Deployment of intelligent advanced stop warning signs in New Zealand

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Abstract

Each year, hundreds of crashes occur where a driver fails to notice a priority-controlled intersection and drives through without stopping. In the Selwyn District of New Zealand, this problem is particularly prevalent due to the flat, straight roads which intersect regularly across the district. To counter this issue, a new intelligent stop sign has been trialed which warns drivers of the approaching intersection via flashing lights as they approach the intersection. The trial was successful, so a nationwide analysis was conducted which identified 50 sites where this technology may prevent crashes and save lives.

Background

Between 2011 and 2015, New Zealand Police in the Selwyn District recorded 47 crashes in the New Zealand Transport Agency's Crash Analysis System (CAS) specifically attributed to drivers who did not stop at a priority-controlled intersection. This resulted in 3 fatalities, 4 serious injuries and 27 minor injuries. One particular issue noted by local police were drivers failing to notice an approaching priority-controlled intersection and driving through the intersection at the open road speed limit.

To counter this problem, a trial of solar-powered Advanced Stop Warning Signs (ASWSs) in the Selwyn District was mooted. ASWSs are activated by radar when a vehicle approaches the sign. The signs (shown in **Figure 1**) replace the existing static pre-warning sign 200m prior to the intersection. The signs are activated 150 to 200m before the sign and the high intensity LEDs have a strobe type pulse that alternates between two lights. The cost of each sign is between $4,000 and $5,000 NZD excluding installation costs. Installation is simple, and no more time consuming than installing a static sign.

Trials of similar systems conducted in Sweden and the UK decreased crash levels by 30-40% (Lind, 2009).

Figure 1. Activated Stop Warning Signs

Trial of ASWSs in the Selwyn District

During the trial, the signs were 100% operationally reliable even though one sign was located beside a hedge which shaded it for most of the day. The system survived without any backup power, in some cases with approximately one hour of sunlight per day.

The signs were deployed at three intersections in the district where crash records confirmed that drivers were failing to notice the intersection. In the two years since the trial began, no crashes have been recorded at these intersections involving a driver who failed to stop.

Nationwide Analysis to Identify Further Sites

Because crashes where drivers fail to notice the intersection are not identifiable through coded crash data alone, hand-written Traffic Crash Reports (TCRs) had to be analysed individually to confirm whether a crash may have been preventable using an ASWS. To reduce the number of TCRs which needed to be analysed individually, an automated filtering system was calibrated using confirmed 'fail-to-stop' crashes. When applied to the Selwyn District, the automated filtering system correctly identified all intersections which had at least two crashes that may have been preventable using an ASWS.

In total, 50 intersections were confirmed as potential candidates using a threshold of at least two crashes where drivers failed to notice the intersection. Between 2007 and 2016, 200 such crashes occurred at these 50 intersections. Of these crashes, 80 caused injury and 45 caused fatalities or serious injuries. The threshold was set low due to the low cost to install an ASWS and the comparatively high social cost of even one preventable crash.

An extended trial is now planned which will involve formal before-and-after analysis and assessment of the effectiveness of ASWSs in various conditions and locations. This will enable the development of best practice guidelines and statistically significant results.

References

Lind, G. (2009*). Estimation of safety benefits of VSL at intersections and on weather-controlled links.* 27th International Baltic Road Conference, p10,Riga, Latvia.