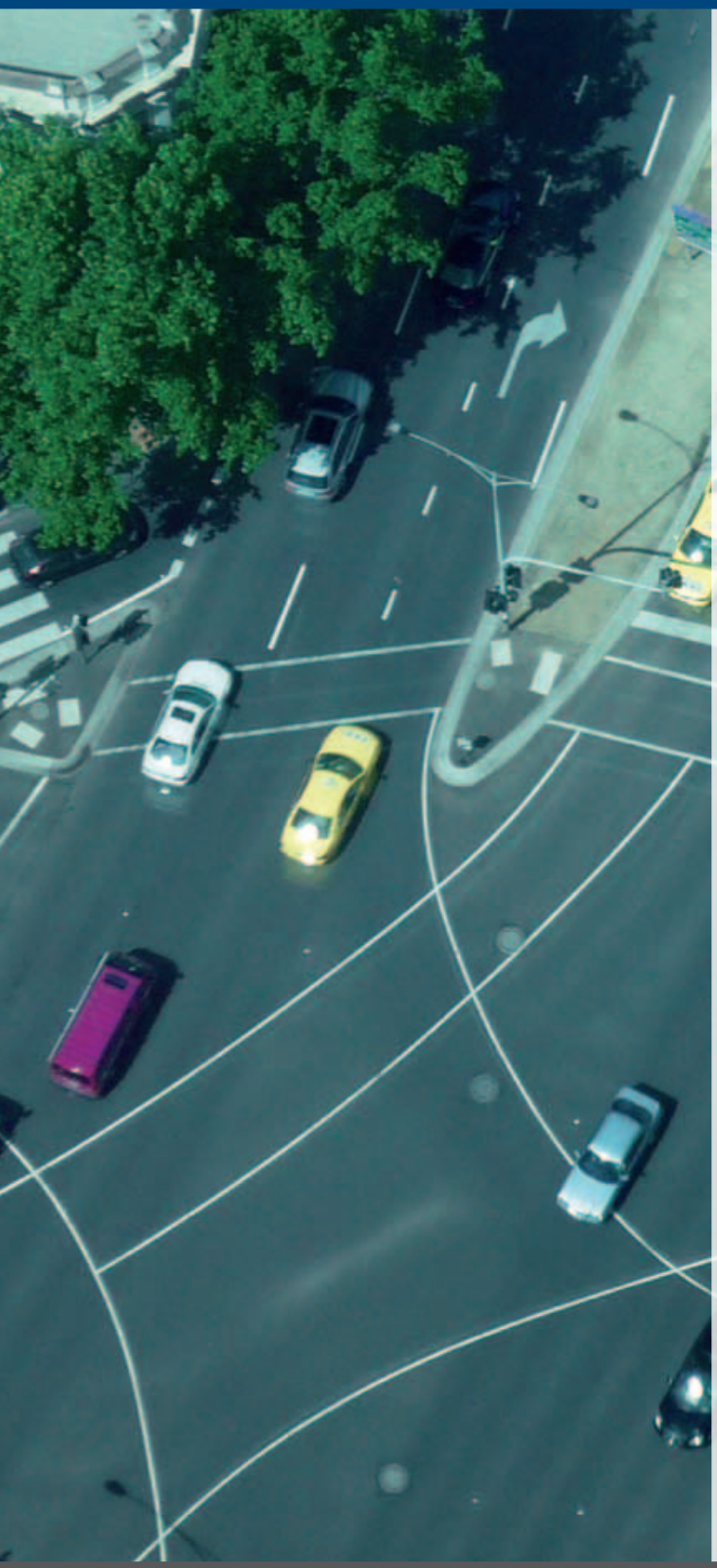
Achievements in 2009

Building on 50 years of road and transport research

arrb GROUP



Contents

50 years and going strong

'These developments help us to tackle the future with renewed confidence, having achieved the milestone of 50 years of continuous service.'

To succeed in the long-term, an organisation must both respond to and initiate change. Self-generated change can arise from taking on new functions, from the expansion of some activities or a reduction in others, and the consequent need to recruit new skills or to restructure parts of the organisation.

Some new functions and responsibilities can emerge from the impact of external factors such as social, economic and technological trends in the environment in which organisations like ARRB Group (ARRB) operate. For example, the increased capability of communication and information technologies over the past decade has changed the way businesses like ours must perform.

Since its establishment in March 1960 (as the Australian Road Research Board) ARRB has continued to develop through recognition of the need for change and improvement. During 2009, we responded by the adoption of a new Strategic Plan (2009–15) and the initiation of the ARRB Academy.

The Strategic Plan lays out the path to ARRB's heightened role as a national centre of excellence in road research, knowledge and technology. The main strategies include:

- conducting multi-disciplinary programs of research on national priorities, making use of the best researchers, research organisations and tertiary institutions
- creating a hub for road industry knowledge and experience which provides certainty and reliability in information
- expanding knowledge sharing and transfer activities to meet industry needs
- developing and commercialising innovative technology and systems.

ARRB has over many years developed the resources to examine issues of national importance. To further focus these efforts, groups have been formed around the issues of sustainable infrastructure, safe systems, and congestion, freight and productivity. Also essential to the concentration on quality and innovation will be an emphasis on:

- Scientific rigour – imparted through ARRB's research methods and national technical leaders in key areas of expertise.
- People development – including mentoring of technical staff towards their aspirations and chosen career goals, as a means of attracting and retaining the best talent.
- Research program development – in which priorities of member authorities and other stakeholders are recognised and understood, knowledge gaps identified, future needs assessed and programs of work undertaken to meet those needs.

The establishment of the ARRB Academy is an integral part of the new strategic direction. Its function is to be the focal point for activities aimed at maintaining excellence in research, knowledge and collaboration. It will concentrate on ensuring quality in three main areas:

- Quality people – attracting and retaining the best scientific and engineering personnel, and building a national capability in critical areas.
- Quality processes – ensuring that research and consulting projects are executed with scientific rigour.
- Quality products – ensuring that outputs from project work meet both the expectations of clients as well as ARRB's own standards.

These developments help us to tackle the future with renewed confidence, having achieved the milestone of 50 years of continuous service.

I would therefore like to thank all our staff in Australia and in overseas locations, the Board of Directors, members, partners and clients for their valued contribution to ARRB's success.

The wide reach and fundamental importance of ARRB's expertise and services are reflected in this brief overview of some of our achievements and activities during 2009.

Gerard Waldron
Managing Director, ARRB Group

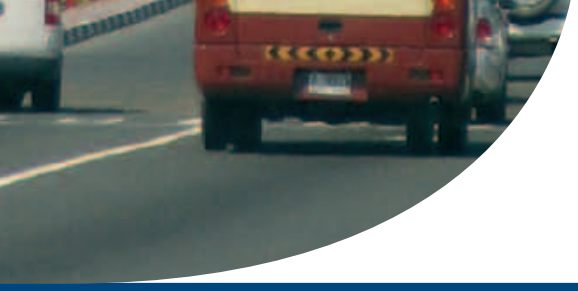
Who we are

ARRB is a public company that works to turn knowledge into practice in road transport. Its capabilities, products and services have diversified from an initial focus on research in road safety, road pavements, road construction and maintenance to all areas of road transport.

ARRB's members are the authorities that manage road transport in Australia and New Zealand. The members elect a Board of Directors who may be representative of the member organisations or independent people with other skills and experience. There are seven Directors, four elected by the company's members, two non-government directors and the Managing Director.

Over the last ten years, ARRB has successfully moved from a reliance on grant funding to commercial operation. While doing so it has maintained its research role and expertise and is recognised as one of the leading road transport research organisations worldwide.

It employs some 250 staff who form a multi-disciplinary pool of research professionals, experienced engineers, and specialist technical and support staff. Its resources include certified laboratory and testing facilities and associated technical personnel.



What we do

Skills and services provided

ARRB's capabilities cover the full spectrum of road transport operations including:

- transport systems – policy development, sustainable transport planning, network operations, climate change interactions, intelligent transport systems, transport economics, heavy vehicles, parking operations
- infrastructure – asset management, data collection, pavements and materials, concrete structures, bridge assessments
- safety – safety audits, traffic engineering, road user behaviour, fleet safety, crash investigation, safety at mining operations.

It develops and supplies a range of road condition assessment products and services including:

- road survey equipment – Hawkeye 1000 and 2000 series, Roughometer, Walking Profiler
- pavement testing – accelerated pavement testing, Falling Weight Deflectometer
- software – road network safety assessment, Road Safety Risk Manager.

Its knowledge transfer and information dissemination services include: staging of conferences, workshops and seminars; provision of road and rail information services; collaboration with all major national and international transport databases; and publication of research reports, journals and manuals.

Benefits to clients and the community

ARRB's contribution to its government and private sector clients is measurable in the better management of the road transport network for the benefit of communities in Australia and internationally, and in the more efficient operation of commercial transport. Direct benefits include:

- improved road transport planning, construction and maintenance standards and procedures
- development of professional and technical skills in government and industry
- promotion of innovations in road network assessment and management technology and systems
- greater cost-effectiveness of investment in road network improvements and road safety measures.

How we do it

ARRB's services are based on the following capabilities and resources:

- multi-disciplinary personnel covering professional, technical and management staff (including scientists, engineers, economists, statisticians, psychologists, and information, computer and communication specialists)
- the availability of products designed and manufactured in Australia to meet international standards; the product range includes: pavement profiling systems; network survey vehicles; road geometry and mapping systems; digital imaging systems; software and data analysis tools; traffic information systems; and portable measuring systems
- the capability of the MG Lay Library which is recognised as the leading transport library in Australia and provides extensive information coverage on all aspects of transport
- close linkages and partnerships with road and transport authorities, private industry, standards bodies, and international agencies
- affiliations and working relationships with organisations around the world such as: AAA (Australian Automobile Association); Roads Australia; AusAid; IRF (International Road Federation); GRSP (Global Road Safety Partnership); iRAP (International Road Assessment Program); PIARC (Permanent International Association of Road Congresses); REAAA (Road Engineering Association of Asia and Australasia); Transportation Research Board, USA; World Bank
- the contribution of national technical leaders who have extensive experience and knowledge in specialised fields, and support the work of researchers; six of the technical leaders have also achieved the position of Chief Scientist, a status that reflects their dedication to research as a career, and the pursuit of knowledge and its application.

Chief Scientists

Geoff Jameson
Pavement structures

Dr James Luk
Transport operations

Dr Tim Martin
Performance modelling

Dr John Oliver
Bituminous materials

Dr Ahmad Shayan
Concrete

Dr Dimitris Tsolakis
Economic evaluation

Chief Consultant

Tyrone Toole
Management systems

Technical Leaders

Dr Peter Cairney
Behavioural science

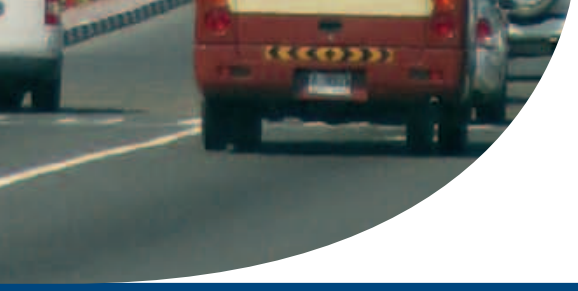
Paul Hillier
Skid resistance/crash investigation

Roland Leschinski
Pavement and road asset survey equipment

Larry Schneider
Parking

Michael Tziotis
Road safety

Richard Wix
Road network survey techniques



The Transport Researchers' Exchange

The Transport Researchers' Exchange (TREx) is an international ARRB initiative aimed at improving collaboration between transport research institutes. The first TREx exchange professional to come to ARRB was Giulia Baracco from the Milan Polytechnic (Politechnico di Milano). Giulia is working for a Master of Science degree. Her work at ARRB involved applying new software tools to assemble valid data and to execute pavement life-cycle costing analyses on a demonstration, pilot-scale road network. The objective was to assess the ability of the new tools to estimate maintenance and rehabilitation funding levels for networks.

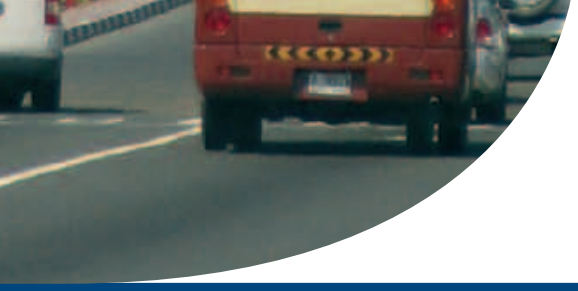
Transport Researchers Exchange

Undergraduate Summer Intern program

ARRB has a responsibility to maintain research capability in areas of interest to its members and takes the view that this includes training of undergraduates. For this reason ARRB runs an annual Summer Intern program, which has doubled in size since first introduced in 2004. Eleven students participated in four states as part of the 2009–10 program. Interns complete 10–12 weeks of work from late November to the end of February. During that time they work under a technical mentor – usually a Chief or Principal Scientist/Engineer. Over and above the on-the-job training, they are also given internal training on report writing and presentations; their experience includes end-of-program presentations firstly to staff and then to the ARRB Board.

Achievements in 2009

ARRB staff undertake hundreds of projects for clients throughout Australia and overseas in any given year. This brief outline of achievements and activities in 2009 can only provide a sample of ARRB's work. The projects are grouped under the following headings which reflect the transport challenges that have been identified as priorities under the National Transport Policy Framework:



Achievements in 2009

Strategic research and technology

Austroads/ARRB Technical Research Program

Austroads comprises the road and transport authorities of the six Australian states and two territories, the Commonwealth Department of Infrastructure, Transport, Regional Development and Local Government, the Australian Local Government Association, and the NZ Transport Agency. One of the major aims of its members is to undertake strategic research on behalf of road agencies and communicate the results.

The sixth year of the Austroads/ARRB technical research program commenced on 1 July 2009. The research projects vary in size from $50,000 to $500,000 with an average budget of $115,000. This research is critical as road authorities are responsible for road assets valued at over $200 billion with recurrent expenditure of over $6 billion on maintenance.

The program continues to develop and sustain a national capability for technical research and knowledge so that this can be available to meet the future requirements of the Australasian road industry. The results add valuable knowledge in the areas of asset management, bituminous surfacings, pavement technology and road safety engineering. The research program covered the following areas:

- Asset management – road network wear and the cost implications of incremental load increases on heavy vehicle axle groups, and improving asset management decision-making capabilities.
- Bituminous surfacings – the sustainability of road construction and maintenance operations, loss of expertise in areas such as seal design, and the increased stresses applied by new generations of heavy vehicles and their threat to sealing practice.
- Pavement technology – the increasing pressure to allow larger loads, the increasing scarcity of quality building materials, and approaches to minimising whole-of-life pavement costs.
- Road safety engineering – the provision of a safe road system, prioritisation of activities to create safer roads and roadsides, and issues related to the link between speed management and road safety.

Results of the research program were disseminated through numerous workshops and training courses, and the presentation of papers at international and Australasian conferences. In addition to the Technical Research Program, ARRB conducts research across a broad range of other technical areas for Austroads. Examples are described in the following pages.

Release of new Austroads Guides

On 1 July 2009 Austroads formally launched a comprehensive set of technical Guides comprising 96 separate parts. The Guides were the culmination of several years of collaborative work between Austroads, ARRB and industry. The Guides cover issues that are at the centre of Austroads member responsibilities – the design, construction, maintenance, operation and safety of Australian and New Zealand road networks. They consist of the following subject areas: Asset Management; Bridge Technology; Pavement Technology; Project Delivery; Project Evaluation; Road Design; Road Safety; Road Transport Planning; Traffic Management; Road Tunnels.

Most of the development and preparation of the Guides was carried out by ARRB staff. Over 90 primary and contributing authors were involved in the project over a period of five years; it represents one of ARRB's major achievements during that time.

Achievements in 2009

Roughometer III

The latest version of the Roughometer series – the Roughometer III – was released during the year. The equipment collects road roughness data that can be used to assess the performance of any road network, and is suitable for both sealed and unsealed roads.

Whilst maintaining a level of simplicity and ease of use, the Roughometer III now incorporates many user recommendations, including the following new features: fully integrated and time stamped global positioning system (GPS) data collection, replacing the need to synchronise the Roughometer with the external GPS used in previous versions; USB connection for super-fast download of data; higher on-board capacity with up to 13,000 kilometres of survey data storage; and improved software with automatic upload, faster processing and customisable maps.

The Roughometer III comes with a complete user package with the fully integrated GPS unit, a high accuracy distance measurement instrument, and the data acquisition, processing and reporting software.

Equipment and software innovations

Several equipment innovations were introduced with the enhancement of many components, and the release of Hawkeye Processing Toolkit Version 2.1. The new high-resolution digital cameras with 2.0 megapixels are now being used for both the Hawkeye 1000 (previously 0.7 megapixels) and 2000 series (previously 1.3 megapixels). The higher megapixel count has allowed the collection of 60% more data, producing clearer, crisper images. The new camera also has auto lens detection and a wider field of view.

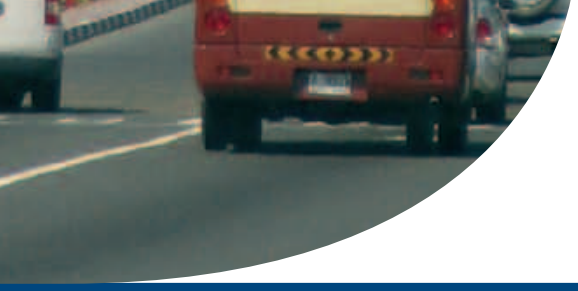
A substantial effort was made to develop and test a new range of lasers to be used in both the Hawkeye 1000 and 2000 series Digital Laser Profilers. Due to the reduced number of processing components and cables, the profilers are produced at lower cost, thus making ARRB equipment more competitive in the international market. The profilers are also smaller and lighter, while still meeting all current international standards.

ARRB has also been developing and piloting the use of spread laser technology to record transverse profile rutting.

Measuring the visibility of pavement markings and signs

Pavement markings and traffic control and guidance signs are vital to ensuring road safety and efficient traffic management. A repeatable and internationally recognised measurement can be taken which will provide a numerical representation of the sign's or marking's visibility. The measurement can be compared to established requirements for that particular item and, if needed, corrective measures taken.

ARRB has added a number of the world leading reflectivity meters to its equipment range from the Delta (Denmark) product group. By combining both the Hawkeye Digital Imaging system and the Delta portable measuring devices, ARRB can provide a complete signage and pavement marking measuring service. With the Delta products, high accuracy and reliable measurements can be conducted which comply with AS-1742 (the Australian Standard) and international performance specifications.



Achievements in 2009

Economic framework for an efficient transportation marketplace

Heavy vehicles

The heavy vehicle program achieved a good balance of small consultancy services for the transport industry to assist in dealing with immediate needs, while still undertaking longer-term strategic research projects aimed at building technical understanding and improving transport safety and efficiency both in Australian and overseas.

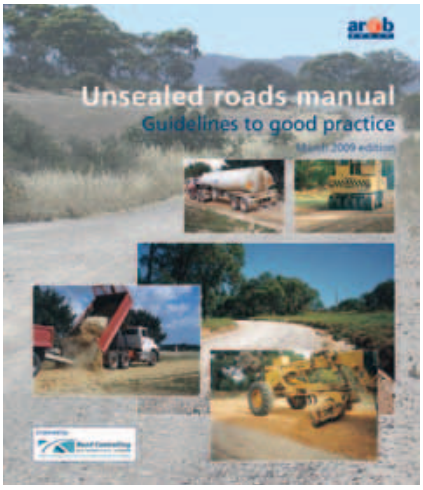
Projects for Austroads: Several projects were undertaken for Austroads including: the measuring of dynamic wheel loads; a study of the equivalent standard axle-gross vehicle mass relationship using weigh-in-motion data; and an investigation of the sight distance requirements for heavy vehicles approaching railway crossings; this included field testing a B-triple combination and the simulation of a range of high-productivity and multi-combination vehicles.

Performance Based Standards (PBS): In 2009 ARRB became the major provider of services relating to PBS applications. A number of projects were completed for clients that included multi-national companies and single-truck operators. ARRB promoted the further development of the PBS scheme by hosting a roundtable discussion. Stakeholders sought to define the way forward for increasing the uptake of high-productivity freight vehicles.

Benchmarking of international heavy vehicles: The Joint OECD/ITF Transport Research Centre conducted an investigation into the safety, environmental and productivity impacts of current and future heavy vehicle operations. The investigation included a study to benchmark the safety performance of heavy vehicle combinations from OECD member countries. The benchmarking study was performed by ARRB; it quantified the safety performance of 40 vehicle configurations across 10 member countries, using a set of recognised vehicle performance measures.

Achievements in 2009

Infrastructure planning and investment



ROMAN II – Western Australian Local Government Association

ARRB and the Western Australian Local Government Association (WALGA) signed a contract that will see ARRB deliver a replacement for the ROMAN asset management software. For the past 20 years ROMAN has been the tool for the state and local governments to enter, analyse and report on the current and predicted condition of the Western Australian road network.

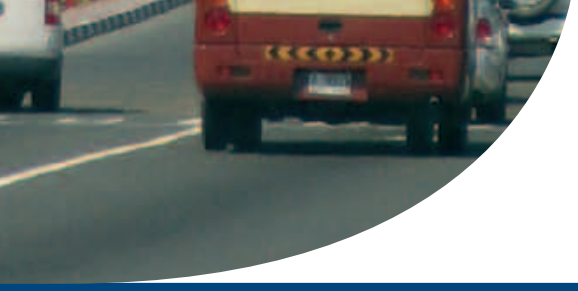
To find a replacement package WALGA commenced an extensive tender and assessment process, with ARRB chosen as the preferred provider. An integrated software solution comprising both Road Assessment and Maintenance Management from CJN Technologies in New Zealand and dTIMS software from Deighton Associates Ltd. in Canada will form the new asset management software to be known as ROMAN II.

In addition to software applications, ARRB will provide its expertise and support in pavement asset management, whilst WALGA will ensure that regular marketing of the system throughout the state is maintained and a consolidated position is reached for all local government authorities in managing their road assets.

Release of updated Unsealed Roads Manual

An updated and expanded *Unsealed Roads Manual* was released. The new edition includes the latest research and information which addresses issues identified by practitioners. The Manual has been a key source of knowledge and good practice for those in local government, state road authorities and other agencies responsible for the care, maintenance and management of unsealed roads.

New features include: details on the latest research findings, new developments and applications; increased content to respond to comments from delegates attending unsealed road workshops; inclusion of New Zealand procedures and practice; equipment developments that provide objective data on unsealed road performance; a detailed section on ways to improve safety on unsealed roads; case studies highlighting how the application of good practice has produced significant cost savings and improved operating conditions; and greater emphasis on asset management requirements.



Achievements in 2009

Development of unsealed road testing protocols

ARRB was engaged by the Federal Department of Infrastructure, Transport, Regional Development and Local Government to develop standard testing protocols for the conduct of field trials on unsealed roads. To assist in the development and evaluation of the protocol, trial sites were being monitored at Alice Springs, supported by the Northern Territory Department of Planning and Infrastructure, and the ACT, supported by the Department of Territory and Municipal Services.

The project also involves the evaluation of stabilisation binders which are typically associated with improving the longevity of unsealed wearing courses and reducing patrol grading maintenance. The performance of untreated control sections and, in the case of Alice Springs, a site stabilised with lime was also being evaluated. A draft protocol was evaluated, based on the provision of simple tools and laboratory assessments that can be undertaken to identify the key material characteristics and their performance in an unsealed road pavement.

Data collection for state road authorities

State and territory authorities continued to utilise a large part of ARRB's data collection services throughout Australia. Major contracts were secured with all road authorities for the first time in ten years. As a result, the data collection fleet covered a vast portion of the Australian road network during the year.

At a local level, projects were completed along the east coast with many councils and municipalities in southern Queensland, regional New South Wales, along the Murray River and in Victoria. Network survey vehicles were also involved in projects such as the Waterloo Windfarm in South Australia and the Sugarloaf north-south pipeline in Victoria.

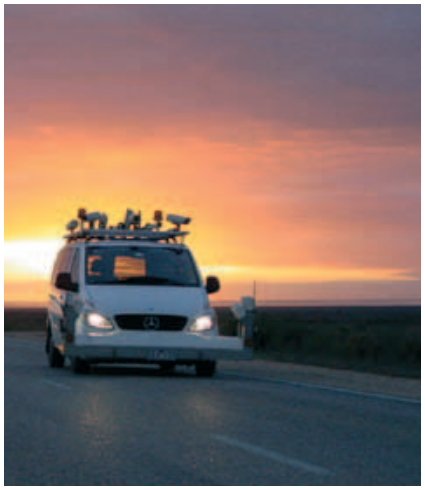
Great success has been achieved with the All-terrain Survey Vehicle (ATSV). The ATSV is a compact vehicle designed to collect data in those places which had previously been difficult to access by the larger network survey vehicles. All types of locations were surveyed for Main Roads Western Australia, the Queensland Department of Transport and Main Roads, and a growing number of local government clients.

ARRB's fleet of Falling Weight Deflectometers has also traversed the country undertaking surveys in north-western Australia, including the Kimberly and Pilbara regions. On the east coast the fleet has worked in both the private and public sectors surveying major metropolitan and regional airports, car parks, construction sites and existing intersections, to assess compliance with specifications.

Parking reviews and assessments

ARRB expanded its parking consulting services and introduced a new set of skills through the establishment of Luxmoore Parking Consulting in 2008. This initiative enabled ARRB to provide a wide range of services including: feasibility studies for new car parks; parking layout and design; safety and security assessment; high-level strategies and parking policy; auditing of revenue and expenditure; operational, management and financial procedures; signage and way finding; market surveys and data collection; preparation and evaluation of marketing programs; and reviews of technology and assessment of life-cycle costs.

During the year Luxmoore Parking Consulting worked on local and international projects and completed airport parking reviews, urban planning studies, parking strategy studies, parking management reviews, and feasibility reports on deck parking and parking meters.



Achievements in 2009

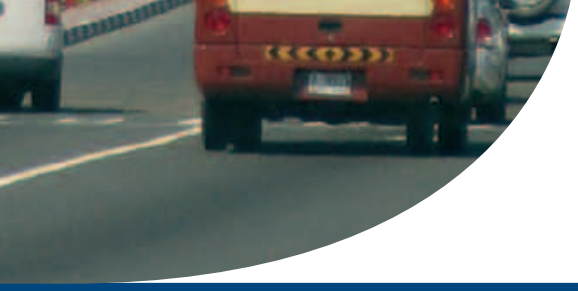
Urban congestion

ARRB provided extensive services relating to transport operations and congestion management. It undertook projects for state road authorities, including a high-level review of urban congestion management for Western Australia and the development of a new Traffic Management Centre in Canberra. Advice was provided in Victoria on the application of overhead dynamic signage for the M1 upgrade project – Australia's most advanced managed freeway. The development and application of ARRB's own travel time model was also continued.

Austroads-funded work on National Performance Indicators for network management was progressed, with some states now applying those indicators in their road transport operation plans. Other Austroads-funded projects included the continued development of the specifications for the next generation traffic controller for signalised intersections, applying accessibility measures and improving safety for heavy vehicles at railway level crossings. Other projects improved the support available to road authorities collecting weigh-in-motion data for heavy vehicles on their networks.

During 2009 ARRB continued supporting private industry clients. It evaluated a method developed by ITIS Holdings to use cellular floating vehicle data to provide a mobile traffic information system. The national service was launched to Optus customers in July 2009, with information provided by ITIS Holdings in international industry publications.

Many local governments are seeking to alleviate road congestion issues by identifying and responding to other multi-modal options. In consultation with a number of local governments, ARRB has developed several transport plans, particularly in Western Australia and South Australia. When implemented, the outcomes will see increases in cycling, pedestrian and public transport usage.



Achievements in 2009

Climate change, environment and energy

Climate change will increase in economic and social importance. ARRB acknowledges its significance, and has conducted extensive research into the impacts of vehicles and transport infrastructure on the environment, and the climate change implications for road transport infrastructure and operations.

In 2009, a Climate Change Focus Group was created which will further build ARRB's strengths, coordinate climate change research across the organisation, and collate climate change and transport information at the international, national and state levels. ARRB also undertook several projects related to the environment and climate change. These include:

- Strategic Review of Future Asset Management Issues (Impact of Reducing Greenhouse Gas Emissions; Impact of 'Peak Oil'; and Impact of Climate Change on Agriculture, Industry, the Community and Road Use). This Austroads project aims to identify issues that will affect road agency asset management in the next 10 to 20 years.
- The Queensland Department of Transport and Main Roads engaged ARRB to develop an Environmental and Cultural Heritage Audit Framework. It required a review of the current auditing processes across the Department's regions. It also developed a format and minimum standards for environmental and cultural heritage audits.

ARRB is a Foundation Partner of Ecostation, which is a joint initiative of the Victorian Transport Association and the Environment Protection Authority, Victoria. The Ecostation program is providing greater efficiencies for freight businesses in the state. It aims to assist the freight industry to become more efficient and reduce its environmental impact. It is designed to ensure the continued viability of the transport industry in a rapidly changing social and regulatory environment.

ARRB is also providing technical advice to an Australian Road Transport Suppliers Association and Monash University project aimed at providing a better understanding of the aerodynamics of the Australian heavy vehicle fleet. The current fleet generally has poor aerodynamics and requires improvement. This project will address the increasing emphasis on greenhouse gas emissions, likely future fuel cost increases, and the predicted increased demands on the road transport industry.

Achievements in 2009

Safety and security

Safe System implementation

The Safe System approach to road safety has been adopted by all Australian state road authorities. The approach recognises that humans, as road users, are fallible and will make mistakes which can result in crashes. There are also limits to the impact forces which the body can tolerate during a crash before serious injury or death occurs.

Safe System Infrastructure: The Safe System requires that road infrastructure be designed to take account of these errors and vulnerabilities so that road users have a much greater chance of avoiding serious injury. ARRB hosted a national roundtable to examine infrastructure options that might help to achieve Safe System outcomes, with 40 senior managers from Australia and New Zealand participating. Discussion covered the progress towards implementing Safe System principles and options for future implementation.

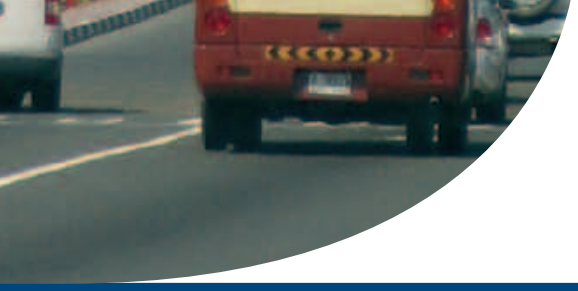
Promoting Safe System concepts: The viability of introducing Safe System concepts to young drivers through the Road Rules Handbook was tested in the ACT. By introducing the concepts in an easy-to-understand manner, driver understanding of their role in road safety should be improved. Safety messages were tested on two focus groups (learner and provisional licence holders aged 16 to 20 years). The Safe System concepts were well received by participants who liked the simplicity and appreciated that their role and responsibilities were immediately clear. It was concluded that designing messages to bring young driver handbooks into line with the Safe System principles was viable and the concept should be further developed.

Queensland NetRisk assessments

State and local governments across Queensland combined to improve safety by launching a state-wide safety check of the road system. The Queensland Roads Alliance (which is a partnership between the Department of Transport and Main Roads and the Local Government Association of Queensland) endorsed an arrangement with ARRB for NetRisk assessments to be conducted and asset data collected across a network of regionally significant roads, defined as the Local Roads of Regional Significance (LRRS). This network is in excess of 32,000 kilometres.

The NetRisk program uses a set of trigger points to prompt practitioners to investigate hazardous sites. Sites are triggered only when they exceed minimum preset safety levels, allowing the road authority to configure the program to detect a manageable number of hazardous locations in a budgeting period.

The project will see ARRB, with data collection assistance from RoadTek (a government business within the Queensland Department of Transport and Main Roads), undertake a NetRisk assessment of in excess of 16,000 kilometres of the LRRS network. The results will benefit local governments, enabling them to invest in the community's safety, and target treatments to high-risk locations across the state.



Achievements in 2009

Black ice

The Roads and Traffic Authority of New South Wales is committed to the upgrade of the Great Western Highway between Mount Victoria and Lithgow in the Blue Mountains region of the state. The existing road section has a challenging local topography and road safety concerns have historically been expressed. Many of these concerns relate to the adverse weather conditions in the region, particularly during winter. Localised sections of the existing route are prone to frost and ice formation with the potential to create hazardous driving conditions. Fog can also be a concern, both in winter and summer months.

In 2008, as part of the preliminary routing and design of the upgrade, the New South Wales Roads and Traffic Authority commissioned ARRB to identify the microclimatic (weather-related) constraints present within four route corridors. In 2009, ARRB was then commissioned to measure road surface temperatures and produce thermal maps in the area of interest, in association with a specialist sub-contractor. The study identified climatological constraints relating to mountainous region fog formation, frost and ice formation affected by downhill air currents and cold air pooling, fog in areas close to watercourses, and frost and ice formation on elevated structures.

All the corridors proposed by the Roads and Traffic Authority were identified as being potentially viable when only climatic concerns and issues were taken into account, although the exact siting, specification and ongoing maintenance of key structures likely to be required (e.g. viaducts and bridges) would need to be carefully considered using the guidance provided in the project report. The thermal mapping will also be used to optimise the ongoing maintenance of the existing road network in this area in response to the presence of frost, ice and snow.

Reducing crashes on local roads

ARRB completed a study (funded by Austroads) to investigate the incidence of crashes on local roads, as well as causal factors and measures to improve safety. The study involved a literature review, crash data analysis, site investigations, in-depth crash analysis (including work conducted by the Centre for Automotive Safety Research in Adelaide) and a workshop to address the issue.

The study showed that around half of all casualty crashes in Australia, and two-thirds of those in New Zealand occur on local government roads. Site investigations identified a number of factors that may contribute to the higher incidence of crashes, many of which related to lower design standards, including the presence of roadside hazards, poor delineation, poor road alignment and junction geometry, and unsealed road shoulders. Barriers to improving safety were identified during a workshop. The workshop also resulted in recommendations to reduce crashes on local government roads.

Mining operation road safety audits

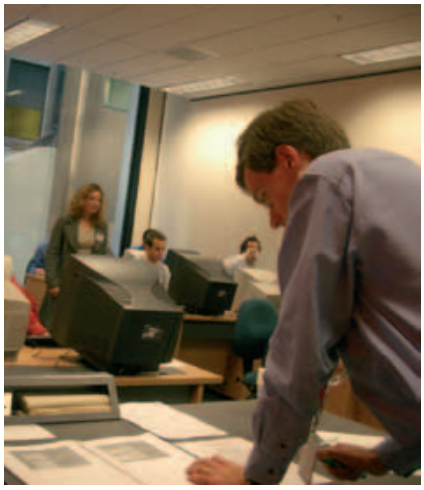
Road safety audits can identify design and layout issues before they become hazards and represent a significant part of ARRB's contribution to improved industry road and traffic management practice. In contrast to road safety audits on public roads, mining operation audits present a greater challenge in identifying solutions for a dynamic, unsealed road network and a varied traffic mix consisting of mining dump trucks, low loaders, dozers, maintenance trucks, four-wheel drives, minibuses and pedestrians. Numerous road safety audits and traffic management projects for mining and resource development clients were carried out in Western Australia and Queensland during the year.

Queensland: Audits of nine open-cut coal mines, and one underground coal mine (concentrating on above-ground operations) located within the Central Tablelands region of Queensland were undertaken. Audit teams consisted of two personnel from the Safe Systems group selected from the New South Wales, Queensland and Western Australian offices. Depending on the size of the site, audits require between one or four days, including both daytime and night-time inspections. The audits typically covered signage, delineation, intersection control, pedestrian control, speed limits, traffic management, and enhancements to mine-site traffic management plans.

Western Australia: These included four audits for HWE Mining as well as a five-day safety inspection of more than 100 level crossings on the 1,000 kilometre railway network owned and operated by BHP Billiton. A safety audit was undertaken of a network of remote dirt tracks and access roads used for exploration activities by BHP Billiton Iron Ore. A pre-feasibility traffic management plan for the construction of a proposed 180-turbine wind farm located to the north of Perth was also developed.

Achievements in 2009

Workforce planning and skills



Workshops and seminars

There were 57 workshops/seminars conducted across Australia and New Zealand in 2009. The number of registered participants for the year was 1,529 which equates to some 27 attendees on average per workshop. Numerous workshops were sold out and a few were also run twice in the same area to respond to the demand.

The subjects of Unsealed Roads, Level 1 Bridge Inspection, Road Safety and Traffic Management, and Speed Management were most popular. With the release of the Austroads Guides in July 2009, a number of seminars were delivered around Australia highlighting the main changes between the previous and the new Guides.

Road Research Register

An online information source for current and recently completed Australian and New Zealand road-related research projects became available. ARRB began developing the Road Research Register in late 2007 as an Austroads funded project. The planning process was assisted by members of the Austroads Research Coordination Group and, after testing, the Register went live in early 2009.

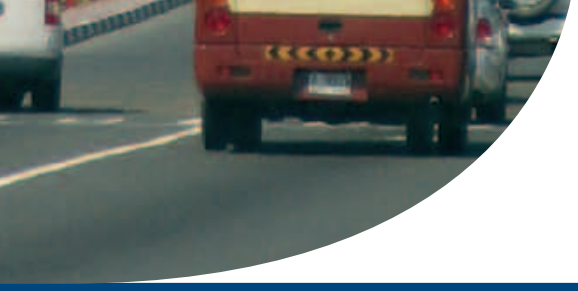
Designed to promote awareness of road-related research activities, the Register covers research in progress and also offers an archive of completed projects. There are over 1,340 projects listed in the register, sourced from contributors including federal, state and territory government organisations within Australia. The aim is to add project information from other bodies commissioning research within Australia, and also on-road-related graduate research. Ongoing maintenance of the Register is managed by ARRB with financial support from the National Interest Service program, with Austroads providing non-financial assistance.

Rail Knowledge Bank

In light of its long and successful track record in the collation and dissemination of information in the land transport sector, ARRB was commissioned by the Cooperative Research Centre (CRC) for Rail Innovation to develop and maintain a Knowledge Bank of rail research and information.

The content will encompass research project details, reports, conference papers, data files and news items. The Knowledge Bank will organise electronic and hard copy items currently distributed across CRC for Rail Innovation participants and stakeholders into a single online resource. Hard copy items will be managed as a dedicated section of the MG Lay Library's 40,000 item collection in Melbourne. In the first instance the Knowledge Bank will draw on information and materials from CRC participants and collaborators.

The CRC for Rail Innovation is providing the initial funding for setting up the Knowledge Bank. Access to the Knowledge Bank will be initially trialled to all parties via the CRC for Rail Innovation website. Discussions will be progressed over the coming months with stakeholders and funds providers to establish a sustainable funding model, which is a pre-requisite for long-term maintenance and open access of the Knowledge Bank.



International activities

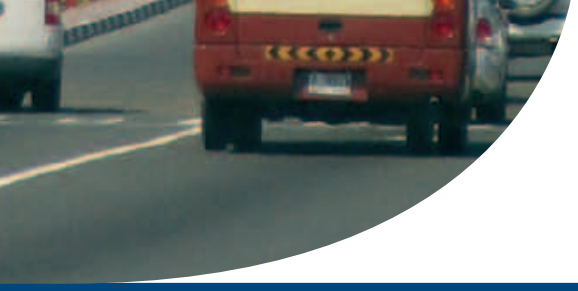
ARRB's international business has provided services and equipment in Europe, the Middle East, South East Asia, South Asia, Central Asia, the Pacific and Africa. The focus of international projects has been on institutional strengthening in areas such as infrastructure management, road safety, capacity building/knowledge transfer, and departmental structuring and strategic development. ARRB is also establishing new distribution chains for the African and South American markets. These activities were complemented by visits to ARRB from a number of overseas delegations, adding further to its growing international reputation.

Safety audit of Dubai roads

During the year ARRB completed a large-scale safety audit project for the Dubai RTA in the United Arab Emirates. The audit covered 1,906 centreline kilometres or 6,518 lane kilometres of the Dubai road network including freeways, expressways, arterial, collector and commercial roads. It was the first major audit program undertaken in the Emirates, and was one of the largest of its type in the world.

ARRB's team consisted of up to five auditors with two or three doing the field inspections while the others processed the findings in the ARRB Dubai office. The location of each finding was recorded using a global positioning system enabled digital camera which allowed each road safety issue to be accurately located, recorded and illustrated in the audit report. For each road audited, a comprehensive report was produced providing the findings and treatment recommendations.

The results of this project will help the Dubai RTA to identify potential safety risks and their location on the whole of the road network and consequently implement the recommended treatments to reduce risk. The project is considered one of the most important in the field of road safety in Dubai and action is already being taken by Dubai RTA to correct some of the road safety issues. It has opened up considerable work opportunities for ARRB as a pioneering firm in this field in the region.



International activities

Samoa – switch to driving on the left-hand side of the road

On 7 September 2009 Samoa became the first major country in over 30 years to make a switch in the side of the road on which vehicles are driven. The move to drive on the left-hand side of the road had the objective of improving accessibility to cheaper and better quality new and second-hand, right-hand drive cars from overseas.

ARRB was commissioned by the Office of the Attorney-General to provide an independent professional review of the planning and preparations for the switch, and give an opinion regarding its likely road safety implications, culminating in providing expert evidence to the Supreme Court.

Ethiopia – review of surface dressing practice

The African Community Access Program (AFCAP) is a research program funded by the UK Government Department for International Development which is promoting safe and sustainable rural access in Africa. Due to widespread road failures in recent years, AFCAP was asked by the Ethiopian Road Authority to analyse and understand the causes of these failures, and provide recommendations for improved practice. ARRB was one of two international consultants engaged for the project; the main tasks included the preparation of a report on the causes of the surface dressing failures, and recommendations for improved practice.

International Road Assessment Program (iRAP) in Vietnam

ARRB was contracted by iRAP to undertake key aspects of its World Bank funded road assessment pilot project in Vietnam. The first phase consisted of surveying more than 3,800 kilometres of major transport corridors including the main north–south route (National Highway 1) using an ARRB Hawkeye 2000 digital imaging system. The survey took four weeks to complete; the survey team was headed by ARRB with assistance from several Vietnam Road Administration staff.

A major component of the project focused on building local capacity to undertake future iRAP projects. Staff were trained to use the Hawkeye equipment, and information sessions were also conducted at four of the Vietnam Road Administration's regional road maintenance units during the survey to promote the iRAP concept.

International sales of equipment

A number of significant equipment sales were made outside Australia. These included Network Survey Vehicles for

- the Central Roads Research Institute in India
- the Road Development Authority in Sri Lanka
- Aurecon in South Africa
- GamComm Malaysia.

Operating performance

The commencement of 2009 saw the implementation of the organisational restructure which amalgamated the Research Division and the Consulting Division, moved Data Collection and Parking to the Systems Division, and created the Program Development Division as the program incubator. This has been a beneficial change for all Divisions, with Research and Consulting performing well and the Systems Division exceeding its budgeted revenue in all areas – Equipment, Luxmoore Parking, and Data Collection. Data Collection achieved national coverage by gaining contracts to conduct road condition surveys with all state road authorities.

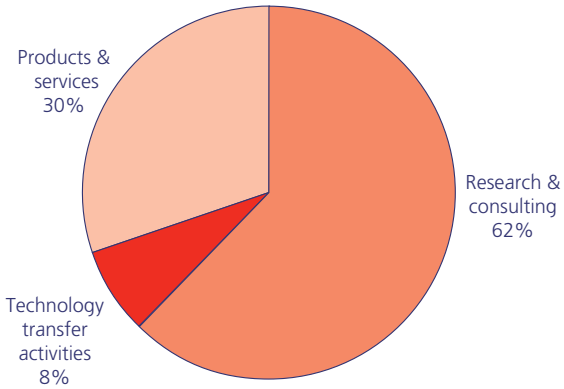
A number of initiatives were commenced such as: the start-up of Indian Road Survey and Management Pty. Ltd., the successful tender for the ROMAN II project with the Western Australian Local Government Association, and ongoing discussions with our member organisations in Western Australia and Queensland for the National Pavement Centres. In Dubai, work is continuing, albeit slowly, moving from the main customer, Dubai RTA, to diversifying into Abu Dhabi.

Internal system initiatives were implemented with a new financial management system and a new intranet site. Work commenced on the new staff performance management system.

In 2009 ARRB attained ISO accreditation for the manufacture of equipment through to the provision of data collection services. This together with the externally accredited Falling Weight Deflectometer (FWD) calibration, clearly establish ARRB as the centre for pavement condition monitoring expertise in Australia. ARRB maintained its Occupational Health and Safety accreditation and NATA accreditation for its laboratories.

A major activity in 2010 will be renewing the Technical Research Agreement with Austroads as the second three-year period concludes in mid 2010.

Revenue sources 2009



NCS INTERNATIONAL CERTIFIED QUALITY MANAGEMENT SYSTEM ISO 9001

NCS INTERNATIONAL CERTIFIED SAFETY MANAGEMENT SYSTEM AS/NZS 4801

NATA

About ARRB:

ARRB Group Ltd (ARRB) provides research, consulting and information services to the road and transport industry. ARRB applies research outcomes to develop equipment that collects road and traffic information and software that assists with decision making across road networks. ARRB is the leading provider of road research and best practice workshops in Australia.

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MATERIALS, PAVEMENT & CONCRETE DESIGN & TESTING | TRANSPORT POLICY, OPERATIONS & ECONOMICS | INFRASTRUCTURE ASSET MANAGEMENT | EQUIPMENT MANUFACTURE & DATA COLLECTION SERVICES | SAFE SYSTEMS | ROAD SAFETY | TRAFFIC ENGINEERING | HEAVY VEHICLE TESTING & SIMULATION | PARKING | LAND TRANSPORT RESOURCES & INFORMATION | KNOWLEDGE TRANSFER & CAPACITY BUILDING |

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