Connected Motorcycle Safety Summary Phase 1

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Executive Summary

i is investigating the potential for motorcycle rider safety through emerging Cooperative Intelligent Transport Systems (C-ITS) technologies. C-ITS enables trusted transfer of standard messages between vehicles and infrastructure that can then alert a rider based on their current riding behaviour leading to greater situational awareness and safer actions. This initiative aims to enhance rider safety by connecting riders with infrastructure, cloud, and vehicle data, providing warnings about safety issues. The first phase of the project begins to answer the question: Are C-ITS warnings for riders technically feasible, desirable for riders, and effective in reducing motorcycle crash risks?

To answer this question, over the past nine months, we have:
- joined the Connected Motorcycle Consortium (CMC), founded by motorcycle manufacturers: Yamaha, Honda, KTM, Ducati, and BMW.
- collaborated with Savic and Harley Davidson outside of the CMC;
- engaged with over 30 vendors of potential human machine interface (HMI) devices all over the world;
- collaborated face-to-face with over 60 riders over dinner (two sessions in Queensland, three in Victoria);
- conducted quantitative research leveraging TAC's Spokes newsletter (which resulted in 378 participants);
- reviewed numerous academic and industry publications;
- normalised, aggregated, and analysed 5 years of crash data between Queensland and Victoria so they can be aggregated;
- worked with TMR and Cohda-wireless, including a 3-day training program in Queensland, to deliver an end-to-end test trial

The key findings are as follows:

1. Feasible
- CMC has several well documented use cases indicating that C-ITS warnings can successfully be delivered.
- Successful end-to-end demonstration. We have integrated various HMI devices into our prototype C-ITS, (smart helmet, smart glasses, haptic wristband, etc) and have developed our own LED warning system. A successful end-to-end system test was conducted, using data from various sources to generate a warning from the vehicle station / or OBU device, which was translated into a warning for the smart helmet and the haptic wristband.

2. Desirable
- Industry shows strong interest. The partners who founded the CMC in 2018 signed up for another three years in January. HMI vendors (smart helmets, heads-up displays, etc.) also show strong interest.
- Many riders have a cautiously positive pre-disposition. The five rider events (three in Victoria and two in Queensland) highlighted the variety of riders, rider attitudes, and riding styles. One solution is unlikely to fit all. 'Racers' look at the road differently compared to 'cruisers', for instance, which has implications for the way they take in information and look at their instruments. There are some requirements that are broadly shared. This may seem obvious, namely that warnings should not distract from or interfere with the rider experience. This, however, poses a real challenge for the delivery and placement of warnings. Overall, many riders who came to the sessions reacted positively, only tempered by concerns about data security fuelled by distrust of governments.
- Findings from the quantitative survey (N = 376) show a positive disposition towards C-ITS solutions, especially those when C-ITS is used to alert other road users of the presence of a motorcycle. The survey is designed to identify factors that influence the adoption of C-ITS warning systems. It seems that self-proclaimed risky riders are less interested in C-ITS safety warnings. Riders who need it most, like it least, which is an example of an adoption challenge for the government and C-ITS industry. Changing road conditions and having a lap of attention were high concern of the non-adaption group. Therefore, addressing this concern by generating a C-ITS warning to alert riders will encourage these riders to like the technology.

3. Effective
- Crash data point to significant potential. The crash data of Victorian and Queensland's past 5 years of crashes has been filtered to be specific for motorcycle crashes. The crash data analysis shows that well over half of the crashes requiring some, or serious medical attention, are situations where, at face value, C-ITS could have reduced the risk of collision or crash. Key crash scenarios include crashes on intersections, rear-end collisions, loss of control in curves, lane change collisions, and head-on collisions.
- Existing studies indicate that C-ITS can be effective. The Rider reaction time can be improved, indicating that C-ITS can potentially reduce crashes involving motorcycles. A study conducted by Will et al. (2023) shows that braking reaction times can be reduced from 3-6 seconds without warning to 1-3 seconds with LED and audible warnings, which they found to be the most effective combination in urban environments. Another study conducted in the UK to assess the impact of implementing safety technologies, including C-ITS warnings, on future road crashes predicts a significant reduction in incidents by 2025 (Cornec et al., 2023). The findings suggest that fatalities could decrease by 30%, serious injuries by 21%, and slight injuries by 13%.

At the end of this phase, we are optimistic about the feasibility, desirability, and potential for C-ITS warning to enhance motorcycle rider safety. However, as this technology is still in its early stages of development, it requires considerable effort to mature. Currently, this project stands as one of the most ambitious of its kind globally.

The next phase, which involves co-developing a prototype with riders, is already well underway.