



Journal of the Australasian College of Road Safety

Formerly RoadWise — Australia's First Road Safety Journal



In this edition —

Contributed papers:

- Interview with Claes Tingvall
- Response to the Burden of Work Related Crashes
- UK Fleet Operators Failing to Implement Basic Road Safety Policies
- Queensland Year 12s Stunned by Crash Scene
- Motorcycle Safety – The Next Magic Bullet?
- Arrive Alive Expo
- Fatigue and coping with driver distraction

Peer-reviewed papers:

- Driver Distraction: Reflections on the Past, Present and Future
- Driver distraction: Breakdowns of a multi-level control process



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Managing editor: Geoff Horne, PO Box 198, Mawson ACT 2607, Australia;
tel: +61 (0)2 6290 2509; fax: +61 (0)2 6290 0914; email: journaleditor@acrs.org.au

General papers editor: Colin Grigg, PO Box 1213, Armidale NSW 2350;
tel/fax: +61 (0)2 6772 3943; email: cgrigg@ozemail.com.au

Peer-reviewed papers editor: A/Prof. Raphael Grzebieta, Dept of Civil Engineering,
PO Box 60, Monash University VIC 3800; tel: +61 (0)3 9905 4970; fax: +61 (0)3 9905 4944;
email: raphael.grzebieta@eng.monash.edu.au

Peer-reviewed papers Editorial Board

Dr Barry Watson	CARRS-Q, Queensland University of Technology
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The policy of the publisher is to provide a medium for expression of views and for debate, within the traffic safety community, on a wide range of issues. The journal provides authors of papers with the opportunity to have their work submitted to the Editorial Board for peer review.

Encouragement also is given to interested persons and organisations to submit articles, photographs or letters for publication. The publisher reserves the right to reject submissions or, with approval of the author, edit articles. No payment is offered for articles submitted.

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Cover photo: Crash recovery simulation for Queensland high school students



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From the President



This is now our second edition of the Journal in its new format. Feedback from readers has been very positive to date. We are keen to hear more from readers concerning the Journal's format and any comments on how we can improve our product are most welcome.

One thing we would like to develop is a 'Letters to the Editor' section, where members can voice their views on road safety issues. This could develop into a very useful forum for new ideas. If you have an opinion to share, please send in your letter by post, fax or email to the College office.

The College has been very active in the last few months with organising new developments and activities. We are planning to hold a one day seminar in Wellington, New Zealand on 'Recidivist Drink and Unlicensed Driving' on 13 November and the College will be promoting membership at the Australasian Road Safety Research, Policing and Education Conference 14-16 November at the same venue. Another main agenda item being dealt with at the moment is the ACRS Road Safety Professional Register. Setting up the application procedures for the Register is proving quite complex, but we should be ready to accept applications for registration early in the New Year. Looking to the future, we are planning two general road safety all-day seminars for Darwin and Townsville, from which we hope to establish new chapters for the Northern Territory and North Queensland. These seminars will probably be in July 2006.

Another issue that has concerned me over the past few months is related to the recent terrorist attacks in London and Bali. My wife and I had a horrible scare the night of the London underground bombings. One of our sons was sleeping in his apartment in London only 100 meters from where the bus in Tavistock Square was blown up. He was thankfully safe and we

were very relieved. However it was not so good an outcome for many other victims and their families. As an immediate response to this and other previous events, the Australian Prime Minister then met with federal, state and territory leaders in Canberra to discuss his proposed new anti-terrorism laws and thrash out a plan that ensures the safeguarding of Australians against similar terrorist attacks. As a result the laws have been changed to strengthen anti-terrorism measures.

Personally I am in strong support of these measures, as I find the acts of such terrorism abhorrent and barbaric to say the least. The tragedy of the most recent events in Bali and the pain and suffering the victims and their family and friends are experiencing yet again in Newcastle NSW and Busselton in WA is incomprehensible. Yet when I consider the pain and suffering of victims of car crashes, and their family and friends, I cannot help but be perplexed at why we cannot invoke a similar determination to change laws and attitudes to eradicate road fatalities and injuries.

In Australia 5 people die and around 60 are seriously injured every day. In ten days of road carnage in Australia we will have killed the same number of people as in the London bombing and in 5 days the same number that died in the most recent Bali bombing. Despite this we do not see politicians lining up shoulder to shoulder declaring we will eliminate road trauma with the same tenacity and funding as terrorism seems to be evoking. Indeed, government priorities, that would help change laws to help to reduce this road trauma disaster of war-like proportions confronting our modern society, is so disproportionate in comparison to anti-terrorism measures currently being pushed forward, it makes a mockery of the



whole political process. Face it, you are at a much higher risk of being killed walking across your suburban street than you are of being killed by a terrorist bomb. Yes, you should be worried, but worried about your next car trip — not about whether you will die in a terrorist attack. So why is it so hard to change our laws?

For example we could introduce tomorrow that: all new vehicles must be required to have a seat belt reminder warning buzzer for each occupant; NCAP and the US IHHS crash tests should replace all current weaker Australian Design Rule tests where a 4 star minimum performance is required, all new vehicles should be required to have Electronic Stability Control systems installed as standard, research immediately be funded and started on establishing a rollover crashworthiness standard; any high speed major highway should have its shoulders sealed; any high speed major highway should have anti crossover median barriers installed and roadside barriers installed where impacts with roadside trees and hazards are highly likely.

Having attended a number of National Road Safety Strategy Panel meetings in Canberra I have noticed that the heads of road safety of each state and territory jurisdiction keenly support changes to our laws to enhance obvious and readily accessible vehicle and road infrastructure safety measures. However, I also see considerable frustration when such changes are proposed and rejected at a federal level in the name of global harmonisation and financial repercussions. We can achieve so many gains federally and internationally when it comes to eliminating anti-terrorism obstacles, yet when we mention new crashworthiness measures it falls resoundingly on deaf political ears. My immediate reaction is that we as a society maybe should place the power back into the hands of the state and territory road safety heads to formulate the design rules for vehicles. At least they are keen to see changes and would do something about it if provided an opportunity.

I also need to inform members that, after seven years of service to the College, Geoff Horne has decided to retire as the College's Executive Officer in January 2006.



On behalf of the College I join all members in congratulating Geoff on his many years of devoted service to advancing the College's objectives. Without him I doubt if the College would now be in such a healthy and prominent position to advance road safety in Australasia. His tireless efforts in helping to coordinate the College's many activities, its publications and website have been exemplary. I am sure past Presidents and Executive Committee members would agree with me that their task of directing the College has been an outstandingly smooth one with Geoff's vigorous support and excellent managerial skills behind the scenes. While his retirement as Executive Officer will be a great loss to the College I am pleased to report that Geoff has agreed to continue as Managing Editor of the College Journal and as Administrator of the new Register of Road Safety Professionals.

Finally, I would like to take this opportunity to wish all road users a happy and above all safe upcoming festive season.

Raphael Grzebieta

Quarterly News

College Chapter News

ACT and Region Chapter

As this Journal goes to press, plans are in hand for a seminar on 21 October at the CSIRO Discovery Centre, Canberra, with Professor Claes Tingvall as the guest speaker, reporting on road safety developments in Europe. The seminar is being sponsored by the NRMA-ACT Road Safety Trust and is entitled 'Road Safety Initiatives Seminar'. A number of local speakers will also be providing presentations on national and regional road safety issues.

NSW (New England) Chapter

The New England Chapter met in July 2005. Major items of discussion included issues related to the Arrive Alive Expo 2005 held in June and the commencement of planning for the 2006 Expo [Ed: see report on the Expo later in this Journal]. It was also decided to commence planning to hold a symposium at Armidale on road safety issues specific to rural and regional Australia, ideally to coincide with Arrive Alive 2006.

NSW (Sydney) Chapter

A seminar is planned for the end of the year in partnership with the AITPM NSW Branch on 'Road Safety and Transport Policy'. A link has also been made with AITPM for their NSW Branch meeting on 3 November. Plans are going ahead for the College series seminar on 'Recidivist Drink and Unlicensed Driving' to be held in Sydney in February 2006. The keynote speakers at this day-long seminar will be Ms Kerry Fitzgerald and Dr Barry Watson, together with three local speakers. The Chapter AGM will be on 2 December.

New Zealand Chapter

The Chapter ran a seminar in Wellington on 11 August when Tony Bliss of the World Bank spoke on 'Global Developments in Road Safety'. This was attended by 32 people. As the Journal went to press two further meetings were in the pipeline — a seminar on 20 October at which the speaker will be Shalom Hakkert, from Israel, currently on sabbatical in New Zealand; and on 13 November the Chapter will be running the College series all-day seminar on Recidivist Drink and Unlicensed Driving before the start of the Australasian Research, Policing and Education Road Safety Conference.

Queensland Chapter

The Chapter held the Recidivist Drink and Unlicensed Driving Seminar on 19 August at CARRS-Q. Attendance was in the mid-20s, lower than had been expected. However, for those who attended it was a very useful meeting, with good exchange of information and views. The Chapter held another of its regular quarterly meetings on 6 September when the focus was on 'Adolescent Risk Taking'. Professor Mary Sheehan and others from CARRS-Q spoke about a particular intervention developed for implementation in schools in regard to adolescent risk taking. This topic was chosen because there had been a lot of media attention on young drivers recently, following some serious road crashes.

South Australian Chapter

With sponsorship by the Motor Accident Commission, the Chapter is well on track to have discussion meetings about every two months. A recent meeting was on taking stock of the SA road safety strategy and where it was at, and the fact that the objectives would not be achieved. In September Lachlan McIntosh of the Australian Automobile Association spoke on 'Information Technology Systems and Vehicle Safety'. Arrangements have been finalised for a seminar on 19 October with Professor Claes Tingvall as the guest speaker.

Victorian Chapter

A seminar on Older Drivers was held on 1 August, to follow up the inquiry held two years before. A Young Driver Forum was held on 20 September at the TAC, to follow up on the release by the Victorian Government of its discussion paper on graduated licensing systems. Claes Tingvall will be speaking on 'Road Safety Developments in Europe' at a Chapter meeting on 25 October at the TAC.

Western Australian Chapter

A planning meeting was scheduled for October. A lunchtime seminar on 'Driver Distraction' with Dr Mike Regan of the Monash University Accident Research Centre (MUARC) as the speaker is planned for 12 December.

Diary

13 November 2005:

'Recidivist Drink and Unlicensed Driving' seminar, Wellington, New Zealand.

Contact: 64 4 801 5385

14-16 November 2005:

Australasian Road Safety Research, Policing and Education Conference, Wellington, New Zealand.
Contact: +64 4 801 5385.

21-24 May 2006:

IPWEA (NSW Division) Annual Conference in Sydney.
Contact: Caitlin Williams, tel: 02-8267 3007;
email: conference@ipwea.org.au

Australian News

Cool Bus Rules

The Queensland Government has launched a new road safety tool, exclusively tailored for primary school students. The Really Cool Bus Rules Resource Pack will be distributed through schools and school bus operators throughout Queensland.

The package was developed by a team that included educational experts from Education Queensland, to ensure the road safety message reached its target audience — primary school students. The pack is based around a comic book with cartoon characters that children relate to. It includes incentives for good behaviour, and rewards in the form of stickers, for bus drivers to issue to students who do the right thing.

The Really Cool Bus Rules Resource Pack contains:

- An A5 full colour comic book showing cartoon characters behaving responsibly on a school bus — each picture with rhyming text
- Stickers for drivers to reward students for good travelling.
- Bookmarks in the shape of a bus, promoting good behaviour
- A poster for inside the school bus to reinforce the rules
- Plastic pouches — one per driver — to safely store the resource pack items on buses.

The resource pack will be explained to school bus drivers in a series of seminars throughout Queensland. The packs will be distributed to schools in time for the new school year. (Source: Qld Dept of Transport and Main Roads)

New ARTSA guide on suspension safety

Australian Road Transport Suppliers Association (ARTSA) launched 'A Guide to the Application and Use of Suspensions on Multi-Combination Vehicles' in Melbourne in September. ARTSA is an industry association with over 35 members from the component and Original Equipment Manufacturers (OEM) sector. It is focused on providing technical expertise and representation to improve safety, productivity and efficiency in many aspects of the road transport industry.

This publication has arisen from a significant research project entitled, 'Stability and on-road performance of multi-combination vehicles with air suspension systems'. The project was instigated by the Remote Areas Group (RAG) to address concerns raised by operators regarding inadequate dynamic stability of certain multi-combination vehicles. Stage One and Two were managed by the WA Department for Planning and Infrastructure (DPI). The project reports are available on the National Transport Commission (NTC) website at: www.ntc.gov.au.

The third and final stage of the project was the preparation of the Guide. This is a 'living document' that is intended to be updated by ARTSA from time to time as new knowledge emerges on the application and use of suspensions on multi-combination vehicles. Free electronic copies of the Guide are available at: www.artsa.com.au.

ARRB Group expands its Sydney operations

ARRB Group (formerly ARRB Transport Research) recently opened larger offices in Ultimo, Sydney, following the signing of a Memorandum of Understanding with TRL Ltd to acquire their Australian staff and business operations based in Sydney. This has resulted in increased capabilities for the ARRB Group, such as accident reconstruction and transport security advisory services.

Helicopters enhance road crash survival chances

A well established fact is that crash victims given medical care during the first hour (the Golden Hour) after a road crash are much more likely to survive and recover. The flexibility and speed of helicopters is having an increasing impact on crash victim survival rates in Australia. An example of this is the CareFlight services operated in NSW, first introduced in 1986. NRMA CareFlight was introduced as a medically focused rescue service. It operated from a modest facility at the rear of Westmead Hospital, Sydney, NSW. The service has been described as a mobile intensive care unit.

CareFlight has now grown to an operation with two bases (Sydney and Orange), three helicopters and seventy staff members. In 2004 the service treated and transported 1,423 patients. Of these 30-40% were road crash victims.

For the financial support of the service, \$5.5 million of the required \$8.5 million comes from business and community sources. The NSW Government provides the remainder. Sponsorship from NRMA Insurance and NRMA Motoring and Services accounts for about 10% of the running costs.

Pilot 'Skipper' program for the Gold Coast

A six month road safety pilot 'skipper' scheme, launched on 26 August 05 on the Gold Coast, is aimed at helping to save young lives. Announcing the scheme, Paul Lucas, Minister for Transport and Main Roads, said 'skipper' was aimed at young drivers and encouraged them to act responsibly by planning ahead before embarking on a big night out. He said that 'skipper' was designed for young people heading out together in a group.

"It's simple. Someone puts their hand up to be the 'skipper' for the night. They wear a special wristband and the hotels in the initiative provide them with free soft drinks and non-alcoholic drinks. (Source: Qld Dept of Transport and Main Roads)

RACV researches Victorian drink driver rehabilitation and education

A recently released report prepared by CARRS-Q and commissioned by the RACV states that significant reductions in drink driving have been achieved in Victoria in recent years. However, the report stresses that drink driving is still a major economic, social and health problem. For example, in 2001, 31% of all drivers and riders killed on Victoria's roads had a BAC of 0.05 or more and repeat drink driving offenders were responsible for 22 fatalities and 560 serious injuries. The cost to the community of such crashes is estimated at \$81 each year.

While Victoria has been a pioneer in its legislative approach to drink driving, the report identifies some weaknesses in the current system and recommends improvements. These include changing the focus from education and assessment to an integrated rehabilitation program; reviewing the current interlock legislation in the light of international research and the outcomes of the first year of the Victorian Interlock Program; and considering reducing the licence suspension period of offenders who participate in the alcohol interlock program. (Source: RACV 'Drink Driver Rehabilitation and Education in Victoria Summary Report 05/01)

New company to improve use of road network

Transport Certification Australia (TCA), a public company established under the Corporations Act, and endorsed by Australian governments, was registered on 15 August, 2005 as an agency for Australian heavy vehicle transport reform.

Initially TCA will support the Intelligent Access Project (IAP); a voluntary program used to monitor heavy vehicles using telematics services via the Global Navigational Satellite System and provide certification and on-going auditing assurance to third-party providers of the service. It is anticipated that this will lead to more productive and efficient use of the Australian road network through more predictable compliance with road transport

laws. TCA will manage national level issues associated with the IAP including the certification of service providers. Jurisdictions will continue to manage access to their road network developing schemes, permits and applications which utilise the IAP.

"IAP provides a win-win outcome to all parties," said TCA's newly appointed Chief Executive, Mr. Chris Koniditsiotis.

"The transport industry can seek improved access to the road network and in return use the IAP to demonstrate compliance to operating conditions. Jurisdictions can better manage heavy vehicle access and have confidence that overall the operating conditions are being adhered to. The telematics industry can enhance their businesses by seeking certification to provide the IAP in addition to their commercial services."

During the establishment phase further information can be accessed from the NTC website and the Austroads website: www.austroads.com.au. (Source: NTC Sept 05)

Novice Driver Review in WA

The Road Safety Council of Western Australia has been engaged in a review of the factors relevant to over-representation of young people in road crashes. The Council prepared a draft report containing nine significant recommendations aimed at improving the way young people are trained and prepared for driving. The draft recommendations were issued for public comment prior to July this year. These recommendations are as follows:

- To increase the minimum number of supervised and logged driving hours required from 25 hours in one learner phase to 120 hours over two learner phases;
- To specify a minimum of six months for the learner phase 2 period;
- To increase the maximum time a learner can stay on their Learner's Permit to three years with no renewal fee;
- To extend the Provisional (P-Plate) licence period from two to three years;
- To tighten the requirements for supervising drivers, particularly in relation to the blood alcohol concentration (BAC) limit;
- To introduce night-time driving restrictions for Provisional Drivers for the first six months of their provisional period;
- To introduce peer passenger restrictions for Provisional Drivers for the first six months of their provisional period;
- To introduce a zero Blood Alcohol Concentration (BAC) limit for both Learner and Provisional Drivers;
- To introduce a graduated demerit point system and issue warning letters to deter unsafe driving practices.

The public is invited to comment on these proposals. To read

the full review on line, to download a feedback form, or to request a hard copy of the report, enter 'novicedriver review' in the search facility of the Office of Road Safety website at www.officeofroadsafety.wa.gov.au or call the Novice Driver Infoline 08 9216 8769.

NTC and ATA acknowledge improving truck safety record

THE National Transport Commission (NTC) and Australian Trucking Association (ATA) have acknowledged the release of statistics for 2004, which show a significant fall in the number of fatalities involving articulated trucks.



Data from the Australian Transport Safety Bureau (ATSB) reveals that, in 2004, there were 135 fatal crashes involving articulated trucks, resulting in 147 deaths. This represents a 26.5 percent decrease in

these fatalities since 2002 (200 deaths from 171 fatal crashes). Over the same period the total number of fatalities on Australian roads fell by 6.8 percent. "This is a really positive and encouraging trend which reflects the hard work of both governments and industry," said ATA Chief Executive, Chris Althaus.

Industry and government have committed to a National Heavy Vehicle Safety Strategy (NHVSS) to identify and manage land transport safety risks. The NHVSS was originally adopted by the Australian Transport Council in 2003 to complement the National Road Safety Strategy target of a 40 percent reduction in the road fatality rate by 2010. "The NHVSS Taskforce is a great example of industry and government working in partnership toward a common goal," said NTC Chief Executive Tony Wilson. Safety initiatives introduced over the last two years include the promotion of seatbelt use, increased road expenditure (including Blackspot programs by state and the federal Governments), greater awareness of fatigue management, and random drug testing. The NTC and ATA also jointly hosted a Speed Summit to address the issue of speed management. Mr Wilson said, "The fall in fatalities has been particularly encouraging in the context of a growing freight task. (Source: NTC/ATA joint media release 5 Aug 2005)

ANCAP developments

Until mid-2004, ANCAP, the Australian New Car Assessment Program, continued to crash test and evaluate passenger cars to the same test and evaluation protocols as used by EuroNCAP. Over the last year, however, ANCAP has undertaken a program of pole tests on the popular selling passenger four

wheel drives to assess head protection in side impacts. With input from the Australian vehicle industry ANCAP has also reviewed its scoring system to encourage improvements in head protection during side impacts. With the updated scoring system in place, the next step is to consider future activities to encourage improvements in occupant protection. The basic principles for the revised rating system agreed to by ANCAP and the industry were:

Retain 5 stars as the maximum score;

- A vehicle can only achieve 5 stars if fitted with effective head protecting side airbags;
- Continue with the offset frontal crash test (with same scoring system currently used);
- Keep the mobile deformable barrier (MDB) side impact test; and
- Maintain harmonisation of overall score and star rating with EuroNCAP to prevent confusion for the new car buyer, except as follows:
 - ANCAP will not conduct the MDB test on high seated vehicles — these vehicles receive a default of 16 points;
 - ANCAP may conduct a pole test if a variant of the vehicle has head protecting side airbags and will score the test as per EuroNCAP;
 - Tested vehicles will need to have effective head rotation in side impacts (ie: achieve at least one point out of the possible two points in the pole test) to achieve the maximum ANCAP rating of 5 stars.

ANCAP is confident that the revised rating system will result in an increase in the fitting rate of head protection in all passenger cars, and especially 4WDs. (Source; AAA's 'Motoring Directions' – 1/05)

Queensland Approved Inspection Stations (AIS) feel the heat

In the past five years, 165 AIS operators have been prosecuted following snap audits by Queensland Transport inspectors. Transport and Main Roads Minister Paul Lucas said there was no place in the industry for shonky operators who issued false safety certificates. "What they're doing is illegal and dangerous. Operators who won't abide by the law endanger the lives of motorists and give the industry a bad name," he said. The blitz on Approved Inspection Stations across the state had led to the closure of 6 operations and tens of thousands of dollars in fines and in some cases, imprisonment. The latest figures show that, between June 2004 and March 2005, there were 277 Approved Inspection Stations audited in Queensland. Just under half were issued with a warning, fine, prosecution, suspension or cancellation. The prosecutions were for various offences relating to the inspection of vehicles and the issuing

of false vehicle safety certificates. In addition to prosecutions by Queensland Transport, Police also charged 129 people with 2111 various offences over the past 4 1/2 years. Offenders could face jail sentences ranging from 3 months to 12 years and fines ranging from \$2,000 to \$10,000. Six Approved Inspection Stations had been forced to close down as a result of the audits. "While the majority of operators are working within the law, there are a number of ongoing investigations and more prosecutions expected," Mr Lucas said. There are over 2,500 Approved Inspection Stations in Queensland that issue more than 600,000 safety certificates each year. (Source: Queensland Dept of Transport & Main Roads, 21 July 05)

New Zealand News

Scientist's life dedicated to road safety research

Dr John Bailey, of Wellington, described as "one of New Zealand's most dedicated researchers into road safety over more than three decades", died in August at the age of 61. His studies in drunk driving showed that 44% of drunk drivers causing fatal accidents already had at least one conviction and that almost one in five drink drivers convicted after surviving fatal road crashes re-offended within four years. Dr Bailey's expertise was often called upon by parliamentary select committees. His qualifications included bachelor and master's degrees in mathematics and chemistry at Victoria University, followed by a doctorate in quantum chemistry at Oxford University. Most of his road safety research was done while working in the Department of Scientific and Industrial Research and then the enterprise Environmental Science and Research. In 1996 he set up his own business with his wife, Margaret, who survives him. (Source: Arnold Pickmere, NZ Herald, 13-8-05)

Publications for drivers new to NZ

Land Transport has published two brochures to assist drivers coming to NZ, one for tourists and one for new residents. Points to note for tourists are NZ's unique give way rule, driving on the left and fatigue caused by journeys taking longer than expected due to the narrow winding roads. Approximately 600,000 tourists drive in NZ each year. The tourist brochure is available in English, German, Japanese, Korean and Chinese and will be distributed mainly through rental vehicle companies. The brochure for new residents deals also with broader issues associated with the diverse range of driving conditions that many new residents find challenging. This brochure is also available in a number of languages. (Source: Land Transport News August 05)

TV ads aimed at young male drink drivers and passengers

A new campaign was launched in August 2005 aimed at reducing the number of road crashes involving drink drivers aged 15 – 24 years, which result in approximately 900 injuries and fatalities per year. Over 40% of all alcohol-related crashes involve this age group. The campaign aims to challenge the passenger's decision to ride with drivers who drink. It uses humour to reflect the reality of young men, including their attitudes and language. The aim is to convince young people to consider carefully before getting into a vehicle with a driver who has been drinking. The TV ads direct viewers to a website: www.canttrustmates.co.nz. (Source; Land Transport News August 05)

Used car safety ratings

The 2005 version of the Used Car Safety Ratings brochure is now available and can be downloaded from: www.landtransport.govt.nz or for a printed version email: order@landtransport.govt.nz or all Land Transport NZ on 0800 699 000.

European News

ETSC critical of EU Driving Licence delay

Jorg Beckmann, Executive Director of the European Transport Safety Council (ETSC), says the EU Transport Ministers' failure to adopt the EU Driving Licence Directive is bad news for the 300 million citizens who hold a driving licence in Europe. He claims that it also delays improved cross-border enforcement, protection against fraud and preventing 'driving licence tourism'. There are more than 110 different driving licence models with different entitlements and validity periods in circulation today in the Member States. [And some of us thought Australia had a problem! — Ed]. The Directive proposes to replace all the licences with one unique European format, which will make it a lot easier for police to determine if someone is entitled to drive a specific type of vehicle or not. The Directive also reinforces the principle of progressive access to the more powerful motorcycles, trucks and buses and emphasizes the importance of training and experience. (Source: ETSC Safety Monitor No.60)

Latest scoring by EuroNCAP

Europe's independent crash test organization, EuroNCAP, announced its latest ratings recently at a press conference co-hosted with the Swedish Road Administration. Peugeot's 1007 became the highest scoring car ever in all classes for adult occupation protection. Professor Claes Tingvall, Chairman of EuroNCAP, commented that

technology such as a Stability Control system can play an important role in reducing the chances of being involved in a crash. In Sweden, studies show that for cars equipped with such a Stability Control system there was a reduction of 22% of accidents, rising to 32% in wet conditions. (Source: ETSC Safety Monitor No.60)

Record reduction in UK road toll

The number of people killed on the UK's roads in 2004 was the lowest figure since records began in 1926, according to the Department of Transport. 8% less people died in road accidents in 2004 compared with 2003 (down 287) and, despite an estimated increase in road traffic of 2%. (Source: ETSC Safety Monitor No.60)

Speed limiting devices to be mandatory

Recent legislation requires that vehicles intended to transport passengers, registered as from 1 January 2005 and having more than 8 seats, including the driver's seat, must be equipped with a speed limitation device set in such a way that their speed cannot exceed 100 kph. Vehicles used for the transport of goods having a maximum weight in excess of 3.5 tonnes

registered as from the same date, must be fitted with a speed limitation device so as not to exceed 90 kph. (Source: ETSC Safety Monitor No.60)

Swiss wine industry's spirited attack on road safety

A Swiss district court has rejected a complaint from a Swiss Wine Industry association against the Swiss Council for Accident Prevention and the Ministry for Health. The complaint accused them of harming the wine industry with their latest drink-driving campaign. On the contrary, the judge told the court, "the billboard campaign does not prevent drinking at all. It only encourages drivers not to drink more than one glass of wine." (Source: ETSC Safety Monitor No.60)

Be seen and survive in Portugal

Since June 2005 drivers in Portugal have to carry reflective vests in their vehicles and to put them on if they are on the road after a breakdown or accident outside of built-up areas. Other countries including Italy, Austria and Spain are also introducing the reflective vest. (Source: ETSC Safety Monitor No.60)

Advertisement

Safe and Mobile: Introductory Studies in Traffic Safety

Now in its third reprint, this manual was written for students in tertiary courses in Traffic Safety at Australian Universities and in Police Academies. The text is recommended also for specialists working in Traffic Safety who wish to become more familiar with broader issues in this multidisciplinary profession.

The contents and authors are as follows:

The Past: Hit and Miss (Jennifer Clark, University of New England)
 The Driver: The Psychology of Road Safety (R F Soames Job, University of Sydney)
 The Vehicle: Automotive Engineering (Chris Coxon, S A Department of Transport)
 The Environment: Road Engineering (Peter Moses, Consultant, Western Australia)
 The Environment: Transport Economics and Planning (Michael A P Taylor, University of South Australia)
 The Environment: Traffic Management (Angus Witherby, University of New England)
 The Future: Whither Traffic Safety? (Colin Grigg, Consultant, New South Wales)

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American News

USA road crash statistics released for 2004

In September 2005 the US Department of Transportation's National Highway Traffic Safety Administration (NHTSA) published statistics for road crashes and their resultant fatality and injury rates for the whole of the USA and also on a state by state basis. The fatality rates recorded are based on a census of fatal traffic crashes and are not subject to sampling error. The injury rates, however, are based on a nationally representative sample of police-reported crashes and are subject to sampling errors.

Fatality rate drops to 30 year low

42,636 people were killed in 2004, compared with 42,884 in 2003, a drop of 0.6%. 2,788,000 people were injured in 2004, compared with 2,889,900 in 2003, a drop of 3.5%. The motor vehicle crash fatality rate per 100 million vehicle

miles traveled declined 1.4% to the lowest since record keeping began 30 years ago. The 2004 fatality rate/100M VMT was 1.46 compared with 1.48 in 2003. If the 2004 fatality rate had remained at the 2003 level, an additional 628 people would have died.

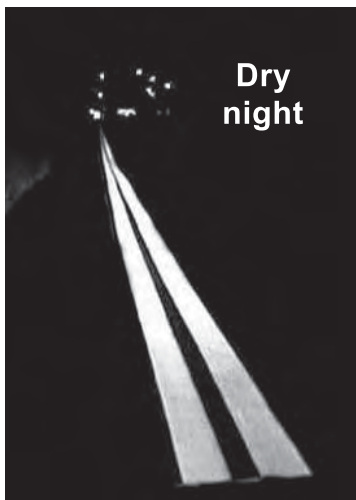
Motorcycle riders not doing well

While motor vehicle occupant and non-occupant fatalities declined in 2004 (occupants 33,134 and non-occupants 5,494), motorcycle rider fatalities increased for the seventh year in a row, from 3,714 in 2003 to 4,008 in 2004, a 7.5% increase.

Restraint use continues to be a major issue in the USA

Of the vehicle occupants killed in crashes in 2004, 17,575 or 55% were not wearing any kind of seat belt. However, this was a slight improvement on the 2003 figure of 56%. Clearly the authorities have a lot of work to do in convincing Americans to 'buckle-up'.

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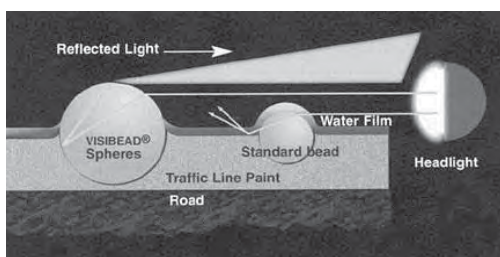
Above: Conventional painted pavement marking (left), and Visibead® pavement marking (right).

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Contributed Articles

Zero Tolerance for Road Slaughter

Article contributed by **SaferRoads**
www.aaa.asn.au/saferroads



The following interview with Professor Claes Tingvall, Head of Road Safety with the Swedish National Road Agency and Chair of EuroNCAP, was first published in the New Scientist Magazine in July 2005 and republished in August in the SaferRoads Supporter Newsletter.

Your plan was to halve the number of traffic deaths in Sweden by 2007. Is it working?

Last year we saw a drastic drop in the number of traffic deaths, the lowest ever at 480, compared with 631 a decade ago. Partitioning the lanes of country roads with thousands of kilometres of fenced cables has reduced frontal collisions by 95 per cent. Car makers now install electronic seat belt reminders on 80 per cent of Swedish cars. That's up from almost none just a few years ago.

A technology called electronic stability control is a great new improvement. ESC compares the position of the steering wheel with the way the car is actually moving, and if there's a discrepancy it slows the engine and applies the brakes. This can stop a car from skidding on a wet road or around a turn. Seventy per cent of Swedish cars are now equipped with this technology - that's triple what it was 18 months ago, top of the world league. In the US, where the use of ESC is about 20 per cent, the results of a consumer survey suggest it is twice as effective at saving lives as airbags, and could halve the number of single vehicle fatal crashes.

We won't reach our target by 2007, in part because traffic has increased since we set that goal. There are more foreign trucks on the road and more young people drinking and speeding. But the plan is working.

A large number of deaths are caused by drink-driving. How do you deal with that?

Alcohol is a growing problem — it is estimated that more than half of single crashes on state highways are caused by drivers under the influence. Alcolocks can change that. The idea is that you have to blow into the apparatus in order to start the car, and at regular intervals during the journey, or else the car will stop.

These devices have been used in Canada, Sweden and the US for convicted drunk drivers who get to keep their licences if they keep alcolocks in their cars for two years. But the Swedish government is the first to propose that all new cars be sold with alcolocks from 2012, and lorries, taxis and buses from 2010.

After a high-profile accident last year, which involved a drunk Hungarian lorry driver going the wrong way down the motorway and killing four people, a lot of Swedish firms are taking their own initiatives. Trucking firms and bus companies are already installing alcolocks on their vehicles. At the moment they are expensive, over 1000 Kronor. They also take a long time to warm up. But the concept is being developed.

In the future we may not use breathalysers at all, but more subtle instruments such as on-board computers that detect when the car is being driven in an erratic way characteristic of drunk driving, and then cut the ignition.

Isn't that a lot of government control over people's lives?

People say things like that, but it's actually a liberating principle. It is every human being's right to use the road without risking their life as an entrance fee. Some campaigners say that driving drunk is like having a 1-tonne murder weapon at your disposal. Fourteen thousand people a day drive while intoxicated on Sweden's roads, and that is unacceptable.

Safety is expensive, and ultimately it's a cost-benefit analysis issue. How much is a life worth?

It is estimated that the public values a life at 1.7 million Kronor. That is how much they are prepared to pay in taxes for improvements to save a life. Wire barriers at 140 Kronor per metre are cheap by that measure, especially since they make the safety of country highways equivalent to that of motorways - the safest roads around - which cost 6000 Kronor a metre.

Are you exploring other safety measures?

A colleague at the Transport Research Laboratory in the UK says that many deaths could be avoided by restructuring the front bumper to absorb energy and reduce the chances of leg breakage. The average cost would be less than 100 Kronor.

There is also a technology called speed limiters, in which the accelerator vibrates or a voice sounds an alarm when the driver exceeds the speed limit, as measured by GPS. Sweden is running a trial in four towns, and both the European Commission and the UK Department for Transport are interested in the technology.

What about the behaviour of individual drivers?

Drivers can improve their survival rates significantly by wearing seat belts, keeping to the speed limit and not drinking. But the zero vision recognises that everyone makes mistakes, and there will always be accidents, even with the best drivers. So we have to take a comprehensive approach to safety, tackling not only individual road users' behaviour but also road infrastructure and vehicle design.

Response to the Burden of Work Related Crashes

by Lori Mooren, Consultant, Safety and Communications, Sydney

Road trauma is a major burden on global well-being, with World Health Organisation data suggesting that approximately 1.2 million of the 5 million global injury deaths each year are road use related. As data collection improves there is likely to be increasingly clear evidence that many of those deaths involve, or are caused by employees engaged in work related driving.

Australian Work Related Road Safety Problem

Precise data on the numbers and rates of work related crashes throughout Australia – or indeed in other countries is not known as the 'purpose of journey' is generally not recorded by police or other investigation agencies. But in Queensland where the best data is collected, crashes involving fleet vehicles account for 25% of road fatalities, 43% of work-related fatalities, and cost businesses more than \$1 billion per annum. This problem is of a magnitude that likely has a deleterious effect on the competitiveness of Australian industry.

There is a growing concern about the high costs of driving incidents and crashes. Company vehicle crash rates are estimated to be between 20-65% per year. And fleet crashes are estimated to factor up fleet costs by around 15%. One Australian manufacturing company with a fleet of 4000 vehicles reports an annual vehicle incident rate of nearly 50% with \$4.5 million in direct costs associated with these events. But increasingly, the hidden costs are being calculated. Insurers like Lumley General advise that a multiplier of between 3-5 should be factored in to show the real costs of these incidents.

In Australia, road crashes are the most common cause of work-related death, injury and absence from work. A study published by the National Occupational Health and Safety Commission (NOHSC) found that 23% of occupational deaths occurred while employees were involved in work task related driving, and 26% of occupational deaths occurred from road related crashes whilst commuting to and from work.

Non-fatal injury data is less clear. However, Queensland Workers Compensation figures for 1997-2000, show that vehicle accident payments from 10,195 claims (5% of total claims) cost over \$52.5 million (10% of total costs) and resulted in 233,013 workdays absent (9% of total days).



While much of the focus on work related driving is on heavy vehicle transport risk, 63% of the workers compensation claims were light vehicle related. Also, insurance data under-represents the problem as many workers are either not covered under worker compensation schemes, or crashes involving third party injuries are claimed through separate insurance arrangements or private settlement.

A truck safety benchmarking study commissioned by the National Road Transport Commission in 2002, found that the truck related fatality rate in Australia is much higher than in some other OECD countries per vehicle kilometres travelled (risk exposure). For example, it was 47% higher than in the US and 39% higher than in the UK. But it was comparable to Germany and New Zealand. On average there are 180 deaths per year in Australia involving heavy trucks.

Nature of the Problem

A number of direct factors are involved in work related crashes, including the same road, vehicle and human factors that are involved in non-work related crashes. However, the underlying reasons for these factors manifesting in work related journeys are important to examine in order that employers can focus their safety effort in the best way.

The sheer amount of risk exposure of corporate fleet driving is greater than that of the general driving community. Fleet vehicles travel about three times the distance of the average private motorist in Australia (about 30,000 compared to 10,000 kilometres per annum). Company car drivers travel further; but often drive under greater time pressure due to tight schedules, and do not own the car they drive so are less inclined to take special care not to damage it.

A number of studies have found that greater risks are associated with work related or fleet vehicle driving. There is a common perception that company car drivers are the most likely to speed, tailgate (drive too close to other vehicles), show aggression, take risks, lose concentration, use their mobile

phone while driving, and park in illegal places. They are often seen to have worse lane discipline (excessive use of the outside lane on motorways) and commit more traffic offences than the general driving population (speeding and illegal parking).

Moreover, the risk of fatigue is pervasive in work-related driving. Commercial pressures mean that rosters often push to and beyond the legal limits for transport drivers, due to the need to optimise the use of the equipment and meet delivery schedules. Fatigue is also a major risk factor in light vehicle, non-transport related driving. The risk scenarios include, return journeys after long or difficult shifts, sales representatives determined to get to their destination within a day, drivers with a sleep disorder, poor sleep patterns affecting driver alertness on work related trips.

Government Response – Assistance and Support

In recent years, road safety authorities and agencies, insurance and industry groups, and occupational health and safety agencies have been simultaneously increasing their commitment to fleet safety. Each is endeavouring to promote greater involvement by employers in road risk management.

In NSW, the RTA (Roads and Traffic Authority) began focusing on fleet safety in the early 1990s in tandem with developments in the private sector in companies like 3M and Telstra. In 1994, the RTA developed a fleet safety policy brochure (Safe Driving Policy for Fleet Operators) that provided advice to employers. The State Government boosted attention to the issue by making fleet safety part of its platform for improving road safety over the next ten years ('Road Safety 2010 – a framework for saving 2000 lives by the year 2010 in New South Wales').

The Federal Office of Road Safety together with the National Safety Council of Australia produced a Fleet Safety Manual in 1995, to assist employers to take an active part in road safety.

In Victoria VicRoads and the Transport Accident Commission teamed together to produce a set of materials aimed at making fleet safety easier for employers. A Fleet Safety Manual and Kit was developed in consultation with a number of companies and is now available for employers to purchase and adapt to suit their needs.

The Queensland Department of Transport has provided assistance to some organisations to develop and implement fleet safety policies. The Queensland Government has also developed a detailed Work Book incorporating the idea of self assessment against key criteria for the award of a gold, silver or bronze rating. Well over 200 companies are already using the workbook.

Government Response - Regulation

In the late 1990s it was recognised that heavy vehicles drivers are often pressured to take driving risks in order to carry out the expectations of their employers or customers. This recognition resulted in the introduction of 'Chain of Responsibility' principles, which were introduced to ensure that all in the transport chain would be held responsible for their contribution to breaches of transport laws and incidents.

Moreover, under employers' duty of care, driving is regarded as a work related task, and the vehicle is defined as a 'workplace'. Requirements under Australian OHS legislation, like the Western Australian Occupational Safety and Health Act 1984, stipulate that "... an employer must provide safe workplaces, safe plant and safe systems of work, as well as information, instruction, training and supervision". In relation to road safety, Wendy Clarkson of Worksafe Western Australia says that OHS provisions, "clearly apply with respect to employees who are driving as part of their work."

Clarkson goes on to illustrate the extent of an employer's duty of care. She says, "It is not only the effect of driving itself which needs to be taken into account, but the work activity as a whole. In 1990, an employee was killed while driving following an extended work shift. The work itself did not involve driving, apart from travel between the depot and the place of work." However, it was found that his work shifts in the period leading up to the crash did not permit adequate rest breaks.

The penalties for breaching OHS laws are also getting tougher. On 1 March 2004, the Australian Capital Territory's Crimes Act was amended to include the new crime of industrial manslaughter. Victoria, New South Wales, Queensland, Western Australia and Tasmania have all considered introducing stricter penalties for incidences of workplace death including industrial manslaughter laws, although none of the mentioned states has introduced such laws or penalties yet.

However, each of the relevant state and territory OHS Acts have very similar provisions, generally requiring an employer to ensure the health, safety and welfare at work of all the employees of a company. In NSW, the maximum penalty is \$825,000 for a corporate offender facing its second or greater offence. Even a first offence carries a maximum penalty of \$550,000. An individual with a previous offence faces a maximum fine of \$82,500 and/or two years imprisonment. In Tasmania the fines can be as high as \$165,000 for corporations and \$55,000 for individuals. But, there is no provision (yet) for jailing any offender. Likewise there are no jail sentences available in South Australia, Western Australia or the Northern Territory. Victoria has similar provisions to NSW, with a maximum penalty for a second offence being \$275,000 for corporations, but up to five years imprisonment for

an individual. Queensland offenders also face the risk of up to two years jail and up to \$88,000 in fines.

With driving being the biggest cause of work related death, employers are well advised to put in place good policies, systems and programs to reduce this risk.

Employer Response

For probably a range of reasons, employers are increasingly taking an active approach to identifying and addressing work related driving risks. The impetus for this is many fold. Beyond the legal reasons (preventing deaths and injuries to employees), the costs associated with employee driving incidents are compelling arguments for investing in driver risk management.

Some employers are taking a very strong policy position on road safety, and commit to ambitious targets. For example, Dupont is well known for its holistic commitment to safety and is applying these principles to driving, whether employees are on the job or not. BP and BHP Billiton have zero accident/zero harm goals and recognise that operating motor vehicles is among the biggest risks to work safety. Many others are actively involved in driver and fleet safety programs.

Some are even promoting community road safety as well, consistent with their commitments to both their staff and the communities that they operate within. Notably, the Global Road Safety Partnership is a network of Government, businesses and non-government organisations committed to working together to achieve improved road safety in selected focus countries.

A number of benchmarking programs aiming to identify and promote good practice are also beginning to emerge. Lumley General has a "Benchmarking Club" for its clients to compare their fleet safety performance with others in their industry grouping, as well as to share good practices at an annual seminar. Benchmarking Partnerships convenes a unique set of workshops, that enable participants to hear from fleet safety professionals and peers about good practices in fleet safety – and importantly to discuss in small groups the practical issues involved in implementing good practices.

Summary and Conclusions

While the area of 'fleet safety' or 'occupational driving safety' is still relatively new, increasingly the injury prevention, road safety, fleet management and OHS practices are becoming synthesized with a focus that aims to reduce road injury and costs associated with fleet and work related driving.

Regulatory bodies are forging more rigorous legislative requirements of employers and others involved in fleet safety and managing work related travel risk.

Many employers are taking an active approach to identify and manage risks associated with work related driving. Through the development and sharing of good practices for managing fleet and occupational driving risk, a reduction in road injury associated with work related driving can be expected over coming years.

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UK Fleet Operators Failing to Implement Basic Road Safety Policies

by Dr Will Murray, Research Director, Interactive Driving Systems (IDS), UK-Australia-EU-USA

There has been an increasing amount of discussion on fleet safety in the UK in recent months, in part caused by the proposed Corporate Manslaughter and Road Safety Bills, as well as changes to Police and HSE reporting requirements on fleet vehicles.

Recent research studies in the UK have focused specifically on the fleet safety policies that organisations have in place.

Towards the end of 2004, Nottingham Business School's Centre for Automotive Industries management found that only 31% of the fleets in its survey had a written fleet safety policy in place.

A study by the Royal Automobile Club in early 2005 put this figure at 60% of fleets

More recent findings published on the internet suggest that 79% of companies have no fleet risk management strategy in place.

Clearly there are some conflicting figures coming out from these surveys. For this reason we at Interactive Driving Systems decided to undertake our own research on this issue, based around three questions.

1. Do you have a written fleet safety policy in place?
2. Is the policy reviewed, improved and updated annually?
3. Do you check your drivers' knowledge of the policy?

The latter two questions were felt to be important because having a policy is a good starting point – but living, breathing and making the policy work for you is better!

The survey was posted on our internet site at www.vfrm.net and was responded to by 242 fleet managers. Of these:

- 70% have a written fleet safety policy, 30% don't.
- 49% update the policy annually, 51% don't.
- Even less, 41%, check their driver's understanding and application of the policy, 59% don't.

IDS CEO Ed Dubens said: 'These results suggest that although almost three quarters of respondents had a policy, less than half of them reviewed and updated it on a regular basis and that almost two thirds of them did not bother to check whether their people were aware of, understood or applied the policy'.

Dubens continued: 'This led us to believe that there are some clear gaps between organisational policies – what they say and procedures - what they actually do. This suggested that we should import one of our successful US tools into the UK'.

Risk Foundation is a tool to help organisations take the step from having the policy to making it an integral part of their 'crash free culture' program. To develop a Risk Foundation solution, we work closely with each client to turn their Health and Safety and Road Safety Policy and Procedure Manuals into 45 question assessments of the most safety critical issues for drivers.

The objective of the assessment is to create a critical mass of knowledge amongst employees who drive for work purposes about the key policies and procedures designed to keep them safe at all times.

Following the launch of this new service to a number of clients earlier this year, the key benefits have been identified as:

Significant reductions in the number of 'I was not aware of that' excuses.

Much greater awareness of company policy and procedures.

Better understanding by management of the operational implications of key policies and procedures.

Creates a Management Review process to update, clarify and/or rewrite key policies and procedures not being used or monitored.

Risk Foundation is designed to be updated and retaken every 12 months by everyone driving for work purposes, to keep them up to date on changes in working practices and legislation that may impact on certain policies and procedures. The extensive management information system that sits behind Risk Foundation also ensures that the policies and procedures are regularly reviewed and updated by managers — as well as ensuring that drivers read and understand them.

New drivers are tasked with completing their Risk Foundation Assessment before finishing their induction/orientation program.

According to Dubens: 'this is a massive step forward in terms of converting organisations' existing, but often 'dead', fleet safety policies into a living, breathing fleet safety process'.

New Case Studies

Ten new case studies of our successful programs in the UK, Australia and the USA have been written up on the internet. These cases provide useful, practical and proven ideas that other fleets can learn from and implement. Car, truck, van and bus fleets are included and can be found at www.vfrm.com/casestudy.php. Several other successful fleet safety programs and trials can also be seen at www.idsholdings.com/news.php.

Queensland Year 12s Stunned by Crash Scene

By Geoff Horne, Executive Officer, ACRS

Thanks to the enthusiasm and commitment of Barry Collis, retired teacher and former Road Safety Officer with Queensland Education for 17 years, hundreds of year 12 students each year are being challenged to think about road safety by a hard-hitting look at the realities of road accident trauma. Based in Sandgate, Queensland, Barry visits about 20 high schools each year with his 'Docu Drama' program. With the full cooperation of the school staff and a handful of volunteer students as actors, Barry sets up a very realistic-looking crash scene. Other helpers who contribute to making the scene come alive are the local Fire and Rescue Authority and the Ambulance and Police Services. Additional people who contribute to the Docu Drama program are a doctor, a solicitor, paraplegics and other accident victims, a funeral director and counsellors.



The program does not, however, begin with the crash scene, but in the classroom. There Barry sets the scene for the accident and explains to the students some of the statistics associated with car accidents. The students then move outside where the crash scene has been set up. This is a description of what one group of students experienced at their Docu Drama:

"The blood chilling scream of Police and Ambulance sirens as they raced to the showgrounds probably alarmed a number of local residents last Monday afternoon. The Year 12 students from St George State High were participating in a Docu Drama — a life-like scenario of a road accident. The scenario, which confronted the Year 12s as they arrived at the scene was one of carnage — with Sophie lying lifeless on the ground, Leslie, Kate and Nick inside the vehicle and blood everywhere. Leslie, the driver, had been drinking, swerved to miss a dog, lost control and collided with a light pole. While Leslie's and Kate's physical injuries were minor, Nick needed careful extraction as he suffered likely spinal injuries.

After the accident demonstration and subsequent rescue work of the police and emergency services, each Docu Drama includes an appraisal period where the Year 12 students are able to discuss with the participants what they have viewed and talk with actual victims of road trauma to hopefully avoid becoming an accident statistic themselves. The doctor, solicitor, funeral director and a representative from each of the emergency service groups then explain the impact of road accidents from their perspectives.



Here are some typical comments from students after participating in the Docu Drama:

"The Docu Drama had a tremendous impact on the way

I will drive and the decisions I will make." "The emergency crews were an inspiration to us and the Docu Drama will help us to make the right decisions about driving." "The Docu Drama was amazing. I cried. I don't know how the emergency crews can do that every day." "The Docu Drama was awesome. It was really moving. I won't ever drink and drive." "It makes you really think. You watch and think that it can really happen to you. Did you see the number of people crying?" "Words could never create the impact that this Docu Drama had."

The Docu Drama program is sponsored by the RACQ and the Paraplegic Benefit Fund and is also supported by the Paraplegic and Quadriplegic Association and the Trauma Committee of the Royal Australian College of Surgeons. Barry Collis can be contacted by email bmcollis@bigpond.net.au or tel: 07-3269 3936

Motorcycle Safety – The Next Magic Bullet?

by Brian Wood, Motorcycle Council of NSW

Although motorcycle crashes account for more than 10% of road trauma, motorcycle safety is an area of road safety that has generally been overlooked

When I started taking an interest in this subject several years ago I was told that it was adequately taken up under the general road safety message. This does not appear to be the case when comparing our record in motorcycle safety and our general road safety record against other OECD countries. In motorcycle safety we are ranked 6th last whereas at that time we were ranked 6th best for general road safety (ATSB). Had motorcycle safety been adequately taken up in the general



road safety message, our record in motorcycle safety would be similar to that of our general record.

Whereas our general road safety ranking is not dissimilar to the world's best, in motorcycle safety the world's best countries have a fatality rate one third of ours. Therefore, there is significant potential for improvement.

While it is generally agreed that Australia is on track to achieve its goal of a 40% reduction in the rate of road fatalities by the year 2010, motorcyclists have not enjoyed the same level of improvement. When the current National Road Safety Strategy was introduced in 2000 the 12 monthly moving average motorcycle fatality rate was 5 fatalities per 10,000 registered motorcycles. This fatality rate then increased to 6.3 in November 2001 and has since decreased to 5. Therefore, there has been no overall improvement.

The National Road Safety Action Plan 2005 & 2006 uses a 'star rating' system to rate the potential of each initiative, 'car occupants' score a total of 42 stars whereas 'motorcyclists' only rate a total of 30 stars. Thus the expected improvement in motorcycle safety as a result of this Action Plan will lag well behind that for car occupants.

While there are national strategies for Pedal Cyclists, Heavy Vehicles, International Visitors, Level Crossings and a national internet-based system to share information on indigenous road safety, there is no National Strategy for motorcycle safety.

Traditionally motorcyclists have been viewed as a road user group that is difficult to deal with. However the development of a road safety strategy for the Motorcycle Council of NSW called 'Positioned for Safety', has demonstrated what can be achieved when a consultative process is adopted. Positioned for Safety indicates that there is much that can be done to improve motorcycle safety.

Motorcyclists are people with a passion, their passion is motorcycles and they ride because they enjoy it. Like all people who have a passion, motorcyclists do not take too kindly to those who do not share their passion interfering with their chosen activity. In the past, road authorities have attempted to introduce initiatives with little consultation and have then been surprised when their proposals have not been generally

accepted. If improvements are to be made in motorcycle safety, motorcyclists need to be actively involved in the process.

Their passion for riding motorcycles binds riders into an Australia wide community of about 400,000 with links that are both formal and informal. This common 'bond' was demonstrated recently when Alan Mitchell, the economics editor for the Australian Financial Review suggested that motorcycle safety could be 'fixed' by taxing riders off the road. The response was both quick and decisive. A wide range of views was expressed by riders in letters to the editor. The editor received the largest response ever on a single topic, not because riders are avid readers of the Review but that word quickly spread through the rider community. This common 'bond' and network should be used to advantage in communicating safety messages to riders.

Why can motorcycle safety be the next magic bullet?

- There is considerable potential for improvement,
- Practical countermeasures are being developed,
- Unlike other road user groups, motorcyclists are passionate about their mode of transport,
- This passion binds them into a community that has a common interest,
- The motorcycle community is not so large that it is unwieldy, and
- Rider groups are becoming more active, effective and unified. The national body, the Australian Motorcycle Council now represents rider groups from all states and New Zealand.

To be able to bring about a positive change in motorcycle safety it is necessary to engage riders in discussion on safety, something that is rarely attempted. Recently, a number of brochures specifically for motorcyclists have been produced in NSW. These have been very well received as it is the first time riders have received a positive message about motorcycling. These brochures have an underlying safety message.

How can motorcycle safety become the next magic bullet?

- Develop a national strategy for motorcycle safety using a consultative process,
- Tap into the existing motorcycle networks,
- Support the motorcycle groups to bring about a positive change, and
- Deliver programs that allow motorcyclists to take ownership of motorcycle safety.

Brian Wood has been a motorcyclist for over 30 years. He has been a member of the Australasian College of Road Safety since 2001. He has an honours degree in mechanical engineering from the University of NSW and a graduate certificate in road safety from the University of New England. He is chair of the Motorcycle Council of NSW's road safety committee

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Arrive Alive Expo

by Brian Connor and Colin Grigg of the ACRS NSW (New England) Chapter

Introduction

The Arrive Alive Expo is a three-day event conducted annually for the last six years as an activity of the New England Chapter. It is conducted at the New South Wales Traffic Education Centre in Armidale. Participants are learner drivers from secondary schools in the region. Schools as far afield as Warialda have participated. Tenterfield High School has indicated an interest in attending in future.

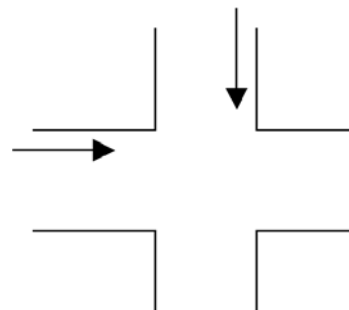
Work Stations

The Brain Injury Rehabilitation Service, located at the Tamworth Base Hospital, provided a static display and two health care professional staff on each day plus two different brain injured clients for the various sessions on a daily basis. This segment commenced with an overview of the long and short-term effects of brain injury and was then followed by a personal story from one of the brain-injured clients. They described the effects of brain damage on their lives with particular emphasis on their very long and slow periods of recovery. These stories were particularly moving.

The Ambulance session was delivered by an Ambulance Officer who demonstrated emergency equipment from the rear of an ambulance vehicle. The talk emphasised the various procedures performed by ambulance staff on injured road crash victims. These are carried out in the critical period immediately after a crash.

The Alcohol Vision Impairment work station used special goggles that replicated the visual distortions associated with a certain blood level. Students tried to catch balls while wearing the goggles and then drove cars around a small, enclosed motor cycle training area. It was found at the Expo in 2004 that participants at this area tended to correct for distorted lateral vision while driving. Consequently, in 2005 they were required to drive up to a stop sign and to stop the car beside it. They were then asked to drive the car through a series of 'witches hats', which represented an increasingly narrower path.

[What was most surprising about this activity, however, was the interest shown by students in the information provided about the range of penalties that could be imposed on "P" plate holders who had been found to be drinking and driving. Students were also given information about alcoholic drinks because of the confusion over volumes of liquid and the concentration of alcohol in various beverages.]



The Braking and Intersection exercise demonstrated reaction times when required to apply the brakes. Students were given printed material about stopping distances at various speeds and then invited to drive into an intersection

marked by 'witches hats'. They were required to apply the brakes at the appropriate spot when vehicles crossing the intersection would become visible. The spot in the intersection where they stopped was then noted.

The Tyre Demonstration consisted of instruction about tyre technology, the importance of adequate tread and equal tyre pressure for all tyres, according to the recommendations of the vehicle manufacturer. The on-site demonstration consisted of driving standard vehicles, with uneven tyre pressures, at relatively low speeds and then braking. The students sat along side experienced rally drivers who could demonstrate the instability associated with inadequate tyre pressure, even at speeds as low as 20 km/hr.

The Safe Vehicle Following Distance exercise had the aim of demonstrating the importance of the three-second gap behind

the vehicle in front. After demonstrating stopping distances at various speeds, experienced drivers took the students on the Traffic Education Centre's highway circuit and into a situation where the stopping distance was under three seconds. Students observed the problems encountered by the following vehicle. They then drove with the aim of keeping the three-second distance between vehicles and with the possibility of distractions occurring at the same time.

Evaluation

An evaluation of the event is conducted each year. This has enabled the activities to be modified for effectiveness. Also, students are given a questionnaire at the beginning and conclusion of the event. This provides an indication of the impact of the learning experience.

The New South Wales Traffic Education Centre

The New South Wales Traffic Education Centre is an off-road training facility in east Armidale. It is composed of an administration building with lecture theatre, motor cycle training area, highway circuit, skid-pan and an area for pre-driver education.

Fatigue and coping with driver distraction

by Ann Williamson, NSW Injury Risk Management Research Centre, University of New South Wales

This paper was presented at the International Conference on 'Driver Distraction' in Sydney, 2-3 June 2005, run jointly by the ACRS, the NRMA and the Travelsafe Committee of the NSW Parliament.

Abstract

Distraction while driving can divert attention away from the driving task and can, as a consequence, have irretrievable effects on driving performance. Driving is a task that particularly requires selective attention from moment to moment as well as sustained attention over the duration of a drive. Factors, such as fatigue, that reduce the capacity to pay attention to the driving task can seriously impair driving performance. In fact, fatigue can be viewed as an internal source of driver distraction due to its effects on attention. On the other hand, some effects of fatigue suggest that tired drivers may be less affected by distraction. This presentation will review the findings of research on the effects of fatigue on performance, including the effects on vision, reaction speed, selective and sustained attention and decision-making. The implications of these findings for driving and for coping with distraction while driving will be discussed.

Introduction

Fatigue is recognized as one of the major problems for road safety. Fatigued drivers are at considerably higher risk of crashing due to their reduced capacity to respond to the information processing demands of the driving task. For example, the Auckland Car crash case-control study showed that the risk of injury-related crashes increased significantly for self-reported sleepy drivers, for drivers with five hours sleep or less and for drivers on the road between 02:00 and 05:00 hours (Connor et al, 2002). Similarly, Cummings et al (2001) showed a clear relationship between long distance driving and increased crash risk, with drivers doing more than 600 mile journeys showing a more than ten times increased risk of crashing. Current estimates of the involvement of fatigue in crashes suggest that in NSW fatigue plays a role in around 20 percent of fatal crashes (RTA, 2002). This is a similar level of involvement to the role of alcohol in fatal crashes.

Fatigue presents greater problems for road safety, however than other driver behaviour-related problems like alcohol and speeding. Fatigue is a hypothetical process which cannot be measured directly. Fatigue measurement relies on measures of its effects, such as on self-rated feelings, driver performance and changes in physiological state. Definitions of fatigue emphasise factors like tiredness, adverse effects on performance in response to repeated stimulation by the same stimulus, problems of sustained attention and a range of effort-related experiences such as unwillingness to continue with the task or the inability to continue putting effort into the task. These characteristics make management of driver fatigue a challenge for road safety.

In the context of a discussion on driver distraction, the issue of fatigue may be relevant on at least two levels. First, fatigue, itself may be considered to be a distractor. Second, vulnerability to the effects of distractors while driving may vary when a driver is fatigued. In this presentation, each of these aspects will be considered in turn.

Fatigue as a distractor

Fatigue can be thought of as a form of internal distraction. Many definitions of driver distraction specify that it is a form of inattention that shifts attention away from the task at hand. For example, the US National Highways and Transport Safety Administration categorised four distinct types of driver distraction including visual, auditory, physical and cognitive distraction. The last category is particularly relevant to the current discussion of fatigue and distraction. The NHTSA definition of cognitive distraction includes "any thoughts that absorb the driver's attention to the point where they are unable to navigate through the road network safely and their reaction time is reduced" (NHTSA, 2002).

Definitions of fatigue similarly include reductions in attention, especially under conditions requiring sustained attention and in tasks with little variety. For example Brown (1994) defined driver fatigue as a disinclination to continue performing the task at hand and a progressive withdrawal of attention from road and traffic demands. Such definitions are consistent with the idea that fatigue is an internal distractor from the driving task as they include attentional withdrawal from the driving task.

The effects of fatigue on performance are also similar to the effects of external distractors. Fatigued drivers show slowing of reaction speed and missing of relevant information, especially visual signals compared to drivers who are not fatigued (Dinges, et al, 1997). These performance effects tend to increase markedly with increasing time on task, an effect called the vigilance decrement (Davies and Parasuraman, 1982; Warm, 1984). This effect is accentuated when the task is monotonous such as is often the case when driving. Under these conditions the continuous requirement to sustain attention at a sufficiently high level to maintain good driving performance produces a high workload for the driver (Hancock and Warm, 1989). The level of workload increases with increasing time at the wheel, also making fatigue effects increasingly more likely.

Other effects of fatigue include changes in mood states (Broadbent, 1979), attentional narrowing (Easterbrook, 1959), less analytical processing of information, especially poorer planning and tendency to perseverate on particular strategies (van der Linden, Frese and Meijman, 2003) and reduced effort in the task (Smit, Eling and Coenen, 2004). All of these effects are likely to have adverse effects on driver performance and safety. These effects contribute to the evidence that fatigue and the effects of fatigue have the effect of distracting the driver away from the primary task of driving.

Fatigue occurs due to three main causes: time on task, time of day and the length of time awake or amount of sleep obtained recently. The effects of fatigue differ somewhat depending on the cause, although slowing of responses, missing of signals and the tendency to apply less effort seem to be outcomes of fatigue no matter what the cause. It can be concluded then that fatigue effects on driving look like the sorts of effects we see when a driver is distracted, although the causes are due to the driver's internal state, not to an external distraction.

Fatigue and vulnerability to external distractions

The second link between fatigue and driver distraction relates to the extent to which tired drivers are vulnerable to the effects of external distractors. Some of the effects of fatigue are likely to have an effect of moderating the driver's response to external distractors. As mentioned above, there is some evidence that attentional narrowing is more likely under



conditions of fatigue. While this narrowing effect may reduce the amount of attention being paid to the task of driving, it may also reduce the driver's susceptibility to external stimuli and so make them less vulnerable to the distraction effect. Related to this is the fatigue-related effect of changes in effort being applied to the task (Hancock and Warm, 1989). This effect has been shown to result in concentration on aspects of the task that are simpler and require less effort. This effect may result in drivers focusing only on the main task of driving, so again making them less vulnerable to external influences that are potential distractors.

There is some evidence for greater vulnerability of tired drivers to external distractors. There is evidence that drivers attempt to control their increasing fatigue levels, especially those relating to monotony and the requirements for long periods at the same task, by increasing the amount of stimulation available in the task environment. For example, research on long distance truck drivers shows that they employ a range of different strategies to help them overcome the effects of fatigue (Williamson, Feyer and Friswell, 2000). These include listening to the radio, talking on the mobile telephone or CB radio, eating, drinking or smoking cigarettes. Most of these strategies have been implicated as potential external sources of distraction. It is possible then, that the strategies that tired drivers use to moderate the effects of fatigue may increase the amount of distraction so further increasing their level of inattention to the main task of driving.

Conclusions

Fatigue may be related to driver distraction due to its similar affects of withdrawing attention from the main task of driving. In this sense fatigue could be considered to be an internal distractor due to the effect of the current state of arousal and alertness of the driver. Furthermore, some of the strategies that drivers use to manage fatigue while driving fall into the category of external distractors (including using mobile phones and conversing on the CB radio) and so are also likely to increase the withdrawal of attention from the driving task

in drivers who are beginning to experience fatigue. On the other hand, some of the characteristics of the effects of fatigue may actually reduce the vulnerability of a fatigued driver to attentional capture by external features in the driving environment. Effects due to tunneling of attention and the tendency to move to simpler and less effortful approaches to the driving task may reduce the inclination for drivers to be distracted by external stimuli. Further research is needed to establish whether fatigue effects do moderate the effects of external distractors while driving.

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The Australasian College of Road Safety Inc. is seeking an Executive Officer for its Canberra Office to commence work in February 2006. The College is a members' association with State and Regional Chapters in Australia and New Zealand.

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Peer-Reviewed Papers

Driver Distraction: Reflections on the Past, Present and Future

by Dr Michael Regan, Senior Research Fellow, Monash University
Accident Research Centre

This paper was presented as a keynote address at the International Conference on 'Driver Distraction' in Sydney, 2-3 June 2005, run jointly by the ACRS, the NRMA and the Travelsafe Committee of the NSW Parliament.

Abstract

There is a large and converging body of evidence to suggest that certain activities, objects and events inside and outside the vehicle can, and do, distract drivers, leading to degraded driving performance, increased crash risk and crashes.

This paper is a transcript of the opening Keynote Address given by the author at the International Conference on Driver Distraction held in Sydney, Australia, on 2 June 2005. The paper outlines recent and emerging technological developments and their potential impact on the driving task, including their potential to distract drivers. The paper then focuses on what is known more generally about driver distraction, what it being done to manage it, and what ought to be done in Australia to limit its impact on driver performance and safety.

Introduction

Five years ago I submitted to one of our transport safety authorities here in Australia — that shall remain nameless — a proposal for funding to undertake research on driver distraction. The proposal was rejected. At the time driver distraction was barely on the Australian road safety radar scope and there were other safety issues perceived at the time as being of higher priority. It is pleasing, then, that in Australia, the time is finally right to hold a conference on this important topic.

It is important from the outset to put distraction, and indeed this conference, into perspective. A fighter pilot probably wouldn't understand why we are here today. The primary control task for a fighter pilot is to fly the plane, and what we might regard as distracter tasks, such as monitoring for and defeating enemy threats, are for the pilot just part of the job. Fighter pilots are carefully selected for their jobs — only people who are superior at performing two or more tasks at the same

time are chosen to fly. Not only that, they are given proper training in how to effectively multi-task - because we know that training and practice can improve our ability to resist distraction. If during the design of a fighter aircraft, it is determined that all of the tasks that have to be performed - even with automation - are too much for one pilot to cope with, then the aircraft is designed for two pilots - so that what we might regard as the distracter tasks can be shared or delegated to the co-pilot or navigator.

The point I am making is that we are here today because we have a totally different mindset about distraction in the road safety domain. The mindset of the vehicle manufacturer is that control of the vehicle should be in the hands of the driver only. The mindset of the driver is that the passenger is a back seat driver rather than a co-pilot, even though the passenger has an extra set of eyes, ears and hands. The mind-set of the road safety community is that driving means looking out for hazards, navigating to a destination, and controlling the vehicle. But that's just the way it is now. Already, cars have been developed that can drive themselves. It may be that we need to redefine in future what we mean by "driving".

In short, driver distraction would not be a problem if the motor car was specifically designed for two-crew operation, if drivers and passengers were trained in how to operate as a team, and if the passenger shared or was delegated tasks which are secondary to driving. But that is not so, and that is why we are here today.

I'd like to start this presentation by outlining some recent and emerging developments in vehicle technology and their potential impact on the driving task. I will then focus, in particular, on driver distraction - on what we know about it, what we are doing about it, and what we ought to be doing about it in Australia.

New Vehicle Technologies

In recent years, the motor vehicle has undergone some major transformations. For the most part, these have been invisible to the driver and the cockpit itself has remained largely the same. All of that is starting to change, however, and this is being driven by the migration into the cockpit of a range of new technologies (Regan, 2004a; Regan, 2004b). These can be categorized as entertainment systems, information and communications systems and advanced driver assistance systems, although the boundaries between the categories are becoming increasingly blurred. I'll consider each of these in turn.

Entertainment Systems

The car radio has now been augmented by a range of new entertainment systems. These include cassette players, Compact Disk - or CD - players, video, television and DVD players. In addition to factory-fitted systems, there is an emerging trend towards the provision of entertainment services to the driver through portable devices such as the mobile phone or Personal Digital Assistant - or PDA. In the United States, Europe and Japan, for example, information about the nearest restaurant, the latest movie, or other sources of entertainment can be obtained from one or more of these devices, which can be brought into the vehicle.

Information and Communication Systems

Information and communication systems represent the second category of devices entering the vehicle cockpit. These are usually referred to as “telematics” devices. Mobile phones have been used in the vehicle cockpit now for over a decade. More recently, however, we have seen a wider range of communications systems and services enter the cockpit. These include text messaging, video messaging, internet, email, and fax facilities. Some of these devices are being built into vehicles as factory-fitted units, whilst some are being offered as services which can be accessed through portable devices such as mobile phones and PDAs.

So-called “plug and play” products are also becoming available as aftermarket devices. These employ “open architectures” which allow portable devices carried into the vehicle to interact with other devices installed in the vehicle. Wireless communication technologies like Bluetooth TM, for example, will allow vehicles to access files and display information from nearby portable devices such as mobile phones, PDAs and lap top computers.

Emerging information and communication systems will be able to advise drivers of the quickest route to take when their normal route is congested, and how long it will take to reach their destination. They will also allow drivers to remotely turn on and off the lights, heating, appliances, watering system and garage doors in their house, to check the weather in the area they are driving into, to check if there is still a spot left in the early bird car park, and to find the nearest petrol station. A prototype vehicle system with these and other features (known as the AT Signature Project) has already been developed here in Australia by Holden and other industry partners, and will be demonstrated at this conference.

Advanced Driver Assistance Systems

Advanced Driver Assistance Systems — or ADAS — represent the third main class of telematics technology entering the vehicle cockpit. These form a sub-set of a broader category of systems known as Intelligent Transport Systems (ITS).

ADAS – Crash Prevention

Most Advanced Driver Assistance Systems have been developed as safety systems. These warn drivers, via visual, auditory, and/or tactile displays inside the vehicle, if they are driving in an unsafe manner.

Some of these are designed to prevent crashes from occurring. These include systems which warn the driver:

- if they are exceeding the speed limit;
- if they are following a vehicle ahead too closely;
- if they are about to collide with vehicles, objects or pedestrians in front of them, behind them when reversing, in their blind spots, when merging or changing lanes, or when driving through or turning at intersections;
- if they are about to drive off the roadway; and
- if they are falling asleep.

ADAS – Trauma Minimisation

Other Advanced Driver Assistance systems are designed to minimize the trauma to occupants if a crash occurs. These include systems which:

- remind drivers and their passengers to fasten their seatbelts, or prevent the vehicle from being started if someone is unbelted; and
- warn the driver if he/she is exceeding the speed limit — or exceeding lower speeds if weather and traffic conditions are poor.

ADAS – Comfort

Finally, some Advanced Driver Assistance Systems have been designed primarily as driver comfort systems, although they have some secondary safety benefits:

- Adaptive Cruise Control (ACC) systems, for example, automatically increase the following distance to the car ahead if the cruise control in your own vehicle is set to a speed that is faster than the speed of the vehicle ahead; and
- Route Navigation Systems allow the driver to program in a destination address, following which the system issues turn-by-turn instructions - both voice and visual map-based instructions - until the destination is reached.

The systems I've described that are capable of warning the driver of danger can be made to go a step further — to take control of the vehicle if the driver fails to heed warnings. Collision warning and avoidance systems, for example, have been developed to automatically brake the vehicle if the system predicts that a forward collision is imminent. These have been trailed in the United States, Europe and Japan. Intelligent Speed Adaptation (ISA) systems, trailed in Europe, can automatically limit vehicle top speed to the signed speed limit.

ADAS - Configurations

Advanced Driver Assistance Systems can be configured in different ways. Some systems, like route navigation, can be self-contained within the vehicle. Others, such as intersection collision warning systems, rely on road-side sensors — such as cameras and radars — to detect vehicles approaching the intersection and transmit this information, via in-car displays, to each of the drivers on a collision course. Alternatively, each car can be equipped with transmitters, Global Positioning Systems and receivers that enable it to signal to another car, via on-board displays, that they are on a collision course. These are currently operating in parts of Japan. Services can also be accessed whilst driving through a portable device, such as a mobile telephone or a PDA. In Australia, for example, you can now use your PDA as a route navigation system. Finally, some Intelligent Transport Systems, such as Variable Message Signs, can be located on the roadside to warn drivers about imminent hazards — such as fog, slippery roads, or a crash ahead — without direct physical communication with the vehicle.

Summary

In summary, many new technologies exist and are being developed to make drivers safer, of entertaining them, of providing them with information, and of enabling them to communicate with virtually anyone in the world whilst on the move.

Very little is known, however, about how drivers do - and will - use and adapt to these technologies over time (Regan, 2004c). Will they use them in the manner intended by system designers? Will drivers understand the technological limitations of emerging systems? Will they become over-reliant on them? And if so, what happens if the system fails? As vehicles become more automated, and drivers have less to do, will they engage even more in secondary task activities such as using mobile phones? Or will automation have the opposite effect of sending the driver to sleep? In the very near future, Australian drivers will receive information from conventional road signs, electronic road signs, entertainment systems, information and communication systems and Advanced Driver Information Systems — from both inside and outside the vehicle, and from a range of portable devices, such as the mobile phone. This information will be able to be presented anywhere, in any language, at any time, and via visual, voice and even tactile displays. The potential benefits of these technologies will be undermined, however, if the information they display — and the mental and physical operations they require — overload, distract or confuse the driver.

The wave of new technologies entering the vehicle cockpit can affect driver performance and safety in a variety of ways. Distraction is just one by-product of the information and communications revolution - but it is an important one because it is the only one so far to emerge as a road safety

issue. On top of all this there is a range of other everyday activities, such as eating, drinking smoking, chatting to passengers - and even having sex - which can distract the driver (see Young, Regan, & Hammer, 2003, for a review). I do a lot of talk back radio so I know what goes on out there.

I'll turn now to what we know about distraction, what we are doing about it, and what we should be doing about it.

What is driver distraction?

Everyone talks about driver distraction as if they know what it means, but it is a concept that is very poorly defined in the literature and there has been very little modeling of the factors that underlie it.

Distraction occurs when a driver engages, willingly or unwillingly, in a secondary activity which interferes with performance of the primary driving task. The human brain has a limited supply of attention. We can perform two tasks at the same time — without one degrading performance of the other — only if the tasks demand no more than the limited supply of attention (Gladstones, Regan & Lee, 1989). In addition, they must be as dissimilar as possible. Driving a car (which is a visual/manual task) and having a conversation with a passenger (which is an auditory/verbal task) are dissimilar tasks. So, provided the traffic is light and the conversation is simple, the two tasks can be combined with relative ease. If an unexpected traffic event occurs, however, the driver will usually stop talking because the combined demands of the tasks are too high. Similarly, if the conversation becomes too complex, driving performance will suffer.

We can differentiate between 3 main mechanisms of distraction:

- visual - visual distraction occurs when drivers look at, say, a route guidance map display instead of the road;
- attentional - attentional distraction occurs when people take their minds off the road, such as when listening to a passenger conversation or simply day dreaming;
- physical - physical interference occurs when the driver holds a device, such as a mobile phone, rather than steering with both hands. It also occurs if rotating a radio control, say to increase the volume of your radio, causes you to rotate the steering wheel in the same direction; and

Attentional distraction usually accompanies most other forms of distraction.

Sources of Driver Distraction

There are many things that can distract the driver. The US National Highway and Traffic Safety Administration has identified several main sources of driver distraction (Stutts et

al., 2001). These include those deriving from inside and outside the vehicle, those deriving from vehicle technologies and those deriving from everyday activities that people perform in the cockpit:

- Eating/drinking
- Outside person/object or event
- Adjusting radio, cassette, CD
- Other vehicle occupants
- Moving object in vehicle
- Smoking related
- Talking/listening on mobile phone
- Dialing mobile phone
- Using device/object brought into vehicle
- Using device/object integral to vehicle
- Adjusting climate controls
- Other distraction
- Unknown distraction

Driver Involvement in Distracting Activities

We know very little in Australia, however, about the extent to which our drivers engage in these potentially distracting activities. Most of what we know relates to mobile phone use, and even then we know very little.

Around eighty percent of Australians own mobile phones, but the exact number of drivers who use them whilst driving is not known. In one survey (Khadem, 2003), about a quarter of drivers admitted to using a hand-held phone while driving, even though it is illegal to do so in Australia. About 30 percent of drivers in that survey admitted to sending text messages while driving, 15 percent of them regularly. In another study (Taylor et al., 2003), 2 percent of drivers in Melbourne were observed using hand-held mobile phones whilst driving, most of them young males.

In the UK, about 40 percent of drivers report that they use their mobile phone whilst driving, with the figure increasing to about 80 percent for high mileage drivers and company drivers. Around 10 percent of all drivers report that they use the mobile phone often, whilst around half of high mileage drivers say they use it often (Green Flag, 2000; cited in RoSPA, 2002). The same data also suggest that younger drivers are more likely to use mobile phones than all drivers, and that most drivers who use a mobile phone use a hand-held phone.

Interestingly, drivers in the UK seem to be aware of the potential dangers of using mobile phones. In two separate studies (RoSPA, 1997, Green Flag, 2000; cited in RoSPA, 2002), around 90 percent of drivers said that the use of hand-

held phones should be illegal. Interestingly, though, only 50 percent said that using a hands-free phone whilst driving should be illegal. There is a perception in the UK, as I suspect there is here in Australia, that hands-free phones are safer than hand-held devices. In another UK study (MORI, 2001, cited in Direct Line Motor Insurance, 2002), drivers reported text messaging as being the most distracting activity they engage in whilst driving a vehicle.

In a recent US study (Stutts et al., 2003), video and other recording equipment was installed in the vehicles of 70 drivers for a week in an attempt to determine how much time people spend engaging in the full range of potentially distracting activities. It found:

• conversing	15.0%
• manipulating vehicle controls	3.8%
• prepare food/drink	3.1%
• external distracters	1.6%
• smoking	1.6%
• eat, drink, spill	1.5%
• manipulate music/audio controls	1.4%
• dial/answer/talk mobile phone	1.3%
• reading/writing	0.7%
• baby distracting	0.4%
• adult/child distracting	0.3%
• grooming	0.3%

They found that drivers spent on average just over 30 percent of their time engaging in distracting activities, with most of the time spent talking to passengers, manipulating vehicle secondary controls and eating and drinking. The fact that drivers were videotaped might account for the relatively little time spent using a mobile phone. Virtually all the drivers adjusted vehicle secondary controls whilst the vehicle was in motion, around 80 percent conversed with passengers, and around 70 percent ate and drank.

Impact of Distraction on Driving Performance

Various scientific methods have been used to study the impact of distraction on driver performance and safety. The main techniques that have been used, fall into three general categories. The first is performance studies, which include on-road and test track studies, driving simulator studies, dual-task studies, eye glance studies and the visual occlusion technique. Epidemiological studies and crash studies are the other two main methods used to study distraction. I'll talk briefly about each of these in turn.

Performance Studies

Many performance studies have been conducted to determine to what extent using various entertainment, information, communication and advanced driver assistance technologies whilst driving affect driving performance. These have also examined distraction deriving from everyday activities, like eating.

Mobile Phones

The impact of the mobile phone on driving has been widely studied. A wide range of driving performances are adversely affected whilst using a mobile phone.

Collectively, these studies have shown that using a mobile phone whilst driving can:

- impair your ability to maintain the correct lane position;
- impair your ability to maintain an appropriate and predictable speed;
- result in longer reaction times to detect and respond to unexpected events - one study (Burns et al, 2002) found that reaction times were 50 percent slower as a result of using a mobile phone, but only 30 percent slower when the driver had a blood alcohol concentration of 0.08;
- result in drivers missing traffic signals;
- reduce the functional visual field of view, which has been shown to be correlated with increased crash involvement;
- result in shorter following distances to vehicles in front;
- result in people accepting gaps in traffic streams that are not large enough;
- increase mental workload, resulting in higher levels of stress and frustration;
- encourage people to look straight ahead rather than scanning around the road ahead; and
- reduce drivers' awareness of what is happening around them in time and space.

Importantly, there is significant evidence that the use of both hand-held and hands-free phones whilst driving degrades performance. The physical act of holding a mobile phone appears to have little effect on steering control unless an unexpected event occurs that requires the use of both hands.

Only two published studies I know of have investigated the impact of text messaging on driving. A Swedish simulator study (Kircher et al, 2004) found that retrieving text messages increased braking reaction times to a motorcycle hazard, but little else. The findings from a recent MUARC simulator study (Hosking, Young & Regan, 2005), which will be reported at this conference by the NRMA, found that both retrieving and sending text messages adversely affects driving performance.

Other Technologies

Few other technologies have been studied in such detail.

Navigation Systems

One exception is the route guidance system, as it has been in production vehicles for about a decade. Drivers simply program into these systems the address they wish to travel to, and the system issues turn-by-turn instructions on how to get there - usually voice instructions like "in 100 metres turn left". Most systems also display the same information visually on a display in the vehicle.

Generally, these systems have been shown, if well designed, to reduce mental navigation workload and the distraction associated with using paper maps and street signs to navigate. However, these systems are distracting if they allow drivers to enter destination information while the vehicle is in motion and if they provide visual guidance, especially complex guidance information, without any accompanying voice guidance. Even systems that allow the driver to enter destination information using their voice rather than manually have been shown to be distracting (see Young & Regan, 2005; Regan et al., 2001, for a review). The worst designed route navigation systems, however, are usually only marginally more distracting than conventional navigation using paper maps. The best systems incorporate a lock out feature which prevents the driver from entering a destination whilst the vehicle is in motion or travelling above a certain speed.

Email

A couple of studies have examined the effects on driving performance of retrieving, reading and responding to email messages. In one (Lee et al., 2001), drivers used voice commands to accomplish these activities whilst driving in a simulator. It was found that, even the requirement to issue voice commands and listen to the email, led to a 30 percent increase in reaction times to a braking lead vehicle and an increase in subjective estimates of mental workload. In a follow up study (Jamson et al., 2004) it was found that drivers adopted longer headways to compensate for the increased workload, but were again slower to brake in response to a braking lead vehicle and made less corrective steering movements when distracted. Interacting with email was less distracting when drivers had control over when they were opened.

Entertainment Systems

Entertainment systems have also been examined. Here, the main focus has been on the effects on driving performance of interacting with radios, cassette players, CD players and, more recently, DVD players.

Radios

A few studies have examined distraction deriving from the use of car radios. One found that drivers spent more time looking away from the road when tuning a radio than when dialing a mobile phone, which adversely affected lane control (Wilkman et al., 1998). In one of our own studies at MUARC (Horberry et al., 2003), we found that tuning the radio resulted in increased subjective estimates of workload, degraded speed control and delayed responses to unexpected hazards. Even listening to a car radio has been shown to degrade lane-keeping performance (Janke et al, 1994).

CD Players

Selecting, inserting, listening to and ejecting CDs whilst driving has also been examined. Generally it is found that these activities result in poorer lane keeping ability, more glances away from the road and greater variation in speed control than dialing a mobile phone.

DVD Players

Very little research has been done on how interacting with DVD players affects driving. In Australia, it is illegal for manufacturers to install DVD screens anywhere in the vehicle where they can be seen by drivers whilst driving, even by drivers of other vehicles. However just because drivers can't see them doesn't mean they won't pay attention to them; and it is likely that using their ears to keep up with the plot will be more attentionally demanding than listening to a radio. The flip side, of course, is that these devices are great for parents if the children in the back seat can watch and listen to them with ear phones.

Portable Devices

There are many services becoming available that can be implemented on portable devices, such as lap tops, PDAs and mobile phones. No research I know of has been conducted to examine the potential for these devices to distract drivers whilst driving. The main problem with these devices is that if they are deemed to be "driver's aids", they can be viewed from anywhere in the vehicle by the driver whilst the vehicle is in motion and, if they are poorly ergonomically designed, could demand dangerously high levels of vision and attention. Current laws regulating the installation and use of these devices by drivers whilst the vehicle is in motion are ambiguous with respect to the definition of "driver's aid". The information displayed by the devices may also be incompatible with information displayed by other systems installed by manufacturers within the vehicle.

Everyday Activities

Drivers also engage in a range of everyday activities that have potential to distract them from the driving task. The main such activities they engage in are eating, drinking, smoking and talking to passengers.

Eating and drinking can cause visual, physical and attentional distraction, especially if there is a spill. One study found that eating a hamburger was as distracting as dialing a mobile phone using voice commands (Jenness et al., 2002).

Smoking has the potential to be visually and physically distracting, and even attentionally distracting — although I haven't come across any studies that have specifically examined the impact of smoking whilst driving on performance.

The findings from studies which demonstrate that hands-free phone conversations are distracting for drivers imply that talking to passengers whilst driving should also be visually and attentionally distracting for the driver. Surprisingly, I have not come across any performance studies that directly confirm this. From first principles, however, it can be deduced that, for several reasons, conversing on a mobile phone will be more distracting than talking to passengers. First, passengers typically support the driver in self-regulating their driving performance - passengers often stop talking or tone down the conversation when they see that traffic conditions ahead are difficult for the driver. A person at the other end of a phone can't see what is going on around the driver. Secondly, there may be social imperatives to continue a conversation on a mobile phone, even though driving conditions don't warrant it. This might occur, for example, if the person at the other end of the phone is a business client. Finally, it is generally more difficult to hear and follow mobile phone conversations, because the reception is not always perfect and because you can't physically see the person you are talking to. A lot of communication between the driver and passenger is non-verbal.

External Distractions

So far I've talked about distractions deriving from within the vehicle. A US study (Stutts et al., 2001) has estimated, however, that about 30 percent of crashes where distraction is involved derive from outside the vehicle. Nevertheless surprisingly little research has investigated the effects of external distracters on driving performance and crash risk. One Australian laboratory study I am aware of has shown that distraction deriving from advertising billboards adversely affects the ability to detect peripheral hazards (Johnston & Cole, 1976), and a few studies have demonstrated that the presence of billboards is correlated with crash risk in some circumstances, but not others (eg Farbry et al., 2001). One of my MUARC colleagues will present a paper during the conference that sheds further light on external distractions (Edquist, Horberry, Regan & Johnston, 2005).

Epidemiological Studies

While performance studies provide information about the effects of distraction on driving performance, they do not take into account exposure. The degree to which a secondary activity adversely affects driving performance depends not only on how distracting it is in absolute terms, but whether a driver actually engages in the activity whilst driving, when they engage in it, how often they engage in it, and for how long they engage in the activity. Whilst talking to a passenger might not be as distracting, for example, as talking on a mobile phone, people spend relatively more time talking to passengers that may be more risky in the long term. Epidemiological studies have attempted to take into account driver exposure to a range of potentially distracting activities, and to quantify the level of risk associated with engaging in those activities.

There have been few such studies in the field of driver distraction, and virtually all have focused on mobile phone use.

The general finding to date is that using a mobile phone whilst driving increases crash risk by anywhere between 4 and 6 times, regardless of whether the phone is hand-held or hands-free, and that the risk is greater for young novice drivers. That is about the same increase in risk as driving with a Blood Alcohol Concentration (BAC) of 0.08.

There is evidence from epidemiological research that smokers and young novice drivers who carry their peers as passengers, are also at increased risk of crashing. Young novice drivers appear to be up to 5 times more likely to crash if they carry two or more friends as passengers (see Williams, 2001; Regan & Mitsopoulos, 2001, for reviews). Smoking has been found to increase crash risk by up to 1.5 times (Brison, 1990). In both cases, distraction has been cited as a contributory factor.

Crash Studies

It is difficult to quantify the number and proportion of crashes attributable to distraction. The main problem for crash studies, as for epidemiological studies, is that it is rarely recorded on accident report forms whether or not a driver was engaging in a distracting activity – and even where provision is made to do so, drivers may not admit that they were doing so. Crash data from the National Highway Traffic Safety Administration in the US indicate that about 25 percent of all crashes are the result of inattention (Wang et al., 1996), with about half of these thought to be attributable to distraction. A recent US study estimates that crashes relating to mobile phones contribute to nearly 3,000 deaths and over 300,000 injuries per year (Cohen & Graham, 2003).

A recent US study examined detailed crash records from the Crashworthiness Data System between 1995 and 1999 (Stutts et al., 2001). Of the crashes examined, about 8 percent were claimed to be caused by the driver being distracted by some

event, object or activity inside or outside the vehicle. The study categorised the sources of distraction contributing to these crashes as follows:

Distraction Source	Contribution
• Outside events	30%
• Tune radio/cassette/CD	11%
• Vehicle occupants	11%
• Moving object ahead	4%
• Device/object brought into vehicle	3%
• Adjust climate controls	2%
• Eating and drinking	2%
• Using/dialing mobile phone	2%
• Smoking-related	1%
• Other distractions	26%
• Unknown distraction	9%

As you can see 30 percent derived from outside the vehicle and interacting with entertainment systems and conversing with passengers, seem to be the sources of distraction inside the vehicle that contributed most to crashes. I suspect that in this study there was significant under-reporting of mobile phone use as a contributing factor given that it is now illegal to use hand-held phones in many jurisdictions in the US.

In Australia, 30 drivers in NSW were killed or injured between 1996 and 2000 in crashes where a hand-held phone whilst driving was a contributing factor (Lam, 2002). While this represents less than 1 percent of all drivers killed, it is likely to be an underestimate given the likelihood of under-reporting and the increase since then in the prevalence of mobile phone use by Australian drivers. Also, it does not relate to hands-free phone usage.

My estimate, taking into account all the available evidence, is that between 10 and 15 percent of crashes in Australia are attributable to driver distraction of one kind or another.

Summary of Findings

So what can we conclude from all this information? Certainly there is a large and converging body of evidence to suggest that driver distractions of various kinds can and do degrade driving performance, increase crash risk and cause crashes. Ranking the degree of distraction, however, that derives from these different sources of distraction, from the most to least, is not an easy task for several reasons. In the absence of exposure data, it is currently impossible to rank the relative increase in crash risk deriving from these sources of distraction. However, if I had to make an educated guess, based on all the available evidence, I'd probably rank the degree of driving performance degradation deriving from the sources of distraction within the vehicle discussed — from most to least — as follows:

- internet/email (when widely available)
- mobile phone – text messaging
- mobile phone – talking (hand-held and hands-free)
- DVD (if portable, poorly located and viewed)
- talking to passengers (if driver and passengers are young)
- route navigation (if poorly designed)
- radio/cassette/CD
- climate controls
- eating/drinking
- smoking

It is difficult to know where to rank external distractions on such a list, given how little we know about them. Also missing from the list are portable devices, like mobile phones and PDAs, that can be used for other applications. When these are more widely available, they may be somewhere at the top of the list.

There are further trends that emerge from the literature on driver distraction (see Young & Regan, 2005).

There is evidence that people are miscalibrated — that they grossly underestimate or sometimes even over—estimate the effects of distraction on their driving performance.

People appear to attempt to self-regulate, according to the demands of the driving task, the demands of the device they are using, and their own capabilities, when performing secondary tasks whilst driving. For example, a number of studies have shown that drivers compensate for the additional mental workload imposed by talking on a mobile phone by slowing down or increasing following distances. Obviously, though, this self-regulation is not always effective. At a higher level, older drivers have been found to self-regulate by generally not using mobile phones at all.

There is evidence that both young novice drivers and older drivers (55 and over) are, for different reasons, more vulnerable to the effects of distraction. Young novice drivers are more vulnerable because they have not yet automated many driving activities, and hence have less spare attentional capacity to devote to secondary tasks. They are also probably less effective in self-regulating their driving performances across tasks. Older drivers, on the other hand, require more glances at mobile phones and other devices to read information, require more time to complete tasks, require more time to move their eyes between the road and displays inside the vehicle, and have less attention to distribute between competing tasks.

Even in drivers of the same age and experience cohort, there are individual differences in the ability to simultaneously drive and use a mobile phone. Some people, it seems, are better able than others to do two things at once — to perform the two tasks together in a manner which minimizes the distracting effects of the mobile phone.

There is some evidence that training and practice can reduce, to some degree, the distracting effects of mobile phones.

Finally, and perhaps most importantly, it must not be forgotten that there is a flip side to distraction. Most advanced driver assistance systems are predicted to have significant safety benefits. Our own research at MUARC has clearly demonstrated this. Mobile phones can, and do, provide important safety benefits. Mobile phones and radios have been used for years by truck drivers to keep them awake. They also allow users to summon help or report accidents. They provide a wide range of important societal and work benefits.

The Status Quo

In Australia, we are doing very little at present, relative to other developed countries, to address the issue of driver distraction.

Australian Road Rule 300 bans the use of hand-held phones and as far as I know all Australian States have incorporated this Rule into their road safety legislation. The only other country I know of that has enacted the same legislation and evaluated its effectiveness is Japan, which has reported a 53 percent reduction in the number of injury crashes involving a driver using a mobile phone 12 months after the legislation was introduced (RoSPA, 2002).

Australian Road Rule 299 prohibits TV screens and video display units from being seen by drivers whilst the vehicle is in motion, or stationary but not parked - and the device must not distract other drivers who are nearby. Australian Design Rule 42/04 (Section 18) prohibits the installation in new vehicles of video display units in locations where they can be seen by the driver whilst the vehicle is in motion. There appear to be some loop holes in these laws that may allow drivers legally to install and use these devices in a manner which could distract them and compromise their safety.

Other than that, police officers have discretion under their own State legislation to reprimand drivers who they think are driving carelessly or dangerously as a result of being distracted. Section 65 of the Victorian Road Safety Act, for example, contains such a provision for careless driving.

At the national level, The Australian National Road Safety Action Plan for 2005/2006 notes the accumulating evidence regarding the potentially distracting effects of hands-free phones and the need to monitor research on the topic and encourage the development of vehicle fleet policies that prohibit the use of devices that distract drivers.

Generally, little has been done in Australia to educate the public about the relative risks associated with distraction. Compared to the United States, Canada, Europe and Japan, governments here have invested relatively little — indeed almost nothing — on distraction research.

One of Australia's local vehicle manufacturers — Holden — has been proactive, however, in obtaining from the Federal government significant funding to set up a Cooperative Research Centre for Advanced Automotive Technology that will, among other things, undertake fundamental research to develop and refine vehicle technologies that limit driver distraction through effective ergonomic design. MUARC will be actively involved in those activities. The car industry, here and overseas, is certainly aware of the key issues and has been more active than other stakeholders in addressing the issue.

The Future

There is a lot that we can do to prevent driver distraction from becoming a major road safety problem in Australia based on what is already known.

Data

The current lack of accident data in Australia is preventing an accurate assessment of the number of people being killed and injured in crashes attributable to distraction. Police report forms, therefore, need to be amended to record data about distracting activities. Most new vehicles are equipped with event data recorders which could also be used to automatically record information about the use of telematics systems, for example, what information was displayed and what controls were being operated just before and during a crash. This would help to clarify the role of these devices in crashes.

In the meantime, regular exposure surveys need to be developed, administered and analyzed to determine what, when, where, why, and how drivers engage in distracting activities. These are already undertaken in Australia to monitor a wide range of other risk factors, such as speed.

Education

Governments, Police, motoring clubs and other relevant agencies should conduct education and publicity campaigns to raise public awareness of the relative dangers associated with engaging in distracting activities, how to minimize the effects of distraction on themselves and others, and the penalties associated with engaging in distracting activities where these exist. Transport authorities in other countries, for example, provide advice on their websites about the safe use of mobile phones and other devices. As a matter of priority, it is important that the Australian public be made aware that text messaging is potentially more dangerous than using a hand-held phone, and that hands-free phones are just as risky as hand-held phones. The immediate focus should be on those groups most vulnerable to the effects of distraction.

Training

Learner drivers need to be trained in how to safely manage distraction: it needs to be determined at what stage in their training it is best to start being exposed to distracting activities, such as talking to passengers; they need training in how to optimally self-regulate their driving to reduce the effects of distraction; they need training in the optimal modes in which to program and interact with systems — both on-board systems and portable devices carried in and out of the vehicle — which create the least potential for distraction; they need to be made self-aware and calibrated, through training, of the effects of distraction on their driving performance; and passengers need to be trained in how to act as co-pilots rather than backseat drivers by doing things for the driver and behaving in a manner which minimizes distraction. We should be thinking about team training, not just driver training.

Legislation

There is currently very little regulation in Australia governing the design and use of vehicle technologies that have potential to distract the driver. There is a need to review the existing legislation and, where necessary, to create new legislation to limit driver exposure to distracting activities.

Regulatory measures currently being considered by Transport Canada (2003), for example, include regulations that:

- require manufacturers to follow a specified driver-system integration process when designing and testing new technologies to ensure that ergonomic design issues are properly addressed during the design process;
- require all devices known to be highly distracting — for example manual destination entry for route guidance systems — to be automatically disabled when a vehicle is in motion or travelling above a certain speed;
- require manufacturers to adhere to some or all of the performance requirements specified in North American, Japanese and European human factors and ergonomics guidelines for the design of telematics systems;
- prohibit or limit open system architectures, re-configurable interfaces and the design and number of functions available through multifunction devices; and
- finally, regulations that could be introduced that specifically prohibit the installation of devices known to adversely compromise safety — or, alternatively, ban drivers from using such devices (as is currently the case in Australia with respect to hand-held mobile phones). There is, in my view, sufficient evidence to support a ban on the use of hands-free mobile phones, especially by young novice drivers, if this is enforceable.

Vehicle Design

Other than preventing drivers from being distracted, the most effective way to reduce driver distraction deriving from technologies is to ensure that the human machine interface within the vehicle is designed ergonomically - by both vehicle manufacturers and the manufacturers of portable devices brought into the vehicle. Research has shown, for example, that dialing telephone numbers using voice commands is less distracting than manually dialing the same numbers.

In Australia we rely on industry to develop and apply voluntary safety standards for the ergonomic design of cockpit technologies and, as mentioned, vehicle manufacturers here and overseas are becoming more focused on ergonomics as a critical design criterion. The problem with this voluntary approach is that many ergonomic standards, even if industry were aware of them, still allow for some unduly distracting tasks to be carried out by drivers whilst driving and don't ensure that all features of in-vehicle telematics devices are safely integrated into the driver-vehicle system.

To resolve this problem, we could follow Canada's example. Transport Canada (2003) is entering into a Memorandum of understanding with industry that ensures that systems entering the market will meet certain minimum requirements. You will hear more about this during the conference. This is a practical approach which involves a number of voluntary commitments by industry:

- to comply, in designing their products, with best practice human factors and ergonomic guidelines and standards;
- to limit the implementation of open architectures for portable devices brought into the vehicle, and limit the degree to which devices offer re-configurable displays and controls.
- to design their event data recorders to record information about the use of telematics systems; and
- to implement and adhere to a driver-system integration process which, like ISO quality standard 9001, would identify the key ergonomic processes that a manufacturer should incorporate during the design and development process to address safety and driver-system integration issues relating to distraction. Such integration process documents have already been developed in the military and software development domains.

It is important that such an approach involves consultation with all relevant stakeholders - drivers, vehicle manufacturers, aftermarket system suppliers, information service providers and road authorities.

Transport Canada (2003) is also supporting the development of procedures and standards for testing the level of distraction imposed by new technologies, and working with stakeholders to develop tools and techniques for measuring driver distraction and defining criteria and limits on distraction from new devices.

Unfortunately, even the best designed human-machine interface may not solve the distraction problem because a well-designed device that reduces distraction might encourage drivers to use it more frequently while driving. This has been referred to as the "usability paradox" (Lee & Strayer, 2004). Ultimately, as I said at the beginning of this presentation, two-crew design and operation of the motor car might be the only way to limit the impact of driver distraction whilst at the same time allowing drivers to enjoy the safety, mobility and comfort to be derived from emerging technologies.

A promising development is the "workload manager", an on-board technology that uses vehicle sensors to estimate driver workload and suppress mobile phone calls and other sources of distraction until driver workload reduces. Some rudimentary systems already exist in production vehicles overseas.

Road Design

The findings reviewed here suggest that distractions deriving from outside the vehicle are significant in number and type, yet very little is being done around the world to address this issue. There is a need to develop a taxonomy of those objects, events and activities which are potential sources of distraction outside the vehicle and to determine to what extent drivers are exposed to these. There is a critical need, as more and more traffic information is displayed inside the vehicle cockpit, for vehicle manufacturers to enter into dialogue with traffic engineers - to ensure that there are no incompatibilities in the design, timing and number of traffic messages and signals impinging on the driver from within and outside the vehicle. Road safety audits, routinely undertaken in this country, should include criteria for the identification and ergonomic assessment of traffic management activities, objects and events that could distract drivers and degrade driving performance. As for vehicle design, there is a need for Memoranda of Understanding with industry, and between different tiers of government, to ensure that the traffic management system is designed ergonomically to limit the adverse effects of distraction.

Research

There are a number of priority areas for research on driver distraction. These will be discussed by one of my MUARC colleagues during the conference. Areas in which our knowledge base is particularly scant are: knowledge of driver exposure to distraction; knowledge of the self-regulatory strategies that drivers use to cope with distraction; ergonomic design of the human-machine interface to limit distraction; the quantification of crash risk; the definition and measurement of distraction; identifying levels of performance degradation due to distraction that constitute safety impairment; and estimating the costs and benefits of regulatory approaches to management of the issue in this country. Notable is the relative absence of

research on distraction deriving from outside the vehicle and the effects of distraction on the performance and safety of pedestrians, motorcyclist riders and other road users.

Enforcement

Intelligent transport system technologies now exist that could significantly enhance the ability of Police to enforce traffic laws. For example, it should be possible to configure mobile phones so that they can only be used if the phone is travelling at less than a particular low speed, or when stationary.

It is also important to survey Police to assess their experience and views about the extent of existing powers to deal with drivers who engage in distracting activities that are known to compromise their safety and that of other road users.

Employers

Almost half the crashes on our roads occur when people are driving vehicles for work purposes. Guidance for employers to raise awareness amongst their staff of the dangers of engaging in distracting activities is therefore critical. The guidelines should explain to employers their legal responsibilities and potential liabilities, methods for collecting and analyzing data on the role of distraction in incidents and crashes, and policies that could be adopted by them and by drivers to limit the adverse effects of distraction. This would include information that stimulates them to purchase vehicle types and technologies that maximize safety and minimize distractions.

Licensing

Finally, handbooks for learner drivers can draw attention to the relative risks associated with engaging in distracting activities. Knowledge tests should include items pertaining to the relative risks associated with these activities and strategies for reducing their impact on driving. The graduated licensing system should be used to systematically expose young drivers to distracting activities that are known to compromise safety and to test for their ability to manage them.

Conclusion

In this presentation I have tried to give you a feel for the kinds of technologies and services that are finding their way into the vehicle cockpit. Whilst these have tremendous potential to enhance the safety, mobility and enjoyment of driving, they also have potential to distract drivers and compromise their safety. I have outlined a range of measures that can be taken to limit the potentially adverse effects of distraction. In managing driver distraction, however, we need to be sensible. It is impractical to ban people from engaging whilst driving in everyday activities, such as eating and drinking. We must also recognize that it is human nature for people to involuntarily

succumb to some distracting objects, events and activities. We also need to recognize the positive benefits to users that derive from the various technologies entering the vehicle cockpit, which in most cases outweigh any disbenefits. We are, however, at an early enough stage in the evolution of the vehicle cockpit to prevent distraction from becoming a greater problem than it already is in Australia. It is important, as members of the road safety community, that we exercise our duty of care to our constituents.

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Driver Distraction: Breakdowns of a Multi-level Control Process

by Professor John D. Lee, Department of Mechanical and Industrial Engineering, University of Iowa, USA

This paper was presented as a keynote address at the 'Driver Distraction' conference in Sydney, 2-3 June 2005, run jointly by the ACRS, the NRMA and the Travelsafe Committee of the NSW Parliament.

Beginning with the introduction of the car radio, there have been concerns regarding how in-vehicle technology might undermine driving safety. Those concerns are particularly apparent today as many worry about the safety consequences of introducing vastly more complex technologies into the car, most prominently cell phones. Developments in the areas of wireless communication, computing, and GPS technology make an increasing variety of navigation, email, and internet systems available to the driver (Lee & Kantowitz, 2005). This availability, coupled with increased commute times, productivity pressures, and the diffusion of work beyond the office makes it likely that drivers will use these devices while driving. For example, 90% of all cell phone owners in the US report that they use the phone while driving (Goodman, Tijerina, Bents, & Wierwille, 1999) and 60% of total cell phone usage occurs while driving. The increasingly common use of existing technology and the rapidly emerging new technology make it imperative to understand how in-vehicle technology affects driving safety. Properly designed, the new technologies may enhance driving enjoyment and safety; poorly designed, they can be deadly.

The rapidly evolving technology brings a mixed blessing to the driver. Although hands-free cell phones may eliminate some of the visual and manual demands that undermine driving performance, many studies have shown the cognitive demands of conversation are not eliminated with hands-free devices (Brown, Tickner, & Simmonds, 1969; Redelmeier & Tibshirani, 1997; Strayer & Johnston, 2001) and may even increase if the intelligibility of the handsfree devices is less than the handheld device (Matthews, Legg, & Charlton, 2003). New devices, such as MP3 players and text messaging, have the potential to impose visual, manual, and cognitive demands that may greatly exceed those of cell phones. A recent special issue of the journal *Human Factors* brings together recent research addressing some of this technology (Lee & Strayer, 2004). Understanding how emerging technology influences distraction is an important driving safety issue.

Limits of human cognition that underlie distraction

A large and rapidly growing body of research shows that using a cell phone while driving degrades driving performance and increases crash risk (Alm & Nilsson, 1995; Brown, Tickner, & Simmonds, 1969; Haigney & Westerman, 2001; McKnight & McKnight, 1993; Redelmeier & Tibshirani, 1997; Violanti, 1997). By one estimate, cell phone-related crashes cause approximately 2600 deaths, 330,000 injuries, and 1.5 million instances of property damage in the U.S. per year (Cohen & Graham, 2003). The true safety impact of these devices in terms of crashes and fatalities may be underestimated. Compared to alcohol-related crashes, where there is a clear marker of a causal agent, cell phones do not leave a tell-tale trace. Even in the portion of cases where cell phone records are available, it is often difficult to precisely time-stamp the crash and relate it to the distraction. Many telematics devices leave an even weaker trace. Estimating the true cost of technology induced distraction is very difficult.

One of the underlying causes of driver distraction is the limited ability to do two things at once. Early theories of human information processing described people as single channel information processing systems (Broadbent, 1958). Recent research suggests performance depends on an information processing bottleneck at one or more of the stages of perception, decision making, response selection, or motor control (Pashler, 1998). By carefully manipulating perceptual and response demands for multiple tasks, substantial evidence suggests that a bottleneck exists at the response selection or central processing stage. A bottleneck at the response selection stage forces responses to be queued and delayed at the point of response selection, but makes it possible to perceive multiple stimuli in parallel (Pashler, 1998). This finding is particularly important for predicting driver distraction because it suggests

that activities that require response selection will interfere with each other to a great degree. Specifically, listening to an audio book does not require response selection, but a conversation does. As expected, the task requiring a response selection interferes with driving activities that also require response selection (Strayer & Johnston, 2001). However, there is also evidence that task interference can occur for other stages than response selection (Wickens, 2002).

Wickens (1984) developed the multiple resource theory to describe the near perfect timesharing that can occur with certain pairs of tasks. According to this approach multiple, independent attentional limited capacity resources govern dual task performance. Multiple resource theory describes how well people can do two things at once by identifying how much each task competes for resources. Processing stages, modes, and codes define these resources. If two tasks demand the same resources performance of one or both suffers. Driving requires visual and spatial resources, whereas a handsfree cell phone requires auditory and spatial resources and so the multiple resource theory would predict relatively little interference; however competition for central processing demands will lead to interference even if the resource requirements are relatively independent (Wickens, 2002, Gladstones, Regan and Lee 1989).

Driving performance and interactions with the in-vehicle technology can both suffer from competition from the other activities. For example, business negotiations by cell phone while driving suffered in comparison to those conducted when not driving (Parkes, 1993). Importantly, breakdowns in the telematics interactions can increase the telematic demand, which may have a surprisingly negative effect on driving performance.

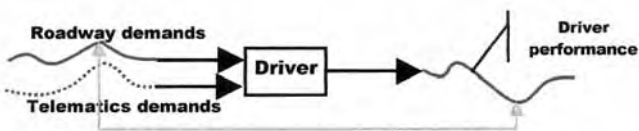
Driving and telematics interaction as control processes

The ultimate effect of new technology on driving safety depends on a wide array of interacting factors. At the most simple level, Figure 1 shows that driver performance depends not only on the demands of the in-vehicle information system (telematics), but also on the concurrent roadway demands. Dialing a phone on a straight road during daytime may not undermine driving performance dramatically. However, dialing a phone at night on a curve could be deadly. Simultaneous peaks in both roadway and telematics demands can greatly diminish driving performance.

Driver response to demands is more complex than Figure 1 suggests. Drivers do not passively respond to demands imposed on them by the roadway and telematics. Instead drivers play an active role in defining these demands. Telematics demands depend on how and when drivers choose to interact with the device. Likewise, roadway demands

depend in part on how fast drivers choose to go and the route they choose. Both feedback and feedforward processes guide drivers' response. With the feedback process, drivers adjust their behavior on previous levels of driving performance. Drivers use feedback control to adjust their speed in response to the increasing demand of a cell phone conversation. With the feedforward process, drivers adjust their behavior based on anticipated demands. Drivers use feedforward control in choosing not to place a call until after they negotiate a difficulty maneuver, such as merging onto the highway. Feedback and feedforward control play a critical role in defining the demands to which the driver must respond (Sheridan, 2004).

Figure 1. The concurrent peaks in driving and telematics demands can undermine driving performance.



Multi-level control in driving

The timescale at which drivers engage in feedback and feedforward control ranges from fractions of a second to days. Figure 2 (page 36) reveals some of these interactions by distinguishing between three levels of driving behavior associated with distraction (Allen, Lunenfeld, & Alexander, 1971; Michon, 1985; Ranney, 1994). Strategic behavior describes driving and telematic activities at a very molar level, with a time scale of minutes to days. Tactical behavior describes driving and telematic tasks at a finer level, with a time scale of 5-60 seconds. At the bottom of the figure, operational behavior describes tasks at a micro level, with a time scale of 0.2-5 seconds. Each of these levels provides a different description of how the characteristics of new technology interact with the driver to influence distraction-related safety problems.

With cell phones, the top of Figure 2 describes the factors that might lead drivers to bring a cell phone into the car. At the strategic level, societal norms and regulations might discourage drivers from bringing a cell phone into the car, but handsfree technology and productivity pressures might encourage drivers to bring a cell phone into the car to do so. At the tactical level, the immediate roadway demands might influence the decision to answer the phone and the perceived demands of a conversation might lead drivers to adopt longer headways or slower speeds. At the operational level, the cognitive demands of the conversation influence headway, speed and lane keeping performance. Each level of Figure 2 provides a different perspective of how the demand of the roadway and the telematics might interfere and undermine driving safety.

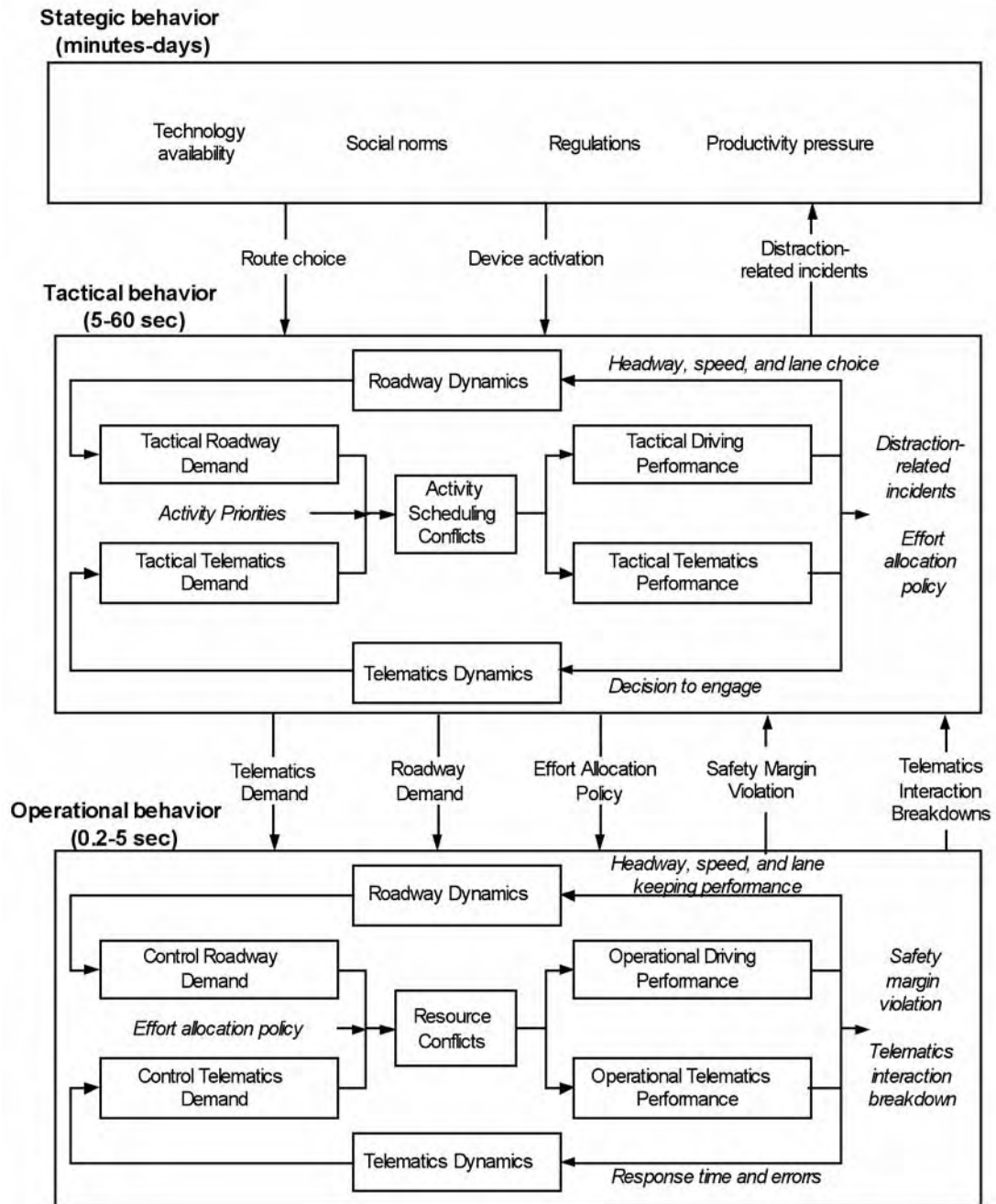
Problems with feedback control

Driving provides poor feedback, particularly concerning the inappropriate use of telematics. Because driving is often forgiving, drivers can neglect the driving task to a dangerous degree and suffer no immediate consequences. Even when drivers receive feedback in the form of a crash it seldom results in a lasting change in behavior (Rajalin & Summala, 1997). Similarly, a well-designed device that reduces distraction at the operational level may actually undermine driving safety if it encourages drivers to use the device more frequently while driving. This usability paradox occurs when increased ease of use reduces the distraction of any particular interaction, but increases overall risk by encouraging drivers to use the device more frequently. This tendency for drivers to adapt to improvements and undermine the expected safety benefit is a common phenomenon. For example, when roadway improvements are made (lanes widened, shoulders added, lighting improved) speeds increase (Evans, 1991). Drivers may view handsfree cell phones as safe to use while driving and so make more calls than they would with a handheld cell phone. Another example of poor feedback is that good control of one driving task provides false confidence for another. Experienced drivers are able to maintain their lane position using peripheral vision while interacting with a visually demanding device and so receive continuous feedback suggesting they are monitoring the driving environment well. However, the visual demands may severely degrade their ability to detect events (Summala, Nieminen, & Punto, 1996). Such misleading feedback can give drivers a false sense of how safely they can drive while interacting with telematics devices.

Problems with feedforward control

Feedforward control is difficult because roadway and telematics demands are unpredictable. In addition, drivers tend to neglect future demands and focus on the current situation. As an example, drivers tend to answer cellphones independent of the upcoming roadway demands (Nowakowski, Friedman, & Green, 2002). Another challenge to effective feedforward control is that breakdowns in control at the operational level can lead to unexpected demands and poor management of the telematics and driving demands. Speech recognition systems, particularly in the context of a noisy car, will likely induce errors. Such errors can lead to an unanticipated and increasing spiral of demand. Inexperience also undermines feedforward control in a way that can be particularly devastating. The tendency for young drivers to underestimate risks already plays a major role in driving safety (Fisher et al., 2002). Interaction with telematics will likely exacerbate problems of feedforward control and the difficulty drivers have in anticipating and responding to upcoming demands.

Figure 2. Distraction results from breakdowns of multi-level control that is shared between telematic interactions and driving (Lee & Strayer, 2004).



The most powerful factors governing distraction may be the most difficult to quantify and shape. In particular, social norms governing acceptable risks and specifically, whether it is socially acceptable to use a cell phone while driving, may have the largest effect on driving safety. Subtle design modifications that reduce distraction at the operational level of behavior may have a much smaller effect on driving safety compared to changes in societal norms that influence the strategic level and make the use of a device while driving taboo. The driving behaviors influenced by telematics devices and the complex feedback processes make a comprehensive understanding of driver distraction a substantial challenge.

Mitigation strategies for driver distraction

Addressing the issue of driver distraction is often approached from a legislative perspective in which laws are developed to limit or eliminate drivers' use of certain technology while driving. The ban on handheld cell phones is a salient example. Using sensor and computer technology may be a more effective approach to reducing distraction and enhancing safety. A wide range of distraction mitigation strategies are possible and this section presents a taxonomy and provides examples of some promising strategies (Donmez, Boyle, & Lee, 2003).

Recent reviews of automation and its effect on human performance highlight the important considerations of distraction mitigation strategies (Lee & See, 2004; Parasuraman, Sheridan, & Wickens, 2000; Sheridan, 2002)). Sheridan (2002) has defined eight levels of automation that range from high (e.g. automation takes control and ignores human) to moderate (e.g. automation executes action only if human approves) to low (e.g. human does it all). These distinctions have been used to integrate studies of automation in many domains and can be used to identify design tradeoffs with distraction mitigation strategies. These mitigation strategies can be further categorized according to whether they address driving-related (e.g. steering, braking) or non-driving related tasks (e.g. tuning the radio, talking on the cell phone). Strategies that address driving related tasks focus on the roadway environment and directly support driver control

of the vehicle, whereas strategies for non-driving related tasks focus on modulating the driver interaction with telematics (Donmez, Boyle, & Lee, 2003).

One particularly promising set of mitigation strategies falls under the category of driving related tasks. Three levels of automation define these substantially different strategies within this category: intervening (high automation), warning (moderate automation) and informing (low automation). Intervening involves the system taking control of the vehicle and performing one or more driving-related tasks during hazardous situations when the driver is too distracted to react in a timely manner. Warning alerts the driver to take a necessary action. A collision avoidance system is a function that employs warning as a strategy and encompasses both visual and audio alerts. This is considered a moderate level of automation compared to intervening since the driver is still in control of the vehicle. Lee et al (2002) showed that this type of system benefited both distracted and non-distracted drivers. A concern with this system is the distrust and disuse can result from high false alarm rates. This problem also contributes to driver's response to, and acceptance of the system, which may influence the system effectiveness (Parasuraman, Hancock, & Olofinboba, 1997). Informing provides drivers necessary information that they typically would not observe if distracted. For example, a speed limit indicator might provide information on changes in posted speed limits. Donmez et al.(2003) discuss the other mitigation strategies in detail.

Conclusions

Current technological and societal pressures will make distraction-related crashes more prevalent unless steps are taken. An important contribution to distraction related crashes is the fundamental limits of human perception and cognition. People have limited capability to do more than one thing at a time. As a consequence, telematics interactions that occur while driving are risky. The degree of risk posed by cognitive limits depends on how they contribute to breakdowns in the multi-level control process that includes strategic, tactical, and operational responses. Considered in this context, distraction results from:

Table 1. Mitigation strategies for driver distraction (Donmez, Boyle, & Lee, 2003).

LEVEL OF AUTOMATION	DRIVING RELATED STRATEGIES		NON-DRIVING RELATED STRATEGIES	
	System Initiated	Driver Initiated	System Initiated	Driver Initiated
High	Intervening	Delegating	Locking & Interrupting	Controls Pre-setting
Moderate	Warning	Warning Tailoring	Prioritizing & Filtering	Place-keeping
Low	Informing	Perception Augmenting	Advising	Demand Minimizing

- Conflict between driving and telematics demands — information overload.
- Poor feedback that leaves drivers unable to adjust their behavior to compensate for the telematics demands.
- Inadequate support of feedforward control that makes it difficult to anticipate and respond to peaks of telematics and roadway demands.

Considering distraction as a breakdown in a multi-level control process has critical implications for telematics design, development of adaptive telematics to mitigate distraction, and measures and methods to evaluate telematics devices.

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Road Safety Literature

New to the College Library

Study on the Effect of Passenger and Night Driving Restrictions on Novice Drivers

published by SMEC Australia Pty Ltd and Smithworks Consulting, with funding by the NRMA-ACT Road Safety Trust, June 2005.

Drink Driver Rehabilitation and Education in Victoria published by RACV, April 2005.

Recent Publications

From Monash University Accident Research Centre (MUARC)

The history and development of speed camera use, Delaney, A., Ward, H. & Cameron, M. (2005), Monash University Accident Research Centre, Report No. 242 - <http://www.monash.edu.au/muarc/reports/muarc242.html>

Development of a model resource for parents as supervisory drivers, Mulvihill, C., Senserrick, T. & Haworth, N. (2005) Monash University Accident Research Centre, Report No. 243 - <http://www.monash.edu.au/muarc/reports/muarc243.html>

From the Australian Transport Safety Bureau, Canberra

Road Safety - Research - A Pilot Study of the Relationship between Macrottexture and Crash Occurrence. <http://www.atsb.gov.au/road/res-exec/cr223ex.cfm>

Road Safety - Research - Assessing the Level of Safety Provided by the Snell B95 Standard for Bicycle Helmets. <http://www.atsb.gov.au/road/res-exec/cr220ex.cfm>

Road Safety - Research - Community Attitudes to Road Safety - Community Attitudes Survey - Wave 17, 2004. <http://www.atsb.gov.au/road/res-exec/cr224ex.cfm>

(This report documents the findings from the Australian Transport Safety Bureau's latest survey of community attitudes to road safety. The seventeenth in a series of national surveys on community attitudes to road safety was conducted in March and April 2004. A total of 1,665 interviews were conducted with persons aged 15 years and over. The issues examined include: perceived causes of road crashes, exposure and attitudes to random breath testing, attitudes to speed,

perceptions of police enforcement, reported usage of seat belts, involvement in road crashes, and experience of fatigue while driving.)

Road Safety - Novice Driver Safety

- Novice Driver Programme Trial - Bulletin 1, June 2005. http://www.atsb.gov.au/road/novice_bulletin1.cfm

Road Safety - Research - Static Fires at Retail Petrol Stations:

An examination of the myths and facts about fires caused by static electricity and exploding mobile phones. June 2005. http://www.atsb.gov.au/road/research/static_fires.cfm

Road Safety - Statistics - Road Crash Time Series. July 2005.

<http://www.atsb.gov.au/road/stats/current.cfm>

Road Safety - Research Grant Projects - The Road Safety Implications of Unlicensed Driving: A Survey of Unlicensed Drivers. http://www.atsb.gov.au/road/research/unlicensed_driving.cfm

Bibliography of Recent Research

Australian Transport Safety Bureau, 2005, "Static Fires at Retail Petrol Stations: an examination of the myths and facts about fires caused by static electricity and exploding mobile phones", Australian Transport Safety Bureau, Australian Capital Territory.

The full document is available online at http://www.atsb.gov.au/road/pdf/static_fires.pdf

Carter T, Major H, Wetherall G, Nicholson A., 2004, "Excessive daytime sleepiness and driving: regulations for road safety", *Clinical Medicine*, (formerly the *Journal of the Royal College of Physicians of London*), Vol. 4, No.5, pp. 454-6.

Individuals who fall asleep at the wheel usually do so because they are sleep deprived. It is likely that they are aware of the circumstances leading to sleepiness and of feeling sleepy before the event. Nevertheless, sleepiness sufficient to cause or contribute to an accident may involve a disorder of sleep, and little attention has been given to such disorders in the consideration of accident prevention. In this context, the Department for Transport brought together a group to explore the potential significance of sleep disorders in accidents. The Driver and Vehicle Licensing Agency has clarified existing regulations, particularly those that concern vocational drivers.

Fildes B, Langford J, Andrea D, Scully J, 2005, "**Balance Between Harm Reduction and Mobility in Setting Speed Limits: A Feasibility Study**", Monash University Accident Research Centre, Melbourne.

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This project has been funded by Austroads to develop, trial and evaluate a new system for setting speed limits based on harm reduction principles. In this, the feasibility stage of the project, three main tasks were undertaken. (a) a literature review examined present and emerging philosophies in regard to setting speed limits (b) an Expert Group has considered the findings from the literature review and advised on the best options for developing speed limits, based more fully on harm reduction principles (c) the information obtained from the literature review and from the Expert Group has been used to describe a model for setting speed limits based more fully on harm reduction principles.

This report presents the findings arising from these three tasks. In particular, the broad support from jurisdictions for a new speed setting method based more firmly on factors of safety, has led to a recommended approach combining economic optimisation and harm reduction objectives.

Freeman J, Liossis P, Schonfeld C, Sheehan M, Siskind V, Watson B, 2005, "**Self-reported motivations to change and self-efficacy levels for a group of recidivist drink drivers**", *Addictive Behaviors*, Vol. 30, No.6, pp. 1230-5.

(Department of Psychology and Counselling, Centre for Accident Research and Road Safety, Queensland University of Technology)

This study reports on the stages of change and self-efficacy levels for changing and controlling both drinking and drink driving behaviour by a sample of 132 recidivist offenders. The majority of individuals in the sample reported being motivated to change their drink-driving, but not their drinking behaviour. The sample also indicated high self-efficacy levels for their drinking and their drink-driving behaviour. However, a notable finding was that participants reported higher levels of control over their drinking rather than drink-driving behaviour. Examination of the self-reported frequency of drink-driving revealed that both motivation and self-efficacy levels were predictors of past offences and future intentions to drink and drive.

These findings could be applied to the management of repeat drink-driving offenders, e.g., the inclusion of rehabilitation and alcohol treatment programs in court sentences for individuals who appear to be resistant to change.

McEnvoy SP, Stevenson MR, McCartt AT, Woodward M, Haworth C, Palamara P, Cercarelli, 2005, "**Role of mobile phones in motor vehicle crashes resulting in hospital attendance: a case-crossover study**", *British Medical Journal*.

(Abstract not available)

Odell, M, 2005, "Assessing Fitness to Drive Part 1", *Australian Family Physician*, Vol. 34 No. 5, pp. 359-63.

(Victorian Institute of Forensic Medicine, Monash University, Victoria).

The requirement for general practitioners to write reports about their patients' fitness to drive will increase as the population ages and licensing criteria change. It is important that GPs understand the medical and legal issues involved in this important area of public health.

This two-part article discusses the rationale behind assessing fitness to drive and briefly summarises several medical conditions that commonly give rise to problems. This information will help GPs understand the decision making process regarding this sensitive issue, and improve the quality of medical reports. Adequate assessment and reporting can help patients avoid becoming involved in traffic crashes, and the doctor from becoming involved in court appearances.

Specific medical conditions discussed in part one are epilepsy, diabetes, and cardiovascular disease. Guidelines are based on currently available evidence regarding the effects of medical conditions on driving and are subject to regular review, as new information becomes available.

Odell, M, 2005, "**Assessing Fitness to Drive Part 2**", *Australian Family Physician*, Vol. 34, No. 6, pp. 475-7.

(Victorian Institute of Forensic Medicine, Monash University, Victoria).

This is the second of a two part article discussing the guidelines for fitness to drive in Australia and how they are applied to specific medical conditions.

Visual functioning, psychiatric conditions, sleep disorders, acute medical illnesses and chronic disorders, and driving with disabilities are discussed. Information on exceptions from wearing seatbelts and cycle helmets is provided as well as a discussion on disability assessment for privileged parking.

Stevenson, MR, 2005, "Steering in the Right Direction? Young Drivers and Road Trauma: we need restrictions on night driving and peer passenger numbers for novice drivers", *Medical Journal of Australia*, Vol.182 No, 3, pp.102-3.

(Abstract not available)

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