

Conclusion

Safer journeys sets a new direction for New Zealand's road safety with its vision and Safe System approach for reducing the number of deaths and injuries on our roads. Its approach to the safety of our roads, focusing on forgiving and predictable roads, is also a first for New Zealand. Research and evidence have

been crucial to the strategy. At the same time, consultation has been important to ensure actions are appropriate to New Zealand and acceptable to New Zealanders. We hope that giving road users the chance to have their say in the creation of *Safer journeys* encourages them to support its actions and share the responsibility for making our roads safer.

Loads off roads: Shifting freight to rail creates a shift in road safety

By Peter MacKenzie, Independent Transport and Road Safety Researcher, Westbury, Tasmania. Email petermac1984@hotmail.com

Australia is not meeting national road safety targets [1], national progress in reducing road trauma over recent years has been much slower than was originally projected [2], and we face a challenging future in which it will become increasingly more difficult to achieve reductions in road trauma without significant investment in the road network [3].

Trucks are over-represented in road fatalities [4], and destructive crashes involving trucks occur across Australia far too often to be considered acceptable in either road safety, public health or the on-road transport workplace systems that it represents.

Yet with political will, coupled to industry and community support and co-operation, we can choose to begin saving more lives quite quickly through compulsory shifting of more freight from road to rail, beginning with specifically targeted routes and freight type – particularly fuel products and other dangerous goods.

It is probable that many truck-related deaths and serious injuries would be prevented if the roads used by trucks were upgraded to meet the Safe System approach adopted by Australian jurisdictions. John Wikman, Executive Manager Traffic and Safety, Royal Automobile Club of Queensland (RACQ), quotes the Australian Transport Council as saying: 'Improving the safety of roads is the single most significant achievable factor in reducing road trauma.' [5]

However, while safety upgrades to roads (including roadsides) are considered a core component of the Safe System, the major impediment ahead of us is that many thousands of kilometres of highways and roads across the nation lack the safety features required for Safe System approaches; it will take decades and tens of billions of dollars to even part complete that work. Infrastructure Australia indicates that \$42 billion would be required to bring the National Highway to four star safety rating. The RACQ notes that '...nine years on from the original [2001-2010 National Road Safety Strategy] not enough has been done to improve the safety of roads and roadside environments themselves'. [6]

While the Australian Trucking Association echoes the need for safer road environments, they also place much emphasis on introducing longer and heavier vehicles to reduce exposure to risk of crashes, something repeated by the National Transport Commission. [7]

Thousands of larger, Higher Mass Limit or HML trucks have been introduced in an effort to gain efficiency savings for the road transport industry and to gain safety benefits from reduced exposure to risk during massive growth in the freight task. But much of this is on roads that are very inadequate in safety terms. Professor Ian Johnston, Deputy Chairman from the National Transport Commission (NTC), said in 2008: 'Yet 50% of the road network is more than 20 years old and designed for wheelbarrow sized trucks.' [8]

Professor Johnston also noted that these HML vehicles are supposed to be limited to 'better' (that is, safer) roads [9], but my investigations across several States show too many examples of heavier vehicles being approved access to roads that have numerous safety deficiencies that would not anywhere meet Safe System requirements, nor modern occupational health and safety (on-road) workplace practices. (This is not to say that access approvals do not always meet outdated processes and requirements). I suspect the problem is far more widespread, and warrants an urgent national safety audit, perhaps through a Senate enquiry.

This mismatch of unsafe road environments and introduction of heavier freight vehicles results in an outdated, one-dimensional approach to freight transport and road safety, not a Safe System.

While two reputedly safer B-Doubles can replace three semi-trailers, their numbers have increased from 700 in 1997 to more than 6000 across Australia. There are now more than 500,000 trucks overall, including numerous less-safe older semis, still operating. [10]

There are also serious concerns within the rail industry about the ability of increasingly HML trucks to derail trains in level crossing crashes. (Somewhat ironically, the greatest threat to rail safety is from road users at level crossings.)

A simple shift to rail of the 15 per cent of road freight said to be transferable (or contestable) could save up to 45 lives annually (calculated on the basis of roughly three deaths for every 1 per cent of freight hauled). It could also save 275 or more people from paraplegia, quadriplegia, brain damage and other serious long-term disability (because ratios of fatalities to injuries in truck-related deaths are not the same as for overall motor vehicle deaths/injuries, and estimates vary greatly, a mid-range estimate was used). That is equivalent to reducing the annual average road deaths to zero in Tasmania or the Northern Territory, and significantly reducing the serious injury levels.

During the next decade, up to 450 Australian men, woman and children could be saved from death, 2750 from serious injury, and thousands more family and friends not grieving. That is near 3 per cent reduction in road deaths alone. It would include a significant reduction in numbers of dead or traumatized truck drivers, and less occupational health and safety burden on employers, as well as substantial savings to the hospital and health services.

Much of the potential saving of more than \$1 billion dollars in crash costs could be invested in the massive backlog of urgently needed safety works on roads and highways where there is no rail alternative to truck use, thus preventing more deaths and further reducing serious injuries.

While the imperative is strong, the ability to shift freight from road to rail has been seriously impeded by continuing rail line closures, train service suspension and lack of upgrades due to under-funding.

In NSW in recent months, a combination of government policy and corporate profit motives have resulted in the end of rail haulage of petroleum products, despite all the risks involved in road haulage. This concern about too many trucks on inadequate roads and with a very incomplete safety system was raised by the Privy Council members in the landmark 1954 Hughes and Vale transport case, and obviously continues today. It is a very clear non-alignment of policies, stakeholder budgets and safety.

While two B-Doubles can replace three semis, one train can replace up to 150 semis. This results in significantly greater safety gains, as well as reductions in emissions and fuel usage, while substantially reducing costly road damage.

The safety priority would need to target the greatest potential gains, which would include those freight tasks where the roads have safety deficiencies. Trucks would still be needed for part of many haulage tasks, linking to rail using various modern coordinated intermodal technologies. The linking roads where trucks would be used would require assessment for Safe System upgrades, to ensure 'seamless' safety across both modes.

This change will not cost truck drivers jobs due to the massive growth in the freight task (doubling by 2020) and the impending shortfall in truck driver numbers. The consequent safety implications of having inexperienced or inadequately

regulated imported drivers is raising serious concerns within the trucking industry, but also needs to be on the radar of developing issues within the road safety domain.

Unfortunately, while the aim of modal shift from road to rail is agreed to by most if not all Australian jurisdictions, it has not been matched by strategically dedicated targeting, timeframes or resourcing. For example, the 2001-2010 National Road Safety Strategy includes 'Encouraging alternatives to motor vehicle use', but that does not translate into any specific actions in the National Road Safety Action Plans for the period.

Modal road to rail shift would also have substantial benefits in reduction of emissions and imported petroleum fuels, while reducing urban congestion (expected to be in excess of \$20 billion per annum by 2020) [11], and unsafe traffic overload in regional towns and cities.

Sweden's Vision Zero approach to road safety is underpinned by an ethic whereby deaths and serious injury is not acceptable in road use. We in Australia now need to develop an ethic that puts prevention of serious road trauma before corporate and competition policy priorities in the freight haulage domain.

However, as noted by Lydon: '...major infrastructure improvements are still overwhelmingly aimed at improved mobility, rather than safety.... A national strategy is an opportunity to change the balance in decision making to give the protection of life and health a higher priority than faster travel.' [12] I would add: Or than cheapest, fastest freight movement.

In that light, it is concerning that while the President of the Australasian Council of Road Safety rightly talks of international calls for a 'Decade of Road Safety' to 2020, the Federal Government is clearly focusing on 'Making 2011 the year of freight' [13,14]. I suspect that will continue to be the priority focus beyond 2011 unless there is strong advocacy to make safety 'Transport Priority # 1' from an alliance of those working for road safety.

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Research initiatives to improve the visibility and hence safety of road workers at night-time

By JM Wood* and MJ King**

*School of Optometry and Institute of Health and Biomedical Innovation, Queensland University of Technology, Brisbane

**Centre for Accident Research and Road Safety - Queensland (CARRS-Q), Queensland University of Technology, Brisbane

Introduction

Collisions between vehicles and pedestrians represent a significant road safety problem and are overrepresented at night-time, with pedestrians being up to seven times more likely to be involved in a fatal collision at night than in the day [1]. This is particularly relevant at road work sites, which place road workers in a potentially vulnerable position with respect to oncoming traffic. Over the 1995 to 2002 period, 844 US workers were killed while working at a road construction site, and in over half of these fatalities the road worker was struck by a vehicle or moving equipment [2]. Fatal crash data also demonstrate that night-time construction is five times more hazardous than daytime construction [3]. Visibility and conspicuity issues may be key causative factors; analyses of crash databases have shown that the increased incidence of crashes involving pedestrians at night is primarily a consequence of reduced illumination rather than other factors that might vary between day and night, such as driver fatigue and alcohol use [1, 4]. This suggests that at night, drivers are often unable to recognize and respond to pedestrians from a safe distance [5].

Research approaches

While a variety of approaches have been used to make pedestrians more conspicuous to drivers at night (including vehicle and roadway lighting technologies and night vision enhancement systems), emerging research by our group and others has demonstrated that clothing incorporating retroreflective markers can provide highly significant improvements in pedestrian visibility in reduced illumination. Importantly, retroreflective markers are most effective when positioned on the moveable joints creating a sensation of "biological motion". Based only on the motion of points on the moveable joints of an otherwise invisible body, observers can quickly recognize a walking human

form, and even correctly judge characteristics such as gender and weight (see Blake and Shiffar [6] for a review of the literature).

When reflective strips are positioned in the full biomotion pattern (ankles, knees, shoulders, waist, elbows, wrists) they provide substantial advantages for improving pedestrian visibility over and above that of reflective material positioned on the torso, such as reflective vests [7-14]. In the study by Wood et al. [14], for example, drivers using low beam headlights on a closed road recognised a pedestrian walking while wearing biomotion markers at a distance that was 3.4 times greater than when the same pedestrian wore a vest that included an equal amount of reflective material (148m compared to 43m). Importantly, it is the configuration and not the amount of reflective material that determines pedestrian conspicuity. We have also shown that the visibility advantages of biomotion configurations are robust to the effects of driver age [14, 15], visual impairment and headlight glare [16] and visual clutter surrounding the pedestrian [13].

In collaboration with the Queensland Department of Transport and Main Roads, we recently conducted a field study in order to establish whether biomotion reflective markings are also effective in increasing the conspicuity of road workers under in-traffic conditions at two road work sites (one suburban and one freeway) [17]. We evaluated the value of strategically adding reflective markings to those already present in standard vests by determining drivers' subjective ratings of the relative conspicuity of road workers wearing a standard road worker night vest a) alone, or with additional reflective strips on b) thighs, c) ankles and knees, or d) on eight moveable joints (a convenient subset of biomotion).

Participants, seated in stationary vehicles at three different distances (80 m, 160 m, 240 m), rated the relative conspicuity of the four road workers using a standardized scale. Road worker