ARRB Group at 50

by Peter Cairney, Principal Behavioural Scientist, ARRB Group

This year, ARRB Group celebrates its 50th anniversary. This article is a short summary of the organisation's contribution to road safety over the period. An article this length can be no more than a superficial survey. The interested reader is referred to Jones [1] for an account of the history of the organisation as a whole. A more detailed history of ARRB Group is planned for the near future.

Foundation

The organisation was founded as the Australian Road Research Board (ARRB), which held its first meeting in March 1960. The board had a broad range of objectives, including providing a centre for road research information and coordination, ascertaining road research requirements, encouraging research and the dissemination of findings, undertaking research and the publication of research findings.

AARB was established as a not-for-profit company, owned jointly by Australia's state and territory road authorities (SRAs), the Commonwealth Department of Transport and the Australian Local Government Association. This model has served ARRB well over the years, enabling it to cope with and benefit from dramatic changes to its funding base, to its strategic directions and technical content, and to the scope and geographic spread of its business.

When ARRB was founded, the SRAs were essentially road-building authorities whose primary concern was to complete the roll-out of a sealed road network built to standards appropriate for 'modern' traffic across Australia. While the SRAs were concerned to build roads of an acceptably safe standard and to maintain them in a safe condition, management of vehicles, licensing and driver behaviour were the responsibility of other organisations.

The early years

During its early years, ARRB contributed to road safety through its own research activities, funding of research at universities, developing standards, providing library services and indexing activities, and holding seminars and conferences.

Major research activities

Much of the research program in this period was focused on a number of specialised facilities and pieces of equipment. Experiments on lighting and sign legibility were conducted in a splendid 'dark tunnel' that effectively excluded all sources of external light, and was illuminated by variable-intensity mercury vapour lighting, bright enough to simulate natural daylight (Figure 1). Overtaking behaviour was measured by video cameras mounted on an articulated truck that ARRB owned and operated. A 'tilt deck' was used to tilt articulated trucks until one wheel lost contact with the deck surface – strong chains and even stronger nerves were essential (Figure 2). Two generations of instrumented cars were used to test driver curve negotiation behaviour with different delineation treatments.

Figure 1. The ARRB dark tunnel – with the lights on! Can you identify the two people who are currently prominent in academic life?

Figure 2. The tilt deck in action – strong chains and stronger nerves required!

As well as carrying out research, ARRB funded some substantial projects at universities. This included work at the University of Melbourne on crashes with utility poles, on traffic signal and sign visibility, and on delineation. A major in-depth crash study was carried out at the University of Adelaide.

Achievements

The main safety benefit of early ARRB research was to provide Australia with a body of standards and guidelines for roads and traffic management that matched or exceeded best practice elsewhere in the world, or were specially developed for Australia's unique conditions. Specific items relating to road safety included road lighting standards; lane and shoulder width; traffic signal displays and siting; traffic sign legibility, reflectivity and comprehension; delineation treatments (Figure 3); overtaking lanes; truck stability and suspension matching of

prime mover and trailer; skid resistance management guidelines (Figure 4); roundabout design; and local area traffic management standards and guidelines.

Figure 3. The 'snapping turtle' occluding helmet was used to test delineation treatments by periodically interrupting drivers' vision and seeing how well they could stay on path. Note the dual controls in the car – just in case!

Figure 4. A British Pendulum Tester being calibrated in the laboratory. This was (and still is) used to measure skid resistance.

ARRB also contributed to road safety in other ways in this period. The journal *Australian Road Research* provided an outlet for Australian work. The biennial ARRB conference provided the only national forum for road builders and managers to catch up with developments in research and practice; this included strong representation from local government engineers. In addition, a series of two to three regional symposia per year brought new thinking and findings to practitioners in many areas outside the capital cities. ARRB's library services developed Australia's premier road transport library collection, maintained an index of all Australian work on roads and road transport, and prepared Australian material for input into international bibliographic databases.

The 21st century

The latter years of the 20th century saw major changes in the SRAs, which amalgamated with other organisations to assume responsibility for driver testing and licensing, vehicle registration and other functions. At the same time, business practices changed within the newly formed road and traffic authorities, with much work being outsourced.

These changes caused a major reorganisation of ARRB's business model, with less reliance on direct funding of research programs and more reliance on research and consultancy work on a fee-for-service basis. Revitalised by these changes, ARRB entered the next century well-prepared to deal with its challenges. The following have been some of its most important contributions to road safety in recent years.

Risk management

ARRB has taken a leading role in developing a risk management approach to road safety engineering in Australia. This has been principally through a six-year project for Austroads, which examined the risk associated with different road stereotypes and features, and the risk reduction that could be expected from a range of remedial measures. This work is intimately related to other aspects of ARRB's program.

Software tools

ARRB has developed a range of software to assist road safety practitioners in their decision making. Experience was originally gained with the X–LIMITS set of programs to assist with speed limit selection. Road Safety Risk Manager was originally developed to assist practitioners to prioritise the remedial actions suggested by road safety audits, but has recently been expanded to incorporate the findings of the risk management project. It provides guidance regarding the extent to which different treatments will reduce crash risk in different situations. Road Safety Toolbox provides guidance as to which treatment is most appropriate in different situations. Both these products are used in conjunction with the road survey products described below and are widely accessed by practitioners across the globe.

Austroads guides

The ARRB team has undertaken the bulk of the work in drafting Austroads guides covering all areas of road authority activities. This includes the nine volumes in the Austroads *Guide to road safety*. The Austroads *Guide to road design* and the Austroads *Guide to traffic management* also have substantial safety content. The Austroads guides are acknowledged as leaders in their field, and have influenced the design and content of similar publications in other countries, particularly in the Asian region.

Safe System

Safe System was adopted by the Australian Transport Council as a guiding principle in the *National road safety action plan 2005 and 2006*. Since that time, ARRB has been among the leading contributors to the interpretation and development of the doctrine. Workshops have been held to explore the implications for infrastructure provision, the management of speed, the management of road users and the implications for local government. Projects are underway to help road authorities and local government come to grips with the practical implications.

AusRap and iRAP

By 2005, as the culmination of many years' research and development, ARRB had produced a network survey vehicle (Figure 5) that could create a three-dimensional map of the road along which it travelled while surveying the road and

roadsides using the Hawkeye video camera system. Road and shoulder cross-section, offset to roadside objects, and the presence of signs and road markings could all be determined from the video images and related to their exact location on the road map.

Figure 5. A network survey vehicle equipped with Hawkeye video cameras are mounted on the roof. The apparatus at the front of the van is a battery of laser sensors for measuring road surface characteristics.

These vehicles were used to conduct the Australian Road Assessment Program (AusRAP) surveys, funded by the motoring organisations, which allocated star ratings to major roads according to the level of safety the road offered. Since then, the ARRB Hawkeye system has been widely used in the International Road Assessment Program (iRAP), with surveys conducted in several countries using this equipment and the associated procedures for rating the safety of roads.

In recognition of ARRB's contribution to iRAP, the establishment of an International iRAP Centre of Excellence at ARRB was announced at ARRB's conference in October 2010. The role of the Centre of Excellence will be the continued development of survey technology and analytic procedures for iRAP, and training of personnel from user countries in the conduct, analysis and interpretation of surveys.

Behavioural research

ARRB has continued to conduct behavioural research in a number of areas. The safety of young drivers has been an ongoing theme, including monitoring the accumulation of supervised driving experience by learner permit holders, redevelopment of a computer-based hazard perception test, contributions to the development of practical on-road tests in several states and investigations of factors contributing to risk-taking by novice drivers. With the assistance of subcontractors, ARRB developed an educational program to reduce recidivism among convicted drink drivers; an independent evaluation found the program to be of high quality and much more effective than other programs with similar aims.

Motorcycle safety has also been a continuing theme, with work on crash analysis, training and licensing requirements, and rider's views and acceptance of new technologies. Work has continued with road signing but has evolved to tackle new conventions for complex direction signing and issues relating to variable message signs and changeable speed limit signs. ARRB has also been active in community and local government road safety, principally at the level of developing and reviewing programs, supplemented by 'hands-on' experience with local communities.

Other areas

ARRB has contributed to other areas of road safety. These include road surfacing, where the ability to assess aspects of surface condition using low-cost laser measurements has raised fundamental questions about the best strategies to manage Australia's extensive road network. Work to ensure stability and other aspects of safe performance of new heavy vehicle designs continues. Acceleration and braking of heavy vehicles at railway crossings has been a particular concern, as part of a wider body of work on railway level crossings, including an assessment of the Australian Level Crossing Assessment Model (ALCAM) currently used to assess the safety of individual crossings. ARRB has also carried out work related to the safety benefits of different types of intelligent transport systems (ITS) technologies – both in-vehicle and roadside – in Australia.

The future

ARRB's 50th anniversary is a time when the land transport system is faced with substantial changes and enormous challenges. Major changes in the way road travel is powered seem imminent, with as yet unknown effects on the mix of vehicles using the network. Efforts to achieve sustainability and shortages of some traditional road-building materials are forcing changes in the way roads are built and managed, while climate change has implications for drainage and the resilience of structures and roadside furniture. The implementation of Safe System principles with limited budgets requires careful consideration. Rapid motorisation confronts developing countries with the prospect of an enormous casualty toll, the containment of which requires knowledge transfer on a very large scale.

ARRB's team looks forward to the challenge of the next 50 years. For the Safe System team in particular, the challenge will be to assist progress towards Safe System goals, while addressing these other factors and constraints. In pursuing this challenge, ARRB would be wise to rely on its traditional strengths – capable and enthusiastic people, close working relationships with its customers, a wide mix of disciplines and expertise available within the organisation, and opportunities to pursue new ideas.

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Reference

1. Jones D. 50 years of road engineering and scientific research. World Highways 2010; 19(7):20-22.