Identifying and treating high risk locations on high speed roads for cyclist crashes

David Milling and Brooke Young
ARRB, Safe Systems and Human Factors

Abstract

The number of cyclist fatalities on high speed roads low compared to lower speed urban environments, however due to the more simplex nature of traffic movements there may be an opportunity to address the contributing factors to these crashes. A methodology to establish cyclist risk on a route using established crash risk factors (AusRAP) and then through a conceptual cyclist crash likelihood matrix developed to identify locations with a high likelihood of a cyclist being struck by a vehicle and identify suitable treatments to treat these often-isolated locations. The cyclist crash likelihood matrix is based on road design principles and identifies the locations that present a higher likelihood of a cyclist being struck from behind, side-swiped, or at an angle in an intersection or interchange due to restricted stopping sight distance, safe intersection stopping sight distance and cyclist clearance times through intersections and interchanges.

Background

Currently an assessment of a high-speed road to identify mitigation treatments would indicate that physical separation should be provided between the traffic stream or an off-road cycleway should be provided. This paper aims to identify the option to provide interim treatments (before physical separation or off-road cycleways can be provided) to reduce cyclist risk on high speed roads (rural, freeways and urban arterials) and provide a method to identify locations where cyclists are most at risk of being struck by a vehicle. It also aims to provide guidance on what treatments are required to reduce the risk of a cyclist being struck by a vehicle and demonstrate that once the risk and relevant treatment are identified low cost treatments can be implemented through existing maintenance programs, or mass action programs.

Methodology

The identification and assessment of cycling risks on a route was achieved by an analysis of existing road infrastructure, cyclist crash history, speed limit and cyclist volume data. The infrastructure data included lane widths, sealed shoulder width, road condition, cyclist treatments, sight lines and intersection and interchange layout type and quality. This data was analysed in AusRAP to establish the AusRAP cyclist SRS. A unique assessment methodology based on road design principles and existing cyclist provision guidance was developed to build a matrix to assess the likelihood of a cyclist being struck by a vehicle at an interchange, intersection or on a midblock section.

Identifying cyclist crash risk (likelihood and severity)

Cyclist crash risk at intersections and on midblock sections was assessed at a route level by producing a cycling SRS in AusRAP. SRS considers variables including the sealed shoulder width, cyclist treatment, curvature, sight distance, lane width, delineation, curve warning signage, traffic calming, grade, road condition, skid resistance, rumble strips, roadside parking, street lighting intersection layout type and quality. Currently the AusRAP model does not specifically assess cyclist risk at interchange crossings.
Identifying locations with a high crash likelihood

The likelihood of a cyclist being struck by a vehicle (cyclist risk) at an interchange, intersection or on a midblock section was determined by assessing the previously collected data with the guidance as per Austroads Guide to Road Design series and Cyclists Guide (Austroads 2016, 2017a, 2017b).

For an intersection or midblock section, the resulting compliance or on-compliance of the road infrastructure compared to the relevant guidance was entered into a matrix which identifies and ranks cyclist risk which ranges from Rare to Almost Certain. A cyclist risk of Rare is achieved when all of the criteria as per the above-mentioned Guides is met, a cyclist risk of Almost Certain is achieved when none of the criteria is met.

For interchanges a cyclist risk ranking was not provided. Given the complexity of sightlines, observation angles, narrow shoulder widths, potential high percentages of heavy vehicles, high traffic and ramp entry/exit volumes and high speeds at interchanges a pass/fail criterion was applied. With further investigation the pass/fail criterion can be reviewed, and a risk-based ranking applied in the same way that it was applied to intersections and midblock sections.

Treatment identification and mitigation

As the cyclist risk matrix was developed using road infrastructure condition, road design principles and cyclist facility criteria the treatments the risk resulting from the condition of these can be identified in a manner that is easily understood by practitioners. This allows the matrix to identify the risk, and the intuitively the relevant countermeasure treatment in a simplex manner. The matrix allows a practitioner to enter one or more countermeasure treatments to reduce the cyclist risk. These treatments are generally low cost and could be achieved within existing maintenance activities or in remedial works packages. Once treatments are selected within the matrix, the before and after cyclist risk is then shown for each location, as well as identifying the number of sites on a route the will demonstrate a reduction in cyclist risk.

Conclusion

The AusRAP risk assessment model and the methodology developed, enables cyclist routes to be assessed using established crash risk factors and road safety design principles. The matrix identifies critical high-risk locations and risk likelihood ratings based on treatments used to generate a crash reduction factor.

References

Austroads. (2016), Guide to road design part 3: geometric design, AGRD03-16, Austroads, Sydney, NSW.
Austroads. (2017a), Cycling aspects of Austroads Guides, AP-G88-14, Austroads, Sydney, NSW.
Austroads. (2017b), Guide to road design part 4a: Unsignalised and signalised Intersections, AGRD04a-17, Austroads, Sydney, NSW.