An estimate of the future road safety benefits of autonomous emergency braking and vehicle-to-vehicle communication technologies

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Abstract

The aim of this study was to examine the consequences of delaying introduction of new technologies on future reductions in fatalities and serious injuries. This was done specifically for Autonomous Emergency Braking (AEB) and Vehicle-to-Vehicle (V2V) communications, which represent the two most promising technologies in the short-term and medium-term future. The results demonstrate that a delay in introduction, or a slower rate of introduction, can have a significant effect on how long it takes for the benefits to be realised in the greater vehicle fleet.

Background,

In Searson et al. (2014), AEB was identified by every vehicle safety expert interviewed as being likely to have a significant road safety benefit in Australia over the next five to ten years. According to the literature (for example Anderson et al., 2012; Rosén et al., 2010) it seems likely that this will be the case, and that the benefits of AEB are potentially large. Searson et al., (2014) also found that V2V is a technology that may have a significant effect in the longer-term future. Although there are no results from long term trials that confirm this, research is promising and it is likely that V2V may fill the ‘gaps’ left by AEB by providing emergency braking that avoids or mitigates crashes.

Method

Three potential introduction rates of AEB and V2V are considered in this study – Aggressive, Encouraged and Slow introduction. An estimate of the year-by-year reductions in fatalities and serious injuries is then calculated based on the speed of the introduction of these technologies. The three introduction rates suppose there is 100% saturation of the technologies in new vehicles sold by 2020, 2025 and 2030 respectively.

The potential effectiveness of AEB was estimated by Anderson et al., (2012) based on computer simulations of crashes that had been investigated in-depth. The most conservative AEB possibility in that study was used to represent AEB in this study. An estimate for the effectiveness of a combined AEB and V2V system is provided by Doecke and Anderson (2014)

The proportion of vehicle ages of the Australian fleet is assumed to be similar to the ages shown over the last decade (ABS, 2013).

Results

Under the fastest, ‘Aggressive introduction’, scenario the reduction in fatalities and serious injuries due to AEB alone is estimated to be around 20% and 24% respectively by 2030. When AEB and
V2V are used in combination, the reduction in fatalities and serious injuries is estimated to be around 23% and 28% respectively. This is shown in Table 1, which also shows the year in which a greater than 25% reduction in serious injuries and fatalities might be expected for the three introduction scenarios using a combined AEB and V2V system.

Table 1

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Total reduction in injuries by 2030</th>
<th>Total reduction in fatalities by 2030</th>
<th>Year in which a &gt;25% reduction in injuries is achieved</th>
<th>Year in which a &gt;25% reduction in fatalities is achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggressive introduction</td>
<td>28%</td>
<td>23%</td>
<td>2029</td>
<td>2032</td>
</tr>
<tr>
<td>Encouraged introduction</td>
<td>20%</td>
<td>17%</td>
<td>2033</td>
<td>2037</td>
</tr>
<tr>
<td>Slow introduction</td>
<td>15%</td>
<td>13%</td>
<td>2036</td>
<td>2040</td>
</tr>
</tbody>
</table>

Discussion

The results quantify a clear improvement in road safety outcomes that is sustained over many years with faster introductions of AEB and V2V technologies in the Australian motor vehicle fleet. Effort will be required from organisations like government departments and consumer advocacy groups to achieve these faster introduction rates. Conversely, without this effort Australia is likely to miss-out on the road safety benefits that may be achieved.

References


