

Maintaining safe following distances

using low cost solutions



For the better

Maintaining safe following distances using low cost solutions

Perth is highly car dependent and will remain so for some time. In 2012, the RAC forecast that there will be 1 million additional motorised vehicles in the State by 2020. This growth is placing increasing demands on our road network and impacting on the quality of the journey experience for WA motorists.



Behaviours such as tailgating have adverse impacts on road user safety and can contribute to congestion. Discouraging tailgating behaviour through low cost infrastructure solutions should be part of the response to improve the safety and efficiency of our roads.

Tailgating and following distances

Tailgating is the practice of driving too closely to the vehicle in front and not maintaining a sufficient distance (referred to as a safe following distance) to allow for the reaction and braking time necessary to avoid a possible crash.

Stopping distance, and thus safe following distance, will vary depending on a number of factors such as a driver's attentiveness, size and condition of their vehicle, the speed at which the vehicles are travelling, the road surface and weather conditions. However, it is widely accepted that two seconds is the minimum headway (gap in distance or time) which should be maintained between two vehicles, under ideal conditions.

The two-second rule is a time-lapse formula for estimating safe following distance and can be applied to any speed, to passenger cars and light trucks (a driver counts the seconds between the vehicle in front passing a point on the road and their vehicle passing that same point; the time taken should be two seconds or longer).

An alert driver will take approximately one second to react to an emergency (known as reaction time or distance), and at 50km/h a vehicle would travel approximately 13 metres in that time. In ideal conditions, a typical vehicle would continue to travel approximately 15 metres after the brakes have been applied (known as braking distance). Adding these together means the combined stopping distance at 50km/h would be 28 metres¹.

Impacts of tailgating

Tailgating, which can result from drivers being unaware of road rules, adopting poor driving practices or driving aggressively, is a cause of irritation and distraction to other drivers. More seriously, tailgating increases the risk of rear-end crashes, which endangers the safety of motorists and contributes to road trauma.



76% of crashes on the Kwinana Freeway, between the Mitchell Freeway and Canning Highway, over the five year period from 2009 to 2013 were rear-end crashes.

Main Roads WA Crash Data

Whilst not the only cause of rear-end crashes, tailgating and inattention are considered to be two of the main contributory factors². An in-depth analysis of crash data in Australia revealed that inattention in various forms is a more frequent cause of this crash type than tailgating, but that inattention could naturally lead to tailgating³.

Tailgating can impact congestion and average vehicle speeds along a corridor in two ways. Firstly, if sufficient stopping distances are not maintained between consecutive vehicles in a platoon of traffic, when the vehicle in front slows down the following driver has less time to respond and thus heavy braking is required to avoid a crash. The same then goes for each successive vehicle but each time even harder braking is required. Numerous studies have shown that allowing more space between vehicles helps to reduce the frequency of the formation of traffic shock waves, achieving a more consistent flow of traffic and reducing congestion and travel times^{4&5}. Secondly crashes, whether property damage only or resulting in personal injury of any severity, can cause significant delays and disruption to traffic flow.

¹Office of Road Safety (2010). Keeping a safe distance behind other vehicles.

²Dingus, T.A., et al. (1997). Human Factors Field Evaluation of Automotive Headway Maintenance/ Collision Warning Devices. Human Factor, Vol. 39. Cited in: Song, M. & Wang, J.H. (2010). Studying the Tailgating Issues and Exploring Potential Treatments. Journal of the Transport Research Forum, Vol. 49, No. 3.

³Hutchinson, P.T. (2008). Tailgating. Safety Research Report # CASR046, Centre for Automotive Safety Research, University of Adelaide, Australia.

⁴Chacon, Scott Henry. The Effect of Driver Behavior on Freeway Traffic Flow. Department of Operations Research & Financial Engineering, Princeton University, 2008.

⁵Vanderbilt, T. (2008). Traffic: Why We Drive the Way We Do (and What it Says About Us). ISBN 0307277194, Alfred A. Knopf, 2008.

The ubiquity of tailgating in WA

The RAC has conducted a number of surveys over recent years examining issues around driving ability, behaviour of other motorists and the impacts of congestion on driving in WA. Driver behaviours such as tailgating and related issues are frequently identified as being a cause of concern for drivers in our State.

A 2009 RAC member survey revealed that eight in ten respondents claimed to see unsafe driving behaviour on a daily basis. When asked about the standard of driving in our State, over 60 per cent rated it as poor or very poor. The two most frequently cited skills that WA drivers were considered to be most lacking were the ability to merge (70 per cent cited this as the worst skill) and keeping a safe distance behind another vehicle (64 per cent).

'Poor driving ability / unaware of road rules / unsafe drivers' (35 per cent - top concern) and 'bad attitude / road rage / impatient drivers' (12 per cent) remained in the top five concerns for motorists in WA in 2011, based on the results of the RAC's Motoring Survey conducted that year.



From the RAC's 2013 Congestion Survey it is apparent that, for drivers in WA, congestion is a contributory factor to increasing driver frustration, stress, anxiety and irritation (35 per cent of respondents said this was a personal cost of congestion), which can manifest in drivers becoming more impatient.

"...road congestion has led to a huge increase in frustrated drivers breaking the road rules by tailgating, lane changing with no indication and running red lights."

"...the worst feature of being in congestion is that it promotes road rage, with the impatient drivers jostling for a better position in the traffic."

RAC Congestion Survey 2013

What can be done?

There is a range of quick-win and longer term infrastructure, technological, educational and enforcement solutions that have been trialled and implemented world-wide to discourage tailgating and mitigate its impacts, including:

» Advisory signs

These may be standard or variable messaging signs. Studies have shown that those which emphasise the consequences of tailgating (such as the "Help Prevent Crashes Please Don't Tailgate" signage used in the "Stop Tailgating" project in Minnesota, USA) and those that use graphical images to convey meaning are most effective⁶.

» Carriageway markings

Examples include chevrons, dots or bars installed at fixed intervals in the centre of running lanes to help drivers judge and maintain a safe distance from the vehicle in front. Recent stated preference surveys have shown that drivers prefer bars and chevrons⁷. These markings are accompanied by appropriate signage instructing drivers of the number of markers to allow between them and the vehicle in front.

» Police enforcement

This could involve regular enforcement activities or targeted campaigns. Examples include the use of Lidar (light detection and ranging) technology as part of regular enforcement activities to more accurately measure distances between vehicles than permitted by standard speed gun equipment (currently used in various US States). Examples of targeted campaigns include Colorado State Patrol's 2013 tailgating campaign and Connecticut State Police's month long "Stop Tailgating, You're Too Close" campaign, both of which involved the use of billboards and increased police patrols.

In WA, regulation 109 of the *Road Traffic Code 2000* states that 'except when overtaking and passing, the driver of any vehicle shall, when following another vehicle, keep such distance behind it as will enable the driver to stop the vehicle with safety, without running into the vehicle in front of him or her'. This can however be challenging to enforce as a minimum headway is not specified in the legislation.

» In-vehicle intelligent transport systems

Technologies already available on some new vehicles (although still rare among vehicles priced at less than \$25,000) include adaptive cruise control, advanced collision warning and autonomous braking systems. Vehicle telematics could potentially also encourage changes in driver

⁶Song, M. & Wang J.H. (2010). Studying the Tailgating Issues and Exploring Potential Treatments. *Journal of the Transport Research Forum*, Vol. 49, No. 3.
⁷Song, M. & Wang, J.H. (2010).

behaviour where drivers are aware their driving behaviours are being monitored, although this remains largely at the experimental stages of development. It is important to recognise that whilst, once widely available, such technologies would help mitigate the impacts tailgating, with the exception of vehicle telematics, they would not address the driver behaviours which cause tailgating.



What the future looks like...

With developments in intelligent transport systems the future may hold interconnected fleets of driverless vehicles that may one day "talk" to one another and the road, thereby reducing the potential for crashes.

Where to now?

In the short-term, merit exists in developing and implementing a trial to test a low cost infrastructure solution(s), such as regularly spaced carriageway markings and advisory signs, to mitigate tailgating behaviour. Whilst the trial would focus on a priority location it would also act to raise awareness amongst drivers of the minimum following distances that should be maintained, encouraging safer and more efficient driving behaviour across the wider network.



Carriageway markings and advisory signs

The 'Keep Your Distance' trial on the M1 motorway in the UK, which tested chevrons road markings spaced at 40 metres intervals along two 4km to 5km stretches of road, and accompanying advisory signs, reported a 56 per cent reduction in crashes as a result⁸. Furthermore, the effect was detected up to approximately 18km beyond the end the trial area. These measures were subsequently installed on various motorways and major roads.

The 'Stop Tailgating' project, which introduced dots (circular pavement markings) and information signs along a 2 mile section of Highway 55 (a rural roadway with a 55mph speed limit), demonstrated an average headway increase of 5.46m. The total cost of the project was \$14,866 USD⁹. This followed the success of the Pennsylvania Department of Transport's Tailgating Treatment Program on Route 11, which reported a 60% reduction in tailgating after implementation¹⁰.

About the RAC

The RAC is the leading advocate on the mobility issues and challenges facing our State and is committed to ensuring safe, accessible and sustainable mobility options for our members and the broader community.



⁸Helliar-Symons, R., Webster, P. & Skinner, A. (1995). The M1 chevron trial. *Traffic Engineering and Control* 36; 563-567.
⁹Minnesota Department of Public Safety (2006). Minnesota tailgating pilot project. Report from the Office of Traffic Safety. <http://www.dot.state.mn.us/trafficeg/tailgating/Tailgating-finalreport.pdf>
¹⁰Song, M. & Wang, J.H. (2010).

For further info on this RAC Mobility Bulletin please contact advocacy@rac.com.au

