John Aitken

Director, JJ Aitken & Partners Pty Limited
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Australia
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Qualifications

Bachelor of Engineering, University of NSW 1974

Environmental Impact Assessment, Sydney University, 1983

Introduction to EMI/RFI/EMC, Interference Control Technologies, Melbourne, 1990

Measurement of Radio Noise Emissions, IEEE Standards Board, Dallas, 1993

Advanced Rail Safety Investigation Course, University of NSW 2003

Associate Member, Institution of Railway Signals Engineers

Accredited Person – Australian Communications Authority

Technical Papers

"Development of a Radio Propagation Model for an Open Cut Mine"
IREECON 20th International Electronics Convention, Melbourne, 1985

"Television Propagation at VHF and UHF in various types of Terrain",
IREECON 20th International Electronics Convention, Melbourne 1985.

"Does Centralised Control Mean Centralised Communications"
IRSE Technical Meeting, Sydney 1990.

"Outsourcing of Communications Networks"
IRSE Technical meetings, Adelaide, 1996.

"Australia Wide Communications for the CargoSprinter"
Proceedings Conference on Railway Engineering, CORE 2002, Wollongong, November 2002.

"Australia Wide Communications System for Railway Operators",
IRSE Conference, Adelaide, March 2003.

"Error Tolerant Communication Systems",
Rail Safety 2004, Sydney, February 2004.

Train Radio – A Solution
Railway Technical Society of Australia, Sydney, March 2004.

"You can get lonely out there"
(Reliability in railway communication)
Conference on Railway Engineering, Darwin, June 2004.

"Error Tolerant Communication Systems",
IRSE Sydney Technical Meeting, Sydney, December 2004.

"Fundamental Issues in Railway Communications;"
China Railways 2004, Beijing, December 2004.

"Teletype to Megabyte – 150 Years of Railway Communications", IRSE Conference, Sydney March 2005.

"Public Carrier Communications Technologies and Strategies for Low Traffic Lines"; IRSE Technical Convention, Singapore, October 2005.

Professional Experience

Director **Sep 1983 – Present**
JJ Aitken & Partners Pty Ltd
Consulting Engineers

Railway Communications

For Nortel, provided guidance on the introduction of GSM-R in Australia. Briefing papers, visited six countries to observe and report on the current status of GSM-R.

For Westnet Rail (Australian Railroad Group), documented requirements for driver-only operation when CDMA is the basic communication medium for calls to/from Train Control.

For the Railways of Australia, prepared a national frequency plan for the 403-420MHz band, providing a consistent frequency plan for train radio and associated services throughout Australia.

For the Department of Transport, NSW, assess the practicality of implementing Metronet radio on locomotives. Participate in workshops with interested parties to determine the feasibility of implementation of Metronet radio and the extension of the Countrynet system to the Sydney area.

For the Public Transport Corporation of Victoria, designed and specified a Flexible Communications System to revitalise train control for V/Line services.

For Westrail, prepared Specifications and Tender Documents for a Voice Switching System to provide train controllers with an integrated communications system. The Voice Switching System uses a PABX and LAN to combine voice and data communications over both telephony and mobile radio circuits.

For Railcom, performed a number of studies on the performance of the Government Radio Network and the Siemens equipment being supplied for the CityRail system.

For National Rail Corporation, a review of existing communications in all their freight terminals and shunting yards as well as developing a communications strategy for each centre.

For National Rail Corporation, production of Technical and Functional Scope for Train Radio, costing and planning for this project and associated tasks as well as supervision of tender.

For National Rail Corporation, prepared a detailed specification for the Adelaide Train Control Centre radio and communications equipment and including an Engineer's Estimate for the project.

For the State Rail Authority of New South Wales, provided advice on the radio interfaces required for their Combined Control Centre in Sydney.

For Westrail, prepared a specification for Automatic Test Equipment for train radio and microwave systems.

For Harris Corporation, prepared an RF survey strategy and proposal for the Queensland Railways signalling project.

For a major radio systems contractor, provided specialist advice on train radio for a large system being installed in South East Asia.

For National Rail Corporation, performed a benchmark study, establishing and comparing communications maintenance costs for the State railways. Studied and evaluated maintenance philosophies and determined the costs for a world's best practice approach.

For RailNet, preparing an efficient costs model for the communications area of State Rail based on world's best practice.

Railway Safety & Security Systems

For Westrail, designed and developed a Driver Assistance Video System which consists of cameras on platforms to allow the driver a clear view of the doors and side of the train which can be displayed on a colour television receiver in the driver's cab.

For Queensland Rail, analysis and design of a security system for each station. A CAD model was developed to assist in the analysis of camera placement.

For Teknis International Railroad Systems, and their Client Australian National, provided an analysis of the operation of an end-of-train monitoring system. Theoretical considerations were verified by measurement on the Trans Australia Railway.

For Westrail, investigation and design for an Emergency Telephone System for Perth Passenger Services, including extensive survey of current technology in this area.

For CityRail, designed an underground Emergency Communications system associated with the Underground upgrade project.

Train Radio – Infrastructure

For Westrail, designed and specified a Train Radio System for the Perth Urban Electrification Project. Measurements were performed at both VHF and UHF to determine the impacts of electrification, system designs were prepared and final recommendations given.

For Teknis International Railroad Systems, designed a low cost radio system for voice and data communications in low traffic railways. This system has been sponsored by the United Nations agency ESCAP and is being installed on the Maha Chai line of the Thailand State Railway.

For the State Rail Authority of New South Wales, designed a train radio system to serve the railway line from Sydney to Albury and the branch lines to Griffith and Lake Cargelligo. This project involved extensive map study, field measurement and coverage and site documentation of some 1,200 route kilometres. The design of the Train Radio system was closely integrated with the proposed SRA southern microwave system.

For the State Rail Authority of New South Wales, supervised a study of Train Radio requirements for State Rail. This multi-disciplinary study explored the operational requirements of the railway, available technology and the application of the technology in the railway. The study included the design of Train Radio systems to serve the CityRail area - a radius of about 100km from Sydney. The impacts of 1,500VDC electrification and the difficult terrain around Sydney were evaluated in detail. Coverage measurements were performed throughout the area and a design achieving better than 95% coverage was completed. The design included evaluation of radiating cable for application in the tunnels that form the Sydney underground network.

For the State Rail Authority of New South Wales, designed a train radio system to serve the railway line from Sydney to Brisbane. This project involved extensive map study, field measurement and coverage and site documentation for some 1,000 route kilometres.

For Freight Rail, specification of Train Radio system, including preparation of specification tender negotiations and assisting in factory and commissioning tests as well as conducting the Pilot Trial Working of the completed system.

Train Radio – Locomotive & RailCar Systems

For Teknis International Railroad Systems, advised on the licensing requirements for the ATCS Transponder/Interrogator systems. Supervised field tests on the equipment, negotiated with the Department of Transport and Communications and obtained licensing approval.

For the Rail Motor Society, advised on the application of train radio to their fleet of historic rail cars.

For United Goninan, advised on the implementation and interconnection of Metronet and CountryNet train radio equipment.

Rail Safety & Accident Investigation

For NSW Department of Transport, assisted in the investigation of communications aspects of the Hexham Incident in 2002.

For FreightLink, facilitated a risk assessment workshop regarding communications for the Tarcoola to Darwin Railway.

Expert Witness

For Expert Opinions, provide technical advice regarding an rail accident injury claim.

For the State Rail Authority of New South Wales, performed an analysis of alternative microwave and train radio designs for the Unanderra - Moss Vale lines. Appeared at the Commission of Inquiry as an expert witness for State Rail.

For Mackay Television Limited, appeared as expert witness before the Australian Broadcasting Authority Inquiry into the award of the television licence for Tieri.

Point to Point and Microwave

Design and specification of microwave bearers to replace the existing NSW railway microwave systems in Sydney, on the North Coast and on the Main Western Line.

Design of a 7 hop, 2 + 1 bearer 2GHz microwave system for Mackay Television Limited. Commencing from specified end points, this System's design has included route selection, survey of possible sites and choice of the optimum site for each repeater. Wherever practicable the microwave repeaters are co-sited with existing Mackay Television installations.

Assessment of the design (by others) of a 9 hop, 300 channel 2GHz microwave radio system to determine whether the proposed design would meet performance specifications. The analysis included detailed map study, path profiling and reflection analysis.

For Queensland Railways, design of a TDMA radio system to serve seven locations on the Cairns - Mareeba railway line.

For BHP Engineering, preparation of a frequency plan for microwave systems serving the railway line and other services for the Yandicoogina mine.
Design and specification of a 14 hop, 300 channel Systems 2GHz microwave system for Queensland Railways main electrification between Gladstone, Rockhampton and Blackwater.

Design of several multi-hop 7GHz systems for the Department of Defence Defcomnet microwave network.

Documentation of test procedures and factory tests for a 7 hop 60 channel 1.5 GHz system being installed by Plessey Telecommunications Pty Limited for SANTOS in the Moomba area.

Design of 11 GHz microwave for cross-city communications in Sydney between two offices of Leighton Contractors.

Analysis of the Mt Newman Mining Company's UHF Radio link along the 430 km railway line between the mine at Newman and Port Hedland. The study was undertaken to predict the effective remaining lifetime of the existing radio equipment, in terms of reliability and the maintenance effort required to maintain that reliability, in order that informed decisions could be made regarding retention or replacement of the radio system. It involved inspection of the equipment, spare parts, and test equipment, examination of the available documentation, and an analysis of the maintenance practices used by the company.

Electromagnetic Compatibility

For Burns Bridge, assess the impact of the Rockdale Gardens development on television reception in the Rockdale area. Develop remediation plan and provide technical supervision of the remediation work at 59 properties.

For Teknis International Railroad Systems, analysed the electromagnetic compatibility of the several voice and data radio systems to be installed on Australian National locomotives. Selected antenna locations and measured the coupling between the antennas. Provided advice on the implications of the coupling.

For VFJ Electronics, investigation of electrostatic fields in a product, evaluation of their impact and proposal of a set of solutions.

For OTC, measurement of electromagnetic fields in the vicinity of broadcast and television transmitters and microwave presence detectors.

For Cashmaster, evaluation of the design of a point of sale terminal.

For Westpac, through Barry Webb & Associates, measurement of electromagnetic fields at a number of potential computer centre sites. Detailed measurements at the selected site, advice to the building architects, preparation of a specification for a large screened room.

For R & I Bank, through Barry Webb & Associates, measurement of electromagnetic fields at two potential computer centre locations in Perth.

For the Commonwealth Bank, through Barry Webb & Associates, measurement of electromagnetic fields at a dealing room site at The Rocks, Sydney.

For the Electricity Trust of South Australia, analysed the impact of a proposed major television and FM broadcasting tower on mobile radio facilities at Mt Lofty.

Mobile Radio

For Mount Newman Mining Co, detailed field survey and antenna pattern analysis for a mobile radio system operating in an open-cut mine at Mt Newman, WA. The survey involved measurement of field strength throughout the mine and measurement of the radiation patterns of antennas installed on various items of heavy plant used in the mine. Recommendations of optimum antenna placement and the most effective antenna type were made. A detailed study of the meteorological conditions in the mine was performed to determine the extent of radio ducting conditions. Data for this study was obtained by digitising several years of chart recorder traces of

temperature pressure and humidity at three locations in the mine. Radio refractivity gradient data was then derived from computer analysis of this data. The propagation conditions were analysed to predict ducting effects on the availability of the system. A computer model of propagation in an open-cut mine was then prepared using the Geometrical Theory of Diffraction as applied to impedance wedges. The model predictions were compared with field measurements and applied to the model to produce contour maps of signal strength for present and future mine configurations.

For Systom Pty Ltd, and their client, the Melbourne and Metropolitan Board of Works, investigated the application of simulcast techniques in mobile radio systems. Documented alternative solutions and investigated equipment on the market.

For BHP Engineering, wrote a report on selective call systems for large mobile radio systems. The report analysed the application of selective call systems for their project and proposed a system design and application.

For BHP Engineering, determined the coverage achieved by data base stations and radio beacon transmitters and receivers for a computerised truck despatch system. The project was comprehensive, including the investigation of electromagnetic compatibility, commissioning and maintenance requirements.

For Warkwork Mines, a review of mobile radio communications, assessing current system and proposing a system design for operations, maintenance and data communications.

For Hunter Valley Communications, a review of the communications requirements at Lexington mine.

Broadcasting

For Channel 7, assisted in the analysis and costing of equipment for the conversion of their studios and networks to fully digital operation.

For the Australian Broadcasting Corporation (ABC), investigated the potential effects of Year 2000 issues on their broadcast studio and transmission equipment, auditing the analysis that had been performed by ABC staff.

For the Special Broadcasting Service (SBS), investigated the potential effects of Year 2000 issues on their broadcast studio and transmission equipment, auditing the analysis that had been performed by SBS staff.

For Gippsland Christian Broadcasters, assisted in the preparation of their community broadcasting licence application. Following the allocation of a temporary community broadcasting licence, designed, specified and commissioned FM studios and transmitting equipment for a high power broadcasting service.

For National Transmission Agency, controlled all transmission aspects of contract involving replacement of seven AM broadcasting transmission sites including site documentation, performance measurements, condition appraisal, tender documentation and assessment, contract supervision and documentation.

For National Transmission Agency, FM/TV Equipment Replacement Program for fourteen MF and FM/TV stations in Western Australia and Northern Territory including site visits, condition appraisal measurement work and preparation of tender documents.

Design of a supplementary transmission and transmitting system for Mackay Television Limited and preparation of technical documentation for the licence submission to the Department of Communications.

Preparation of contour maps of television coverage from a proposed site in Perth, WA, for Public Television (WA) Inc.

Design and documentation for the change of Technical Operating Conditions consequent upon the relocation of the Glenden Commercial and National Television Translators for Mackay Television Limited. Prediction of the coverage to be achieved by the translators combined with field measurements to determine the accuracy of the predictions and the effectiveness of the translator coverage.

For Gladstone Christian Broadcasters (Rhema FM Gladstone), advised on requirements for relocation of their transmitter site and coordinated with the ABA and the site owner.

Telephony & Data

For Telepower, supervision of the measurement of telephone and facsimile traffic at some 150 New South Wales State Government sites.

For Table Talk Poultry Farms, development of national and corporate communications strategy for voice and data. Implementation of the strategy.

For Hazelton Air Services, design and implementation of telephony and ground-to-air radio systems at Sydney and Cudal.

For GKN, analysis of data communication systems throughout Australia. Recommendations were made that would achieve substantial cost reductions and performance improvements.

For NSW Department of Youth & Community Services, analysis of existing communications in the south-west of Sydney. Presentation of results and recommendations for improved efficiency and effectiveness.

Analysis of communications facilities for Auscott, a pastoral company with offices and farms at seven locations in NSW. Recommendations were made for rearrangements to the company's PABX and data communications systems.

Electronic Design

For Nascor, design and documentation of a multifunction Neonatal Monitor, based on touch screen and personal computer technology.

For Nascor, supervision and review of the design of an oxygen mixing and measurement system. The system is battery powered with a graphical display and is designed to satisfy stringent electromagnetic compatibility requirements.

For Aitken & Hill, designed 50 W, 125 W, 500 W and 1 kW solid state AM radio transmitters.

Senior Engineer **1981 - 1983**
Priestley & Shearman Pty Limited
Consulting Engineers

Point to Point & Microwave

Design and specification of a 14 hop, 300 channel Systems 2GHz microwave system for Queensland Railways main electrification between Gladstone, Rockhampton and Blackwater.

Design of several multi-hop 7GHz systems for the Department of Defence Defcomnet microwave network.

Documentation of test procedures and factory tests for a 7 hop 60 channel 1.5 GHz system being installed by Plessey Telecommunications Pty Limited for SANTOS in the Moomba area.

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Broadcasting

Detailed design of television translator station in Queensland, including site selection, coverage analysis and input signal arrangements. Preparation of documentation for Department of Communications.

Site selection for MF AM Radio Station in Perth, WA.

EMC

Measurements of interference signals for a computer centre for the Commonwealth Bank.

Proof measurements of Defence standard screened room, under construction by Metal Fabrications Pty Limited for the Department of Defence.

Telemetry

Detailed design and factory testing of 30 site UHF Telemetry System being provided by Plessey Telecommunications for SANTOS wellhead telemetry equipment at Moomba, Gidgealpa and Tirrawarra.

Senior Engineer & Engineer Class 2 **1979 - 1981**
Telecom Australia
Radiocommunications System Section
Private Communications Group

Radio Systems

Installation and commissioning of Sydney Mobile Radio Telephone System (PAMTS) Radio Network.

Specification and supervision of installation and commissioning of Radio Communications Systems. Projects included 1800 and 300 channel broadband microwave systems, any 24 and 60 channel medium capacity systems and numerous 12, 6 and single channel telephony systems.

Rearrangement of the Sydney Telefinder paging system and installation and commissioning of the Wollongong and Newcastle paging system extensions. Design of special purpose test equipment for transmitter phasing at widely separated sites.

Design of low cost "package" installation for solar powered radio telephones for use in remote areas.

Implementation of Telemetry and voice systems for:
- Sydney - Newcastle Oil Pipeline
- Sydney - Newcastle Natural Gas Pipeline
- Young - Wagga Natural Gas Pipeline
- Dalton Canberra Natural Gas Pipeline.

Senior Engineer **1979 – 1981**
Engineer Class 2 **1975 – 1977**
Engineer Class 2 **1974 – 1975**
Telecom Australia
Primary Works (Country & Metro No 3)

Cable & Conduit Construction

Responsible for professional and sub-professional staff engaged in design and specification of cable and conduit installations in the Monaro, Riverina and Western Areas of New South Wales. Responsible for field staff (200) engaged in the implementation of these major capital works.

Responsible for design (from briefs supplied by planning engineers), preparation of estimates and specifications, supervision of installation and commissioning of all major Telecom cable and conduit installations in the ACT. Co-ordination with National Capital Development Commission Engineers, their Consultants and Contractors involved in the construction of new suburbs, town centres and major roads.

Design and installation of coaxial cable systems in Black Mountain Tower, planning and supervision of cable cut-overs.

Administration of construction camp accommodating over one hundred linemen.

Supervision of construction staff (60) engaged in major conduit and cable installation in Sydney Area. Supervised contract installation of a submarine river crossing for cables.