

ASSESSING THE SAFETY OF ROADS

Prepared by: Jim Langford
Monash University Accident Research Centre

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1. A BRIEF STATEMENT OF THE ISSUE

EuroRAP is an organization of motoring associations and transport jurisdictions, which has for some time provided safety ratings for European roads. An equivalent program, the Australian Road Assessment Program (AusRAP), is now being developed under the auspices of the Australian Automobile Association (AAA). This paper describes the methods for assessing the safety performance of roads, with a particular emphasis upon current and impending Australian developments.

2. AN EXTENDED ASSESSMENT OF THE ISSUE

Road safety outcomes vary greatly across the road network, with higher casualty rates symptomatic of a poor match between the road environment and traffic speeds. From a systems view, the solution is to reduce the risk of bad outcomes by lowering vehicle speeds and/or making the road infrastructure more forgiving of human error. The latter has the advantage of meeting mobility as well as safety objectives.¹

The European Road Assessment Program (EuroRAP) was formed in October 2000. In the same way that the European New Car Assessment Program (EuroNCAP) informs consumers about the relative safety merits of new vehicles entering the market, EuroRAP seeks to provide a consistent system to allow users to rate Europe's roads for safety.

EuroRAP's objectives are²:

- to establish a program of systematic risk assessment and benchmarking to help reduce deaths and serious injuries on European roads
- to identify major shortcomings on roads which are amenable to practical remedy
- to make injury risk assessments a focus of strategic decisions for road infrastructure improvements and route management standards
- to establish partnerships among those responsible for a safe road system.

EuroRAP is a major step away from the traditional 'fixing the driver' approach. Recognising that most crashes result from normal people making often minor errors, a central precept of EuroRAP is to provide a vehicle/road interaction that can effectively cushion against death and serious injury. This philosophy makes the EuroRAP approach fully compatible with many Safe System philosophies.

In 2003 AAA announced its interest in applying the EuroRAP approach to Australia:

In order to highlight the problems of Australia's road network and to identify how, and where, improvements need to be made, AAA has commenced discussion with Austroads and individual State Road Authorities on an Australian Road Assessment Program (AusRAP). This program would ideally be undertaken in collaboration with government, following the EuroRAP model in Europe which is a collaborative effort between a number of motoring clubs, road authorities and others. AusRAP aims to ... assess the inherent safety of roads.³

Since then, considerable trialling of the approach has occurred, with a major progress report having been released in November 2004⁴.

3. A REVIEW OF THE RESEARCH

3.1 How does EuroRAP assess the safety of roads?

EuroRAP uses two protocols to assess and present road-related crash risk⁵:

- risk rate maps, based upon the location and level of fatal and serious injury crashes along segments of the road network
- a road protection score based on 'drive-through' inspections, whereby road segments receive star ratings according to their capacity to protect users from crashes or from death or serious injury in the event of a crash.

Risk rate maps

EuroRAP's initial work was restricted to roads outside built up areas, essentially motorways and primary routes with speed limits mainly exceeding 40 mph. This restriction was justified by the finding that some 60 per cent of road deaths across Europe occur outside built-up areas, mainly on major arterial single-carriage two-way roads⁶. Most of the selected routes however have reduced speeds for some of their length - for example, when going through villages and towns - and these lower-speed lengths have been included in the analyses. The most extensive data collection and analyses have been conducted in Britain, with activities increasingly occurring in the Netherlands, Sweden and Catalonia.

Taking the British exercise as an example⁶, 833 road links of average length of 27 km were categorized thus:

- 4-star low risk roads (92 sections)
- 3-star low to average risk roads (415 sections)
- 2-star average to high risk segments (213 sections)
- 1-star high risk roads (90 sections).

In addition, 23 sections were considered to have a crash rate too high to award any stars.

Not unexpectedly, the analyses of crash data showed substantial differences in crash rates across the various types of roads⁷. For example, the fatal and serious accident rate of the 'A' road network in Britain was around four times that of the motorway network - with crash rates on the national portion of the 'A' network being significantly lower than rates on the regional portions. Overall, crash risk was as much as ten times higher on the worst performed sections of the network, relative to the best performed sections⁸.

Road protection scores

The scoring system is based on the finding that across Europe four main crash types (head-on, single vehicle run off road, intersection and pedestrian/cyclists crashes) account for around 80% of all fatalities on major non-urban roads. Reducing these crash types has been related to the following road features⁶.

- separation of opposing traffic flows (particularly through safety barriers)
- edge of road features (hardened shoulders, barriers etc)
- intersection design, including frequency and nature of minor road access
- facilities for protecting cyclists and pedestrians.

By February 2002⁹, total road lengths of 1200 km in Britain and 2250 km in Europe had been inspected on a drive-through basis and subsequently scored for elements of primary safety (relating to the prevention of four main crash types) and secondary safety (protection from injury when crashes do occur).

The road assessments are not intended to act as either road safety audits or traditional black spot programs². The purpose is to provide a measure of safety performance for the total route and to identify interventions for that route, rather than focusing upon the problems and solutions associated with individual sites.

3.2 Commencing AusRAP

Australian automotive clubs through the AAA are leading developments in Australia to produce AusRAP, based broadly upon the EuroRAP strategy. In its report of November 2004⁴, the AAA confirmed its intention to develop two standard protocols – risk mapping of casualty crashes and a star rating system based on a road protection score. It is intended that these two sets of information be used:

- to alert road users as to how risk can vary according to changes in the road environment – desirably, resulting in changes to driving behaviour according to road conditions
- to provide road planners and engineers with ready measures of road safety performance – particularly to assist in more strategic road management.

Risk Mapping

To date, risk mapping has occurred for rural sections of the national highways system in all States and Territories except for Tasmania. Rural links were defined as those road segments occurring outside of metropolitan areas and major country towns, and generally (but not always) have a posted speed limit exceeding 90 km/h. Links were constructed using three criteria:

- there needed to be a minimum of 20 casualty crashes, 1998-2002
- the links needed to be readily recognized by road users (that is, to have identifiable start and end points)
- the links needed to have reasonably common characteristics over their length (for example, be dual carriageway).

The risk measures have been based on casualty crashes where at least one person has been either killed or injured. Two levels of risk measure have been calculated:

- Collective risk – based on the number of crashes per kilometre over a given link's length. As such, the traffic volumes along a given length would be expected to have a substantial role in determining collective crash risk – and as a general (but not absolute) rule, the higher the traffic volume, the more likely that there will be a high collective risk
- Individual risk – based on the number of crashes per vehicle kilometre travelled, using Annual Average Daily Traffic (AADT) volumes as provided by individual jurisdictions. This measure effectively controls for different traffic volumes and provides an estimate of the crash for an individual driver travelling the length of the given link.

It is contended that the collective and individual risk measures are most useful when considered together, with roads that rate poorly on both being the priorities for intervention programs. Based on the risk mapping that has already occurred in regard to rural links of the national highways system, best and worst links in each jurisdiction (using both risk measures) have been identified. Risk analyses for specific roads for each jurisdiction may be found at the following website: <http://www.ausrap.org/ausrap/>

Road Protection Score

As is the case with EuroRAP, the Australian program aims to provide a star-rating system to measure the overall safety of a road, based on drive-through inspections. Further details on exact procedures will be forthcoming. Developments to date in this area include:

- the formation of a technical working group to develop an appropriate model for providing road protection scores
- a pilot study has been run in Victoria to test and refine the model
- further trials will be conducted in Victoria in 2004/05.

4. POLITICAL, SOCIAL AND OTHER FACTORS

Recent court findings, which have increased jurisdictions' levels of responsibility in regard to the safety of their roads. Prior to 2001, a road authority in Australia could not be held accountable for failure to maintain or repair a road. However the High Court then abolished the nonfeasance immunity (*Brodie v the Singleton Shire Council, 2001*)¹⁰ by declaring:

Authorities having statutory powers ... to design or construct roads, or carry out works or repairs upon them, are obliged to take reasonable care that their exercise or failure to exercise those powers does not create a foreseeable risk of harm to (road users)."

Accordingly, a program which aims to promulgate widely the safety performance of individual road segments, particularly when that assessment is based upon specific road features either present or absent, might not be welcomed by all authorities.

On the other hand, the current national government gave its support to AusRAP in the recent election campaign. In addition, the latest National Road Safety Action Plan 2005-06 has as an action item, to "produce and promote information about the relative safety of different roads - develop an Australian ratings system similar to the EuroRAP programme"¹¹. Further, all State and Territory road authorities have committed support to Austroads' Safe System approach, suggesting likely support for further development of the AusRAP program.

The added emphasis likely to be given to AusRAP findings by the automobile associations may assist jurisdictions to achieve at a political level the necessary resources to implement a safe roads program.

As a final point, AusRAP as a national program relies upon pooled casualty data from all individual jurisdictions. As such, it is but one further example of the need to produce consistent and compatible road crash data - and in this specific instance has been hampered particularly by the sizeable differences in the collection and treatment of serious injury data across different agencies.

5. CONCLUSIONS

Safer roads represent a key component of Austroads' Safe Systems strategy. In particular, the strategy explicitly calls for improved risk analysis of the road network and its crash-related safety performance. The AusRAP program currently being promoted by Australian automotive clubs should prove to be a valuable complement to the road safety infrastructure programs being implemented by individual jurisdictions.

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