

AAA ROAD SAFETY RESEARCH PROGRAM

REQUEST FOR PROPOSALS

**TO CONDUCT A RESEARCH PROJECT TO DEVELOP A METHOD TO EVALUATE
THE DISTRACTIBILITY OF HUMAN MACHINE INTERFACES (HMI) IN MODERN
VEHICLES**

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1. Introduction

Every month 100 Australians die on our roads, and every day the same number are hospitalised for road crash-related injuries. Every year road trauma costs the national economy almost \$30 billion and brings tragedy into the lives of thousands of Australians. Road safety is a national crisis that demands real leadership, collaboration and solutions.

In September 2019, Australia's motoring clubs, as represented by the Australian Automobile Association (AAA), launched the AAA Road Safety Research Program (the Program) in response to this national crisis. The Program is making significant investments in research to identify solutions that focus on addressing key road safety issues. The Program supports research and translation activities that deliver tangible benefits for road users and the wider community and have a strong potential to prevent road fatalities and injuries on Australian roads.

For 2021 the Program is investing in research into matters relating to **distracted driving**. The Program will fund research into distracted driving that will help us to better understand the scope of the problem, understand what causes distraction, what countermeasures are effective and innovative solutions to tackle this serious road safety problem.

Distracted driving

Distracted driving plays a large role in the number of road crashes and subsequent road fatalities and injuries in Australia and globally. Research has shown that in Australia distraction is the main contributing factor in approximately 16% of serious casualty road crashes (Beanland et al., 2013; Dingus et al., 2016). Research suggests that distracted driving is as dangerous, if not more dangerous than drink-driving (Qin, Li, Chen, Bill, & Noyce, 2019). It is a serious problem on Australian roads.

Driver distraction can be understood as any circumstance where the driver is diverting attention away from critical activities for safe driving towards another competing activity (Regan, Hallett, & Gordon, 2011). Distraction can be cognitive or mental (the mind is engaged with non-driving tasks), visual (taking eyes off the road), auditory (noise that diverts attention), or manual (taking hands or feet off the vehicle controls) (Kinnear & Stevens, 2015). The literature relating to distracted driving can be categorised into three main streams: (1) 'studies focused on the impact of distracted driving on driving behaviour; (2) studies focused on identifying the performance attributes (e.g. braking, swerving) mostly impacted by distracted driving; and (3) studies focused on the secondary tasks that cause significant changes to driving behaviour' (Qin et al., 2019).

Distraction causes increased reaction time (including braking), impairs a driver's ability to maintain speed and lane position, impairs the ability to detect hazards and impacts the operational efficiency of traffic; (Ye, Osman, Ishak, & Hashemi, 2017); bringing with it the potential to seriously and negatively impact a broad range of road users.

2. Distractibility of the Human Machine Interface in vehicles

The AAA is pleased to request proposals to undertake a major real-world research project that aims to develop methods and tools that can be used to evaluate and compare the distractibility of the Human Machine Interfaces (HMI) in vehicles in the Australian market (existing and future) in Australian conditions.

Modern vehicles contain a variety of technologies that provide the driver, through the HMI (e.g. touch screens, head up displays), access to a wide range of entertainment (e.g. music), communication (e.g. phone calls, texting) and information (e.g. weather, internet) functions, unrelated to the primary task of driving, that have potential to distract (Regan, Lee, Young, & (Eds), 2009). These are referred to commonly as In-Vehicle Infotainment Systems (IVIS).

Importantly, 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 vehicle manufacturers. The result of these different design choices is that some vehicle cockpits are more demanding of drivers' attention than others and are more likely than others to distract them from activities critical for safe driving. This has been confirmed in a series of research studies carried out by Professor David Strayer, Joel Cooper, and colleagues at the University of Utah in the USA. In the USA, researchers have developed distraction safety ratings for over 40 different vehicles (see for example Strayer et al., 2017; Strayer, Cooper, Turrill, Coleman, & Hopman, 2015). Please see *Attachment A* for an example of how the distraction rating was utilised for a consumer fact sheet in the USA.

In 2019, the AAA, Department of Transport (Road Safety, Victoria), and the Federation Internationale de l'Automobile (FIA) (France) collaborated to fund a project that would seek to replicate, extend, and refine existing research methodologies to assess the distractibility of IVISs developed by researchers from the University of Utah. The goal was to determine the replicability of their methods in the Australian context. This research project was intended to be the precursor to a wider scale project that would ultimately lead to improved designs for the HMI in future vehicles to reduce distraction and crash risk via rating the distractibility of different vehicles. It built on an earlier project funded by the Victorian Government and managed by the Department of Transport (Road Safety, Victoria). Detail of this project is in the journal paper by Imberger, and colleagues titled *Considerations for the development of a driver distraction safety rating system for new vehicles* and available here <https://doi.org/10.33492/JRS-D-19-00243>.

While planning for this project to be undertaken by the University of New South Wales (UNSW) was well advanced (including obtaining ethical clearance by UNSW for the study), ultimately the project was unable to proceed. The ethics protocol recognised the safety and ethical issues associated with distracting test drivers on public roads (with the attendant risk to test drivers, researchers in the vehicles and other road users and the breaching of road rules). The project was then scoped for an off-road test environment but was unable to proceed due to associated budget increases and the impact of COVID-19 preventing testing. A fact sheet was developed to explain the scope of the project, its aims and research questions. Please see *Attachment B* for a copy of the fact sheet.

In an effort to extend and streamline the HMI distraction assessment protocol used by Drs David Strayer and Joel Cooper, VicRoads funded a project in 2020 with Red Scientific Inc. (A research consulting company owned by Joel Cooper) to re-evaluate the power and sensitivity of the measures used by the Utah team and to explore new and alternative approaches to assess the distraction

potential of vehicle HMI interaction. As a result, viable avenues for assessment modification were identified to better meet cost, time, and resource criteria of a large-scale evaluation program such as that used by the Australasian New Car Assessment Program (ANCAP). Red Scientific is currently the major global supplier of industry standard driver distraction assessment devices (e.g., Detection Response Task – ISO 17488 and Visual Occlusion Goggles – ISO 16673:2017) and is uniquely positioned to provide equipment and expertise to this project.

The project subject to this tender intends to broaden and deepen the planning and scoping work already undertaken to date and broaden the scope to include extended project aims (see Section 4 below). It is expected that the successful applicant for this project will work closely with Professor Strayer and Dr Cooper through Red Scientific on this piece of research (with details to be confirmed during the feasibility phase).

The project will be conducted in two phases, the first being a feasibility study (which will need to be finalised by January 2022) and the second being the major research project, which is anticipated to begin in mid-2022, subject to the outcomes of the feasibility study and final approval by the AAA Board.

Note 1: the AAA will consider proposals to undertake the feasibility phase of the project only. These proposals will still be expected to meet the requirements outlined in Section 3.

3. Phase 1: Feasibility study

The feasibility study will be required to propose a research plan / study design to undertake the research above and provide a project plan around the assessment of the viability and effectiveness of conducting said research.

3.1 *Project Proposal for the feasibility study*

The project proposal will need to include a detailed plan for both phases of this project. The details required for both phases are listed below:

Feasibility Study - Design, cost, and structure of the feasibility study

- Costs and timing to undertake the feasibility study including:
 - A proposed methodology / design to undertake the feasibility study.
 - Details of the resourcing levels to undertake the feasibility study (please note the names and percentage of full time equivalent (FTE) of those participating in the study)
 - An objective and rational identification of any potential strengths, weaknesses, opportunities, and risks.
 - Details of the quality assurance framework, including health and safety considerations for the research participants.
- A proposed cost and methodology to undertake a pilot study of on-track testing methods that will be used for the major study, to provide assurances around timeframes, safety, logistics (how many cars can be on the track at one time, how do the participants get to the track safely etc) and costs.

Major research project – proposed design, cost, and structure for the research

- A research plan for the major research project which includes:

- Details on proposed methodology and study design including potential size (or options for size) of the study, noting that at a minimum it will need to include a minimum of 24 participants.
 - Details of the research team member/s, their areas of expertise and role/s in the research project (this must include levels of FTE to be attributed to the project).
 - Details of engagement with key stakeholders who are leading experts in relation to this research
 - Details of the quality assurance framework that will be utilised as a part of the research.
- Indicative costs, timeframes, and milestones to undertake the major research project (noting that some revisions may be likely subject to the findings of the feasibility study).

3.2 *Requirements and research outputs for feasibility study*

The AAA will require the following requirements as a part of the service agreement for the feasibility study:

- Participation in a regular progress / project meeting fortnightly. These meetings will take place between a representative of the AAA and the Project Manager for the project and will be used to monitor project deliverables, outcomes, and timings.
- The research provider will also complete a regular project status report template (at the interval detailed in the Service Agreement) – noting progress on the study and any issues/risks that may have been identified.
- Minutes for the progress/project meetings are required and will be provided to the AAA by the service provider.
- A progress report to be delivered midway through the study timeframe.
- A final feasibility study report which includes:
 - The findings of the pilot study undertaken to test on-track research methods, including a recommendation of a suitable test track/non-public road that can be used for the major research project.
 - The detailed project plan to undertake the major research project and a summary of the work undertaken to provide assurances around the project plan.
 - A detailed project cost to undertake the major research project and a summary of the work undertaken to provide assurances around these costs.
 - A summary of any strengths, weakness, opportunities identified as a part of the feasibility study.
 - A detailed risk analysis for the major project, outlining a risk matrix and any risk mitigations strategies required for the major research project.
 - Details of the quality assurance process to be used for the major research project.

The feasibility study will need to be completed by **10 January 2022**.

Note 2: the feasibility study will be used by the AAA and its Board to ensure confidence in the research plan, methodologies, timing, and budget for the major project. Whilst it is anticipated that the research team who undertake the feasibility study will also be contracted for the major project (pending approval by the AAA Board following the feasibility study), the AAA reserves the right to contract the major study to another candidate if required.

4 Phase 2: The HMI distractibility research project

The aim of the major research project will be to develop methods and tools that can be used to evaluate and compare the HMIs for the In-Vehicle Infotainment Systems (IVIS) for vehicles in the Australian market (existing and future) and for Australian driving conditions by assessing the extent to which the design of the HMI causes driver distraction. The project will develop, test, and validate an HMI distraction rating protocol by replicating, extending, and refining the scientific method developed by the research team at the University of Utah in the USA and the work of the Department of Transport (Road Safety, Victoria) and UNSW.

4.1 *Project proposal for the major project*

The research project is expected to:

- Develop a scientifically validated method to test the distractibility of HMIs in vehicles.
- Test and compare the distractibility of HMIs of the IVIS for at least five new vehicles in the Australian market.
- Test and compare at least one computer tablet that has been fitted to a vehicle for work-purposes (e.g., to assign jobs for the driver) and one work-related app (e.g., those used by delivery or ride share drivers) if it is considered viable in the feasibility phase.
- Focus on a range of different cohorts such as learner, professional, delivery, shift, and older drivers.
- Consider touch enabled systems and voice activated systems and the different demands on the driver to undertake activities for each type.
- Consider the different types of tasks that can be undertaken through the IVIS (such as entertainment, calling and dialling, texting messaging, navigation, and car controls)

The goal of this research project is to:

- Provide scientifically validated method and tools for testing the distractibility of HMI systems to enable best practice consideration for future HMI development and implementation.
- Provide a distraction rating for the cars, tablets and apps tested as a part of the major research project.
- Develop guidance / communication materials to raise consumer awareness of the HMI distractibility and potential crash risks, enabling them to make safer vehicle choices (please see example of the type of materials that have previous been developed at Attachment A).
- Develop guidance materials for vehicle and system designers and fleet operators of all sizes to ensure safer vehicles.

4.2 *Reporting, meeting, and research outputs requirements for the major project*

The AAA will require the following requirements as a part of the contract for the major research project:

- Provision of draft ethics applications and associated documentation for AAA approval prior to submission to the ethics committee.
- Participation in a regular progress / project meeting at an interval to be determined once the study design and timeframe has been finalised. These meetings will take place between

a representative of the AAA and the Project Manager for the project and will be used to monitor project deliverables, outcomes, and timings.

- Minutes for the progress/project meetings are required and will be provided to the AAA by the service provider.
- The research provider will also complete a regular project status report template (at the interval detailed in the Service Agreement) – noting progress on the study and any issues/risks that may have been identified.
- The Service provider will be required to establish a governance committee to oversee the major project. Details on suggested members should be included as a part of the proposal but will be subject to negotiation with the AAA upon approval of funding.
- Research progress reports to be delivered at multiple points through the study timeframe (timeframes to be determined following approval of the study design and timeframes).
- A draft final report and draft project collateral to be delivered approximately 3 months prior to the submission of the final report – the format of the final report will be included as a part of the AAA Service Agreement with the successful service provider.
- A final project report and final project collateral.

Please note: Commencement and finalisation of research outcomes for the major research project will be finalised once the feasibility study has been concluded and if the project is accepted by the AAA Board as feasible. The AAA reserves the right to terminate the project after the feasibility study phase.

4.3 Existing project information

As detailed above, there has been existing work already completed for planning of a similar project on HMI distractibility in vehicles. Undertaken by the University of New South Wales with a team led by Professor Mike Regan, this includes the development of methodologies and ethical approval. The AAA will make this existing information available to those parties who demonstrate a genuine intention to submit a proposal for this piece of work. This previous work will be provided commercial-in-confidence and can only be utilised for the purposes of submitting the proposal for this project.

Please contact the National Program Manager to discuss this information further (contact details included on the front page of this pack).

5 Demonstration of experience

The applicant must clearly demonstrate, in its response to this Request for Proposal, experience in the following areas. Applicants will be assessed and rated against these criteria.

5.1 *Research Experience*

- A proven track record and experience in relevant similar projects, including the delivery of on-track or simulated studies.
- A proven track record in the use of suitable methodologies and study designs to meet the project aims.
- Demonstration of relevant subject matter expertise, including appropriate allocation of roles and responsibilities to research staff given qualifications and availability.
- A demonstrated ability to conduct focus groups, workshops, and interviews to a high level of quality, including reporting of findings.
- A demonstrated strong knowledge of the distracted driving literature and countermeasure research to be able to assist in interpreting the outcomes of the analyses.
- Demonstrated value for money with previous research projects.
- Demonstrated ability to report findings using language that is appropriate for a general audience.

5.2 *Project experience*

- Demonstrated experience and expertise in project management and delivery, including a demonstrated appreciation of the project objectives and requirements.
- Demonstration of suitable methods to achieve the project objectives, requirements, and overall outputs.
- Proven ability to co-ordinate and manage the project team to deliver high quality outcomes.
- Demonstrated capacity to deliver the project within a specified timeframe.

5.3 *Statistical experience*

- Proven experience and expertise in understanding, undertaking, and describing complex statistical analyses.
- Demonstrated experience and expertise in reporting on statistical analyses in a non-technical manner (i.e., for consumers).

6 Other information

6.1 Timeframes

The feasibility study is to be finalised by **10 January 2022 (this deadline is non-negotiable)**. The AAA is inviting proposals from researchers with extensive experience in this field. Project proposals are to be received by the AAA at the email address: research@aaa.asn.au and **must** be received by **5pm (AEST) 26th July 2021.**

It is anticipated that the major project study would start in mid-2022, dependent on outcomes of the feasibility study and the final approval by the AAA Board.

6.2 References

The AAA will also require the details of at least two (2) referees, including one from industry, who may be contacted by the AAA before commissioning the work to verify the expertise of the lead researcher/s and their ability to deliver high-quality work on time and on budget.

6.3 Contracting

The AAA has a standard Service Agreement that outlines the standard terms and conditions that will need to be agreed to prior to participating in the research program. A copy of the Service Agreement is available from the National Program Manager (see contact details on the cover page).

The service agreement will be between the AAA and the preferred supplier.

There will be two service agreements – one for each phase of the research project: the feasibility study and the main research project (whose funding is contingent on the outcomes of the feasibility study and further approval by the AAA Board).

6.4 Reference Output

Any citations in the report/s should be in American Psychological Association (APA) 6th or 7th. Endnote. The relevant Endnote library generated is to be shared with the AAA.

6.5 Reporting

As detailed the previous sections the AAA will require several reporting outputs as a part of both the feasibility study phase and the major project phase. Please note that all outputs required under the Service Agreement must be technically edited and quality checked (and revised where necessary) prior to submission to the AAA. The AAA will not accept outputs that have grammatical or spelling errors or that are badly written – they will be returned to the service provider for revision without substantial review of the draft.

6.6 Stakeholder engagement

This project will require extensive stakeholder engagement as a part of both the feasibility study and the major research project.

Stakeholder engagement should include (but is not limited to) state and territory road authorities, the AAA and its member clubs, industry associations as well as safety and regulatory bodies who are within scope for both parts of the project.

6.7 Ownership of intellectual property

Intellectual property created in the projects (which includes both the feasibility study and the major project) will be owned by the AAA. This includes the de-identified data collected during the projects. The AAA will grant to the other party a non-exclusive, irrevocable, non-transferable, royalty-free perpetual licence to use and publish the intellectual property. The AAA does not anticipate publishing the material in a peer-reviewed journal or similar, but strongly encourages the preferred supplier to do so in line with the provisions in the standard Services Agreement.

6.8 Ethics applications

Any ethics applications required for the conduct of the research will need to be provided to the AAA in draft format prior to submission.

Ethics applications (and any subsequent consent forms, explanatory statements, recruitment information statements) need to reflect the terms of the service agreement, including the ownership of the de-identified data by the AAA.

6.9 Acknowledgements

The preferred supplier must ensure that AAA funding and support of the research is properly acknowledged anytime during or after completion of the project, where materials or outputs are produced from the project. Likewise, the AAA will appropriately acknowledge the preferred supplier as the author of the work.

6.10 Information session

The AAA is hosting an information session for interested parties on the **8th of July at 2:00PM(AEST)** via video conference (please contact the National Program Manager – details included on the cover page - if you would like to attend). The information session will focus on working with the AAA, the AAA's expectations, contracting, reporting requirements, and will provide an opportunity for interested parties to clarify any aspect of this request for proposal.

References

- Beanland, V., Fitzharris, M., Young, K. L., & Lenné, M. G. (2013). Driver inattention and driver distraction in serious casualty crashes: Data from the Australian National Crash In-depth Study. *Accident Analysis & Prevention*, 54, 99-107.
- Cooper, Joel M., et al. (2020). Age-related differences in the cognitive, visual, and temporal demands of in-vehicle information systems. *Frontiers in psychology*, 11, 1154.
- Dingus, T. A., Guo, F., Lee, S., Antin, J. F., 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), 2636-2641. doi:10.1073/pnas.1513271113
- Kinney, N., & Stevens, A. (2015). The battle for attention. Retrieved from <https://www.iamroadsmart.com/media-and-policy/research-and-policy/research-details/the-battle-for-attention>
- Qin, L., Li, Z. R., Chen, Z., Bill, M. A., & Noyce, D. A. (2019). Understanding driver distractions in fatal crashes: An exploratory empirical analysis. *Journal of Safety Research*, 69, 23-31.
- Regan, M. A., Hallett, C., & Gordon, C. P. (2011). Driver distraction and driver inattention: Definition, relationship and taxonomy. *Accident Analysis & Prevention*, 43(5), 1771-1781.
- Regan, M. A., Lee, J. D., Young, K., & (Eds). (2009). *Driver distraction: Theory, effects, and mitigation*. Florida, CA: CRC press.
- Strayer, D. L., Cooper, J. M., Goethe, R. M., McCarty, M. M., Getty, D., & Biondi, F. (2017). Visual and cognitive demands of using in-vehicle infotainment systems. Retrieved from <https://trid.trb.org/view/1486450>
- Strayer, D. L., Cooper, J. M., Turrill, J., Coleman, J. R., & Hopman, R. J. (2015). Measuring cognitive distraction in the automobile III: A comparison of ten 2015 in-vehicle information systems. Retrieved from <https://trid.trb.org/view/1373184>
- Ye, M., Osman, O. A., Ishak, S., & Hashemi, B. (2017). Detection of driver engagement in secondary tasks from observed naturalistic driving behavior. *Accident Analysis & Prevention*, 106, 385-391.