



Understanding Filtered Right-turn Through Crashes Occurring at Traffic Signal Intersections

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Main Roads identified the need to better understand the nature and timing of right-turn/through crashes at signalised intersections and how to potentially manage filtered traffic signals to minimise the risk of this crash type occurring.

Background

Filter right-turn crashes at signalised intersections are one of the most dangerous intersection conflicts on the network. The reasons for this are complex and involve critical decision-making by drivers to identify and select an appropriate gap in traffic across multiple lanes. This involves the judging of speed and proximity of approaching traffic, monitoring changes in traffic signal phases, and having awareness of the presence of other road users potentially crossing side roads drivers are entering.

Approach

This study involved the following main steps:

- Identify candidate sites for inclusion in the study, drawing on crash history for filter right-turn crashes.
- Conduct video survey at the candidate sites to identify filter right-turn crashes and near-miss incidents.
- Using video analytic software, undertake analysis of the video survey data applying surrogate safety/traffic conflict metrics, including PET, TTC, Delta-V, Kinetic Energy to describe crash likelihood, severity and risk factors.
- Review candidate site traffic management arrangements to assist in identifying potential site-related factors that may be contributing to cause and severity of filter right-turn type crashes.

Right-turn type crashes considered in the study



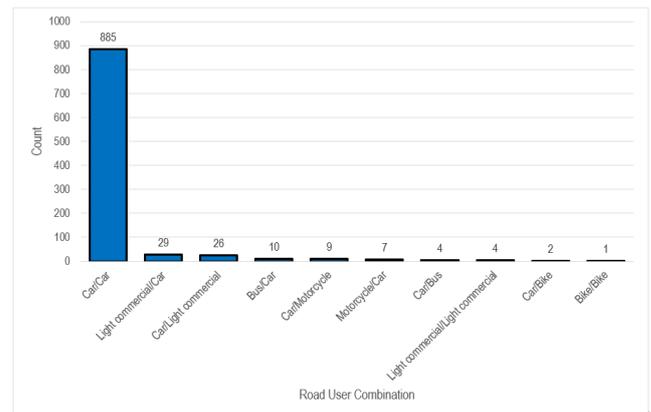
22 Thru-right 23 Right-left 24 Right-right 27 U-turn

Findings

Analysis of the video survey across the eight intersections sites identified 977 near-miss incidents meeting the PET/TTC criteria adopted for this study. Notable results from the analysis of these near-miss incidents found that:

- 90% involved two light passenger vehicles
- 3% involved a light commercial vehicle crossing the path of a light passenger vehicle
- 2.7% involved a bus and light passenger vehicle
- 1.6% involved a motorcycle and a light passenger vehicle.

Frequency of road user combination in filter right-turn near-miss incidents

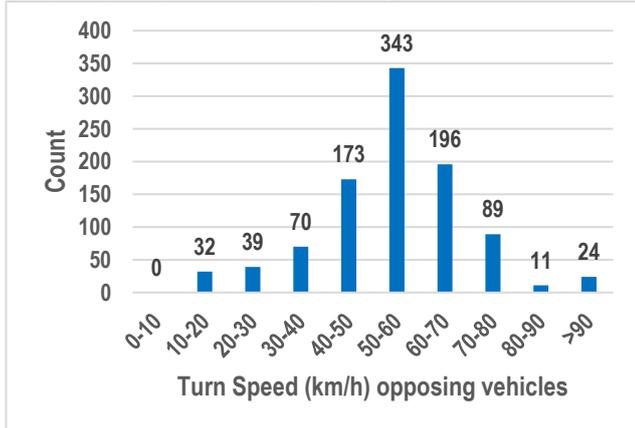


The analysis also identified that almost 98% of the near-miss incidents occurred during the green phase and just under 3% occurred during the yellow phase; no near-miss incidents were recorded as occurring during the red phase of the signal cycle.

Other key results of the analysis found:

- While the speed of turning vehicles tended to be in the low to moderate range, almost 68% of vehicles in the opposing movement, i.e. the bullet vehicle, exceeded the accepted Safe System speed threshold of 50 km/h for this type of crash.
- On average 8.27% of near-miss incidents across the eight sites fall into the 'higher likelihood of a collision' category range.

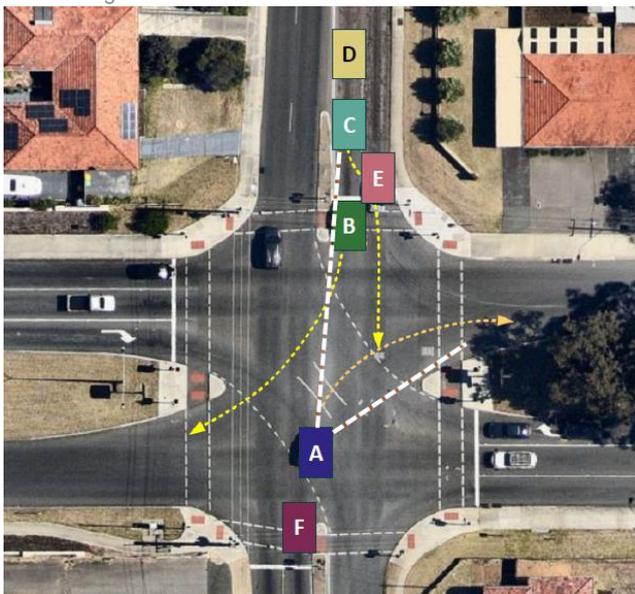
Frequency of speed bins for opposing movement vehicles



A review of the video of near-miss incidents identified that dynamic visual obstruction (DVO) is a contributing factor to the cause of filter right-turn crashes. DVO is a feature of the intersection geometry and arrangement of right-turn and through lanes.

In the following images, Vehicle 1(B) obstructs a clear view by Vehicle 2(E) to the presence of Vehicles 3(C) and 4(D).

Example of dynamic visual obstruction impacting on the likelihood of a filter right-turn collision



Example of dynamic visual obstruction leading to a filter right-turn near-miss incident



Next stage

Measures to mitigate the risk of right-turn/through type crashes include:

1. Eliminating filter right-turn manoeuvres through re-phasing traffic signals, on a priority risk-based approach.
2. Altering traffic arrangements at priority intersections, including:
 - a. Providing dedicated right-turn lanes for storage and to reduce conflict with other traffic.
 - b. Allocate more green time to right-turn movements to reduce the need for filter right-turn movements.
3. Measures to improve lines of sight for drivers in stacked right-turn traffic, including:
 - a. increasing the offset of opposing traffic lanes
 - b. technology solutions to provide warning and advice to right-turner and through movement drivers of when suitable gaps are available.
4. Reducing speed in the through traffic stream by:
 - a. reducing speed limits on approach
 - b. only permitting filter right-turns at sites signposted 50 km/h or lower
 - c. introducing vertical deflection approaching and through the intersections where filter right-turns are permitted.

How does this research change the way we think?

An examination of the incidence of filter right-turn crashes and near-misses at nominated high crash locations provides supporting evidence of the potential contributing factors and encourages a more critical assessment of retaining filter right-turns at locations of higher risk and provides suggestions for potential on-ground treatments to mitigate risk and risk factors.