The Safest System: Preventing crashes by preventing errors

Julie Hatfield[a] and Julie Brown[b]

[a]Transport and Road Safety [TARS] Research, University of NSW; [b]Neuroscience Research Australia and School of Medical Science, University of NSW

Abstract

The Safe Systems Approach [SSA] focusses on limiting the likelihood that user-errors result in serious injury. A safer system might also limit user-errors. We explored how the system contributed to errors that preceded 94 serious crashes from the Austroads Crash Investigation Study. Passenger-vehicle-occupants who were admitted to one of five NSW trauma units were interviewed, and their vehicle and the crash location were inspected. The in-depth data was reviewed by a multidisciplinary panel using an SSA framework to identify contributing factors. Features of the road and regulatory environment contributed to common errors. The panel suggested strategies to minimise errors.

Background

A decline in the pace of road safety improvement (BITRE, 2014) calls for refinement of our approaches. The Safe System Approach that drives policy and practice in Australian jurisdictions accepts that road-users make errors and focusses on developing a system (comprising road-user behaviour, particularly travel speed, as well as vehicles and the road environment) that minimises consequent injuries (e.g. Austroads, 2014). However, the system might also play a role in discouraging errors (Austroads, 2012, 2014). The recent shift away from a singular focus on road fatalities toward consideration of "serious injury" requires attention to the factors that contribute to such injuries. The Austroads Crash Investigation Study (see Austroads, 2015), used an in-hospital method to recruit vehicle occupants who were seriously injured in crashes, and collected information which is more detailed, and relevant to understanding factors that contribute to crashes and injuries, than is routinely-collected data (see McLean, 2005).

Method

Between March 2010 and February 2013, passenger-vehicle-occupants who were admitted to one of five NSW trauma units were interviewed, and their vehicle and the crash location were inspected. A Crash Review Team comprising a behavioural researcher, a forensic pathologist, a vehicle specialist, a roads specialist, a Police crash investigator, and other specialists in crash investigation, discussed the in-depth data from 94 crashes. The team identified factors that contributed to the crash and recommended road-, vehicle- and person-based strategies for avoiding crashes.

Results

Following the Finnish Crash Investigation System (VALT, 2002), first impacts were classified according to the road user movement immediately prior to the crash that allowed the crash to happen (driver error). The five most common errors were: crossing the median (28% of crashes); leaving the carriageway to the left (14%); inability to perform a sufficient evasive action (10%); inappropriate "filter" right turns at signalised intersections (9%); and red light running (7%).

Features of the road and regulatory system were often judged to have contributed to errors. Common road-related contributors are depicted in Table 1. Inappropriate filter turns are only possible where uncontrolled right turns are allowed. The Crash Review Team considered that impairment due to a medical condition or episode, and/or medication may have contributed to 9.6% of crashes. Interviews suggested that around one in five case drivers had a poor license history in

terms of crashing or offending. In 13.8% crashes drivers were judged to have made errors at least partly due to their immaturity.

Table 1. Road-related factors which contributed to errors, percentage of crashes involving factor, and suggested safety strategies

Background factor	Percentage of crashes	Safety strategy
Stationary visual obstruction	26.6%	• Removing vegetation to improve sightlines • Widening cut-batters to improve sightlines • Using "no stopping" zones where stopped vehicles could be a stationary visual obstruction or a hazard
Speed limit too high	20.2%	• Reviewing speed limits ("least safe" conditions) • Using variable speed limits; responding to weather and traffic (with Intelligent Highways)
Inadequate shoulder	18.1%	• Repairing/upgrading shoulders to provide a traversable area beside the carriageway.
Inadequate or misleading cues to speed	10.6%	• Using design principles to create "self-enforcing" road environment; incl. local area traffic management devices, and increasing roundabout deflection • Installing speed advisory signs on curves
Unusual configuration	9.6%	• Considering perceptual cues in intersection design) e.g. improving alignment of intersection • Using self-explaining configurations consistently
Poor surface	9.6%	• Repairing/upgrading road surfaces • Improving drainage e.g. with surface material or drains
Adverse curvature	8.5%	• Correcting adverse curvature • Widening the lane at the curve
Moving visual obstruction	7.4%	• Not allowing filter turns where curves result in moving visual obstruction of on-coming traffic for right-turning driver
Inadequate delineation	7.4%	• Improving delineation, and perceptual cues to the curve (e.g. reflectors) • Installing audiotactile edge and centre-line • Improving procedures for audit and maintenance of line-marking
Problems with management of breakdown or works	7.4%	For breakdowns, crashes and/or abandoned vehicles: • Education about emergency procedures (e.g. use of bays/shoulders, use of hazard lights, calls to make) • Providing, improving, or relocating emergency lanes • Using "Stop in emergency only" signs in emergency lanes • Improving monitoring and response procedures; incl. Intelligent highways warning drivers, changing speed limits, initiating clearance operations For road works: • Reviewing traffic management planning, and auditing practice • Using traffic calming • Providing advance warning signs of merging traffic • Using detours in preference to contraflow on busy roads

The Crash Review team suggested specific strategies for addressing road-related contributors (see Table 1), as well as strengthening processes for restricting licences of people with medical conditions that can cause driving impairment, and making practices around licence

probation/suspension more stringent. The Crash Review Team recommended "ongoing young driver initiatives" as a strategy for avoiding crashes involving young drivers. A range of vehicle technologies were specified for avoiding particular errors.

Conclusions

Results suggests that the Safe System Approach may be refined by aiming not only to minimise the consequences of user-errors (e.g. injury severity), but also to minimise the likelihood of errors occurring. The research also demonstrated the value of multi-disciplinary review of crash data to identify strategies for moving toward a safe system.

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