The BROADCASTER

Newsletter of the Broadcasting Division

No. 19 March 1991

MOUNT GOONANEMAN, WIDE BAY, QLD.

THE BROADCASTER

The Broadcaster is the in-house newsletter of the Broadcasting Division and is published three times a year to inform and recognise the people who make up this organisation.

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EDITORIAL

One of the articles in this issue concerns the manufacture of coaxial feeders.

The coaxial feeder was developed by Charles Franklin, one of the great engineers of the Marconi Company and was one of many of his outstanding inventions.

Franklin designed the short wave transmitter and the flat grid aerial which became famous as the beam service, giving Britain an all Empire globe-girdling system of radio communication in the 1920's.

The aerial which Franklin developed, consisted of a multiplicity of vertical half wavelength wires with reflectors. The array had a zig-zag form to provide a non-radiating phase reversing device.

At the time, no one had developed a transmission line to carry high powers at high frequencies or an unbalanced non-radiating feeder system to feed a large number of aerial elements in phase.

Under great pressure to get the system operational, Franklin invented the concentric feeder—the forerunner of the modern coaxial cable.

Today, the solution would be regarded as straight forward engineering, but in the 1920's, with absolutely no precedent to guide him, it was a brilliant solution carried out at astonishing speed.

JACK ROSS

Front Cover: Tower after removal of top section.

Contributors to this issue:

Leon Sebire	Bryan Madeley	Cliff Moule
Roy Badrock	Ron Johnson	Janis Ozolins
Greg Duncan	Graham Riddy	Gordon Hall
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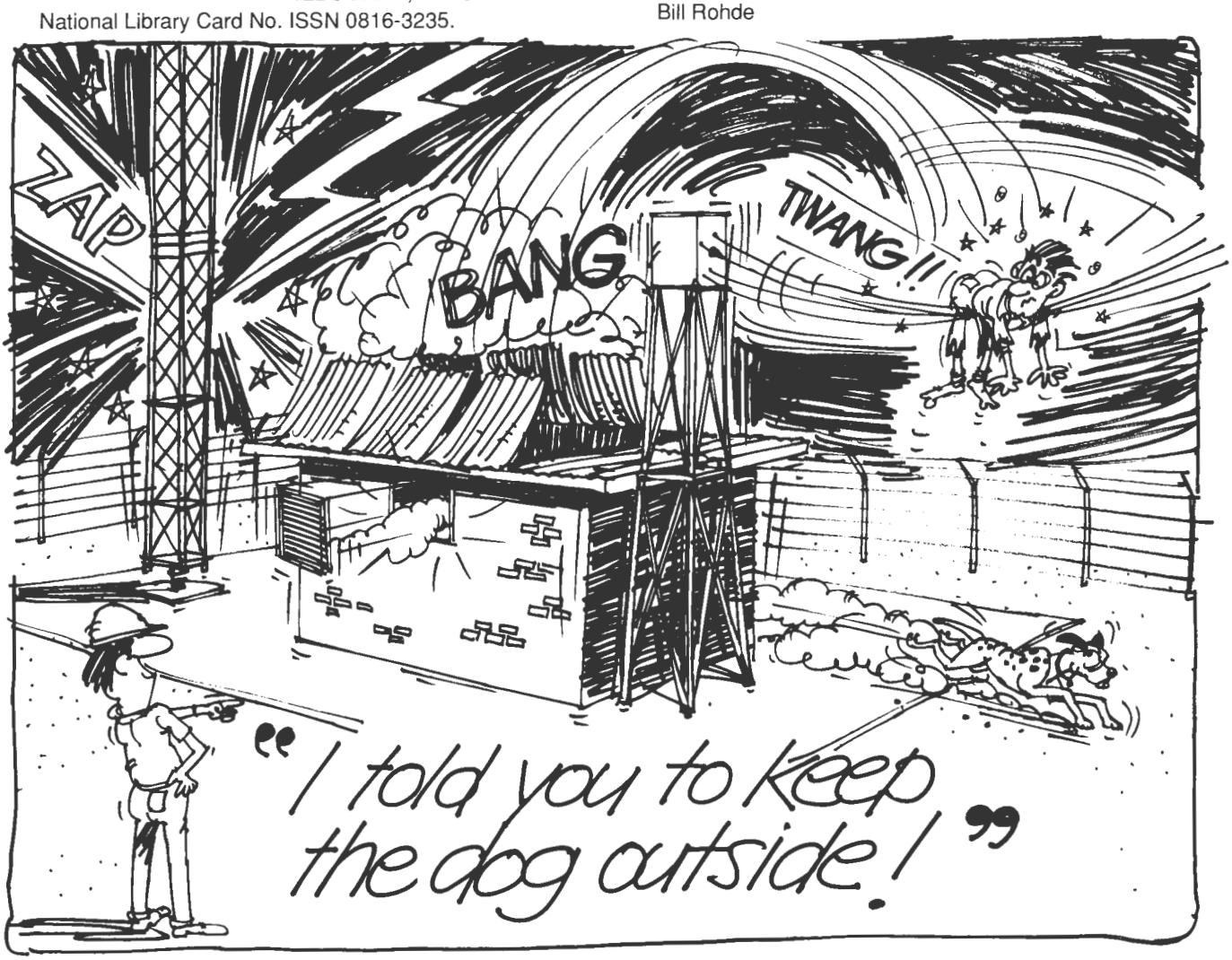


Leon Sebire

I am fortunate that from time to time I have the opportunity of travel overseas to represent our organisation at international broadcasting conferences. Our broadcasting organisation is unique in Australia but it has counterparts of various size and configuration elsewhere in the world. Through the venues of the Asia-Pacific Broadcasting Union and the Commonwealth Broadcasting Association conferences, I have met broadcasting executives from more than 100 countries and my wife Jenny and I now count many of these, their wives and families, among our best friends.

The international broadcasting conferences, as well as providing the opportunity to meet with our industry peers, provides scope for comparisons on how our operation rates against others. I am proud to say that we rate very highly both in our Asia/Pacific region and the larger world. I have presented many papers on our activities at these conferences and I continue to receive requests for more details or advice for some years after these contributions have been published.

At the same time participation in such events provides advance insight into many new innovations and developments in the industry. While recently at a CBA conference in Cyprus it was extremely interesting to learn of the BBC's developments in relation to digital sound broadcasting—a technology which is certain to make other forms of radio broadcasting obsolete, probably within the next decade.

The use of computer techniques to provide audio storage on hard disks and instant recall in the studio area is also developing rapidly and our colleagues in the ABC are probably more advanced than any other broadcaster in this technology.

Overall, there is much to be learned from interaction with other broadcasting organisations and the benefits far outweigh the work involved in producing papers and lectures which I believe are a prerequisite to attendance.

LEON SEBIRE

General Manager, Broadcasting

STATION ROLL CALL

ABD6 DARWIN

Station ABD6 is located at Darwin, the administrative centre and capital of the Northern Territory. Darwin is a relatively small city but its value to the country cannot be judged merely by its size. It is an important terminus of road, sea and air communications and has a large military base with airfields and a naval post.

After the devastation of the city by Cyclone Tracy on Christmas Day 1974, an air lift evacuated 30 000 people and a commission was set up to rebuild the city. The major work of rebuilding was completed by the late 1970's and multi-storey buildings replaced most of the buildings which dated from the time Darwin was a frontier town. In the early 1980's a new satellite city named Palmerston was built 20 km east of Darwin.

The station was commissioned on 11 August 1971 using two 1 kW Toshiba TV-41A transmitters operating in parallel mode. They were located in a large brick building erected primarily as the Darwin broadband radio communication terminal.

The antenna system is an RCA/COEL dual channel phased array of screen back dipoles and gives a pattern with a mean ERP of 10 kW including a lobe of 20 kW ERP. The support tower is an EPT 76 m high lattice steel structure which also accommodates the radio-communication antennas. The feeder is a 50 ohm semi-flexible pressurised air dielectric type.

The transmitters were replaced on 14 August 1986 by two NEC units with one being a 5 kW transmitter derated to 2 kW and the other a 1 kW standby unit.

Programs were originally provided by tape replay from ABC Darwin studios and later via the broadband microwave network from Brisbane. Two dishes were subsequently installed by the ABC and programs provided via Intelsat. The AUSSAT satellite is now used with live news and current affairs being produced in Darwin.

BARRIE MORTON

8TC TENNANT CREEK

Broadcasting station 8TC Tennant Creek was the third station commissioned in the Northern Territory. It went to air on 11 June 1960 on a site at the southern end of Patterson Street using two 50 watt vacuum tube transmitters manufactured by Commonwealth Electronics. They operated in a main/standby mode and fed a T type antenna supported by two 21 m high towers. Transmission line was a buried coaxial cable which terminated in an antenna coupling unit mounted in a small metal box on the earth mat under the antenna wire.

The building comprised a single room which accommodated the two transmitters, a control desk and rack mounted equipment. Power was supplied from the power house of a nearby gold mine and a special regulator was installed at the transmitter to minimise wide fluctuations in voltage during operation of mining equipment.

In 1973 the service was upgraded with the installation of two AWA 500 watt transmitters operated in a parallel mode and a 49 m vertical radiator. This was necessary in order to cater for growth in nearby mining settlements, particularly in the Warrego area.

When a high frequency inland service station was established on a site on the Peko mine road, 8TC was relocated at the new site, about 9 km east of its original site. A 1 000 watt Harris solid state transmitter was installed and this has resulted in improved reliability of service.

Programs for 8TC are provided via the Darwin studios of the ABC and are a split off the Darwin-Alice Springs program circuit. In common with other NT stations, 8TC has operated on a 24 hour schedule for some years.

The maintenance of the station is carried out by the NT Maintenance Group based in Darwin, more than 1 000 km north of the transmitter.

BARRIE MORTON

END OF AN ERA

MARCONI TV TRANSMITTERS REPLACED AT ABS2 MOUNT LOFTY

"We are sad to announce the closing down of the original Marconi transmitters which have seen continuous service for the past 30 years." This was the announcement which preceded an invitation to about 20 people to gather for a "Ceremonial Close-Down Function" held at Mount Lofty on 11 October 1990 at 2.00 p.m.

So the group of past and present staff who had worked on the original ABS2 transmitters came with suitable tools, and dressed in original issue dustcoats and overalls to put the "Old Faithful to rest".

The property in the Adelaide Hills used for the National TV Service was acquired by the PMG Department in June 1943 and was first used to provide part of a 40 MHz radio link to Kangaroo Island. Later, the hut was crowded with a variety of radio equipment, so a new building was built in 1959 to house the TV equipment.

(L to R) Graham Shaw SA/NT Regional Manager, Peter Rowe, Cliff Moule, Eric Barnden, Uido Tamme, Bruce McGowan, Lew Grubb.
(Front) Rod Jolly, Peter Williams, Rawdon Mitchell, Harold Stanford, Wes Graham.

The bulk of the Marconi equipment arrived on 15 October 1959 in 158 packing cases. Fortunately, Mount Lofty had been made a temporary bond store, so installation proceeded as fast as the cases could be opened. We were assisted by three Marconi engineers, Peter Naish, Geoff Wheeler and Tom Brand, who worked on similar installations in Brisbane and Perth as well as new TV links for Melbourne. Bryan Madeley (now with SBS) came from Central Office to assist our local engineers, Ted McGrath, Jack Truss and Brian Hammond—so the poor technicians were almost outnumbered on several occasions.

During installation, the frequent fogs and cloud stopped work on the positioning of aerial panels and feeder cables on our site, but the adjacent commercial contractors pressed on regardless. One day, whilst we were unpacking cases, a most annoyed voice came out of the thick fog from the Channel 9 tower, "I tell you, the bloody thing won't fit." There was somewhat more restrained language from our lines staff, headed by Don Beames, when they struck trouble because they were working right on the boundary of St. Michaels Anglican Seminary.

Our training course in Melbourne was very helpful in several ways; good lectures at Central Office, lectures and practical at RMIT, visits to ABV2 Mount Dandenong, and by boarding at the same guest house, good staff relationships were formed. While talking about the future installation, a few of us with transmitter experience decided that we would need a better alarm system than that provided at AM transmitters, so on our return to Adelaide, the idea of an integrated phone and alarm system was submitted to Jack Truss (Class 3 Engineer TV), who approved the plans. Before the installation started, Uido Tamme had all the bits and pieces to make a three alarm system with different tones and spacing to cover urgent, non-urgent, telephone and front door alarms—all fed into a public address system.

The opening night, 11 March 1960, was almost marred by one of the link receivers at Mount Lofty failing within an hour of the big event. Brian Hammond and Lew Grubb were greeted with a strong smell of burning on opening the link hut door, and they had to cut the ties around a melted cable form to find where an HT supply had shorted two filament wires.

Mount Lofty transmitter hall with the new NEC PCN 1410AL transmitter (R) and NEC 20 kW FM transmitters.

There was no air conditioning supplied initially, but in spite of the extreme differences in temperature, inside and outside, we reckoned that we were a healthy lot, until after two years, the first sick leave had to be taken by Lew Grubb with a bee sting at home, with one of his own bees.

The air conditioning came eventually after taking many temperature readings with any "important" visitors carefully taken on a guided tour to the hottest spot behind Vision 1 transmitter, and explaining the details of the VSB filter, combining filter, etc.

We were always happy to work on the Marconi equipment. It was solidly built and reliable, and when colour came, minimum alterations were required—a little more power from the modulator and a change to a diplexer to meet specifications.

So, we say farewell to almost an old friend who gave such sterling service for 30 years.

CLIFF MOULE

SHORT INTERVAL AUDIO TESTING

Following the formalisation of the contract between Telecom Australia and the Department of Transport and Communications for the design, provision, operation and maintenance of the transmission facilities of the NBS, it became apparent that changes would be needed to some of our operational practices if we were to comply with many of the Department's new requirements. In particular, the need to maintain transmissions at all times and yet carry out regular audits of service performance will require the introduction of new and specialised testing techniques in order to avoid interruptions to program content.

Of course, in the case of television transmission systems, it has long been possible through the use of Vertical Interval Test Signals (VITS) to establish video system performance without interrupting service to viewers. However, the problem of assessing the sound side of broadcasting services, without interfering with the program, has taxed the ingenuity of broadcasting engineers for many years.

Some of our older staff may well remember, that as far back as the early 1960's, the then Central Office Radio Section in Melbourne produced a small quantity of automatic program monitors built to BBC specifications and introduced them into the NBS on an experimental basis. Similar updated units were also tried again experimentally in the late 1960's and also in the early 1970's before the concept was finally abandoned. It is interesting to note that the early TETRA, ADAM and later ACTTS station monitoring units had their foundations in this early automatic monitoring investigatory work.

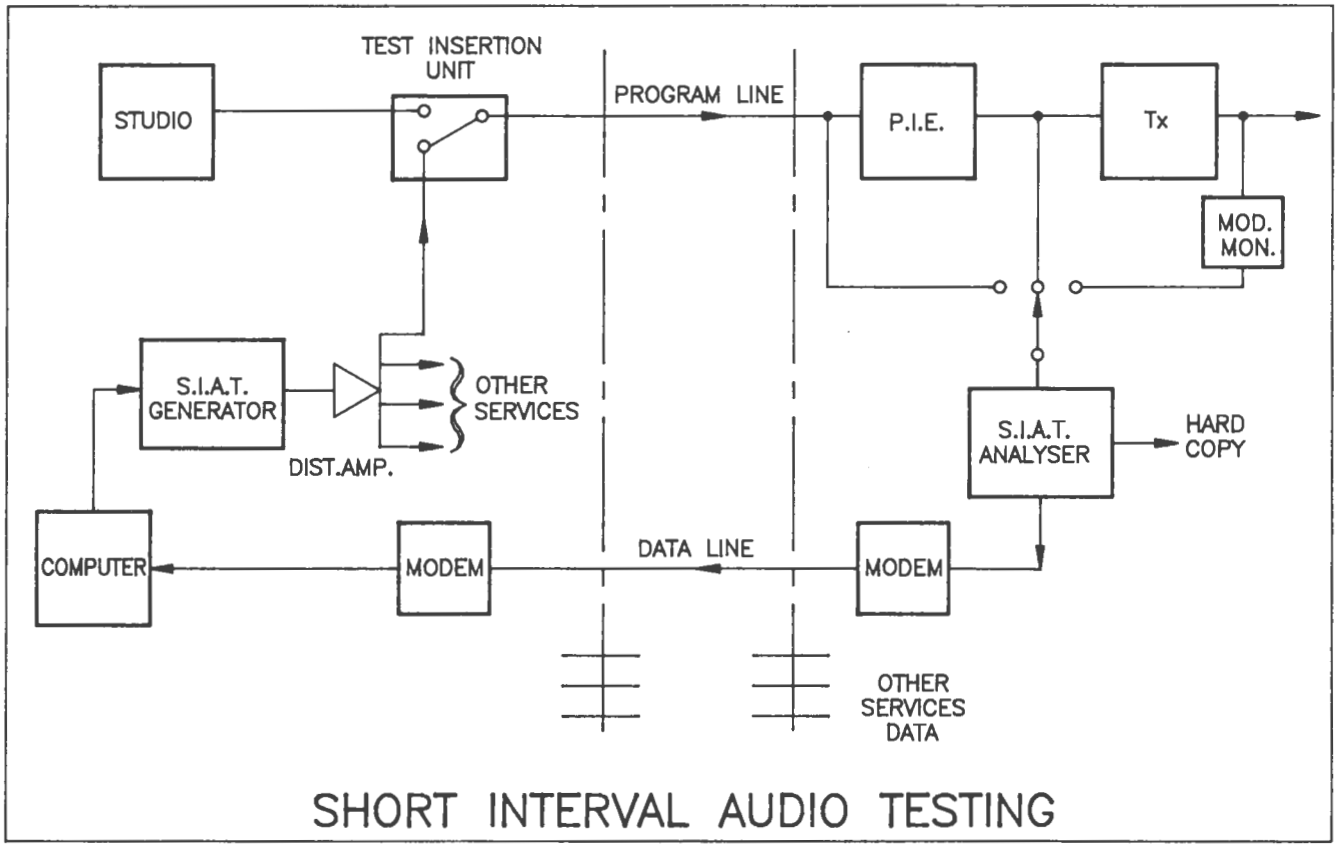
During the 1970's it became apparent to the industry that what was really required was a unit that could test and fully analyse the performance of a sound system rather than just switch equipment in and out of service and as a result, the first short interval audio tester (SIAT) was developed in Sydney by AWA. This particular equipment, which was made possible by the quite considerable advances in solid state technology by that time, formed the basis for the current range of SIAT systems, currently available throughout the world today.

The problem today, as in the past, is that when analysing the performance of an operational sound transmission system, the test tones are audible and thus objectionable to the listener. The principle of the SIAT system is to limit the annoyance factor by sending a short burst of tone information, typically lasting between 5 and 60 seconds and then analysing the result in a special receiver/analyser at the output of the transmission system under test.

Modern SIAT systems comprise a separate generator and receiver whose flexibility can be extended by placing them under the control of a computer. Equipment of this type can perform a wide range of tests on both mono and stereo systems, typical of which include frequency response, harmonic distortion, intermodulation distortion, cross talk, phase/level difference between stereo channels, noise (both weighted and unweighted) and channel transposition.

The test results obtained, depending on the brand of receiver in use, can be presented in the form of an instant hard copy printout of all results, an LCD display of individual test results, via a data line to a remote point or in conjunction with a compatible computer, be stored and displayed as and when required. The use of computer controlled SIAT equipment opens up the possibility of the automatic testing of a large broadcasting network.

ROY BADROCK



SHORT INTERVAL AUDIO TESTING

SPECIAL BROADCASTING SERVICE

Prior to the mid 1970's, foreign language broadcasts were restricted to 2.5% of a station's transmission time. All such broadcasts in languages other than English were accompanied by an English translation. These restrictions were part of Government policy which stressed the need for assimilation of migrants into Australia's predominantly Anglo-Saxon society.

Entrepreneurial interests in the Greek and Italian communities in Sydney and Melbourne had been pressing for commercial radio station licences for some time as their communities were large enough to support such stations from advertising revenue. Other migrant groups, however, wanted broadcasting for ethnic groups to be supported solely by the Government as their communities were too small to support a commercial radio approach.

During July 1974, the Department of the Media, which at that time was responsible for broadcasting policy and licensing, considered applications for a subscriber type service to provide programs to the Greek and Italian communities in Sydney and Melbourne. A number of difficulties were foreseen, particularly in the political field and no approvals were granted.

Early in 1975, the Government accepted a scheme developed by the former Minister for Immigration, the Hon. A. Grassby, who had then been appointed Special Consultant on Community Relations. He proposed establishing a three months radio experiment in Sydney and Melbourne to inform ethnic communities of the Government's plans to establish the Medibank scheme. The experiment was seen as a means of providing a test bed for a permanent ethnic radio service.

Stations 3EA Melbourne and 2EA Sydney were established in June 1975 on an experimental basis and a committee was to report to the Government at the conclusion of the experiment. The stations were placed under the control of the Attorney-General's Department and broadcast in seven languages in Sydney and eight in Melbourne.

The demand for ethnic broadcasting was demonstrated beyond doubt and the Government agreed to extend the experiment for a further six months. Responsibility for the stations was transferred to Department of the Media.

In September 1976, the Government requested the ABC to establish a permanent ethnic broadcasting service. However, in June 1977 the Government withdrew its offer to the ABC to establish ethnic broadcasting on the grounds that the ABC's estimates to operate the service were unacceptable.

In January 1978, the Special Broadcasting Service was established and assumed responsibility for 2EA and 3EA.

2EA studio facilities
(Courtesy Renzo Tonin and Associates).

3EA transmitter No. 1.

During August 1979, 2EA relay transmitters were established in Newcastle and Wollongong. Both stations employ 150 watt transmitters. The Newcastle transmitter operates on 1584 kHz and feeds a 30 m omnidirectional aerial while the Wollongong transmitter operates on 1485 kHz and feeds a 32 m omnidirectional aerial.

The 500 watt 3EA transmitter was replaced by a 5000 watt unit on 26 January 1980. It operates on 1224 kHz and feeds a 61 m directional aerial system at Craigieburn.

In July 1980, the 2EA transmitting facilities were upgraded with the installation of a 5 kW transmitter and a 54 m directional aerial system. At the same time the station frequency was changed from 801 kHz to 1386 kHz. On 9 December 1988 the transmitter was destroyed following a direct lightning strike and a Nautel 5 kW solid state model later installed.

BRYAN MADELEY

OUR BROADCASTING PIONEERS

MR J. J. (JIM MALONE)

James (Jim) Malone as Chief Officer of the Post Office Wireless Branch for 20 years during the formative period of broadcasting, played a major role in the determination of policy and in the administration of the Regulations associated with the establishment and operation of the National and Commercial broadcasting services in Australia.

He was born on 24 August 1883 and joined the Post and Telegraph Department as a Telegraph Messenger at Lismore in northern New South Wales in 1898, before Federation. In 1900 he was Assistant (Relieving) at Lismore and as a result of a competitive examination was appointed to the Telegraph Engineering Branch, Sydney, in 1906. In 1907 he was appointed Cadet in the Electrical Engineers Branch.

From that time, he occupied a number of engineering positions including Telegraph Testing Officer, Sydney, 1911; Engineer for Cables, 1912; District Engineer, Goulburn, 1913; and, until 1915, Engineer for Lines in Queensland.

Jim Malone

He then enlisted for War Service and was immediately appointed Instructor in Wireless at the Wireless School, Moore Park, Sydney. He was sent to the War front and placed in charge of all the AFC Wireless activities in France. He had the honour of being awarded the Military Cross for service.

After the War, Jim remained in Europe for more than a year, studying wireless developments that had taken place in various countries during the War period. At one stage, he was at the RAF Wireless Experimental Establishment, Biggin Hill and the Signals Experimental Establishment at Woolwich in England.

On his way back to Australia, Jim spent five months in the United States where he made a detailed study of the latest technology developed there, particularly in advances in vacuum tubes, radio telephone transmitters, antenna systems and receiving equipment.

In 1919, on resuming duty with the Department, he was appointed Deputy State Engineer, Perth, but when the Department was given back the Coastal Radio Station Service from the Navy, Jim was transferred to Central Office, Melbourne, to take charge of the Service. The Radio Service was transferred to AWA in 1922 and he was then appointed to the position of Controller of Wireless.

In 1922, he was Technical Adviser to the Parliamentary Committee on Wireless, and later prepared the Wireless Telegraphy Regulations and oversighted the introduction of the broadcasting service. In 1923, he was the PMG's Department representative at the Conference convened by the Government for the purpose of obtaining the views of various organisations and representatives for establishment of broadcasting in Australia. He was instrumental in preparing the Regulations which were gazetted on 1 August 1923. However, Mr Malone did not fully support the scheme, known as the Sealed Set Scheme, which those at the Conference had recommended. As he had anticipated, the Scheme was a failure and on 11 July 1924, new broadcasting Regulations which he prepared, were introduced into Parliament creating two categories of stations, designated A Class and B Class. The A Class stations were to be funded by listeners' licence fees while the B Class stations were to be supported by revenue from paid advertisements.

The Regulations set the pattern for the present day broadcasting system in Australia with the A Class stations later becoming part of the National Broadcasting Service and the B Class stations becoming known as Commercial stations.

In more recent times another class of broadcasting, known as Public broadcasting has been introduced. There are three sorts of Public radio licences comprising community, educational and special.

One of his actions with the impending introduction of broadcasting was to establish an office of Radio Inspector in each State to oversight the technical and licensing aspects of broadcasting, to issue certificates of competency, to conduct examinations for technical staff involved in the operation of the stations and to investigate interference to broadcast reception.

The Radio Inspectors performed an important role. They carried out regular technical inspections to ensure that the standards of transmitting and studio equipment were being observed, they undertook inspections of homes to ensure that those listeners who possessed a broadcast receiver possessed a current licence and they handled complaints from listeners concerning program matters.

In 1923, his position was designated Chief Manager, Telegraphs and Wireless and in 1927 it was changed to Chief Inspector (Wireless).

On 8 June 1939, he was appointed Deputy Director, Queensland, and on 8 November 1944 transferred to Sydney as Deputy Director, New South Wales.

Mr Malone retired on 23 August 1946 and became the first Chairman of the Overseas Telecommunication Commission, a position he held until 22 August 1954.

He was an active member of the Institution of Radio Engineers from its inception, and held the office of Chairman during the period 1935 to 1937. He was also a member of the Institute of Electrical Engineers and member of the American Institute of Electrical Engineers.

Mr Malone was awarded the Order of the British Empire for services to the Department and following retirement he settled in Sydney where he passed away in May 1967, in his 84th year.

JACK ROSS

6CA—REGIONAL AGRICULTURE

Station 6CA is located at Carnarvon on the Gascoyne River 990 km north of Perth and was commissioned on 26 February 1964.

Facilities comprise two Commonwealth Electronic 200 watt transmitters operating in a main/standby mode and feeding a 31 m high omnidirectional radiator mounted on a concrete column 1.8 m high because of flood problems. A local 1 kW Commercial station has been co-located with 6CA and shares the radiator.

The Gascoyne River which provides water for the crops rises in the north of the Robinson Ranges, flows westwards for some 680 km and enters the sea at Geographe Channel. The town of Carnarvon stands at its mouth and there are more than 160 plantations along the river banks.

The climate of Carnarvon is suited to the growth of tropical and sub-tropical fruits. Temperatures in autumn, winter and spring are ideal for vegetable crops. Rainfall occurs irregularly and can be expected in either winter or summer months. The alluvial soils of the plantation area are loamy fine sands or silty loams. They are well drained and alkaline.

The plantation area comprises 1 700 hectares of which 750 are cultivated. Vegetable crops contribute about 41% of total income and fruit tree crops the remainder. Carnarvon provides 15% of the State's vegetables and 70 to 80% of the bananas. Vegetables are mainly produced from May to January with peak production from August to November. Bananas are harvested throughout the year with maximum production from October to April.

6CA radiator and coupling unit.

The Gascoyne Research Station plays an important role in the district agricultural activities. It was established in 1922 but there was very little developmental work undertaken until 1941 when 700 banana plants and a number of other tropical fruits were planted on a small cleared area and watered from the nearby Gascoyne River. Today, the station has 16 ha cleared and cultivated.

The principal vegetable crops grown in the area include beans, capsicum, carambola, cucumber, pumpkin, rockmelon, watermelon, tomato and zucchini. Fruit crops include avocados, bananas, cashew nuts, citrus, custard apple, coconut, dates, jackfruit, jojoba, macadamia, mango, papaya, pecan nuts and pineapples.

The surrounding area also supports a thriving pastoral industry. Individual properties are usually very large and the land is held by pastoralists on long-term lease from the Government.

In the Exmouth/Carnarvon Shire district there are some 3 500 cattle and nearly half a million sheep.

GORDON HALL

Typical high fertility alluvial soil of plantation area.

Bananas, the most valuable single crop. Average yield per bunch highest in Australia.

Tomatoes, the major vegetable crop grown in Carnarvon.

HAZARDS IN RIDING A BICYCLE

When 5CK Crystal Brook was commissioned in 1932, the Officer-in-Charge was provided with a residence on site, but all other staff found accommodation elsewhere in the district and travelled to work by their own transport. One rode a horse, but bicycles were the most popular means of getting to work. Very few technicians could afford a car in those days.

One of the operators lived in the nearby township and rode his bicycle over the rough gravel road, which was a bad hazard, especially during the night.

One very wet winter night, after a late shift, he was making his way home, dodging potholes in the road, when a heavy downpour began. He was going down the hill at a rapid pace just before reaching the township, when the front wheel became wedged in a deep rut. The bicycle fell sideways and the operator hit the ground heavily. He sustained severe cuts and bruises, and the bicycle was in a terrible mess. Fortunately, he was only a short distance from home and walked there, dragging his bicycle with him.

When he arrived home, his wife immediately called the doctor. His injuries put him off work for a week.

Three days after resuming work, he was again on the late shift. The weather was the worst it had been all winter. The rain pelted down, the wind howled, and it was bitterly cold. He rugged up as well as he could with the clothes he had, but on going outside, he felt as though he was about to freeze to death, so he returned to the transmitter building to think things over. He decided that the best way to brave the weather was to put his coat on back-to-front, so that the wind and rain would not pass through the flap and button-holes, and to put a cardboard box over his head with two holes to see through. There were plenty of cardboard boxes used for packing transmitter valves, so he had no problem in selecting one of the appropriate size to fit over his head.

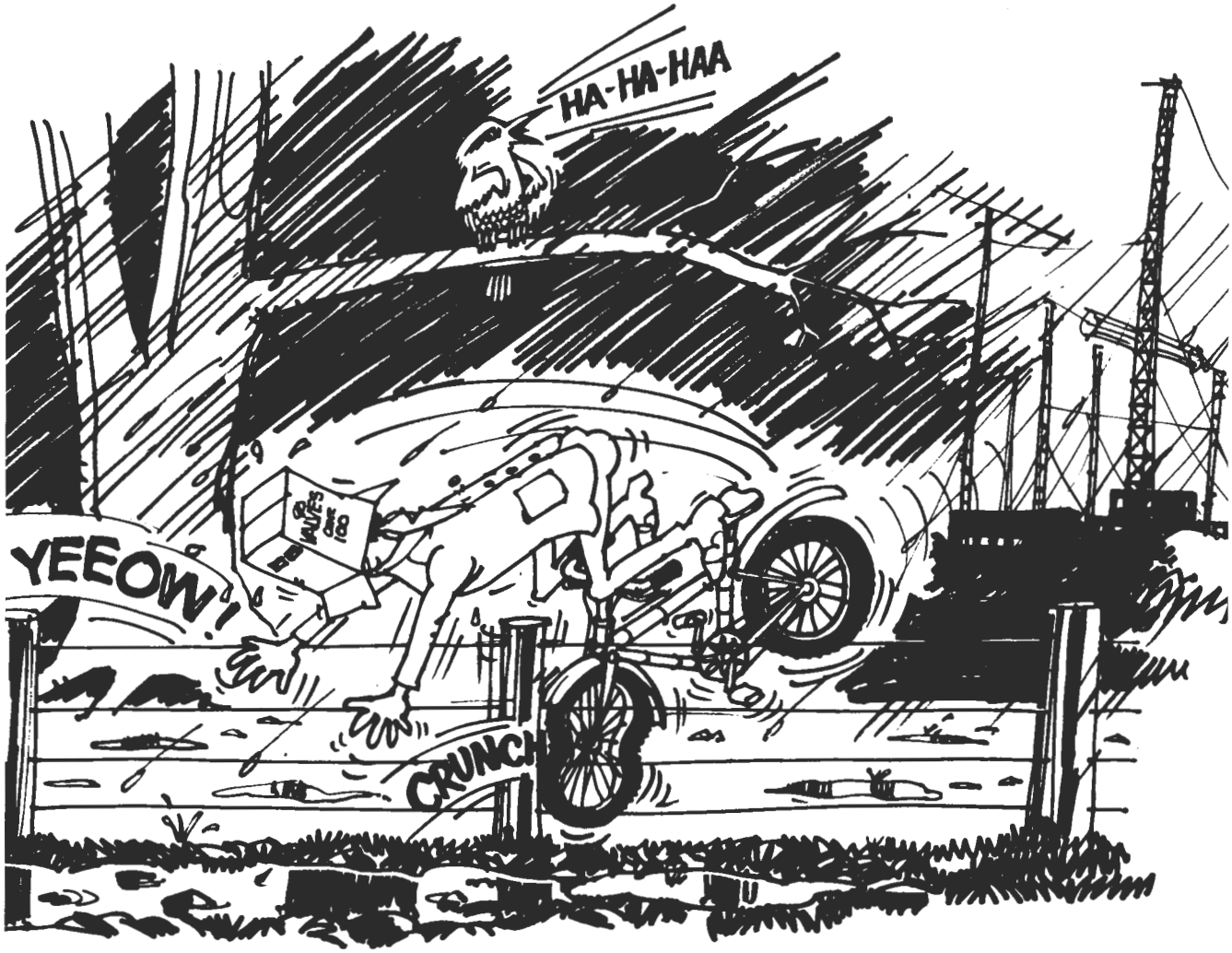
Everything went all right until he began to descend Billygoat Hill where he had the accident about ten days previously. Unfortunately, when he applied the brake, the cable broke, and as the bicycle increased speed, he was having extreme difficulty in keeping it upright. The Ned Kelly type cardboard box hat wasn't helping either, so he took one hand off the handlebar and tried desperately to remove the box. He shifted it slightly, but it caught on his nose and he lost sight of the road. The bicycle crashed into a wire fence on the side of the road and catapulted him into the air and over the fence. Fortunately, he landed on soft dirt, and except for the fact that he was covered in mud from head to toe, he was not injured. The front wheel was bent in the middle, and it looked like two semi-circles. Once again he had to walk home and drag the bicycle.

On arriving at his house, he found that his wife and young daughter had only just arrived home after having been to a church social. As he was putting the key in the front door, his daughter heard him and rushed up the passage to greet him.

When she saw him she gasped. He stood there covered in mud, his coat torn, and on back-to-front.

"Mummy, Mummy, come quickly", she shouted. "Daddy has had another bad accident. This time his face is twisted around to the back."

JACK ROSS



Assembly and testing of 16 way UHF power divider for China.

Inside view of partially assembled antenna.

Band III TV panel array for TCN9 Sydney.

UHF—TV ANTENNAS

DESIGN AND MANUFACTURE IN AUSTRALIA BY RFS

Radio Frequency Systems Pty. Ltd., is well known to readers of *The Broadcaster* as a major supplier of TV and MF antenna systems for both National and Commercial services. The company grew from the marriage of Antenna Engineering Australia, a subsidiary of kabelmetal electro GmbH of West Germany, and Hills Industries, Antenna Systems Division. There are two factories operated by the organisation, one in Melbourne and the other at Lonsdale, an Adelaide suburb, where there is an extensive antenna test range. Staff include 15 professional engineers and 160 technicians, skilled tradesmen, assemblers, administration and sales staff.

All broadcasting products are concentrated in Adelaide, whereas HF/VHF/UHF and microwave antennas, filters, multicouplers, combiners, coaxial cables and waveguides are handled in Melbourne.

The company endeavours to manufacture the greater part of its needs "in house". Facilities include the latest in NC machines, drilling and welding robots and full MIG and TIG welding for stainless steel and aluminium. An extensive quality control system is in force at each factory.

At the company Adelaide Broadcasting Division plant, the manufacture of an antenna from receipt of an order to completion is a complex task and takes between 16 to 22 weeks, depending on complexity of the antenna.

The complete factory process involves design work, drafting, specialised fabrication, assembly and testing. In general, the only imported components are the antenna phasing cables.

Use is made of subcontractors to produce some specialised components such as panel reflector screens and dipoles, EIA flanges, connector bodies, UHF radomes, etc., in order to cope with fluctuating demands. However, all critical work, such as welding is carried out at the factory under tight supervision. Power dividers and couplers are assembled in a clean room area where care is taken to ensure the assemblies are not contaminated. This is especially important when considering that some power dividers handle 160 kW power.

All antennas manufactured are individually tested and adjusted for optimum impedance. When arrays are ordered, range tests are performed to ensure that the horizontal and vertical radiation patterns conform to the required specifications.

Typical of large antenna arrays recently supplied to National television stations is the 32 wavelength broadband array for Mount Ulandra near Wagga Wagga.

The combined output of up to four 30 kW UHF TV transmitters can be fed to the antenna, each transmitter achieving a mean effective radiated power of 750 kW due to the gain of the antenna. Two runs of five inch kabelmetal cable deliver the power to the antenna which has been constructed in four modules, each with four levels of panels.

The array was designed with five panels/level, mounted in a pentagonal arrangement rather than the more common square configuration. The five sided arrangement also provides greater access inside the antenna for maintenance.

A similar five sided 16 level panel array was provided for Mount Goonaneman near Maryborough.

JANIS OZOLINS

Assembly of a 2 sided UHF panel array.

Assembly progress.

Antenna loaded on truck for transport to site.

BROADCAST LINES

RECENT ACTIVITIES OF QUEENSLAND GROUP

The Queensland Broadcasting Radio Lines Group has its Depot at Bald Hills, the site of the Brisbane MF and HF transmitting centre. The Group headed by CO6 Dave Southby, comprises a staff of 18 to handle the capital works and maintenance program for the Branch, involving some 130 transmitting sites throughout the State.

The type of work covers a wide range, from the installation of such facilities as a new Radio Australia station at Brandon to the fixing of an air leak in such a remote place as Birdsville, close to the South Australian border.

Last year was a particularly busy period with most of the effort being directed towards meeting the December deadline to convert six major sites in the State to UHF for equalisation purposes. There were also a number of smaller stations requiring conversion to UHF.

To assist the Group in meeting the deadline, staff levels were increased by the temporary transfer of Radio Lines staff from Western Australia. Even the Depot Supervisor CO4 John Kirkwood found himself out in the field supervising contractors. To fill this gap, the services of Des Allen from the Buildings Unit was made available to supervise Depot activities.

For the first time, a Favco crane was employed to assist in the dismantling of redundant parts of towers at some sites and erection of the UHF antennas. The use of the crane made this part of the project activity more efficient and resulted in considerable manhour saving compared with the use of conventional rigging methods. At other sites, e.g. Mackay, a mobile crane was brought into operation to facilitate the work.

The task at Bellenden Ker was particularly difficult because of access problems and environmental considerations. The only land access to the site is by cable car with a maximum weight capacity of 800 kg and materials had to be broken down to meet this weight requirement. Items which could not be broken down had to be air lifted by helicopter. Items included coaxial cables for which lightweight drums had to be specially manufactured. With no mechanical aids available, all foundation excavations had to be dug by hand, the concrete mixed in small portable mixers and then taken carefully through the rainforest to the guy block positions. Credit must go to the staff who worked through rain and cold to complete all the ground work necessary for upgrading the tower. On the days that they could see sunshine through the heavy mountain top cloud cover, staff worked with maximum effort on erection of steelwork and the antenna to ensure the project was completed on schedule.

After averaging 100 hours per fortnight for six months, staff certainly looked forward to a well earned Christmas break.

With all the activity on the capital works program throughout most of the year, the maintenance program had to take a back seat along with other jobs. However, staff have now moved into these areas and are enjoying the diversion.

STEVE ROBERTS

EQUALISATION

QUEENSLAND PROJECTS

On 31 December 1990 two additional Commercial television services commenced transmission on UHF at seven major regional transmitting sites and several TV translator sites in Queensland. The introduction of these services is in keeping with the Federal Government's Equalisation policy.

Six of the seven major sites are Commonwealth sites and the Queensland Broadcasting Branch provided the infrastructure including building accommodation, UHF antenna and combiner for the Commercial licensees involved.

Planning the accommodation of UHF, VHF (where applicable) and FM antenna systems and having the facilities in place by December 1990 presented the Branch with engineering and logistical problems of some magnitude. Different solutions were adopted for each site to suit the circumstances. Major external plant activities included:

- Bellenden Ker, Cairns

The 85 m tower was extensively upgraded, the top 10 m of Band III column replaced, the tower guyed three ways at the top of Band III column to stabilise the base of the UHF antenna column and an RFS UHF antenna installed.

- Mount Stuart, Townsville

The 113 m tower was modified and upgraded, a new Band II antenna column constructed within the tower below the old Band II column, a combined TV/FM antenna commissioned to accommodate the existing ABC TV and FM services, the tower steelwork above the splice point for the new Band II column removed and the UHF antenna installed.

- Mount Blackwood, Mackay

A new 101 m tower was erected by EPT, and an RFS UHF antenna lifted in position by a mobile crane.

- Mount Hopeful, Rockhampton

A new 135 m tower was erected by EPT, and Jennis and Le Blanc lifted a Sira UHF antenna in position by conventional jury.

- Mount Goonaneman, Wide Bay

The original tower was extensively modified.

A mast was erected through the centre of the tower from ground level to just below the top platform, the mast braced by the tower proper at the base of the proposed FM antenna column and four outriggers installed off each diagonal to facilitate guying of the antenna column from the upper portion of the tower to the base of the tower (i.e. like the mast of a sailing ship) and the antenna column guyed at two levels.

A new Band III antenna was installed on the new mast within the tower and the ABC (ABWQ-6) and Commercial (SESQ-8) services transferred to the new antenna, to facilitate removal of the redundant tower steelwork above the base of the proposed FM antenna column. Subsequent to this, the UHF antenna was lifted in position.

EPT designed and installed the mast and guying arrangement. Branch Radio Lines staff completed the tower dismantlement activities as well as installation of the RFS UHF antenna. A Lindores tower crane was used in the work.

- Passchendaele Ridge, Southern Downs

The mast was upgraded to accommodate a Sira UHF antenna. Currently the Commercial service is dual broadcasting with a second channel on UHF but when Band II is cleared in June 1991 an FM antenna will utilise the column. A tower crane was employed to replace the top 10 m of the tower and to lift the UHF antenna in position.

GREG DUNCAN

Mount Goonaneman, Wide Bay. Before removal of top tower section.

Bellenden Ker, Cairns.

Mount Blackwood, Mackay. UHF antenna being lifted into position by mobile crane.

Passchendaele Ridge, Southern Downs. UHF antenna being lifted into position by tower crane.

VISIT TO INDIA

Jenny and I arrived late at night at the Delhi Airport after our long flight. We joined the jostling queue of Indians returning home, backpacking tourists, well intentioned do-gooders and a few international business people in a very crowded airport. In no time we were identified by a Government Official from the Conference host broadcasting organisation and whisked through Customs without formalities. What a good start; we had been warned of very long delays. We then waited almost 3 hours at baggage collection for our luggage to appear during which time we were constantly assured that all was normal and our possessions would ultimately turn up. Meanwhile other delegates to the Conference emerged.

I pushed the luggage on a stubborn worn-out trolley through the teeming crowd wishing someone had warned us that we should have worn shin-guards. Our "limousine" and driver awaited us—a white, somewhat battered Ambassador sedan which is a locally built version of an early Morris Oxford design that has been in production since the British withdrawal more than 40 years ago. Our guiding host pointed out that this particular vehicle was a 1987 model incorporating the very latest steering column gear-change, hence enabling more people to be carried in the front seat. Six of us crammed aboard with luggage. With clattering bearings and tappets and an unbreathable atmosphere of engine fumes, we proceeded to our hotel on the outskirts of the city.

The "international" hotel was a grand building with much of the interior constructed of polished white marble. On entry we were assailed by a strong smell of mould and decay. We were later to learn that this stems from the local habit of bathing on the floor—squatting and pouring water over oneself rather than using the bath or shower. In consequence, the carpets become rather waterlogged and the hot environment does the rest. Our room although well appointed could have done with a good clean and fumigation. Everything we touched was filmed with sticky grime. The telephone, an ancient looking heavy black bakelite unit had all of the latest facilities but few were operational. The cotton covered cord was frayed and intermittent and required constant experimentation to establish continuity. Calls to Australia were $A15 per minute and call timing was performed manually with rather imprecise recording of time used.

Next morning, on drawing the curtains, the view was unusual. Several families squatted across the road using the footpath as a public convenience, vultures circled all around and the air was so polluted with vehicle exhausts that it seemed that a storm was about to break. Breakfast was far from enjoyable because of fears of food poisoning, or worse. Later on arriving at the Conference it was clear that depression was widespread among new arrivals but those who had been in residence for several days assured us this would pass, which it eventually did.

Our Conference hosts were marvellous and did their best to make us welcome and ensure a happy stay. We were treated to lunch daily but alas, always the same selection from yellow curried chicken, brown curried lamb or goat and green curried vegetables for the vegetarians. The hotel was about 5 km from the city centre and, warned of the dangers of eating out, we ate in the hotel dining room nightly but again the menu provided much the same choice as lunch—a selection from the multi-coloured curries. A passable local beer (Kingfisher) was available but at $A15 per bottle consumption was rather limited. Salads were declined because we had observed the local populace utilising the market gardens for their frequent visits "to the bathroom".

I was totally committed to the Conference from 9 am to 6 pm daily but Jenny, with the wives of other delegates, was escorted daily on visits to places of interest by our generous hosts. I must admit to playing truant for several hours one day to visit the archaeological museum which has a fascinating collection of stone carvings from about 3000 BC and some outstanding Persian paintings from more recent times.

Delhi has in excess of 50 000 beggars, most of whom are professionals operated by standover men—a sort of Mafia equivalent. Takings generally exceed the normal working wage and entire "begging families" can be seen arriving daily by bus and other forms of transport to take up their allotted positions. The normal family transport is the Indian equivalent of the

The Taj Mahal.

Vespa motor scooter and it is not uncommon to see father, mother and up to three children crammed on to one of these machines. Delhi traffic is probably the most chaotic in the world with buses, trucks, motor scooters, auto-trishaws, cars and rickshaws competing for road space. Jenny rode in a taxi (Ambassador, naturally) that ran over a rickshaw. The rickshaw driver, unhurt, ran for his life. The taxi driver alighted, removed the rickshaw remains to the roadside and proceeded on without comment.

Life has little value and numerous deaths occur daily in this country where the average life span is only about 43 years. Most deaths occur in young children. Corpses of one particular sect are conveyed to perforated mosque-like structures known as "Temples of Silence" where they are left to have the bones picked clean by vultures before interment.

As the Conference progressed more and more delegates with Western constitutions succumbed to the infamous Delhi belly. At the first signs Jenny and I transferred to a diet of Lomotil and imported mineral water and thus staved off the worst.

We noted daily reports in the newspapers of numerous domestic accidents and house fires resulting from home manufacture of fireworks. Subsequently we learned that frantic

fireworks manufacturing activity was taking place in preparation for the Hindu festival of Duvali which took place in the last days of the Conference. Duvali, or the Festival of Light, lasts for several days and welcomes the New Year. The first night is spent with massive firework discharges. Celebrations conclude two or three days later with people donning new clothes and exchanging gifts to welcome better times. Fireworks lasted from dusk to dawn on the first night with spectacular displays, and the army barracks near the hotel joining in by discharging mortars and small bombs to add to the cacophony. The pall of sulphurous smoke made the pre-existing motor exhaust pollution seem insignificant by comparison.

Elephant ride.

After seven days the Conference was eventually over and our hosts invited us on a trip to Agra some 200 km away by "air conditioned coach" to see the Taj Mahal. We left very early in the morning and arrived at our destination 5 hours later after crossing two state borders. State boundaries have check points manned by officials whose task it is to record all crossings and to extract tolls assessed on the spot according to a scale which reputedly defines the financial worth of each class of visit. Long queues were involved and some vehicle drivers slept by the roadside awaiting their turns for interrogation. We were through in about 15 minutes at each crossing (the wheels had obviously been oiled) but we were given to understand that delays of several hours are not uncommon.

At the hotel.

Hi-tech lawnmower.

The Taj Mahal and the Red Fort nearby at Fatehpur were every bit to our expectations but the persistent beggars and street vendors of local trivia were a constant nuisance. Jenny, as an experienced trader, bartered several Australian kangaroo stick pins for a collection of postcards, lacework and carved marble jewel boxes.

The return trip was even longer as we needed to queue en-route for almost an hour to obtain diesel fuel for our bus. It was a long and tiring day with 11 hours in a "luxury coach" with a suspension not unlike that of a Melbourne tram. Nevertheless, the sightseeing was well worth the discomfort.

Taxi?

We left India early next morning with mixed feelings. It had certainly been a great experience but I doubt that we will ever repeat it. We had been treated as "VIPs" with great hospitality and generosity. We had stayed in one of the most expensive hotels in India and seen some of the world's great attractions. Yet we couldn't help wondering just how hard it would all have been had we visited as normal tourists.

LEON SEBIRE

THE RADIO MUSIC BOX

This year is the centenary of the birth of David Sarnoff, famous for his role in the *Titanic* disaster of 1912, and his concept of the Radio Music Box—sound broadcasting—proposed in 1915.

David Sarnoff was born in Russia on 27 February 1891, and migrated to the USA in 1900 with his Jewish parents. He began work as an office boy with the American Marconi Wireless Telegraph Company and soon qualified as a wireless operator. On 14 April 1912 he was listening to routine wireless traffic at a shore station when he heard a

David Sarnoff

very weak signal amongst the static being transmitted by *SS Olympia*, a ship in the Atlantic some 2 200 km away. The message read: "*SS Titanic* ran into iceberg. Sinking fast".

For three days and nights without sleep, he remained glued to his earphones while a horrified world hung on every word as he transcribed the names of 1 517 people who drowned in the disaster.

The company saw great potential in young Sarnoff, so they plucked him out of his operating job with promotion following promotion at a rapid pace.

The opportunities placed before him were enormous. Although only a young man, he was gripped by the feeling that in the world of radio he was witnessing the birth of something incalculably bigger, more meaningful for the future of humanity than others seemed to realise. Great ideas began to germinate in his mind, particularly in relation to the use of radio telephony—the emerging offspring of radio telegraphy—for public entertainment.

In the late autumn of 1915 Sarnoff wrote a memorandum to company Vice-President Nally outlining a broadcasting scheme. The memorandum has been acclaimed as one of the most remarkable documents in the annals of radio. The following is an abridged version:

> "I have in mind a plan of development which would make radio a 'household utility' in the same sense as the piano or phonograph. The idea is to bring music into the home by wireless.
>
> For example, a radio telephone transmitter having a range of say 25 to 50 miles can be installed at a fixed point where the instrumental or vocal music or both are produced. The problem of transmitting music has already been solved in principle and therefore all the receivers attuned to the transmitting wavelength should be capable of receiving such music. The receiver can be designed in the form of a simple 'Radio Music Box' and arranged for several different wavelengths, which should be changeable with the throwing of a single switch or pressing a single button.
>
> The 'Radio Music Box' can be supplied with amplifying tubes and a loudspeaking telephone, all of which can be neatly mounted in one box. The box can be placed on a table in the parlor or living room, the switch set accordingly and the music received.
>
> Within a radius of 50 miles there reside hundreds of thousands of families; and as all can simultaneously receive from a single transmitter, there should be no question of obtaining sufficiently loud signals to make the performance enjoyable. The power of the transmitter can be 5 kW thereby giving extra loud signals in the home. The use of headphones would be obviated by this method. The development of a small loop antenna to go with each 'Radio Music Box' would likewise solve the antenna problem.
>
> The same principle can be extended to numerous other fields as, for example events of national importance can be simultaneously announced and received. Baseball scores can be transmitted in the air by use of one set installed at the Polo Grounds.
>
> This proposition would be especially interesting to farmers and others in outlying districts removed from the cities. By purchase of a 'Radio Music Box' they could enjoy concerts, lectures, music, recitals etc. which may be going on in the nearest city within their radius."

The memorandum then went on to detail the technical and financial aspects of the scheme.

To Nally and other executives who read it in wide-eyed amazement, the Music Box idea seemed harebrained and unreal. They shrugged it off and filed it away.

The timing for introduction for such a scheme was certainly not appropriate. Europe was at war and the United States was soon to join in the conflict.

After the War, the Radio Corporation of America was formed. It was in effect the old American Marconi Co., in a revised corporate form.

Although Sarnoff used every opportunity to press senior executives into adopting his scheme of broadcasting, they remained unconvinced and it was left to competitors to introduce it.

Westinghouse, in 1920, supported the operation of broadcasting station KDKA by one of its employees and produced receivers and kit parts which were quickly swallowed up in a hungry market just as Sarnoff had predicted in his financial analysis in 1915.

Had David Sarnoff's scheme not been so long ignored, the Marconi Co., and then RCA, would have had a head start in the broadcast transmitter and home receiver market, instead of later struggling to catch up with competitors. The company marketed its first home receivers under the brand name Radiola in 1922.

David Sarnoff died in New York city on 12 December 1971.

JACK ROSS

CONSTRUCTION AND MANUFACTURE

Kabelmetal electro GmbH of West Germany have for some 45 years been one of the world leaders in the design and manufacture of coaxial cables for sound broadcasting and television purposes. Their cables are marketed under the brand name FLEXWELL. This article outlines the construction and manufacture of these cables.

Construction

The inner conductor of small size cables are either solid copper wire or cylindrical copper tube. Larger size cables have a corrugated copper tube inner conductor.

The outer conductor of all sizes of cable up to 8 inch (200 mm) is corrugated copper tube. The 9 inch (225 mm) cable has a corrugated outer conductor made of aluminium manganese alloy.

A high density polyethylene material with low dielectric losses is used to support and coaxially centre the inner conductor in the cable. The amount of dielectric material used is the minimum required to safely perform this function. In smaller size cables the dielectric material takes the form of a helix with rectangular or trapezoidal cross section, while in larger size cables with corrugated inner conductors the helix has T-shaped supports. The attenuation of these cables therefore approaches the theoretical limit of a cable with pure air dielectric.

Feeding and forming of outer conductor of large size cable.

The largest size FLEXWELL cables such as the 8 inch special version and 9 inch used for very high power r.f. transmissions use a different arrangement to position the centre conductor. The conventional helix is replaced by three Teflon spacer elements radially positioned at 120 degrees and kept in place by a copper-clad steel spring.

Cables are fitted with an abrasive resistant black polyethylene outer jacket as standard. The space between the outer conductor and the jacket is filled with a flooding compound called Polyment. An exception to this is the 9 inch cable which has no plastic outer jacket. For added protection this cable may be painted when installed above ground.

Manufacture

The cable may be manufactured in stages or as a continuous process depending upon the size of the cable. The cable making machinery consists of several individual sections (machines) each performing a specific task but connected in such a way as to provide a continuous production facility for the cable.

Both, tube inner and outer, conductors of FLEXWELL cables are manufactured on a "Wellmantel" machine. This machine takes a thin flat copper strip, forms it into a tube and butt welds the edges to form a continuous closed copper tube in a single process. This tube is then fed into the UNIWEMA corrugating sheathing machine which is one of the Company's most significant developments. The copper conductors produced in this manner are both flexible and resistant to transverse stress.

Application of helix to centre conductor of FLEXWELL HF 7/8 inch Cu2Y cable.

The single manufacturing process commences with the thin copper strip being fed into the "Wellmantel" machine to form the inner conductor. The inner conductor is then cleaned and the dielectric helix is formed onto it. Continuing the process, a second copper strip for the outer conductor is fed into the machine and formed around the inner conductor and helix. Due to the heat generated during seam welding the cable is drawn through a water trough to cool it. The outer conductor is then cleaned and the hot Polyment applied to it. Hot polyethylene is then applied by extrusion to form the outer jacket and the cable drawn through another water trough to cool it. The final part of the process is to print the outer jacket with the cable type number before rolling it onto the drum.

HF antenna array fed with FLEXWELL HF 3 inch Cu2Y cable.

The cable is continuously monitored at each stage in the manufacturing process to ensure that specifications and quality requirements are achieved.

The manufactured cables are then removed to the test area where each drum is sweep tested for VSWR over its operating range. Air dielectric cables are also pressure tested.

GRAHAM RIDDY

PROFILES

JENNY DATSCKEVICH

Jenny Datsckevich is Professional 2 in the National Office, Engineering Services Section. She joined the Broadcasting Division in 1989 initially as a contract Engineer prior to permanent appointment.

Jenny was born in Leningrad and between 1966 and 1974 gained her Diploma in Plumbing and Sewerage at Leningrad Technical College and a Degree in Building Services Heating, Ventilation and Air Conditioning from the Leningrad Mechanical Institute of Civil Engineering. Jenny's work experience in Russia ranges from being a Draftswoman for the Government Building Consulting Office, a Graduate Engineer for the Department of Buildings in Leningrad, to Assistant Design Engineer in the Head Office of that Department.

Jenny migrated to Australia in November 1980 at which time she commenced studying the English language and a post-graduate Degree in Air Conditioning and Refrigeration at Swinburn Institute of Technology.

Jenny will be the first to admit that her inaugural months with the Division were "interesting" as she came to grips with the bureaucracy and decision making process of the Division, but once the local ground rules and protocols were established, Jenny has and is continuing to make significant contributions to numerous building services upgrades within the network.

Jenny Datsckevich

Fiona Somers

FIONA SOMERS

Fiona Somers, Manager, Office Services in National Office, commenced with Telecom back in 1979 as a Clerical Assistant with the Finance and Accounting Department in Western Australia and shortly after was promoted to the Information Systems Branch as Clerical Assistant Grade 3 and in this area performed both clerical and computer operator functions.

Following a six month holiday in 1985, Fiona transferred back to the Finance and Accounting Department where she gained valuable experience in several positions prior to her promotion as Staff Clerk within the Western Australia State Broadcasting Branch.

In May 1989 Fiona departed the warm climate and relative serenity of her native Perth to join the National Office of the Broadcasting Division in Melbourne for what was initially a temporary transfer of six months.

For some unknown reason, but to the delight of her colleagues and dismay of her parents, Fiona decided to stay indefinitely and was subsequently promoted to her present position as Administrative Officer 3.

In her spare time Fiona enjoys playing competitive lacrosse, bike riding and extensive workouts at the Health Club.

MARILYN WINDEBANK

Marilyn Windebank, Human Resources Manager in National Office, commenced as a Typist in the Victorian Administration 19 years ago, but later transferred to Headquarters Human Resources Department as Personnel Officer Class 6.

This particular area provided Marilyn with a diverse range of experience and a solid grounding for her present position. Some of her roles at Headquarters included Typing and Secretarial Services Co-ordinator, Personnel Officer handling all aspects of Voluntary Separations/ Redundancies, along with a spell as Discipline, Resources and Projects Officer prior to a period as Executive Officer in the Corporate Finance and Control Directorate before joining Broadcasting.

With the development of personnel functions in association with the Change Process, Marilyn joined the Division in August 1988 to head the newly created National Human Resources Section in time to help guide staff with the intricacies of important functions as new Conditions of Service, recruitment, separations, discipline, Freedom of Information and superannuation for which very little external training was available.

Having two young sons to care for, Marilyn does not have a lot of "spare" time, but does enjoy spending some of that time either at a fitness centre or just relaxing at home.

Marilyn Windebank

Kimb Smithe

KIMB SMITHE

Kimb Smithe, Administrative Officer 3, Engineering Services Section in National Office joined Telecom in 1981 as Clerk Class 1 following four years with the State Bank of Victoria. Kimb first worked in the Headquarters Radio-communications Construction Branch where she progressed through ranks to the level of Class 4 prior to joining the Broadcasting Division.

Her first work in the Division was as Sharing Officer advising the Department of Transport and Communications on the shared use of Commonwealth owned broadcasting and television facilities including work undertaken by Telecom on behalf of other users, the investigation of sharees account discrepancies and the negotiation or review of sharing contracts with the Department.

However, with the Division no longer having responsibility for this sharing function and growth in the Engineering Services Section staff, Kimb is now providing high level administrative assistance to the Engineers and Drafts-persons in the Section. With the large amount of structural and building services work being carried out, Kimb's role has become more of a project manager, which gives her considerable satisfaction in managing this important aspect of work.

LETTERS TO THE EDITOR

Contributors to Letters to the Editor are reminded that full names and addresses must be supplied. Letters should be brief and to the point. Long letters may be edited. The Editor's decision in respect of the suitability of letters for publication in *The Broadcaster* is final and no correspondence on the Editor's decision will be entered into.

Sir,

When I joined the staff responsible for operation of 4QG following take-over of the station by the Postmaster General's Department on 1 February 1930 as part of the formation of the National Broadcasting Service by the Government of the day, we were responsible for all the technical facilities including the transmitter, studio equipment and pick-up apparatus used for outside broadcasts.

W. C. (Bill) Rohde with condenser microphone.

This arrangement continued until 1964 when the Australian Broadcasting Commission became responsible for the provision and operation of the studio technical facilities. The transmitting function remained with the Postmaster General's Department and today is under the umbrella of Telecom.

It is surprising that the control of the studio technical facilities remained in the hands of the PMG Department for so long.

When we took over the facilities there was only one microphone—a Reisz carbon type—in use to cover the total requirements of the announcer on duty. For OB work there was one single channel amplifier so we were put to work to construct two twin channel battery operated amplifiers and three carbon microphones which were look-alike Reisz types. The Reisz microphone originated in Germany from work by Dr E. Reisz, but the Marconi Company in England produced a modified version for the BBC and a number were exported to Australia for use by A Class and Commercial stations.

The Marconi made Reisz microphone consisted of an octagonal block of marble with a cavity in one side in which the carbon granules were placed. The diaphragm was at first made of thin rubber, but later mica was used. A peak resonance between 4 and 6 kHz caused violins to scream resulting in letters from listeners questioning the competence of the violin player. Rice paper was substituted for mica and criticism of violin players ceased.

The Reisz pattern took on a different shape with Australian made versions, largely as a result of work by C. A. Cullinan, a well known Sound and Radio Engineer. It was made using a block of marble about 100 mm long, 85 mm wide and 85 mm deep. Many hours were spent in chipping out a hollow in the marble block to accommodate the carbon granules but the end result was a beautiful looking microphone with a performance relatively flat over the range 100 to 7000 Hz. Very fine carbon granules were essential for a low hiss microphone. Often carbon granules used for telephone transmitters were employed but they were ground with a pestle and the dust blown out.

Early 4QG carbon microphones. Locally made Reisz types and double button carbon type (centre).

The microphone position was later improved with the provision of the STC condenser microphone mounted in a wooden box with an enclosed amplifier using a 4102D valve which required a 4 volt supply for filament and 150 volts for the anode.

The condenser type was later superseded by ribbon and moving coil types, but in the 1950's made a comeback and is today widely employed in studio work.

Although the word "condenser" was later replaced by "capacitor" for radio components, the microphone hung on to its heritage and is still referred to as a "condenser" microphone.

BILL ROHDE

BROADCASTING MILESTONES

2CY CANBERRA

Broadcasting station 2CY Canberra was the first National Broadcasting Service transmitter to be commissioned in the national capital when it began transmission on 23 December 1938.

Canberra which has a population approaching 250 000 is the national capital of Australia and is located in the Australian Capital Territory in south-east Australia. The city serves as the administrative centre of the Federal government and as headquarters of national political, business, professional and cultural organisations.

When Canberra was chosen as the site for the Federal capital in 1909, sheep grazed on the limestone plains where the city now stands. An American architect, Walter Burley Griffin, submitted a winning plan for Canberra in 1912. The Duke of York, later King George VI, opened Parliament House there in 1927.

The original transmitter was one of a number manufactured by Standard Telephones and Cables of Sydney for the Postmaster General's Department. It had an output power of 10 kW and was based on a design by STC London staff but modified for Australian conditions.

The manufacturing process of the transmitter was a departure from previous practice in that it was built up in modules to take advantage of production line techniques. A notable technological improvement at the time was the introduction of negative feedback to improve transmitter performance. It gave substantial improvement in frequency response characteristics, distortion and signal-to-noise ratio.

The high power tube stages were housed in two separate cabinets each capable of producing an output power of 5 kW. These stages were combined to produce 10 kW in a coupling and tuning cubicle. Each 5 kW stage included three 4220B water cooled triodes. Two were in operation while the third was available as a spare. Simple switching facilities allowed this operation to be effected quickly. The major advantage of the twin 5 kW system was that it allowed the station to continue transmission on half power until close down should a major problem occur in one of the power amplifier stages.

EHT supply was provided by six 4078A hot cathode mercury vapour tubes in a three phase full-wave rectifier circuit.

An engine generating set was provided in a separate room to provide power in the event of interruption to the mains supply. The fuel tanks were located in a large pit away from the building. The pit is still there but not now used.

Cooling water to the 4220B tubes was fed via rubber hoses wound on insulating formers. The pumps and radiator were mounted in a room near the present transmission line outlet.

The transmission line was an 80 ohm coaxial tube type but this has since been replaced by an open wire coaxial system.

The present 10 kW transmitter is an STC model installed in 1964 and operates on a frequency of 846 kHz. It shares a 192 m omnidirectional radiator with 2CN.

The station covers a service area which extends north nearly to Cowra, south to Cooma, east to Goulburn and west to Gundagai.

A house was erected on a block adjacent to the transmitter building for the Officer-in-Charge but the station is now operated in an unattended mode under control of staff at Black Mountain Tower for first-in maintenance.

RON JOHNSON

Present Canberra transmitting centre.
(Far right) 2CY 10 kW. (Right) 2CY 2 kW standby also used for Radio for Print Handicapped service.
(Left) 2CN 2 kW transmitter.