally” drifted over the speed limit
- increased their awareness of how often they exceeded the speed limit, and how often other motorists exceeded it
- made them aware of speed zones which they had not previously been aware of
“And it went beep, beep. And I thought what on earth are you beeping for and I looked and thought 40, when did they put 40 here!… Never knew that an old people’s home had 40 around it.” [Fleet driver, drives over 20 hours per week]

- made speeding a conscious decision to take that risk (a benefit only articulated by some male drivers);
  “I realised you’re more conscious of deciding to speed. You’re more conscious that you made the wrong decision, it makes you think twice.” [Private driver, Male, < 25 yrs]

- provided reassurance that they would not unwittingly get caught for speeding

- helped them to relax by encouraging them not to be in a rush and not to worry about their speed.

Having experienced the ISA technology, almost three in four drivers (73%) agreed at Stage 2 with the notion that the use of this technology in all vehicles would lead to a reduction in the number of crashes, with just under two in three (64%) thinking it would reduce the severity of road crashes. A clear majority (61%) also agreed that with the technology in their vehicle, they had always been aware of the speed limit that applied to the roads that they were on, as a strong ‘personal’ benefit. Just over half of the drivers felt that the technology had allowed them to spend more time attending to traffic demands - either because they had not needed to look at their speedometer as frequently (54%), or they had not needed to look for speed signs as often (52%).

Drivers were divided on whether or not they had felt safer driving with the technology. This result was explored in the group discussions. Most felt that they didn’t feel any different with the technology installed. Most drivers maintained they were already good, safe drivers. There was a fair amount of resistance to the idea that having the technology in their vehicle would make them personally better drivers.
Question: Based on your experience with ISA technology in the ISA Trial, to what extend do you agree or disagree with each of the following statements about ISA technology and the ISA devices? [11-point scale from 0 (strongly disagree) to 10 (strongly agree), plus “don’t know”]

6.1.3 Concerns about ISA technology

Generally, drivers expressed fewer concerns than benefits of having ISA in their vehicles.

The main concern expressed in the group discussions was that the ISA technology was ‘unforgiving’, that is, it did not allow the driver leeway to travel a few kilometres per hour over the speed limit. Several drivers found the device ‘beeping’ as soon as the speed limit was reached irritating and frustrating. They felt it was unrealistic to expect people to stay on or below the speed limit at all times. These comments are in line with the attitudes reported in Section 6.1.1 that 30% of drivers agreed that ‘driving up to 5km/h over the speed limit is not really speeding’.

Concerns about drivers reacting to the ISA warnings, keeping to the speed limit, and therefore being the victim of tailgating was not very pronounced. While some expressed this as a concern in the group discussions, most seemed to consider it a hypothetical problem. They had been tailgated but the majority were unperturbed. Other concerns included that the ISA technology:

- was disconcerting or distracting when it was first installed (and drivers were still unfamiliar with it) or when it was not functioning properly
- was unreliable at times – for example not starting up immediately and not detecting speed zones in side streets
- was intrusive when there were passengers in the vehicle
- was a potential target for thieves
was not positioned optimally in their vehicle - such that they had to turn their head to look at the device and hence take their eyes off the road.

In the Stage 2 online survey, just over half (54%) of the drivers agreed with the idea that driving with the ISA device had increased their frustration levels while driving. Figure 64 shows the results of the question aimed at quantifying concerns about ISA technology. In the figure below, responses on the scale from 0 to 10 have been collapsed into the three categories of Agree (6-10), neither agree nor disagree (5) and Disagree (0-4).

Question: Based on your experience with ISA technology in the ISA Trial, to what extent do you agree or disagree with each of the following statements about ISA technology and the ISA devices? [11-point scale from 0 (strongly disagree) to 10 (strongly agree), plus “don’t know”]

![Figure 64: Extent of agreement with statements relating to concerns with the ISA technology – Stage 2](image)

Five of the seven statements dealing with driver concerns about the technology also appeared in the Stage 1 questionnaire, some appearing with slightly different wording (for example, ‘having the ISA technology in my vehicle has probably increased my travel times’ was reworded as ‘having the ISA technology in my vehicle will increase my travel times’ in the Stage 1 questionnaire).

Between surveys there was a reduction in the mean level of agreement that: the ISA technology had distracted them from their driving; they had relied too heavily on the ISA technology; and that the ISA technology gave too many false warnings and errors. Red arrows on the graph indicate a statistically significant change between surveys. These changes in attitudes suggest that some of the concerns that drivers had prior to the ISA devices being installed in their vehicles did not come to fruition.
The average level of agreement with the statement ‘the ISA technology would be wasted on drivers who speed intentionally because these drivers would ignore or override the warnings’ increased significantly between surveys. Indicatively from feedback in the group discussions, this response is likely influenced by the fact that in its current form the ISA device could be turned off if the driver so wished.

Question: (Based on your experience with ISA technology in the ISA Trial,) to what extent do you agree or disagree with each of the following statements about ISA technology and the ISA devices? [11-point scale from 0 (strongly disagree) to 10 (strongly agree), plus “don’t know” (set as missing value for repeated measures analysis)]

<table>
<thead>
<tr>
<th>Statement</th>
<th>Stage 2</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISA technology would be wasted on drivers who speed intentionally</td>
<td>7.8</td>
<td>0.8</td>
<td>5.3</td>
<td>4.7</td>
</tr>
<tr>
<td>ISA technology has probably increased my travel times</td>
<td>3.5</td>
<td>4.3</td>
<td>4.7</td>
<td>3.5</td>
</tr>
<tr>
<td>ISA technology has distracted me from my driving</td>
<td>3.6</td>
<td>4.7</td>
<td>6.8</td>
<td>3.2</td>
</tr>
<tr>
<td>Relied too heavily on ISA technology to let me know if I am speeding</td>
<td>3.5</td>
<td>4.3</td>
<td>3.5</td>
<td>1.2</td>
</tr>
<tr>
<td>ISA technology issues too many false warnings and errors</td>
<td>6.8</td>
<td>3.2</td>
<td>6.8</td>
<td>3.2</td>
</tr>
<tr>
<td>Device has increased my frustration levels</td>
<td>5.4</td>
<td>5.4</td>
<td>5.4</td>
<td>5.4</td>
</tr>
<tr>
<td>Device has made my driving more complicated</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
</tr>
</tbody>
</table>

Figure 65: Changes in extent of agreement with statements relating to concerns about the ISA technology, with experience with the technology

6.1.4 Potential for ISA devices to distract drivers

Despite the decrease in agreement with the idea that the technology has distracted them from their driving, around one quarter (27%) still agreed with this statement when it was included in the Stage 2 questionnaire. The most common reasons given for the technology being at least to some extent distracting were that the warning tones were too persistent (58%) and too loud (52%).

The 77 drivers who had at least somewhat agreed with the notion that the ISA technology had distracted them from their driving were asked “what is it that you find distracting about the device?” and given eight possible reasons to select from, plus the option of providing their own particular reason. The results are displayed in Figure 66. The proportions do not add up to 100% as some drivers gave multiple responses.

The most common reasons given for the technology being at least to some extent distracting were that the warning tones were too persistent (58%) and that the warning tones were too loud (52%). Concerns relating to an increased propensity to look at their speedometer, or having to look at both the speedometer and the ISA device, were the next most commonly cited reasons (mentioned by 27% of drivers and 30% indicated that the technology was at least to some extent distracting).
The warning tones are too persistent

The warning tones are too loud

Looking at both the speedometer and the ISA device

Although the device itself isn’t distracting, I’m looking at my speedo more

Added distraction when I’m talking on hands-free / have passengers

Where it is situated on the dashboard

Having to keep looking away from the road to look at it

Having yet another device in my vehicle

Other

Question: You mentioned that the ISA device is, at least to some degree, distracting. What is it that you find distracting about the device? Please select all that apply.

Only one or two of the drivers who attended one of the group discussions felt, with any real strength of feeling, that the ISA technology was distracting. Most recognised that if they keep to the speed limit the device won’t beep and so they will barely notice the device in their vehicle at all. Some felt that the technology could have been loosely described as “distracting” when it was first installed in their vehicle because the driver was unfamiliar with it at that point.

6.1.5 Technical problems experienced

The Stage 2 questionnaire included a list of sixteen technical problems drivers may have experienced during the course of the trial (based on issues reported by drivers to the ISA Trial Support Line). The most common technical problems experienced by drivers included; the ISA device not starting up (62%) and the ISA device, at times, displaying incorrect speed limits (59%).
Question: Have you experienced any of the following issues with your device? Mark any that apply.

- Smoke coming from the device
- Permanent loss of sound
- Not adjusting to daylight saving time
- Interfering with other electrics in the vehicle
- Falling of cradle warn or broken
- Night time screen operating during daylight hours
- Night mode not working
- Not detecting all curve advisory speed signs
- Switching off at start-up
- Intermittent loss of sound
- Frequently without GPS network coverage
- Frequently displaying a question mark
- Not starting up
- Displaying incorrect speed limits
- Turning itself off whilst driving
- Frequently displaying a question mark

n= 92 (participants completing Driver Commencement, Stage 1 and Stage 2 questionnaires)

Figure 67: Technical problems experienced with the ISA devices

6.1.6 Reliance on the technology and workload issues

The group discussions suggest that some drivers relied heavily on the ISA device to advise them of the prevailing speed limit, by accelerating, without looking at their speedometer, until the ISA device beeped. However, more commonly, drivers explained that they had used the device as a ‘back-up’ to advise them if they unwittingly exceeded the speed limit - either by accident, or they had been unaware of the prevailing speed limit.

Few if any drivers felt the ISA device had increased their driving workload. If anything, they felt the device had decreased their workload and freed them up to concentrate on the traffic and road conditions.

6.1.7 Reactions to audio warnings

Just under half (45%) of drivers felt that the ISA device’s audio warnings were not appropriate, in terms of their volume, pitch and persistency. In the group discussions a strong preference was expressed for the audio warnings to increase in frequency and volume as the driver persisted to exceed the speed limit. While acknowledging that the audio warnings were important as a deterrent to speeding, they felt that ‘nudging’ the limit should not result in such loud and persistent beeps.

The speed limit value display and the red annulus around the speed limit which appears just before the audio warnings, were seen to be beneficial to those drivers whose device was installed where it could be seen out of the corner of their eye. The school zone audio warnings were particularly well received, as most recognised the importance of slowing down in these zones. The audio curve advisory warning received mixed reviews. Some drivers felt the curve ahead ‘voice’ was startling and that the number of warnings was excessive on very winding roads.
How often did participating drivers turn the ISA device off?

Among those who reported they had turned the ISA device off at least on the odd occasion, the majority (63%) reported that they had generally only turned it off for a short period before turning it back on. Those holding a provisional licence reported turning their device off more frequently than full licence holders (p<0.01).

Question: How often have you chosen to turn your ISA device off? Please exclude occasions on which the device was not working properly. [5 options presented from “never” through to “every trip”]

![Chart showing frequency of ISA device turn off]

n=92 (participants completing Driver Commencement, Pre-Trial and Stage 2 Questionnaires)

Figure 68: Frequency with which participants chose to turn off their ISA device

Nearly one third (31%) of provisional licence holders reported turning their device off on a fair proportion of trips, compared with only 5% of full licence holders, while, at the other end of the scale, only 13% indicated they had never turned it off, compared with 49% of full licence holders (p<0.01).

Some drivers indicated in the group discussions they had never wanted to turn off their device as they valued having it there to alert them when they exceeded the speed limit. Others, however, admitted that they had felt obliged to leave it on because they were participating in a trial and, if outside of the trial, they would turn it off in a variety of circumstances. A variety of circumstances were mentioned of when drivers would turn their device off on occasion including: when they were running late; when they were having a “bad day”; when the device was malfunctioning; or when they had passengers in their vehicle.

6.1.8 Impacts of the ISA device on behaviour

Although there was some shift between the Stage 1 and Stage 2 surveys towards drivers self reporting exceeding the speed limit less frequently, this shift was not statistically significant. However, given the ISA device alerted drivers every time they exceeded the speed limit, it is likely drivers became more aware of the frequency they exceeded the speed limit.

Between the Stage 1 and Stage 2 surveys there was a significant shift towards drivers reporting exceeding the speed limit by a smaller average margin, with this change in behaviour apparently sustained at Stage 3. As illustrated in Figure 69, only a quarter of drivers reported exceeding the speed limit by an average margin of less than 5 km/h prior to the ISA device being installed. This rose to 46% in both the Stage 2 and Stage 3 surveys. At Stage 2, fleet drivers reported exceeding the speed limit by a larger margin than private drivers. This difference was not observed at Stage 1.

Question: When you are speeding, by how many kilometres per hour do you usually exceed the speed limit?
In Stage 3, drivers were asked whether they thought their speeding behaviour had reverted back to that of their levels at Stage 1. Just over half (54%) maintained that they were driving more slowly than before the ISA trial, but not as slowly as they were when the ISA device was installed. One in five drivers reported having completely reverted back to the way they drove before the trial. Those who reported that they had not slowed down because of the technology are included as “I drove no differently with the ISA device in my vehicle”.

At Stage 2 (‘After ISA’ period), four in five drivers agreed with the statement ‘the ISA device has influenced the speed at which I drive’ (giving it a rating of between 6 and 10 on a scale from 0, ‘strongly disagree’ to 10, ‘strongly agree’). Three in four drivers (76%) felt that they had reduced the frequency with which they exceeded the speed limit, and almost two in three (64%) felt they had been driving more safely with the ISA technology in their vehicle. Of some concern, just over half (53%) agreed with the idea that they were no longer slowing down as much as they had done earlier in the trial because they had gotten used to the audio warnings.

Question: Based on your experience with ISA technology in the ISA Trial, to what extend do you agree or disagree with each of the following statements about ISA technology and the ISA devices? [11-point scale from 0 (strongly disagree) to 10 (strongly agree), plus “don’t know”]

Only one in ten drivers felt they were driving just as slow as when the ISA device was installed. Just under one in three (32%) of these drivers who felt they were still driving more slowly, explicitly mentioned that experience with the technology had made them think more about their own speed and made them more conscious of sticking to the speed limit. The attitudinal research
did not find any evidence of attitudes toward speeding having changed as a result of using the ISA device for three months.

Question: Thinking about the way you have been driving since the ISA device has been removed (or has become non-operational), which of the following is most true?

![Bar Chart: Changes in driving since de-activation of ISA devices](image)

The most common reason mentioned by the 56 drivers who said they were still driving slower than they had been prior to the trial – by almost one third of those answering this question – was that their experience using the ISA device had made them think more about their own speed or had made them more conscious of sticking to the speed limit. One in five (21%) had been made to realise how often they speed (often without realising) which had helped them to slow down.

The most common reason given by the 16 drivers who said they had reverted back to the way they had driven prior to the trial was that they had been reliant on the device to advise them when they had exceeded the speed limit, so without the technology installed they were back to exceeding the speed limit “unintentionally”. This reason was mentioned by six drivers or 13% of those asked this question.

6.1.9 Overall acceptability and personal interest in keeping the ISA device

Participating drivers were asked to rate the overall acceptability of the ISA device. The majority of drivers (61%) gave it a positive rating. Drivers were more likely to have a positive view of the technology (in terms of overall performance, usability, functionality and acceptability) than be inclined to recommend the technology to others, or be interested in using the technology themselves. Many drivers in the group discussions were favourable about ISA, and many particularly thought ISA would be useful for ‘other drivers’ as they themselves were ‘good, safe drivers’.
Question: Thinking about the overall performance, usability, functionality and acceptability of the ISA technology, how would you rate it, overall? [11-point scale from 0 to 10]

Figure 72: Ratings of overall performance, usability, functionality and acceptability of ISA technology

Those who had experienced a greater number of technical problems with their devices also tended to rate the overall acceptability of ISA lower.

Drivers were divided on whether or not they would be interested in continuing to use the ISA device, with comparatively large proportions feeling very strongly one way or the other. One in five rated their interest at zero, indicating they would not be interested at all in keeping the ISA device, but almost the same percentage (21%) rated their interest at 10, indicating they would be very interested in keeping the device. Indicatively, it appears that those who had incurred speeding offences in recent years were more likely to be interested in having the device in the future. Overall, interest in keeping the device declined with actual experience with the technology. On scale of 1 to 10, the average interest rating was 7.2 at Stage 1. This rating dropped to 5.3 at Stage 2.

Question: Hypothetically, if you had the option of keeping the ISA technology in your vehicle at the end of the Trial (at no extra cost), how interested would you be in continuing to use the ISA technology?

Figure 73: Ratings of personal interest in keeping the ISA device at the end of the trial
6.1.10 Use of ISA technology by the broader community

Provisional licence holders were most often nominated as a group that would particularly benefit from having the ISA device in their vehicle (nominated by 92% of drivers at Stage 1 and 82% of drivers at Stage 2). Even 69% (11 out of 16) of provisional licence holders themselves felt that the ISA technology would be particularly beneficial for people who hold a provisional licence. People who speed “accidentally”, people who have had their licence cancelled or suspended for speeding in the past and younger drivers were also nominated by over 70% of drivers. Comments made in the group discussions suggested that although many considered the technology could be as useful for all drivers, there was a tendency for individuals to view themselves as ‘good, safe drivers’ and as such, less in need of the technology for themselves.

After using the ISA technology, 72% of drivers felt its use should be compulsory for at least some groups of drivers. The remaining 28% felt the technology should not be compulsory for anyone. The largest percentage of research participants (67%) felt the technology should be compulsory for those who have previously had their licence suspended or cancelled for speeding.

In the group discussions strong support was expressed for the use of ISA technology to be offered as an option for repeat speed offenders to reduce their sentence, or similar leniency during court appearances. Most felt that it was very important for drivers to have an element of choice on whether to use the ISA technology. For example, repeat speed offenders could be given a choice of having the ISA technology installed or losing their driver licence. Potential covert measures of speed enforcement using the ISA technology (combined with a data recorder) were viewed negatively. Drivers felt that using such technology for speed enforcement was not appropriate given that it may not be completely reliable (further supporting the need for comprehensive and accurate speed limit mapping) or that the driver may have been exceeding the speed limit for a valid reason. In their view, the offender would need to exceed the limit often and for extended periods before being issued with an infringement was warranted.

6.1.11 Preferred ISA device features and marketability

The quantitative survey results suggested that there would be more interest in an ISA device that constantly displayed the prevailing speed limit (84%) rather than only displaying the speed limit when the vehicle exceeded it (16%). More drivers (88%) would prefer an Advisory ISA device than one that physically prevented the vehicle from exceeding the speed limit (12%). Almost three quarters (72%) would prefer a device that could be turned on or off depending on the driving conditions, rather than a device that could not be turned off (28%). While many recognised that the ISA technology would be most effective if it could not be switched off, under these circumstances the technology was also less appealing. It is likely that including volume control or a tolerance when exceeding the speed limit before the audio warnings take effect would lower the 72% of drivers who would prefer a device that could be turned off, however this is likely to reduce the effectiveness of the device.

There was far more interest in the ISA technology being integrated with a GPS navigation device (61% indicated this would be their first preference) rather than as a separate ISA device, such as that which was used in the trial (28%) or as an application on a mobile phone (13%).

6.1.12 Willingness to pay

Among those interested in keeping the technology (rating their interest at between 6 and 10 out of 10), almost half (47%) would be willing to pay between $100 and $249 to have the device. The
qualitative research results suggested that although most drivers recognised that the ISA technology was useful, they would have limited interest in purchasing this technology as a stand-alone device for themselves. Most would feel comfortable acquiring the technology if it was made standard in a new vehicle - although they would want a choice of using it or not. The idea of all drivers having the technology made it more appealing to some.

“If it didn’t cost me anything and if I had the option, the choice of being able to use it or not, if I could turn it on and off then maybe I would consider using it. Because there are times, like you said before, driving around in a strange area, like for schools or speed zones that might suddenly creep up on you that you didn’t know about. That’s quite handy to have that, you know, that warning ability.” (Fleet driver; drives less than 20 hours per week)

“No, I wouldn’t want to put up with it until I knew everybody else was putting up with it.” (Fleet driver; drives less than 20 hours per week)

6.2 Fleet managers

6.2.1 Perceived benefits and concerns about the ISA technology

In both the Stage 1 and Stage 2 surveys, fleet managers were given a list of eight statements addressing possible benefits and drawbacks of having the ISA devices in their fleet vehicles. At Stage 2 the majority of fleet managers agreed (providing a rating of between 6 and 10 on a scale from 0 – strongly disagree – to 10 – strongly agree) that the ISA devices had significant benefits for their fleet of vehicles. The mean level of agreement was 5.0). A majority also agreed that the technology had:

- helped them to be better corporate citizens
- provided occupational health and safety benefits
- resulted in fewer speeding fines and losses of licence.

While the mean level of agreement with the idea that the device had benefits for their fleet did not differ significantly between Stage 1 and Stage 2, there was a shift towards decreased agreement in relation to the three specific benefits mentioned above.

The idea that having the ISA devices in their fleet vehicles had resulted in increased travel times, had a negative impact on vehicle performance, or had resulted in additional maintenance being required, were rejected. Three of the seven individuals surveyed indicated that they had no concerns about having the technology in their fleet vehicles. Concerns expressed by others included the device had impacted on other devices within the vehicle, and the device had not been well received by their staff.

6.2.2 Interest in keeping the technology

Fleet managers were asked how interested they would be in continuing to use the ISA technology if they hypothetically had the option of keeping it – at no extra cost – in their fleet vehicles at the end of the trial. Having experienced the technology in their fleet vehicles, the mean level of interest in keeping it, on a scale from 0 (not at all interested) to 10 (very interested) was 7.3. For the fleet managers to consider including the technology in their fleet vehicles in the future, they felt the technology would need to be:

- affordable (initial purchase, installation and maintenance)
• easy to obtain
• have demonstrated benefits (for example fuel savings, reduced speeding infringements and speed-related crashes)
• be less obtrusive with fewer auditory warnings
• provide more of a speed tolerance band
• be part of a device that is smaller / more discreet
• be able to be easily moved from an old vehicle into a new vehicle - to cope with high fleet turn-over
• have associated support for installation, user training and upgrades.

Those who participated in the mini group discussion said that they did not operate in industries that experience the same pressure to invest in road safety measures that are experienced by, for example, trucking companies, where considerable investment on such technology as fatigue management systems is undertaken. Their decision to purchase the ISA technology would be based on their own cost-benefit analysis.

6.2.3 Willingness to pay
All seven fleet managers who completed the Stage 2 Questionnaire indicated that they would be prepared to pay to have the ISA technology in their fleet vehicles. The amount they would be willing to pay varied from less than $100 per vehicle up to $549 per vehicle. However, their willingness to pay appeared to decrease following experience with the technology. Of the five fleet managers who completed both the Stage 1 and Stage 2 questionnaires, three moved into a lower price category and two stayed unchanged.

Despite staff preferences for switching off the technology when desired, fleet managers recognised that the ability to turn the ISA device on and off would weaken the effectiveness of the technology. As put by one fleet manager:

“If you can’t turn it off there is one way to stop the beeping”

6.3 Comparison of ISA trial participants to NSW drivers
6.3.1 Interest in in-vehicle technologies and use of automatic speed alert
Interest in in-vehicle technologies
All research participants completing the NSW Driver Comparison Questionnaire were asked if they were interested in using in-vehicle technologies in the future. The greatest interest was shown in route navigation, with just over four-fifths of research participants (82%) indicating ‘Yes’. A similar percentage (80%) said they would be interested in using cruise control. Fewer research participants expressed interest in using reverse parking aid (66%) or a manual speed alert (61%) in the future.

Those who had previously used a manual speed alert system, were significantly more likely than those who hadn’t, to express interest in using this system again in the future (84% compared with 49%, p<0.01). Despite this, almost half of those who hadn’t used a manual speed alert (49%) still showed interest in using this technology in the future.
Current use of automatic speed alert

Research participants were asked if they had an automatic speed alert system they could use in their vehicle. They were advised that this technology would alert them when their vehicle exceeded the speed limit on any particular stretch of road. The 39% who said ‘Yes’ then indicated the frequency with which they used the automatic speed alert system. The largest percentage (28%) reported using their automatic speed alert system some of the time, with just under a quarter (23%) reporting always using it. A similar percentage indicated they mostly (21%) or rarely (19%) use the automatic speed alert system, while 17% said that although they had one they can use in their vehicle, they never use it.

Question: How often do you use this automatic speed alert function?

![Frequency of use of automatic speed alert system](image)

Ordinal relationships were observed in the data, such that males and older research participants tended to report more frequent use of their automatic speed alert function compared to females (p=0.03) and younger participants (again, p=0.03). For example, 27% of males indicated they ‘always’ use this system compared with just 16% of females (p=0.05), while 17 to 24 year olds were least likely to report always using the speed alert system in their vehicle (9% compared to 23% of participants overall, p=0.03).

Research participants who indicated they ‘rarely’ or ‘never’ use the automatic speed alert system were asked why this is the case. As Figure 75 shows, the reason most frequently given was the warning alert was annoying (18%). More than one in ten indicated that they don’t need to use the system because they don’t speed (14%); the speed alert system is part of their GPS/satellite navigation system which they rarely use, or they forget to turn the system on; and they don’t require such a system as they always monitor their speedometer or know at what speed they are going (10%).
Question: Why do you choose not to use this automatic speed alert function?

![Figure 75: Reasons for not using the automatic speed alert system](image)

6.3.2 General impressions and awareness of ISA technology

Advisory ISA
Research participants were provided with a brief description of Advisory ISA technology. The majority (69%) indicated they had not heard of this technology before. Males were significantly more likely than females to have heard of the Advisory ISA technology (35% compared with 28%, p=0.01).

As Figure 76 illustrates, more than four in five participants were in favour of this type of technology being available in NSW (85%). Only 9% indicated they would not support the availability of Advisory ISA technology, while 7% indicated they had no opinion.

Question: Would you be in favour of Advisory ISA technology being available in NSW?

![Figure 76: Favourability of Advisory ISA technology being available in NSW](image)
Attitudes did differ, by age. An ordinal relationship was observed, such that older research participants were more in favour of the technology being introduced than were younger research participants (p<0.01). For example, 17 to 24 year olds were least likely, and those aged 60 years and over most likely, to be ‘strongly in favour’ of this technology being introduced (38% and 55% respectively, compared to 47% of research participants overall, p<0.01).

Supportive ISA
Research participants were also provided with a brief description of Supportive ISA technology (the order of questioning relating to Advisory versus Supportive ISA was rotated between surveys to reduce order effects).

As Figure 77 indicates, a smaller percentage of research participants were in favour of Supportive ISA becoming available in NSW (69% compared to 85% for Advisory ISA). Just under a quarter (23%) were not in favour of Supportive ISA, while 8% weren’t sure or had no opinion.

**Question:** Would you be in favour of supportive ISA technology being available in NSW?

![Figure 77: Favourability of Supportive ISA technology being available in NSW](image)

In the case of Supportive ISA technology, females were more strongly in favour of the technology being available in NSW than were males (p<0.01). Similar to Advisory technology, older research participants were also more strongly in favour of the technology being introduced than were younger research participants (p=0.05). For example, 17 to 24 year olds were least likely to be ‘strongly in favour’ of this technology being introduced (15% compared to 28% of research participants overall, p=0.02).

6.3.3 Overall acceptability and personal interest in ISA technology
Using a scale from 0 (strongly disagree) to 10 (strongly agree), research participants were asked about the extent to which they agreed with five statements about ISA technology. Figure 78 shows the level of agreement with each of the statements, with responses on the 11-point scale re-coded into three semantic categories – ‘disagree’ (0-4), ‘neither agree nor disagree’ (5) and ‘agree’ (6-10), in order to simplify the picture for the purposes of charting.

The level of agreement was highest for the statement ‘the Advisory ISA technology should be included as standard in new vehicles’, with almost seven in ten research participants agreeing with this statement (68%). The majority of research participants also agreed with the statements ‘I would only consider acquiring the ISA technology if there was an incentive for me to do so (such as car insurance)’ (59%) and ‘I would consider using the Advisory but not the Supportive technology’ (53%). In comparison to the Advisory technology, support for the mandatory inclusion of Supportive ISA technology in new vehicles was much lower, with less than half of all
participants (48%) agreeing with the statement, ‘the Supportive ISA technology should be included as standard in new vehicles’. Roughly half of all research participants (49%) agreed with the statement, ‘I only support the use of the ISA technology if drivers can easily turn it on or off as desired’.

Question: Please indicate the extent to which you agree with the following statements.

- ‘I only support the use of the ISA technology if drivers can easily turn it on or off as desired’ (correlation co-efficient of -0.15, p<0.01); and
- ‘I would only consider acquiring the ISA technology if there was an incentive for me to do so’ (correlation co-efficient of -0.08, p<0.01).

Those who had their licence suspended or disqualified for speeding, at some stage in their life, tended to more strongly disagree with the statement, ‘I would only consider acquiring the ISA technology if there was an incentive for me to do so’ than those who had not (mean level of agreement of 5.6 on the 11-point scale compared to 6.4, p=0.05).

Compared with provisional licence holders, full licence holders more strongly agreed that:
- ‘The Advisory ISA technology should be included as standard in new vehicles’ (mean of 7.2 for full compared to 6.4 for provisional licence holders, p=0.01)
- ‘The Supportive ISA technology should be included as standard in new vehicles’ (5.8 for full compared to 4.7 for provisional licence holders, p<0.01).
Ratings of personal interest in having ISA technology

In three separate questions, research participants were asked about how interested they would personally be in having ISA technologies – Supportive, Advisory and a device that combined ISA with route navigation technology. Again, they were asked to respond on a scale from 0, indicating ‘not at all interested’, to 10 indicating ‘very interested’. For the purposes of simplifying charting, the scale has been re-coded into ‘not interested’ (0-4), ‘neither interested nor not interested’ (5) and ‘interested’ (6-10) in Figure 79. Greatest interest was shown for a device that combines ISA technology with route navigation technology (67%) and Advisory ISA technology (62%), while less than half indicated that they would be interested in having Supportive ISA technology (46%).

Questions: How interested would you be in having [advisory/supportive] ISA technology in your vehicle? / in having a device that combined ISA technology with route navigation technology?

![Figure 79: Personal interest in using ISA technologies](chart)

Females were significantly more likely than males to express interest in personally having the Supportive ISA technology (mean level of interest of 5.4 for females compared to 4.7 for males on the full 11-point scale, p<0.01). No such difference, however, was observed in regards to the Advisory ISA. This is in line with findings, as detailed above, that females were more likely to be in favour of Supportive ISA being introduced in NSW than males, but no gender difference existing for Advisory ISA.

Interest in having both ISA systems (Supportive and Advisory) was positively correlated with age. Older participants tended to rate their interest in the technology higher (correlation co-efficient of 0.10 for Advisory and 0.06 for Supportive technology, p<0.01 and p=0.04 respectively).

Those research participants who had an automatic speed alert system in their vehicle were significantly more likely to be interested in having a device that combined ISA with route navigation technology (mean of 6.8 compared to 6.3, p=0.01).
6.3.4 Perceived applicability of the ISA technology

Views on the groups of drivers for which the technology would be most beneficial

The NSW Driver Comparison questionnaire included a question asking research participants to indicate which groups of drivers they thought ISA technology would be most beneficial. They were able to select more than one group of drivers from a list of seven. As illustrated in Figure 80, ‘people who speed “accidently”, not realising they’ve crept over the limit’, were most often nominated as a group that would particularly benefit from having Advisory ISA (84%). In contrast, provisional licence holders and ‘young, inexperienced drivers’ were most often nominated as a group that would particularly benefit from having the Supportive ISA (both at 82%). Even 61% of provisional licence holders thought Supportive ISA would be beneficial to those holding a provisional licence (although they were less likely to think this compared with full licence holders – 84%; p<0.01). Three in five provisional licence holders (60%) felt Advisory ISA would be beneficial for those with a provisional licence, a proportion that was not significantly lower than the 63% of full licence holders who thought this.

Question: In your opinion, which of the following groups of drivers would the ISA technology be most beneficial for? Please answer for the ‘advisory’ technology separately to the ‘supportive’ technology.

![Figure 80: Number of research participants that felt the ISA technology (Advisory versus Supportive) would be most beneficial](image)

Almost four in ten (37%) felt the use of Advisory ISA and almost one in ten (10%) suggested Supportive ISA would be beneficial for ‘all drivers’. Those aged 60 years and over were most likely to think Advisory ISA would be beneficial for all drivers (44% compared to 37% of research participants overall, p=0.04).

Views on whether ISA should be compulsory for any groups of drivers

Research participants were asked in two separate questions whether they thought Advisory and Supportive ISA should be compulsory for any groups of drivers. Nearly seven in ten indicated that they felt it should be (rounding to 68% for each ISA system type).
The youngest age group, those aged 17 to 24 years, were the least likely to agree that Advisory ISA should be compulsory for any groups of drivers (55% compared to 68% of research participants overall, p<0.01). Not surprisingly, given the age distribution of provisional and full car driver licence holders, provisional licence holders were less likely to agree, while full licence holders were more likely to agree, that Advisory ISA should potentially be compulsory (58% compared to 69%, p=0.03).

As with the Advisory ISA, the youngest age group was least likely to agree that Supportive ISA should be compulsory for any group of drivers, while the oldest age group was most likely to agree (48% and 76% respectively compared to 68%, p<0.01). Again, provisional licence holders were least likely to agree and full licence holders were most likely to agree that Supportive ISA should be compulsory for at least some drivers (49% compared to 70%, p<0.01).

Those research participants that felt Advisory or Supportive ISA should be compulsory for any groups of drivers, were then asked for which groups of drivers this should apply. The largest proportion of participants (61% concerning Advisory and 60% concerning Supportive ISA) felt each system should be compulsory for provisional licence holders. More than half of the participants also felt the ISA systems should be compulsory for younger drivers (60% for Advisory and 58% for Supportive) and those who have previously had their licence suspended or cancelled for speeding (59% for Advisory and 57% for Supportive ISA).

Question: For which groups of drivers do you think [‘advisory’ / ‘supportive] ISA technology should be compulsory? Mark any that apply.

<table>
<thead>
<tr>
<th>Group</th>
<th>Advisory</th>
<th>Supportive</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-platers</td>
<td>61</td>
<td>60</td>
</tr>
<tr>
<td>Younger drivers</td>
<td>60</td>
<td>58</td>
</tr>
<tr>
<td>People who have previously had their licence suspended or cancelled for speeding</td>
<td>59</td>
<td>57</td>
</tr>
<tr>
<td>Fleet or commercial drivers</td>
<td>45</td>
<td>35</td>
</tr>
<tr>
<td>Older drivers</td>
<td>45</td>
<td>32</td>
</tr>
<tr>
<td>It should not be compulsory for any drivers</td>
<td>32</td>
<td>32</td>
</tr>
</tbody>
</table>

Figure 81: Number of research participants that felt the ISA technology should be compulsory

Those who had never had their licence suspended or disqualified for speeding were more likely to think that both Advisory and Supportive ISA should be compulsory for those who had previously had their licence suspended or cancelled for speeding (87% compared to 79% of those who have had their licence suspended or disqualified for Advisory ISA and 85% compared to 66% for Supportive ISA, p=0.02 and p<0.01 respectively).
Overall, just under a third of research participants (32%) felt Advisory ISA should be compulsory for ‘all drivers’, while 19% felt Supportive ISA should be compulsory for all drivers. Provisional licence holders were more likely to agree that Advisory ISA should be compulsory for all drivers (59% compared to 46% of full licence holders, p=0.05). No such difference, however, was observed between provisional licence holders and full licence holders in respect to Supportive ISA.

Females were more likely than males to think that Supportive ISA should be compulsory for all drivers (31% for females compared to 25% for males, p=0.04). A significant difference according to reported levels of speeding was also observed. There was an increased likelihood among those who reported ‘rarely’ exceeding the speed limit to support mandatory use of Supportive ISA for all drivers (33% compared to 28%, p=0.02).
7. Conclusions and Discussion

The NSW ISA Trial has demonstrated that Advisory ISA technology has the potential to deliver considerable road safety benefits, by reducing the level and duration of speeding amongst the majority of participating drivers. Results from the attitudinal research showed that the Advisory ISA technology was generally well received and accepted by those participating in the trial.

During the time when the ISA device was installed in participants’ vehicles, most drivers were less likely to speed, with a substantial reduction (31.8%) in the median probability of speeding. The general effect of ISA technology was to improve speed zone compliance across the road network. There was a reduction in the mean and median speeds in all speed zones, with the largest reductions in the 110 km/h and 90 km/h speed zones. The mean speed decreases appeared consistent with other ISA field trials conducted around the world (Doecke and Woolley, 2010). Many drivers mentioned in the attitudinal research that the device was also particularly effective at ‘slowing them down’ in the lower speed zones, and this is supported by the speed data analysis which showed that 91% of vehicles sped less in 50 km/h speed zones. Also, 88% of vehicles reduced their time speeding in 70 km/h speed zones, 85% in 100 km/h speed zones and 84% of vehicles sped less in 60 km/h speed zones.

When the ISA device was installed, 89% of vehicles reduced the amount of time they spent exceeding the speed limit. There was some evidence to show that after driving with the ISA device for three months, some drivers experienced a ‘learning effect’. Despite 86% of vehicles increasing the amount of time they spent driving in excess of the speed limit when the ISA device was de-activated, generally vehicle speeds increased in the ‘After ISA’ period, but not to the same level as speeds observed in the ‘Before ISA’ period. The median percentage of time spent speeding reduced in the ‘During ISA’ period from 36.3% to 24.1%, and increased in the ‘After ISA’ period to 30.5%.

A number of drivers in the trial reported relying on the device to inform them of the speed limit and when they were exceeding it. In some cases they reported using it almost like a form of cruise control. Consequently when the device was de-activated these drivers returned to their previous driving behaviour. However, many drivers commented that they were now more aware of their speeding behaviour and consequently more conscious of keeping to the speed limit. This may have impacted on their ‘After ISA’ speeding behaviour. The attitudinal research did not find any evidence of changes to a range of attitudes towards speeding as a result of having used the ISA device. This outcome reinforces the finding that the most effective aspect of the ISA technology is its visual and audio warnings, as opposed to the ISA device becoming an ‘educational tool’.

Advisory ISA was equally effective at reducing speeding amongst all driver demographics, including ‘repeat speeders’ and ‘deliberate speeders’, with the exception of younger drivers aged 25 years or less. More than half of the drivers who did not slow down during the trial were in this youngest age group. Younger drivers were significantly less likely to reduce the percentage of time they spent speeding when the ISA device was installed (77% compared to 93% of drivers aged over 25 years). Self reported responses from the attitudinal research revealed that these drivers were also more likely to admit turning their ISA device off during the trial, which would obviously reduce its impact on their speeding behaviour.

The results from the attitudinal research indicated that the ISA technology was seen, overall, to have merit. The technology was seen as acceptable, even if trial participants wouldn’t necessarily recommend it to others or be interested in using it themselves. Many participants perceived it to
be more useful for those drivers who are the ‘real problem’ on the roads, that is, for other drivers. There was also considerable polarisation of personal interest in using the technology in its current form. There was also evidence to suggest that the technology was not as useful as drivers thought it would be. After experiencing the technology, drivers appeared to be less convinced of some of its benefits, but they also had fewer concerns about its use.

Based on the attitudinal research the ISA device seems to have been most useful in preventing “accidental” speeding and ensuring drivers were always aware of the speed limit. Generally, drivers reported more benefits than concerns about having ISA technology installed in their vehicles. The main concern expressed in group discussions was that the ISA device was ‘unforgiving’, that it did not allow the driver leeway to travel a few kilometres per hour over the speed limit before the audio warnings began. Several drivers found the device’s ‘beeping’ immediately the speed limit was reached irritating and frustrating.

Most vehicle speedometers over-read the true land speed of the vehicle. In order to overcome the disparity between a vehicle’s speedometer display and the ISA device, a 3% "over-read" error factor was introduced into the ISA device. This meant that a driver would receive an audible warning for exceeding the speed limit when the vehicle reached a speed 3% below the legal speed limit. For example, in a 60 km/h speed zone the driver would receive a warning when the vehicle’s speedometer reached 58.2 km/h. Drivers were not informed of the introduced error factor. If the 3% error factor had not been introduced drivers would have been informed when they were travelling above the speed limit but it would have provided the perception of a ‘leeway’ and probably made it more palatable to drivers. Hypothetically, if this error rate had not been introduced into the trial, some feedback from drivers may have been more positive in this respect.

In a quantitative study of NSW drivers’ attitudes towards speeding conducted by the NSW Centre for Road Safety in 2009, it was found that low-level speeding had high levels of social acceptability and that there was a perception that tolerance bands existed in speed enforcement (Walker et al, 2009). It is likely that these attitudes contributed to the participating drivers’ frustrations with not being able to exceed the speed limit by a small margin without setting off the audible warnings. Many would either favour the technology incorporating some leeway or tolerance, such as the audio warnings commencing a few kilometres per hour above the prevailing speed limit, or else, more commonly, the initial warnings being subtle and increasing in intensity as the vehicle exceeded the speed limit.

A significant challenge will be to slow people down in situations such as when they perceive they have a need to speed, for example if they are running late for an appointment. Prevention of low-level speeding is also a challenge. Many believe they won’t or can’t be issued an infringement by police for being a few kilometres per hour over the speed limit. Approximately three in five (63%) drivers agreed that they should not be booked for exceeding the speed limit by less than 5km/h. In situations such as this, many drivers may choose to switch the ISA device off when not participating in a trial.

Just over half (54%) of the participants agreed that driving with the ISA device had increased their frustration levels while driving. The technology was seen as ‘necessarily annoying’, due to the strong role the audio warnings played in deterring speeding behaviour. If the technology remained in its current form, which enables the driver to switch the device off, it seems likely that a considerable number of people would opt to do this at times, outside of a trial situation. This would be particularly true of those who choose to speed deliberately, or believe it is unlikely they would be caught and those drivers 25 years of age or less. It could therefore be hypothesised that those drivers who could benefit the most from the ISA technology would also be the most likely to switch the device off. An ISA device that could not be switched off would be more
effective, but it is likely to be less acceptable to drivers. Volume control would make the technology more palatable and would likely limit the number of times the device was switched off. However this too may reduce its effectiveness.

While many participants would not mind having the technology in their vehicle, it seems unlikely that many would purposely buy the product, although it would be more marketable if it was combined with the vehicle’s satellite navigation system or incorporated into new vehicles. There is increased interest in the technology amongst those who have recently received an infringement for speeding. The mandatory use of ISA devices for some drivers is acceptable to most, assuming there is perceived fairness (if every driver has it or it is acquired through choice), with no covert surveillance coupled with the technology.

Provisional licence holders were most often nominated as a group that would particularly benefit from having the ISA technology in their vehicle. Even 69% of provisional licence holders in the trial felt that the ISA technology would be particularly beneficial to drivers who held a provisional licence. People who speed “accidentally”, people who have had their licence cancelled or suspended for speeding in the past and younger drivers were also nominated by a majority of trial participants.

Current awareness of the ISA technology among the general driving population in NSW was not high, but support for it being made available was strong, as revealed in the NSW Driver Comparison survey (Appendix J). Personal interest in having the technology was lower than general support for making it available. Just fewer than two in five NSW drivers said they currently had an automatic speed alert function they could use in their vehicle. Of these, the majority however only used it ‘some of the time’. The most common reason for not using the speed alert function was because it was annoying. Other reasons cited related to a lack of need for the technology (‘I don’t speed, I’m able to monitor my speed myself’), highlighting that many drivers believe the technology is simply not necessary for ‘safe drivers like them’.

One of the most significant challenges to deploying ISA technology in Australia, or anywhere in the world, is ensuring that the infrastructure required to support the technology is developed, implemented and maintained. ISA technology is unlikely to achieve widespread support until it can provide reliable and accurate advice on speed limits in all circumstances and throughout all states and territories. Driver acceptance and usability is another significant challenge for even the most technically advanced ISA system.

Young et al (2009) state that the long term benefits of ISA for Australia far outweigh the costs associated with its implementation. The AISAI group was formed to facilitate the uptake and improvement of ISA technology in Australia and New Zealand. Consumer and vehicle manufacturer demand and acceptability of ISA technology will obviously be impacted by the reliability and accuracy of the speed zone databases across the states and territories. For this reason the ISA Connect project has been established to agree upon a national speed zone data exchange format. Currently consumers can purchase a vehicle personal navigation device which includes an advisory speed warning functionality. Consumer education on the existence of such technology is required, and further research is also necessary on the quality of these personal navigation devices, including the accuracy and completeness of the speed zone databases they rely on.

By employing Nilson’s power model (Elvik, 2009; Nilsson, 1982) to changes in mean travel speed obtained from the results of the NSW trial (an overall reduction from 69.4 km/h ‘Before ISA’ to 67.9 km/h ‘During ISA’), it is estimated there will be an approximate 8.4% reduction in fatalities and 5.9% reduction in injuries. Applying these theoretical percentage changes to recent casualty histories, this equates to a projected saving of 35 persons killed and 1,455 persons injured in one
year in NSW. Using the willingness to pay methodology, this results in an estimated saving to the community of about $370 million using September 2009 values. Attribution of these savings to Advisory ISA implementation is dependent upon the assumptions mentioned in the main body of the report.

It is likely that the voluntary implementation of Advisory ISA may not be fully successful at targeting those drivers who are most likely to benefit from it. Younger drivers and those who choose to speed in varying circumstances are probably the least likely to voluntarily adopt the technology, and if they do adopt it, they are probably the most likely to turn it off when they choose to speed. It is likely that results of the NSW ISA trial could be further improved upon if a reason or motivation could be created for drivers to keep their ISA device switched on at all times. This could range from a penalty policy regime or a rewards system as trialled in Denmark (Agerholm, 2009). Further research is required to determine ways to create a need for drivers with a desire or likelihood to speed, to keep the device switched on and thereby gain the full safety benefits that ISA technology can offer.

Further results on the NSW ISA Trial are to be reported in the following publication: NSW ISA Trial report – Fuel consumption and travel time effects and modelling the effects of ISA on the wider NSW population.
## Glossary of terms

<table>
<thead>
<tr>
<th>Terms</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Advisory ISA</td>
<td>This system warns the driver when their vehicle exceeds the sign-posted speed limit by an audible alarm or message combined with visual feedback. This system allows the driver to make a decision on what action to take.</td>
</tr>
<tr>
<td>AISAI</td>
<td>Australasian Intelligent Speed Assist Initiative</td>
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<tr>
<td>Analysis of co-variance (ANCOVA)</td>
<td>General linear model with one continuous outcome variable (generally referred to as the dependent variable) and one or more factor variables (generally referred to as the independent variables)</td>
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<tr>
<td>Analysis of variance (ANOVA)</td>
<td>Analysis of variance between groups</td>
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<td>ATC</td>
<td>Australian Transport Council</td>
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<td>CASR</td>
<td>Centre for Automotive Safety Research</td>
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<td>CRS</td>
<td>NSW Centre for Road Safety</td>
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<tr>
<td>85th percentile speed</td>
<td>The speed at or below which 85% of all vehicles are observed to travel under free flowing conditions (free speeds) past a nominated point.</td>
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<tr>
<td>Exclusive driver</td>
<td>A participant who estimated that they would be the sole driver of the participating vehicle for at least 80% of the time when the vehicle was in use during the trial.</td>
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<tr>
<td>Fleet driver</td>
<td>A participating driver belonging to an organisation that is participating in the trial, who may be an exclusive driver or a shared driver.</td>
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<tr>
<td>Fleet manager</td>
<td>The representative from a participating organisation who was either solely responsible for, or highly influential in their organisation’s decision to participate in the trial.</td>
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<tr>
<td>FOT</td>
<td>Field Operational Test</td>
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<tr>
<td>Free speed</td>
<td>A measure of a driver’s chosen speed (i.e. not influenced by impedances such as traffic signals and congestion). When headway information is available (that is, the gap between moving vehicles expressed in seconds), any vehicle travelling with a headway of four seconds or more is considered to be travelling at a free speed. For the ISA trial headway information was not determinable so all vehicles travelling at 75% of the speed limit or less were...</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>GPRS</td>
<td>General Packet Radio Service</td>
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<tr>
<td>GPS</td>
<td>Global Positioning System</td>
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<td>Headway</td>
<td>The gap between moving vehicles expressed in seconds.</td>
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<tr>
<td>ISAT Knowledge Base</td>
<td>A database developed for the ISA trial as an information system to record, manage and report on aspects of the trial.</td>
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<tr>
<td>Limiting ISA</td>
<td>An ISA system similar to a Supportive ISA system but cannot be overridden by the driver.</td>
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<tr>
<td>Mean speed</td>
<td>A numerical value representing the average speed in kilometres per hour for the dataset.</td>
</tr>
<tr>
<td>Median speed</td>
<td>The speed in kilometres per hour, separating the higher half of a sample, from the lower half. The median of a finite list of speeds can be found by arranging all the observations from lowest value to highest value and picking the middle value. If there is an even number of observations, then there is no single middle value; the median is then defined as the mean of the two middle values. This can return a more truly central value than the mean, by removing distortion in the presence of unusually high or low speeds.</td>
</tr>
<tr>
<td>Participant</td>
<td>A person enrolled in the ISA trial</td>
</tr>
<tr>
<td>Participating vehicle</td>
<td>A vehicle that had a data recorder and an ISA device installed for the purposes of the ISA trial</td>
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<tr>
<td>PND</td>
<td>Personal Navigation Device</td>
</tr>
<tr>
<td>Private driver</td>
<td>A participating driver who owns the vehicle they used in the trial</td>
</tr>
<tr>
<td>RFP</td>
<td>Request for Proposals</td>
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<tr>
<td>RTA</td>
<td>Roads and Traffic Authority</td>
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<tr>
<td>SCT</td>
<td>Smart Car Technologies Pty Ltd (the supplier of the ISA devices used in the ISA trial)</td>
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<tr>
<td>Term</td>
<td>Definition</td>
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<tr>
<td>Shared driver</td>
<td>A driver of a vehicle used by more than one participating driver.</td>
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<tr>
<td>SIMRA</td>
<td>Supply, Installation, Maintenance and Removal Agreement (that is, the contract prepared to engage ISA services).</td>
</tr>
<tr>
<td>Speed data</td>
<td>A GPS-enabled tracking device installed in participating vehicles which collects speed and location data from that participating vehicle in ten second intervals</td>
</tr>
<tr>
<td>Supportive ISA</td>
<td>An ISA system similar to an Advisory ISA system but which restricts the flow of fuel to the vehicle so that it cannot exceed the speed limit, but allows the driver to override the system if necessary.</td>
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<tr>
<td>SZMS</td>
<td>Speed Zone Management System</td>
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<tr>
<td>TAC</td>
<td>Transport Accident Commission</td>
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<tr>
<td>Trial area</td>
<td>The road network within the local government areas of Wollongong City, Shellharbour City and Kiama Municipality.</td>
</tr>
<tr>
<td>Trial period</td>
<td>The period from when the vehicles were fitted with data recorders to when the vehicles had the data recorders removed (inclusive of the shorter period when the vehicles were fitted with ISA devices).</td>
</tr>
</tbody>
</table>
References


Carsten, O., & Tate, F. (2005). Intelligent speed adaptation: accident savings and cost-benefit analysis. Accident Analysis and Prevention


Crackel L (2009), ‘Intelligent speed assist in Western Australia – where we have been and where are we going?’ in Proceedings of the Intelligent Speed Adaptation Conference, Sydney, Australia, 10 November 2009.


Pallas T (Minister for Roads and Ports) 2010, Trial of new technology to slow down speeding drivers, VicRoads, Melbourne, 13 January).


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Appendix E  ISA device user manual
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Appendix G  NSW Intelligent Speed Adaptation Trial – Attitudinal Research Report – Stages 1, 2 and 3
Appendix H  NSW Intelligent Speed Adaptation Trial – Attitudinal Research Preliminary Research Report
Appendix I  NSW Intelligent Speed Adaptation Trial Proceedings from the 2009 Intelligent Speed Adaptation Conference, 10 November, Sydney
Appendix J  NSW Intelligent Speed Adaptation Trial – NSW Driver Comparison Study Research Report
Appendix K  Frequently Asked Questions sheet (Private drivers)
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