

Racal In Africa – A Tribute to Horace Dainty MBE (1916-2006)

by *Brian Austin, G0GSF*

In May 1972, Ernest (now Sir Ernest) Harrison, the Chairman of Racal, announced some senior management changes within his company's South African operation. Horace Dainty, Managing Director since its inception would become Chairman of Racal Electronics South Africa. He would be succeeded as MD by David Larsen, previously Technical Director and the man responsible for so many highly innovative technical advances made over the previous twenty years. Those South African contributions (of which the Wadley receiver was perhaps the best known) had enabled Racal International to reach its dominating position, particularly in the world of military mobile communications.

Since then much has happened. Racal became one of the major electronics companies in the world, but is no more having been swallowed up by Thomson CSF to become Thales. South Africa, too, has undergone massive changes. Its electronics industry is thriving but that is no new phenomenon. Its origins, and the very origins of such an industry anywhere on the continent of Africa, are traceable to 1935 and the opening of the country's first radio factory in Johannesburg.

This article is a tribute to the man who started that factory and who then turned another in Durban into a uniquely inventive electronics organisation. It was Horace Dainty's drive, dedication, courage and foresight that fostered some of the most remarkable developments in radio communications in South Africa, and which then facilitated such a fruitful collaboration with Racal in England.

Early Days In Natal

Horace Dainty was born in Natal, that most British of the South African provinces, on 6 March 1916. His father, also Horace, hailed from Easton on the Hill, between Leicester and Peterborough, which he left as a young man to make his fortune in South Africa. There he was known as Captain Dainty following his service

in the Boer War as the adjutant of Kitchener's Fighting Scouts, an irregular outfit of mounted infantry under the command of the famous hunter and sometime soldier, Lt Col J W Colenbrander.

The young Horace Dainty faced formidable challenges. By the age of 13 he was orphaned and was left with no means of support. He abandoned his schooling and started work at the





The Mars Manufacturing Company in Johannesburg in 1938 with Horace Dainty seated in the centre and Boris Wilson in the dark suit to his right

Durban North Estates, a housing company, on a salary of £5 per month. There he worked in the office where he became familiar with bookkeeping, assisted the nurseryman and ordered materials for the hardware store. In later life he was given to claiming that so many of his achievements were due just to luck. But making ones own luck always has much more to do with it and Horace Dainty certainly made his – often when the odds seemed stacked against him.

One stroke of enormous good fortune occurred in his early life when he was fostered by Reg Fripp, an assistant manager at the Estates company, and a man of great humanity. Fripp was a highly accomplished model-maker and soon Horace became pretty adept at the lathe and at the workbench. Then Fripp decided to exchange his model-making equipment for a collection of amateur radio gear owned by a friend and ardent amateur radio operator, Taffy Boyce ZS5CJ. Crystal sets soon gave way to TRF receivers and not long after to superhets, which the young Horace was soon designing himself. He made up for his lack of formal training by enrolling on a correspondence course at the Witwatersrand Technical

College in Johannesburg. Soon the local radio amateurs regarded him as something of an expert.

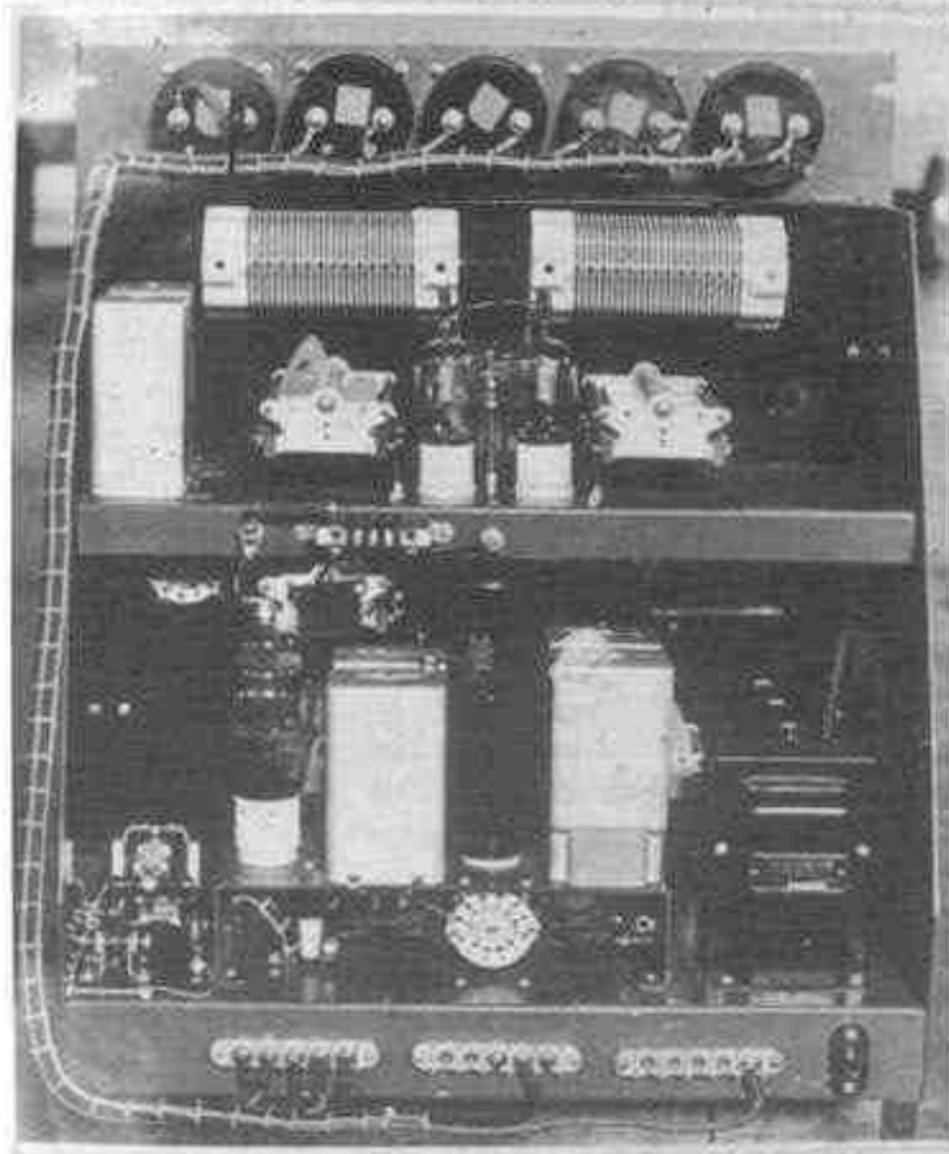
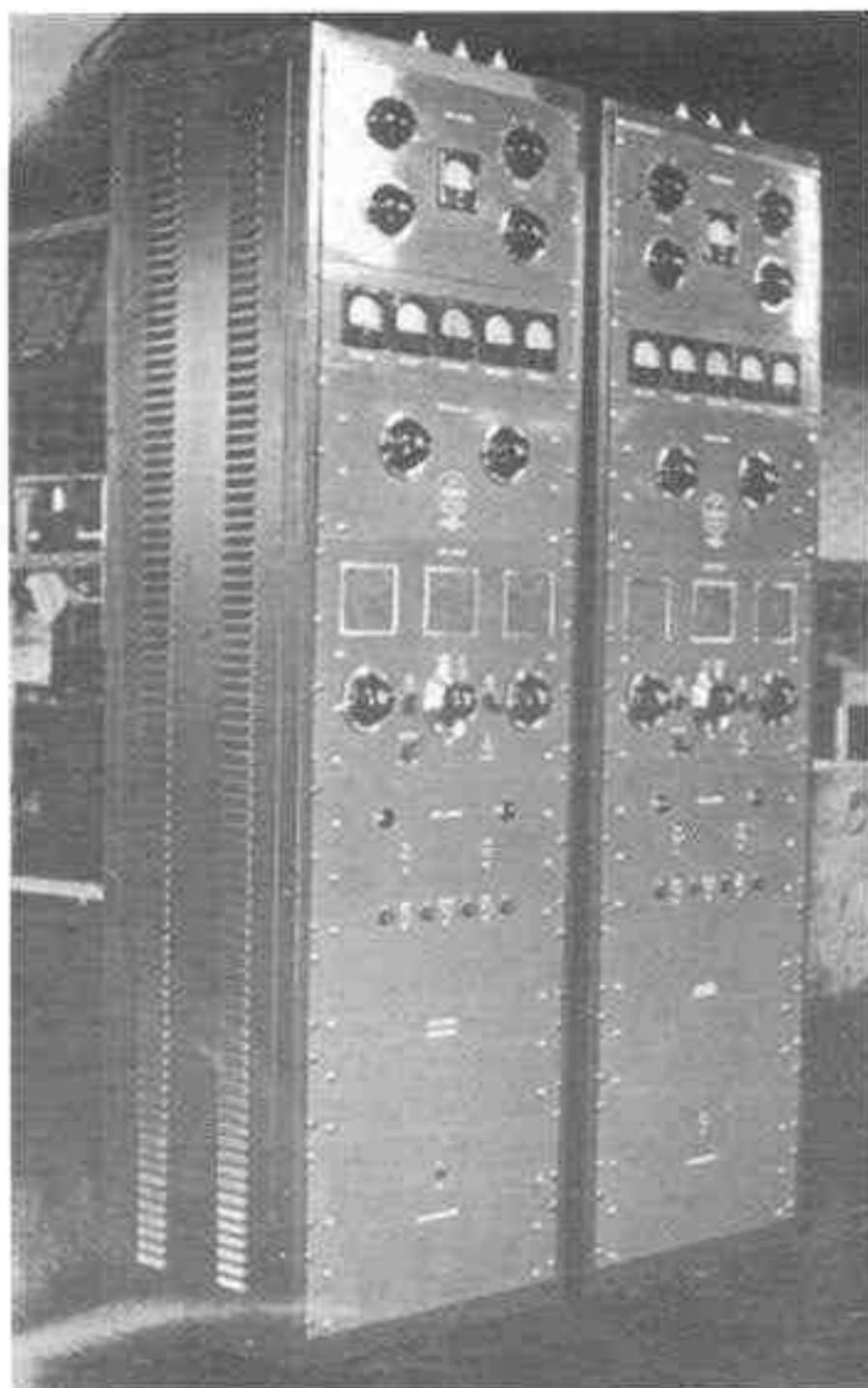
Then calamity struck as the Great Depression of 1931 took hold. The Estates Company, along with many other businesses across Durban, closed and hundreds of men were out of work. Horace Dainty, one of the youngest, was too. To earn a few bob, he produced a mixture of woodstain and beeswax which he sold as a restorer of wooden floors. Then one day he found a job with Natal Motor Industries and was assigned to assist the workshop foreman. Charging batteries and repairing armatures soon became his *métier*.

In 1932 he was offered a job at the Radio Electro-Equipment Company (Pty) Ltd. This was Durban's only wholesale supplier of radio components and spares and it was a place that Horace knew well as an occasional customer when the pennies would stretch that far. As he wrote seventy years later, it was truly his heaven on earth. Settling in quickly, he soon became familiar with the complete range of components while, at the same time, his confidence grew as a technical adviser to those who used them.

Though just short of his seventeenth birthday, this very self-sufficient young man soon displayed judgement and maturity that belied his age. Theo Perlman, his boss, noticed this too and decided to take a gamble. His branch in Johannesburg had just lost its manager and finding a suitable replacement hadn't been easy, so he offered the position to Horace. Since he had no ties at all, the young Dainty accepted and together he and Perlman left for Johannesburg within just a few days. Once there, Perlman found him accommodation in a boarding house, showed him the stock and the list of customers. Within hours Mr Perlman was on his way back to Durban and Horace Dainty was manager of his own business.

The Radio Business

For two years Horace ran the show in Johannesburg, visiting customers across the length and breadth of The Reef, that ridge of low-lying hills so named because of the abundance of gold that lay beneath them. Radio broadcasting commenced in South Africa in 1924 and a radio repair industry followed soon after. Most of the valves used in the sets were



The 150W transmitter (left) in its rack-and-panel style developed for the SAAF

The rear view (above) of the 150W transmitter

supplied by the Arcturus Company in the United States, which Horace represented, and he soon realised that he could also offer a radio repair service.

This brought him to the attention of a Dr Sidley, a scientist whose family ran a large chemical company in the city. The Sidleys were aware that there was no radio manufacturing industry in South Africa and being industrialists, they believed that they could set it up as long as they could find the right man to run it.

Dr Sidley approached Horace Dainty in 1935. He believed that wireless sets covering the medium and short wavebands would be much in demand because the local listeners were very partial to broadcasts from the BBC, as well as from their local station. Horace agreed and convinced Dr Sidley that he could design and manufacture such a receiver using tuners manufactured by the F W Sickles Company of Massachusetts. Working at night and throughout the weekends he produced two receivers that met all Sidley's requirements, and at a cost that would allow a reasonable

profit margin when compared with the imported sets then on sale in South Africa. The Mars Manufacturing Company soon came into being with Horace Dainty as its chief engineer. He was just 19.

Between 1935 and 1937 Dainty established the first radio manufacturing business in South Africa amongst the mine dumps south of Johannesburg. He built, by hand, the wooden workbenches to accommodate the sets as they progressed along his 'production line' while his 'development laboratory' was enclosed in chicken wire as a precaution against interference. He hired and trained staff, including women to act as assemblers.

He also engaged, as his salesman, a remarkable young man of 18 by the name of Boris Wilson whose life to date had already involved selling fruit, insurance and chocolates while also studying part-time at the University of the Witwatersrand. In the years to come, Wilson qualified as a medical doctor and was elected to the South African Parliament where he became

one of the most strident opponents of apartheid.

Horace and Boris soon realised there would be a ready market for a radiogram and they sketched a suitably stylish unit based on the new Garrard automatic turntable and the original radio that Dainty had designed. The cabinets in walnut or bird's-eye maple were made within the factory. Their performance and appearance were excellent and Boris Wilson was a most effective salesman.

By the end of 1937 he and the Mars Manufacturing Company had sold more than 1000 of their Viking radiograms across the length and breadth of South Africa, but for all that things were not well within the company. The business had always suffered from a chronic lack of capital, while both Dainty and Wilson were finding it very hard to come out on their salaries of twelve pounds ten shillings a month. The Sidleys were clearly not making a go of their radio manufacturing business and within a matter of months they announced its closure. Horace immediately returned to

Durban and Boris Wilson resumed his peripatetic career.

Back In Durban

Back in Durban Horace Dainty found that Mr Perlman's Radio Electro-Equipment Company rather in the doldrums. Other suppliers of components had opened up around the country and the pace of competition was quickening. There was clearly a need to diversify into manufacturing and it didn't take Perlman long to realise who could make that happen, so he persuaded Horace to take over the company.

Recent events in Johannesburg had taught the entrepreneur in Dainty that without sufficient financial underpinning he would always be on thin ice. So he negotiated with his suppliers in the USA and took active steps to increase his working capital by approaching various possible investors. On the technical side of things two new areas of manufacturing now beckoned: transmitters for radio amateurs and public-address systems for all and sundry.

By now Horace had obtained his own amateur radio callsign (ZS5HT) and was an active member of the South African Radio League, the SARL. The possibility of supplying imported equipment to the ever-increasing population of radio amateurs was most

attractive. But even more so was his idea of designing and building the sets himself. So in the evenings, just as he'd done in Johannesburg a few years before, he made transmitters to order based on ideas gleaned from the *ARRL Handbook* and Terman's *Radio Engineering*. He used imported chassis and cabinets and built the equipment in the rack-and-panel styling of the day. They rivalled any piece of imported gear in their professional appearance and worked as well too.

The valve line-up was the conventional combination of a 6V6 oscillator driving an 807 final amplifier, but there were some interesting bits of originality, too, such as the use of an Ohmite tapped inductor instead of plug-in coils, making band switching much easier. For those wanting higher power, Horace also produced transmitters with either the 813 tetrode or the HK54 triode in the final stage.

Amplitude modulation required appropriate transformers and the Thodaron range served the purpose admirably, as did their mains transformers in all the power supplies he built. Variable capacitors (or condensers as they were then), dials and their drive mechanisms were vital elements of the VFO-controlled transmitters and, for all of these, Horace used the National Company of Massachusetts as his supplier. They

offered a range of wonderfully crafted 'Velvet Vernier' dials that added significantly to the quality of Horace's craftsmanship. But receivers remained the preserve of the professionals and many amateurs used the famous National HRO, some of which the Radio Electro-Equipment Company had imported.

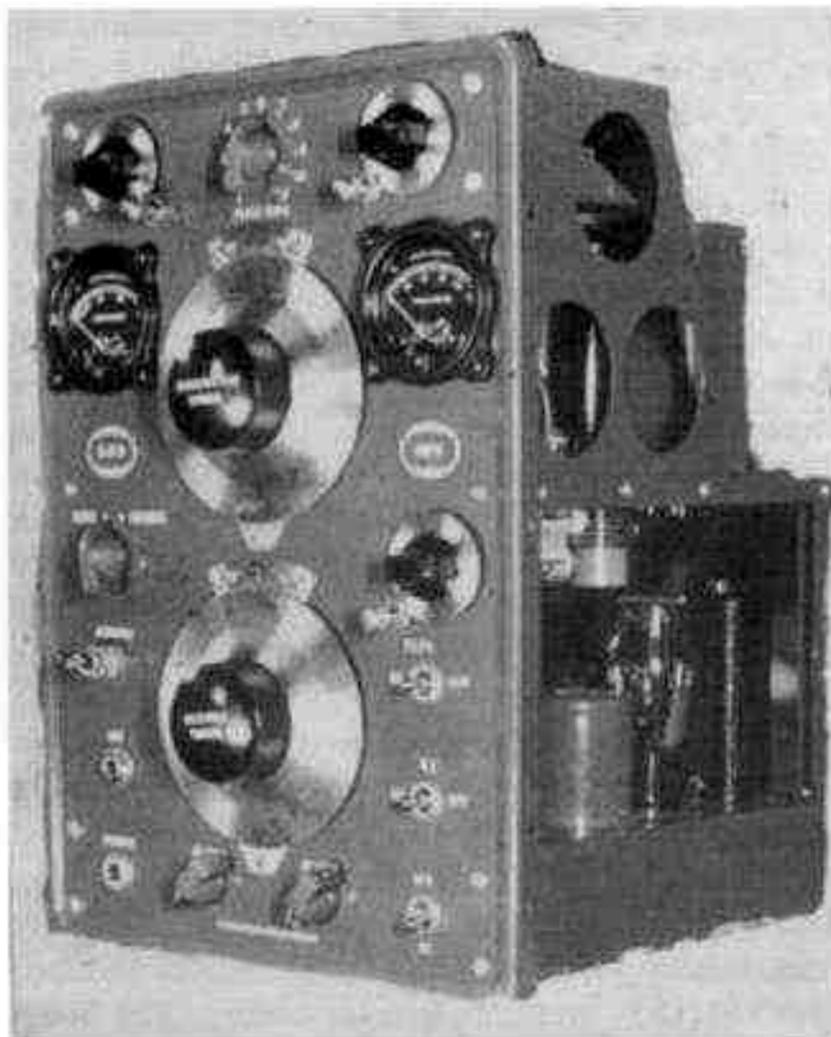
War And Wireless

On 6 September 1939 South Africa declared war on Germany. It was by no means a unanimous decision in Parliament as a sizeable proportion of those eligible to vote were strongly opposed to fighting any war on the same side as England. Their memories were still bitter about events forty years before when the Boer War and Kitchener's concentration camps claimed the lives of so many Afrikaners, particularly women and children. But General Smuts won the vote by a slender majority and South Africa began to mobilise.

Horace Dainty had already experienced a little of the military way of life when he served in the Natal Mounted Rifles as an Active Citizen Force volunteer at the height of the depression. One thing that struck him then was the paucity of wireless communications equipment within the Union Defence Force, the UDF. Not

Fitting out the SAAF vehicles outside the Radio Electro-Equipment Company in 1939, with Horace Dainty second from the left.





The M17 transceiver (above) developed for the Marmon-Herrington armoured cars
A selection of the Eveready portable domestic receivers (right) made by SMD



much had changed since then but now he believed he could do something about it. He also knew that all technical matters within the South African Corps of Signals (SACS) were handled by the Postmaster General's department, so he sent a cryptic telegram to the PMG saying simply "Can make transmitters". A reply came back almost immediately requesting him to make a 150W transmitter using a master oscillator from 2 to 16Mc/s for communicating with the Royal Navy ships off South Africa's east coast and Horace set about producing it in double-quick time.

Fortunately, all the necessary components were in stock and he knew that a pair of HK54 triodes would easily produce the power. The transmitter was built in a rack-and-panel configuration very similar to the RCA ACT-200, a 200W transmitter intended for the US amateur radio market. The Dainty transmitter was ready well within the six to eight weeks specified by the PMG and soon a South African Air Force (SAAF) Junkers JU52 was winging Horace plus the transmitter to Port Elizabeth where they were met by a Post Office engineer plus his wavemeter. Together they set up the

transmitter and calibrated it as carefully as they could. It soon went into service and the Radio Electro-Equipment Company, and more particularly Horace Dainty, had established themselves as the only local source of wireless transmitting apparatus for the war effort.

Things moved quickly after that. Orders came in from the PMG for various small items such as heterodyne wavemeters, while the SAAF asked him to produce further transmitters for its ground stations and also to upgrade the receivers fitted to their Anson aircraft – a simple task since the original valves only had a guaranteed life of twelve hours. There was also a need for a 500W AM transmitter to be set up on South Africa's northern border, and business was suddenly booming. What's more, there was talk of a possible contract from the army for semi-portable transmitter-receivers.

Then a phone-call came from Pretoria. A SAAF officer was already in the air and on his way to Durban. Would Mr Dainty please arrange to meet him at Stamford Hill aerodrome? To announce his arrival the pilot had been instructed to fly low

along Broad Street where Horace's company had its premises.

On his arrival the officer had with him a few pages torn from an RAF manual. These described a set-up consisting of three vehicles, one housing two 150W transmitters another, the Signal Office, contained two receivers while the third was the power supply truck fitted with a petrol-driven generator set plus two portable antenna installations. "Could Mr Dainty oblige?" Needless to say, Horace could and he agreed there and then even though he had none of the facilities to cope with such a large installation. But luck smiled on him again. The municipality waived all restrictions and the three vehicles were duly parked outside the company's front door and the road was then closed to all other traffic.

Other Parts

To be able to cope with the UDF's requirements while also continuing to run the component-supply business meant that Horace needed someone to take over from him 'in the shop'. He therefore employed a young Indian man by the name of Moonsammy

Naidoo who quickly became familiar with the stock and its purposes. In time his knowledge of electronic components was almost encyclopaedic and he served Radio Electro-Equipment throughout the war while Horace Dainty was serving King and Country somewhat further afield.

Most components for the SAAF order were on hand, but the heavy-duty cables and their couplings to link the generator vehicle to the others were hardly everyday items. However, it turned out that Waygood Otis lift cables were ideal for the purpose, while the massive electrical connectors were supplied by the South African Railways from their stock of such things. The necessary receivers were requisitioned from the supply of HROs belonging to radio amateurs that had been sealed by the Post Office radio inspectors soon after amateur radio was curtailed when war was declared.

Construction of the transmitters, based on the original 150W design, went ahead apace while the vehicles were fitted out in the street outside. Local residents watched with some fascination from the flats round and about and plied Horace and his staff with supplies of tea and coffee as the work went on well into the night and over weekends. Security was provided by the local equivalent of the Home Guard. The first installation was completed on time and duly delivered to the docks where it left for the SAAF Headquarters in Kenya from where battle was being joined against Mussolini's forces in Abyssinia. Further such installations were to see service with the SAAF squadrons operating right across the Middle East from Egypt to Tripoli.

All in all nine sets of these vehicle installations were delivered to the UDF. The vehicle superstructure was fitted by a caravan manufacturer in the town of Standerton in the Transvaal. Often the lorries were subjected to a bombardment of rocks and stones as they passed through certain towns and villages on their way to Durban. If anyone had forgotten, that was a reminder that the war effort was certainly not favoured by all in the country.

By now it was apparent that meeting the UDF's requirements necessitated both considerably more financial stability as well as larger premises. The first was assured when Steele and Matson, a local company representing many of the US component suppliers, provided Dainty with the extra finance he needed on favourable terms. They agreed to form a joint company, linked their initials with his, and SMD Manufacturing Company (Pty) Ltd came into being to meet the radio communication needs of the UDF. Shortly afterwards SMD was accommodated in new and spacious premises near the Durban docks.

M17 Radios For The Army

The South African Army had been relying on the Collins Radio Company in Iowa to meet their needs for radio equipment for the new Marmon-Herrington armoured cars being manufactured in large quantities around the country. Special provision had already been made to accommodate the Collins 18M transmitter/receiver when suddenly the UDF was informed that the equipment was no longer available. Immediately, SMD were asked if they could supply an

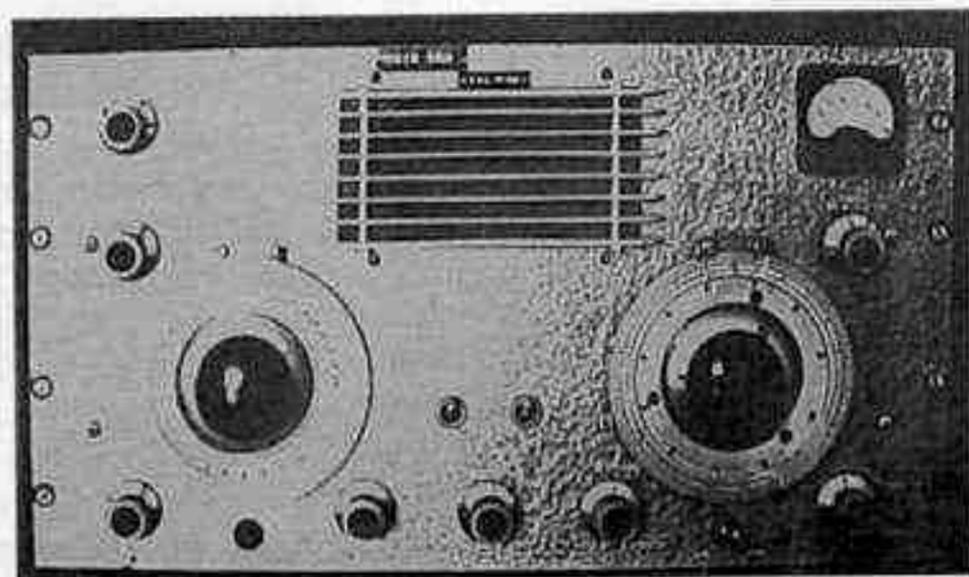
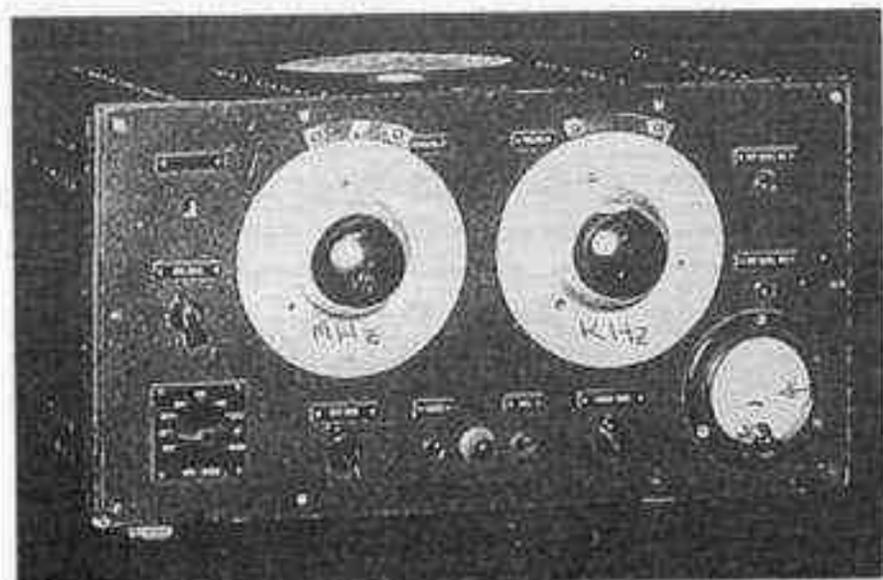
equivalent set with dimensions and mountings that matched those of the 18M. Dainty said they could and agreed to supply a prototype for testing and approval within just a few weeks.

The outcome was the M17, of which more than 400 went into UDF service. It used a 30W AM transmitter with an 807 in the PA, while the receiver front-end was an American tuner that SMD had ordered in double-quick time. A heavy-duty synchronous vibrator provided the required high voltage from the vehicle battery.

A crisis occurred when the ship carrying the 'Velvet Vernier' drives and the 350pF variable capacitors needed for transmitter and receiver tuning was torpedoed off Durban. Necessity now required local solutions and they were not long in coming. The South African Railways Workshop in Johannesburg produced superb replicas of the National dials while, with the assistance of a Durban machine shop, SMD manufactured 1200 variable capacitors. The M17 was soon in service with the South African Armoured Car regiments that served with distinction in the battles against Rommel's forces 'up North'.

In Uniform And 'Up North'

By late 1942 the Union's Directorate of War Supplies had come into being and SMD, along with many other small companies, were asked to move to Johannesburg in order to consolidate their activities. Horace agreed and so he found himself in South Africa's biggest city once again. By then radio equipment was beginning



The original TRL prototype (left) and the SMD version (right) of the Wadley triple-loop receiver that became the Racal RA17

SMD back into full operation. The company had just been ticking over during the war under the stewardship of Jack Matson and Moonsammy Naidoo. South Africa, as elsewhere, was suffering from a shortage of foreign currency as well as severe import restrictions. A £1250 government loan to returning ex-servicemen bolstered his capital while Horace pondered his next move.

He teamed up with a colleague who'd made small power transformers before the war and they then extended the operation to include fluorescent light ballasts. Both soon became profitable ventures as South African industry readjusted to peacetime production and this soon required a new factory – employing more than 300 people in time to come – which Jack Matson built in Pinetown near Durban.

Horace then considered making domestic radio receivers. As non-essential items their importation was by no means a priority and local radio suppliers were running out of stock. SMD therefore stepped in and set up an assembly line to meet their individual requirements. One of his first customers was Boris Wilson who, amongst many other activities, was selling radios again.

The first transistors appeared in the mid-1950s and were soon used in audio amplifiers and other low frequency applications. The bulk of the design work was undertaken by David Larsen who had joined the company as an apprentice in 1952. Subsequently SMD produced a range of portable radios and accessories under the Eveready and other nameplates and hundreds of thousands were sold throughout southern Africa. Printed circuit board manufacture, the silk screening of dials as well as the first flow soldering plant in South Africa all followed in short order. These developments laid the foundation for SMD's move back into designing and manufacturing radio transmitters and they opened the way for a most important collaboration.

Wadley's Receiver

At the beginning of this article reference was made to the Wadley receiver that became the Racal RA17. This story was very well told within the pages of *Radio Bygones* (see RB25/26, 1993) by Keith Thrower, then Research Director of the Racal

Radio Group Ltd. In the late 1940s when Trevor Wadley was a Senior Research Officer at the CSIR's Telecommunications Research Laboratory (TRL) in Johannesburg, he invented what has since become known as the Wadley loop.

The similarity between the initials TRL and TRE, the Telecommunications Research Establishment in Malvern, England led Keith, and many others, inadvertently to assume that Wadley developed his ideas whilst seconded to the TRE during the war. I pointed out the error in a letter to the editor of *RB*, published in the issue of August/September 1994, which also contained Keith Thrower's acknowledgement of that mistake.

In 1950, after the receiver had been patented in South Africa, Wadley took his prototype to England to demonstrate it to the Ministry of Supply. They showed little enthusiasm, however, and directed him to Mullard instead where it was viewed with interest but reservations were expressed about its lack of front-end selectivity. Wadley assured them that this could easily be improved but at the cost of somewhat more complexity. Wadley also approached the British Patents Office who produced a patent

issued in 1945 to a French radio group describing a method of frequency generation that operated on similar principles. However, no further developments had taken place in France nor was the South African patent ever challenged but, for this reason, the Wadley receiver was never patented in Britain.

In the meantime, the BBC had expressed interest and indicated that they would be prepared to acquire six sets. Thus fortified, Wadley returned home to South Africa to the news that the UDF had provided funding for the production of six prototypes with the possibility of an order for a further 100 to follow, if they were produced by a local manufacturer.

It was with this background that SMD won a tender from the CSIR in 1951 to develop six pre-production versions of the Wadley receiver at a cost of £75 each. These followed the two that Wadley had made at the NITR and one other made there by an engineer from the South African Post Office. In 1954 Wadley's boss at the TRL, Dr Frank Hewitt, when on an official visit to England, heard that the Racal company (a name with which he was completely unfamiliar) had obtained an order from the Royal Navy for 500 receivers to be



The TR28: the world's first HF solid-state SSB manpack



The TR15H: the world's first HF frequency-hopping military transceiver

based on the Collins 51J-1, which represented the state-of-the-art at that time. But difficulties had arisen between Collins and Racal and the 51J-1 could not be manufactured in England as originally intended.

Racal was in trouble and were particularly interested to see the Wadley receiver and so Hewitt took one of the TRL models plus one built by David Larsen at SMD to Bracknell. Keith Thrower (in *RB25/26*) tells what happened next. Suffice it to say that Racal soon moved into top gear to turn the Wadley receiver into a form acceptable to the Royal Navy. It became the famous RA17.

SSB In Africa

Horace Dainty's wish to get back into the business of designing and manufacturing transmitters was given impetus following a request from the meteorological office in Mozambique for an AM transmitter. The outcome was the FSR 26, with two 6146s in the transmitter: one as the modulator, the other the final, with a solid-state receiver. Similar orders soon followed from the neighbouring territories of Basutoland (now Lesotho) and Bechuanaland (now Botswana).

Then, in 1959, SMD embarked on a venture that would put them in the forefront of HF radio communications when they produced what was possibly the world's first commercially available transistorised, filter-type SSB transceiver, the RT422B. With a pair of 6146s in the 100W linear amplifier it began life, as did so many SMD products, as one of David Larsen's amateur radio projects. This crystal-controlled transceiver was ruggedly housed in two die-cast aluminium boxes and could be used in either fixed or mobile installations and, most importantly, was very sim-

ple to operate. It was soon in service in Mozambique and the countries of the Rhodesian Federation. By the early 1960s over 600 were in use throughout southern Africa.

In March 1963, Douglas Morrell, the Racal sales director, paid a visit to SMD in Pinetown. He told Horace Dainty that he'd "come to see what sort of operation they were because SMD had effectively put Racal out of business more or less up to the equator". As well as seeing the production lines turning out hundreds of domestic receivers per day, he also saw the RT422B and another amateur radio project, a fully transistorised version of the Wadley triple loop receiver that had been designed and built by Ken Clayton ZS5GU and which would soon become the RA217 in England. And undergoing trials was the RT14 SSB manpack (described by the author in *RB93/94*, 2005). It was arguably not only the world's first SSB manpack but it contained a unique form of RF speech processing. In addition, the broadband circuitry meant that the single inductor ATU was the only tuneable element throughout its 2 to 8MHz range.

By May of that year a new company came into being: Racal SMD (Pty) Ltd, with its headquarters in Pretoria. The professional and military communications market completely displaced domestic receiver production: the RT14 became the TR28 and went into service with the Portuguese and Rhodesian forces fighting bush wars north of South Africa's borders.

Racal's holdings increased with the formation of Racal Electronics South Africa in 1965. The world's first synthesised FM/SSB manpack, the SA50X, operating in the 30 to 70MHz range, was taken to an advanced stage of development before being scuppered, mainly for political reasons to do with the quid pro quos of the international arms trade. Such dark

dealings by the country's politicians are another story entirely! The TR15, a synthesised, all solid-state HF 100W transceiver was designed and produced in large quantities and both it and the RT14/TR28 used the broadband push-pull, transformer-coupled RF PA topology so familiar to us today. Then, just as Horace Dainty was preparing to retire, the TR15H appeared. It was the world's first frequency-hopping HF transceiver – a truly world-shattering advance. And he said it was all down to luck!

Colonel Farmer Dainty

When he retired as Chairman in 1976 Horace donned a uniform again as a part-time colonel in the SADF charged with marshalling the country's emergency communications resources. He was prevailed upon to undertake this task by the Director of Telecommunications who saw both the need and the man with the skills to make a difference. But Horace's soldiering days were long past and after 18 months he called it a day, returned to Natal and became a sheep farmer – and a very successful one at that.

Acknowledgements

I must acknowledge the assistance I received from a number of people in putting this tribute together: Adam Farson, Colonel Bert Howes, David Larsen and Keith Thrower contributed very useful information and valuable comments. Mike Perks provided some of the photographs.

All had known Horace Dainty at some stage of his career. But it was Horace's own summary of the highs and lows of his life, sent to the author in a number of emails in 2005, which provided the heart of the story. RB

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