# OTN

Old Timers' News

Journal of the ***Radio Amateurs Old Timers Club Australia Inc***

Number 61 March 2018

## Contents

# Radio Amateurs Old Timers Club Australia Inc

Established 1975 Incorporated 2002 Member of the WIA

## Correspondence

Please note that all correspondence for the RAOTC and for *OTN Journal* is to be addressed to:
RAOTC
PO Box 107
Mentone VIC 3194
or by email to: *raotc@raotc.org.au*

## *OTN* Journal

*OTN* Journal is published twice yearly by **RAOTC Australia Inc** and is mailed to all members in March and September of each year. **OTN is dependent upon material supplied by members and all contributions are most welcome,** particularly those describing your experiences in your early years of amateur radio communication.

## RAOTC Office Bearers

| | |
|---|---|
| **President; Secretary; Broadcasts.** | Ian Godsil VK3JS, Tel: 0466 286 003 |
| **Vice President; Broadcasts.** | Bruce Bathols VK3UV |
| **Treasurer** | Mike Goode VK3BDL, Tel: 03 9589 5797 |
| **Minute Secretary** | Jim Gordon VK3ZKK, Tel: 03 9893 1711 |
| **Membership Secretary; *OTN* Editor.** | Bill Roper VK3BR, Tel: 0416 177 027 |
| **Web page co-ordinator.** | Andy Walton VK3CAH, Tel: 03 9783 6859 |
| **Committee Members** | David Rosenfield VK3ADM, Tel: 03 9700 1225 |
| | Derek McNiel VK3XY, Tel: 0418 991 119 |
| | Anthony Rogers VK3JIA, Tel: 0447 747 213 |

## RAOTC Membership and Fees

With the objectives to maintain the interest and original pioneer spirit of amateur radio, honour the history and heritage of our hobby, and encourage good fellowship amongst all radio amateurs, **Full membership** of the **RAOTC** is available to any person who has held, or has been qualified to hold, an Amateur Licence for a minimum of 25 years.

**Associate membership** is available to any person who has held, or has been qualified to hold, an Amateur Licence for a minimum of 10 years. Associate members are entitled to all the privileges of Full membership except the right to vote or to hold office.

**Membership subscriptions**, which fall due on 30th April each year, are: a $5.00 joining fee for new members (to cover the cost of a membership certificate, recording of membership, and initial postage); $18.00 for a one year membership; or $32.00 for a two year membership; or $375 for a Life membership.

An RAOTC member, on achieving 90 years of age and having been a member for a minimum of 10 years, automatically qualifies for a free Life membership.

The **address flysheet** accompanying your mailed copy of *OTN* journal shows your **RAOTC** membership number and your membership financial situation in a line immediately above your name and address. In addition, if your membership subscription is due, a reminder notice will appear below your name and address.

**Application forms** for membership of the **RAOTC** are available from the RAOTC, PO Box 107, Mentone VIC 3194 on receipt of a stamped self-addressed envelope, or on receipt of an email request to *raotc@raotc.org.au* or as a download from the RAOTC web page at *raotc.org.au*

**Enquiries** will be welcomed by President/Secretary Ian Godsil VK3JS on 0466 286 003; or by Membership Secretary Bill Roper VK3BR on 0416 177 027; or by email to *raotc@raotc.org.au*

## RAOTC Broadcasts

**VK3OTN, the offical callsign of the RAOTC, transmits news and information sessions for the benefit of members on the first Monday of each month (except January) at the following times and frequencies:**

| | | |
|---|---|---|
| 10.00 am | Victorian time (all year) | VK3REC on 147.175 MHz FM, plus 1.825 MHz AM, and 7.146 MHz LSB. |
| 08.30 pm | Victorian time (all year) | 3.650 MHz LSB. |
| | | **Interstate relays** |
| 10.00 am | WA time (all year) | VK6OTN on 7.088 MHz LSB and NewsWest FM repeaters. |
| 01.00 | UTC (all year) | 14.150 MHz USB beaming **North-east** from Adelaide. |
| 07.30 pm | Tasmanian time (all year) | via the VK7RAA network across northern Tasmania and the VK7RTC network in southern Tasmania. |
| 08.30 pm | Local time (all year) | VK7AX Video Stream via BATC - *www.batc.tv/streams/7ax* |

*Check the RAOTC web site for any broadcast variations - call back sessions follow each transmission.*

**RAOTC web site:** *www.raotc.org.au*

# From the president . . .

Greetings. 2018 is well under way, the monthly broadcasts have resumed and here is our first edition of *OTN Journal* for the year.

I take this opportunity to write to you because, after three years of being a widower, last October I married a Dutch lady who lives in my Retirement Village. Nothing too special about that, but as we are both octogenarians we hope that we shall be spared a few happy years together before illness and infirmity overtake us.

To this end I have notified the Committee that I would like to relinquish my various positions with RAOTC at the AGM in September. Therefore, several vacancies will occur - President, Secretary/Public Officer and broadcast team member.

Any club is only as good as the contributions from its members, be they administrative or via articles and photos for *OTN*. Taking responsibility and commitment today are not popular activities, but whilst RAOTC could run without a President or Vice-President, legally it would cease to exist if there were no Secretary.

The Committee has always been Melbourne-centric, but it does not need to be; although it would be practical for the Secretary to be in Melbourne as long as the Treasurer is also.

There are many of you out there with skills to help keep RAOTC alive and my plea to you is to consider the good of the Cub and to nominate your services.

I would like to see nominations from those interested in the next month or so, not left until a few days before the AGM. This way there can be a smooth transition in September.

There is a 'list of duties file' that I could send to anyone interested, so don't hesitate to ask. President, Vice President and Secretary duties are listed there. Becoming a Broadcast Officer requires finding, editing, recording and broadcasting material each month.

In the words of an advertisement for a type of motor car some few years ago, Please Consider. Then ACT now!!

***Ian Godsil VK3JS***
***RAOTC President***

ar

# From the committee . . .

I am very fond of camping out in the bush, either in a swag, a small caravan, or something in between. Some five or more years ago, I was camped alongside the shores of Rocklands Reservoir in the west of Victoria. Incidentally, Rocklands Reservoir is formed by the damming of the Glenelg River.

I had recently joined the RAOTC at the suggestion of another member and had begun to listen to their monthly news broadcasts. Back then band conditions were a lot better than they are now at the current lull in solar activity. I had recently installed an Icom IC-706 transceiver in my Toyota Hilux and was swapping between the 40 and 80 metre broadcast relays. The signal strengths were about the same although transmitted from two different stations both located in Melbourne.

At the time, our current *OTN* Editor and Membership Secretary, Bill Roper VK3BR, prepared the monthly news broadcasts. Having done so for many years, Bill was somewhat keen to divest himself of this and some of his other RAOTC responsibilities.

One of these responsibilities was web master, or web page co-ordinator. I'd used HTML previously so I had a quick look at the RAOTC web site, and thought, "I can help doing that".

In a nutshell, that's how I became involved in becoming a member of the RAOTC Committee. With meetings held four times a year, and not too far from where I lived in Melbourne, I attended where I could, pretty much all the time whilst I was still working.

Allow me to fast forward five years. I am now retired, but I still manage the RAOTC web site, have a good grasp of the RAOTC committee meetings, and attend when I'm in town. However, I don't allow it to interfere with my holiday and travel plans.

When I'm at home, I also help with the 80 metre evening broadcast relay - my transmissions seem to get out reliably around 750 km using 100 watts SSB. I only attended two committee meetings during 2017, because they coincided with when I was in Melbourne.

The RAOTC web site can be managed wherever I have internet access, which is wherever I have mobile phone coverage. This costs me around $50 per year for a data-only prepaid plan. My internet runs seamlessly, whether I'm home or not.

During the past 12 months or so, many listeners may have missed the monthly RAOTC news broadcast because of poor HF propagation. Most of them will have turned to the internet to download a copy of the audio file and will have enjoyed some of Ian's and Bruce's jokes at the tail end of the news.

The audio file of the broadcast on the internet is exactly the same as supplied to the broadcast relay stations.

***(continued at foot of next page)***

**Editor**
Bill Roper VK3BR
**Typesetting and Layout**
Bill Roper VK3BR
**Article proof-reading**
Clive Wallis VK6CSW

**Printer**
High Tech Printing Services P/L, Ballarat
**Enveloping and addressing**
Bill Roper VK3BR
**Mailing**
Mike Goode VK3BDL

**Front Cover Photo**

Darcy Hancock VK5RJ, Australia's oldest radio amateur at age 106 at the time of his death in August last year. An obituary to Darcy is published on page 33.

# From the editor . . .

As RAOTC members have come to expect, this edition of your journal contains a wealth of interesting reading with many articles of varying length covering a wide range of subjects.

My thanks to those authors who toiled over their keyboards to supply this material.

My thanks also to proof-reader *par excellence* Clive Wallis VK6CSW who, as always, did a great job in picking up my editing errors.

Some little time after Graeme Scott VK2KE's article *The Telegraph Station at Beechworth* (see page 53) was prepared for publication, Herman Willemsen advised of a YouTube video titled *Keeping it alive* which can be accessed at: https://www.youtube.com/watch?v=1taa-quTHJI

After you have read VK2KE's article it is well worth having a look at that video.

And while talking about the articles published in this edition of *OTN*, club members who are also recipients of the WIA's *Amateur Radio* will notice quite a few similarities between an article published in the September 2017 issue of that magazine by John Anderson VK9JA and the one published on page 28 in this issue of *OTN* by Allen Burke VK7AN.

Allen's article for *OTN* was prepared for publication well before the similar article appeared in *Amateur Radio*. As quite a few RAOTC members are not members of the WIA, and there are some differences in the articles by the different authors, I decided to go ahead and publish Allen's article.

As editor I continue to be in the delightful situation of having more articles to hand than could be published in this issue of *OTN*. Articles received and prepared ready to go into the next issue of the journal are from: Clive Wallis VK6CSW (3 fillers, 2 articles and 2 more on the way); Herman Willemsen ex VK2IXV (5 articles); Lloyd Butler VK5BR (3 articles); Bill Toussaint VK6LT; Cal Lee VK3ZPK; and John Sutcliffe VK3TCT.

. As readers know, articles are generally published in the order in which they are received unless circumstances dictate otherwise. Despite all those articles in hand, I would still like to receive a lot more, particularly letters, stories and photographs about your radio history so we can record your experiences, not only for others to enjoy reading about them, but for posterity. Every radio amateur has a story or stories to tell. Let us get them into print before it is too late.

Sadly, in each issue of *OTN* I have to record a list of Silent Keys. In this issue there are five such well known amateurs and RAOTC members listed on page 33. I had spoken on air to all of them and knew three of them personally for many decades. Amateur radio is very much the poorer for the passing of all of them.

I was honoured to deliver the 'Ham Radio Tribute' at the funeral of Ron Fisher VK3OM on Friday, 9th February. Amateur radio and the RAOTC were well represented in the over 200 people present.

### Membership renewal

Renewal of their RAOTC membership falls due this year for 156 of our members. Are you one of those who needs to pay a renewal subscription fee by 30th April 2018 to continue as a member of the club?

How would you know? Well, there was a subscription renewal invoice printed in red ink on your address flysheet that came with this *OTN*.

Please pay your membership dues promptly. In fact, why not pay them now, before you forget!

The various easy methods of payment are explained on the back of the address flysheet and also on the RAOTC web page.

If you tossed the flysheet aside in your eagerness to read *OTN*, and are not quite sure whether your subs are now due, please contact me (see page 2).

In the meantime, enjoy lots of great reading.

***Bill Roper VK3BR***

ar

---

***From the committee . . .***

***(continued from the previous page)***

The main point of what I have written above is to show that you don't need to live in metropolitan Melbourne to be an active part of the RAOTC management committee. If you can connect to the internet, you can contribute just the same as anyone else, without ever having to attend a committee meeting.

Please have a thought as to how you may be able to contribute to ***your club***.

I sincerely hope you have a thought along the lines of, "I can do this! I can contribute!"

And then ACT!!

***73,***
***Andrew Walton***
***VK3CAH***

ar

---

## QSO PARTY RESULTS 2017

| | | | | |
|---|---|---|---|---|
| 1st | VK6CSW | Clive Wallis | SSB | 52 points |
| 2nd | VK3KTO | Mike Ide | SSB | 32 points |
| 2nd | VK3CAH | Andrew Walton | SSB | 32 points |
| 4th | VK3FB | Len Steel | SSB | 31 points |
| 5th | VK3RV | Peter Wolfenden | SSB | 30 points |
| 6th | VK6AR | Mark Bussanich | SSB | 29 points |
| 6th | VK3AIC | Bob Duckworth | SSB | 29 points |
| 8th | VK6ATS | Graeme Smith | SSB | 28 points |
| 9th | VK4EMF | Ron Goodhew | SSB | 7 points |
| 10th | VK4TE | Alex McDonald | SSB | 6 points |
| 11th | VK5PL | David Poole | SSB | 4 points |
| - | VK3JS | Ian Godsil | Mixed | 33 points |

I am pleased to present the Results of the 2017 QSO Party. As you can see, 12 logs were received, a good representation of the number of stations heard on air.

My sincere thanks to you all for your continued support and a special thanks to David VK5PL. David is a recent member of RAOTC and made a special effort to join in for the first time.

I look forward to hearing you all next year.

***73,***
***Ian Godsil VK3JS***
***QSO Party Manager***

ar



ar

# From our members . . .

### Closure of Radio Australia

Dear Bill,

The closure of Radio Australia by the ABC is a wakeup call for all radio amateurs as became evident in the Senate Committee hearing. The usual claim of 'wide consultation' was once again put forward as did the fact that many effected Australians and overseas governments, our Pacific neighbours, were unaware it was being closed down - all within a month!!

Radio Australia was established during World War Two and was widely listened to by our Defence Forces that were widely deployed in that war and also in later conflicts, Korea/Malaya and Indonesian confrontations, Bougainville, Timor and the Solomons plus numerous other deployments on and through the region.

In WWII the defence organisation actually produced a receiver so units back in reserve could listen to home via Radio Australia, BBC and Voice of America as well as 'Tokyo Rose' - as my father told me when he was on RAAF 'ops' with 34 Squadron from Morotai Island.

It is interesting how many 'hams' listen to the shortwave bands. Many amateurs of long standing have talked about listening to shortwave as part of their hobby and how it also gave indications of band openings.

Australian amateurs need to ask their federal MPs why this has occurred as it has deprived a lot of remote Aussies - road trains/fisher-persons/mining exploration/ primary production and remote communities - of the ability to listen to news, weather reports and warnings, entertainment and current affairs, etc.

In the Pacific the Prime Minister of Vanuatu wrote asking that the 'switch off' not go ahead - similar concerns were expressed by other countries who are our allies and have a close relationship which developed during WWII.

If this can occur so rapidly and with almost no truthful consultation, one can but wonder if pressure was brought to bear about taking over an amateur band if the same successful tactic could be used once again.

Amateurs need to stand up and let our government know that the WIA and 14,000 Australian radio amateurs do care!

***Mike Patterson VK4MIK (ex-RAN)***
***RAOTC member No 1467***

### Licensed since 1948

Dear Bill,

In response to your suggestion re 'Licensed for 50 years' I am sending a scan of my *Amateur Operators Certificate of Proficiency* dated 1948. Note the personal particulars and photo on the back. Had it not been for a war which silenced ham radio it would probably have been dated several years earlier.

I had started building crystal sets at age 12 and studied a mail order radio course advertised on the back of the first issue of *Radio and Hobbies* which came out in April 1939 when I was 15. I can't remember the questions I had to answer at that exam but do recall the Morse reading test seeming a bit slow.

I had studied Morse in a group, conducted by my uncle, of young people who aimed at being wireless ops in the various forces. He was a ham and tried to enlist but was considered too old. I could do 20 wpm in those days but did not use it in the forces or, for that matter, very much on air.

I have to admit that I did not immediately get a licence and go on air. A few things like a college course, getting married and having kids got in the way. But it was well within the 50 years number. Closer to 70.

Of course the war did give me the opportunity to learn about an aspect of radio far beyond my dreams - radar, or RDF as it was called then. I had never heard of it when I signed up to do a Wireless Mechanic course at 18 years of age.

It was a six month course: the first three on receivers and the second on transmitters. At the end of the first three months we had an exam on receivers. There was only one question: **Draw the circuit of a 5 valve dual band superhet receiver. Include every part, marking it with its name and value. Then explain the purpose of every part.**

This exam, like all of them in those days, was done by sitting for a couple of hours in a silent room with nothing but blank paper and the question sheet, plus a ruler and pen or pencil. The examiner would be wandering round watching your every move.

*(I have to say that the idea of giving questions followed by three or four possible answers, including the right one, and being required to tick the right one, would, I think, have been laughed at in those days. With a bit of luck you could pass an exam with no knowledge at all!)*

Anyway, a few days later our radio instructor gathered us together to read out the examination results. He began with the lowest marks and proceeded towards the higher ones. The last few were in the nineties. Eventually he stopped. My name had not come up. My heart sank! He must have lost my papers!

Then, as an afterthought, he picked up another paper from his desk and announced, "Oh yes, Holmes. I gave him 100. Actually I shouldn't have because he left out one short line in the circuit. But since everything else was correct I put it down as a slip."

As most readers of this magazine may remember, the circuit of a five valve dual wave superhet was reasonably complicated. Unfortunately, I can't put my hand on one at the moment to demonstrate. However, I found that soon afterwards I was sent off to the radar school in Sydney and popped into a class there. Since I knew practically nothing about transmitters that was hard going.

As my computer got hacked I am not on the net at the moment. Frankly, I am planning to stay off it. So all this will come by the postman. Hope some of it may be of use.

***73, Ron Holmes VK5VH***
***RAOTC member No 1299***

PS. In case I have not appeared to be boasting enough already, I was definitely chuffed to discover that in the new RSGB book *International Antennas* (with 50 plus antennas from hams all over the world), the five chosen from Australia included one of mine which was described on page 15 of the July 2010 issue of *Amateur Radio* magazine.

ar

# OTN Stewart Day Award 2017

**Bill Roper VK3BR**
RAOTC member No 978

## Lloyd Butler VK5BR is the 2017 winner of this award!

The success of *OTN Journal* depends almost entirely upon the articles and photographs submitted for publication by the members of the RAOTC. All of us who are members of the RAOTC have been involved with radio for many years in one form or another, and we all have many interesting stories to tell of our experiences, whether those experiences were in the military, with commercial radio or with the many and various facets of amateur radio.

The articles published in *OTN* are a mix of club members' own experiences and historical items relating to electricity, electronics, wireless and radio.

This award, entitled the **OTN Stewart Day Award** in order to commemorate the late Stewart Day's service to the RAOTC in producing *OTN Journal* over a long period of time, is in the form of a colourful certificate. It is presented each year to the RAOTC member whose original contribution to *OTN* has been judged by the RAOTC management committee to be the best published in that calendar year.

The list of award winners since its inception is as follows:

| | | |
|---|---|---|
| 2003 | Arthur Evans | VK3VQ |
| 2004 | Bill Magnusson | VK3JT |
| 2005 | Graeme Scott | VK2KE |
| 2006 | David Dunn | VK3DBD |
| 2007 | Clive Wallis | VK6CSW |
| 2008 | Clive Wallis | VK6CSW |
| 2009 | Bob Crowe | VK6CG |
| 2010 | John Drew | VK5DJ |
| 2011 | Lloyd Butler | VK5BR |
| 2012 | Gerry Wild | VK6GW |
| 2013 | Winston Nickols | VK7EM |
| 2014 | Lloyd Butler | VK5BR |
| 2015 | Herman Willemsen | VK2IXV |
| 2016 | Rob Gurr | VK5RG |


RADIO AMATEURS
OLD TIMERS CLUB
OF AUSTRALIA
*OTN* Stewart Day Award
2017
(for the best original contribution to *OTN* magazine during the year)
awarded to
Lloyd Butler VK5BR
*in recognition of the high standard of his articles*
*'A history of Parafield Airport and its facilities' and*
*'History of Leigh Creek and its early radio installations'.*
Issued 17th November 2017 Editor ......................

Again in 2017, as we have come to expect year after year, there were many excellent contributions published in *OTN* which were considered for the 2017 award.

However, it was finally decided to present the OTN Stewart Day Award 2017 to Lloyd Butler VK5BR for the high standard of his original articles *A history of Parafield Airport and its facilities* and *History of Leigh Creek and its early radio communications*, both of which were published in the September 2017 edition of *OTN Journal*.

As readers well know, Lloyd has been one of *OTN*'s more prolific contributors in recent years.

On behalf of the RAOTC management committee and, in particular, myself as editor, I would like to thank all the contributors of material to *OTN*. Without your invaluable efforts we would not be able to produce such an interesting and popular publication.

ar

# RAOTC 2017 AGM and Melbourne September luncheon

**Bill Roper VK3BR**
RAOTC member No 978

The September 2017 Melbourne luncheon of the RAOTC, and the RAOTC 2017 AGM, took place on Thursday, 28th September 2017 at the Bentleigh Club, Yawla Street, Bentleigh VIC with 50 RAOTC members and guests present.

The AGM kicked off at 12 noon and ran smoothly. As there had been no new nominations received, the current members of the committee were declared re-elected for the current financial year

Nominations of Ian Godsil VK3JS for President and Bruce Bathols VK3UV for Vice-President had been received, together with nominations of Ian Godsil VK3JS as Secretary and Mike Goode VK3BDL as Treasurer. As no other nominations were received they were declared elected until the 2018 AGM.

The AGM was followed by an excellent three-course lunch and then it was time for the guest speaker. Unfortunately, the advertised speaker, Victorian Police Inspector Peter Ferguson, had succumbed to influenza two days prior to the luncheon and was unable to attend. With only 36 hours notice I stepped in and presented a hurriedly prepared PowerPoint supported talk titled *Victorian Police Wireless Patrol - the early days*.


**Bill VK3BR presenting the fill-in talk at the September Melbourne luncheon.**

A recording of this talk can be accessed on the RAOTC internet web page under *Luncheon Speech Recordings*. Also, an article, based on the talk, is published in this edition of *OTN* on page 36.

ar

# Don't be vague - ask for Sprague

Clive Wallis VK6CSW
RAOTC member No 1289

**I'm sure that many *OTN* readers will be aware of Sprague capacitors, especially the famous Black Beauty and, later, the Orange Drop series. Some of you may even have a few of these excellent units lying in your junk (whoops! spares) box, and former radio technicians will undoubtedly have used Sprague components with their well-deserved reputation for close tolerance and high reliability when repairing valve radios and TVs. Although best known for their capacitors, Sprague Electric also manufactured resistive components, transformers and coils, filter assemblies, semiconductors and integrated circuits used in a wide variety of equipment including industrial and commercial electrical and electronic applications, plus military and space equipment.**

Robert C Sprague was born in New York City on 2nd August 1900, the son of Frank and Harriet Sprague. His father had already built a reputation as a developer of electric traction systems and ultimately became known as 'the father of electric traction'. Robert was also destined for fame but in electronics rather than electric motive power.

Just like his father, Robert began his adult life as an Ensign in the US Navy, enlisting in 1918. While in the Navy he graduated from the Massachusetts Institute of Technology (MIT) and during his period of service devised the simple audio 'top cut' tone control for the newly introduced wireless sets and amplifiers. About this time he also created a compact cylindrical version of the paper foil condenser, or capacitor as we now term it. Both ideas were patented in 1926. That same year Robert founded his Sprague Specialties Company, working from his new home in Quincy, a southern suburb of Boston, Massachusetts, USA.

One of the first products was his paper foil 'Midget' condenser. Although the paper foil condenser (one which uses suitably impregnated paper as the dielectric between two metal foils) was first patented in 1902 by George Mansbridge when working for the Dubilier Condenser Company, there were many practical problems to overcome and until the early 1920s most of the condensers used in wireless sets were of the mica dielectric type[1]. Paper foil capacitors needed a very clean manufacturing environment to avoid foreign materials like tiny metallic particles which might puncture the thin dielectric and connections to the foils were often unreliable. The paper needed the right moisture and ash content, even the right pH; the


**A sample of Sprague capacitors over 60 years.**

**Robert C Sprague founded Sprague Electric in 1926, was its president until 1953 and chairman and chief executive until 1971. He was also a director of many institutions, including MIT, the First National Bank of Boston, the Charles Stark Draper Laboratory, the Associated Industries of Massachusetts, the Massachusetts Science and Technology Foundation, and the Federal Reserve Bank of Boston.**

impregnating oils and waxes required a very high purity, and only certain kinds worked well.

Sprague's patented Midget condensers overcame these problems and were soon in high demand by the new wireless industry for applications such as signal coupling, noise filtering and, of course, tone control. Sprague Specialties' core 'Midget' capacitors were the foundation of what was to become one of the world's most successful electronic component suppliers.

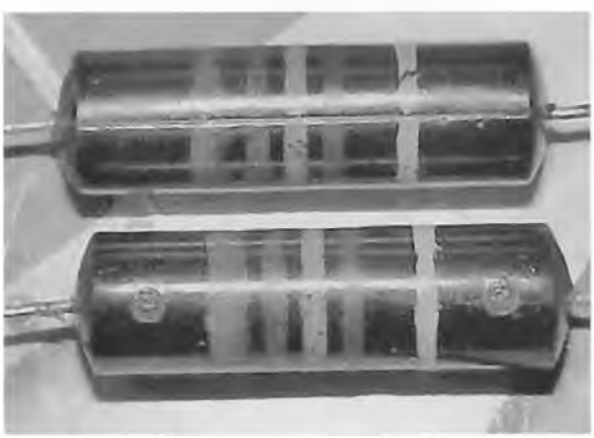
By the late 1920s, AC mains powered radios were rapidly displacing battery powered ones, creating a need for many different types of capacitors; there was also a ready market for high power applications such as electric motor starter capacitors. Sprague soon turned his attention to all of these areas.

From the start business boomed, growing from a simple cottage industry in 1926 to one which did $54,000 of business in 1927. By 1929 Sprague Specialties was employing 525 people in Quincy with sales of $500,000, roughly equivalent to $6,800,000 in 2017.

By 1930, the rapidly growing Sprague Specialties Company needed bigger facilities, leading Robert Sprague to purchase a plant at North Adams, Massachusetts, some 150 miles west of Quincy. He chose this area partly because his father had grown up there and partly because there was more skilled labour available. Despite the difficulties of the Great Depression the company survived and WWII proved very advantageous.

Over time Sprague would become the largest single employer in North Adams, employing some 4,000 of the town's 18,000 population, with production facilities housed in a maze of 26 buildings all connected by tunnels and overpasses. Ultimately, Sprague would expand further to employ some 18,000 people in facilities throughout America, Europe and the Far East, producing a wide range of high quality electronic components.

By the mid-1930s Sprague capacitors had gained an enviable reputation among radio manufacturers and repairmen, and also for their use in other electrical applications. Between 1936 and 1944 sales increased seven-fold and soon after America declared war in December 1941 the company diversified into other products such as the making of civilian gas masks, incendiary bomb casings, and crucial electronic components for the Variable Time (VT) proximity fuse used in bombs, anti-aircraft shells, and rockets, etc, which played a vital part in defeating the enemy. Sprague Electric's participation in the US war effort improved its reputation, its future contracts and its sales, and propelled the Sprague name to the forefront of the growing American electronic business. Sprague's war time contribution also earned the firm five Army-Navy 'Excellence in Production' awards, more than any other single company achieved. Post war, Sprague's reputation continued to grow.



**Sprague Bumblebee capacitors.**

Following on from the success of the Midget came the 1950s Bumblebee series of oiled paper dielectric foil capacitors which looked more like overgrown resistors. These were followed by the famous Black Beauty hard-cased series with their unmistakable red or yellow lettering and which used the 'Difilm' dielectric of paper and polyester (mylar). Black Beauties were then followed by the more compact Orange Drop series encased in


**A Sprague Black Beauty capacitor.**

**A Sprague Orange Drop epoxy capacitor.**

orange coloured epoxy, still made today by Vishay who acquired the capacitor division of Sprague in 1992.

Around 1940, Sprague introduced the first of a range of Tel-Ohmike capacitor analysers which are now prized collector's items. These could accurately test all types of capacitor between 10 pF to 2,000 mF for capacitance, leakage current, power factor, insulation resistance up to 10,000 megohms, and detect intermittent faults. These instruments could also test resistors for accuracy.


**A Sprague TO6B Tel-Ohmike capacitor tester.**

In 1944 the company name changed from Sprague Specialties to Sprague Electric.

In the late 1940s Sprague Electric developed the wet tantalum capacitor which, for equal capacity and voltage rating, was very much smaller than the standard aluminium electrolytic capacitor of that era. Improvements followed but the solid (dry) tantalum was invented by Bell Laboratories in 1956. In 1975, Sprague introduced its own line of all-tantalum capacitors, a major improvement over wet ones, specially developed for the NASA space program.

WWII, the Korean War, the Cold War and the Space Age cemented Sprague's position as a crucial supplier of reliable high-performance military-grade components. In 1960 the company received a $1.3 million contract from Autonetics to develop super high-reliability components for the Minuteman intercontinental ballistic missile's guidance and control system. Sprague's newly developed solid tantalum capacitor not only filled the bill admirably, it also filled a need in the expanding computer market.

IBM eventually became Sprague's largest customer (Delco Radio, the electronics division of General

Motors, and AT&T were the next two largest). There were more than 50,000 Sprague devices in every Apollo mission and more than 25,000 in every Space Shuttle, not to mention thousands more in related ground control equipment.

Sprague also invented the multi-layer ceramic capacitor that came to dominate the world capacitor industry but, unfortunately, Sprague was never able to make it a business success[2].

Sprague capacitors also had a remarkable reputation among audiophiles. Surf the net and you will find testimony from amplified-music enthusiasts who swear that Sprague capacitors make amplifiers 'sound better'. Be that as it may, it is true that many of the leading manufacturers of sound amplifiers, particularly in the valve era, such as Marshall, Gibson, Marantz and Fender, chose Sprague ahead of other capacitor manufacturers.

A 1955 edition of the *ARRL Handbook* which I have advertises the following Sprague products, some of which will probably 'resonate' with older amateurs: Hypass feedthrough capacitors; Filterol mains filters; Cera-mite disc ceramics; Telecap phenolic molded paper tubular capacitors; Atom metal cased dry electrolytics; Twist-loc chassis mounting electrolytics; Micas high-Q RF capacitors; metal encased paper capacitors; and Koolohm ceramic coated wirewound resistors.

With the introduction of computers came the need for high capacity electrolytic capacitors in linear power supplies, often of tens of thousands of microfarads capacity at medium voltage ratings. Sprague's Extralytic and Powerlytic series proved highly reliable for military, space and computer purposes - and later many found their way into homebrew amateur linear power supplies via disposals outlets[3].


**A typical Sprague Clorinol capacitor which used PCB oil!**

**A word of caution!** As with many other capacitor and transformer manufacturers in the 1940s and 50s, Sprague used toxic polychlorinated biphenyls (PCB) in some capacitors, notably their Clorinol series.

While these were mainly electric motor start capacitors, the bathtub types were used in radio equipment. Never open or puncture any device thought to contain PCB.

**A Sprague bathtub capacitor containing PCB oil.**

The invention of the transistor at Bell Telephone Labs in 1947, followed by the development of the integrated circuit in the 1950s, generated a revolution in electronics. Sprague Electric played an early pivotal role in the invention of PN junction isolation, without which integrated circuits would not be possible. The development of the ion implantation process by two Sprague researchers made possible the early success of Mostek, a business which in the 1970s specialised in dynamic random-access memory (DRAM) production. Sprague Electric sold off its interest in Mostek in 1979. Nevertheless, Sprague Electric had a long and rocky road to success in semiconductors, finally succeeding in the early-1970s when the company settled on a niche strategy of offering unique circuits for consumer applications, Hall Cells, and power integrated circuits. The last two remain key strategies today, but for a legacy company under very different ownership.

Robert C Sprague retired as Company Chairman in 1971. In 1976, Sprague Electric was acquired by General Cable (renamed GK Technologies in 1979). In 1981, Penn Central acquired all the stock of GK Technologies. In 1985, the Sprague North Adams operations were closed. At this time, Sprague was manufacturing a wide range of products including tantalum, aluminum, film, paper, and ceramic capacitors; resistor networks; pulse transformers and filters.

Despite these successes, following Robert's death in 1991 Sprague Electric ceased to exist as an entity. By 1992 it was broken up and sold off, many of its former business units continuing operations under different management and ownership. In 1992, the huge American company Vishay Intertechnology acquired most of the capacitor manufacturing, now trading as Vishay-Sprague, while other product lines were spun off to other manufacturers, but the reputation of Sprague is such that the name lives on.

If any *OTN* readers have memories of Sprague components, vague or vivid, why not pen a few lines to the Editor and make history live?

### Notes

1. See my article: William Dubilier, *OTN* No 55, March 2015.
2. Engineering and History Wiki.
3. Including those made by many *OTN* readers, no doubt!

### References

• Various Wikipedia articles, cross-referenced and verified as far as possible.

ar

# When Maritime Coastal Radio Stations played a role in aviation

Herman Willemsen ex-VK2IXV
RAOTC member No 1384

**The Department of Civil Aviation (DCA) had its origins as the Civil Aviation Branch of the Department of Defence, which was established on 28th March 1921. I recently acquired a Morse key, marked 'DCA Western Region' which, although the DCA did not exist until 1938, reminded me of the fact that in the 1920s and 1930s most radio communication with civil aircraft was conducted by wireless telegraphy (W/T). This included ground-to-air as well as point-to-point services. The operator's tools of trade were straight keys, bug keys[1] and sometimes the Aldis lamp.**

Experimental ground-to-air communications in Australia commenced in the 1920s, following successful experiments in the USA and Europe. A good example of this would be the installation in 1928 by Amalgamated Wireless Australasia (AWA) of a 600 m (500 kHz) transmitter and receiver in Sir Charles Kingsford-Smith's tri-motor plane the *Southern Cross*.

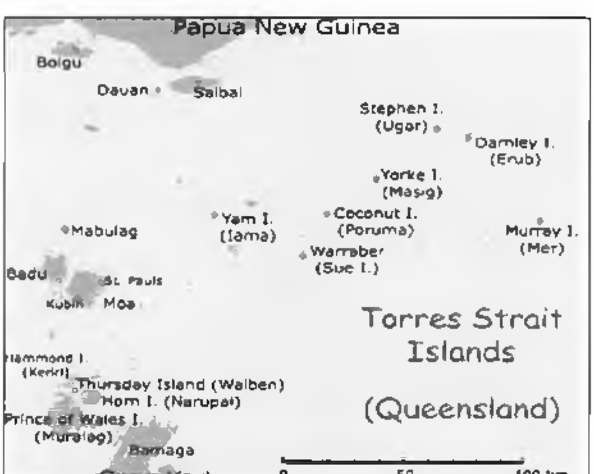
In the early 1930s, the ground radio operator and his equipment would usually be located in a hut alongside the airport. The operator of this lonely outpost was one of a band of highly skilled communicators able to make Morse code contact with aircraft and to provide, where available, Direction Finding (DF) facilities, to guide the pilot to a safe landing. Routine communication with other aerodrome ground stations was by Morse code[2] over HF radio, because landlines were precious, unreliable and mainly for public use.

Prior to the creation of DCA and the Aeronautical Service (Aeradio) in 1938, the Civil Aviation Branch arranged for AWA to provide a network of permanent ground-to-air communications services at the principal aerodromes along the major air routes between Hobart in the south and Salamaua in Papua New Guinea (PNG) in the north. This was achieved by using a combination of existing Maritime Coastal Radio Stations and temporary stations at aerodromes. Those Maritime Coastal Radio Stations provided a ready-made network for communications with aircraft in flight.

In 1939 DCA began a large recruiting campaign to employ staff for their 34 Aeradio stations around Australia and PNG. Maritime Coast Radio Station (CRS) Radio Operators[3] and seagoing Marine Radio Operators with PMG tickets were invited to join DCA as Aeradio Operators.

**The author's recently acquired DCA key with a PMG type knob.**

Thus began the progressive separation of Aeradio from the Coastal Radio Service, although the Coastal Radio Service[4] continued to provide an Aeradio service at Townsville until 1942 and Thursday Island (TI) until 1977. This brought back pleasant memories of my dual role on Thursday Island as a professional Overseas Telecommunications Commission (OTC) Coastal Radio Service Radio Operator and as a ring-in DCA Flight Service Operator (FSO).




**A map showing the Torres Strait islands. Thursday Island is located near the bottom left hand corner.**

**Under the base of the DCA key. Note the faint DCA Western Region logo on the cover.**

**A closer look at the DCA key base cover plate and the DCA Western Region logo.**

### Thursday Island or Waiben

In 1976 my comfortable existence as Radio Operator at Townsvilleradio/VIT came to a halt when OTC transferred me to 'Thursdayislandradio', callsign 'Victor India India' (VII). It turned out to be one of my favourite postings. At that time VII was the only Maritime Coastal Radio Service station left which was manning a Flight Service (FS) Unit on behalf of DCA. Therefore, before I started my two year term on Thursday Island, I had to do a crash course in Flight Service procedures at the Townsville airport.

On Thursday Island my family and I moved into a large tropical house, built on stilts, within walking distance from the radio station and adjacent to the local jail. This stilt-house had no windows, but plenty of adjustable louvres to let in the sea breeze, plus a fair amount of red dust as the roads were unsealed.

**Douglas Street on Thursday Island when the author was stationed there.**

At work, the Radio Operator's duty roster was divided between Maritime and Flight Service duties. Each service had its own radio room, located side by side, with a large sliding window in between. With the window open, it would give either operator a chance to have a comfort break, have a drink of water, or get his sandwiches out of the fridge, whilst his frequencies were being monitored by his workmate next door.

As you can imagine, Coastal Radio Service and Flight Service duties were as different as apples and oranges.

Coastal Radio Station VII was open for business 24 hours per day. Especially during daylight hours the duty Radio Operator was extremely busy, sending and receiving Reef Pilot telegrams to and from 'big'[5] ships. The link between Coastal Radio Service and the Pilot House on Thursday Island was by landline telephone and a Siemens Telex machine. The ring-ring sounds of the telephone and clack-clack hammering noise of the Telex machine often dominated the QRM and QRN in the small radio room.

Besides a 24-hour listening watch on the international distress and calling frequencies of 500 and 2182 kHz, the Coastal Radio Service Radio Operator's other duties were the transmission of the weather and navigational warnings by Wireless Telegraphy (W/T) to big ships and by Radio Telephony (R/T) to small ships. These small ships, mostly prawn trawlers, also sent and received their personal and company messages through VII. Thus, as a Coastal Radio Service operator, you had many fish to fry and before you knew it your eight hour shift had finished.

The W/T main and standby MF transmitters were respectively a CTM2K (2 kW) and a CTHP5J (500 W). The R/T Tx was a CLH1L (1 kW). All three were manufactured by AWA. The receivers were type AWA CR-3D, covering the range from 14 kHz to 30.1 MHz. Whilst being relatively old, these receivers were very capable of an excellent performance on AM and CW.

From 26th February 1913 until its closure on 1st February 1992, the OTC Coastal Radio Station played an important role on Thursday Island.

Aeradio Station VII[7] was open during daylight hours only. It should have been a peaceful retreat, as its surrounding airspace was small. However, this was not the case due to Thorpe's[6]. On a daily basis this local air charter company would conduct their inter-island flights which meant many quick arrivals and departures.

**Aeradio radio room on Thursday Island - note the flightstrip board and AWA receivers CR-6B and CR-3D. The large sliding window was to the right.**

Before taking off, Thorpe's pilots would lodge a handful of flight plans that had to be hand-written on small paper slips called flight progress strips. Each strip was mounted in a plastic boot called a strip holder and placed with other strips on a portable flight strip holder board. The strips were constantly updated as the flight progressed. Its aim was to track each flight. The strip for the aircraft with the next action due would be placed at the bottom, with the next action due above that one, and so on.

Due to this island-hopping of Thorpe's aircraft, the pace in the Flight Service radio room was frantic.

The Telex machine in the radio room was for the reception of weather messages and NOTAMs (Notices to Airmen). This teleprinter was also used to keep Cairns Flight Service up-to-date. If you had any spare time you busied yourself cutting and pasting the latest amendments into the Flight Service Operations Manual.

Although Thorpe's planes were our best customers, other aircraft bound for Thursday Island or overflying

Thursday Island could request Thursday Island's local time, weather and safety information.

In our role as Flight Service Operator we had to get used to the Flight Service jargon which was so different from what we were used to when communicating with ships at sea. Voice communications with aircraft was far more formal and to the point. No abbreviations or salutations were used. It had, of course, a lot to do with the difference in speed of aircraft and ships.

**1950s radio room in an ANA DC-4. The Morse key is a USA flameproof 26003A.**

A lot of the gaps in my memory were filled by reliable sources. But, unfortunately, not all. As far as I can establish, the Flight Service Unit on Thursday Island communicated with aircraft on a VHF frequency of 122.1 MHz. The receivers were rack mounted in the next room and were most likely DCA R20 crystal-locked units. Tunable backup receivers AWA CR-3D (for Coastal Radio Service) and AWA CR-6B (for DCA) were located on the console desk, but were later removed.

The remotely controlled HF transmitter was housed in the Bureau of Meteorology building on Milman Hill (104 m ASL). It was probably a 500 W STC AT20. HF, on 6 MHz R/T, could be used to communicate with Cairns Flight Service, but the landline Telex machine was used instead. The DCA equipment was regularly maintained by a DCA Technical Officer from Cairns and we did not have anything to do with it. Although ancient, this equipment appeared to be pretty reliable as it never broke down during my stay on the island.

The Flight Service Unit closed its doors in 1977. It had been on Thursday Island since 1939. Its functions were taken over by Weipa Flight Service Unit.

Is Morse code still used in aviation? Yes, but only in a limited and slower capacity.

In 1958 the job of qualified Radio Operators on aircraft was made redundant. From then on until the early 1980s, pilots and navigators were required to read Morse code at only 10 wpm so that they could interpret the Morse identifications (IDs) of navigational aid beacons like NDB, ILS, VOR and others[8].

These days, where Morse IDs are still being used, they are printed as Code on the air navigation charts alongside the three- or two-letter ID. For instance, the Pearce aerodrome NDB (340 kHz) would be shown as PEA (. - - . . . . - ) and the pilot simply compares the dots and dashes heard with the printed ones.

From about 1990 the GPS (the satellite-based Global Positioning System) began to be used as an en-route aid.

Much aircraft voice and data communication is now conducted via satellite systems.

On a personal note I would like to add that my two year term on Thursday Island passed too quickly. Besides my interesting job, the things I most remember about Thursday Island are the colourful characters I met, the great fishing and boating, the outdoor movie theatre and the Federal Hotel where I heard the Mills Sisters sing. For me, the red dust, the humidity, the rain, the basic amenities and the remoteness of this tiny island were never an issue.

**The view over Thursday Island from Green Hill. Horn Island is in the background.**

### Footnotes

1. Leo Cohen's Simplex Auto bugs were used by the Army, Police, Civil Aviation and OTC.
2. Even Q-codes were used. The three-letter Q-code was initiated in 1912 at the London Wireless Telegraphy Convention to make a Morse code 'shorthand'. It was mainly used by ships. But in the 1930s aviation started to use Q-codes and the groups QAA to QNZ were reserved for the aeronautical service.
3. In 1912, due to the *Titanic* disaster, Coastal Radio Stations were established worldwide. In Australia, Coastal Radio Service stations were respectively managed by the PMG, the Navy, AWA (1922-47), OTC (1947-92) and Telstra (1992-1999).
4. The terms Coastal Radio Station and Coastal Radio Service are often used interchangeably.
5. All vessels of 50 m or more (35 m for foreign flag ships) were required to have a Great Barrier Reef Pilot on board. The Reef Pilot's task was to guide a ship safely through the Great Barrier Reef and the treacherous passages in the Torres Strait.
6. In the 1970s the Thursday Island based aircraft of Thorpe's Transport P/L offered regular transport services between Horn Island and the majority of Torres Strait islands as well as to Bamaga on the mainland.
7. The radio callsign of Aeradio stations consisted of four letters, starting with VZ (eg Cooktown was VZCK). When an Aeradio service was conducted by Coastal Radio Service, the Aeradio radio callsign was the same as the three letter Coastal Radio Service callsign.
8. NDB = Non-Directional Beacon. ILS = Instrument Landing System. VOR = VHF Omni-directional Radio Range.


### Acknowledgements

- RAOTC members Clive Wallis; Lloyd Butler; and Mike Patterson.
- Roger Meyer, President Civil Aviation Historical Society, Airways Museum Essendon Airport.
- Nick Watling VK4YT, former Cairns aerial ambulance pilot; and Roger Boyden, former OTC Coastal Radio Service colleague.


ar

# Communicating the Warrnambool Road Race - the first 60 years

## Part 3: Wireless 1947 - 1955

**Barry Abley VK3SY**
RAOTC member No 1496

**This article is the third part of an extract from a more comprehensive narrative produced in conjunction with the 70th anniversary of the reinstatement of the race after WWII. It was written for broad general readership which is reflected in the limited technical descriptions of devices and circuits. Parts 1 and 2 were published in the September 2017 edition of *OTN Journal*.**

### The Bicycle at War

The Warrnambool Road Race was suspended during World War II and recommenced in 1947. During this time, however, bicycle production around the world increased enormously for both military and civilian purposes. Wartime shortages throughout WWII resulted in many nations utilising the bicycle to save on fuel. This was especially true in isolated Great Britain during the Blitz, and continued even after the Americans arrived in great numbers. The United States, which was also on wartime rationing, produced bicycles in great numbers.


**A WWII British paratrooper with a collapsible cycle in the 'jump' position[1].**

All protagonists involved in WWII assembled bicycles for mobility in bases and training areas and they were also used by troops in operational areas. Fines were issued in Britain if bicycles were left unattended and were not immobilised.

### Advances in mobile communications

Advances within all areas of technology during WWII were particularly evident in wireless communications, notably the adoption of voice communications through portable and transportable wireless sets. During the course of the war improvements in components enabled wireless sets to be more compact and lighter while at the same time having higher power, permitting amplitude modulated (AM) voice communications and Morse Code (CW) to be transmitted over longer distances.

Several of these radios were adapted for use by operatives behind enemy lines, such as Coastwatchers and the Special Operations Executive (SOE). At times the radios were fitted into suitcases and referred to as spy radios.

**Type 3 Mk II (B2) spy radio.**

At war's end many of these wireless sets were available through army disposal shops and were quickly acquired by amateur radio operators who carried out modifications to transmit within the frequency bands allocated for amateur use. The Wireless Set No 19 Mk III used within armoured vehicles and noted for its durability was much favoured for amateur radio operation at war's end.

In the immediate post war era those operating portable wireless sets required either an Amateur or Commercial wireless licence.

**Wireless Set No 19 Mk III.**

### The return of the Warrnambool Classic

The reactivation of the Warrnambool Road Race in 1947 afforded an opportunity to instigate a leap forward in the capacity to broadcast the race in real time. The possibility of adapting mobile wireless transmissions in conjunction with telephone land lines to offer flexibility to the race commentary, occurred as a consequence of the foresight of two men - the chief engineer at 3GL and amateur radio enthusiast Jack Mathews VK3SY, and announcer, later general manager of 3GL, Reg Gray.


**The car used in the 1948 broadcast of the Warrnambool Road Race, a 1939 Packard Model 1700 showing commentator Jack Dillon and 3GL chief engineer Jack Mathews adjusting the AWA FS 6 transmitter and receiver.[2]**

The 1947 race from Melbourne to Warrnambool, won by Arnold Edwards and the Fastest Time by Keith Rowley in 6 hrs 57 min 43 sec, was the catalyst for an arrangement that would revolutionise broadcasting of road cycle races. The 1947 race was broadcast to the listeners of 3GL and relay stations using the same pre-war strategy of picking up telephone land line.

**An AWA FS 6. Wireless sets of this kind were used by the military to communicate with personnel over longer distances than smaller portable units were capable of. They were normally carried in specialised radio vehicles or transported by a small number of men who would then establish a base or relay station. There is provision for a microphone in addition to the Morse key.**

In addition, however, a car had installed within it a portable transmitter and receiver, and during the course of the race transmissions were made to a small number of amateur radio operators to test the feasibility of broadcasting the race while mobile. The 1947 race was in many respects experimental as far as wireless was concerned. It provided the impetus for a much more ambitious effort in the following two years, which was foreshadowed in the *Geelong Advertiser* a week before the race on Saturday, 9th October 1948.

The concept was simple, the implementation decidedly more complex, and it took three years to perfect. A car with driver would carry an announcer, a wireless technician with an amateur radio licence, and a modified portable ex-military transmitter-receiver, initially the FS 6 with obligatory six volt battery packs.

If wireless conditions were optimal the announcer could transmit a commentary from the car in a stationary or mobile position, which would be received by another amateur radio operator who would then patch the audio through a telephone line back to 3GL for relaying and broadcasting.

### Wireless and the Warrnambool

The assistance of amateur radio operators, colloquially referred to as 'hams', was integral to the broadcasting of the Warrnambool Road Race during the 1940s and 1950s. Amateurs, having built their own equipment, had an intimate knowledge of wireless transmission and reception, and were practiced at dealing with the vagaries of this form of communication.

3GL utilised both the operators and, with the concurrence of the PMG, a portion of the radio spectrum allocated for amateur operation. During the mid-1950s 3GL applied for a radio licence to operate on that part of the spectrum allocated to commercial enterprises. This enabled them to include advertising and sponsors names which were not permitted on the amateur band.

**In an attempt to confirm the authenticity of events which occurred seventy years ago, efforts were made to contact families of those who played a pivotal role in the development of communicating the Warrnambool. It was with great delight that contact was made with Bruce Plowman VK3QC, now in his late 90s, and his wife Muriel VK3BJO. Conversations with Bruce and Sandy Gray, son of Reg Gray, brought these events into sharp focus.[3]**

In 1948 both 3GL and the participating amateur operators received from the Radio Commissioner within the Post Master General's Department a variation to the conditions of their licence, for a period of 24 and 6 hours respectively, to permit them to transmit signals in relation to the Warrnambool Classic. They operated using AM within the 80 Metre band, on a frequency of approximately 3.7 MHz.

The radio car transmitted from 14 locations along the route of the race, almost certainly when stationary. Although able to transmit while mobile, the need to travel at speed, passing the riders to the next location, would mitigate against mobile operation.

During the following years two radio cars were used, one travelling with the Limit Group and one with the Scratch men.

### Technicalities

In 1948, 3GL Geelong, was broadcasting on a frequency of 1350 kHz with a power output of 500 watts. On 20th August 1949, two months before that year's Warrnambool, they commissioned a new STC500 1 kW transmitter claimed to be, "*the most modern post-war broadcasting transmitter of its kind in the Commonwealth*".[4]

Short wave radio was increasingly a part in Commercial Broadcasting in Australia. The two portable transmitters used by 3GL in 1945 were obtained from the Disposals Commission for approximately £30 each. To buy new equipment of this type would have cost between £200 and £300.[5] Chief engineer Jack Mathews VK3SY modified each unit to operate within the designated amateur radio band of frequencies. Average male weekly earnings in 1946 was £6.12/- ($13.20).

The transceivers were trialled at an air pageant, shortly after the end of WWII. They were also utilised when broadcasting from a vessel for several yacht races during which the aerial was run up a 40 foot (12.2 m) mast to increase the range of reception by up to 50 miles (80.5 km).[5]

During the 16th annual 100 mile (161 km) race between Melbourne and Colac in 1947, wireless engineers used the mobile short wave transmitter between Werribee and Winchelsea to transfer information about the race to the 3GL studio. Geelong's internationally acclaimed cyclist Russell Mockridge, who had won the 125 mile (201 km) Olympic time trial in Sydney prior to this race, rode in the scratch bunch. Mockridge turned professional after winning gold at the 1952 Helsinki Olympics.[6]

The AWA transmitters used extensively in the 1948-49 Warrnambools each relied for their operation on two 6 volt car batteries connected in parallel to achieve a power output of eight watts. This would enable reception of a signal well in excess of 20 miles (32.2 km) over land with a substantial aerial. However, with the whip aerial attached to the rear of the car the distance in which the transmitted signal could be received would be considerably smaller.

**An amateur radio operator in his shack.**[7]

This is where the 'hams' came into the picture. With extensive aerials at their home locations, at strategic points along the course of the race, and having access to a telephone land line, these operators were permitted to receive the signal from the car and patch the audio into the telephone line to the broadcast studio The patching was achieved by the use of an isolation transformer which could be configured to allow two conversations on the one telephone line. The second or 'phantom' line enabled the operator to speak to the broadcast station while the race description from the commentator was being sent to the station.

### Amplitude Modulation (AM) and Frequency Modulation (FM)

Reception of amplitude modulated short wave signals in the 1940s was subject to interference by both atmospheric conditions and man-made disturbances such as arc welding equipment and faulty insulators on high tension lines located close to the receiving points. The magnetic effect of the volcanic subsoil in the Stoney Rises, near Camperdown, on the reception of wireless transmissions was the bane of the operators during the Warrnambool Classic.

### Warrnambool Radio Station 3YB

This station has actively supported and covered the race from its opening, at times taking an audio feed from 3GL and later providing a relay to a number of stations during the final phase of the race.

The 'Voice of Warrnambool" Lyndsay Hill was an announcer for 3YB Warrnambool for nearly half a century, assisted for many years by Johnnie Holland.


**In 2011 John Holland, left, and Lyndsay Hill scan a copy of the 1933 *Sporting Globe* which featured the Melbourne to Warrnambool bike race in 1933.**[8]

At about this time FM was beginning to be used for land based and mobile radio transmission and reception overseas. Its advantages were less noise in reception and the requirement for less power for transmission. In 1949 FM systems were being installed by the State electricity Commission, Melbourne and Geelong Harbour Trusts and a company operating taxis in Launceston. Broadcasting on the FM band was some way into the future. However, at that time, both the FM transmitter and receiver were much more complicated

From left, 3GL Chief Engineer Jack Mathews VK3SY, Sir Hubert Opperman and Commentator Reg Gray.[9]

and expensive than AM equipment. During the 1950s commercial radio stations including 3GL began using FM equipment.

### The participants in the 1940s broadcasts

Those who participated in the historic 1948-49 broadcast of the Melbourne to Warrnambool were: 3GL Chief Engineer: Jack Mathews VK3SY; Commentators: Reg Gray, Jack Baker and Jack Dillon; Driver: Alby Clements (other driver not known): Amateur Operators in the Car: 1948, Jack Mathews VK3SY; 1949, N Nielson VK3AGN and B Barratt VK3WT; Stationary Operators: Bill Brownbill VK3BU, Geelong; Murray Palmer VK3AMP, Colac; Bruce Plowman VK3QC, Terang; and H Fuller VK3HF, Warrnambool. Others who were available as required were Jack Anderson VK3JA, Terang; Tim Wells VK3TW, Hamilton; Frank O'Donnell VK3ZU, Warrnambool; and Kevin O'Rourke VK3AKR in Westmere.

### Post-race acclaim

Praise was heaped on 3GL and its relay stations for the quality and regularity of the 1948 race commentary. Not surprisingly the *Geelong Advertiser* included the following accolade in the days following the race: "*For the first time in the history of road cycling in Australia a race was broadcast by means of two mobile transmitters installed in cars which travelled the entire 163 miles. This was done by 3GL, The Geelong Advertiser Station, and after the race at the Mayoral reception in Warrnambool, Mr. J. Baker of the Broadcasting Commission congratulated 3GL on the cover they had given. A message from the Lord Mayor of Melbourne (Cr Disney) to the Mayor of Warrnambool (Cr J. B. Dwyer) was recorded on a wire recorder by 3GL and played to the Mayor of Warrnambool during the reception. Also a message was taken by Mr. Reg Gray on behalf of the Mayor of Geelong (Cr B. E. Purnell). A written message was presented to Cr Dwyer from the Melbourne Lord Mayor, by the race winner Stan Bonney.*"[10]

### Evolution and change

Commercial broadcasting of the classic race continued for many decades with 3GL on relay to metropolitan and other regional stations. 3LO undertook live updates and broadcasting from its beginning in 1936. Over the subsequent years changing technology, population increases and infrastructure development have impacted on the promotion and media coverage of the Warrnambool.

The race is currently structured as a scratch race; the days of commentators from commercial broadcasting stations flying by the seats of their pants to acquire telephone connections to broadcast an update from a remote rural town, or dealing with the vagaries of wireless propagation, have given way to social media and live-streaming on Facebook.

Enthusiasts still continue to line the routes in rain or mercilessly hot sun to see their favourite cyclists. Long distance cycling events are as popular as ever, with team cars in radio contact with individual riders, television images transported by microwave relay from helicopters and motorcycles, all aimed at the lounge-room spectators. As an event in the Subaru National Road Series calendar, the Warrnambool is destined to continue as an Australian iconic long distance cycle race.

Geelong cycling legend and Olympian Russell Mockridge was tragically killed on 13th September 1958 while competing in the Tour of Gippsland.[11]

### Acknowledgements

I wish to thank the following for their encouragement, technical expertise and enthusiasm to assist in the telling of events which should not be lost in the mists of time. Cal Lee VK3ZPK who's technical expertise was much sort after, Mike Trickett VK3ASQ, Sandy Gray, Rod Charles, Bruce Plowman VK3QC, John Craven, Ian Baxter VK3ZIB, David Connoley, Max Esler, Norman De Grandi, and Lindsey Heath.©

### Endnotes

1. Military Bicycles in WWII Liberator magazine.
2. Sandy Gray, Gray family collection.
3. Author's photograph
4. *Geelong Advertiser*, 20th August 1949.
5. *Geelong Advertiser*, 8th October 1949.
6. Tour racing Biographies.
7. Shutterstock.
8. *Warrnambool Standard*, 27th October 2011.
9. Sandy Gray, Gray family collection.
10. *Geelong Advertiser*, 8th October 1949.
11. Sandy Gray, Gray family collection.

ar

# *Wullenweber: circles that encircled the world*

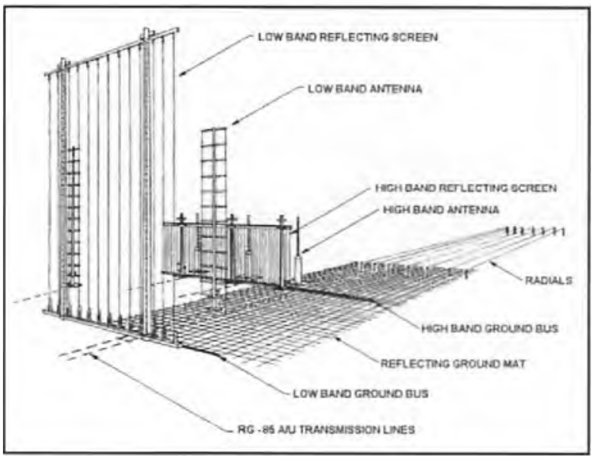
**Clive Wallis VK6CSW**
RAOTC member No 1289

**In 2014 the huge Wullenweber Circularly Disposed Antenna Array, located at the US Naval Radio Station, Silver Strand State Beach, San Diego, California, was decommissioned. Within America, it was the last one of a series of massive HF directional antennas invented by the Germans during WWII and subsequently used by the Americans, Russian, British, Canadian and Japanese military and intelligence agencies to spy electronically during the Cold War and afterwards. Two in Canada still remain.**

As can be seen in the photographs, the Wullenwever, later renamed Wullenweber, was a large type of Circularly Disposed Antenna Array (CDAA) receiving antenna, sometimes referred to as a Circularly Disposed Dipole Array (CDDA), often up to 1,300 feet (396 m) in diameter, capable of accurate direction finding of radio signals over a wide range of HF frequencies.

For the military, radio direction finding (RDF) is a key tool of signals intelligence. Between about 1941 and 2008 these types of array were used by various military and intelligence agencies to triangulate radio signals for intelligence gathering, radio navigation, and search and rescue operations. During the post-WWII Cold War, two of the most commonly used types were the US Navy's large AN/FRD-10 and the US Army Air Force's massive AN/FLR-9, though smaller designs also existed.

This type of antenna was invented early in WWII by German Dr Hans Rindfleisch, then group leader of the German Naval Communication Research Command (Nachrichtenmittelversuchskommando or NVK). The technology was further developed by NVK in association with Telefunken, using the codename Wullenwever as cover for this secret CDAA research. The Germans often used codenames which vaguely hinted at the technology and I suspect that Wullenwever is a deliberate corruption of the German surname Wollenweber or wool-weaver, a not unimaginative name for a device using masses of poles, wires, and phasing devices, all 'woven together' - but I may be quite wrong.




**The major components of a typical Circularly Disposed Antenna Array (CDAA) system, including ground radials, a reflecting ground mat, low band and high band reflector screens and their associated antennas, and transmission lines.**

**A typical Wullenweber CDAA antenna.**

The Wullenwever CDAA/CDDA consisted of a group of omnidirectional antennas symmetrically spaced about the periphery of a circular reflector screen. The location of each antenna with respect to the screen, and to the adjacent antenna, was such that by using a suitable antenna output scanning system, the array provided high uni-directional gain in all directions of azimuth. Phasing of individual antenna elements was by delay lines consisting of either lumped constants or lengths of coaxial line.

The scanning procedure resulted in sweeping the horizon with a direction-finding beam through a continuous arc

**Detail of monopole antenna element (right) and 25 ft (7.6 m) high-band reflector screen poles (left), viewed facing northeast at the US Naval Base, Pearl Harbour, Naval Radio Station, AF-FRD-10 CDAA antenna system.**

of 360°, akin to radar. A CDAA could also be connected to fixed-lobe-forming devices that provided fixed directional beams for receiving signals in any desired direction of azimuth. The array was capable of creating either a wide or narrow beam by selecting antennas in the array.

**Detail of dipole antenna element (right) and 94 ft (28.7 m) low-band reflector screen poles (left); note the guy wires from the antenna element; viewed facing north northeast at the US Naval Base, Pearl Harbour, CDAA antenna system.**

The photographs give some idea of the size of these arrays. In 1970, the estimated cost to construct an AN/FRD-10 CDAA antenna was just under $900,000 ($5.55 million today) with electronics at the site estimated at around a further $20 million ($123 million today). This system had 120 high band antennas and 40 low band antennas which had to be positioned within +/- two minutes of arc and +/- three inches (7.62 cm) of their intended distance from the centre of the array. One hundred and sixty 75-ohm coaxial transmission lines were used to carry signals from the antennas and had to be electrically matched to within 0.75° at 10 MHz. This task alone took 300 to 400 man hours to complete.

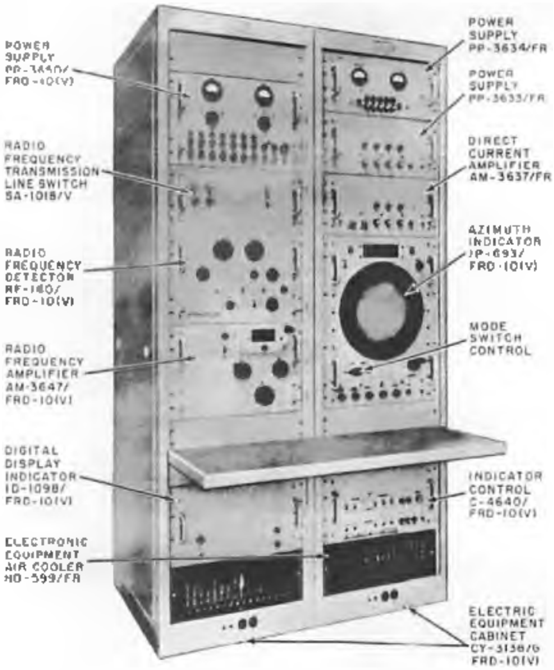
There was also an extensive grounding system used at the FRD-10 sites. This included 360 ground radials made of 8 AWG wire, each 150 feet (46 m) long, extending from the outer antenna ring. It also included a massive ground grid, made of 10 AWG wire bonded together to create a mesh with two feet (61 cm) squares, laid underground up to the radials in the area between the high and low antennas.

The first Wullenwever was built during the war at Skibsby, Denmark, after that country was overrun and occupied by the Germans. It used forty vertical active elements, placed on the arc of a circle with a diameter of 120 metres (390 feet). Forty reflecting elements were installed behind the active elements, suspended on a circular wooden support structure with a diameter of 112.5 metres. To more easily obtain true geographic bearings, the north and south elements were placed exactly on the North-South meridian.

How many German Wullenwevers were built during WWII is uncertain but a second one, built by NVK in conjunction with Telefunken, was found near Friedrichshaven in southern Bavaria shortly after the war ended. Both this and the one at Skibsby were captured intact. British military engineers took a close interest in the Skibsby array while the Americans subsequently dismantled the Bavarian array and reassembled it in America. After WWII, many of the scientists who had worked on the Wullenwever project were taken either to Russia or America where their knowledge was used to advantage by their captors.

The Russians appear to have been the first post-war users of Wullenwever technology, aptly renaming their antennas Krug (Russian for circle). At least 30 Krug arrays were installed all over the Soviet Union and its allied countries in the 1950s. Several Krugs were installed in pairs, each less than 10 kilometres apart, apparently for radio navigation purposes. At least four Krugs were installed near Moscow and it is known that Krugs were used to track the early Sputnik satellites, using their 10 and 20 MHz beacons, and they were also instrumental in locating the re-entry of space vehicles. Krugs were also built in Cuba, with the clear intent of spying on America's communications. All Russian Krugs appear to have been direct copies of the original German design using 40 vertical elements whereas during the early part of the Cold War the Americans developed the technology further, based on lessons learned from the captured Bavarian array.

During the Cold War - the state of hostility that existed between the Soviet bloc countries and the Western powers from 1945 to 1990 - electronic eavesdropping by both sides became highly developed with Wullenwever systems playing a vital role detecting the origin and contents of HF transmissions, not the least of which was the monitoring of Russian Navy ship




**An annotated photo of a Channel watcher's position at an FRD-10 array site.**

and other military movements. Incoming signal direction could be determined with great precision, probably better than 1° under good conditions.

In the late 1940s, the US disassembled the Wullenvever array located at Langenargen, just south-east of Fredrichshaven[1] on the shores of Lake Constance (Bodensee) in Bavaria and brought it back to the US, where it was reassembled and, for some unclear reason, was renamed 'Wullenweber', the name by which this antenna system is now generally known.

Professor Edgar Hayden, then a young engineer in the University of Illinois Radio Direction Finding Research Group, led the reassembly of the array, studied its design and then built America's first larger Wullenweber array at Bondville, Illinois, not far from the University itself. This was nearly three times larger than the original German design, consisting of a ring of 120 vertical monopoles covering 2-20 MHz. Tall wood poles supported a 1,000-foot-diameter (305 m) circular screen of vertical wires located within the ring of monopoles. This design became the military AN/FRD-10, later followed by the even larger 1,300 foot (396 m) diameter AN/FLR-9. In the Joint Electronics Type Designation System (previously known as the Joint Army-Navy Nomenclature System, usually referred to as AN or JAN), FRD stands for Fixed

**The Wullenweber FR-10 array at the US Naval Radio Station, Hawaii.**

**The huge Wullenweber CDAA which was located at the US Naval Radio Station, Silver Strand State Beach, San Diego, California.**

ground, Radio, Direction finding, while FLR means Fixed ground, Countermeasures, Radio.

In 1959, the US Navy contracted with ITT Federal Systems to deploy a worldwide network of AN/FRD-10 HF/DF arrays in countries including Japan and Canada, plus a number within the USA. The same year the US Air Force awarded GT&E Sylvania Electronics Systems[2] a contract to build the larger AN/FLR-9, the first of which was completed in Britain in 1962 at RAF Chicksands, adjacent to Old Warden airfield in Bedfordshire where the famous Shuttleworth Collection of historic aeronautical and automotive exhibits is now housed. The same year another AN/FLR-9 was built in southern Italy at the US Air Base then located near Brindisi. Later contracts saw AN/FLR-9 arrays built in Japan, the Philippines, Turkey, Germany, Alaska and Thailand. In 1971 two FRD-10 arrays were erected in Canada at Gander, Newfoundland, and at Masset, British Columbia, operated jointly by US and Canadian personnel.

In the 1970s, the British firm Plessey[3] developed their smaller, more economical Pusher CDAA array, so called because the monopoles were inside the reflector screen. At least 25 Pusher CDAAs were installed in many countries around the world. Several Pusher arrays were installed in US military facilities where the array was known as the AN/FRD-13. The entire worldwide HF/DF network, code-named 'Iron Horse', could accurately locate HF communications originating almost anywhere on the planet.

With the cessation of the Cold War in 1990, and now that military HF radio communications have largely been replaced by satellite communications, the need for HF eavesdropping has almost disappeared. Most Wullenweber arrays have been dismantled although it appears that at the time this article was written, March 2017, the Canadian Armed Forces installations in British Columbia and Newfoundland are still in existence, but may not be operational.

For readers seeking more technical detail on Wullenweber arrays, KB1SG's Rhombic Pages>Wullenweber, *http://www.mapability.com/ei8ic/rhombic/wullen.php* makes interesting reading.

### Notes

**1.** Friedrichshaven was once renowned as the home of Zeppelin airships but today is better known amongst the amateur radio fraternity for its huge annual Hamfest, the biggest in Europe.

**2.** Now General Dynamics Advanced Information Systems.

**3.** Now Plessey Roke Manor Research Limited.

### Principle references

• KB1SG's Rhombic Pages, Wullenweber;
• Wikipedia, various articles.

ar

# Energy - nuclear and other sources

**Bill Toussaint VK6LT**
RAOTC member No 1561

**Meaningful debates on the science of the use of nuclear energy to generate electricity can sometimes be difficult. This is primarily because some people feel that one should be either 'anti' or 'pro' nuclear energy. Also, to some, being either 'pro' or 'anti' has become something like a religious mission or being a fanatic football team supporter. The likelihood of such people changing their stance is like getting an 'Eagles' football team supporter to change to supporting the 'Dockers'.**

The point of this note is thus simply to highlight scientific facts.

Occurring naturally are only two main radioactive chains. They are the uranium chain which starts with uranium-238 and the thorium chain which starts with thorium-232. Uranium-238 and thorium-232 slowly change into other elements by a process known as radioactive decay. Thus, if one were to start with uranium-238, it would give rise to other elements along the decay chain including radium-226 and radon (a gas associated with lung cancer). These are the so-called daughters (or progeny) and when equilibrium is established the radioactivity of the parent is equal to the radioactivity of each of the daughters.

During the decay process there are radiating emissions given out. These are gamma rays, beta rays and alpha particles. The gamma rays are most penetrating and, like X-rays, can pass through the body. The beta rays are much less penetrating, while alpha particles are stopped by normal skin. Alpha particles can, however, cause harm to delicate lung tissue if decay takes place within the lung. This can occur, for example, when radon is breathed in and decays.

Also associated with the uranium-238 chain is uranium-235 which occurs naturally in very small quantities. When this isotope is artificially concentrated it provides the basis for nuclear fuel. Uranium-235, when split by a neutron, releases many more neutrons and considerable energy. This fission process produces more fission and results in a chain reaction. A reactor allows this reaction to proceed in a controlled manner so that the energy (in the form of heat) can be used for electricity production.

In a similar manner, when thorium-232 decays, it gives rise to progeny and emits radiation.

Both uranium-238 and thorium-232 occur naturally in all soils and rocks to some degree. They, in conjunction with the naturally occurring isotope potassium-40, render soils slightly radioactive. The degree of radioactivity depends on the concentrations of uranium, thorium (and hence their progeny) and potassium in the soil. Publications are available which give the typical radioactive concentrations for various soils throughout the world and hence the radiation (terrestrial radiation) coming from them. For Perth, the activity is quite low for the coastal sand plain and higher for the Darling Scarp.

The prudent approach to radiation protection involving low doses is to assume that all amounts of radiation carry a risk of cancer which may manifest itself after some long delay. It is important to emphasise that this is only an assumption or hypothesis. The additive nature of the doses is called the linear hypothesis. Many studies nowadays suggest that this may not be the case and that the body can tolerate a certain threshold of radiation and self-repair with no harmful effects.

Some other studies have suggested that low levels of radiation might be more harmful than anticipated. Put simply, harm from low doses of radiation is unknown. It is thus considered prudent to apply the linear hypothesis and assume that all levels of radiation carry some risk of harm (primarily cancer) in proportion to the dose received. This implies that radiation dose should be minimised.

When talking about safety in general, it is important to remember that safety is a function of both technology and wisdom. This particularly applies for the case of radiation safety, where a good understanding of the physics of radiation dose must also be associated with the wisdom of practical application. This will minimise dose and maximise safety.

The harm from high doses, on the other hand, is much more evident. At very high doses the effects are almost immediate. Data on harm from high levels of radiation exposure have come from studies of victims of the atomic bombing in Japan, accidents involving inadvertent human exposure and, more recently, the victims of the Chernobyl and Fukushima disasters. Data from early (pre or early twentieth century) mining practices have also contributed to our knowledge of health effects from radiation exposure. This was particularly apparent when ventilation was poor in mines and workers were exposed to high

**The Chernobyl nuclear power plant with the new Safe Confinement structure to protect Reactor No 4 visible to the left.**

concentrations of radon gas and hence their progeny. In these studies, the risk of lung cancer was greatly compounded if the miner also smoked.

When speaking of the Chernobyl disaster, the number of deaths occurring in a relatively short time after being exposed to high radiation levels was relatively few. Among the emergency services staff and others, 34 people died in the first few months. With time, this figure has become higher. What humanity has difficulty in accepting is the number of likely future deaths or illnesses that may be attributed to Chernobyl. Such data are difficult to accurately predict but it is most likely that many exposed people will eventually succumb to various forms of cancer after a certain time. This unknown factor is perhaps the most insidious aspect of being exposed to radiation.

The Chernobyl accident has thus made people extremely wary about nuclear energy.

In a similar manner, the Fukushima accident has put a big cloud over nuclear electricity generation for many people, particularly those in Japan.

On the positive side, countries such as France now rely on nuclear energy to generate close to 80% of their electricity with no apparent health detriment. Such countries have been concerned about the reliability of oil supplies. By committing to nuclear electricity generation they are less likely to be seriously affected by future 'oil shocks'. Emissions from reactors are minimal and do not contribute to green house gases in the same way as coal fired power stations do.

**A nuclear power plant under construction in the Indian city of Kudankulam.**

On the negative side, some uranium mine workers accumulate a certain radiation dose during the mining phase of uranium. If we accept the linear hypothesis, theoretically this dose will result in extra cancer cases. The International Commission on Radiological Protection (ICRP) and the International Atomic Energy Agency (IAEA) are bodies of world radiation experts who review scientific studies on radiological protection and make special recommendations for those likely to be occupationally exposed to radiation. It is accepted by most countries that if the ICRP and IAEA recommendations are complied with the increased risk is acceptable when compared with similar professions.

Possible exposure pathways are from direct gamma and beta exposure, internal exposure due to dust and radon gas inhalation (alpha and beta radiation) as well as exposure from intake of liquids containing radioactive material (again alpha and beta). With this awareness of radiation exposure pathways, radiation dose both in mining operations, product transportation and reactor operation is unlikely to be excessive and certainly within the ICRP recommendations. There are many engineering practices which have been developed and introduced over the years to reduce radiation dose. These practices have included appropriate shielding of gamma emissions, dust suppression and radon concentration reduction.

One of the biggest drawbacks of nuclear energy is the disposal of the long-lived radioactive waste. Many countries (such as Finland) have embarked on a nuclear power generation scheme mindful of the need to cope with such waste. To this end, they have developed deep underground (geologically stable) disposal facilities where all waste is accounted for and stored. The metallurgists give assurance that the containers will last for a time commensurate with the life of long-lived waste. Some do not believe that metallurgists are capable of making a container that will not deteriorate over the long life of the waste. In addition, although areas chosen for disposal may be assessed by experts as being currently stable (ie free from earthquakes) there is always uncertainty about the future. As in Fukushima, any instability could release the waste (and also other nuclear material) into the environment. Many believe that it is irresponsible to leave future generations to deal with problems associated with possible waste leakage, while current populations reap the energy benefits in the short term.

It is also worth mentioning that some concern exists about the export of uranium. If Australia does decide to export uranium, how effective are our safeguards that track our uranium? Do we increase the risk of nuclear war and nuclear terrorism by exporting uranium?

## Overseas nuclear power plants

There are 32 overseas countries with nuclear reactors including Belgium, Bulgaria, China, Czech Republic, Finland, France, Germany, Hungary, India, Japan, Netherlands, Romania, Slovakia, Slovenia, Spain, Sweden, the United Kingdom and the USA.

As of November 2016 there is a total of 186 nuclear power plant units with an installed electric net capacity of 163,685 MW in operation in Europe and 15 units with an electric net capacity 13,696 MW were under construction in six countries.

As of 2016, India has 21 nuclear reactors in operation in seven nuclear power plants, having an installed capacity of 6,780 MW and producing a total of 30,292.91 GWh of electricity while six more reactors are under construction and are expected to generate an additional 4,300 MW.

Also as of November 2016, the People's Republic of China has 36 nuclear reactors operating with a capacity of 31.4 GW and 20 under construction with a capacity of 20.5 GW. Additional reactors are planned, providing 58 GW of capacity by 2020. China's National Development and Reform Commission has indicated the intention to raise the percentage of China's electricity produced by nuclear power from the current 2% to 6% by 2020 (compared to 20% in the United States and 78% in France). Nuclear power contributed 3% of the total production in 2015 - 170 billion kWh. Nuclear was the fastest-growing electricity source in 2015 (29% growth).

As at 2016, the countries with the most nuclear reactors were the USA with 99, France with 58 and Japan with 43.

Most of the nuclear energy production discussed earlier has been from the fission process associated with uranium-235 as the fuel. Little publicity has been given to possible fission from the thorium chain. While a theoretical chain reaction is reasonably straight forward for uranium-235, thorium-232 needs to be converted into uranium-233 by neutron bombardment. Uranium-233 is fissionable and can hence be used as reactor fuel. The advantage it has over uranium-235 fission is that the waste products are much shorter-lived and can hence be more readily disposed of. This would seem to go some way to solving the waste disposal problem. While some experimental work has been done with thorium, it has generally been easier to work with uranium-235. It is timely for a greater effort to be given to research into thorium-based reactors.

Australia is fortunate in that it has an abundance of both uranium and thorium. If a decision were made to use reactors for electricity generation, it would seem most desirable to conduct research into using thorium as the primary fuel.

Although we have looked at both uranium and thorium as nuclear fuels, it should be remembered that Australia is also fortunate in having considerable sunshine (for solar panels and production of ethanol from sugar cane) and wind to supply energy (for wind turbines). Any further energy planning should also take these sources into account and use them to the maximum (taking into consideration any environmental impacts). The fundamental rule that applies to such energy sources is, however, that the energy saved by their use must be greater than the energy that went into their production.

In the Australian situation, while maximising the energy generated from solar and wind, there remains the problem of base-load energy to fill in when the sun isn't shining and the wind isn't blowing. Such energy could be supplied by massive banks of batteries, but this is currently very expensive (though becoming cheaper).

**The Australian Nuclear Science and Technology Organisation (ANSTO) Lucas Heights nuclear reactor.**

Another possibility would be to experiment with a small base-load reactor, preferably located in a remote area (such as at a remote uranium mine site where nuclear waste could be returned to the mine in accordance with IAEA specifications). This may also provide the opportunity to relocate the current experimental reactor at Lucas Heights (which produces medical isotopes - not electricity) to a remote area. Such an experimental reactor would provide isotopes for both radiopharmaceuticals and also base-load electricity. As some radiopharmaceuticals have short half-lives, there would need to be airport access to ensure prompt delivery to hospitals.

It is unlikely, however, that there would be the political will to undertake such reactor experimentation.

**Carrington gas fired power station near Manchester in the UK generates enough electricity to power 1,000,000 homes.**

This leaves only gas powered generators (or 'clean coal' powered generators) available to come on line at a moment's notice to assist with base-load electricity supplies. While it is unlikely that there is anything which might be called 'clean coal', gas appears to be ideal (Butler, 2017). There is, however, a reluctance to have such gas supplies available cheaply for Australia. The companies which produce the gas are locked into long term lucrative contacts to supply overseas countries. There is no financial incentive to supply gas to Australians at an inexpensive rate. This might be overcome by Governmental legislation, whereby a tariff is applied to gas producing companies. In this case the tariff would be paid to the Government in the form of gas to be supplied to produce base-load energy, including electrical energy.

In summary then, the main problems associated with nuclear energy lie in the disposal of long-lived radioactive waste and the almost permanent contamination of land surrounding a reactor should a melt-down accident occur. After Chernobyl and Fukushima, the chance of any accident is unacceptable. Can anything made by man really be absolutely perfect?

On one hand, some engineers have enough faith in technology to believe that these concerns can be overcome by applying state of the art engineering solutions. On the other hand, those affected by the Fukushima accident will never again have faith in any engineering solutions.

It is important that Australia is self sufficient in all types of energy, including petroleum for transport. It is alarming that there are now no refineries in Australia refining crude oil. Australia gets all its refined fuel from overseas - particularly Singapore. In a time of future emergency this could result in fuel shortages within about three weeks.

### References and selected bibliography


- Butler L, 2017. *Base-load power stations and their interaction with renewable sources in South Australia. OTN* Australia, No 59, pp 38 - 44. March 2017. The Journal of the Radio Amateurs Old Timers Club Australia Inc.
- IAEA: https://www.iaea.org/
- ICRP: https://en.wikipedia.org/wiki/International_Commission_on_Radiological_Protection
- UNSCEAR: https://en.wikipedia.org/wiki/United_Nations_Scientific_Committee_on_the_Effects_of_Atomic_Radiation


ar

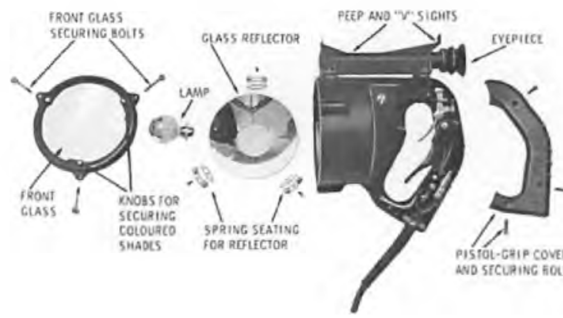
# Morse code with an Aldis lamp

**Herman Willemsen ex-VK2IXV**
RAOTC member No 1384

**I remember sending slow Morse code on an Aldis lamp when I was an Apprentice Deck Officer on the Dutch Shell tanker *Vasum*[1]. The year was 1958, just on 60 years ago. The handheld Aldis lamp I describe is a signalling device for sending Morse code.**

During WWI the Aldis lamp was invented by, and named after, the Englishman Arthur Cyril Webb Aldis (1878-1953). Worldwide it was used for daylight and night-time visual signalling by the Navy, Merchant Marine and Air Traffic Control.

The idea of flashing dots and dashes from a lantern was first put into practice by Captain, later Vice Admiral, Philip Colomb, of the British Royal Navy, in 1867. His original code, which the Navy used for seven years, was not identical with Morse's, but Morse code was eventually adopted with the addition of several special signals.




**An exploded view of a handheld Aldis lamp.**

**A WRNS (Wren) rating using a handheld Aldis lamp during WWII.**

In shipping, the heyday for the Aldis lamp was during WWII. When radio silence was required, Aldis lamp signalling was used between blacked-out merchant ships sailing in convoy. Submarines and other warships also used the Aldis lamp. More powerful Aldis lamps were mounted on pedestals. Visual signalling was also done via yardarm lights and signal projectors[2].

When I sailed as an Apprentice Deck Officer on this oil tanker and as a Radio Officer on cargo ships, the Aldis lamp was at times used for ship-to-ship[3] but seldom for ship-to-shore communications. When a ship anchored offshore, awaiting a berth, pilot messages to and from the ship were handled by the ship's Radio Officer by Morse code via MF radio. In that way the berthing instructions were received in the form of a ship's telegram and handed by the R/O to the Captain in black and white.

It could, however, happen that the Port Authorities had to use the Aldis lamp when no contact could be made with the ship by radio. The ship's officer on anchor watch on the bridge could then request the off-duty R/O to switch on his radio.

Between ships the speed of transmission with the Aldis lamp was around 10 wpm or perhaps even slower, depending on the time of day, the rolling and pitching of the ship, and the proficiency of both parties involved.

In the late 1950s the use of VHF radio grew and more and more watch officers used the VHF on the bridge to communicate with other ships. This was especially the case when the passing ship was of the same company. Then crew lists and other information were eagerly exchanged.

**The Shell oil tanker *Vasum*.**

From the 1950s onwards, VHF was installed on all Navy and cargo ships. Just like a sextant, the use of the Aldis lamp became a victim of advanced technology and became a dying craft.

Further digital and satellite technology in the late 1990s also spelled the end of the ship's R/O and soon all ship-to-ship and ship-to-shore communications were handled by the deck/navigation officers via VHF, digital radio or satellite systems.

### Air Traffic Control

One of the tools of the trade of an Air Traffic Controller in the 1940s was the Aldis signalling lamp. Most light aircraft in those days

**An Air Traffic Controller at Mascot Airport, Sydney using a handheld Aldis lamp in 1940.**

were not radio equipped. Control of non-radio aerodrome traffic was done by signalling to aircraft using red, green or white steady or flashing lights.

Rather than Morse code, they were assigned signals[4]. Until well into the 1960s, light aircraft without radio were still being routinely managed using this method.

The Aldis lamp is rarely used these days by ATC, but it is still a mandatory requirement to have one in a control tower available for immediate use. If necessary it could be used as a backup device in case of a complete failure of an aircraft's radio. These days, though, it is likely that the old filament style lamp will have been replaced by a modern, lithium ion powered. LED lamp[5].

### Jack of all trades

The oil tanker *Vasum* sailed between Rotterdam and Mina-Al-Ahmadi, an oil refinery 45 km south of Kuwait in the Persian Gulf. In this desolate place, tankers moored alongside a long oil pier which extended far out to sea. For the loading and unloading of oil, this pier was connected to the shore installations via huge pipelines. During my first two months on *Vasum* I did not even get near the bridge. Dressed in overalls, the forecastle was my place of work and the boatswain (bo'sun) my boss. I was kept busy with splicing cables, rust removal, painting and all other jobs done by able bodied seamen.

Finally the day came when I was allowed to stand watch on the bridge. The Second Officer was my designated tutor and together we stood the afternoon and middle watches[6].

I made him cups of coffee, took part in celestial navigation, learned how to steer the ship by compass and stood lookout watch out in the open on the bridge wing or on the magnetic compass platform above the bridge. If it happened to rain I put on an oilskin and sou'wester.

I badly needed practice on the Aldis signal lamp so that I could communicate without apprehension with ships at sea or ships at anchor. Therefore, whenever the Second Officer allowed me, I took the Aldis lamp out of its wooden box and plugged its long cord into a nearby power socket, ready to go. As soon as I saw a passing ship I would flash a series of 'AA AA AA' from the bridge wing, trying to attract her attention. After the ship acknowledged receipt by sending a 'T', my first question would be 'what ship' and then other questions, like 'where bound' and 'where from' would follow.

99% of the time I received a response and a pleasant, although often ponderous, exchange of information would take place, ending in 'BV' for 'bon voyage'.

One early morning, when sailing through the Persian Gulf, I asked a passing ship the usual questions. The ship's short reply was, "from here to eternity". That was it, over and out!

When I told the Second Mate, he just laughed and said that it must have been an US warship that did not want to give anything away. By the way, he added, the warship's answer is the title from the 1953 movie *From Here to Eternity*, starring Burt Lancaster, Montgomery Clift, Frank Sinatra, Ernest Borgnine, Deborah Kerr and Donna Reed.

Our Second Officer was a movie buff and he enjoyed writing a small preview before each new movie was shown to the crew and officers.

Unlike cargo ships, oil tankers do not moor alongside a wharf in exotic or interesting ports but, for safety reasons, pump their cargo into pipelines on a jetty several miles away from an uninviting shore. The result is that seafarers on oil tankers spend long periods of time at sea without once leaving the ship.

That is why the *Vasum*, and tankers in general, had an extensive library and a selection of the latest movies on board.

These movie tapes, on 16 mm film spools, were stored in heavy metal chests and belonged to a company called Walport International Ltd, which provided movies to seafarers on oil tankers. Because Shell Tankers had a subscription with Walport, every tanker would yearly receive 13 chests containing three films each, or a total of 39 films per year. When a chest of movies had been watched, it was handed in to a Walport depot in the next port of call and exchanged for a new chest.

One of my roles as an Apprentice Deck Officer was being the ship's projectionist, showing these movies to the crew and officers with the aid of a noisy film projector. Depending on the weather, this either took place in the officers' wardroom or on deck.

Rather a nerve-racking job, especially if the bulb blew or the film broke. Finding another bulb and joining a broken film took time, which was not always appreciated by the impatient audience.

**A typical Aldis lamp used by the Merchant Marine. Note the two 'triggers' on the handle.**

### The Merchant Marine Aldis lamp

The Aldis lamp, size 6-inch on merchant ships, uses a 12 volt, 36 watt bulb and a swivelling, concave mirrored reflector. It has two trigger switches. The large trigger switches the light on, and the smaller trigger, pressed with the forefinger, tilts the mirrored lens at the receiving ship or shore station. There is an optical sight along the top of the lamp. It has a 6 m long cord and is powered from the ship's low voltage power mains or sometimes from a rechargeable battery.

It is made of light-weight aluminium, painted flat black enamel and is fully waterproofed.

For night signalling, red or green coloured light-reduction filters can be secured to the front glass, but I never used these filters. Neither did I use the portable battery power pack.

### Naval pedestal Aldis lights

Used mainly on larger Naval surface vessels, the pedestal mounted Aldis light is much bigger than the handheld versions and the pulses of light are achieved by opening and closing shutters mounted in front of the lamp, either via a manually operated pressure switch or, in later versions, automatically.

This method of operation differs from the more commonly used handheld Aldis lights where a concave mirror is tilted by a trigger to focus the light into pulses.

**A typical large Naval, pedestal mounted, shutter operated Aldis lamp aboard *HMAS Success*, the Australian-built Durance-class multi-product replenishment oiler serving in the Royal Australian Navy since the 1980s.**

### Footnotes

1. Dutch oil tanker *Vasum*, carrying capacity 32,150 tons, built in 1955 and scrapped 1975 in Pusan, South Korea. It was my first ship after finishing the Merchant Marine Nautical College in Amsterdam.
2. See website http://www.jproc.ca/rrp/rrp2/visual_lights.html
3. Mainly to break up long boring watches.
4. For instance, a flashing green light cleared an aircraft to taxi; steady green to take off or land. Steady red meant go-around. For vehicles or ground personnel steady green meant proceed.
5. For more information and illustrations see the website: http://www.signallightgun.com/aviation_lamp.php
6. The afternoon watch extends from noon to 4.00 pm and the middle watch runs from midnight to 4.00 am. Therefore, I worked a four hours on and eight hours off cycle.


### Acknowledgement

• Clive Wallis VK6CSW, RAOTC member No 1289.
• Wim van Alebeek, Master Mariner, Dutch Merchant Marine.


ar

# Changes afoot!

*The following news item was published in* The Register *(www.theregister.co.uk/) by Iain Thomson on 19th July 2017:*

For over a hundred years, navies around the world have messaged each other at the speed of light - signal lamp light.

Communicating using Morse code and lamps has been outpaced by modern radio and satellite transmissions, although every US Navy ship still carries one of these lights. The problem, however, is that no one is very good at using Morse code these days, so the US Navy has turned to a technological fix.

The snappily titled *Flashing Light to Text Converter* was developed in association with the Office of Naval Research and is a retrofit to existing signalling lamps. Rather than requiring a human Morse code specialist, the lamp is linked to a tablet and messages can be typed in, then motorised shutters on the lamp send out the signal. A GoPro camera on the top of the unit picks up incoming messages, and the *fondleslab*'s software decodes them.

"The best part of this flashing light converter is how easy it is for sailors to use," said Scott Lowery, an engineer at Naval Surface Warfare Center. "It's very intuitive because it mirrors the messaging systems used on iPhones. You just type your message and send it with the push of a button."

The new system does have a number of advantages over traditional human-only Morse signalling. Even the most skilled operator can seldom reach speeds of more than a dozen words per minute between ships, whereas the computer could drastically increase this rate - assuming the receiving ship has the technology to read the message.

On the other hand, human operators, compared to a computer and camera, don't emit electronic noise, and can continue to work amid an emergency systems crash or after an electromagnetic pulse event.

The other advantage, for the Navy, is that it doesn't have to make sure it has Morse code operators trained up and ready. That saves time and money - but also raises some interesting questions as to whether the Navy should be abandoning low-tech backup solutions.

In 1998, the US Navy stopped insisting that its officers know how to use a sextant to determine the ship's position on the planet, because GPS was so prevalent. In 2015 sextant use came back on the curriculum over fears that ships would be left in the lurch if the GPS went down for any reason.

***Thanks to Bill Toussaint VK6LT for bringing this item to my attention. Bill Roper VK3BR, editor.***

**US sailors using a tablet to operate the signalling lamp at the left.**

ar

# Far North Queensland amateurs - Nick Watling VK4YT

**Mike Patterson VK4MIK**
RAOTC member No 1467

**Australia is fortunate to have some knowledgeable radio amateurs and we in Far North Queensland are lucky to have such a gentleman in 'Nick' Watling VK4YT, RAOTC member No 1263. He has had a long career in aviation and has a passion for ex-military radios and their history.**

Nick was first licensed in 1953 as VK2AWT then followed VK4WT, VK1NW and eventually VK4YT in 1969. Nick is very active on-air and joins in various nets. He enjoys operating on AM and has been a supporter of AM and CW on the Anzac Day event since its inception where he has operated using various ex-military radios from Mareeba War Birds as well as from his home QTH.

Nick has also operated portable from the Rocky Creek WWII Australian General Hospital Memorial Park. During the overhauls, repairs and portable operations of the ex-military radios he has been assisted by his good friend Barrie Smeaton VK4ALK who is highly regarded for his technical knowledge and abilities.

Whilst serving in the RAAF Nick piloted the Winjeel, Wirraway, Avro Lincoln, Douglas C47A and B, C130A Hercules and the C7A Caribou with 35 Squadron as Flight Commander in Vietnam, for which he was awarded the Distinguished Flying Cross (DFC).

After leaving the RAAF Nick piloted aircraft for the Cairns Aerial Ambulance from 1969 to 1979 during which period he was required to fly in all weathers and land at remote airstrips. This required very skilled airmanship and navigation as this was well before the time of satellite fixing, etc. Nick then joined the Queensland Section of the Royal Flying Doctor Service as chief pilot in 1979, a position from which he retired, aged 65, in 1997.

An indication of the time he did 'up in the air' is indicated by his flying hours: RAAF, 5,000 hours; Aerial Ambulance, 5,000 hours; and Royal Flying Doctor Service, 8,000 hours. This is equal to being airborne continually for more than two years!

Nick has restored many ex-military radios over the years, including a complete set of SCR-274N Command equipment which will be installed in a WWII P40 Kittyhawk aircraft being restored in Victoria. Other equipment is in a working display at RAAF Garbutt, Townsville.

In the photograph below, Nick is sitting in front of his GRC-19 radio which consists of the T195B transmitter which was made by Western Electrics for Collins, and the Collins R392 receiver. The GRC-19 was used during the Korean War and by the US National Guard until the early 1980s.

The transmitter operates from 1.5 to 20 MHz at 100 watts output and the receiver covers from 500 kHz to 32 MHz.

The other radios in the photo to Nick's right are, bottom to top, an R390A receiver, a BC348-N US Army Signal Corp WWII receiver and an AWA Teleradio 5A which was used in rural Australia on AM.

Nick has also donated an AR7 receiver, complete with its coil boxes, to the Tolga Museum. The AR7 was used extensively by the RAAF and other services during WWII for monitoring specific frequencies for operations and intelligence.

It has recently been discovered that an AR7 was a part of the equipment at Coastal Radio Station VIC, Cooktown during World War II.

I also was able to acquire an ATR4A transceiver from Nick. He was able to provide the manuals for the ATR4A and some of the history of that Australian-designed and built transceiver. It was used by Allied Intelligence Bureau (AIB) for Z Force, Coastwatchers and M Special Unit during WWII and by US Forces in their Coastwatcher organisation in the Philippines.

ar

**Nick Watling VK4YT. See text for details of some of the equipment.**

# The first portable radio?

**Clive Wallis VK6CSW**
RAOTC member No 1289

**Whilst browsing around on the internet recently I stumbled across this intriguing piece about what must be one of the first (if not the first) portable radios. It appeared on page 75 of the August 1920 edition of *Radio News*.**

What I thought intriguing was that in 1920 broadcasting as such was yet to appear in either Australia or the UK. A quick Google search revealed that on 31st August 1920 the first known radio news program was broadcast by station 8MK, the unlicensed predecessor of WWJ (AM) in Detroit, Michigan. In 1922 regular wireless broadcasts for entertainment began in the UK from the Marconi Research Centre 2MT at Writtle near Chelmsford, England so the Portaphone described below was really well ahead of its time especially since it had both RF amplification ahead of the detector and also a loudspeaker.

What follows is the text of the *Radio News* article, slightly modernised as the original text contained some 'Old American' words and spelling:

### Music Wherever You Go
### Government Experts Develop a Portable Radiophone

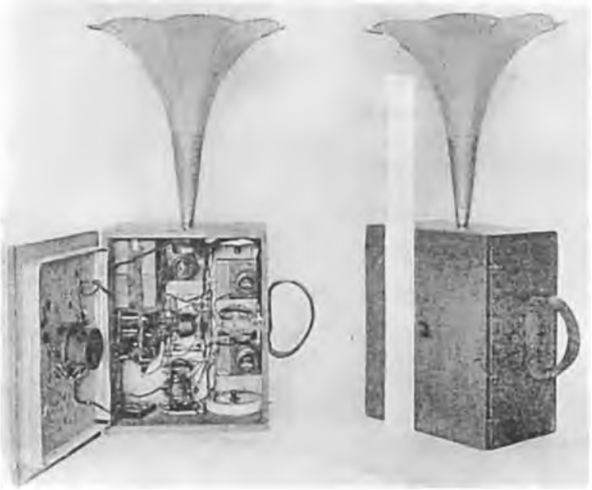
Here is the last word embodied in the portable receiving set idea. This highly efficient instrument has been developed in the radio section of the Bureau of Standards at Washington and although the experts of this Bureau modestly referred to it as being in the experimental stage, it is probable that this type of instrument is destined to become widely used on account of its practical and portable nature.

"The present *portaphone* has one stage of radio amplification and two stages of audio amplification; one tube being used both as a radio and audio amplification stage.

"By referring to the left hand illustration of the photograph, which shows the internal construction of the set, may be seen the loop which is wound upon the four sides of the cover. Directly in the centre of this cover is the tuning condenser for wavelength variation. The instrument, by the way, was designed to receive waves of 500 metres. The vacuum tubes are of a special design requiring but 0.2 ampere to operate the filament. It will also be noted that both the A and B batteries are conveniently arranged within the case, they being as small and compact as possible in order to secure minimum weight for the entire unit. It will be seen that the amplifying transformers are at right angles to each other in order to eliminate all possible mutual effects between individual circuits.

"When the radio telephone station of the Bureau of Standards at Washington is in operation with an antenna current of two amperes while transmitting, music and speech may be readily picked up by a person situated within the city limits by using the *portaphone*.

"The instrument itself without the horn is 12 inches high and 10 inches wide (30.5 cm by 25.4 cm). This gives an idea of its compactness and portable nature. The horn, of course, may be strapped to the case and carried along as well. A desirable feature connected with the instrument is that it is very simple of operation and



**The *portaphone* permits of music being heard anywhere within a large city and of sufficient intensity to be heard clearly within an ordinary room.**

does not require an expert electrician or radio ham to set it in operation. This fact alone opens up considerable future possibilities in the commercial field. Incidentally, it would be an ideal set for the more advanced amateur to take along with him on his vacation, be it far into the mountains or at the seashore. He thus can keep in touch with the news, weather reports, radiophone conversations, radiophone music, and any other information transmitted by radio,

"The approximate range of the instrument in its present development is about 20 miles (32 km), but of course this can be considerably increased by making use of a regular antenna. An instrument similar to this one has been built at the radio section of the Bureau of Standards which is sufficiently powerful as a transmitter to reproduce phonograph or other music with enough intensity so as to be heard within a room of considerable size and which, by the way, would be an excellent arrangement for dancing.

"A more sensitive type of *portaphone* is now under construction by the Government experts. It will contain three radio and two audio stages of amplification and will be so arranged that the horn and all other instruments are self-contained within the box. With this device music may be heard within the limits of any large city."

ar

It is always interesting to read letters and articles from members on a variety of subjects. How about writing, or emailing, a letter to *OTN* with your comments on matters of interest to RAOTC members, or submitting an article such as the one above!

# Norfolk Island and John VK9JA

**Allen Burke VK7AN/VK9N**
RAOTC member No 1270

**On a recent trip to Norfolk Island I spent quite a lot of time with John VK9JA, helping him with his amateur radio station so that he is now back on-air after many years of being absent from the HF bands.**

John G Anderson OAM has lived on Norfolk Island from 1946 until the present and during that time he has served as a meteorologist, curator of his own museum, a Board member of National Parks for 20 years, a Botanical Gardens organiser, a film maker, an author and a Flora and Fauna Board member.

John has lived such an interesting life on Norfolk Island I asked him if he would allow me to share some details of his experiences with fellow members of the RAOTC. John agreed, and this is his tale in his own words:

"When I arrived on Norfolk Island in 1946, there was an assortment of radio communications and navigation aids in different locations around the Island from the Second World War, when up to 230 aircraft were passing through the Island in one month on their way to the Islands further north.

"Owen King, in charge of the equipment for the New Zealand Air Force was granted the first ham licence, VK9ANF, on the Island in an emergency situation to help some yachts in one of the first Trans-Tasman Yacht Races in 1945.

"The Island had the best of receivers and powerful transmitters and, importantly, HF Direction Finding (DF) equipment, etc.

"I was impressed, as a boy, with the equipment in the receiving station - the glowing dial of the RCA AR88 and the 'musical tone ' of Morse code coming out of the speakers.

"I trained as a Commercial Radio Operator at the Marconi School of Wireless in Sydney, which was operated by AWA in the mid-1950s, along with other courses they had. There were many opportunities in those days to work in shipping, aviation or broadcasting.

"My first ship had a spark transmitter and, keen to express my new skill, I started contacting VIS (Coastal Station Sydney) before the ship was out of the Sydney Heads, to send the departure message. The noisy radiation from the spark transmitter covered a wide spectrum in the shipping band (usually between 400 and 500 kHz) and must have nearly blown up their receivers. I was told in no uncertain terms to get well down the coast before transmitting again.

**John VK9LA eating some fruit from his own orchard with a visitor Nicholas Gee.**

"Following my time at sea, I became a radio technician with the Department of Civil Aviation (DCA). This involved one of my other interests, aviation.

"Eventually I returned to Norfolk and set up my own business, Hibiscus Radio Service, and became the Sony dealer, etc, in the heydays when Norfolk Island was a tax free and duty free haven. I even sold Yaesu gear, mainly to New Zealanders, all of which was imported direct from Japan.

"I had no problem getting a ham licence and had a TH6 antenna above the shop for a number of years. I would have a weekly QSO with Pitcairn Island, both Islands sharing the descendants of the Bounty mutineers. Tom Christian was my main contact, although there were four or five others - Pitcairn Island probably had the highest proportion of hams than anywhere else in the world.

"One ham contact that took place from the shop seemed to impress Sony in Japan and also one of their engineers, as it was written up in the *Sony International Newsletter*. I used a Yaesu FT-200 transmitter and Sony's CRF-230 as receiver.

"'*Mr T Huoshima (KA1BNW) of the Radio Engineering Section, Sony Corporation, Tokyo, and the original designer of Sony's World Zone 23 band radio CRF-230, successfully exchanged long distance messages on 14.240 MHz SSB between Japan and Norfolk Island (Mr Anderson VK9JA) in the South Pacific on November 17th, 1970.*'

"One of the early hams on Norfolk Island after Owen King was Ray Hoare VK9RH who started SSB transmission in the 1950s.

"In the early 1990s a Norfolk Island stamp issue featured the five hams operating on the Island at that time.

"The Island had no public telephone communications with the outside world until the 1970s. Ham radio often proved helpful in the isolated situations, particularly in the case of emergencies and times of personal distress.

"Over the years I have endeavoured, where possible, to save and display some of the WWII equipment. In the hall we have the first Distance Measuring Equipment (DME) designed and manufactured in Australia by AWA.

"The British COL Radar with a bedstead type antenna with 42 dipoles was installed on the top of Mt Bates in 1943. It had a radiation focus as narrow as 5 - 10°.

"In April 1946, *Radio & Hobbies* magazine reported the radar receiver picking up the sun's radiation in the

**The WWII radar station located at the top of Mt Bates on Norfolk Island in 1943.**

150 - 200 MHz band area at sunrise and sunset. This lead to the development of Radio Astronomy. These scientists visited Norfolk Island to celebrate the discovery in recent years and it is now known as the 'Norfolk Effect'.

"The rotator is all that remains of the radar and it would be good if an organisation such as the WIA could encourage governments in the restoration and presentation of what is left.

"In 1976 I joined a ham radio Maritime Net (Tony ZL1ATE's net) for yachts focusing on the Pacific. At any one time there were a few hundred yachts at sea, and one of the main routes was from North America down through the Marquesas, Tahiti, Cooks, Tonga and Fiji, then to New Zealand for the cyclone season and then up to New Caledonia and Vanuatu, next season and further on.

"A considerable number were licensed hams. Amateur radio was considered an ideal communication addition on long oceanic voyages.

"I would draw up a weather chart from five figure group Morse code transmissions and other sources of information, which I had done as a hobby before joining the net. Yacht reports were added to the information, resulting in an instant analysis in some instances.

"In the 1982/83 summer season, a strong El-Nino developed with the Southern Oscillation Index (SOI) dropping to a very low level. This was an unusual or unknown event in those days. The result was six tropical cyclones forming in the Tahiti area, and some of the yachts with amateur radio on board were able to be kept up with the latest developments.

"As time went on advances were made in computers with long range weather modelling development which helped yachts decide on the best time to leave on a particular voyage. Climatology was often discussed.

"Tony's Net was an ideal medium to invite ham yachts to join what became known as Pacific Wildlife Watch. I would distribute information on seabirds, whales, dolphins, turtles and dugongs, etc. Amateur radio was an ideal way of discussing the observations, including the identification and collating of data.

"A number of ham yachts scattered in strategic locations, as an example, could track seabird Shearwater migration across parts of the Pacific and I would endeavour to coordinate the radio reports.

"Similarly, whales could be tracked. Spectacular sightings were made, and birthing locations reported - usually in remote lagoon locations. Seabird population counts were done on coral Cays.

"Radio Australia interviewed about 'Pacific Wildlife Watch and Ham Radio's role'; it was broadcast around the world, with some of the highlights being:

•Several ham yachts protesting and reporting from Mururoa Atoll observed humpback whales entering the lagoon when the bomb was about to be set off.

•A three week voyage from New Zealand to Tahiti, as an example, observing wildlife - a stimulating pastime and something to talk about on ham radio.

•Tongan waters - a ham yacht reported seven humpback whales leaping out of the water, sitting on their tails in a circle around the yacht!

•A ham yacht that had been in the Pacific for 50 years, including the US Navy in WWII, watching turtles on Huon Reef, North New Caledonia; he said it was one of the most wonderful experiences he had during those years in the Pacific.

•Yachties with wildlife knowledge were able to draw attention to the need for conservation of certain species, while visiting villages. The dugong population in Vanuatu was an issue.

"It is interesting to mention that there were occasional round-the-world sailors that would check into the various nets on a daily basis.

"One solo lady attempted sailing around the world twice - she succeeded the third time - being knocked down in Southern Ocean or equipment breakage. So every time that happened she had to start again. I am sure her repeated attempts and eventual success was due to her daily contact with ham operators round the world, to encourage and help.

"Some of these sailors were at sea for many months and had the ham family to talk to each day. Even when propagation was difficult, there was a ham operator somewhere who would make contact. In distress situations ham operators would be monitoring the frequency on a 24 hour basis.

"The Maritime Nets helped in many ways in saving life at sea, passing on medical advice, assisting with rescues, and coordinating with the Navy, Air force and Maritime Safety Authorities in emergency situations.

"One of the best operators on the net was a blind man, Trevor ZL1MA. He never seemed to make a mistake in taking reports or relaying whatever.

"Looking back, ham radio has been a wonderful hobby in all its facets and not only because I was living on a remote island but also in furthering my other interests."

ār

# RAOTC members list

*as at 31st January 2018.*

**Legend:** L = Life Member A = Associate Member B = Associate Life Member
* = Licensed 50 years or more + = Aged 90 years or more

| Name | Call | No |
|---|---|---|
| **ACT** | | |
| L Ted Peppercorn | VK1AEP | 1314* |
| A Chris Thompson | VK1CT | 1717 |
| L Ernie Hocking | VK1LK | 1260 |
| B Andrew Robertson | VK1NRO | 1611 |
| **NSW** | | |
| Don Hunt | VK2ADY | 1141 |
| Jim Brown-Sarre | VK2AGF | 1640* |
| L George Paterson | VK2AHJ | 1333+ |
| L Ben Mills | VK2AJE | 832+ |
| L Jim Patrick | VK2AKJ | 1003 |
| Alan Whitmore | VK2ALA | 1381 |
| Adrian Blake | VK2ALF | 1704 |
| John Howard | VK2AMH | 1520* |
| L Max Mondolo | VK2AML | 1227 |
| Bruce Thomas | VK2AMT | 1415 |
| Max Riley | VK2ARZ | 1518* |
| Brian Woods | VK2AZI | 1515* |
| L Tony Mullen | VK2BAM | 882* |
| L John Trenning | VK2BAR | 1226* |
| L Jim Griffiths | VK2BGG | 1271 |
| Steve Leatheam | VK2BGL | 1498* |
| George Archibald | VK2BGU | 1360 |
| L Brendan Connolly | VK2BJC | 1213 |
| Russ Jacob | VK2BJP | 1681 |
| John Marland | VK2BJU | 1399* |
| Peter Bass | VK2BPB | 1726 |
| L Ray Gill | VK2BRF | 1592 |
| Lex Brodie | VK2BYA | 1638 |
| Dave Rothwell | VK2BZR | 1414 |
| Ken McCracken | VK2CAX | 1730* |
| John Clark | VK2CF | 903* |
| Peter Presutti | VK2CIM | 1705 |
| Neale Imrie | VK2CNI | 1480 |
| L Ray Turner | VK2COX | 1348* |
| Dot Bishop | VK2DB | 1403 |
| Brian Kelly | VK2DK | 1645 |
| Al MacAskill | VK2DM | 1277* |
| Trevor Wilkin | VK2ETW | 1570 |
| John Boyd | VK2EZC | 992* |
| A Syd Brooksby | VK2FACG | 1736 |
| L Glen Millen | VK2FC | 1180 |
| L Nick Perrott | VK2FS | 1327 |
| Ray Davies | VK2FW | 1563* |
| L Gary Baxter | VK2GAB | 1504 |
| L Allan Mason | VK2GR | 1221 |
| L Peter Ritchie | VK2HC | 1326 |
| John Rath | VK2HY | 1534* |
| Ian Jeffrey | VK2IJ | 1571 |
| Ralph Parton | VK2IRP | 1301 |
| Herman Willemsen | VK2IXV-ex | 1384 |
| John Lockwood | VK2JL | 1678* |
| L Pat Leeper | VK2JPA | 1629 |
| Kevin Parsons | VK2JS | 1586 |
| Graeme Scott | VK2KE | 789* |

| Name | Call | No |
|---|---|---|
| Greg Hilder | VK2KGH | 1375 |
| Barry Wood | VK2LA | 848* |
| L Tom Sanders | VK2MY | 1393 |
| L John Gaynor | VK2NCE | 1475+ |
| L William Spedding | VK2NLS | 1394 |
| John Sullivan | VK2OH | 1687 |
| L George Hodgson | VK2OH-ex | 544 |
| L Mike Rautenberg | VK2OT | 1335 |
| L Peter Mair | VK2PF | 1318 |
| L Roger Conway | VK2RO | 1255 |
| Trevor Hoodless | VK2RU | 1673* |
| Robert Ward | VK2TAX | 1625 |
| L Robert Taylor | VK2TR | 1469 |
| A Reg Hawkins | VK2TRH | 1727 |
| Trevor Thatcher | VK2TT | 1080* |
| Ray Wells | VK2TV | 1076 |
| L Eric De Weyer | VK2VE | 1253 |
| L Barry Mitchell | VK2WB | 1456 |
| L Keith Sherlock | VK2WQ | 1138+ |
| Brian Rodgers | VK2XFL | 1608 |
| Jack Hodge | VK2XH | 1605 |
| L Richard Cortis | VK2XRC | 1474 |
| L Bill Hall | VK2XT | 812+ |
| Ron Cameron | VK2XXG | 1410 |
| Dean Davidson | VK2ZID | 1423 |
| Gary Ryan | VK2ZKT | 1267 |
| John Bishop | VK2ZOI | 1404 |
| L Steve Grimsley | VK2ZP | 465+ |
| L Robert Alford | VK2ZRJ | 1444 |
| L Sam Faber | VK2ZZ | 1359 |
| **Victoria** | | |
| Peter Doolan | VK3ACJ | 1549 |
| L Graham Rutter | VK3ACK | 1322 |
| L David Rosenfield | VK3ADM | 1622* |
| L David Wardlaw | VK3ADW | 408* |
| L Ron Cook | VK3AFW | 824* |
| L Bob Duckworth | VK3AIC | 1245* |
| Dave Parslow | VK3AIF | 1552 |
| Rob McNabb | VK3AIM | 829* |
| L Ken Young | VK3AKY | 1103+ |
| L Tony Smith | VK3ALS | 1521 |
| David Waring | VK3ANP | 1037 |
| L Bill Babb | VK3AQB | 904+ |
| Roy Badrock | VK3ARY | 1211* |
| L David Stuart | VK3ASE | 1346 |
| Ivan Brown | VK3ASG | 1669* |
| Max Carpenter | VK3AUA | 1489+ |
| L Ron Mackie | VK3AVA | 1478 |
| Laurie Middleton | VK3AW | 1152 |
| L Rod Green | VK3AYQ | 1380 |
| L Roy Thorpe | VK3BAM | 1323 |
| Carl Dillon | VK3BBW | 1618* |
| Tim Humphery | VK3BCN | 1620 |
| Neil Muscat | VK3BCU | 1695 |
| L Brian Tideman | VK3BCZ | 1184 |

| Name | Call | No |
|---|---|---|
| Mike Goode | VK3BDL | 1610 |
| L Digger Smith | VK3BFF | 1424 |
| Peter Cossins | VK3BFG | 1257 |
| Ed Roache | VK3BG | 1692* |
| L Muriel Plowman | VK3BJO | 1511 |
| Noel Jeffery | VK3BMU | 1021 |
| Len Hearnes | VK3BMY | 1188* |
| L Alex Edmonds | VK3BQN | 1341 |
| L Albert Hubbard | VK3BQO | 1506 |
| L Bill Roper | VK3BR | 978* |
| L Stan Roberts | VK3BSR | 1272+ |
| Mark Gillespie | VK3BU | 1661 |
| Bob Whalley | VK3BWZ | 1237 |
| L Graeme Brown | VK3BXG | 1542 |
| L Andy Walton | VK3CAH | 1599 |
| L John Machin | VK3CCC | 1421 |
| Bob Crowle | VK3CDV | 1588 |
| Ken Morgan | VK3CEK | 1457 |
| L Mick Ampt | VK3CH | 1365 |
| L Vic Punch | VK3CKD | 1250 |
| Kevin Leydon | VK3CKL | 1557 |
| L Dick Webb | VK3CP | 972* |
| Clint Jeffrey | VK3CSJ | 1648 |
| Don Jackson | VK3DBB | 1290 |
| L Mike Pain | VK3DCP | 1204 |
| Doug Twigg | VK3DIJ | 679* |
| L Russell Ward | VK3DRW | 1376 |
| Peter Cosway | VK3DU | 1447* |
| Peter Milne | VK3DV | 1546* |
| Bill Fanning | VK3DWF | 1038* |
| L Nigel Holmes | VK3DZ | 1435 |
| L Sarjiet Singh | VK3EAM | 1052 |
| L Dallas James | VK3EB | 1238 |
| L Steve Harding | VK3EGD | 1524 |
| L John Eggington | VK3EGG | 1683 |
| L Mark Harris | VK3EME | 1574 |
| Bob Frencham | VK3EQQ | 1684 |
| Ellis Pottage | VK3FG | 1087* |
| Dave Bell | VK3FGE | 1339* |
| Noel Ferguson | VK3FI | 1416* |
| L Ernie Walls | VK3FM | 1401 |
| Peter Lord | VK3FPL | 1590 |
| L Ray Taylor | VK3FQ | 1216 |
| L John Brown | VK3FR | 1407 |
| Geoff Wilson | VK3GJW | 1658* |
| L Lee Moyle | VK3GK | 1363 |
| Max Morris | VK3GMM | 1265 |
| Graeme Harris | VK3GN | 1630 |
| A John Piovesan | VK3GU | 1235 |
| A Bruce Stokes | VK3HAV | 1613 |
| A Phil Maskrey | VK3HBR | 1387 |
| A John Kirk | VK3HCT | 1427 |
| L Luke Steele | VK3HJ | 1432 |
| L Steve Bushell | VK3HK | 1001 |
| B Phil Cardamone | VK3HPC | 1539 |

| | Name | Call | No |
|---|---|---|---|
| L | George Francis | VK3HV | 620* |
| L | Bill Jamieson | VK3HX | 1117* |
| L | Gavin Brain | VK3HY | 1304* |
| | Ian McFarlane | VK3IDM | 1332 |
| | Bruce Wilson | VK3IG | 1639* |
| | Peter Collins | VK3IJ | 1686* |
| L | Tim Hunt | VK3IM | 504 |
| L | Ian Palmer | VK3IN | 1643 |
| | Lindsay Allen | VK3IQ | 1674 |
| L | Barry Gauntlett | VK3JB | 267+ |
| | Ray Proudlock | VK3JDS | 1585 |
| L | Graeme Mann | VK3JGM | 1274 |
| | Ray Lenthall | VK3JH | 1663 |
| L | Anthony Rogers | VK3JIA | 1287 |
| | Craig Gliddon | VK3JK | 1701 |
| | Dave Wilson | VK3JKY | 1278 |
| | Fred Storey | VK3JM | 1010 |
| | Peter Drury | VK3JN | 1567 |
| | Ian Sturman | VK3JNC | 1218 |
| | John Walters | VK3JO | 1288* |
| L | Ian McLean | VK3JQ | 1215 |
| | Frank Nowlan | VK3JR | 1286 |
| L | Ian Godsil | VK3JS | 1220 |
| L | Bill Magnusson | VK3JT | 1342* |
| L | Steve Phillips | VK3JY | 1266 |
| | Barrie Halliday | VK3KBY | 1523 |
| L | Ralph Comley | VK3KDD | 1461 |
| L | Jim Baxter | VK3KE | 1354 |
| L | Craig Cook | VK3KG | 931* |
| L | Paul Karlstrand | VK3KHZ | 1528 |
| L | John Blackman | VK3KJB | 1319 |
| L | Jim Hinton | VK3KJH | 1366 |
| L | Reg Lloyd | VK3KK | 506* |
| | Maurie O'Keefe | VK3KO | 1336 |
| | Victor Self | VK3KSF | 1254 |
| L | Mike Ide | VK3KTO | 1194 |
| | Peter Clark | VK3KU | 1573 |
| L | Alan Heath | VK3KZ | 1151 |
| L | Jack Williams | VK3LG | 565+ |
| | Colin Middleton | VK3LO | 1153 |
| | Warren Moulton | VK3LX | 976* |
| | Duncan Baxter | VK3LZ | 1251 |
| | David Davies | VK3MHV | 1293 |
| | Wally Maxwell | VK3MJW | 1720 |
| L | Rob Whitmore | VK3MQ | 1352 |
| | Peter Young | VK3MV | 1400 |
| L | Graeme McDiarmid | VK3NE | 1485 |
| L | Neville White | VK3NZ | 1343 |
| L | Alan Baker | VK3OA | 1646 |
| | Bill Miller | VK3OI | 1598 |
| | Jock Mackenzie | VK3OQ | 1619 |
| L | Peter Freeman | VK3PF | 1443 |
| | Mark Stephenson | VK3PI | 1632 |
| | Stewart Mair | VK3PR | 1641 |
| L | Peter Simons | VK3PX | 1408 |
| | John Longayroux | VK3PZ | 1553 |
| L | Bruce Plowman | VK3QC | 1448+ |
| L | Ian Hocking | VK3QL | 1594 |
| | Ray Dean | VK3RD | 1577 |
| L | Darrell Edwards | VK3RE | 1185 |
| B | Blayne Bayliss | VK3RF | 1412 |
| | Ron Sutcliffe | VK3RS | 1425 |

| | Name | Call | No |
|---|---|---|---|
| L | Peter Wolfenden | VK3RV | 1484* |
| | Ray Wales | VK3RW | 1471 |
| L | Damien Vale | VK3RX | 1239 |
| L | Sarah Dowe | VK3SD | 1535 |
| L | Allen Crewther | VK3SM | 311+ |
| A | Barry Schrape | VK3SW | 1560 |
| L | Barry Abley | VK3SY | 1496 |
| | John Sutcliffe | VK3TCT | 1589* |
| | Deane Blackman | VK3TX | 1378* |
| | Colin Durrell | VK3UDC | 1244 |
| L | Mike Thorne | VK3UE | 1473 |
| | Rodney Champness | VK3UG | 1086* |
| L | Bruce Bathols | VK3UV | 1090 |
| | Kev Trevarthen | VK3VC | 1115 |
| L | Trevor Pitman | VK3VG | 1246 |
| A | Jeff Silvester | VK3VJS | 1582 |
| L | David Harms | VK3VL | 1383 |
| L | Greg Williams | VK3VT | 1402 |
| | Rick Morris | VK3VXI | 1497 |
| L | Peter Dempsey | VK3WD | 1544 |
| L | Brian Endersbee | VK3WP | 1491* |
| L | Jenny Wardrop | VK3WQ | 1656 |
| | Dennis Sillett | VK3WV | 1668* |
| L | Ian Keenan | VK3XI | 1527 |
| L | Ian Simpson | VK3XIS | 1071 |
| | Bob Tait | VK3XP | 1689 |
| | Ted Egan | VK3XT | 721* |
| | Drew Diamond | VK3XU | 1140 |
| L | Derek McNiel | VK3XY | 1370 |
| | Tim Robinson | VK3YBP | 1617 |
| L | Brewster Wallace | VK3YBW | 1126 |
| L | Eric Day | VK3YHN | 1398 |
| L | Terry McIntosh | VK3YJ | 1532 |
| | Peter Godfrey | VK3YPG | 1685 |
| | David Ditchfield | VK3YSK | 1732 |
| | Don Bradbury | VK3YV | 1580* |
| L | John Bennett | VK3ZA | 939* |
| | Alan Hayes | VK3ZAH | 1711 |
| L | Bob Neal | VK3ZAN | 1030+ |
| | Ken Benson | VK3ZGX | 1377 |
| L | John Horan | VK3ZHJ | 1541 |
| | Kevin White | VK3ZI | 1568 |
| | Ian Baxter | VK3ZIB | 1519 |
| | Don Seedsman | VK3ZIE | 1068* |
| L | Jim Gordon | VK3ZKK | 1262 |
| | Tony Zuiderwyk | VK3ZMP | 1733 |
| | Geoff Angus | VK3ZNA | 1482* |
| | Cal Lee | VK3ZPK | 1510 |
| | Eric Gray | VK3ZSB | 1451* |
| | Leigh Tuckerman | VK3ZTU | 1468* |
| | Bill Adams | VK3ZWO | 1356+ |

**Queensland**

| | Name | Call | No |
|---|---|---|---|
| L | Tom Ivins | VK4ABA | 1382* |
| | Colin Gladstone | VK4ACG | 1703 |
| | Ian Saunders | VK4ACU | 1390 |
| | Doug Hunter | VK4ADC | 1697* |
| | Geoff Adcock | VK4AG | 1718 |
| | George McLucas | VK4AMG | 1675* |
| L | Harold Cislowski | VK4ANR | 1550 |
| A | Glenn McNeil | VK4BG | 1633 |
| L | Graeme Dowse | VK4CAG | 1417 |
| | Chris Lowe | VK4CL | 1651 |
| L | Les McDonald | VK4CLF | 961 |
| L | Norm Phillips | VK4CNP | 1015+ |
| L | Jon Walton | VK4CY | 842* |
| L | Ian Browne | VK4DB | 1283 |
| | Dale McCarthy | VK4DMC | 1465 |
| | David Laurie | VK4DT | 1707 |
| L | Merv Deakin | VK4DV | 1230* |
| | Ron Goodhew | VK4EMF | 1516 |
| | Ron Kerle | VK4EN | 1706 |
| | Bob Lees | VK4ER | 1609* |
| | Jim Downman | VK4FAD | 1659 |
| | Len Eaton | VK4FIAA | 1606 |
| | Felix Scerri | VK4FUQ | 1533 |
| L | Geoff Bonney | VK4GI | 969* |
| L | Warren Heaton | VK4GT | 672* |
| | Daphne Ayers | VK4IA | 1647 |
| | Kevin Dickson | VK4IW | 1158 |
| L | Gordon Loveday | VK4KAL | 707+ |
| L | Andy Beales | VK4KCS | 1579 |
| | Tony Dore | VK4KJD | 1737 |
| L | Norman Fiori | VK4LD | 1296 |
| | John Horrocks | VK4LJ | 1362* |
| | Jack Chomley | VK4LM | 1696 |
| A | Mike Patterson | VK4MIK | 1467 |
| L | Mario Antoniutti | VK4MS | 1470 |
| | Mike O'Connor | VK4MW | 1603 |
| A | Ray Crawford | VK4NH | 1653 |
| | Dick Pietrala | VK4OP | 1075 |
| | Ian McCosker | VK4PF | 1162* |
| | Allan Downie | VK4QG | 1565 |
| | Mike Charteris | VK4QS | 1329 |
| L | Rod Rush | VK4RA | 1477 |
| | Ron Grandison | VK4RG | 668* |
| L | Ross Ramm | VK4RO | 1433* |
| L | Alex McDonald | VK4TE | 1411* |
| L | John Roberts | VK4TL | 1005* |
| L | Mick McDermott | VK4TMD | 1317 |
| L | Paul Blake | VK4TPB | 1514 |
| | Trent Sampson | VK4TS | 1657 |
| | Andy Odgers | VK4WKX | 1460 |
| | Victor Stallan | VK4WST | 1688* |
| | Ray Thorn | VK4WY | 1724* |
| L | Chris Bourke | VK4YE | 1436 |
| | Nick Watling | VK4YT | 1263* |
| | Frank Adamson | VK4ZAK | 1406 |
| | Philip Tomlinson | VK4ZPE | 1624* |
| | Kevin Dibble | VK4ZR | 1060 |
| | Bill Wilcock | VK4ZWJ | 1373 |

**South Australia**

| | Name | Call | No |
|---|---|---|---|
| | Mike Hall | VK5AGI | 1615 |
| | Kevin Zietz | VK5AKZ | 1735 |
| | Peter Reichelt | VK5APR | 1612 |
| | Adrian Wallace | VK5AW | 1637 |
| | Wolfe Rohde | VK5AXN | 1628 |
| | Mal Haskard | VK5BA | 1107* |
| | Lloyd Butler | VK5BR | 1495+ |
| | Dick Turpin | VK5BRT | 1347 |
| | Barry Williams | VK5BW | 1551 |
| | Curl Blythe | VK5CL | 1654* |
| L | Brian Condon | VK5CO | 291* |
| | John Drew | VK5DJ | 951* |
| | Mac Macdermott | VK5FLEN | 1631 |

| | Name | Call | No |
|---|---|---|---|
| | Jeff Farmer | VK5GF | 851 |
| | Norm Lee | VK5GI | 1677 |
| L | Paul Spinks | VK5GX | 1214 |
| | Colin Hurst | VK5HI | 1716* |
| | Harro Krause | VK5HK | 1275 |
| L | Ian Sutcliffe | VK5IS | 1355 |
| | Trevor Niven | VK5NC | 946* |
| L | Keith Metcalf | VK5ND | 1537* |
| | Bryan Scott | VK5NOS | 1202 |
| L | John Butler | VK5NX | 1120 |
| L | Terry Franklin | VK5OC | 1430 |
| | Tony Wilkinson | VK5PBB | 1453 |
| A | Ron Zimmermann | VK5PCZ | 1449 |
| | David Poole | VK5PL | 1729 |
| | Trevor Greig | VK5PTL | 1601 |
| | Phil Day | VK5QT | 1722 |
| L | Ivan Huser | VK5QV | 477* |
| | Rob Gurr | VK5RG | 1500* |
| L | Ron Coat | VK5RV | 1000+ |
| | Colwyn Low | VK5UE | 1361* |
| | Rod Cunningham | VK5UV | 1694 |
| | Bill Thomas | VK5VE | 1321* |
| | Ron Holmes | VK5VH | 1299+ |
| L | Ian Werfel | VK5VJ | 968 |
| | Bill Coates | VK5WCC | 1199 |
| A | Lyle Whyatt | VK5WL | 1680 |
| | Colin Luke | VK5XY | 1168* |
| | Hans Smit | VK5YX | 1517 |
| | Geoff Cleggett | VK5ZAE | 1734 |
| | Adrian Waiblinger | VK5ZBR | 1614 |
| | Ian Coat | VK5ZIC | 1682 |
| | Ian Maxted | VK5ZIM | 1562 |
| | Peter Temby | VK5ZJ | 1229 |
| | Peter Russell | VK5ZJR | 1702* |
| L | Peter Whellum | VK5ZPG | 1479 |

### Western Australia

| | Name | Call | No |
|---|---|---|---|
| | Brian McDonald | VK6ABM | 1508* |
| L | Bob Sutherland | VK6ABS | 1483* |
| | Mark Barnett | VK6ACB | 1665 |
| L | Barrie Burns | VK6ADI | 1273* |
| | John Farman | VK6AFA | 1409 |
| | Peter Zwarecz | VK6APZ | 1715 |
| L | Mark Bussanich | VK6AR | 1334 |
| | Geoff Wood | VK6AT | 1721 |
| | Tony Argentino | VK6ATI | 1591 |
| | Graeme Smith | VK6ATS | 1719 |
| | Anthony Benbow | VK6AXB | 1566 |
| L | John Van-Tiel | VK6BCU | 1481 |
| | Bob Good | VK6BI | 1652 |
| | Richard Grocott | VK6BMW | 1555 |
| | Barrie Field | VK6BR | 377* |
| | Dick Roddy | VK6BV-ex | 1146 |
| L | Bob Crowe | VK6CG | 1405* |
| B | Ken Taylor | VK6CO | 1529 |
| | Clive Wallis | VK6CSW | 1289 |
| | Clem Patchett | VK6CW | 742* |
| | Arthur Eder | VK6CY | 1303 |
| L | Doug Wells | VK6DEW | 1458 |
| | Doug Jackson | VK6DG | 1243 |
| | Chris Dodd | VK6DV | 1501* |
| L | Don Newman | VK6EY | 1558+ |
| A | Rob Hatton | VK6FX | 1708 |
| | Gerry Wild | VK6GW | 1112* |
| | Phil Hartwell | VK6GX | 1494 |
| | Bob Howard | VK6HJ | 1623* |
| A | Richard Campbell-Morrison | VK6HRC | 1698 |
| A | Wayne Fiddes | VK6HWF | 1429 |
| | John Tower | VK6IM | 1691 |
| L | Glen Hufner | VK6IQ | 1072* |
| | Peter Scales | VK6IS | 1700 |
| L | John Farnell | VK6JF | 1297 |
| | Chris James | VK6JI | 1587 |
| | Jim Preston | VK6JP | 1121 |
| | Keith Bainbridge | VK6KB | 1664 |
| A | Dudley Donovan | VK6KBY | 1672 |
| | Keith Hobley | VK6KH | 1028* |
| | Phil van Leen | VK6KHV | 1655 |
| L | Bob Lockley | VK6KW | 1172 |
| L | Glenn Ogg | VK6KY | 1358* |
| L | Lance Rock | VK6LR | 1509* |
| | Bill Toussaint | VK6LT | 1561 |
| | Cliff Bastin | VK6LZ | 1310 |
| | Syd O'Neill | VK6MK-ex | 1124 |
| | Lindsay Hirschausen | VK6NO | 1714 |
| L | Noel Sanders | VK6NS | 1493 |
| L | Alan Gibbs | VK6PG | 815* |
| | Rob Penno | VK6PO | 1111* |
| L | Ray Peterson | VK6PW | 346* |
| L | Phil Zeid | VK6PZ | 752+ |
| | Peter Walton | VK6QK | 1627 |
| L | Graham Rogers | VK6RO | 1302 |
| L | Ron Collier | VK6RT | 1440+ |
| L | Phillip Bussanich | VK6SO | 1247 |
| | Don Truscott | VK6UT | 1212 |
| | Wayne Jefferies | VK6VE | 1731 |
| A | Joe Page | VK6VO | 1340 |
| | Steve Ireland | VK6VZ | 1690 |
| | Bill Rose | VK6WJ | 1463 |
| | John Tuppen | VK6XJ | 1525 |
| L | Roy Watkins | VK6XV | 1181 |
| L | Poppy Bradshaw | VK6YF | 1191+ |
| | Trevor Dawson | VK6YJ | 1662 |
| | Peter Savage | VK6YV | 1671 |
| | Tom Berg | VK6ZAF | 1133* |
| | Max Shooter | VK6ZER | 1431* |
| L | Igor Iskra | VK6ZFG | 1559* |
| L | Phil Casper | VK6ZKO | 1445 |
| | Christine Bastin | VK6ZLZ | 1311 |
| | Robert Randall | VK6ZRT | 1225 |

### Tasmania

| | Name | Call | No |
|---|---|---|---|
| | Allen Burke | VK7AN | 1270 |
| | Tony Bedelph | VK7AX | 1676 |
| | Frank Beech | VK7BC | 1522* |
| L | Nicholas Chandler AM | VK7BEE | 1538 |
| | Brian Proudlock | VK7BP | 644* |
| | Anne Landers | VK7BYL | 1439 |
| | Doug Charlton | VK7DK | 1050* |
| | Mike Hawkins | VK7DMH | 1597 |
| | Jerry Smutny | VK7EE | 1595 |
| | Winston Nickols | VK7EM | 899* |
| | Tom Moore | VK7FM | 1593+ |
| L | Herman Westerhof | VK7HW | 1604 |
| L | Joe Gelston | VK7JG | 1101* |
| | Chris Holliday | VK7JU | 1667 |
| | Reg Emmett | VK7KK | 1709* |
| L | Charles Spiegel | VK7KS-ex | 660* |
| | Bob Geeves | VK7KZ | 907* |
| B | Ross Broomhall | VK7LH | 1699 |
| L | Rex Moncur | VK7MO | 1298* |
| L | William Maxwell | VK7MX | 1418 |
| | Bill Dixon | VK7OZ | 1710* |
| L | Peter Dowde | VK7PD | 1554* |
| | Bob Reid | VK7RF | 1666* |
| L | Richard Rogers | VK7RO | 908* |
| | Trevor Briggs | VK7TB | 1316 |
| L | Justin Giles-Clark | VK7TW | 1712 |
| L | Winston Henry | VK7WH | 1526* |
| A | Wayne Hardman | VK7XGW | 1723 |
| | André Bochenek | VK7ZAB | 1725 |
| L | Paul Edwards | VK7ZAS | 1324* |
| | Idris Rees | VK7ZIR | 1713 |
| | John Jongbloed | VK7ZJJ | 1584 |

### Northern Territory

| | Name | Call | No |
|---|---|---|---|
| | Peter Clee | VK8ZZ | 1728 |

### Overseas

| | Name | Call | No |
|---|---|---|---|
| | David Dunn | G3SCD | 1252* |
| L | Ira Lipton | WA2OAX | 1344* |
| L | Martyn Seay | ZL3CK | 1159 |

## Membership statistics

| | |
|---|---|
| 194 | Life members |
| 271 | Full members |
| 5 | Associate Life members |
| 20 | Associate members |
| **490** | **Total membership** |
| including | |
| 131 | Licensed 50 years or more |
| 26 | Aged 90 years or more |

ar

## New RAOTC members

It is with pleasure that we record and welcome the following new RAOTC members:

| Name | Call | No | Gd |
|---|---|---|---|
| Peter Clee | VK8ZZ | 1728 | F |
| David Poole | VK5PL | 1729 | F |
| Ken McCracken | VK2CAX | 1730 | F |
| Wayne Jefferies | VK6VE | 1731 | F |
| David Ditchfield | VK3YSK | 1732 | F |
| Tony Zuiderwyk | VK3ZMP | 1733 | F |
| Geoff Cleggett | VK5ZAE | 1734 | F |
| Kevin Zietz | VK5AKZ | 1735 | F |
| Syd Brooksby | VK2FACG | 1736 | A |
| Tony Dore | VK4KJD | 1737 | F |

# Obituary

## Darcy Hancock VK5RJ

**RAOTC member No 584**

**18th December 1910 - 27th August 2017**

Darcy was born in Kadina, South Australia on 18th December 1910. He was one of the first students to attend the Kadina Memorial High School in the 1920s.

Darcy remembered the first wireless coming to Kadina in the late 1920s and noted that the signal was mostly 'crackle and pop' through the horn speaker as the owner was trying to receive 2FC from Sydney.

He had a keen interest in electronics and in 1927 became one of Australia's youngest licensed radio amateurs at 16 years of age with the call sign VK5RJ that he held for 90 years.

In the early days hams could transmit music and locals took great delight in taking Darcy their records so they could be heard 'over the air' on their wireless receivers. Darcy was, as all hams had to be in those days, a great innovator, and he salvaged a big cast-iron disk record player from the local cinema when it changed to 'sound on film' and converted it into a disc recorder.

Darcy married Jean McDonald in 1946 and they shared 61 years together with three children, Bruce, Grant and Gail. Darcy ran his own electrical business in Kadina, 'Hancock's Radio Sales and Service', which he later expanded with musical instruments and sheet music.

Music was Darcy's other great love. He was an accomplished musician who led his own dance band 'The Rhythm Kings' who played throughout the York Peninsula. He played piano and banjo, amongst other instruments, but his favourite was the saxophone.

In 1964 Darcy and his family moved to Adelaide where he worked in the electronics retail and wholesale trade supplying spare parts for radio and television. He completed his working life at the Brighton Technical College maintaining the workshop machinery.

In Adelaide Darcy continued playing his saxophone with son Bruce on piano. At the time Bruce, who is a professional musician in his own right, became friendly with pianist Ray Carney. Bruce introduced Ray to Darcy and so began a long musical relationship. Darcy played professionally with Ray and the two became the nucleus of the resident band at Port Adelaide Waterside Workers Association where Darcy played well into his late 80s.

Darcy took great pride in his ham radio family as his son Bruce is VK5TRJ and his grandson Ian is VK5LRJ. He had many ham radio friends in the earlier days as part of 'The Northern Net' on AM and in later years with regular daily skeds until well after the age of 105.

He was very proud of being Australia's oldest radio ham.

Darcy celebrated his 106th birthday on 18th December 2016 in Resthaven aged care facility at Marion where he passed away peacefully just four months short of his 107th birthday.

Vale Darcy.

*Ian Sutcliffe VK5IS*
*RAOTC member No 1355*

ar

# Silent keys

It is with regret that we record the passing of:

| | |
|---|---|
| Darcy Hancock | VK5RJ |
| Ken Nisbet | VK2KP |
| Mike O'Burtill | VK3WW |
| John Adcock | VK3ACA |
| Ron Fisher | VK3OM |

# Obituary

## Ron Fisher VK3OM

### RAOTC member No 103

**14th June 1930 - 2nd February 2018**

Amateur radio was a major part of Ron Fisher's life. For much of the time that Ron was a licensed amateur radio operator he was one of the better known, respected and admired Australian hams both here in Australia and overseas.

Ron first became a licensed radio amateur in January 1950 at age 19 and joined the Wireless Institute of Australia in August that year - he was still a member of the WIA at the time of his death.

I first met Ron on-air in 1960. We met shortly thereafter in person when I helped him install a WWII vintage radio, an Army surplus No 122 set - in the Elwood Life Saving Club's *Miss Ampol* cabin cruiser. From that time on Ron became one of my best friends and at the time of his death was my oldest surviving friend.

Ron and I served together on the publications committee of the WIA's monthly magazine *Amateur Radio* for over 50 years. During that time Ron wrote countless articles for the magazine, including 148 equipment reviews which covered from complex multi-thousand dollar transceivers down to coaxial antenna switches. He also wrote countless other articles over the years, including from time to time co-authoring several well known columns such as *Random Radiators*, *Novice Notes* and *Technical Topics*.

Ron was one of the early members of the RAOTC, having joined in 1976 as member No 103. He served on the management committee of the Old Timers Club with me for 20 years. For many years he relayed the club's monthly news broadcasts on several frequencies. At the time of his passing Ron was the longest serving member of the RAOTC.

Although Ron was an extremely valuable member of several amateur radio committees over the decades, he never once took on any administrative position. That was not Ron's scene. But his encyclopaedic knowledge of just about anything to do with amateur radio was invaluable to every committee on which he served.

Many amateurs knew Ron for his excellent sounding voice transmissions. He had an ABC quality announcer's voice and made sure his equipment broadcast it faithfully.

There were not too many days in Ron's life since 1950 that he did not have at least one contact on-air. Apart from radio contacts all around Australia he made countless overseas contacts as well, particularly with hams in the UK. In fact he had so many radio friends there that the first time he ever travelled overseas was to the UK and for the several weeks he was there he did not book into a hotel or motel once, but stayed in the homes of amateurs he had made friends with on air, moving from one to another.

From 1972 until 1990 Ron and I presented what was known as the Federal Tapes, a ten minute news segment played in every WIA news broadcast.


One of the consequences of these 'Federal Tapes' was that quite a number of people had trouble differentiating between Ron's and my voices. I am not quite sure what Ron thought when people inadvertently called him 'Bill' on air, but I felt flattered when people called me 'Ron' because I always envied Ron his most magnificent microphone voice. Even today, I still occasionally am called 'Ron' on air.

Although Ron's and my lives took different paths over the decades, we still remained connected through on-air chats, the regular committee meetings we attended, the many hamfests we attended together around Melbourne and the Victorian countryside, the odd family barbeque, games of squash - you wouldn't believe how competitive the normally placid Ron became on the squash court - several flights as a passenger during Ron's flying days, and my involvement in later years in assisting Ron with many of his much lauded equipment reviews.

Ron was very knowledgeable in the buying and selling of second-hand amateur radio equipment. If amateurs wanted to sell or buy equipment, often they contacted Ron first to see if he was interested or knew where they could find what they were looking for.

Ron was very generous in his advice to new amateurs, and was always there to assist. However, he was a stickler for accuracy of operating procedure on the amateur bands. Sometimes he would politely offer advice when the miscreant really did not want it, but he usually did it tactfully.

Ron's radio shack was always impeccable with lots of equipment. Photos of Ron's 'shack' were published in various magazines over the years and raised the admiration and envy of all who saw them.

In 2010 Ron was awarded the G A Taylor Medallion in recognition of half a century of voluntary service to the Wireless Institute of Australia, mainly associated with the WIA journal *Amateur Radio*. This award is only conferred by the WIA irregularly and rarely, in acknowledgment of exceptional voluntary service to the WIA. Ron was a well deserving and popular recipient of this prestigious award.

Sadly, Ron's life changed dramatically just a few years ago when he suffered a massive stroke, completely paralysing the left side of his body. Despite his disabilities, when he was eventually settled into the Villa Maria Nursing Home, Ron was soon back on-air with his beloved amateur radio, albeit only talking to local amateurs on 2 m FM, thanks mainly to the efforts of John Piovesan VK3GU.

*(continued at foot of next page)*

# Obituary

## Ken Nisbet VK2KP

**RAOTC member No 989**

**8th July 1940 - 3rd August 2017**

Ken was born in Brighton, Melbourne on 8th July 1940 and passed away peacefully at age 77 after a protracted battle with cancer.

Ken started his working life in January 1957 when he was accepted into the PMG technician-in-training scheme, together with Bruce Wilson VK3IG (SK) and Peter Milne VK3DV (RAOTC member No 1546), where he excelled; his appetite for electronics never waned throughout his life. He obtained his amateur radio licence and callsign VK3ZKK and then VK3AKK as a member of the Moorabbin and Districts Radio Club. It was there, along with fellow club members, Ken produced a transistorised amateur band receiver kit as a club project.

Ken successfully applied for a position as senior engineer communications with ACI Electronics. At ACI Ken developed the Acitron SSB 400, a six band 400 watt SSB transceiver specifically designed for the amateur market. His personal Acitron 400 is now on display at the Kurrajong Radio Museum at Kurrajong, NSW.

Ken also taught himself computer programming. Always keen to begin a new project, he could see a future for radio telemetry in Australia so, in 1986, he formed the company Rad Tel Systems. Everything was manufactured in-house, components were sourced locally, circuit boards both digital and analog were produced in WA, while components were fitted by CNS at a sheltered workshop in Hornsby. This association lasted over 25 years; radios used were Tait, Maxon, and GME.

Ken, then in his 40s, obtained a pilot's licence to enable him to get around the country in a timely fashion, and clocked up over 2,000 flying hours,

I met Ken and Sue in 2000 when I answered an advertisement in *Amateur Radio* magazine for a senior radio technician. Working with them, I obtained a good insight as to what it takes to run a successful business. Sue handled the Sydney end, dealing with government departments, frequency allocations, specifications, quotations, drawing, production runs, and day to day running of the factory and office. Meanwhile Ken was out in the field supervising installations, developing the software while on the go to fulfil councils' requirements, and drumming up more work to keep it all going.

Ken and Sue's sons, Adrian and Graham, came on-board around the same time as I did, Adrian a commercial pilot and Graham fresh out of university with a degree in Telecommunications Engineering.

However, early in 2010 China began producing their own radio telemetry units, including a radio for around $1,600. Shortly thereafter, the Sydney factory of Rad Tel Systems was wound up and anything remotely related to amateur radio was donated to the Wireless Institute of Australia ARNSW group, and several trailer loads were delivered to their Dural property.

Rad Tel Systems was then re-badged as Automation Group specialising in software development to cater for developing digital technologies and tailored to suit the client requirements.

Ken is survived by XYL Sue; daughter Heather and granddaughter Stephanie; sons Adrian and Graham, their XYLs Kelly and Kathy, and children Oliver, George, Zoe and Jay.

Vale Ken.

***Peter Ritchie VK2HC***
***RAOTC member No 1326***

ar

***Obituary* - Ron Fisher VK3OM**
*(continued from previous page)*

During his time in the nursing home, I spoke to Ron on-air virtually every day. Initially we talked about technical matters but gradually Ron mainly wanted to reminisce about the past - particularly about the many radio amateurs we had both known over the years.

Eventually, however, his ability to operate even the simplest of radios diminished as he slowly slipped away from us and he finally went off air towards the end of last year.

Since Ron had the last, major stroke and went into care, I have responded to countless enquiries from amateurs, from around Australia and from overseas, wanting to know how Ron was going.

To me and to many others, Ron's passing is almost the end of an era.

But one thing is for sure. Ron, will be long remembered and live on in the annals of amateur radio in this country for his contribution to this wonderful hobby which was so much a part of his life.

Au revoir, Ron and very 73 old friend.

***Bill Roper VK3BR***

ar

# Victoria Police Wireless Patrol - the early days

**Bill Roper VK3BR**
RAOTC member No 978

**Just two days before the RAOTC Melbourne September 2017 AGM/luncheon, the guest speaker became ill with influenza. The subject of this Police Inspector's talk was to be 'The history of D24 and police communications'. Because I had written an article about early police communications, published in the March 2009 edition of *OTN*, I volunteered to present a replacement talk with PowerPoint slides about the early days of the Victoria Police Wireless Patrol. What followed was a frantic 36 hours, hastily researching on-line and obtaining updated material and supporting images. This article is based on my talk plus some further information which came to light later.**

One hundred years ago, 1918, World War I was still being waged on the killing fields of Europe. Here in Melbourne there was no broadcast radio, no TV, not too many telephones, certainly no mobile phones, and definitely no two-way radios!

Police communication methods were very primitive. The whistle was virtually the only way a police officer on the beat could summon assistance. Or he could rap his truncheon on the pavement!

What happened if a crime took place? The Victorian Police still did not have cars - their main means of transport was on foot, bicycle or catching a cable tram.

If a householder reported a crime - a burglary, a domestic or even a murder – unless there were beat patrol police in the vicinity how long did it take for the police to arrive. Well, let me tell you. A very long time!

Beat patrol police had only one link with their local station and that was via a street telephone, and they only made a call every thirty minutes to the station to receive or send crime messages. As expected, long delays were experienced in using this system. Inevitably, the criminals had long gone by the time an officer arrived at the scene of the crime.

However, in the years immediately following World War I, mobility was added to Victoria Police operations by the introduction of patrol cars. Initially, patrol car crews adopted the same means of communication as used by the police on the beat. They called in to police stations at thirty minute intervals from where they rang Police Headquarters in MacKenzie Street, on the corner of Russell Street, Melbourne. Although this gave the car patrols some form of communication, the length of response time to incidents severely restricted their effectiveness.

**Constable, later Senior Constable, and finally Inspector Frederick William Downie.**

The early attempts at overcoming this problem resulted in a world first for the Victoria Police. The establishment of the Victoria Police Wireless Patrol was due almost entirely to the persistent efforts of one man, red-headed Constable Frederick William 'Pop' Downie.

Fred Downie was appointed to the Victoria Police Force in 1903 and transferred from Russell Street to Carlton North in 1904. After spending almost sixteen years at that station he transferred to the Motor Patrol at Russell Street. At this time the Motor Patrol, which was responsible for the checking of Post Offices, Railway Stations and the like, was equipped with a rattly Palm car with a tourer hood, built up from model 'T' Ford parts.

**In 1921, Victoria Police's fleet of vehicles featured a Ford T prison van, a Hotchkiss Criminal Investigation Branch car, a Palm patrol car, and Triumph motorcycles with sidecar, This photo was taken inside the yard of the Russell Street police complex with the MacKenzie Street building in the background.**

In order to receive information on matters requiring attention, the Motor Patrol would call at police stations each half-hour and telephone Russell Street for news. Constable Downie saw that this method of communication was totally inefficient and so he decided to experiment with the new science of wireless to see if that would improve communication between central control and the Motor Patrol units.

While on patrol, Fred Downie had noticed the Domain Wireless Station, VIM, located in the Domain Gardens where the Shrine of Remembrance now stands. VIM, which commenced operations on 18th February 1912, was used at that time for communication with shipping. In 1921 Fred then began examining the possibilities of installing a commercial radio receiver into a patrol car with calls being transmitted to it by wireless telephony.

A young student at the Melbourne Marconi School of Wireless at the time recalls Downie calling at the school, learning Morse code and taking an interest in wireless. That student was Clifford Allison who later became a member of the Victoria Police Force and served as a wireless operator with the wireless patrol from 1925 to 1940.

The first police patrol installation in Australia was carried out by Amalgamated Wireless Australasia Ltd in October 1922. With assistance from the Melbourne manager of Amalgamated Wireless, a modified Marconi seven valve receiver was fitted into Patrol Car 1 of the Victorian Police Department.

Although he received little encouragement from his superiors, Constable Downie persisted with these experiments with valuable assistance from Amalgamated Wireless.

By November 1922, the experiments with wireless telephony had progressed to a point where Constable Downie was finally able to persuade, with some difficulty, Chief Commissioner Nicholson, Superintendent Potter who was in charge of the CIB, and senior detectives to take part in an experimental transmission from the Domain Wireless Station. Actually, Fred had great difficulty in getting Chief Commissioner Nicholson to come out in the car. Even after the Wireless Patrol had become established it was feared that it might be disbanded due to financial constraints. Chief Commissioner Nicholson was not an enthusiastic supporter of the Wireless Patrol!

One night they all drove 15 miles (24 km) to the south of Melbourne to test the feasibility of Constable Downie's far-reaching idea. Prior to leaving Russell Street Police Headquarters, Chief Commissioner Nicholson had arranged that certain messages, the texts of which were known only to himself, be transmitted to the test car at certain intervals.

At 3.15 am, station VIM broadcast on a 500 W De Forest transmitter from the Domain Gardens and the following message was received by the car. "Please get in touch with the CI Branch immediately." Three minutes later the car was at a police station and in touch with Russell Street. Without the wireless radio it would have been 4.00 am before the patrol would have been in touch with the CID.

The era of effective police communication had begun, with the Victoria Police accomplishing a world first!

The May 1923 edition of a popular publication called *Radio* heralded the arrival of police communications with the following words: "*The equipment of the Police patrol car in Melbourne with a radio receiving set is unquestionable evidence that the police authorities in Australia recognise the tremendous assistance they will receive by utilising this newest system of communication in tracking down evil doers. As a record of what has been accomplished to date, and a forecast of what may come in the future, police radio is both interesting and valuable. It will help materially to educate the general public to a realisation of what radio telephony may accomplish in the future and it will likewise impress the police authorities with the wisdom of keeping right up to date in their criminal catching methods.*"

A new era in police communications had begun!

The excellent reception results obtained in the car, and the success of the installation as an aid to the police in the prevention of crime and in capturing criminals, was such that, 12 months later, the Police Department purchased two fast cars and had both of these fitted with wireless.

The message flow in those early days required Russell Street Headquarters to telephone complaints received to station VIM for broadcasting to the patrol cars. However, these broadcasts were continually troubled by poor reception. At the same time, it was noticed that, although the voice transmissions could be often of poor quality, a strong Morse signal also broadcast by VIM could be clearly received.

As it became apparent that wireless telephony was inadequate, a decision was made to switch to wireless telegraphy which involved the use of Morse code. In May 1923, station VIM commenced Morse transmissions to patrol cars, thus necessitating the inclusion of a qualified Morse operator as part of the crew.

Also in May 1923, a Marconi receiving set was fitted to the Force's Hotchkiss car (which had been bought second-hand from the Melbourne Fire Brigade).

The first receivers were not specifically designed for police use and were hired from Amalgamated Wireless for £1 per week before eventually being purchased. This change to Morse code created the problem of finding trained wireless operators.

One serving member, William Hutchinson, was located and became the first wireless operator in the Victoria Police Force. Personnel were then sought from outside the Force and six men enlisted as wireless operators between June 1923 and July 1925, including Clifford Allison.

The Hotchkiss car, which was initially used as a wireless patrol car, was replaced just prior to the police strike in November 1923 and the receiving set was transferred to one of two new, eight cylinder, 80 mph Lancia patrol cars - incidentally, the Lancias only had back wheel brakes!

The strike saw the members of the wireless patrol remain on duty and the car was used to good effect during the strike.

**A 1923 Lancia Trikappal. The police were showing the 7-stage receiver with a tuning condenser they were using for short range transmissions. The antenna was a piece of wire hung over the pole clamped onto to the running board. Incidentally, instead of selling the cars when the police upgraded to newer models, the patrol cars were destroyed in a few years when worn out to stop organised crime gangs from buying them and posing as police officers.**

As well as the human crew carried by the patrol cars, a dog often accompanied the early patrolmen during their tours of duty. Unfortunately, training was lacking and it is reported that much inconvenience was caused to the members rounding-up the additional 'crew', particularly when female dogs were in the vicinity.

The second Lancia was fitted with wireless soon after, but the fact that the cars were only fitted with receiving sets caused some concern. The *Popular Radio Weekly* in 1925 reported that, "*Occasionally criticism is levelled at the Police Wireless Section owing to the fact that wireless communication with the car is only established one-way, that is to say, messages are only sent to the car but not acknowledged. It may be pointed out, however, that in this respect fully 100 per cent efficiency has been attained - no message has ever been missed, and no word has ever been in doubt.*"

**Another photo of one of the Lancias with many of the Wireless Patrol personel present. Constable Downie is at the far right. The Marconi 7-valve receiver is sitting on the running board for the purposes of the photo.**

Whilst the press of the day may have been satisfied with the one-way communication, Constable Downie was not and, as early as 1923, he took part in experiments conducted with a spark transmitter of the type used for ships' life-boats. During one of these tests, not only was communication maintained with both the Domain Wireless Station and with Russell Street but, "*while the car was near Brighton Beach communication was actually established with a ship just out of Newcastle and bound for Melbourne, and we think we are right in stating that this is the first time in history where a ship has communicated by wireless with a motor car in motion*".

Fred Canning, then OA3CQ, was that ship's wireless operator. When Fred arrived in Melbourne he decided to give up his shipboard career aboard the SS *Gilgai* and join the police force. When he applied he was welcomed with open arms because the Department was desperate for men who could send and receive Morse at professional speeds. After a short course at barracks he was given an automatic pistol and he became part of the mobile police section.

However, as we can all imagine, the spark transmitters were not very practicable. When Fred Canning entered the Police Force in 1924, he began to experiment with two-way Morse transmissions. The experiments continued for about two years and Canning, assisted by Allison, eventually developed a suitable transmitter which was built by Amalgamated Wireless in Sydney.

With the help of the Melbourne Branch of AWA, Canning obtained a small transmitting valve and other components were borrowed. With a Model T Ford coil a high-tension supply was created. The low powered CW

**Constable Frederick Canning, Senior Constable Frederick Downie and Constable Charles Murray of the Wireless Patrol.**

transmitter that evolved was fitted at 10 o'clock each night to a car loaned by a citizen while a series of test transmissions was made from various locations. The little flea-power radio was picked up at Russell Street with no difficulty.

Then, assisted by Mr L A Hooke, of Amalgamated Wireless Ltd, the wireless operators installed a transmitting set in one of the patrol cars along with the receiving set. Leaving headquarters at 10 o'clock, the patrol travelled to a point six miles on the other side of Mornington. Tests were carried out every 20 minutes, messages being exchanged in code.

Two systems of aerial were used on the car. The first consisted of a single wire of inverted V formation, the length of wire being not more than 20 ft (6 m), and the height about 8 ft (2.4 m). The other system was a wire coil, consisting of a frame six inches in diameter by about 18 inches (46 cm) in length. This was found to be very effective, but the inverted V type proved superior.

Senior Constable Downie, who was receiving the messages at headquarters, said that, "*The tests were carried out under the most rigid conditions until 5.00 am, when the patrol car was near Dromana. Throughout this period messages were received so clearly at headquarters that they could be heard distinctly by anyone standing in the yard, while the telephones were lying on the table in the office. Despite statics and other interference, clear two-way communication was established, even beyond Mornington. In fact, the messages were so clear both at headquarters and in the car at this point that it would have been possible for the same results to have been obtained at 100 miles.*"

The transmitter was then used in regular patrol cars and soon proved itself. The patrol happened upon a serious road accident, were able to advise HQ immediately and very rapidly ambulances were on their way. This was the first occasion when a police patrol was able to secure help so quickly in such circumstances. It demonstrated the value of the two- way communications system for all time and thus D24 was created.

The first transmitters on the police patrol cars consisted of single-valve, short-wave sets, using a voltage of 750 volts from a rotary transformer or dynamotor running off the car starting battery. The chopper motor and filaments were also fed from the car starting battery. The range of the transmitter exceeded fifty miles and was capable of CW or ICW transmission as required.

In August 1926, a 2 kW transmitter, also capable of transmission of CW, was permanently installed at Russell Street and transmissions from the Domain Wireless Station ceased. The new transmitter had a very effective range and daylight tests were successfully intercepted as far away as Newcastle, NSW, a distance of 524 miles (843 km).

The Police Headquarters transmitter, as well as the patrol car transmitters and receivers, was manufactured at the Radio-Electric Works of Amalgamated Wireless.

From this time, until 1940, police wireless operators worked from Russell Street and alternated between time spent at the Wireless Room and time spent on the cars. Until 1926 messages were telephoned from Russell Street to the Domain and then relayed to the patrolling cars. The formation of the Wireless Section within Russell Street thus resulted in a reduction in the interval between call time and response time, as the wireless operator also acted as a telephone operator in the Wireless Room.

It is interesting to note that in the early to mid 1920s, although the London Metropolitan Police were using wireless communication with Crossley Vans fitted out in a manner similar to ships, and that some other European and United States Police Forces were using wireless by that time, the Victoria Police Force was the first in the world to establish wireless communications using a touring car.

With a wireless section established at Russell Street, the Wireless Patrol began to expand. The early patrol cars were not fitted with sirens and the first audible warning device was a 'cut out' fitted to the exhaust system which effectively by-passed the silencer and provided ample warning of the approach of the car. Bells were fitted to the cars at a later time. Spotlights and illuminated 'police' signs were also used as warning devices.

**One of the earlier police Daimlers, looking a little battered. Perhaps it had been in a high speed chase. Note the spotlight on the passenger's side and the radio antenna on the roof.**

Daimler cars were progressively introduced from August 1926, and used until they were pensioned off in 1937 and replaced with the unsuitable Alvis which, in turn, were soon replaced with Ford Mercurys. The 'press' gave these exotic Daimlers names such as the 'Yellow Peril', the 'Red Streak', the 'Grey Streak' and the 'Brown Terror'.

Although the early Daimlers were six cylinder vehicles, the last of this make to be used by the Wireless Patrol were twelve cylinder cars with a 5' 2" (1.6 m) wheel track. They were built low to the road, had powerful brakes, enormous acceleration, could take hairpin bends at 40 mph (64 km/h) and could exceed 100 mph (161 km/h). The police at the time maintained they were the finest patrol cars ever built. These Daimlers generally carried a crew of six men wearing plainclothes - the patrol leader, a wireless operator, a driver and three patrolmen.

**A close up view of a Daimler wireless patrol car with a full team of six officers on board. The trained wireless operator is taking down a message from a Morse transmission.**

In the early days the crews would patrol very slowly, incorporating foot and mobile patrols. Often the car would drive to a shopping centre where the leader and patrolmen would leave the car and patrol on foot in pairs. At the completion of the foot patrol, the leader would signal the driver who would then collect the members.

As the workload increased it was common for a number of calls to be received in quick succession. To overcome this problem, crew members were dropped off at various locations and collected later.

Constable Downie maintained a close watch on crime reports and was quick to point out instances where local police had missed offenders by attending calls without enlisting the aid of the Wireless Patrol. He impressed upon members the advantages of telephoning crime reports direct to the wireless room at Russell Street for transmission to the wireless cars, thereby enabling quick response to the calls and also saving local police some work.

The year 1926 saw the first fatal accident involving the Wireless Patrol when, on 1st October a Lancia patrol car overturned near the Alfred Hospital, killing the wireless operator, Constable Arthur Currie. The call to which the car was responding at the time of the accident had been transmitted by Allison and involved a report by a watchman of a suspicious car in Malthouse Lane, Melbourne. The Wireless Patrol responded to the call as a matter of urgency. Unfortunately, the watchman had neglected to inform the police that the car had been in Malthouse Lane for three days prior to his reporting its presence.

The car patrol wireless operator, although taking part in some arrests, did not attend court. He was responsible, when on day shift, for checking the wireless equipment, making dry cells for torches and the re-plating of car batteries. When on patrol, the wireless operator was required to ensure that the necessary maps, directories, torches and like equipment were carried in the car. It was necessary for the wireless operator to remain at his post for long periods and, as the number of calls increased, even the demands of nature could not easily be met.

**A group photo of nine members of the Victoria Police Wireless Patrol taken, as far as I can tell, in the early days in the 1920s when it was a night patrol only, with a couple of their early receivers in the foreground. 'Pop' Downie is seated at the far right.**

Although the wireless operators were all trained as Morse operators and possessed a commercial operator's ticket, the only special allowance they received was one shilling and six pence per day. The Wireless Patrol operated as a night patrol in its formative years, expanding its period of operation to include afternoon shifts and later, day shifts, as the needs of the community grew.

Senior Constable Downie, who has been rightly nominated 'the father of the Wireless Patrol' left the patrol in September 1934. He was reportedly unhappy at leaving 'his' Wireless Patrol, but could feel proud in the knowledge that his work had resulted in the Victoria Police Force becoming a world leader in the use of radio communications with police cars.


**A dramatic night shot in 1935 of a Daimler Wireless Patrol car in pursuit!**

Downie left the Wireless Patrol to establish the Information Bureau from which radio messages giving the characteristics of wanted criminals could be sent to wireless patrol cars. Downie had suggested the concept of a central system to record the modus operandi of criminals and other information. Then Chief Commissioner Blamey agreed that the idea was sound and instructed him to implement the proposal.

Downie attained the rank of Sub-Inspector in October 1935 and, in March 1936, transferred to the Criminal Investigation Branch, No 6 Division, Brunswick. Unfortunately, Inspector Downie did not live to see the Wireless Patrol fully develop as he died in the Police Hospital in May 1937, aged 58 years. He was given a Police Funeral with full police honours! A squad of men from the Metropolitan Fire Brigade headed the cortege.

Three years later in 1940, the system of wireless communication between Russell Street and the patrol cars changed dramatically when the Morse telegraphy system was superseded by wireless telephony, the same method that had been tried and found wanting almost two decades earlier.

The last Wireless Patrol to use telegraphy took place on 15th April 1940. It was fitting that the wireless operator on the final patrol was First Constable Allison, the man who had assisted Constable Frederick Canning in the design of the first two-way wireless telegraphy equipment fifteen years earlier.

**The D24 control centre in the early days of WWII.**

World War II involved the necessity for co-ordination of emergency services in the interests of national security. As a result, the Victoria Police were charged with this responsibility using D24 for communications between the Armed Forces and civil authorities in the vital matter of Civil Defence and emergencies, responsibility for transmitting air raid warnings through D24 to Police Wardens and other essential services, recalling Navy personnel on leave to their ships, and involvement with the US forces network, etc.

As a result, on Sunday, 5th December 1939, the 'D24' communications complex was commissioned. This is how that famous name came about.

Originally the complex was to be in Corridor D, Room 23, but this was shifted to room 24 and the now famous name D24 (still in use today) stuck, even when the communications control centre was shifted to the mezzanine floor of the then new ten storey Russell Street Police Headquarters which were opened on 29th April 1943. This new building was eventually dominated by the radio tower, on top of, and equally as high as, the building itself. Incidentally, Victoria Police vacated this landmark building in 1995.

The tower was the antenna for the new AM 2 kW broadcast transmitter on 1630 kHz. This change from Morse to AM telephony in 1940 introduced a new form of entertainment for the citizens of Melbourne who were now able to listen to police messages on their own domestic radio receivers. It also meant that the use of trained wireless operators was unnecessary in the patrol cars.

During these years, the Victoria Police broadcasting callsign of 'VKC' became one of the best known radio

# Wireless Patrol featured in early movie newsreels

The early Victoria Police Wireless Patrol featured in several movie theatre newsreels in the 1920s and 1930s.

The first, an Australasian Gazette silent movie newsreel made in the 1920s, can be viewed at:

*https://www.youtube.com/watch?v=dswz1-ohhGk*

Also, in the early 1930s, the late Geoff Thompson VK3AC, RAOTC member No 12, a foundation member of the RAOTC, became a representative of Cinesound Newsreel and made a feature newsreel story of D24.

In this newsreel a bag-snatching episode from a female pedestrian was staged, followed by the phone call to D24, the message to the nearest Wireless Patrol car, shots of the base transmitter and the mobile patrol car racing to intercept the bandits down in the wilds of Coode Island, and their eventual arrest.

It made quite an exciting story on the theatre screens over 80 years ago.

A digital 'talkie' copy of this 1930's newsreel is retained in the Downie family memorabilia.

**This frame, taken from the 1920s silent newsreel, shows a police wireless operator carrying out the wireless equipment from overnight storage to install in his patrol car. For security reasons, the wireless equipment was not left in the patrol cars when the cars were not in use.**

**The Victoria Police Russell Street Headquarters building from 1943 to 1995, made famous in the opening titles of the TV show *Homicide* which ran from 1964 to 1977.**

stations and was a focal point of interest for the community. Many letters, cards and personal messages were received at D24 from sick and lonely people, or from those just interested, who found the police radio broadcasts were not only their link with crime and adventure, but also of great personal comfort.

One elderly lady baked a huge cake every Christmas for the D24 staff because of the feeling of security their voice transmissions gave her during many lonely nights.

As a young lad in the late 1940s first becoming interested in radio, I discovered the AM broadcasts from the Victorian Police station D24 just out of the top of the AM broadcast band on 1630 kHz. I must confess that this early interest in police communications was further kindled by some of the interesting stories told to me by the late Dick Dowling VK3XD of some of his adventures with the Victoria Police wireless patrols pre-World War II.

The 1630 kHz AM broadcasts lasted until 1957, when they were superseded by VHF FM transmissions with the general public no longer having the luxury of being able to listen to police transmissions. This, of course, changed in the late 1970s when an influx of American broadband radio equipment allowed the general public to once again 'eavesdrop' on police transmissions.

Return transmissions from patrol cars changed from Morse in the early 1940s to AM voice on 31.5 MHz until 1952, when FM transmissions on VHF FM were used with broadcast receivers. The full two way FM system was finally commenced in 1955.

A single VHF channel was used, expanding to three in 1974, later to become 10. Channels were allocated according to geographic areas and assigned 'letters'. In addition, four UHF channels became available in 1972 and were used for both portable and mobile networks.

In October 1959, a new 'D24' control room was established on the 6th floor at Russell Street Headquarters. The VHF network was supplemented by an HF interstate network using Morse code, a service initiated in 1941 with the Queensland and West Australian police forces; and in 1948 with the South Australian and New South Wales forces; and in 1950 with Tasmania Police.

Wireless telegraphy remained the sole interstate radio link until the introduction of the telex system in 1967. The HF radio network became a secondary backup at that time.

### Sources of material


• *Police in Victoria 1836 - 1980*, Victoria Police Management Services Bureau, ISBN 0724120157.

• *Argus* newspaper, 4th November 1925.

• *The Herald Weekend Magazine*, 1956, Alan Dower.

• Ron Downie, grandson of the late Inspector Frederick William Downie.

• *Police Wireless Patrol*, Bill Roper VK3BR, *OTN* No 42 March 2009.


ar

# Forced landing at Murray Bridge

**Lloyd Butler VK5BR**
RAOTC member No 1495

**It was an exciting event for me (14 year old Lloyd) to see. Early in the evening of Saturday, 5th March 1938, the plane flew around and around above the town, obviously in some sort of trouble. The plane was a Lockheed Electra 10, clearly identified by the twin tails.**

The Lockheeds operated essentially on the Guinea Airways Adelaide-Darwin route in the era of 1938 to 1947. However, for a short time in the late 1930s, Guinea Airways operated between Adelaide and Sydney, but this route was abandoned when their Darwin service increased. Here is the story as recorded by the Adelaide newspaper *The Sunday Mail* at that time:

"With a parachute flare dropped from the plane and the headlights of 150 motor cars to guide him, pilot H. Hughes landed a Guinea Airways Lockheed Electra 10 passenger plane on the local race course at 7.45 tonight. The plane, which was on its way to Parafield from Sydney, developed engine trouble after having left Mildura, and sought to land rather than risk crossing the Adelaide Hills on one engine.

"Pilot Hughes decided to land at Murray Bridge. He had been in radio communication with Parafield all the way from Mildura, and he circled Murray Bridge for 15 minutes while getting from Parafield officials complete directions as to the location of the racecourse.

"In the meantime, the people of Murray Bridge had not been idle. Sgt. F. W. Weidenhofer and Mounted Constable F. Lodge spoke to every motorist they could see, and headed a procession to the racecourse, which is one and a half miles from the town.

"Other motorists, who had been watching the plane circling over the town, and had realised that the pilot apparently was looking for place to land, joined in the procession and, on reaching the race course, formed a giant circle round the centre of the course with their headlights pointing inwards.

"A parachute flare fell from the plane as it circled the course before making a perfect landing. A crowd of more than 400 people cheered Pilot Hughes as he stepped from the plane. He spoke in appreciation of the prompt action of the townspeople of Murray Bridge in sizing up the situation and facilitating the landing.

"The five passengers in the plane were laughing and joking as they alighted. They left for Adelaide later by car. Before the Lockheed appeared over Murray Bridge, reports had been received from Mannum, so paving the way for the assembling of the motor cars on the racecourse.

"The night's landing was similar in some respects to that made at Albury (New South Wales) during the England-Australia air race in October 1934, when the Douglas airliner was lost over the Victorian Alps at night. It picked up its bearings when a Wangaratta engineer turned the town's lights on and off to flash the name of the town in Morse code. It then flew back to Albury where, with motor car headlights to illuminate the ground, it landed on the Albany Racecourse."

Our plane stayed at the Murray Bridge racecourse for quite a number of days. I wasn't at the racecourse to see the night landing, but I was up there every day on my bicycle to see what was going on. The faulty engine was removed from the parked plane and taken away (probably off to Parafield) and a new one arrived. The plane flew away to continue its life in the air.

As a radio Old Timer, I have since wondered what radio facilities the Electra used on that night. HF radio communication with aircraft and a direction finding (DF) AWA receiver were first set up at Parafield[1] in 1937 (a year earlier than that event). VHF was not installed at Parafield until 1949. The Airaco Homer (NDB) LF/MF beacons were not installed at general aerodromes (including Parafield) until 1943. So the aircraft used HF radio to communicate with Parafield Aeradio who probably contacted the Murray Bridge police by telephone. One can imagine that the aircraft used the Broadcast Stations (and perhaps 5MU Murray Bridge) to home in with their on-board DF and navigate to the racecourse destination.

I had seen before, at Murray Bridge, various aviators who landed their flying machines on our soil. But this was the first time I had seen an airline passenger aircraft. With just ten passenger seats, I had seen what would develop, 80 years later, into the mighty passenger aircraft we have today.

**A Lockheed 10 Electra aircraft of the Guinea Airways fleet.**

### Reference

1. *A history of Parafield Airport and its facilities - OTN*, September 2017.

ar

# The development of the VHF airband

**Clive Wallis VK6CSW**
RAOTC member No 1289

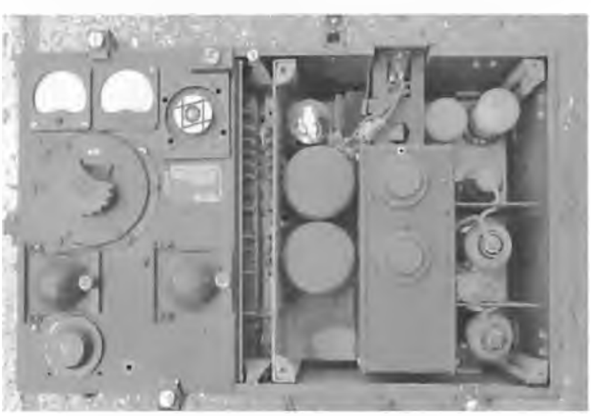
**Before WWII, aircraft radio communications were largely dependent on HF wireless-telegraphy rather than radiotelephony. En-route position reports and requests for navigational assistance from ground-based direction finding (D/F) stations were made by the aircraft's wireless operator via his Morse key. Although in the 1930s HF radio-telephony (R/T) was beginning to be used to a limited extent by some military aircraft and larger civil airliners, most small aircraft had no wireless equipment at all. 'See and be seen' was very much the order of the day, though at busier airfields aircraft movements on the ground and in the circuit area were controlled by Aldis lamp signals supplemented by Very pistol flares in poor visibility. By and large you made your own arrangements and a sharp lookout was key to survival.**

The primary purpose of Air Traffic Control (ATC) is to prevent collisions and to generally expedite the safe flow of air traffic. Essentially, airspace is divided into 'controlled' and 'uncontrolled' regions. Within controlled airspace, such as that surrounding larger airports, their terminal areas and airways, ATC exercise 'positive' control over all aircraft movements from engine start to shut down and has responsibility for the safe and orderly flow of air traffic. Outside controlled airspace, ATC provides an 'advisory' service to aircraft who must then arrange their own separation. To do this, ATC and aircraft must have reliable two-way radio communications at all times.

As we amateurs know, HF communications are affected by many factors including skip distance, frequency in use, time of day or night, atmospherics, solar disturbances and so on. Air traffic nowadays can be very heavy and a moment's thought shows that HF simply cannot be relied upon, especially for short to medium distance communications. Something better is essential.

## Early days

In the late 1930s, as war with Germany looked ever more likely, the RAF realised that reliable radio communications between ground controllers using the newly developed Chain Home radar defences and fighter pilots sent to intercept incoming German raiders would be vital. At that time RAF fighters were equipped with the ubiquitous TR9D HF transmitter-receiver, a puny 1-watt AM transmitter with a TRF receiver, covering 4.3 to 6.6 MHz. Air-to-air range was about 5 NM (nautical miles) and air-to-ground about 30 NM (55.6 km), the latter mainly because the ground station equipment had superior transmitters, receivers and antennas to those in the aircraft.



**The ubiquitous TR9D HF transmitter-receiver.**

Despite careful screening of the engine ignition system, interference from the Spitfires' and Hurricanes' Merlin engine's 24 spark plugs, together with high levels of atmospheric static often experienced at these frequencies (QRN), made radio communications difficult and unreliable. "Say again", was reckoned to be the commonest transmission made by pilots and controllers!

**A TR1133, the RAF's first airborne VHF transmitter-receiver.**

Not long before WWII began in September 1939, the RAF began experiments with VHF communications. A small number of hand-built, four-channel, amplitude-modulated transmitter-receivers covering 100 to 156 MHz, designated TR1133, were produced, the first of which was fitted to Hawker Aircraft's civilian registered test-bed Hurricane fighter G-AFKX. Communications were reported to be of 'remarkable clarity'.

Service trials of the TR1133 took place at Duxford, Cambridgeshire on 30th October 1939 with six Spitfires of No 66 Squadron. An air-to-ground range of as much as 140 statute miles (225 km) was obtained at 10,000 feet and an air-to-air range of over 100 miles (161 km). There could be no doubt as to the superiority of VHF over HF for short to medium range aircraft communications.

Production difficulties limited the availability of airborne TR1133s and companion ground-based T1131 transmitters and R1132 receivers, and just prior to the start of the Battle of Britain the decision to revert to the

**An R1132A receiver.**

old TR9D was reluctantly made. Most of the Battle, which raged from early July to late October 1940, was fought using the flea-powered HF sets; but by 1941 production had improved markedly and the majority of Fighter Command's aircraft were fitted with the improved TR1143 VHF set. By early 1942 the change-over from HF to VHF was complete[1].

The Germans, too, were experimenting with airborne VHF in the late 1930s but on somewhat lower frequencies, usually about 38 to 70 MHz, and were also trialling FM as well as AM. They, too, had production difficulties and most Messerschmitt Bf 109s engaged in the Battle of Britain were also still using HF in the 2.5 to 7.5 MHz range, but at least their Funkgerät Fu-7 radios had a 7 W transmitter and a decent superhet receiver.

During WWII the British 4-channel TR1143 was re-modelled by the Americans as the well-known 28 V powered SCR522 and its 14 V powered equivalent SCR542. By war's end in 1945 VHF was fitted to just about every Allied air force aircraft[2].

The advantages of VHF over HF were obvious; pilot operated press-to-talk operation; easy, tune-up-free frequency changing; clear, static-free speech with squelched noise between transmissions; no need for a specialist HF wireless operator. There could be no doubt that as civil aviation was rebuilt post-war, VHF communications, together with the newly invented VHF navigational aids, would be the way of the future.

## Civil VHF airband

All aeronautical radio frequencies are recommended by the International Civil Aviation Organisation (ICAO), the successor organisation to ICAN (International Commission for Air Navigation) which was founded in 1903 but dissolved in 1945. ICAO, formed in 1947, is a specialised agency of the United Nations which sets out the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth. One of its many tasks is to recommend aeronautical radio frequencies which are then ratified by the International Telecommunications Union (ITU).

In 1947, ICAO recommended that the civil aviation VHF band should extend from 108 to 135 MHz, with 108 to 117.95 MHz being reserved for navigational systems and 118 to 135 MHz allocated to amplitude modulated voice communications. The mid-band frequency of 121.5 MHz would be used exclusively for emergency purposes, including search and rescue, both civil and military.

The lowest 10 MHz of the band, from 108 - 117.95 MHz plus a guard band of 25 kHz, was, and still is, split into 200 narrow-band channels of 50 kHz each. These are reserved for navigational aids such as VHF Omni Range (VOR) beacons, and precision approach systems such as ILS (Instrument Landing System) localisers. (The paired ILS glideslope frequency is in the UHF band between 329.30 to 335.00 MHz.)

## Channel spacing

Pre-1947, VHF voice channel spacing was generally 200 kHz but the new ICAO rules reduced this to 100 kHz, creating 170 channels in the VHF voice segment of 118-135 MHz. In 1954, improved equipment allowed channel spacing to be reduced to 50 kHz and that same year the upper limit of the band was further extended to 135.95 MHz, giving 360 voice channels. In 1972, channel spacing was halved again to provide 720 channels. On 1st January 1990 the voice band was further extended to its present upper limit of 136.975 MHz, resulting in 760 channels.

Ever increasing congestion in European airspace led to the recommendation in 1999 that channel spacing be further reduced to 8.33 kHz, potentially making 2,280 channels available. This spacing became effective in Europe in 2012 but, although such narrow-band equipment is permitted to be operated in most countries outside Europe, including Australia, its use is not yet mandatory outside Eurocontrol airspace.

At this point it may be interesting to reflect that the IF bandwidth of the 1939 TR1133's receiver was 300 kHz, achieved by stagger tuning the 9.72 MHz IF amplifier's interstage coupling transformers. A similar situation existed with the R1132 ground station receiver. The reason for this wide bandwidth was that neither the airborne nor ground based receivers were crystal controlled but had tuneable VFOs, although in both cases the transmitters were crystal locked. This odd situation arose because prior to WWII the British military services did not use crystal controlled oscillators to any extent - even though amateurs did - so the Services had no call for crystal manufacture.

At the start of WWII the only source of suitable quartz was Brazil, isolated from Britain by the German blockade of the Atlantic, and in any case no mass production facilities existed in Britain. With the limited supply available, the decision was made to crystal control the RAF's VHF airborne and ground transmitters but use VFOs in the receivers and compensate for inevitable drift by using a wide receiver bandwidth. Later model TR1133 receivers were crystal locked and its successor, the TR1143, in widespread use by 1942, was fully crystal controlled and the IF bandwidth narrowed.

**A crystal locked R1392 airband receiver, which replaced the R1132, with power supply above.**

At about this time the IF bandwidth on the R1132 was also reduced to 180 kHz. During the war many R1132s were replaced by the newer, crystal locked R1392 receiver, but even so many R1132s were still in operational service throughout the war. Once warmed up, their VFO stability was remarkable. Today, of course, highly accurate phase locked loops have eliminated the need for individual crystal-controlled channels.

| V.H.F. N° 1 | | |
|---|---|---|
| 115·2 | A | Local Airfield Control |
| 100·8 | B | Homer & Approach Control |
| 117·9 | C | Common Aerodrome Control |
| 116·1 | D | Flight Inf. & Distress |
| **V.H.F. N°2** | | |
| 103·86 | E | Bomber Common N° 1 |
| 101·34 | F | Bomber Common N°2 |
| 100·08 | G | Bomber Common N° 3 |
| 105·12 | H | Bomber Common N° 7 |

**A wartime twin 4-channel installation VHF placard. Note the distress frequency of 116.1.**

### International emergency frequency

121.5 MHz warrants special mention. During WWII and in the immediate post-war years, there was no universally recognized VHF distress channel. Aviation lore says 121.5 was chosen in 1947 as the aeronautical emergency frequency because it is exactly mid-way between 108 and 135 MHz. From 1947 and until 2009 when satellite monitoring of the new 406 MHz distress frequency became the norm, 121.5 was the primary VHF emergency and search and rescue frequency.

However, because satellite fixing may sometimes be limited to within a few nautical miles, depending on the number and location of the satellites hearing the signal, the 406 MHz EPIRBs (Emergency Position Indicating Radio Beacon) usually carried on aircraft dinghies nowadays have also a low-power 121.5 MHz beacon for accurate final homing by air or surface search vessels. Personal EPIRBS usually transmit on 406 MHz only. Although 121.5 is no longer monitored by satellites, all manned control towers and ATC centres still do, and all aircraft in cruising flight are expected to monitor this 'Guard' frequency.

Although military aircraft now generally use the UHF airband of 225 to 400 MHz where the emergency frequency is 223 MHz, it is usual for them to also carry a VHF transceiver with at least 121.5 MHz capability for emergency communication with civil facilities, and any civil aircraft intercepted by a fighter of any nationality can expect interrogation on the Guard frequency. Woe betide any airliner straying off course and not listening on 121.5 when intercepted!

### Modulation

From the outset, VHF airband communications have relied upon amplitude modulation. Most other VHF services such as land, marine mobile and fixed networks have changed to frequency modulation or, more recently, to digital modulation. Why have aircraft stuck with AM? The answer is FM capture effect. When two FM stations transmit on the same frequency, one weak and the other much stronger, only the stronger signal will be heard. With AM, even though the weaker signal may not be readable, its presence beneath the stronger one is unmistakable. An ATC controller (or pilot) will recognise instantly that two aircraft are transmitting simultaneously and act accordingly, whereas with FM the weaker station's signal would be inaudible, possibly leading to a dangerous situation.

### Communications distance

How far will an aircraft's VHF signal travel? Discounting the effects of intervening high terrain or other significant obstacles, the usual formula taught to pilots is: Distance in nautical miles = 1.25 x (square root of aircraft height in feet). Thus, if the aircraft were at 10,000 feet, the expected range would be 1.25 x 100 = 125 NM (231.5 km). Interestingly, since 125 nautical miles equals 143.75 statute miles, this ties up closely with what those six Spitfires of 66 Squadron found in 1939!

### Digital communications

While it is highly unlikely that VHF airband voice communications will switch to any form of digital modulation in the foreseeable future, a form of automatic, amplitude modulated, digital communications known as ACARS was introduced in 1978. The Aircraft Communications Addressing and Reporting System is a datalink system that enables ground stations (airports, aircraft maintenance bases, etc) to upload data such as flight plans, weather updates, operational requirements, etc, and download data such as fuel quantity remaining, engine performance, flight management system data, take-off and landing times, etc, via an onboard Communications Management Unit (CMU). When beyond normal VHF range, ACARS messages can be sent via satellite or HF.

Years ago, the required along-track 'procedural' (non-radar) separation of aircraft flying at the same height in the same direction was substantial, 20 minutes for transoceanic flights, 10 minutes for trans-continental. Now, with virtually continuous automatic position reporting, because air navigation service providers know where aircraft are with much greater precision than formerly, even outside areas of radar coverage, separation can be reduced allowing increased traffic density, and routes can be varied to take advantage of favourable winds, saving time and fuel.

Who knows what the future holds, but with ever-increasing air traffic and the necessity to ensure safe separation at all times, far more automation of in-flight communications is likely.

Things have come a long, long way since those early VHF trials back in 1939!

### Notes

1. More background information can be found in my article *Battle of Britain HF R/T communications, OTN* No 41, September 2008.
2. At that time most American aircraft had 28 VDC electrics while the British had 12 V systems. The SCR542 was also fitted to many ground vehicles.

### References


•*The Battle of Britain: The Greatest Battle in the History of Air Warfare* by Richard Townshend Bickers;
•Various Wikipedia articles;
•Personal experience.


ar

# 2 m FM in VK6 before voice repeaters were established

Will McGhie VK6UU

**Will VK6UU was a leading light in the establishment of VHF and UHF repeaters in Western Australia, including the extensive linked repeater system. Fortunately, he recorded much of this work as it was being done. This article, reproduced with his permission[1], outlines his experiences with VHF communications before repeaters were established in WA or, indeed, were widely used anywhere else in Australia. In the 1990s Will wrote a number of *Repeater Link* articles in the WIA journal *Amateur Radio* detailing many of the finer points of repeater construction and operation. Although Will is not an RAOTC member I'm sure that his recollections will 'resonate' with many *OTN* readers.** *Clive Wallis VK6CSW, RAOTC member No 1289*

The introduction of FM in Australia, and in particular VK6, was due to the desire by amateurs to go mobile. Many amateurs post WWII had done so on a variety of bands from 160 metres to UHF. The limiting factor was cheap, easily available equipment, apart from the difficulty that valve technology introduced.

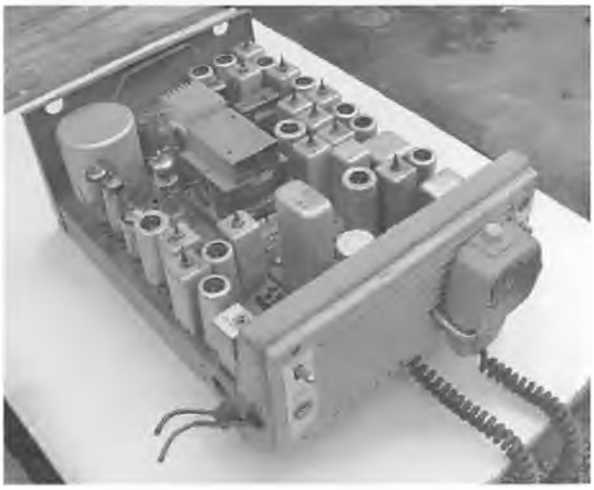
Post WWII there was a variety of equipment available, but it was not until commercial mobile VHF was introduced in the 1950s, and some of these commercial mobile radios became available on the surplus market, that mobile amateur radio expanded.

**A Pye Reporter Radio-telephone.**

The early commercial mobile radios were amplitude modulated (AM) such as the Pye Reporter and, with radios like it, amateurs in VK6 started going VHF mobile, in particular on 6 m. However, amateurs had to wait for these expensive radios to become partly obsolete in the commercial world before they could be purchased on the surplus market. Radios went for many pounds in the 1960s (a couple of hundred dollars in today's money) and they were not always easy to find.

These mobile radios of the sixties were almost always valve with their associated high voltage power supplies. Transistors had started to appear but these few early radios, such as the Philips 1680, were rare and expensive on the surplus market. You could pay $100 (about $900 in today's money) for a single channel transistor mobile.

In VK6, Ron VK6PR was the first to have a Philips 1680. The audio sounded great with a good communications punch to it. Not having to worry about leaving the mobile turned on in the car, with the associated flat battery next morning, was a major plus.



**An inside view of a Pye Ranger VHF radio telephone set.**

In Western Australia the availability of ex-commercial FM mobile radios gained speed in the late 1960s. Valve radios like the Pye FM Ranger shown above could be purchased for about $20 ($200 in today's money) and fairly easily converted to 2 m FM. These radios were wide band FM (15 kHz typical) and were used as such. The more deviation that the receiver could handle, without exceeding the IF band pass, the better the signal-to-noise ratio and the less ignition noise problems while mobile.

FM has a great advantage over AM in its ability to be fairly immune to pulse type noise, but not entirely. The Pye Ranger had a transmit power typically of 10 watts and was used by many VK6 amateurs to get them on to VHF, both as a home base station and as a mobile.

These transceivers were mainly valve, with a transistor DC to DC converter for the high voltage. Conversion to the amateur band required a degree of knowledge about how such a transceiver worked. The transceiver required a new crystal for the receiver and the transmitter plus realignment to 2 metres.

A range of test equipment was needed in order to get the radio working:

- a signal source using the transmit crystal as an oscillator (the crystal was on a much lower frequency and multiplied up to 2 metres - the harmonic from the oscillator made an ideal signal source of about 100 μV on 2 metres);.
- a step attenuator to reduce the signal source level;
- a 50 ohm power dummy load; and
- a VHF SWR meter.

Most of these designs came from *Electronics Australia* which had many amateur radio projects in those days.

The antenna was a drooping radial ¼ wave up at about 15 feet (4.6 m); all activity was on 146.000 MHz.

As with everyone, the first contact with another amateur is amazing. Mine was to Russ VK6CV who was mobile. The first thing Russ said was, "Turn the FM deviation all the way up. At the back right hand corner there is a potentiometer, just turn it all the way clockwise." The FM deviation was now 15 kHz.

So began my introduction to amateur radio....

Later modifications to the FM Ranger were an S meter, dual gate MosFet preamp and a separate DC to DC inverter to increase the transmitter's final plate voltage from 250 volts to 400. This increased power output from 10 watts to 17 watts!

With no talk-through repeaters yet available in VK6, amateurs worked hard to get the most from their mobile installation. Making sure the radio was as good as it could be, along with a good mobile antenna installation, surprising distances were regularly worked mobile to base and mobile to mobile. Emphasis was mainly on getting the receiver working as well as it could. Even realignment of the IF stage was done to reduce ignition noise. If the IF is not flat across its pass-band then ignition noise increases due to phase distortion. FM is not completely immune to ignition noise.

Typical home brew mobile antennas were the ¼ wave and the 5/8 wave. Both required a good mobile ground plane on the vehicle for best results and experimentation was tried with various locations to mount the antenna. When you are dealing with weak mobile-to-mobile signals every improvement, no matter how small, makes a difference.

**Yaesu FT-2FB 2 m FM amateur mobile transceiver.**

When the first fully-transistorised 2 m FM amateur mobile transceiver, the Yaesu FT-2FB, came on the market in the early 1970s, it was what most amateurs wanted to own. This was no large current-hungry valve mobile radio but a 12 channel transistor radio that was easy to mount in the vehicle and was instant on - no waiting for valve filaments to heat up!

The FT-2FB was a 12 channel, crystal locked, 10 watt transceiver that sold for about $400 (around $2,000 in today's money!). The first one in VK6 was owned by Jim VK6RU (SK). Jim could be heard most mornings and evenings driving to and from work using his FT-2FB, and Jim did not have to worry about leaving the radio on in the car and flattening the battery, like valve mobiles did regularly.

Technology has come a very long way for many of us who come from the valve era.

### Frequencies used for FM on 2 m

146.00 MHz was the frequency used on 2 m for FM. All radios way back then in the 1970s were crystal controlled and each channel required two crystals, one for receive and one for transmit. At $100 for a pair (in today's money) few radios had more than one channel.

The allocated channels for FM on 2M were:

Channel A, 145.854 MHz; Channel B, 146.000 MHz; and Channel C, 146.146 MHz.

Note that Channels A and C were 146 kHz lower and higher than the main channel on 146.000 MHz.

Channels A and C were rarely used, if at all. With the cost and difficulty of adding more channels, as the ex-commercial radios were single channel and you had to add your own channel change switching, most FM activity was on 146.000 MHz.

Note also the three channels were close together. This was because it was thought that the ex-commercial radios had a narrow RF front end band-pass and, as you moved away from the frequency the radio was tuned to, performance would degrade. I don't know if this was true, but it was the reason for the three 2 metre channels being close to one another.

### Vertical polarisation

FM operation on 2 metres was not the first use of the 2 metre band in VK6 by a long way. Many dedicated amateurs had made the jump from 6 m AM to 2 m AM using, in most situations, home brew equipment.

This 2 metre AM operating used horizontal polarisation. The antennas were usually Yagis. When FM appeared on 2 metres, vertical polarisation was chosen as it was the easiest to install on a vehicle. Home stations using 2 m FM also used vertical polarisation so as to work mobile stations.

### Talking about a repeater

Talk-through voice repeaters had been operational in the amateur world since the 1960s and Australia's first 2 m amateur voice repeater was at Orange in NSW. Much discussion was taking place in VK6 as to building and operating a repeater but the lack of information and limited communications (there was no Internet in those days) made the going difficult.

Just what equipment to use was a major issue, as way back in the late 1960s there were few options. Much concern at just how good the equipment had to be so as to work without desensitisation was largely unknown, at least in VK6.

Not all amateurs active on 2 m FM thought that talk-through repeaters were necessarily a good thing. Some amateurs could see that a talk-through repeater just made it too easy and the attention to detail at operating a good mobile or base station would fall by the way, an opinion perhaps held by some today.

### Repeaters on air

When repeaters were first licensed by the PMG in the late 1960s, they used a 500 kHz split and their respective in and out frequencies were either side of 146 MHz. I think there were only four channels.

About 1971 the split was changed to 600 kHz to be the same as in the US and the repeater band was moved into the 146 to 147 segment, all with the same negative offset. There were only eight channels, 1 through 8, and there was no repeater band above 147 MHz, hence there was no positive offset.

The repeater segment above 147 MHz came into use in the late 1970s (from memory) and used the positive offset. I'm not sure of the reason for the positive offset.

This history of development tends to result in city repeaters, which were established first, having a negative offset and repeaters in country areas having a positive offset.

### Note

1. Originally published at: *http://www.vk6uu.id.au/fminvk6.html*

ar

# The radio altimeter

**Clive Wallis VK6CSW**
RAOTC member No 1289

**Other than when taxying or taking off, knowing the height of your aeroplane above the local terrain is vitally important. Running out of altitude inadvertently is, at the very least, embarrassing - and all too often has disastrous results!**

Other than guesswork with the Mark I eyeball, there are two methods of measuring an aircraft's height in flight, the barometric pressure altimeter and the radio altimeter. The fundamental problem with the barometric altimeter is that, while it uses the expansion and contraction of aneroid capsules to convert barometric pressure into a height readout, atmospheric pressure at a given height above mean sea level differs, sometimes markedly, from place to place. Also, because the barometric altimeter is calibrated according to 'standard atmosphere' conditions, temperature changes affect its accuracy together with friction or 'stiction' in the gear train.

An error of 50 feet (ft)[1] is acceptable. Even the modern servo-assisted barometric altimeter has some error in its readout, around 30 ft at sea level. Unless the altimeter's subscale is constantly re-referenced to the local area pressure corrected to mean sea level (QNH), it cannot be relied upon to give a true indication of the aircraft's height above the ground. Errors increase with increasing height because the height/millibar change increases.

On aviation charts the lowest safe altitude is a published figure giving at least 500 feet clearance above any obstacle or terrain within a defined safety buffer region around a particular route that a pilot might fly, provided the current QNH is set on the altimeter, but the instantaneous terrain clearance is unknown. In the early days of airline flying when wind forecasts were unreliable and tracking aids largely non-existent, navigation when the ground was obscured was often very inaccurate and around half of all crashes were due to airliners colliding with high ground. For this reason alone, some device that showed actual terrain clearance would be invaluable. Today's Low Range Radio Altimeter (LRRA) does that and far more.

The idea of a radio altimeter was first proposed in 1924 by the American electrical engineer Lloyd Espenschied (1889-1996), many years before radar made its debut.

On the face of it, simply measuring the time it takes for a radio pulse to travel vertically downwards from the aircraft, hit the ground and bounce back, and then translate this into some form of dial readout for the pilot, seems simple enough. Nevertheless, it took 14 years before America's Bell Telephone Company, working in conjunction with United Airlines, Boeing and the Western Electric Company, was able to translate Espenschied's theory into the first practical radio altimeter for use in commercial aircraft. The device was flight tested in 1938 and proved an instant success.

**Lloyd Espenschied who first proposed the idea of a radio altimeter in 1924.**

To achieve its purpose, an LRRA must be able to read down to zero distance, something an ordinary radar cannot do. This is because a radar pulse lasts for a finite period of time and therefore has a physical length between its leading and trailing edges. Radio waves travel at the speed of light, roughly 300,000,000 metres/second, so the length of a 1μsec burst of radio energy (pulse) has a physical length of 300 metres. Since this pulse has to travel from the transmitter to the target and return to the radar receiver, it follows that even if the switching between transmitter and receiver were instantaneous, the nearest a target could be detected is 300/2 or 150 metres. Pulse radar just won't work for an LRRA.

Espenschied's idea was to direct a frequency modulated continuous-wave (FMCW) signal vertically downward from the aircraft on one antenna, receive the signal reflected from the ground on a second antenna, then translate the difference in frequency between the transmitted and received signals into a height readout on a cockpit meter.

**An APN-1 radio altimeter showing height readout, altitude limit selector switch, and warning lights beneath.**

Although Espenschied's radio altimeter used a frequency of 500 MHz in 1938 and today's LRRAs generally work at about 4.3 GHz, the same principle is used. The basic principle of FMCW height measurement is shown in Figures 1 and 2 (see next page).

Two downward-looking antennas are located fairly closely together on the underside of the aircraft's fuselage, one for transmitting and the other for

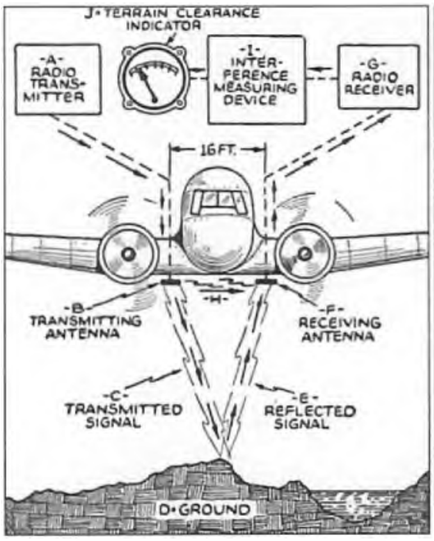



**Fig 1 - Outline of first radio altimeter principle, published in *Radio Craft*, January 1939.**

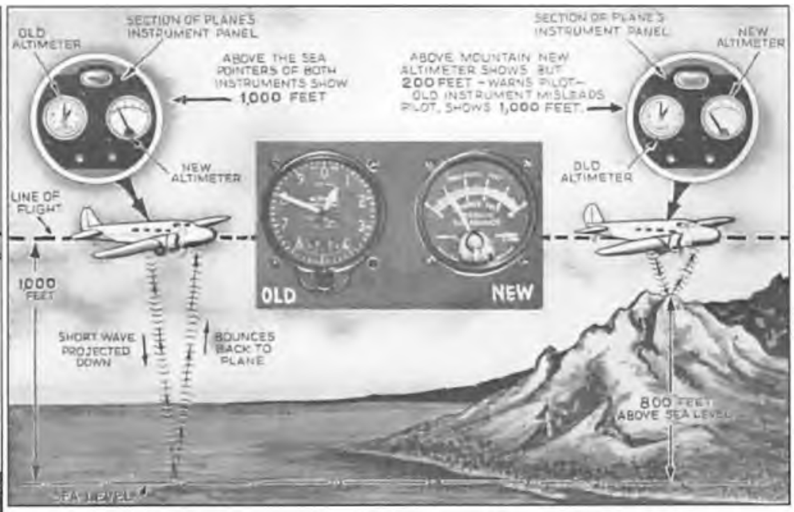



**Fig 2 - Comparing radio altimeter and barometric altimeter readouts, *Radio Craft*, January 1939.**

receiving. The transmitted radio wave is wobbulated such that a continuous linear saw-tooth pattern, T1, T2, T3, T4 is generated. T1 represents the lowest part of the frequency modulation excursion; T2 the highest, etc (see Figure 3 below).

This wave then travels to the ground and is reflected back to the receiving antenna, represented by the dashed line R1, R2, R3, R4. In the time taken for the wave to travel down and back, represented by horizontal line AB, the frequency of the transmitted wave has increased by BC. Clearly, this difference in frequency is proportional to the height between the aircraft and the reflecting surface and, for a given height, will remain constant regardless of the actual instantaneous frequency of transmission. In other words, throughout the wobbulation cycle, at any instant the frequency of the received wave will differ from that of the transmitted wave by a constant amount equal to BC. As the terrain clearance (height above ground) varies, so does the frequency difference.

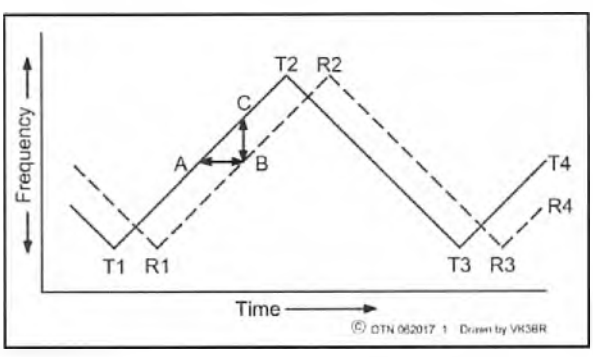



**Fig 3 - Frequency difference with height is constant (see text above).**

This frequency difference is detected by a direct conversion (homodyne) receiver by mixing the transmitted baseband with the reflected signal to generate a beat frequency. Because the transmitter and receiver antennas are close, some of the transmitted signal will 'leak' into the receiving antenna to provide the constantly varying baseband or reference frequency against which the reflected signal is compared. The beat frequency signal is detected, amplified, limited to a constant value, and applied to an output meter calibrated in altitude (see Figure 4 on next page).

The radiation pattern of the radio altimeter's antennas is quite broad. While you might suppose it to be pencil-like, in fact it is conical with a cone angle of about 80°. This is to allow for banking and pitching of the aircraft. Provided the bank angle doesn't exceed about 40° (highly unlikely in an airliner) the radio altitude will remain accurate.

The 1938 radio altimeter could accurately measure terrain clearance from 100 to 10,000 feet in two ranges, 100-500 feet and 100-10,000 feet. A bright warning light could also be set to trigger at a pre-set terrain clearance height determined by the pilot. It proved to be an instant success. Bearing in mind that airliners of this era were unpressurised and rarely flew above 10,000 feet - usually much lower - actually knowing terrain clearance especially at night or in cloud, must have been of great comfort to crew and passengers alike.

The Germans were the first to use radio altimeters in military aircraft. In WWII their Junkers Ju-87 Stuka dive bombers normally made their attack in a near-vertical dive but during the high-g recovery it was commonplace for the pilot to black-out for a few seconds. To overcome this, a radio altimeter set to 750 m above ground level released the bombs and initiated the dive recovery, returning the aircraft to level flight.

**A WWII Junkers Ju-87 Stuka dive bomber releasing a bomb.**

By 1943, many British and American warplanes were beginning to be fitted with radio altimeters. To be able to fly safely over land or water at very low altitudes to

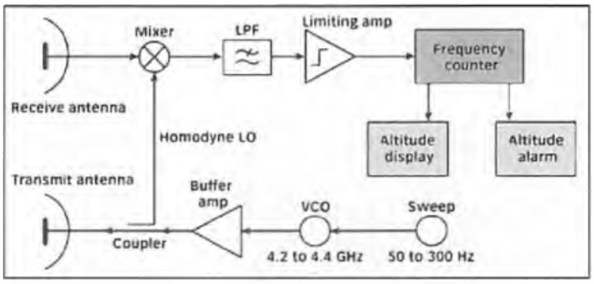



**Fig 4 - A block diagram of a basic single receiver FM CW radio altimeter.**

get below enemy radar coverage, for instance, was hugely advantageous. Two examples are the SCR-718 high altitude radio altimeter covering 50 ft to 40,000 ft with an accuracy of ± 50 ft plus 0.25%, fitted to some heavy bombers, while the AN/APN-1 LRRA provided a dual range capability, 0-400 ft and 0-4,000 ft. Both operated in the 420-450 MHz region. Depending on aircraft type and crewing, the radio altimeter could be operated by the navigator rather than the pilot. As well as the dial readout, the pilot also had warning repeater lights; amber or white while remaining within +/- 25 ft of the pre-set height, red if deviating below and green if deviating above.

The modern LRRA altimeter forms a vital part of terrain following radar which enables military aircraft to safely fly contour-hugging missions at very low level even in conditions of restricted visibility.

Today, almost all radio altimeters work in the C-band, 4 to 8 GHz, where the segment 4.2 to 4.4 GHz is reserved internationally for aircraft radio altimeters. At these frequencies the usual change in beat frequency is 40 Hz/ft change of height and the operating height range is generally standardised at 0 to 2,500 feet, giving beat frequency change of 0 to 100,000 Hz. The zero reading is corrected such that the readout is 0 as the aircraft's main wheels touch the runway with the aircraft in the landing attitude.

While the accuracy of the RA is good, usually better than +/-2.5 feet, it is affected by the nature of the reflecting surface; concrete is better than greenery or choppy water. However, if the receiver uses two homodyne receivers in quadrature, accuracy over a hard surface such as a runway can be improved to about +/- 0.5 ft (see Figure 5 below).

Radio altimeters are now such an important part of an aircraft's navigation and safety equipment that they rarely have an on-off switch but are in standby mode whenever the aircraft's electrical system is powered, and go to active mode from the moment of lift-off to touch-down. The only way to isolate a faulty radio altimeter is to pull its circuit breaker.

All commercial aircraft must carry at least one radio altimeter and, as of 2012, all airliners must be equipped with two. Many have triplicated systems. Apart from its obvious function, the radio altimeter forms a vital component of automatic landing, ground proximity warning, and traffic collision avoidance systems.

Modern airliners are equipped with many automatic safety features, one of which is a voice synthesiser coupled to the pilots' cockpit loudspeakers and earphones. It cannot be silenced nor its volume lowered and the commands it issues may be either advisory or mandatory. One of its several data sources is the radio altimeter. For example, if a "Terrain, terrain, pull-up, pull-up" warning is heard, triggered by the LRRA, the pilot must commence an immediate emergency climb. The reason for the warning can be investigated later! Other important warnings include "Too low, gear" and "Too low, flaps" - reminders that lowering the undercarriage and/or selecting landing flaps would be a very good idea!

During landing, voice advisories sourced from the radio altimeter announce heights in feet above touchdown: 100, 50, 40, 30, 20, 10. Other specific heights may also be announced, such as 1,000 or 'decision height', depending on individual company procedures. The word 'retard' may also be announced as a reminder to close the throttles to idle as the aircraft is flared for touchdown.

Signals from the radio altimeter are also fed to the autopilot and auto-throttle systems during an auto-coupled approach and landing. At about 50 feet above the runway, throttle command switches from the air data computer, which has been controlling the throttles via airspeed commands during the final approach, to LRRA commands, retarding the throttles at around 20-30 feet while commanding the autopilot to flare the aircraft.

For auto-land capability, the aircraft must have three serviceable autopilots each with its own LRRA. The reason for triplication is that although only one autopilot is actually flying the aircraft, the other two perform a monitoring role and both must agree with the operating autopilot. Were only two autopilots fitted and one disagreed with the other, it would be impossible to tell which was correct, but two in agreement will always out-vote the third. Should any one autopilot fail during an auto-land approach, the approach must be immediately discontinued unless the cloud-base and visibility are sufficient to complete the landing visually.

Things have come a long way since Lloyd Espenschied's brainwave in 1924, but without it air travel would not be as safe as it is today.

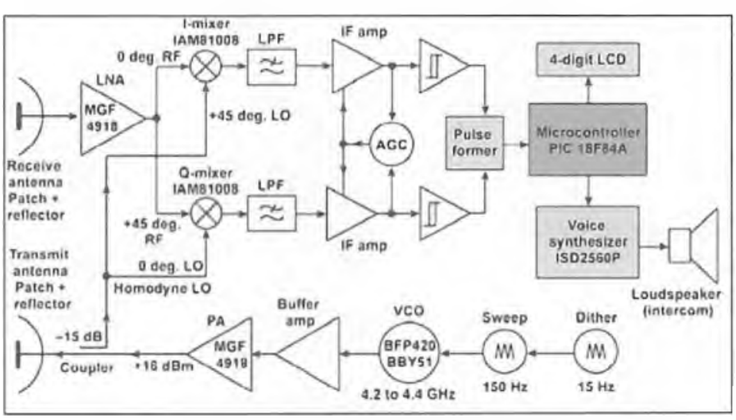



**Fig 5 - This block diagram shows the architecture of a quadrature landing radio altimeter.**

### Notes

1. The aviation industry is one of the last major users of the old imperial system, Because of the proliferation of American and British aircraft during the early years of aviation, the imperial foot became standard for altitude measurement. China (PRC), North Korea, and Russia, however, use metres for altitude measurement.

ar

# *If I only had time*[1]

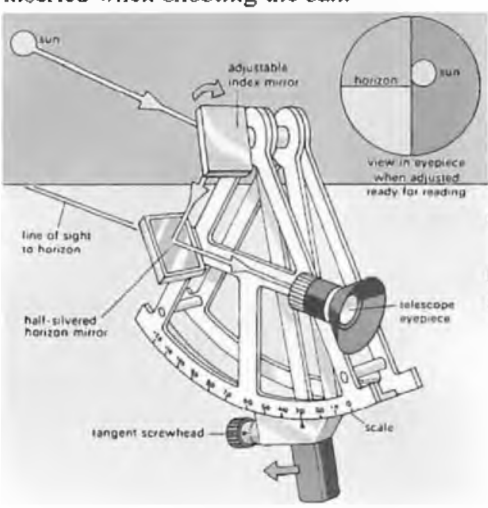
**Herman Willemsen ex-VK2IXV**
RAOTC member No 1384

**Time can be ... free, invested, limited, lost, managed, valued, wanted, wasted and so much more. You can spend it, but you can never get it back. During my careers at sea and ashore, being on time was everything. Time was a tool and an integral part of my job. Examples of why this was so, before the days of Global Positioning Satellites (GPS), are explained below.**

In 1957, when I was a boarder at the Merchant Naval College in Amsterdam, I learned about celestial navigation. It is the science of navigating with the aid of celestial bodies, a visible horizon, a chronometer, a sextant and *The Nautical Almanac*.

When on weekend leave from the Naval College, I often sat at night in my parents' garden with a torch and a star-chart studying the heavens above.

A maritime sextant consists of a system of two mirrors and a telescope, mounted on a metal frame. It is an instrument to measure the angle between an astronomical object and the horizon. Taking a sight of the object is known as 'shooting' the object. It produces an angle, called the altitude. A shade glass is inserted when shooting the sun.




**A diagram of a maritime sextant.**

### A visible horizon

When taking a sextant shot at sea, the horizon, the visible boundary between sea and sky, is not always an uninterrupted clean, flat line. In the tropics the horizon can be quite irregular due to the humidity. It can be invisible due to low fog or haze and it can be fuzzy even in bright moonlight. A poor horizon reduces the accuracy of measuring the altitude of the celestial body and can throw the ship's position out by many nautical miles.

*The Nautical Almanac* contains astronomical data and information of the sun, moon, navigational planets and 57 stars[2]. It transforms the altitude readings of a sextant into degrees of latitude and the GMT time of the chronometer in degrees of longitude and thus provides the ship's position[3].

Before the invention of the chronometer, accurate navigation at sea, when out of sight of landmarks, was an unsolved problem due to the difficulty in calculating the longitude. Navigators could determine their latitude by measuring the sun's angle at noon. Ships would sail to the latitude of their destination and then set a course due east or west (known as parallel sailing) until they reached landfall. Not knowing their exact location was the cause of a great number of shipwrecks. One famous example is the Dutch vessel *Batavia* in 1629 which used the Roaring Forties[4] to sail from the southern tip of South Africa towards the coast of Western Australia en route to Batavia. She was wrecked on the Houtman Abrolhos Islands off Geraldton on the WA coast.

**A maritime chronometer.**

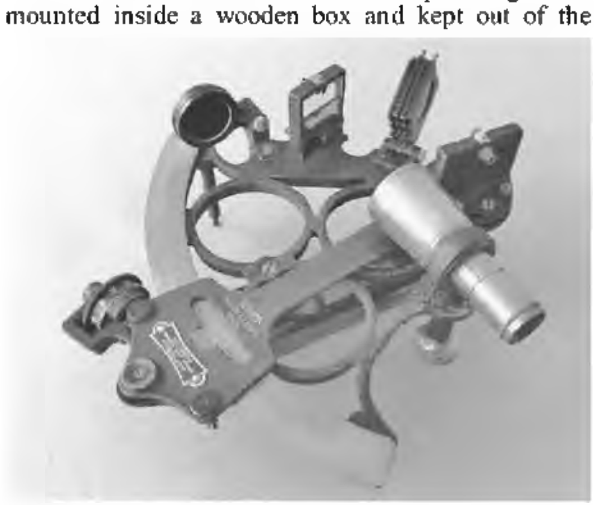
For navigators to find their longitude, they needed a time standard that would work aboard a ship. In 1761, after many years of experimentation, the Englishman John Harrison finally produced the sea clock or chronometer. However, it only became affordable for general use in the $19^{th}$ century.

A marine chronometer is a portable, extremely accurate and reliable shipboard timekeeper. It keeps accurate time amid variations in temperature, humidity and the motions of the sea, which is invaluable in helping determine longitude by means of celestial navigation.

For this purpose, the chronometer's time is accurately set to the time of a known fixed location, the Royal Greenwich Observatory in England. This time is called Greenwich Mean Time (GMT).

As the earth rotates at a regular rate, the time difference between the chronometer's GMT and the ship's local time can be used to calculate the longitude of the ship relative to the Prime or Greenwich Meridian using *The Nautical Almanac*.

The chronometer on board a ship was gimbal-mounted inside a wooden box and kept out of the



**The sextant of Master Mariner Wim van Alebeek.**

weather on the ship's bridge. It was never moved, corrected or fiddled with. The only person to touch it was the Second Officer who wound it up daily.

### A sextant shot of the sun at midday

During ocean crossings, with no land in sight, ships navigators had to rely on the midday shooting of the sun. At noon the sun goes through its highest point called the meridian. All available officers, usually the Chief Officer, Second Officer and Third Officer, armed with their sextants, arrived on the bridge 15 minutes before the estimated time of 12 noon.

The chronometer played a major role and had to be read as accurately as possible, as the sun moves very quickly through its highest point. That is why the timing had to be accurate, hence the preference of having somebody reading the chronometer when the Chief Officer called, "Stop!" when the sun went through its highest point.

**A navigation officer shooting the midday sun.**

As a cadet Navigation Officer on the Shell Tanker *Vasum* it was my task to read the chronometer at midday, but a few times I was allowed to participate in shooting of the midday sun. Later on, when I was a Marine Radio Officer, I occasionally gave the officers a hand by reading the chronometer when the sun went through the meridian.

A simple calculation with the aid of *The Nautical Almanac* would determine the ship's latitude only. So at the midday shoot you didn't get a complete position.

At other times, when the sole Officer-on-duty would shoot the moon, stars or planets, he himself had to read the chronometer. He did this by deducting from the chronometer reading the seconds it took him to walk from the bridge wing to the chronometer.

When shooting sun, stars, planets or moon, the Navigation Officer would get only one line of position (LOP) of each. The calculation for planets, stars and moon is more complex and takes longer than shooting the midday sun.

When shooting stars, three stars from different directions should in theory be enough to get a position. However, a Navigation Officer would often shoot six stars. When he plotted their LOPs on the chart, they wouldn't all go through one point and the Officer would take as the ship's position the middle of where the LOPs crossed.

### The importance of time signals[5]

As a marine Radio Officer I used to pipe a GMT time signal from WWVH (Hawaii) or WWV (Fort Collins, Colorado)[6] through to the bridge, mostly in the mornings when the Second Officer was on watch. He compared the time signal time with the chronometer time and recorded the difference into the chronometer journal.

I used the time signal to check the accuracy of the radio room clock, as all my work was done in GMT. For instance, before departure I had to take a weather forecast for the captain. When at sea, I monitored traffic lists[7] from Scheveningenradio/PCH and the radio station of destination. Routine weather forecasts, gale and cyclone warnings had to be received.

The daily Dutch newspaper broadcast via Scheveningenradio/PCH could not be missed as, besides the news, it contained the Dutch soccer results. All this came in via Morse code on the allotted GMT time.

The same applied to Coast Radio Stations. The start of all scheduled shore to ship forecasts, navigational warnings and traffic lists were listed in GMT and one could not be late.

**Coast Station VIS MF position circa 1970.**

At the MF ships' position at the Coast Station Sydneyradio/VIS, the Radio VNG time signal was daily patched through at noon on 500 kHz as a service to ships.

Over the years time was my master and I served it faithfully. I found it therefore rather amusing when my employer OTC (Overseas Telecommunications Commission) rewarded me with a mantle clock when I reached the 25-year mark.

### Notes

1. Title of song released in 1962 and sung amongst others by Gene Pitney and John Rowles.
2. Of the about 6,000 stars visible to the naked eye, 57 were selected for navigational purposes due to their brightness and ease of recognition.
3. 0° longitude is an imaginary line known as the prime meridian going through the Royal Greenwich Observatory. 0° latitude is the line named the Equator and divides the earth into two equal hemispheres (north and south).
4. The Roaring Forties are strong westerly winds found in the southern hemisphere, generally between the latitudes of 40° And 50°.
5. See Clive Wallis VK6CSW's story in *OTN* No 59 of March 2017.
6. See YouTube https://www.youtube.com/watch?v=7tVH6TqXG0w
7. A traffic list is a list of ships' radio callsigns in alphabetical order. When a Coast Radio Station has a telegram for a ship, this ship's radio callsign is included.

### Acknowledgements

•Wim van Alebeek, Master Mariner KJCPL (Royal Interocean Lines);
•Peter Hewitson VK4QC.

ar

# The Telegraph Station at Beechworth

**Graeme Scott VK2KE**
RAOTC member No 789

**The electric telegraph was invented by Samuel Morse in 1832 but was well and truly obsolete by the early 1960s which was when the last line ceased to function in Australia. At its height, the telegraph system formed a network which could deliver a message round the world and directly to businesses and homes in a matter of minutes. It was a forerunner of today's 'wired world', and was a network every bit as complex and vital to Victorian society as today's internet is to us. The telegraph changed the way we thought about time and distance, and it revolutionised diplomacy, industry and global commerce.**

Today, the last of the men and women who worked the telegraph lines are in retirement, their Morse code skills no longer required. But all around the world there are loose federations of former telegraph workers, anxious to uphold their legacy and their place in history. And anxious also to keep alive Morse code, which was the language of the telegraph.

As radio amateurs, we know that Morse was still being used in maritime and military communications until the 1990s, and is still alive on the amateur bands.

But, for those ex telegraphists who are not amateur radio operators, after the early 1960s Morse code became a lost language to many. However, some ex-telegraphists, such as postmasters and postal clerks, and even military operators, kept Morse alive by private practice and in some cases by forming clubs. For many, these old Morsecodians are our last remaining link with a once illustrious past.

Beechworth is a well-preserved historic gold-mining town located in the north-east of Victoria about half an hour's drive from where I live in Albury.

I recently visited the Telegraph Station in Beechworth, took some photos and had a chat with the co-ordinator, Leo Nette.

Leo has been a Morsecodian since the 1950s when he was a trainee PMG operator in Melbourne. During his early years he was located at various telegraph stations mostly in the suburbs north of the Yarra River. He finished up in 1962 when the PMG closed the telegraph service.

On a personal note, I can recall being at home at times in my grandparent's home in Ormond, a suburb of Melbourne, in the 1950s when a telegram boy would deliver a telegram to my family on his PMG bike. These telegrams would have been handled by telegraphists, who worked in the PMG and other offices around the country and indeed the world.

Once the Morse telegraph service ceased, messages were then handled by teleprinter using an automated switching system called TRESS.

**The historic Telegraph Station at Beechworth.**

**Leo Nette, supervisor at the Beechworth Telegraph Station, sending a telegram by Morse.**

Leo moved to Beechworth in 1982 and tells how he took part in an interstate communication hookup in 1983 that linked SA, Victoria and NSW to commemorate the telegraph links between these states.

The Beechworth Telegraph Station, which is a major tourist attraction at Beechworth, handles hundreds of visitors each year who are wanting to know more about the early message handling systems of yesteryear. The building is an old Lands Department office located in Ford Street.

In 2001 the local group of Morsecodians were given control of the building and commenced to open the telegraph station for the townsfolk and the visitors who come from far and wide.

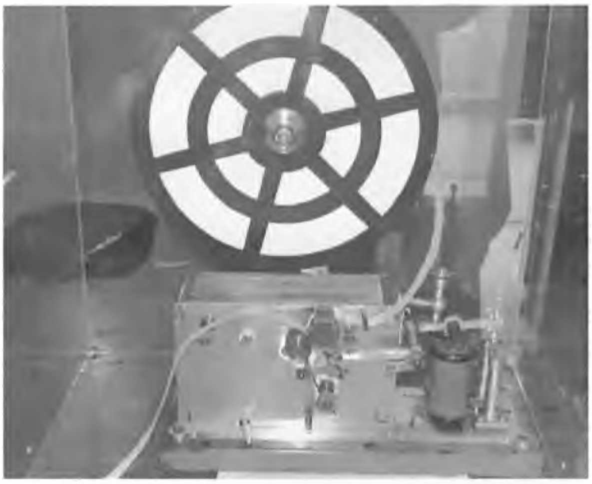
Leo is the coordinator of the station and works with at least four volunteers who man the equipment each day. Telegrams are sent using Morse over the landlines every day. The charges are $2 for messages within Australia and $4 for international messages .

According to Leo, the Beechworth Telegraph Station is the busiest telegraph station in the world as the staff keep in contact with Morsecodians in every corner of the globe. The station is open every day of the week and the Morsecodian volunteers enjoy talking to all of the visitors who drop in. These volunteers are conversant with the history of Beechworth and so can delight the visitors with stories about the gold rush days, Ned Kelly the infamous bushranger, and others.

The local Indigo Shire supports the station and helps keep the infrastructure in good shape.

While I was there I watched some Boy Scouts sending Morse code via a key and oscillator. The boys were clearly fascinated by the Morse code and the use of the key to send messages.

What follows is based on information that Leo has written about Morse code and makes available to visitors to the station.



**A Siemens Brothers & Co Telegraph Embosser (circa 1858). The embosser, also called a register, has a stylus connected to a moving armature suspended above a magnet. The stylus responds to the moving armature by scribing dots and dashes on to a paper tape. The telegraph officer interpreted the marks and wrote out the message for delivery. The paper tape was retained as a permanent record.**

**This embosser was of a type used at the Beechworth Telegraph Office, post offices after 1869 and railway stations throughout Australia. Later versions incorporated an ink well and pen, printing the dots and dashes on to the paper tape.**

"In a small room in May 1844, a group of men were gathered around a bench on which some equipment with wires attached was mounted in a wooden frame. The place was Baltimore, Maryland, USA.

"60 km away in Washington, another group was assembled. Amongst them stood a distinguished looking man whose hand rested on a small instrument. The man was Samuel Morse. And the occasion was one he fervently hoped would mark the beginning of a revolution in world communications. For this was the day on which he promised to show that electric telegraphy was a practical proposition.

"Samuel was at this time 50 years old and was already well known, but not as an expert in technical matters. Whilst a college student at Yale he had shown some interest in science but he had chosen to be a painter - winning a significant reputation. His artistic success had brought him little prosperity and he began to consider other fields of activity.

"About 1832 he interested himself in the electromagnet and its possible application to a system of telegraphy. Others were already researching the possibility of using electricity for telegraphy, but it was Morse who was to be the outstanding pioneer. By 1837 he was able to give a private workshop demonstration of a device he had designed. He showed how a signal could be transmitted by means of a succession of electrical impulses.

"He next went into partnership with two businessmen, Leonard Gale and Alfred Vail, who provided the resources and the industrial experience which he lacked. It was now that the Morse code, with its combinations of dots and dashes representing letters and numerals, was devised.

"In the telegraphic system first devised by Morse and his partners, signals were recorded as embossed dots and dashes on paper tape. Soon the tape was replaced by sound signals. Trained operators transcribed the code messages by hand as they were received. However, it was many years before the tapes were re-introduced.

"It was not until 1843 that the US government at last gave their backing, subject to a successful demonstration.

"In May of the following year the great day came. We can only guess at Morse's feelings as he tapped out the first signal. In the room at Baltimore a gentle clicking began - and for the first time two towns were linked by the electric telegraph. The recipients may have been surprised by the pious wording of that first message, "What hath God wrought?" but they can have had no doubt that they had witnessed an historic event.

"A telegraph line between Melbourne and Sydney was begun soon after the first telegram was sent between Melbourne and Williamstown in 1854. The line reached Beechworth Telegraph Station in 1858 and it was soon extended to Albury to connect with the line from Sydney. Later in the same year, Adelaide was added to the network. Eventually communications were available throughout Australia.

"In Adelaide, Charles Todd, the Chief of Telegraphs, had recently come from the UK and in 1870 he convinced the South Australian Government to invest in a line to Darwin, some 3,500 km through wild and largely unexplored country. It took an army of engineers and workers two years and three months to complete the task (I think largely with the aid of camels and cameleers from Afghanistan). Also, at this time an American company was laying a submarine cable from Java to Darwin. Submarine cables had previously been laid from the UK and Europe to India and then onto Indonesia.

"When this connection was made telegraph communications were possible in a matter of hours rather than messages taking anything up to six months by sea.

"The invention and development of the electric telegraph was a remarkable achievement which revolutionised communications and was probably the most significant event of the 19th century.

"Morse code operated in Australia generally until 1962 when it was replaced with teleprinters. But some lines in outback WA continued to operate until 1968. Finally, the telegram service was terminated in 1989. By then the expansion of mobile phones, emails and internet had far surpassed the achievements of Morse.

"Today, Morsecodians - former telegraph officers - volunteer their time and skills to demonstrate how the electric telegraph worked and to keep Morse code alive to this day."

**A view inside the Beechworth Telegraph Station.**

ar

# The night that Sputnik flew

**Ken McCracken VK2CAX**
RAOTC member No 1730

**It was 4th October, 1957. Having just returned from establishing a cosmic ray recording observatory in Lae, New Guinea, and operating VK7KM/VK9 while there with a lash-up using a final input power of eight watts to a military equivalent of the 6V6, I had spent the day indulging in my other passion, climbing mountains. Driving back to Hobart, I heard a radio announcement that the Soviet Union had launched an 'Earth orbiting satellite'!**

As I walked in, my mother said, "The Professor has called three or four times - he says it is very urgent". I phoned the 'Prof'. He always spoke in a staccato, machine gun-like fashion. "Ah, McCracken ... about this satellite ... I have a telegram from Harvard ... they think it may be a fake ... they want us to determine if it is ... please do it".

Why Tasmania? Why me? Well, Tasmania was ideally placed to see the satellite and its final stage an hour or so after sundown, when they would still be sunlit and very easy to see in the dark sky seen from down below.

And me? The Soviets had announced that Sputnik was transmitting on 20 and 40 MHz. I had sometimes used a Physics Department antenna in amateur contests and had wrecked the measurements the Prof was making on the electrical properties of bean shoots in the process. So I suspect he thought, "Since he seems to know something about radio, perhaps he may be of some use".

I reasoned that the Hobart hams would have been onto it, quick smart. I went onto 40 metres and sure enough, VK7OM (Bob O'May) and others were having a rag-chew about Sputnik - why did it stay up there? - how fast was it going? - etc.

Being an impoverished student, my transmitter was built from junk thrown out by radio shops and liberated from the army (I was a "Nasho" (National Service) member of Army Signals), and therefore I could only use CW. Nevertheless, I broke in and asked, "Has anyone seen Sputnik by eye?". Bob replied, "Yes, Bill Watson VK7YY saw it coming from the south about 30 minutes ago".

I called Bill on the telephone. "Yes, Ken, it went overhead at 1103 UTC. I had been listening to it on 20 MHz and it was becoming very loud. And, funny thing, the transmission frequency was dropping."

"That's good, Bill, that would be the Doppler shift. How big was the change in frequency."

"About 500 Hz."

Having done a quick calculation, I was able to say, "Great, Bill, that's what I would expect".

Bill continued. "I went outside the shack, and there it was about 45 degrees above the horizon to the Southwest. Very bright. I watched it go overhead and continued watching until I lost it about 10 degrees above the northern horizon. Funny thing, though. It was varying in brightness with a period of about 10 seconds."

"That's OK, Bill. You were probably seeing the last stage rocket and it was probably tumbling end over end and reflecting varying intensities of light to us on earth."

Up until then, Bill's observations were spot on. They clearly said that he had seen a satellite in low earth orbit. Then I asked one more question. "Tell me, Bill, how long did it take to go from overhead until you lost it in the northern horizon."

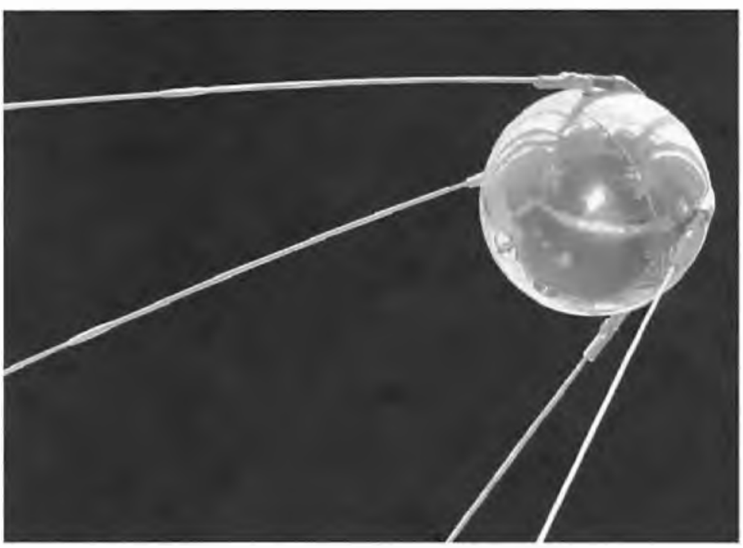
"Oh, Ken, it was moving very fast. Maybe 20 to 25 seconds."

"Bill, are you sure?"

" Definitely."

Now I had a problem - three to five minutes would have been OK. But not 25 seconds.

Bill was the senior telegraphist in the OTC (Overseas Telecommunication Commission) ship-to-shore radio in Hobart. In that job he had to be calm, cool, and collected in stressful situations. But this answer was just plain wrong.

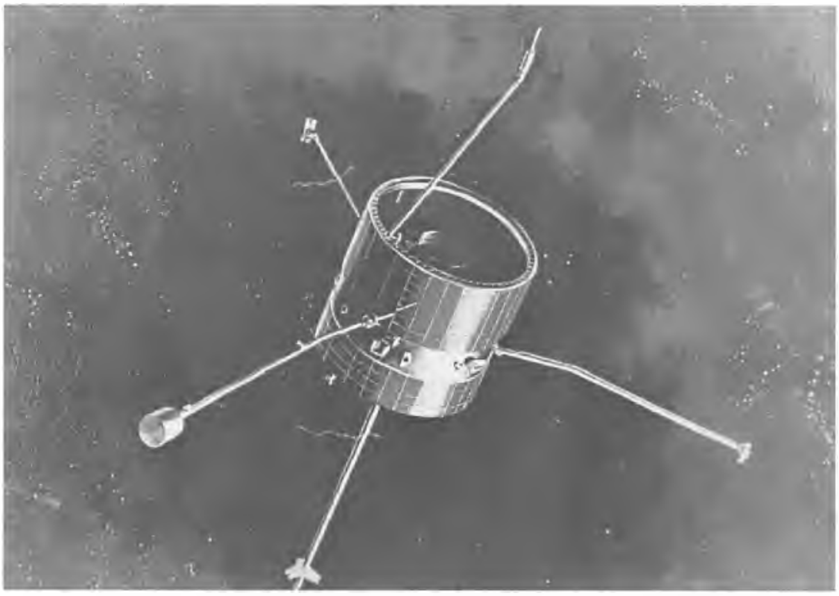


**A Soviet model of Sputnik 1 (1957).**

I composed a telegram for the Prof to send to Harvard. It said the Doppler shift was right; as were the direction of motion and time of overpass, and the period of 90 minutes when it went by one orbit later. It went on to say that the observer's estimate of the duration of the overpass was clearly wrong, but attributable to the excitement of the moment. It was enough. The US accepted that the Soviets had launched an Earth satellite before them.

The US had planned to be the first nation to launch an Earth orbiting satellite. Anticipating this happy event, they named it Vanguard. Sputnik told them that they would not be first. In true Australian style, we called the US satellite 'Guard's van'.

My home-brew receiver could only tune the amateur bands, so I could not tune to 20 MHz. I went to the University and about an hour later I tuned into



**Seven years after Sputnik 1, the interplanetary spacecraft Pioneer 6 with the author's cosmic ray experiment on board. The 'pole' at the bottom was the 2.3 GHz, 10 element collinear array used for two-way communication with Earth.**

Sputnik myself. There it was peeping, peeping away. But hang on - there was 20 words per minute Morse code there as well. Concentrating, I read what it was saying. "Hi there I am the man in the moon", repeated over and over. And no Doppler shift when Sputnik went by to the west. Clearly the transmitter was on the ground somewhere. The idiot fringe had arrived!

The Prof did not repeat that observation in his telegram.

Those days, very few people knew about the possibility of launching anything into earth orbit. The conventional opinion was that if a rocket went up, it would come crashing back to earth when the noise stopped. And if it fell down from an altitude of 100 miles (160 km), say, it would hit the ground with a very big bang.

Some people were aware of the 1920s ideas of Hermann Oberth about an orbiting space station, and children such as I had read the 1930s comics about Buck Rogers flying a rocket ship around the solar system and fighting baddies.

Some technically inclined people knew about Werner von Braun's secret plan for the Earth orbiting rocket, the A4, and Arthur C Clarke's 1945 prediction of geostationary UHF relay satellites.

The ABC children's programme, the 'Argonauts', had explained how rockets worked and I thought they must be wrong once the rocket was in space and had nothing to push against. The general opinion was that the idea of satellites and space travel was too fanciful to be true - but now there was this 90 kg lump of metal staying up there and beeping at us as it went by.

To most people it all seemed too unreal, especially when they were told that the satellite was travelling with a speed of 7 km/sec in order to stay up there.

The ABC went to great pains to explain that the satellite was just like the tea in a billycan that does not fall out when swung overhead with the lid off. Others went to the other extreme. A well known Sydney department store advertised that they had taken out an insurance policy to cover anyone who was hit by a falling satellite while in their store.

The WIA was having its monthly meeting a couple of weeks later and I was quickly captured to explain how it all worked. The meeting room was packed to bursting. Using a slide projector as the sun, a globe of the earth, and a ping pong ball as the satellite, I explained why the satellite stayed up there; how it seemed to shift westward from one orbit to the next, and so on. I explained that we could have geostationary satellites, and go to the moon and the other planets in the solar system.

Little did we all know that within a few years there would be a series of amateur communication satellites, including the Australian OSCAR 5 built by students at the University of Melbourne. And that during the life-times of the younger hams in the room, a man made spacecraft would leave the solar system completely (in 2012) and travel on out into our galaxy while still sending its observations back to Earth.

Sputnik, and its successors, also provided an entirely new form of assistance in matters of a romantic nature that some members of the RAOTC may remember. "Going out to look at the satellites going over" provided a welcome addition to the reasons why a couple could go walking together at night. Some of the satellites were quite faint, so scientific rigor demanded that you should walk as far from street lights as possible!

Two years after the flight of Sputnik I was invited to join one of the leading space research groups in the USA, at the Massachusetts Institute of Technology (MIT). Two more years and I proposed an instrument to NASA that was one of five chosen to fly on the first successful US interplanetary spacecraft, Pioneers 6 and 7, which by 1969 were sending my measurements of the cosmic radiation back to Earth from 300 million kilometres away at the mind blowing data rate of 8 bits per second (shared among the five experiments).

Soon after I was on the US committee whose job was to determine how to protect the virility of the astronauts when they went to the moon.

As they say - if you can't beat them, join them.

And perhaps this all happened because the Prof asked me to prove that Sputnik was not a fake. And without amateur radio, and the hams of Hobart, I would not have been able to do that.

**Note**

A portion of this material was included in the author's book, *BLAST OFF- Scientific Adventures at the Dawn of the Space age*, New Holland, 2008, ISBN; 781741106442. It is in the collections of quite a few municipal libraries in Australia and is also available from Amazon as a Kindle e-reader book. ar

Do you have any interesting stories or anecdotes to tell our readers about your experiences with Sputnik or OSCAR? If so, the *OTN* editor would like to hear from you.

# *Good heavens! Wherever did last year get to?*

**Clive Wallis VK6CSW**
RAOTC member No 1289

**These days just about everything runs on clock time. Unless your computer is accurate to the second, many digital communications systems won't work. Turn up late at the airport or bus stop and bang goes your trip. The world gets all excited about a 'New Year' starting on 1st January - but is there any real reason for choosing this day? And did the third millennium really start on 1st January 2000? This item, taken verbatim from the e-book *A Viking Odyssey: Around the World 1000 Years Ago* by John Man[1], offers food for thought.**

### 1000 years ago: when was that exactly?

Take a nice round compelling number, the beginning of the third millennium: 2000 AD. Most of us think we know what that means: 2000 years Anno Domini, Latin for 'In the Year of the Lord' ie, Jesus Christ. But who are 'we'? Well, Christians, of course; meaning not exactly Christians but those who look back to a Europe when it was a lot more Christian than it is today.

So why should others outside the Christian tradition take the birth of Christ as a base-line? After all, the birth of Christ has less significance for Muslims, hardly any for Hindus, Buddhists and Jews, even less for the Chinese, and none at all for native Australians, Africans or Americans. Those cultures, and many others, had their own base-lines - the start of a new reign, the death of Buddha, the foundation of Rome, Muhammad's flight to Medina, and the creation of the world, to name a few. Many are still in use.

None worked very well, because until recently no one knew exactly how long a year is. Once, Europe relied on Ancient Rome, which originally counted a year as 355 days - 10 days (plus a bit) too short. By the 1st century the calendar was way out. Julius Caesar reformed it. The Julian calendar decreed the year to have 365 days - and a quarter, which was made up with a leap year every four years. But what of the base-line?

The Julian calendar was based on the city's current consul, a shifting base-line, and increasingly impractical.

By the 6th century, with Christianity established, a monk, Dionysius Exiguus, suggest that Christ should provide the base-line - not on his birth on 25th December, but his 'incarnation' or conception. Luckily that did not change the year - but which year was that? Unfortunately, the Gospels conflict. According to the Julian calendar, Christ was born either in the last year of Herod the Great (4 BC) or the year of the Roman census of Judea (6 - 7 BC).

The mistake was steadily compounded by the fact that the year is not precisely 365.25 days long. It's almost 11 minutes shorter (it varies, depending on the earth's slightly eccentric order and on the influence of other planets). After 1,000 years the calendar and the sun were out of synch by a week.

Roman Catholic Pope Gregory reformed the calendar in the 16th century, updating it, and leaving out the leap year every 300 years to take those 11 minutes into account. But Protestant and Orthodox nations lagged behind. For a while you could leave Calais in January and arrive in Dover (some 20 miles away) in the preceding December. Britain switched in 1752, when 2nd September was followed by 14th September, inspiring riots by crowds protesting at the 'loss' of 11 days of their lives! Russia did not change until 1917. By the Gregorian or 'New Style' calendar, the 'October Revolution' moved to November.


The present AD-BC system spread because European dominance carried it around the world. By the time that dominance faded, it was too late to change.

And it works, sort of, because the base-line is less important than the universal agreement. But it still only *sort of* works because the best base-line is the present. The historical base-line is uncertain.

In the Christian Era chronology, there is no year zero. It begins with AD 1. So the second millennium 'really' began on 1st January 1001 and the third millennium on 1st January 2001. And what if the base-line should 'really' be 4, 6 or 7 BC? The year 2000 might really have been in the 1990s.

There is no final answer. Some historians try to avoid Euro-centrism by replacing AD with CE, for Common Era, and BC (Before Christ) with BCE (Before the Common Era). That sounds better, but solves nothing, because the historical base-line is the same. The best historians can do is to be aware of the problems, and get on with their job, which is to make as much sense of events as possible.

Drat! And I thought today was payday…

### Note

1. *A Viking Odyssey: Around the World 1000 Years Ago* by John Man, is an e-book which can be downloaded via Kindle. The original book is entitled *Atlas of the Year 1000*, published by Harvard University Press.

ar

# Morse keys used with Wireless Sets 108, 128 and A510

**Herman Willemsen ex-VK2IXV**
RAOTC member No 1384

**In July 2017 I acquired two Australian military Z1/ZAA Morse keys, which were part of the auxiliary equipment of Wireless Set (WS) 128, the tropicalised version of WS-108. This article is about the closely related Australian Army Field Wireless Sets and Stations 108, 128 and A510, and the Morse keys that belonged to them. It is, however, an abridged description, as more detailed information can be easily found on the websites referred to in the Footnotes below and also in an article on the WS-108 by Bill Roper VK3BR which appeared in the September 2007 edition of *OTN Journal*.**

### Wireless Set No 108[1]

This wireless set was designed and produced by Radio Corporation Pty Ltd (Astor) in Melbourne in 1940[2]. This set was designed for backpack use by the AIF and was based on the existing British WS-18. WS-108 sets were used in the Middle East campaign and in the jungles of Papua New Guinea during WWII.

The set evolved over time, with three different variants being produced, namely the WS-108 Mk I (8.5 - 8.9 MHz - R/T only), WS-108 Mk II (6 - 9 MHz - R/T only) and WS-108 Mk III (2.5 - 3.5 MHz - R/T and MCW).


**A WS-108 Mk III with accessories.**

The sets were all (dry) battery operated and featured a 1.5 V LT battery and two 45 V batteries connected in series for 90 V HT. The unmodulated power output of the sets was between 0.4 and 0.45 watts, depending on the frequency and the length of the aerial. The sets weighed 26 lbs (11.8 kg). Ranges up to 10 miles (16.1 km) could be achieved using vertical antennas, the range largely depending on the type of country.

This radio set was not waterproof and, although partly protected by canvas, tropical moisture and heavy rain made the sets inoperative. Drying out the sets required considerable manpower.

### Morse key for WS-108 Mk III

The Key and Plug assembly No 2B (Aust), which is a WT8AMP key with cord and special plug, was part of the auxiliary equipment of Wireless Set No 108 Mk III.

**The Key and Plug Assembly No 2B (Aust) used with the WS-108 Mk III.**

When not in use it was stored in a waterproof cover. The Key and Plug's Vocabulary of Army Ordinance Stores (VAOS) reference number was ZA4500 and ZAA 8882 for the waterproof cover.

### Wireless Set No 128[3]

In 1944, work on a tropicalised, waterproofed version of the WS-108 commenced. It was approved for production in July 1945 and named WS-128. As the end of WWII was in sight, the urgency for the set no longer existed and it did not enter service until 1946 when it replaced the WS-108.

The WS-128 was manufactured by Tasma Radio (Thom and Smith Ltd) Mascot, NSW and was perhaps the most advanced HF man-pack transceiver at that time. WS-128 sets were used during the Korean War (1950-1953).

By using an eight foot (2.4 m) vertical aerial, ranges of 4 to 5 miles (6.4 to 8 km) in open ground and two to three miles (3.2 to 4.8 km) over wooded or hilly ground could be achieved. Much longer distances could be achieved using wire aerials.

The power source consisted of an internal LT/HT 3 V/162 V dry battery or an alternative vibrator power supply which could be clipped to the bottom of the set instead of the battery box, thus allowing the set to be powered by an external 6 volt lead-acid battery. The frequency coverage was 2.0 - 4.5 MHz with facilities for master oscillator and three crystal locked channel operation. The power output was approximately ¼ watt. Its modes were voice (AM) and Morse (CW and MCW). The IF of the superheterodyne receiver was 1.6 MHz. Nine miniature B7G valves were shared between the transmitter and receiver. The transmitter output valve was a 3A4.

### Wireless Set No 128 Mk II

In 1952, the WS-128 Mk II, with a variety of minor modifications, replaced the original WS-128.

**A front panel view of a WS-128 Mk II.**

### Morse keys for WS-128 and WS-128 Mk II

The original WS-128 used a Z1/ZAA 7990 key[7] and my key is dated 1946. When the WS-128 Mk II came out in 1952, the ordinance number on the Z1/ZAA key changed from 7990 to 0274. The numbering of 0274 was done in two ways. New Z1/ZAA keys were made and marked with "MK2 Z1/ZAA 0274 KEY W/T (AUST) No.1". The characters were engraved into the metal base, except the numbers 0274, which were engraved onto a small 7 mm x 4 mm tin plate with rounded corners. Where the original Z1/ZAA 7990 keys were retained, they had the

**An original Z1/ZAA 7990 key showing how the metal plate changing it to an 0274 key was mounted.**

characters "Z1/ZAA 7990 KEY W/T (AUST) No.1" covered with a 45 mm x 13 mm metal plate attached with two screws to the metal base and on this plate was[5] written "Z1/ZAA 0274 KEY W/T (AUST) No.1 Mk2".

Both military keys Z1/ZAA 7990 and 0274 are the same. They are quite complex and have nearly 60 separate parts. These keys have an unusually shaped lever and the front contact is sealed inside a rubber shroud to make the key safe to use in an explosive environment.

**As can be seen, the Z1/ZAA key 7990 (with the 0274 plate attached) in the upper photo, is identical to the later Z1/ZAA key stamped 0274 in the lower photo (see text).**

The slotted lugs on either side of the base indicate that the key was used strapped to the operator's leg. Both keys have a small flexible connection wire between the lever and the metal base plate.

### Wireless Station A510[4]

The WS-A510 was designed by AWA (Amalgamated Wireless Australasia) in 1950-51 to meet an Australian Army specification for a small waterproof HF transmitter and receiver that would perform well in the Pacific area. It would have to be sealed, of light weight and easy to operate. The Tx and Rx were connected to each other by a cable.

**A low resolution photo of the WS-A510 with accessories. Tx is on the left and Rx on the right.**

In the early 1950s the A510 was extensively trialled[5] in Australia and overseas in the jungles of Malaya by both military and AWA personnel and proved itself to

# Radio Amateurs Old Timers Club Australia Inc

The **Melbourne March 2018 Luncheon**
of the ***Radio Amateurs Old Timers Club Australia Inc***
will take place from
**12.00 noon** (for a **12.30 pm** start) on **Thursday, 22nd March 2018**
at the
**Bentleigh Club, Yawla Street, Bentleigh, Victoria.**

The guest speaker at the luncheon will be serving Victoria Police member Peter Ferguson who will present a PowerPoint supported talk on 'The history of D24 and police communications'. Peter was due to present his talk at the September 2017 luncheon but was taken ill with the 'flu at the last minute. This promises to be a most interesting presentation, so don't miss out!

The Bentleigh Club offers a three course meal at a cost of $36.00 per head. Tea and coffee will be available for free. Soft drink, wine and other drinks can be purchased from the bar at members' prices.

**RAOTC members are welcome to bring a friend, but we must have firm bookings to 'RAOTC Luncheon, PO Box 107, Mentone 3194' no later than Monday, 19th March 2018.**

Any queries to be addressed to Bill Roper VK3BR at < raotc@raotc.org.au > or 0416 177 027.

**The 'Key Telegraph Light Weight (AUST) No 1 TSE (W) 9-2 D^D' used with the WS-A510.**

be superior in overall effectiveness to the heavier WS-68 sets[6] which were at that time used by the British Army during the Malayan Emergency. From 1955, Wireless Station A510 progressively replaced the WS-128 sets.

The A510 is a crystal controlled, low power, lightweight transmitter-receiver, designed primarily for use by long range infantry patrols. The set can be used as a man-pack station on the move, in a vehicle, or as a ground station. Its frequency range is from 2 - 10 MHz and can be used in either Voice or CW (Morse) mode. It is carried in two pouches on basic webbing. The equipment has a range of two miles (3.2 km) on voice and four miles (6.4 km) on CW with rod aerials in man-pack mode, but as a ground station, with a half wave dipole, 120 miles (193 km) can be achieved on CW.

### Morse key for WS-A510

This key was used with Wireless Station A510 and is marked: "Key Telegraph Light Weight (AUST) No.1 TSE (W) 9-2 D^D". TSE (W) 9-2 is the catalogue number and D^D indicates that this key was the property of the Australian Department of Defence.

### Footnotes

1. http://vk2bv.org/archive/museum/ws108.htm
2. For WS-108 handbook with detailed technical description, go to http://www.tuberadio.com/robinson/Manuals/WSNo108mk3.pdf
3. http://www.tuberadio.com/robinson/museum/WSNo128/
4. http://www.qsl.net/vk2dym/radio/A510.htm
5. http://www.tuberadio.com/robinson/Information/A510_Trials.html
6. http://www.radiomuseum.org/r/mil_gb_wireless_set_no68_2.html
7. ZI/ZA refers to British-made field wireless (radio) equipment, whilst the extra A in ZI/ZAA refers to Australian-made field radio equipment. YA refers to landline equipment.


### Acknowledgements

Wayne Tangey; Chris Bisaillion VE3CBK, Ray Robinson VK2ILV and Louis Meulstee PA0PCR.


### References

Several websites in Australia, including the website of Colin MacKinnon VK2DYM (SK in 2004), plus overseas websites.

ar