

## Development of a driver distraction safety rating system for new vehicles

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### Abstract

Drivers engage in a wide range of non-driving related tasks while driving that have potential to distract them and compromise their safety. These include interactions with infotainment systems built into the vehicle by vehicle manufacturers. Tasks can include communication, entertainment, navigation and internet browsing. Performing these tasks can degrade driving performance and increase crash risk. Not all infotainment technologies in new vehicles are equal in terms of their potential to distract. This paper documents the findings of a study commissioned by VicRoads to develop a test protocol for rating the distraction potential of new vehicles entering the Australian market. A Road Map is presented with options for introducing it as a consumer or NCAP distraction rating.

### Background

Driver distraction is often defined as “...the diversion of attention away from activities critical for safe driving toward a competing activity, which may result in insufficient or no attention to activities critical for safe driving” (Regan, Hallett, & Gordon, 2011, p. 1776), and is a significant contributor to road trauma. Competing activities, according to this definition, can be driving or non-driving related. Drivers in Australia engage in a wide range of non-driving activities (Young et al., 2019). These include interactions with infotainment systems provided by vehicle manufacturers. A recent US study found that interacting with the visual display unit (VDU) in a vehicle carries a nearly five-fold increase in crash risk (Dingus et al. 2016).

Not all technologies in new vehicles brought into Australia are equal in terms of their potential to distract. The same technologies are often designed and implemented in very different ways by different manufacturers. Consequently, some vehicle cockpits are more demanding of drivers' attention than others and are more likely than others to distract them. This paper reports the outcomes of a study commissioned by VicRoads designed to develop a test protocol for rating the distraction potential of new vehicles entering the Australian market, along with a Road Map for its introduction as a consumer or New Car Assessment Program (NCAP rating).

### The project and its methods

This project, undertaken by the Australian Road Research Board (ARRB) in collaboration with VicRoads, had two components:

1. Feasibility research examining how the current New Car Assessment Program (NCAP) safety rating processes operate and a review of HMI guidelines and criteria, potential test methods and other human factors literature applicable to development of a distraction safety rating system.
2. Development of a Road Map that outlined how a distraction safety rating system might be incorporated into NCAP ratings, how it could operate as a standalone process and what other potential implementation pathways could be followed.

The project was guided by Scientific and Ratings Advisory Committees; comprised of local and international distraction experts and vehicle safety rating organisations, respectively. The project was undertaken in collaboration with distraction experts from the University of Utah who were engaged in similar work (Regan, Cunningham, & Paine, 2018).

## Project findings

Based on the research literature reviewed, and consultation with members of both Committees, three out of a total of nine scientific methods identified were found to be most suitable for evaluating the distraction potential of in-vehicle HMI (the first step in developing a distraction rating for the in-vehicle HMI):

1. the Detection Response Task (DRT)
2. the Visual Occlusion Test (VOT), and
3. an HMI distraction checklist.

The DRT is an internationally recognised and validated measure of cognitive demand. The VOT is, similarly, an internationally recognised and validated measure of visual demand. Both measures are used by many vehicle manufacturers. The checklist, developed by the project team, derives from well-established vehicle HMI design guidelines and standards. The checklist can tap into visual and cognitive distraction and bi-manual interference (e.g. hand(s) off the steering wheel), with design guidelines and principles that derive predominantly from established human factors theory and principles (NHTSA, 2013). Together, these three methods were judged to be capable of being combined to measure and rate the potential for distraction deriving from driver interactions with in-vehicle infotainment systems (Regan, Cunningham, & Paine, 2018). A voluntary scheme for encouraging vehicle manufacturers to produce less distracting vehicle HMIs is considered the most feasible approach to developing a rating system in the short-term, with a longer-term vision of incorporating the test method into consumer rating systems such as NCAP (Regan, Cunningham, & Paine, 2018).

## Conclusions

An HMI distraction rating system that is credible to industry and consumers is feasible, but requires further validation and possibly demonstration of its potential to reduce crashes - similar to evidence requirements directing the policies of Australasian/European NCAP.

## References

- Dingus, T., Guo, F., Lee, S., Antin, J., Perez, M., Buchanan-King, M., & Hankey, J. (2016). Driver crash risk factors and prevalence evaluation using naturalistic driving data. *Proceedings of the National Academy of Sciences*, *113*(10), 2636-41.
- National Highway Traffic Safety Administration (NHTSA), (2013). *Visual-Manual NHTSA Driver Distraction Guidelines for In-Vehicle Electronic Devices*. National Highway Traffic Safety Administration, Department of Transportation: Washington, DC, USA. Retrieved June 8, 2019, from <https://www.federalregister.gov/documents/2013/04/26/2013-09883/visual-manual-nhtsa-driver-distraction-guidelines-for-in-vehicle-electronic-devices>
- Paine, M. & Regan, M.A. (2018). *Road Map for an HMI Distraction Safety Rating (Component 2; Deliverable 5)*. Sydney: Australian Road Research Board (report available from VicRoads).
- Parnell, K.J., Stanton, N.A., & Plant, K.L. (2018). What technologies do people engage with while driving and why?. *Accident Analysis & Prevention*, *111*, 222-37.
- Regan, M.A., Cunningham, M.L., & Paine, M. (2018). *Towards Zero Distraction Project: Final Report - Overview of Project Findings and Next Steps (Deliverable 6)*. Sydney: Australian Road Research Board (report available from VicRoads).
- Regan, M. A., Hallett, C & Gordon, C.P., (2011). Driver distraction and driver inattention: definition, relationship and taxonomy, *Accident Analysis & Prevention*, *43*(5), 1771-81.
- Young, K., Osborne, R., Koppel, S., Charlton, J., Grzebieta, R., Williamson, A., Haworth, N., Woolley, J. & Senserrick, T. (2019). What are Australian drivers doing behind the wheel? An overview of secondary task data from the Australian Naturalistic Driving Study. *Journal of the Australasian College of Road Safety*, *30*(1), 27-33.