# OTN

Old Timers' News

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




## Number 57 March 2016


## 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; Membership Secretary; *OTN* Editor.** | Bill Roper VK3BR<br>Tel: 03 9584 9512 |
| **Vice President** | - |
| **Secretary; Broadcasts.** | Ian Godsil VK3JS<br>Tel: 03 9782 6612 |
| **Treasurer** | Derek McNiel VK3XY<br>Tel: 0418 991 119 |
| **Broadcasts** | Bruce Bathols VK3UV |
| **Web page co-ordinator** | Andy Walton VK3CAH<br>Tel: 03 9783 6859 |
| **Committee Members** | Jim Gordon VK3ZKK<br>Tel: 03 9893 1711 |
| | David Rosenfield VK3ADM<br>Tel: 03 9700 1225 |
| | Mike Goode VK3BDL<br>Tel: 03 9589 5797 |

## 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 Secretary Ian Godsil VK3JS on (03) 9782 6612; or by Membership Secretary Bill Roper VK3BR on 03 9584 9512; 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 1.843 MHz AM, 7.060 MHz LSB, and 3.650 MHz LSB |
| 0100 | UTC (all year) | 14.150 MHz USB beaming **NORTH** from Melbourne |
| 08.30 pm | Victorian time (all year) | 3.650 MHz LSB plus 145.700 MHz FM |

### Interstate relays

| | | |
|---|---|---|
| 10.00 am | Western Australian time (all year) | VK6OTN on 7.088 MHz LSB and NewsWest FM repeaters |
| 08.30 am | Tasmanian time (all year) | NTARC FM state-wide repeater network |

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

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

# From the committee . . .

The RAOTC Management Committee consists of nine members who meet every three months to oversee the running of the Club in conjunction with the President.

In some ways business each quarter is routine with reports from various co-ordinators being a central feature of the agenda.

Perhaps the most important aspect of the working of the Committee in 2015 was that we had all looked to President Bill Roper for guidance and leadership. However, Bill's ill health late in the year caused him to decide not to stand again for the Presidency at the AGM. This left the Committee without a specific leader, but still legal within the terms of the rules for an Incorporated Club.

Bill underwent medical treatment for some time and at the November meeting offered himself again as President with the proviso that he operated only as an integral part of the Committee, so that all of us work more closely together in the decision-making process. These days that is made so much easier via email.

So far this has worked well - as long as we remember to push 'Reply All' so that our message goes to everyone on the Committee, not just to the person who wrote the original!

Like most committees everywhere, we concern ourselves with the finances and membership levels.

Thanks to the careful oversight of Treasurer Derek McNiel VK3XY, our Club is holding a positive balance, but membership numbers are of some concern as there has been a slight decline over the last year. How to arrest this decline has been occupying our thoughts for several months now.

In the final analysis we feel that each Club member needs to speak to his friends about our Club and try to interest them, whilst stressing that an Old Timer is not necessarily an old man, but someone who has been licensed for at least ten years. Have you any friends who may like to read *OTN* or look at our web page?

Our thanks go, as usual, to Bill Roper VK3BR who keeps very careful management of the Membership records and who can produce almost any type of statistic that you can think of from his database.

The monthly Broadcast continued in 2015 under the care of Bruce Bathols VK3UV and Ian

*(continued on page 5)*

# From the editor . . .

Sometimes I wonder if it is only me that gets so much enjoyment from reading about the history of radio, in particular the exploits and experiences of those who make up the wide ranging mix of amateur radio enthusiasts. But then I receive such positive feedback from *OTN* readers after each issue of the journal is published and realise that I am not alone.

By the time each article is published I will have read it an average of eight times, and yet I still do not tire of re-reading most articles.

Many RAOTC members tell me that they also do not toss out *OTN* as they do other publications once they have read them, but keep *OTN* so that they can re-read the articles again and again at a later time.

Incidentally, if you have misplaced an earlier copy or copies of *OTN*, don't forget that you can get a DVD containing all issues of *OTN* ever published for the low cost of $25.00. See the notice on page 33.

As usual this issue of *OTN* is full of interesting articles from a diverse range of authors covering a wide range of subjects.

I hope that reading this issue of *OTN* will motivate more club members to tender their own contributions for publication. .

There is one indisputable fact that is proven with each issue of *OTN* and it is that radio amateurs are always keen to read about the experiences of other radio amateurs.

If you are concerned about your ability to tell your story in 'good' English, don't be! Simply put it down on paper as you would tell it to one of your mates and send it along, preferably with a photo or two.

If it needs a little 'polishing', I will look after that for you. The main thing is to get your story down on paper or disk so it is recorded and others can read it.

Articles already to hand for the next issue of *OTN* are from Lloyd Butler VK5BR, Herman Willemsen VK2IXV (3), Rob Gurr VK5RG, Clive Wallis VK6CSW (5), and John Bennett VK3ZA/VK2SIG

It would be great if your article or letter was also in the next issue of your RAOTC journal, wouldn't it?

Anyway, without further ado, turn the page and get stuck into a feast of most enjoyable and interesting reading.

***Bill Roper VK3BR*** ar

**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**

A photo from 90 years ago! The late Trevor Watkins 7DX operating CW from his homebrew station in July 1926.

*Photo from the historic photo collection of Richard Rogers VK7RO.*

# From our members . . .

## Unusual phonetic alphabet

In the September 2015 issue of *OTN*, Mike Patterson VK4MIK queried the origin of the 'unusual' phonetic alphabet printed on a metal plate. This was the system used by the RAF from 1924 to 1942 and differs only in spelling from the British Army phonetics used in 1916. Although different website references do have some variations the following may shed some light.

The RAF system was: Ac Beer Charlie Don Edward Freddie George Harry Ink Johnnie King London Monkey Nuts Orange Pip Queen Robert Sugar Toc Uncle Vic William X-ray Yorker and Zebra; whereas from 1927 the Army used: Ack Beer Charlie Don Edward Freddy George Harry Ink Johnnie King London Monkey Nuts Orange Pip Queen Robert Sugar Toc Uncle Vic William X-ray Yorker and Zebra.

Apart from the spelling of Ac/Ack and Freddie/ Freddy the two are identical and are as per Mike's photo.

Between 1942 and 1943 the RAF changed to: Apple Beer Charlie Dog Edward Freddy George Harry Ink Jug/ Johnny King Love Mother Nuts Orange Peter Queen Roger/Robert Sugar Tommy Uncle Vic William X-ray Yoke/Yorker and Zebra although some preferred the alternative: Apple Baker Charlie Dog Easy Freddie George Harry Ink Johnny King London Mother Nuts Orange Popsie Queenie Robert Sugar Tommy Uncle Willie York and Zebra.

The Royal Navy had its own version, too, that of 1917 being: Apples Butter Charlie Duff Edward Freddy George Harry Ink Johnnie King London Monkey Nuts Orange Pudding Queenie Robert Sugar Tommy Uncle Vinegar Willie Xerxes Yellow and Zebra. Some minor changes were introduced in 1921.

It would appear that from 1943 all three British (and probably Commonwealth) Services standardised as per the table below, with a further minor change in 1955.

Fortunately, the introduction of the NATO Phonetic Alphabet in 1955 standardised all English speaking NATO forces phonetics, with minor changes in the French version. Most civilian services now use this, too.

The table below, taken from *The Wireless Set No 19 Group's* website, provides a useful summary but there are minor differences with other references, as listed above.

Amateurs, of course, may use whatever phonetics they choose provided they are not obscene!

***Clive VK6CSW***
***RAOTC member No 1289***

| | 1904 | ARMY 1914-18 | ARMY 1918 | NAVY 1921 | 1938-1942 | 1943 | INTER-SERVICE 1952 | 1955 NATO |
|---|---|---|---|---|---|---|---|---|
| A | Ack | Apples | Ack | Ac | Ac | Able | Able | Alfa |
| B | Beer | Butter | Beer | Beer | Beer | Baker | Baker | Bravo |
| C | Cork | Charlie | Cork | Charlie | Charlie | Charlie | Charlie | Charlie |
| D | Don | Duff | Don | Don | Don | Dog | Dog | Delta |
| E | Eddy | Edward | Eddy | Edward | Edward | Easy | Easy | Echo |
| F | Freddy | Freddie | Freddy | Fox | Freddie | Fox | Fox | Foxtrot |
| G | George | George | George | George | George | George | George | Golf |
| H | Harry | Harry | Harry | How | Harry | How | How | Hotel |
| I | Ink | Ink | Ink | Ink | Ink | Item | Item | India |
| J | Jug | Johnnie | Jug | Johnnie | Johnnie | Jig | Jig | Juliett |
| K | King | King | King | King | King | King | King | Kilo |
| L | London | London | London | Love | London | Love | Love | Lima |
| M | Emma | Monkey | Emma | Monkey | Monkey | Mike | Mike | Mike |
| N | Nuts | Nuts | Nuts | Nan | Nuts | Nan | Nectar | November |
| O | Orange | Orange | Orange | Orange | Orange | Oboe | Oboe | Oscar |
| P | Pip | Pudding | Pip | Pip | Pip | Peter | Peter | Papa |
| Q | Quad | Queenie | Quad | Queen | Queen | Queen | Queen | Quebec |
| R | Robert | Robert | Robert | Robert | Robert | Roger | Roger | Romeo |
| S | Esses | Sugar | Esses | Sugar | Sugar | Sugar | Sugar | Sierra |
| T | Toc | Tommy | Toc | Toc | Toc | Tare | Tare | Tango |
| U | Uncle | Uncle | Uncle | Uncle | Uncle | Uncle | Uncle | Uniform |
| V | Vic | Vic | Vic | Vic | Vic | Victor | Victor | Victor |
| W | William | William | William | William | William | William | William | Whisky |
| X | Xerxes | X-Ray | Xerxes | X-Ray | X-Ray | X-Ray | X-Ray | X-Ray |
| Y | Yellow | Yorker | Yellow | Yoke | Yorker | Yoke | Yoke | Yankee |
| Z | Zebra | Zebra | Zebra | Zebra | Zebra | Zebra | Zebra | Zulu |

**Where is your 'From our members . . .' contribution to *OTN* ?**

It is always interesting to read letters 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!

## September 2015 OTN

I found a couple of articles in the last issue of *OTN* particularly interesting. The article on page 55 about the Super Constellation brought back memories of when I was in Cloncurry in North West Queensland during 1955-58.

A Super Constellation landed at the Cloncurry Airport but, when it landed, it ran out of runway and got bogged at the end of the runway where it remained for a week until they got it going again and it flew out on its way. It was really something to see such a large aircraft in those days.

The second article that made me very interested was about the 5/8th wave antenna. I had heard and used them previously but did not know the formula about how to make them. I used them mostly on 2 m mobile. To me it was a very interesting article by Clive Wallis VK6CSW.

Many thanks for the memories.

*Merv Deakin VK4DV*
*RAOTC member No 1230*

## The radar man

Quite a few years ago when I was in the US doing a radio course with the US Navy I chanced across an electronics magazine called the *CREI Newsletter*.

In it was printed a small verse called the RADAR MAN which I cut out and tucked away in a book (that was in 1981!)

I was wondering if it may be of interest, Bill, in *OTN*.

**The radar man**

If you should see upon the street
A man equipped with dipole feet
With a family of curves trailing behind
He's a radar man with a micro-mind.

His eyes take on a neon gleam
His ears extend into a Yagi beam
His mouth becomes a pulse gate
His heart pumps blood at a video rate.

With micro seconds and micro waves
And micro volts he fills his days
And thereby in the course of time
He develops a micro mind.

This radar man with the passing years,
Attained infinite impedance between the ears,
And finally succumbed to a heavy jolt
When he got what he thought was a micro-volt.

The doc looked up from his microscope
Turned to his colleagues and softly spoke
"Not a trace of a brain can I find
He was a radar man with a micro-mind!"
*(Submitted by: J B Schafer CRT)*

*Gerry Wild VK6GW*
*RAOTC member No 1112*

## Prompted memory

Dear Bill,

What a great job you are doing with *OTN*; it is a pleasure to read it and then to read it again and chat to people about the articles.

I had just re-read March 2015 again and what great stories and articles - the contributors have done well. I wish I could come up with something worthwhile - the best I could come up with is a bit of humour that may be acceptable. The story by VK2MW re the radio station at Parkes prompted memory of a humorous event at a radio station in Perth WA (set in the early 1950s).

The central character is a well known amateur whose identity we will keep secret. I have written a little story - I don't know if it is suitable for *OTN* (it is published on page ?? of this edition of *OTN*).

The article on electrical energy by Lloyd Butler VK5BR rang a bell when he mentioned pumped storage. We visited such a place in Scotland in 1978 and it was BIG. I have photographs but whether I have enough material to do an article I am not sure.

*Max Shooter VK6ZER*
*RAOTC member No 1431*

ar

## QSO PARTY 2015 RESULTS

Thank you to everyone who took part, even if there were only a few of you.

One wonders why there is so little interest from other States?

**Results**

| | | | |
|---|---|---|---|
| 1st Place | Neil | VK6NSB | 45 points |
| 2nd Place | Mark | VK6AR | 43 points |
| 3rd Place | Clive | VK6CSW | 40 points |
| 4th Place | Ian | VK6DW | 8 points |
| 5th Place | Tony | VK6ATI | 5 points |
| 6th Place | Deane | VK3TX | 1 point |

*Ian Godsil VK3JS*
*QSO Party Manager*

ar

***From the committee . . .***
*(continued from page 3)*

Godsil VK3JS. Whilst content perhaps became more contemporary in subject matter, the format remained the same; but by the end of the year our great need was for assistance with relays on the various HF frequencies.

Is this something that you can do for your Club? If so, we would be very pleased to hear from you.

Finally, the present Committee has members who have been there for between eight and fifteen years. An ideal turnover time is three or four years so that people don't get stale or feel 'bogged down'.

Again, is this an area where you could consider nominating yourself at the next AGM in September? New ideas will not go astray - even for an historically-oriented Club.

Enjoy the hobby and enjoy RAOTC!

*73,*
*Ian Godsil VK3JS*
*RAOTC Secretary*

# A MIR contact from the bush

**Wolfe Rohde VK5AXN**
RAOTC member No 1628

**I am sure that a few members would have contacted the Russian MIR Space Station, and possibly spoken with Andy Thomas, in the days that it was still circling the Earth. My particular contact in 1998 was a little different due to both the listening audience and the historical significance.**

In March 1998 I was involved with an organisation called the Operation Flinders Foundation. This organisation conducts what is termed Wilderness Therapy and is still in the forefront of this activity today.

Several times a year it takes teams of young people, who are aged between 13 and 17 and who are at risk of falling foul of the law or reoffending, to a remote area in the North Flinders Ranges of South Australia. Within a team environment and through a combination of positive reinforcement, role modelling, team building, various challenges and a building of self esteem, a large percentage of these young people re-enter society as productive members. In 1998 these exercises took place at a pastoral station called Moolooloo (an Aboriginal word meaning 'slippery ridges').

At that time the Russian built space station MIR was circling the Earth every 90 minutes and on board, amongst others, was Australian astronaut Dr Andy Thomas on a four month posting.

What follows is an outline of the events leading up to the contact with Space Station MIR and Dr Andy Thomas from Moolooloo Station on 27th March 1998.

### The exercises

My task, during the 11 days of exercises at Moolooloo, was to set up a radio communications system in a remote area of some 500 square kilometres. This involved the installation of three remote VHF repeaters with 50 foot (15.24 m) winch up tele-towers and solar panels to charge deep cycle batteries.

Eventually, to save setting up time, I organised and carried out the permanent installation of the three towers, involving a trip from Adelaide with a compressor, jack hammers, concrete mixer and the required hardware. I organised some local labour from the small town of Blinman to assist. The repeater systems were left on-site between exercises as it is so remote that security was not considered an issue.

Then, for each exercise, it was just a matter of taking up the hand-radios, batteries and vehicle pack-sets from Adelaide to enable the system in a very short period of time. Each exercise was directed from a well fitted-out permanent operations room in the shearers' quarters near the station homestead.

I remained for each exercise, keeping the communications system running, operating the base radios, fixing any faulty radios and performing odd jobs as well as occasionally cooking for the base camp staff in order to give the cook a break. More often than not I would bring up my 100 watt HF rig and a long wire antenna for some night time contacts.

Prior to the exercise of March 1998 I had made several contacts with Andy Thomas on board MIR from my residence in the Adelaide Hills using the assigned VHF frequency. I also had some Packet Radio contacts. MIR took 92 minutes to circle the earth and in any

Dr Andy Thomas.

24 hour period often passed over Adelaide which also happened to be the home city of Andy Thomas. Each pass lasted about 10 minutes, as MIR travelled at 30,000 kph (or 18,000 mph) at an altitude of about 380 km above our planet Earth.

To ascertain the precise position of MIR in space at any one time, I used a satellite tracking programme that also provided the positions of a myriad of other satellites, as well as the Sun and the Moon. The tracking programme required regular updates of Keplerian elements, which are sets of two line positioning data that are fed into the tracking programme and provide the accurate positions of objects such as satellites in space. This procedure is required on a regular basis in order for the programme to pinpoint the required object. The data is available over the internet or, in my case at the time, by using the Packet Radio system.

The CEO of Operation Flinders Foundation at the time was John Shepherd and he had heard that I was going to take my amateur radio VHF equipment to Moolooloo in an attempt to contact the MIR station

**The MIR Space Station.**

My suggested MIR contacts with Andy were to be on 27th March 1998 at 1720 hrs local for the primary pass, 28th March 1998 at 1800 hrs local for a secondary pass and on 29th March 1998 at 1730 hrs local for an alternative pass. This gave us three good 'windows of opportunity'. Unfortunately, all those times were during sunlight hours, so we would not be able to view the MIR as it passed over. I suppose one can't have everything!

### The contact

On Wednesday, 25th March 1998, I arrived at Moolooloo. Unfortunately, I could not test the equipment live, so to speak, as there were no other passes before 27th of March, the first of the three predicted passes. I had to trust that my equipment 'would be alright on the night'!

Eventually, Friday the 27th arrived, the day of the first pass. At about 1550 hrs local, and for a bit of historical significance, I drove my SAPOL (South Australian Police) Toyota Landcruiser to the stone monument adjacent to the Moolooloo homestead and placed my equipment on the bonnet of the vehicle for all to see, a full 1½ hours before the pass. For this historic occasion I wanted to leave nothing to chance.

The tracking programme was fired up on a laptop computer. The main antenna was a VHF ¾ wave vertical on a magnetic base and, just in case, there was also a VHF Yagi as a backup, to be hand pointed by a colleague.

The VHF mobile radio produced 25 watts which was usually enough but again, just in case, I had a 100 watt linear amplifier standing by to patch in at a moment's notice. A cassette recorder was hooked up to capture the moment.

The final piece of equipment was a 25 watt Operation Flinders VHF pack-set radio patched in to relay Andy Thomas's voice to the seven teams of young people who would be sitting around their camp fires about that time having their dinner. The participants had been pre-warned that something special was about to happen.

The waiting game began. A crowd of interested bystanders started to form, comprising folk from Leigh Creek Hospital, the Station owners, John Shepherd the CEO of the Foundation, and the Operation Flinders Base Camp staff to witness the great occasion.

Even some sheep started to gather, thinking there was food about, I guess, and also the customary sheep dogs. To say that I was tense would be an understatement.

At about 1720 hrs local time the tracking programme showed that MIR was just coming up at about five degrees over the South Australian coast near Port Lincoln. I placed an eager call but there was no answer. Of course I knew and realised that a host of things can

from the area in my spare time, assuming any suitable passes occurred. He suggested that we make an official contact and even try to get Andy Thomas to talk to the participants 'live' if possible, as he would make a great role model for the kids. I agreed that it would be a splendid opportunity and offered my services.

In preparation during the weeks preceding the March exercise, I contacted Andy Thomas aboard MIR on several occasions, using both voice and Packet Radio (data transmission). Andy agreed to the contact and confirmed this to me by live voice contact about two weeks before our exercise. He said that this radio contact would actually be quite an historical one because his great-great-grandfather was a man by the name of Frederick George Waterhouse. This man was the naturalist who had accompanied John McDouall Stuart the explorer in his fifth epic journey from Adelaide to the Northern Territory, attempting to find a route for the overland telegraph in 1861. John McDouall Stuart and his team had stopped at Moolooloo to rest and restock after leaving Adelaide and also for him to recuperate following a horse accident where he was injured. Today a stone monument commemorating the journey of John McDouall Stuart and his team rests just outside the Moolooloo homestead.

Andy Thomas asked me to provide at least three good passes of the Space Station during our time at Moolooloo. Through use of the tracking programme I was able to identify three suitable passes over the Flinders Ranges and I forwarded this information to Andy by Packet Radio. He in turn had to gain approval for a contact to occur by sending requests both to NASA, and also to the Russian Space Centre since it was Russia's space station.

prevent these pre-arranged contacts to occur, such as the astronaut being otherwise engaged, or that approval had not been granted, but hope springs eternal.

I found out later from Andy that, as he was just ascending south of Adelaide, he had announced to eager Adelaide amateurs he was about to have a pre-organised contact and for all to stand-by.

What a privilege!

I placed another call at about 45 degrees and am very glad to say that Andy came up on air, right on time with a fine signal. At that, the anxious crowd, including myself, leapt up in a frenzy of both joy and relief as his very clear voice emanated from the speaker. I almost forgot to start the tape recorder!

**The author with several of his SAPOL colleagues and Andy Thomas. From left to right: Ben VK5BB, Adrian VK5ZBR, Andy Thomas, Wolfe VK5AXN and Rod VK5UDX.**

After some official preamble we moved into the reasons for the contact and Andy spoke of the historical significance of his great-great-grandfather F G Waterhouse travelling with John McDouall Stuart's team and departing Moolooloo Station for the Northern Territory in 1861.

During the live contact Andy kept us abreast of his progress and the magnificent views he was witnessing. I handed the microphone to John Shepherd who told Andy of the Teams now in the field listening to his voice live.

Andy then spoke very eloquently to the participants of his own struggle to become an astronaut and then also a Russian cosmonaut, of having to learn the Russian language, of all the space craft systems being in Russian and of having to pass all the relevant tests in the Russian language.

He said there were times when he thought of quitting, but he pressed on and of course succeeded. He suggested that the listening participants would have their own unique struggle and challenges in their respective lives, but if they have the desire and don't give up that they too could soar like eagles.

The contact lasted about 10 minutes and Andy's voice eventually started to cut out and fade when he was over the Gulf of Carpentaria in the northern regions of Australia. I thanked Andy for his kind gesture of speaking to us all and closed the contact.

We then contacted each Team straight after the pass to gauge the effect. I was pleased to hear mainly positive feedback from most of the Teams and that they thought it was extraordinary that they could hear an astronaut live from space. This unique contact was, to my mind, very worthwhile to the participants in the encouragement that it offered them and I'm sure that they will never forget that day.

The following day, a documentary team from TV Channel 9 Adelaide arrived on a pre-arranged visit to do a segment about Operation Flinders. When they heard about our momentous contact the evening before, they requested if possible that we do a re-enactment for the TV Channel.

Of course, I could not make the space station appear on request. However, we did the next best thing by using the recorded voices from the evening before and setting the whole thing up again at the stone monument, complete with most of the bystanders that we could get hold of at short notice, including some of the sheep and a couple of dogs.

Despite the re-enactment taking place in the morning, it went off well, even to the folk jumping up and down on cue at the appropriate moment. Ah, the magic of television!

The re-enactment footage was shown on Channel 9 Adelaide during a 6 pm news service, and Radio 5AD aired an audio version. Later on, back in Adelaide, I had the privilege of meeting Andy Thomas at a Press Club luncheon held in Adelaide and I'm pleased to say that he remembered both me and the contact.

Some time later I met Andy yet again when the West Torrens Council decided to put on a luncheon for a score of distinguished guests to hear Andy talk of his experiences in space and show some slides. Also invited to that gathering were any amateur radio operators who had made contact with Andy Thomas aboard MIR. Later we met with Andy and there were photo opportunities.

I was pleased and honoured to organise this particular radio contact with Andy Thomas and the MIR Space Station on behalf of the Operation Flinders Foundation and the participants listening that day.

It was not only an honour to be part of radio history, it was also a lot of fun.

ar

What a great story about a piece of amateur radio history.

How about sending in the story of your part in some amateur radio history for publication in your journal, *OTN*.

It needs to be recorded before it simply becomes a part of the forgotten past.

# An introduction to fibre optics and fibre optic communications

**Lloyd Butler VK5BR**
RAOTC member No 1495

**With the National Broadband Network (NBN) well under way, it seemed to be a good time to introduce some basic information on fibre optics and communications using fibre optic cable.**

### Introduction

We have all been attracted to a world of communication connected by electro-magnetic waves which travel through space and by copper wired links. Over the years, there has been a continual effort to develop mediums which can support wider bandwidths to accommodate higher and higher digital bit rates. We have now reached an era where much of those communication requirements are being achieved by fibre optic links. Typical of this, in Australia, is the present roll out of the National Broadband Network. It seemed a good time to introduce, in *OTN*, some basic information about fibre optic cables and how they operate.

Much like electromagnetic waves at microwave frequencies are often confined to a restricted transmission medium in a metal encased waveguide, infrared rays are guided within the silica glass core of a fibre optic cable.

The fact is that the infrared rays are also electromagnetic waves, just like those at microwave frequencies but are shorter in wavelength and higher in frequency. Just as electric and magnetic field patterns are set up in the microwave guide, similar electric and magnetic field patterns are set up in the fibre optic cable. These field patterns are quite complex. However, to explain a few things, we will introduce some theory based on optical fundamentals.

An optical fibre is a single, hair-fine filament drawn from ultra-pure silica glass. The light rays are guided down the centre of the fibre, known as the 'core'. This core is surrounded by an optical material called 'cladding' which traps the light in the core. The core and cladding materials are usually ultra-pure combinations of optical glass or glass and plastic.

Visible light, to which our eyes are sensitive, has a wavelength about 400 nanometres (nm or billionths of a meter) to 700 nm. For cables with glass fibres, wavelengths in the infrared region are used, typically around 850, 1300 and 1550 nm (see Figure 1). These are windows between regions which have high absorption in the core (see Figure 2).

The band around 850 nm was first used for optical fibre communication in the 1970s and early 1980s. It was attractive because of the attenuation profile of fibre of the time but also because of the low cost optical

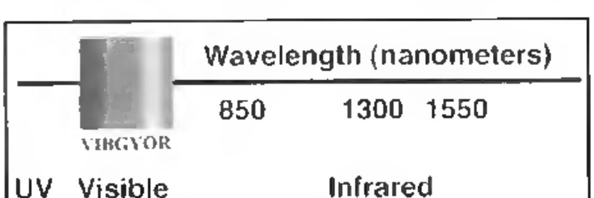



**Figure 1 - Optical Wavelengths.**

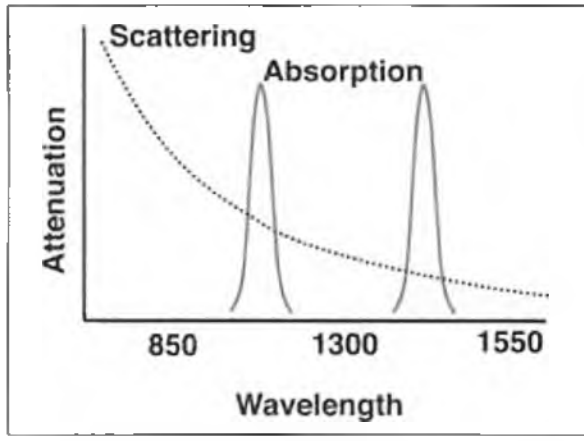



**Figure 2 - Wavelength of high attenuation and selected wavelength windows.**

sources and detectors that were available in this band. It is still used for shorter links but the longer wavelengths are more suitable for long distance communication because of the lower attenuation at these wavelengths. Typical attenuation is around 0.4 db per km for the region around 1300 nm and 0.26 db per km for the region around 1550 nm.

There is also the question of dispersion which will be discussed further on. Distances of 50 to 100 km are achievable for 1300 nm cable and larger distances for 1550 nm cable.

### Some basic optics - refraction and total internal reflection

The following paragraphs recall some basic optical theory of what happens when a ray of light passes from within one material into another of lesser refractive index. In the fibre optic cable the cladding is made with a lesser index than the core and this basic theory is fundamental to understanding how the rays are confined to the core.

The refractive index of a material is a measure of the ratio of the speed of light in a vacuum (or air as an approximation) to its speed in the material.

When light passes from one medium (material) to another it changes speed. This is because the speed of a wave, and the refractive index, is determined by the medium through which it is passing.

As light passes from one transparent medium to another, at an angle to the plane of the junction, it changes speed and bends. (Just think of the wave front of the ray having width. One side of the wave front hits the junction before the other side and the front twists.)

How much this happens depends on the refractive index of the mediums and the angle between the light ray and the line perpendicular (normal) to the surface separating the two mediums (medium/medium interface) (See Figure 3 on next page).

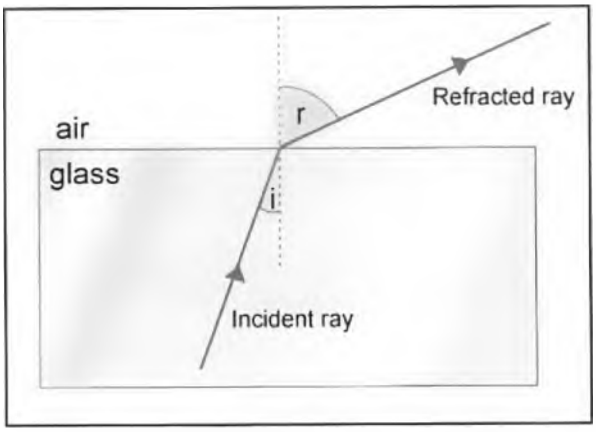



**Figure 3 - Refraction of a light ray passing from glass to air.**

Each medium has a different refractive index. The angle between the light ray and the normal, as it leaves a medium, is called the angle of incidence. The angle between the light ray and the normal as it enters a medium is called the angle of refraction. The amount of bending follows Snell's Law which states:

Ni * Sin(Ai) = Nr * Sin(Ar) ; where

Ni is the refractive index of the medium the light is leaving,

Ai is the incident angle between the light ray and the normal to the medium to medium interface,

Nr is the refractive index of the medium the light is entering, and

Ar is the refractive angle between the light ray and the normal to the medium to medium interface.

In Figure 3, the light ray passes from the glass to the lower refractive index of air, speeds up, and the angle of refraction is larger than the angle of incidence.

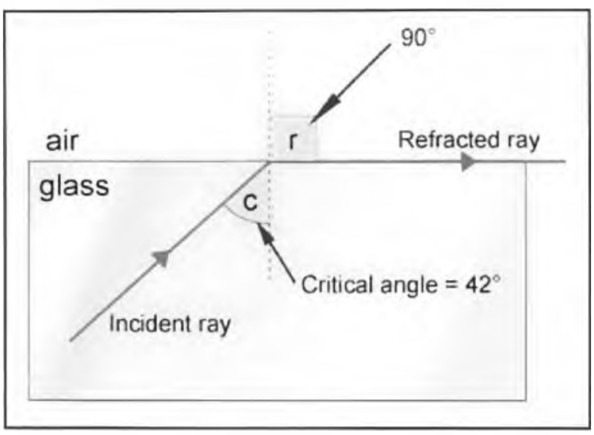



**Figure 4 - Angle of incidence equal to the critical angle. Refracted ray parallel with glass/air interface.**

In Figure 4 the angle of incidence has increased to what is called the critical angle and the refracted angle in now 90 degrees so that the refracted ray is parallel with the X axis.

In Figure 5 the angle of incidence is increased to beyond the critical angle and, instead of a refracted ray, it becomes a reflected ray. This is called total internal reflection.

In the fibre optic cable, the cladding around the core is made with a lower refractive index than the core and the optic ray is confined to the core by reflection in the process shown in Figure 5.

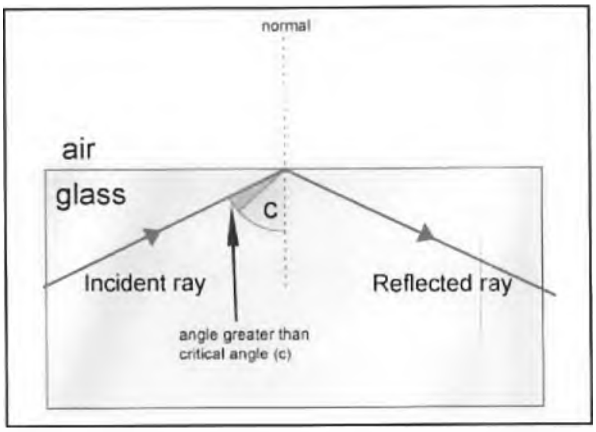



**Figure 5 - Angle of incidence greater than the critical angle. Ray reflected within the glass material**

### Fibre optic cable - modes of operation

Fibre optical cable has been made over the years for several different modes of operation in the communication fields. Three common modes are illustrated in Figure 6. Stepped index multimode fibre has a step down in the refracted index between the core and the cladding, and the optic rays are reflected at the core to cladding junction by the Total Internal Reflection process.

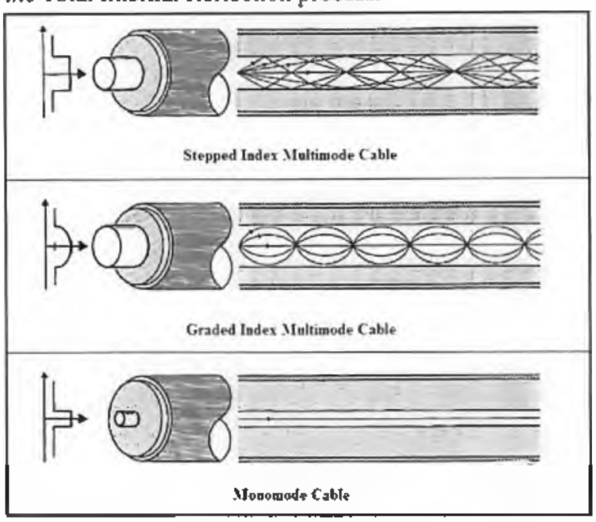



**Figure 6 - Modes of cable operation (profiles of refractive index at left).**

This type of fibre has a core around 50 to 60 microns (1 micron is a millionth of a metre or 1 μm). This allows many different paths or modes of operation as shown in the upper diagram of Figure 6. Overall diameter (core plus cladding) is 125 microns.

Low angle modes travel less distance down the cable than high angle modes. This causes the high angle rays to arrive at a destination later than the low angle rays. This is called time dispersion. Different wavelengths have slightly different indices of refraction causing different arrival times. This is called material dispersion. Dispersion is defined as the arrival of multiple rays at their destination displaced in time with each other.

The dispersion causes waveform distortion and bandwidth limitation. The greater the distance, the more the dispersion, hence multimode fibres are more suitable for shorter distances, such as Local Area Networks or Video Surveillance.

In graded index multimode fibre, the refractive index of the core reduces parabolically from the centre of the core to that of the cladding. The optic rays travel along a helical path instead of the linear path of the stepped index fibre. This is illustrated in the centre diagram of Figure 6. The effect results in a reduction in transit time and a reduction in dispersion. The dimensions of core and cladding are similar to those of the stepped index fibre.

Single mode fibre is a stepped index cable with the core reduced to 8 or 9 microns (only about six times the wavelengths used). Apparently, the electric and magnetic fields around the optic ray (which is an EM wave) require minimum space to travel in the supporting medium. For a given core diameter there is a minimum wavelength where multimode operation can take place. Cut-off wavelength can be defined as the wavelength below which a single mode fibre will act as a multimode fibre. At any wavelength above the cut off wavelength, operation will only be in a single mode.

Typical single mode fibre with the reduced core diameter has a Wavelength Cut-off of 1260 nm. As such it is suitable for the 1300 nm and 1550 nm bands. Dispersion due to the different ray paths is eliminated and with this, and the lower attenuation in these longer wavelength bands, the single mode fibre is more suitable for transmitting high speed data over long distances.

Material dispersion was mentioned earlier, but there is another type of dispersion called WaveGuide Dispersion. Some light rays travel directly in the cladding as well as in the core. As these have different refractive indices, the speeds of the two rays are different and this causes dispersion of the signal at their destination.

As it turns out, at a certain wavelength, Waveguide Dispersion and Material Dispersion cancel. By fine tuning the dimensions of the single mode fibre and the refractive indices, cables have been developed to position this cancellation in either of the long wavelength bands.

### Short wavelength band (first window)

This is the band around 800-900 nm. This was the first band used for optical fibre communication in the 1970s and early 1980s. It was attractive because of a local dip in the attenuation profile (of fibre at the time) but also (mainly) because you can use low cost optical sources and detectors in this band.

### Medium wavelength band (second window)

The second band around 1310 nm came into use in the mid 1980s. This band is attractive today because there is zero dispersion for single-mode fibre. Whilst sources and detectors for this band are more costly than for the short wave band, the fibre attenuation is only about 0.4 dB/km. This is the band in which the majority of long distance communications systems operate today.

### Long wavelength band (third window)

The band between about 1510 nm and 1600 nm has the lowest attenuation available on current optical fibre (about 0.26 dB/km). In addition, optical amplifiers are available which operate in this band. However, it is difficult and expensive to make optical sources and detectors that operate here.

Also, whilst this band has lower attenuation than 1310 nm, the standard 1310 nm fibre, working on this third band, exhibits dispersion. Since the late 1990s, this band is where many new communications systems operate.

### Optical sources to feed fibres

Common light emitters to feed fibre optic waveguides are the LED (Light Emitter Diode) and the LASER diode (Light Amplification by Stimulated Emission of Radiation diode).

LEDs convert an electrical current into light. They are small, low cost and efficient in that they generate little heat. They generate a wide spectrum of wavelengths and a diverging light pattern which makes them suitable for multimode fibres (but not for single mode fibres). For analogue use, their light output is not a linear function of diode current but negative feedback can be applied to reduce harmonic distortion. The step function rise time allows a bandwidth of around 250 MHz. The laser diode is much faster and more suitable for high speed digital operation. Comparison in bandwidths of the two sources is shown in Figure 7.

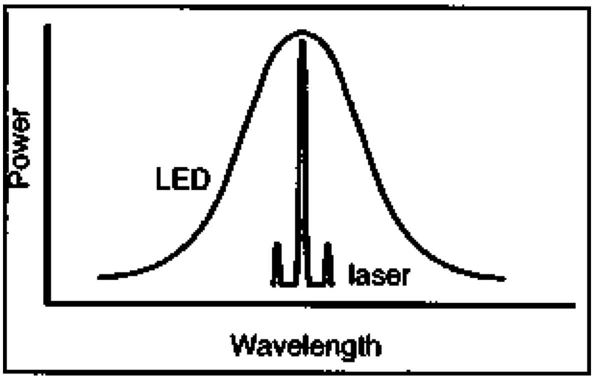



**Figure 7 - Comparative spectrum of laser and LED.**

For those who are familiar with the operation of electronic oscillators, we might consider the laser as an oscillator which operates at a frequency in the vicinity of light waves. Instead of electronic feedback to maintain continuous oscillation, light is amplified and fed back into the optical loop. If the oscillation is continuous, the output is at one frequency, or one light wavelength. If the laser is pulse modulated, the output becomes a band of frequencies centred round a carrier frequency and determined by the wave shape of the pulse.

A laser oscillator may comprise an optical resonator in which light can circulate between two mirrors. Within this resonator loop, there is a gain medium, such as a laser crystal, to amplify the light. The amplification serves to restore light energy which is lost within the circular resonator path and hence continuous oscillation is maintained. The gain medium requires some external supply of energy, either optical pumping or, in the case of semi-conductor lasers, electrical pumping.

There are many examples on the Internet describing different arrangements to produce the laser source. Some lasers use a diffraction grating which provides slots of width equal or less than the desired wavelength. Rays of shorter wavelength pass right through but longer waves are bent at an angle dependent on the wavelength. The larger the wavelength, the greater the angle of deviation and hence the desired wavelength can be selected from the angle of reception. Here the grating can act as a selective filter in the circular feedback path.

A laser diode is an electrically pumped semiconductor laser in which the active laser medium is formed by a p-n junction of a semiconductor diode, similar to that found in a light-emitting diode. The laser diode is the most common type of laser used for fiber optic communications. The laser diode has a typical bandwidth of 10 GHz. The laser source is essential for use with single mode fibres.

### Fibre optic receivers

Receivers use semiconductor detectors to convert optical signals to electrical signals. Silicon photo-diodes are used for 850 nm multimode fibre. Lower noise level Indium gallium arsenide detectors are used for 1300 and 1550 nm fibre.

### Optical time delay reflectometer

For many years, time domain reflectometry has been used on metallic transmission lines to examine their attenuation characteristic and locate impedance anomalies (such as due to faults) in the line system. The instrument used is called a Time Domain Reflectometer (TDR).

Pulses are fed down the line and reflections of these pulses are returned back to the source when a deviation from the line characteristic impedance is encountered. A sample of the initiating pulses, together with the returned pulses, is displayed on a time base. This forms a plot which shows the time difference between the initiating pulses and the return pulses. Knowing the velocity factor of the transmission line and the sweep rate of the display, the distance to the point initiating the return pulse is determined.

An optical time-domain reflectometer (OTDR) makes use of similar principles to characterise the attenuation of a length of optical fibre. Similar to the TDR, optical pulses are fed into the fibre under test. It also extracts, from the same end of the fibre, light that is scattered or reflected back from points along the fibre. The strength of the return pulses is measured and integrated as a function of time, and attenuation plotted as a function of fibre length.

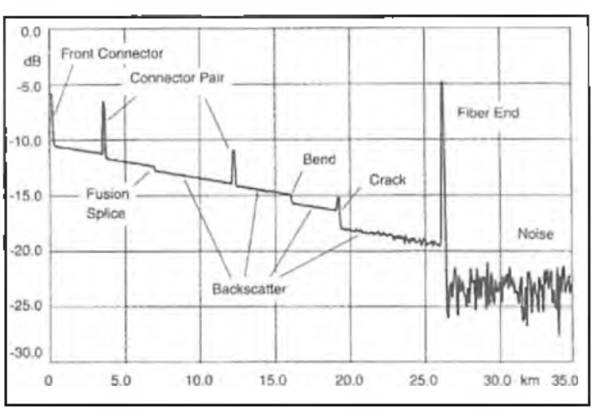



**Figure 8 - Optical time delay reflectometer - typical display.**

Figure 8 shows a typical display of the attenuation verses distance. The attenuation, as measured by the instrument, is derived from the combined loss of the forward pulse and that of the return pulse. No doubt, the instrument would be calibrated to correct for that combined loss.

Figure 8 clearly shows the loss in joining fibre lengths with physical connectors. Fusion splice gives lower loss. Splicing these fibre ends is a technique which has to be learned (Figure 9).

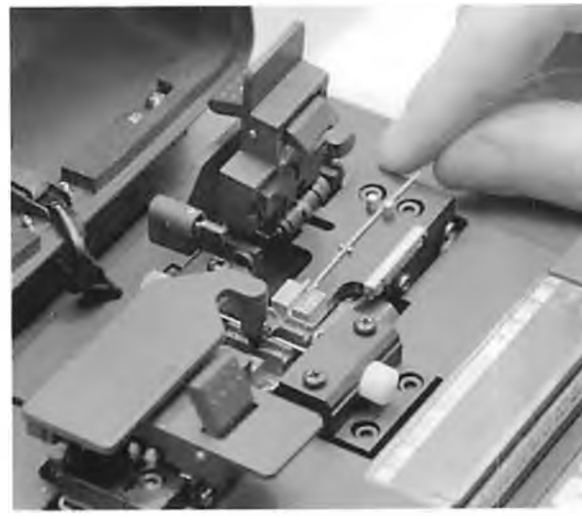


**Figure 9 - Preparing an optical fibre end for splicing with another fibre end.**

### Making fibre optic cable

It is not intended to go into the detail of how the optical fibre is made. But it is interesting to mention that the long length of fine fibre is drawn from a silica glass cylinder called a preform. The preform may be from 1 to 10 cm in diameter and about 1 metre long. It is made up from chemicals in various proportions to fabricate the core and cladding regions for the particular fibre mode. More detail is given in Reference 6.

During the 1980s, Amalgamated Wireless had a laboratory set up in North Ryde to experiment with making the fibre. Around that time I had a need to learn about fibre optics and I had the pleasure of several times visiting that laboratory to see their operation. In more recent years the country seems to have lost the skills to engineer and manufacture many of these techniques.

### Why fibre optics?

Somewhere in this article we should discuss why we might prefer fibre optics to other transmission mediums. But before we answer the question, "Why Fibre Optics?", perhaps we should first answer, "Why Digital encoding?" which has gradually replaced many analogue transmission systems.

Good transmission of pictures by analogue means, such as television, requires a dynamic signal range of about 20 dB. This is a power range between the lowest signal power level and 100 times that for the highest power level. For noise free pictures, the noise level needs to be below the lowest signal level. Also for good quality sound reproduction, the dynamic signal range needs to be 60 dB, or a signal power range between the lowest level and the highest level of a million times. Again the noise level needs to below the lowest signal level.

So, with analogue it's a question of using a transmission system which can support a wide range of signal levels without noise interference at the signal lowest level. However, if we encode steps of the progressive analogue signal into digital form, we transmit only two different levels of signal.

To decode the received digital signal into its original form, we only need to detect between the two levels. The digital system can operate in a transmission system where the noise level would be prohibitive for analogue operation.

The development of modern digital communication systems calls for faster transfer of data, higher digital bit rates and higher bandwidths in the transmission systems used. Systems commonly in use have their own limitations. The copper conductor national telecommunications system, originally designed to connect telephones operating at speech frequencies, has been developed to connect the Internet service.

**An NBN team installing fibre optic cable.**

The ADSL2+ system seems to be limited to downstream bit rates of 20 Mbits per second, or less, much determined by the length of cable pair (and signal attenuation) between the exchange and the consumer. Even so, this is really amazing considering the high attenuation of the normal telephone cable at high frequencies.

Radio connection, which the computer people call 'Wireless', has its limitation in bandwidth and line-of-sight limits. The problem is that, to get sufficient bandwidth approved, the microwave region has to be used. It appears that two bands are commonly in operation, one at 2.4 GHz and one at 5 GHz. Bit rates are limited to around 20 MBits/sec with bandwidths limited to the 20 to 40 MHz region. Communication at microwave frequencies is limited to line-of-sight but the wide range of Internet operation has been enabled because of the connection via the established, extensive, mobile phone network.

The higher in frequency we go, the smaller proportion a given bandwidth is relative to the operating frequency. For the short wavelength of the light ray (or EM wave) travelling down our fibre optic cable, the wide bandwidths needed become a small fraction of the wavelength. Hence, these bandwidths are easily accommodated. NBN Co, at present installing fibre, has made reference to their system operation up to 100 MBits/sec and envisage up to 1000 MBits/sec.

Signal attenuation in the fibre is quite low compared to copper based systems, such as coaxial cable. As discussed earlier, single mode fibres operating at a wavelength of 1550 nanometres have attenuation figures as low as 0.26 db per kilometre.

Another advantage of fibre cable is that it is immune to interference from external electric and magnetic fields. It also has a security advantage in that its signal field is confined to the fibre core and cannot be tapped from induced fields outside of the cable.

In conclusion, the ultimate aim for the National Broadband Network (NBN) is a network of high standard, covering most of the Australian country with a digital communication system which supports very high speed transfer of data. It would be very difficult indeed to achieve the high speed required, had not Optical Fibre Waveguides been developed.

**References**


1. Fibre Optic Communication
http://en.wikipedia.org/wiki/Fiber-optic_communication
2. Guide to Fibre Optics and Premises Cabling - The Fibre Optic Association Inc.
http://www.thefoa.org/tech/fibr-mfg.htm
3. Fibre optic communications tutorial
http://www.radio-electronics.com/info/telecommunications_networks/fiber-fibre-optics/communications-basics-tutorial.php
4. Light Emitting Diode
http://www.fiber-optics.info/articles/light-emitting_diode_led
5. How Fibre Lasers Work
http://www.orc.soton.ac.uk/61.html
6. How are Optic Fibres made?
http://computer.howstuffworks.com/fiber-optic5.htm


ar

**Is your RAOTC membership renewal due this year?**
**Have you checked the address flysheet that came with this issue of *OTN*?**

## RAOTC Perth Luncheons

The Perth RAOTC monthly lunches for members and friends take place at 12 noon on the second Tuesday of each month (except January) at the Bayswater Hotel, Railway Parade, Bayswater.

## Time is running out!

**The story of amateur radio should be told through the eyes of those who participated in it, particularly during the early days.**

**Now is the time to put pen to paper (or fingers to keyboard) and tell your story, be it ever so short a piece of interesting history, otherwise it may be lost for ever!**

**Do it NOW and send it to your journal, *OTN*.**

# Who really invented wireless communication?

**Clive Wallis VK6CSW**
RAOTC member No 1289

**Russia and many eastern European countries[1] recognise 7th May as Radio Day; in Russia its official title is Communication Workers Day while in Bulgaria it is called Radio and Television Workers Day. In the western world we radio amateurs celebrate Marconi Day each year on the Saturday closest to 25th April to mark Marconi's birth on that day in 1874.**

Both events claim to honour the inventor of wireless communication, yet while most of us have a pretty good inkling of Marconi's achievements, few of us know why Russians believe that Popov's claim is just as valid. 7th May 1895 was the day on which Alexander Popov successfully demonstrated his invention.

According to the minutes of the Physics Department of the Russian Physical and Chemical Society, on 7th May 1895 Alexander Stepanovich Popov delivered his paper entitled *On the Relation of Metallic Powders to Electric Oscillations* to the Society at St Petersburg University, together with a practical demonstration of his receiver. As the minutes recorded. "Utilizing the high sensitivity of metal powders to extremely weak electric oscillations, the speaker constructed an instrument designed to indicate rapid oscillations of atmospheric electricity". Popov's demonstration of the practical application of distant electromagnetic signals to operate a bell shook to the core the audience at the Physics Department's meeting.

Alexander Stepanovich Popov.

### Who was Popov and what was the machine he invented?

Alexander Stepanovich Popov was born in the western Russian mining town of Krasnoturinsk in the Ural Mountains on 16th March 1859. His father, a priest, wanted his son to follow in his footsteps and sent him to the Russian Orthodox Seminary School at Yekaterinburg, some 350 km south of their home. However, Alexander became more interested in science and mathematics and, rather than go to Theology School, enrolled at St Petersburg University in 1877 to study physics, graduating with honours in 1882.


**A 1959 stamp printed in Czechoslovakia showing Alexander Popov, 1859-1905.**

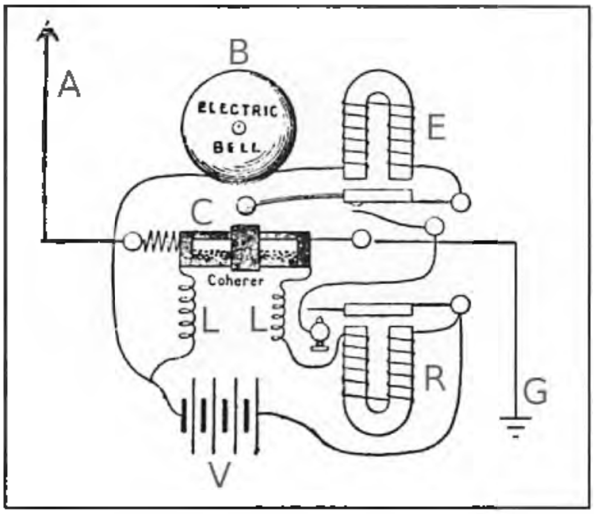
After graduating, he remained at the university as a laboratory assistant, but a year later took up a post as tutor and head of laboratory at the Imperial Russian Navy's Torpedo School on Kotlin Island, a naval base located in the Gulf of Finland just to the west of St Petersburg.

Apart from his teaching duties, Popov pursued other areas of research and it was an investigation into the cause of electrical wire insulation failure on steel ships (which turned out to be a problem with electrical resonance), that led him to further study oscillations of high frequency electrical currents. His interest was further intensified during a visit to the USA to attend the World's Columbian Exposition held in 1893 where he met and conferred with other scientists studying the new field of Hertzian waves.[2]

In 1887 the German physicist Heinrich Rudolf Hertz had conclusively proved the existence of electromagnetic waves as earlier predicted by James Clerk Maxwell's electromagnetic theory of light. On 14th August 1894, at a meeting of the British Association for the Advancement of Science at Oxford University, physicist Oliver Lodge (knighted 1902) gave a memorial lecture on the work of Hertz who had died earlier that year on 1st January.

Lodge set up a demonstration on the quasi optical nature of 'Hertzian waves' (radio waves) and showed their similarity to light and vision, including reflection and transmission. However, rather than using nearby spheres to detect the transmitted impulse as Hertz had done in his famous 1887 experiment, Lodge used a coherer (see sidebar on the next page) to detect the waves at distances of up to 50 metres.

Popov read an article describing Lodge's lecture, realised its significance, and set about designing a more sensitive radio wave receiver that could be used as a lightning detector with the idea of giving advance warning to shipping of approaching electrical storms




**The circuit of Popov's receiver taken from *A History of Wireless Telegraphy* by John Joseph Fahie, published by Dodd, Mead and Co. See the text below for an explanation of how it worked.**

by detecting the electrical impulse radiated by a stroke of lightning.

Popov's receiver was designed to ring an electric bell when the electromagnetic pulse or 'radio noise' from a lightning strike or flash was detected. A long 'aerial' wire was attached to point A. The current induced in the wire by the flash was fed through a resistor to the self-restoring coherer C and then to earth via a grounding wire attached to point G. Chokes L, L at either end of the coherer prevented the RF impulse from being shorted by the battery powered DC circuit. When the lightning impulse caused the coherer to conduct, relay R closed, routing current to the bell's electromagnet E making the bell ring.

The contact beneath the coil E would be 'made' when the armature was relaxed but broken when the armature was attracted towards the coil. Here Popov added an innovative feature. After the striker had struck the bell and broken the energising circuit, the arm would spring back to tap the coherer thereby restoring it to its receptive state, and at the same time reconnect the bell's energising circuit. The bell would ring while ever the flash continued to induce current in the aerial.

**An early Popov receiver with ink recorder to record lightning strikes.**

## The coherer

The coherer is a primitive form of radio signal detector used in the first radio receivers during the wireless telegraphy era at the beginning of the 20th century. Its use in radio was based on the 1890 findings of French physicist Edouard Branly and adapted by other physicists and inventors over the next ten years or more.

The device consists of a tube or capsule containing two electrodes spaced a small distance apart with metal filings in the space between. When a radio frequency signal is applied to the device, the metal particles would cling together or 'cohere', reducing the initial high resistance of the device, thereby allowing an electric current to flow through it. In a receiver, the current would activate a device such as a bell, or a Morse paper tape recorder, to make a record of the received signal.

The metal filings in the coherer remained conductive after the signal (pulse) ended so that the coherer had to be 'decohered' by tapping it with a clapper each time a signal was received, thereby restoring the coherer to its original state.

Coherers remained in widespread use until about 1907, when they were replaced by more sensitive electrolytic and crystal detectors.

***Adapted from Wikipedia, the free encyclopaedia.***

**A metal filings coherer of the type used by Oliver Lodge (British Science Museum).**

Popov gave a full description of his lightning detector when he presented his paper *On the Relation of Metallic Powders to Electric Oscillations* to the Russian Physical and Chemical Society in St Petersburg on 7th May 1895, but there is no evidence that Popov sent any kind of message during the presentation nor did he apply for a patent for his invention. Nevertheless, his paper concluded, "I can express my hope that my apparatus will be applied for signalling at great distances by electric vibrations of high frequency, as soon as there will be invented a more powerful generator of such vibrations".

Later that year, in July, Popov set up his receiver with a siphon recorder (a machine which records magnetic impulses on a paper tape via an inking pen)[3] on the roof of the Institute of Forestry in St Petersburg and was able to detect thunderstorms up to 50 km away. However, there is no evidence Popov sent any type of message on that occasion either.

The first account of communication by Popov was a demonstration in St Petersburg University given the following year on 24th March 1896 to the Physical and Chemical Society, when Russian Morse code signals were received from a spark transmitter some 250 metres distant. Nevertheless, with improved apparatus, by 1898 he achieved ship-to-shore telegraphic communications over a distance of six miles, increasing this to 30 miles just a year later.

**A late 1800s siphon recorder.**

The French scientific instrument maker Eugene Ducretet (1844 - 1915) saw the potential of Popov's work and, in November 1897, succeeded in making a spark transmitter, together with a receiver modelled on Popov's lightning detector. In collaboration with Ernst Roget he began manufacturing wireless telegraphy equipment and became the first person in France to experiment with wireless communication.

**A drawing of Ducretet in 1898, celebrating his 5th November 1898 transmission of radio signals 4 km between the Eiffel Tower and the Panthéon.**

But did Popov's wireless telegraphy system work? The following story speaks for itself.

Hogland (Gogland) is an island in the Gulf of Finland in the eastern Baltic Sea, about 180 km west of St Petersburg. Here, in November 1899, as winter approached, one of the Imperial Russian Navy's newest coastal defence ships the *General Admiral Graf Apraksin* ran aground. It was hoped that she could be salvaged as a similar incident in 1897 had cost the Russian Navy the loss of another battleship, the *Gangut*. The *Apraksin's* crew were ordered to remain aboard to maintain the ship as best they could when the Gulf froze over for the winter.

On Alexander Popov's recommendation, and under his guidance, the ship's crew established a radio station on Hogland Island to maintain communication with the Navy's headquarters at Kronstadt, St Petersburg's main seaport. Wireless messages would be sent from Hogland to Kymi (now called Kotla), some 36 km away on the Finnish coast where another wireless station was to be established, and thence by landline to Kronstadt. Assisting the salvage efforts was the icebreaker *Yermak*.

**The Imperial Russian coast defence ship *General Admiral Graf Apraksin*.**

By the time the *Apraksin* was towed free from the rocks by the *Yermak* at the end of April 1900, 440 official telegraph messages had been handled by the Hogland Island wireless station. Besides the rescue of the *Apraksin's* crew, more than 50 Finnish fishermen, who were stranded on a piece of drift ice in the Gulf of Finland, were saved by the *Yermak* following distress telegrams sent by wireless telegraphy.

In 1901 Alexander Popov was appointed as professor at the Electrotechnical Institute, located at the major Naval base of Odessa, Ukraine, and in 1905 he was elected director of the Institute. Sadly, later that year he became seriously ill and died of a brain haemorrhage on 13th January 1906, precluding any possibility of him further developing his apparatus. In 1967 the Institute was renamed the Odessa National A S Popov Academy of Telecommunications.

So, who really invented radio? My own view is that like so many other things, wireless communication was the logical development of a communications medium based on the work of many other scientists.

As Sir Isaac Newton famously quoted, "If I have seen farther than other men, it is because I have stood on the shoulders of giants". Just as Newton stood on the shoulders of men like da Vinci, Galileo and Keppler, so Marconi and Popov stood on the shoulders of men like Faraday, Maxwell and Hertz. Both Marconi and Popov realised the possibilities of electromagnetic wireless communication and had both the entrepreneurial skills and scientific background to turn a scientific curiosity into a practical system, but neither truly invented radio communication.

Maybe we should take a wider view of the world and celebrate both Radio Day and Marconi Day!

**Notes**

1. Generally speaking, the 15 countries which composed the former USSR.
2. Also known as the 1893 Chicago World Fair, held to celebrate the 400th anniversary of Columbus' discovery of America, albeit a year late!
3. A siphon recorder was a sensitive recording instrument that could replace a mirror galvanometer to indicate the flow of a small electric current. A mirror galvanometer was an electromechanical instrument that indicated that it had sensed an electric current by deflecting a light beam with a mirror, so a permanent record of the signals was not possible apart from what the operator interpreted and wrote down. Although the output from the siphon recorder still required interpretation, it did create a permanent record in the form of an ink line on paper using a thin glass pen.

**ar**

# The great balloon experiment

'Anon'

**The name and callsign of the author have been supplied but not published for possibly obvious reasons. Did the events in this tale happen? If so, at the time the University student members of VK5UA thought it great fun. It seems to be a remarkably detailed story of some of the antics that a small group of ex one metre band exponents may have indulged in when arguably they were old enough to have known better. I am informed that the main miscreants have seen the article and agree that, if it did happen, it is accurate within the capacity of their fading memories.**

There are some stories that must be told for they are part of the history of amateur radio in Australia; however, the names in this instance have been changed to protect the guilty! The author is neither verifying nor denying the events chronicled here. Treat it as entertainment if you like.

I suppose the University of Adelaide Radio Club VK5UA of the 1960s should accept some corporate responsibility for what follows. Maybe that is why it is currently defunct or inactive as the callsign is now allocated to a private person. It appears that Uni students now spend their time studying; a pity really, so many youthful opportunities lost!

Unfortunately, this narration has no photos, mostly because we were poor university students at the time, there were few cameras and film was expensive, but also because we didn't think that we would be making history. Thankfully, we did not and you'll learn later why this was a good thing.

Here's the story.

It was a dark and stormy night (I'm told all stories should start with this) when, at an informal[1] meeting of VK5UA club members, Morrie, now a respected astronomer, suggested that, in view of the club's great skills in tracking hidden transmitters on the one metre band, we should endeavour to track a moving target, perhaps a balloon.

The idea was met with great enthusiasm, so it was decided to break the project into manageable tasks. Essentially there were four major components - the balloon, the transmitter, the transmitter recovery device and the tracking system. On reflection there were two important matters not addressed, but more on that later.

Morrie took on the task of building the transmitter recovery system as the club had decreed that such a valuable piece of equipment as a transistorised transmitter should not be lost. The whole setup should be lightweight, reliable and cheap. Morrie took on the task with great inventiveness and enthusiasm, and he quickly came up with a recovery solution.

Remember that this was before the days of microprocessors and fancy mechanical bits like servos to accompany them. At the time we were mostly messing with valves and large and heavy components powered from high voltages.

A travelling alarm clock was requisitioned from Morrie's home as was a mouse trap, a square of bed sheet and string. The latter two items were used to make a parachute about a metre in diameter. The general principle was that the parachute would be suspended from a balloon via the release mechanism; in turn the transmitter would be suspended from the parachute using one side of the dipole antenna.

The second half of the dipole would dangle below the transmitter.

The release of the payload was determined by the alarm which was to be set for thirty minutes after launch. As the alarm sounded, the winder of the alarm would rotate thus shortening a length of string which in turn tugged on the trigger of the mouse trap causing it to fire. The spring of the trap would open releasing the parachute allowing the payload to drift gently to earth.

Club members were impressed but no experiment should go untested so it was decided that a field check should be carried out. The Uni Radio Club was located at the very top of the Engineering Building. It was one of the highest buildings at the University but the roof, apart from the Electrical Engineering Prof's large circular copper platform for his antenna experiments, was sloping and there was no access to the edge. Our club's window, although high, overlooked another building. Not a suitable launch site.

One of the club members, who shall be called James in this tale, was able, although unapproved, to access the roof of the Zoology Building. The building was about eight storeys high and deemed to be suitable as it had an open area to the west, and a flat roof. Access wasn't normally available to the public or the student body; however, in those peaceful 'pre security everywhere' days, it was just a matter of choosing the right time to zip up the stairs to the roof; fortunately, we were young and fit in those days.

We had chosen a beautiful sunny day with no wind. Morrie had remembered to bring a broom stick and the plan was to use this to hold the works away from the building and into free air. We had a dummy payload made up and this was put in position below the parachute. I should mention that this side of the Zoology building overlooked an area where many students would sit to read, observe the passing opposite gender or perhaps eat a leisurely lunch.

The alarm was wound and set for five minutes and the broom stick with its load was suspended over the edge as far as Morrie could reach. The package was ready, would it work?

The alarm sounded, the winder gathered the string, the students below looked up at the sound and Peter the 'payload fetcher' readied himself on the lawn below. The mouse trap snapped and the payload was released and it drifted gracefully down to the open area.

Peter swept it up to the cheers of the crowd. The test was a success!

The trip down the stairs with the broomstick was made faster than the climb but we needn't have bothered as no one asked what we were doing. It all comes down to looking innocent and in any case, compared with what the Arts Students got up to, it was quite a minor stunt.

In the meantime James started work on the transmitter. It was decided that the best band was six metres. Several of the club members had converters for 6 m and these fed into the broadcast band receivers in their (or their dad's) car. James had a 52.5 MHz miniature crystal and built a simple one transistor oscillator using a 2N706A purchased for 15 cents from Robbies Disposal store at Port Adelaide.

When oscillating on 52.5 MHz the transmitter drew about 10 mA from a 9 V battery. The RF was coupled into a half wave wire antenna via two turns around the collector tank coil. To simplify identification a simple square wave oscillator was wired to switch the oscillator off and on at one second intervals. Testing in the Adelaide parklands proved that the signal could be heard for about half a mile and could be easily found by our trackers. We reasoned that it would be readily heard when in the air. The transmitter and its battery were placed in a small cardboard box - the payload was ready.

The balloon itself now needed to be obtained or made. In those days it was not possible to access weather balloons as is now the case. We also didn't have access to helium. Fortunately, we did have access to hydrogen or, to be more precise, a mixture of hydrogen, carbon monoxide, methane and small amounts of other gases. You guessed it - coal gas. This was before the days of natural gas which is predominantly methane and more dense than air. The key point being that coal gas is lighter than air, admittedly not as good a lift as pure hydrogen or helium, but not bad.

Firstly, the balloon had to be constructed and to do this we were able to track down a mattress manufacturer not far from Greenhill Road. This company used plastic tubing to package mattresses. Readers would be aware of the plastic packaging around mattresses and so have an idea of its dimensions. Laid flat on the ground the tube was just over a metre across. In those days there were no holes punched in the plastic to stop children being suffocated.

To determine the lift required, we calculated, knowing the density of coal gas, the weight of the plastic and the weight of the payload, what size would be required. We determined that a length of about six metres should be satisfactory.

Came the big day and Morrie's house was to be the launch site as it was located in a northern suburb of Adelaide. The club was divided into three teams. One portable station was established at Windy Point to the south of Adelaide while another was positioned on Mt Lofty. The launch team assembled at Morrie's home where communication was established with the tracking teams via 53.1 MHz. As an aside, most of us used Pye Reporters - ex taxi radios and easily modified for a few watts on our 6 m band with amplitude modulation.

Before we began preparations in earnest, Morrie insisted we sample his mead - it had been brewing for some weeks and was very pleasant. As a bonus it helped jolly us along as we did need to build our confidence because the next process was dangerous and 'ahem', a little illegal. Please do not try this at home! In any case, it won't work anymore!

The 'balloon to be' was prepared. The far end of the mattress tube was gathered together and tied off to seal the top. The bottom of the tube was also gathered together ready for tying off and as much air as possible was expelled from the mattress tube by walking up and down on the plastic. Morrie's backyard water hose was requisitioned and cleared of water.

Next the gas supply had to be set up. This was arranged by disconnecting the house supply at the meter and, with a little manipulation of pipes, was fed to one end of the garden hose. The hose snaked its way to the back lawn where everything was laid out ready for the filling operation. The hose nozzle was inserted into the base of the balloon which was tied tightly. The filling took well over an hour and we would like to retrospectively thank the SA Gas Company for their excellent gas.

The balloon rose nicely after the hose was removed and the end tied off. Next, the transmitter was switched on and the whole assembly was attached, the mouse trap set, the alarm and clock wound and the alarm set for 30 minutes hence.

The trackers at Windy Point and Mt Lofty were advised via 53.1 MHz that launch was imminent.

A ladder had been placed against the house and Morrie was to have the honour of performing the launch. He climbed the ladder and stood on the roof while the balloon was passed to him somewhat gingerly because it was quite awkward to handle and wanted to move around in the gentle breeze. Pause a moment to consider a six metre long plastic sausage filled with gas below which is suspended an alarm clock, mouse trap, a parachute, and a transmitter payload.

The time of launch approached, the sausage waving in the air anxious to be gone, the payload dangling below, Morrie trying hard not to fall off the roof.

"Let it go, Morrie," we all shouted and with a flourish Morrie did.

Unfortunately, as Morrie released the balloon, a gust of wind came up and, instead of climbing majestically into the air as planned, it was blown into the neighbour's chimney. I say 'unfortunately' because the payload hit the neighbour's TV aerial on the chimney and fired the mouse trap which did its job and dropped the parachute and transmitter. The balloon, relieved of its load, except for the alarm clock, shot into the sky, tumbling end over end and was never seen again.

We had achieved the shortest flight of a transmitter ever, even outdoing some of NASA's early efforts with rockets. In addition to being the shortest it may have been the first unlicensed radio amateur balloon flight in South Australia. Are there any other contenders for the title?

The group saw the funny side of it, but it might not have been. A six metre sausage is not a small object to be wandering about the sky and we were a little worried it might bring down one of those new fangled jet aeroplanes by being sucked into an air intake.

In retrospect it was a stupid experiment but we were young and didn't think of the consequences. We hadn't notified the airport or checked aircraft arrivals/departures, and secondly we hadn't fully considered the possibility of a spark from the plastic rubbing together. With residual air, the coal gas and a spark would have created a nasty explosion or fire. We should have been more careful but we got lucky.

Of course we didn't get the alarm clock back so, if anyone ever found an alarm clock attached to a rather large plastic sausage would you please post it to the Editor of *OTN* as he knows who wrote this article and it would be nice to return it to Morrie.

**Footnote**

1. In my years with the radio club we never had a formal meeting.

ar

# My early days in amateur radio and business (part 2)

**Bruce Plowman VK3QC**
RAOTC member No 1448

**Readers will recall that in Part 1 of *My early days in amateur radio and business*, published in the last issue of *OTN*, I had left Bendigo and moved to Terang in South Western Victoria, made contact with my future 'Boss' Major Conway, and together we formed a new Unit of the Volunteer Defence Corp, based in Camperdown, serving South Western Victoria.**

It was at his suggestion we should allow a month for me to establish a business, and get myself settled in. One snag I had not anticipated was one of age. Because I was under the age of 21, there were certain things I could not legally do, so I asked a friend in Terang, whom I had previously met, as to whom he would recommend as a dependable Solicitor and also an Accountant. For the Solicitor (one of three in the town of 2,500 people) he recommended Mr David Trickett, and for an Accountant, Mr Rob Eastwood.

They were both very good choices and I retained them professionally, and later as friends, for all of the years I spent in Terang. I empowered David Trickett to act as my Attorney who could 'make legal' anything I wanted to do to register and legally operate a business. He suggested an annual retainer of £50 ($100) with any extra 'costs' to be charged as separate items.

The first things we did were to notify the appropriate Government Departments such as Tax, Postal, Shire Council, PMG, Vehicle Registration, Bank accounts using the National Bank of Australia (with which I banked for the next 62 years), Life and Business Insurance, and all the other important and trivial matters as they arose.

Mr Eastwood was very helpful for advice on handling money and general business practices, and he too agreed on the same £50 per annum retainer. He set up a simple book-keeping system and, as my business grew, found a lady 25 years my senior who was a widow from WWI (or as it was always referred to up until about 1940, The Great War), Muriel Gray, who had office experience, as my book-keeper, and who was able at times to look after the shop.

He also warned me that he was an officer de-facto of the Australian Tax Office and, as such, anything I told him, or he found in the course of business, he had to reveal to the tax office if they specifically asked for it. I got that message, and I have observed it ever since. His words were, "Never tell any authority, voluntarily, ANYTHING they do not ask about, and answer truthfully anything they DO ask you." He also told me that anything I wished to discuss with him on a 'what if' basis would remain confidential.

**Inside the author's Radio Sales and Service and Electrical Appliances store in High Street, Terang - 1945 to 1950.**

At this point I should perhaps make more obvious my operations from two separate shops. One Johnston Court, on the north side of the High Street, was my start of trade point and I used it for the first couple of years until my Solicitor, David Tricket, told me he had been talking to his landlord about offering me a deal to move across the street which was very wide with an elm tree lined centre strip down the middle and on the south side a quite wide matching one-way street which would give me plenty of room to park and move my and my customer's vehicles. It would also give more prominence to my presence!

I cannot remember the landlord's name, but he was a very co-operative and pleasant man. He came up with a proposition that I could take, as soon as I wished, a deal where he would give me the keys to the shop and from that time I could have full access and arrange external sign writing and painting to his approval, as well as the shop front windows' signs and lighting. I could also proceed with any interior fittings which I wanted installed.

This would be on a rent-free basis for a period of three months, when I would start paying rent on a three year contract of £12 ($24) per month. This was what he had suggested to David Trickett who already, as a tenant, occupied one third of the total width of the shop and was already my retained Solicitor.

I discussed the deal with Rob Eastwood, my Accountant, who already was aware of the deal and he strongly advised me to accept. Which I did!

Now let us move on from my business activities to the VDC. The VDC (Volunteer Defence Corps) presented a lot of challenges and we, Conway and I, were quite happy with the co-operation and relaxed treatment we received from Headquarters. We were given quite a number of powers, including requesting help from the Victoria Police and also Military Police. We had powers of arrest, search, interrogation, seizure of goods, etc, and traffic control.

We were also expected to organise the formation of local district groups to arrange week-end bivouacs, or meetings to encourage farmers and townspeople to work together on projects. The biggest task we were given was the setting up of Coast Watch 'Posts' along the coast from the western side of Cape Otway to Warrnambool on what is now the western end of the Great Ocean Road.

There was nothing great about it then. It was largely a gravel track with huge potholes, with very little habitation. The coast was, with the exception of some small coves, rugged cliffs varying in height from 30 to 250 feet (9 to 76 m), and constantly pounded by the Southern Ocean. The prevailing wind was from the south west and it was the only place where I have seen horizontal rain.

Emphasis was placed on night time surveillance for any boats, and daytime of boats and aircraft, and every person we saw, unless they were known to our 'spotters' had to be questioned and notes taken of their activities. Of course we had no radio communication so the posts, which varied from 2 to 5 miles (3.2 to 8 km) apart, had to be connected by telephones. We had to beg, borrow, or 'acquire' any hand ringing phones we could, and put in a single wire telephone system using earth return.

We later added to the furthest away posts new galvanised steel fencing wire which we 'swiped' from an Army truck! Nothing was easy. We begged farmers in the surrounding areas for galvanised fencing wire, and posts of any type, shape or size. The wire was kept as close to ground as practical to make it less visible from the sea. The PMG were not interested in installing a 'temporary' phone system, but were agreeable to connecting the western end of our phone system to their phone exchange at Timboon. We experimented with various materials for insulators and finally settled on beer bottles.

We would wind a couple of turns of knitting wool around the bottle about one third of the height from the top just below where the tops of the parallel bodies started to taper into a neck. The wool was wetted with kerosene which was lit with a match and, holding the bottle near the bottom end, the bottle was slowly rotated until the flame started to peter out. The bottle was then plunged vertically into cold water. When the cold water reached the burning wool, the bottle would crack off with an almost perfect 'cut'.

A wire loop of one turn of thin galvanised wire was made around the lower end of the cut top, with three small loops arranged around the taper of the neck of the bottle about three inches below the top. This allowed the, now insulator, to be put on the top of almost any sized pole or pipe and wired down from the loops to another similar wire band near the top of the post (or screws at one third of the circumference of the pole). The main phone wire was made into a upside down U shape and thin wire wound on the cap groove at the top of the insulator would be twisted around the main wire a few times.

Bottles soon became hard to find. Some of the bottle cuttings would fail because of large cracks appearing in the top section of the cut, so instead of discarding the bottle the very top would be cut off using the wool and fire method, and it would make a strain insulator by putting one wire around the cap groove and the other through the outlet so it gave a small amount of glass insulation between the loops.

Two such insulators would be used in series at points in the line where a change of direction made the top arrangement impractical, The straining wires would be erected as a broad 'V' shape (looking from the top) and the main wire made a third guy (a bit like an antenna pole with two guy wires pulling outward, and the antenna itself making a third guy, pulling horizontally).

There were lots of compromises in this style of construction as, for the least signal loss, larger diameter wire was preferred, but that in itself formed a problem because of its weight, and consequent sag. Smaller diameter wire was much to be preferred for weight and flexibility. Unfortunately, such wire was very hard to find.

At one stage during the war the PMG made changes to the type of insulator they used on their normal phone systems, so we were able to acquire some of the older 'wooden peg' insulators. These rather large glazed pottery insulators had an internal coarse thread and were screwed on to wooden rod mandrels that had a matching thread. The other end of these mandrels was slightly conical and could be hammered into a one inch hole drilled into posts (or wooden cross arms).

The real challenge came due to the very low signal levels in the output of the phones and lack of sensitivity on the input of these phones. Ultimately we persuaded some of our spotters to learn Morse code and we could use these along the line to relay critical yes/no messages. The terminal for this phone system was at Timboon Post Office. From there on we had only minor communication problems into Camperdown and on to Melbourne. Bear in mind that there was no power line along the road and no really useful way of obtaining power to use repeaters.

The phones we were using normally operated on two large 1.5 volt cells in series, giving 3 volts. We were able to get away with using an additional cell or two in the further out phones to give some lift in signal strength.

All of the phones operated in parallel across the line. So we experimented at one stage by all phones answering a ring and then, if needed, drop off those that were not needed by asking them to 'hang up'. The originating operator would verbally pass on his message and if the first phone down the line could read him OK, would ask him to hang up, and he would then give two short but separate rings as a signal for all others to pick up, and the furthest from him (away from Timboon) would in turn relay the message, and so on.

Minimal speech was used, repeated two or three times until the message 'got through', and pre-arranged words were used, such as "number three nothing to report" or "number three has traffic". As all of the spotters travelled out to their posts from home, and as they always worked in pairs, if things were of an urgent nature one of them would take the car and head back to Timboon or some phone he could get in from, leave the message, and go back to his 'spot'.

On lousy roads, long distances at night, and more often than not rain, with blackout lights, it was very hazardous. The improvisations made by these Spotters (mostly farmers) and what they gave to the job, and all at their own expense, has never been recognised and rewarded.

We had many false alarms, such as sightings of lights at sea which were reflections of stars on waves, or at night 'fast travelling aircraft' which were shooting stars, and noises which were never traced, added to the almost constant wave and wind noises. Plus having mates taking it in turn to snatch an hour of sleep, then travel home and go to work on their farms or shops was a real problem. We were mostly able to staff these posts on a basis of one day and one night per week, as a maximum for each Spotter. The spotters themselves would get together and discuss their problems and find solutions, almost entirely without those of us 'back at base' having to intrude.

I would go out, sometimes with a Camperdown or Terang police officer as a 'mate', at least once per week on a night run, and another as a day trip, to the furthest out Post and have a chat with the guys, offer them smokes or sweets or fruit, never booze, and take their problems in hand.

We did have a few personality problems, but after a couple of group meetings we were able to get them to openly discuss swapping around so it was not often that two clashing mates were together.

We had very few real problems to investigate, and eventually it was decided that the night operations were not worth the cost of inconvenience to the spotters and their families. The region we were guarding was mostly uninhabited, and at night it would have been virtually impossible for anyone to come ashore without land based help as the steep cliffs, heavy seas, and no reference features in the landscape meant intruders would simply not be able to land. So that was that!

Except that nine months later the Japs attacked Pearl Harbour! Within a few weeks, Coast Watch stations were set up in New Guinea and Islands in those areas. We were then told by HQ that they wanted the night operations restored. As we had continued the day time service, it was fairly easy to re-start the night posts. However, we did decide to ask for senior staff to visit us at Camperdown to inspect our operations, and HQ agreed. They suggested that it might be a nice gesture for several Senior Officers to come on one weekend and meet with, and address, our whole operation, which by now numbered over 100 personnel.

We arranged for a local hotel in Camperdown to supply overnight accommodation and to put on a dinner on the Saturday night; and also, for later in the evening, a lounge room so we could have a meeting at Staff level. All of the expenses for these visits by Staff were readily met by Headquarters, and it was a good investment in increased interest and appreciation by the ordinary 'troops'.

There was one very interesting and spooky job I had to do. On one of my rare nights at home with family, at about 8.00 pm in mid-winter, I had a visit from Constable Jack Young from the Terang Police Station. He had received a call from the Police Headquarters in Melbourne which had been initiated by the Geelong Police of reported lights out to and from a ship off the North West part of Cape Otway, which was well east of our eastern boundary.

As we had many times been assisted by Jack when we wanted help, and as at that time his only Terang off-sider was away on holidays, and as Jack had been told to investigate, I offered to take him out to see what was going on.

Fortunately, it was one of the rare, clear sky, starry nights although it was very cold. The description given was of a small house in a gully with vague information that there was a German-born but unnaturalised man named Otto Rensch living in the house with his aged invalid mother. When we were able to discern the house and make a very quiet approach we found there was a car entrance on the east side of the house, but no car.

There was a very dim light in a room with a fire burning, and a person sitting in a wicker chair. Not wanting to unnecessarily disturb the old lady we went around the side of the house away from the car area and found there was another building behind and parallel but about our height higher than the house; this meant that someone in the shed would have been able to look out to sea over the top of the house.

**The repair workbench at the author's Radio Sales and Service and Electrical Appliances store in Terang immediately post WWII.**

There was a set of steps up to the shed. We walked around the back of the shed and Jack told me he was brushing against a thin wire at his face level. The only light we had apart from the stars was two small flashlights with hooded lenses.This wire came from the eaves of the shed and went up-hill and it was obviously an antenna of some sort.

Looking into the window, which had spider webs inside, there appeared to be a carpenter's type bench with the centre dropped about two inches (5 cm) length-ways. We quietly went around the rest of the shed down to the floor level and went in the door. Jack stayed outside to keep watch while I went in. It was obviously a carpenter's shed.

I checked around but could not readily see the copper wire and I tried lifting the bench top from one end. It did open but instead of having hinges it just lifted off. Inside was a transmitter with a set of headphones and under the bench were two 12 volt batteries. The radio was a factory made military type Bosch with headphones of good quality. There were also books and note pads, and a very nice Morse key. There were also two signalling lamps. As we did not want to disturb the old lady we quietly left and when we arrived back I phoned our headquarters in Melbourne with details. We made it back to Terang in time for breakfast! Neither Jack nor I ever heard anything more about Otto or his fate!!!

By this time, after many months of operations, Major Conway had done a great job of getting to know some of the 'Squatocracy' (owners and/or managers of several of the larger Western District Station properties), who were delighted to feel that they had a part to play in Home Defence.

Especially the Manifold Family who between them owned three properties, which were very large (averaging 25,000 acres - 10,117 hectares) and were well equipped with trucks, tractors and fire fighting gear, etc.

When I had the time to spare from the Coast Watch, I would make an appointment by phone to visit an owner or manager who would accompany me to assess the layout and functions of their properties, and list the equipment we may find useful.

We did this also with several other properties. The idea was to know what facilities could be made available to us for accommodation of people who may have to be evacuated, and housed and fed, in the event of hostilities. Particularly children and their mothers from Melbourne and Geelong, etc.


**Another view inside the author's Radio Sales and Service and Electrical Appliances store in High Street, Terang - 1945 to 1950.**

Most of them had large shearing sheds which were well equipped, most with power, water, cooking and toilets. These contacts, and in my case a couple of friendships, were to be very helpful later in the war years when I was involved in Bush Fire Services, and communication. We invited these people (men only at this stage) to come to the Dinner and meet the Army Brass (high ranking officers).

I was by this time very heavily involved in my business which I needed for my own living. This, along with the Coast Watch, took all of every weekend and week nights. I had also moved into a Boarding House where I was very well treated by Mrs Purdy, the lady who ran it in her large private house in Terang.

She was very understanding of my ridiculous hours. I often was away all night, but whenever I came 'home' there was always a hot meal on her Aga stove and in winter a hot water bottle in my bed! She was also well aware of my stomach problems and provided me with suitable food.

We had set the date for the visit of the Army Officers to Camperdown one month ahead of the time we decided to have the meeting. This gave us time on weekends to organise 'events' on two properties, and to be able to have bivouacs with our 'troops' as rehearsals on the Sunday after the dinner.

Conway and I were still the only 'official' personnel of our Corps, but we had gathered around us about 20 devotees who were our dependable 'troop leaders'. They in turn were recognised by being invited to come along on Wednesday nights at the Drill Hall and instruct the other members and, when possible, we also invited some of them, one at a time, to come on our (my) calls along the Coast Watch. Some of them were Coast Watch Members.

We had decided early in the setting up of the Corps that we would only use rank and formality at the opening and closing of each parade. The Army did insist, though, that when in uniform dress we were always addressed by our rank. I never did get used to being Sergeant Plowman! I was by far the youngest member of the group in my early 20s. The next one up in age was 46 years old.

When the Party from HQ arrived on the Saturday morning in two Army trucks, we both laughed at the need for two three-tonners with a frame on the tray and a khaki canopy, to bring five officers, their drivers and one orderly! The weekend went very well. We had a light lunch in the Drill Hall provided by the 'Ladies' to officers in uniform, and three Sergeants (myself and the two drivers).

By early afternoon we headed out to Warrnambool and from there travelled more or less along the coastline to Port Campbell where we had a group of three 'privates' who lived there meet us and show our visitors around. We met the one truck (most of the people had come in from Camperdown) at Port Campbell with its driver and he went inland to Timboon, while our 'locals' used their cars to take most of the officers. I took a Captain who was a Signals man in my panel van.

From Port Campbell we drove east along the coast, stopping at points of interest (militarily) and calling on our Watch points, which were of course manned as usual, stopping several times in secluded spots for a 'pit stop' so the gentry could be more comfortable, and part way along we stopped for tea and sandwiches which the wife of one of the Port Campbell members had prepared.

But no grog! Conway and I had several times looked at the subject of 'hospitality' but decided that the only place we would permit alcohol would be in private homes, if offered, and Licensed Premises such as Hotels or BYO. We turned around at the end of our run and went back to Timboon where the Postmaster who, of course, was 'one of us', had arranged for his assistant to come to work (it was a Saturday). The post office had two telephonists who worked 50 hour weeks, taking over from each other at shift's end. One of these ladies, Sue, was a helper on the counter during 'open' hours and also did the bookwork. Sue was also a very good telegraphist and she shared this work with the Postmaster.

All of this up to now was totally new to all of the officers, except for the Captain who had run his own radio/electrical business in Melbourne before the war. They were really impressed at all of our activities. We left Timboon and stopped at Cobden, where a friend of mine, Colin George, lived. He was a solicitor and a Shire Councillor, and he was very involved in the Bush Fire Brigades Association (the forerunner of the CFA) as the State Secretary. I especially wanted the 'troops' to meet Colin, as he had a lot of influence in the district. Colin was a keen camper, and he had offered all of his camp gear to the VDC SW Branch on loan for the duration; it was to go to Camperdown so the second truck was put to good use!

We returned the visitors to their hotel for a nap and a freshen up, and met them at the hotel at 7.30 pm for dinner. We started our meeting at about 8.30 pm and talked until midnight, at which time under the liquor laws of the time, all non-guests of the hotels had to leave. On the Sunday morning we again met the visitors at their hotel for breakfast, and went to the Drill Hall where our gang had prepared the 'stuff' for our visit to Bortcoi Station where we showed off our gang to the visitors, starting off with a parade and an 'Inspection' by the two most senior of the officers.

On the trip to Bortcoi we showed them what were, for us, 'Strategic Places' such as rail yards and loading facilities, sources of water, bridges both road and rail, etc, which seemed to impress our visitors and showed them we were doing our job.

At this point I would like to mention the ladies (including daughters) of our members who not only made it possible for the men to leave their homes and properties, but also actively gave of their time and effort in supplying food, water, sandwiches and cakes, etc, and in some cases drivers to get the men to 'events' in which we were involved. ar

# Reminiscences of National Service as a trainee Telegraphist in the RAN 60 years ago

**Bill Roper VK3BR**
RAOTC member No 978

**National Service in Australia in the 1950s was a product of the post-WWII global and regional conflicts facing Australia. These began with the Berlin blockade by the Soviet Union in 1948, the first Arab-Israeli war the same year, Communist insurgencies in Malaya and Vietnam, and Communist North Korea's invasion of South Korea in 1950. It was a time when the threat of nuclear war hung over the entire world.**

When recruiting for the regular Armed Services proved insufficient, the Government of the time, led by Bob Menzies, with bi-partisan political support, re-introduced conscription which had ended in 1945. In the first National Service scheme between 1951 and 1959, all young men aged 18 were called up for training in the Navy, Army and Air Force. A total of 227,000 served in 52 intakes of which a total of 6,862 did their training in the Royal Australian Navy (RAN). For every three young men who served in the Navy, 10 served in the Air Force and 87 in the Army.

So it came about that in July 1955, at the tender age of 19 years and three months, I found myself fronting up for 176 days of standard recruit training in the Navy to be followed by four years in the Naval Reserve.

At the time of writing this article in 2015, that was 60 years ago, just 40 years after Gallipoli, 10 years after the end of WWII and just two years after the signing of the uneasy armistice in the Korean war.

I first reported to the RAN training establishment HMAS *Lonsdale* at Port Melbourne (since closed down and now the site of a luxury high-rise waterfront apartment complex which bears the name 'HMAS'). There, along with a large group of similarly somewhat bewildered looking youths, I submitted to a roll call and

The author in his No 2 work uniform at HMAS *Cerberus* in July 1955.

A Navy Morse key 'liberated' from the junk box at the training school at HMAS *Cerberus* in 1955. The broken knob skirt needed to be replaced. It still works very well.

a basic lunch before being loaded on to one of a convoy of Navy buses and thence a steam train to the shores of Westernport Bay where lay the RAN's primary training establishment, HMAS *Cerberus*.

Over the next few days we were kitted out with uniforms, boots, shirts, underwear, etc - the works; and of course our bedding including hammocks. Yes, hammocks! Learning to string a hammock up to the seven foot (2.1 m) high rails correctly and then to climb in without immediately falling out, and then eventually to stay in and fall asleep without falling out, oh boy, was that fun!

Morning reveille was at 6.00 am. If you were still in your hammock at 6.10 am one of the duty watch sailors would take great delight in tipping you out. I quickly learned to set my mental alarm for 5.45 am each morning so that I could avoid the mad rush and queue in the shower block. That early rising habit developed during National Service has stayed with me all my life.

There were two 'classes' of 15 trainee telegraphists each in my intake and we only had to endure half the drill time in the 'bull ring' that the other classification 'Nashos' (Stokers, Writers, Seamen, etc) endured. A vivid recollection of that time is one morning having to line up in sick bay with both hands on our hips as an SBA (Sick Bay Attendant) on each side simultaneously thrust a needle into our arms. And then shortly afterwards, while participating in drills in the 'bull ring' with old Lee Enfield .303 rifles, several of my class mates falling stiffly forward flat on their faces in a dead faint.

Luckily, when I reacted to the injections and felt faint, I was able to retain my feet, just!

For the first month of telegraphy training, we were taught Morse code receiving and, in separate sessions, typing using old Imperial typewriters locked in uppercase only. I found the Morse easy because I had completed Morse classes with the WIA a few years earlier. But the typing was an interesting challenge. After two weeks we then had to do the typing exercises with a sheet metal bridge or shield over the keyboard to hide the keys from our sight which forced us to develop touch typing skills.

Our instructors were ex Chief Petty Officer (CPO) Telegraphists who had retired from the RAN and were re-employed as civilians to train Navy recruits. A CPO equivalent rank in the Army is Sergeant Major.

After the first month we then proceeded to receiving Morse and keying it into the typewriter instead of writing it down. The other trainee telegraphist class was taught from scratch to receive the Morse character direct to the key on the typewriter keyboard. This was an experiment by the Navy. I don't know what the results were, but I am glad I was not in that class.

Life settled down at HMAS *Cerberus* and we continued to develop our Morse and typing skills. We also picked up a few seamanship and other skills (I have never forgotten "there's a little **red port left** in the bottle") including rowing a ship's boat, a 'whaler', out on Hann's Inlet and firing a Lee Enfield .303 rifle on the shooting range. My several years experience in hunting rabbits with a .22 rifle came in handy.

### HMAS *Sydney*

Communication from the officers to the ranks did not seem to be a major skill in the Navy but 'scuttlebutt' generally let us know when something was afoot. One evening at about 9.00 pm the base PA system requested all National Servicemen to report to the SBA immediately for a smallpox injection. We immediately jumped to the conclusion, correctly as it turned out, that we were being shipped out the next day for overseas.

Sure enough, with sore arms, the next day we were bussed up to Frankston pier where we could see HMAS *Sydney* lying off shore. She looked enormous! (In fact she was a small aircraft carrier by today's standards being only 213 m long and displacing only 19,550 tons.)

**HMAS *Sydney*, originally HMS *Terrible*, with a full complement of Hawker Sea Fury and Fairey Firefly aircraft on deck.**

We were told that we were off to Malaya (as it was then). However, there was one small problem. Port Phillip Bay was not cooperating. It was very rough and the waves were making it quite difficult to disembark us from the pier.

The motor launches from *Sydney* were only taking four of us, plus kitbags and hammocks, at a time instead of the expected ten because of the rough sea. Jumping from the bouncing launch to *Sydney's* companionway platform was 'hairy' and several hammocks ended up overboard (a properly rolled and lashed Naval hammock will float for a long time).

Eventually all of us were aboard and found our mess deck. *Sydney* was like a rabbit warren to us 'land lubbers' and it took a while to find our way around. However, by this time we were experienced with hammocks and could sling them up, sleep in them and in the morning roll them up tightly, lash them with the regulation seven half hitches and stow them in the hammock bins with some expertise.

Our Morse and typing training continued on *Sydney* and my 'Class' used the Ship-to-Air radio room. This radio room was equipped with a wall of Murphy B-40 receivers. HMAS *Sydney* did not have any operational aircraft on board at this time (they were to be flown on while we were off the Fleet Air Arm base, HMAS *Albatross*, at Nowra) so the Ship-to-Air radio room was not in operational use.

When our Leading Telegraphist training officer would 'skive off' to have a quick smoke with his mates, with encouragement from the others I would quickly tune my B-40 to a broadcast station and pipe some pop music through to everyone's headphones until the Leading Telegraphist returned. I'm sure he knew what I was doing but he never said anything. Aboard *Sydney* was the first time we had come face to face with any radios and I was the only one in my Class who had any knowledge of communications equipment.

Not long after we rounded Cape Howe and were heading north in the South Pacific Ocean we noticed a sudden reduction in the speed of *Sydney*. Scuttlebutt had it that three of her four boilers had 'blown'. Whatever, it meant that *Sydney* limped slowly towards Garden Island in Sydney Harbour. To us on board it seemed that you could have rowed a boat faster and, in the cross seas, *Sydney*, with only slow headway, rolled considerably.

It was customary each day at the end of the afternoon watch at 1600 hours for all crew not on duty to assemble on the flight deck for 15 minutes of PE (physical exercise). With a complement of over 1,000 men plus 'Nashos', there were quite a few hundred sailors on the flight deck jumping around performing PE to the instructions coming over the PA from the bridge. Bearing in mind that there was no railing around the perimeter of the deck, and that the aircraft carrier was rolling wildly in the cross sea, it was one of the few times in my life when I have been really scared.

I felt that if one of us fell over and began to roll on the steeply sloping deck, there could be an avalanche of sailors going overboard and falling the sixty or so feet (18 m) into the sea. Fortunately, before this could happen, some wiser senior head came onto the Bridge, saw the danger, immediately cancelled the PE and ordered an emergency clearing of the flight deck.

Well, that in itself was also somewhat 'hairy'. Only officers leave the flight deck via the 'island'. All other ranks have to go over the edge of the flight deck via a vertical ladder and swing into a gun sponson. As I was on the ladder *Sydney* had heeled over in a roll and I was hanging over a drop straight down into the water. Scary! Particularly when the next matelot down the ladder was stamping on my fingers in the haste to clear the flight deck!

When we finally docked at Garden Island, we Nashos were taken by a Navy General Purpose Vessel

**Our Mess at HMAS *Penguin* showing our lockers and the overhead racks from which we slung our hammocks at night.**

(GPV) out towards the Heads and around to Balmoral on Middle Head to the Naval Base there, HMAS *Penguin*, where we were quartered in multi storeyed barracks.

Each day we were taken by GPV from *Penguin* out across the heads and then down in towards Garden Island where we were used as 'navvies' for a week or so as *Sydney* was de-munitioned before repairs could be carried out to the damaged boilers and engine room. We still managed to get in some training, however, in *Sydney*'s Ship-to-Air radio room each day.

This daily trip by GPV took us past Rose Bay and the timing in the morning often coincided with the morning flight by the Ansett Short Sandringham flying boat to Lord Howe Island. It made for a magnificent sight flying low directly over our heads shortly after take-off on several occasions.

**HMAS *Tallarook*, a typical RAN General Purpose Vessel (GPV) in the 1950s.**

### HMAS *Condamine*

In order to make up for any disappointment in missing out on the trip to Malaya, the Navy decided to give us varied experience with several different vessels. The first of these was a Modified River Class or Bay Class frigate HMAS *Condamine*, commissioned in 1946.


**HMAS *Condamine*, 2,200 tons, 92 m long, 19.5 knots (36.1 km/h) top speed, 4 x 4 inch (100 mm) guns, 3 x 40 mm Bofors, 4 x 20 mm Oerlikons, 1 x Hedgehog and 4 x Depth Charge Throwers.**

On her way back from patrolling with UN forces in Japanese and Korean waters she collected us in Sydney and proceeded down to Hobart via Port Arthur. Although we were Nasho Recruit Telegraphists, we were aboard *Condamine* as Recruit Seamen which meant we stood normal seamen watches.

*Condamine* was a small ship and the seas were rough. I was very glad we were sleeping in hammocks and not in bunks. One day I was in a working party close to the bow. The ship was pitching quite a bit but I more or less had my sea legs by then when an urgent call came over the Tannoy from the bridge, "Brace! Hang on! Big sea coming!". Immediately I grabbed a nearby vent pipe with both arms. The bow plunged beneath the wave and I was drenched up to my neck! We were sent below to change into dry clothes and finished our watch elsewhere on the ship.

That evening we hit a storm more or less at the confluence of Bass Strait and the Tasman Sea. It was wild. *Condamine* was corkscrewing (pitching and rolling). It lasted all night. There were just on 200 men on board (175 crew plus 23 Nashos) and I found out the next day that I was one of about only a handful who were not seasick. But it was a close run thing!

Even today, 60 years later, if I get a whiff of diesel fumes from a bus exhaust while waiting as a pedestrian at traffic lights, it instantly takes me back to that night!

I also well remember one night when we were half way down the coast of Tasmania and I had to do the mast lookout from 2.00 to 3.00 am. When I reported to the open bridge and climbed the 15 steps or so to the lookout platform to relieve the young seaman on lookout duty, he was so frozen from the icy wind he literally couldn't move. Somehow I managed to manhandle him down to the Bridge and the Officer on Duty summonsed an SBA to attend the seaman and get him to his Mess.

After about five minutes on duty on the mast lookout platform, I called down to the Officer on Duty and requested permission to continue the rest of my watch from the open bridge. To my surprise, he agreed.

At Port Arthur, *Condamine* anchored in the bay and we rowed a whaler ashore where we spent a couple of hours exploring the unspoilt and uncommercialised ruins. I have visited Port Arthur several times since (but via road) and prefer it as it was before it became a commercialised tourist attraction.

Then on to Hobart where it seemed we tied up almost in the centre of the town. My watch did not get leave in Hobart but I remember Hobart well because I was lowered over the side of the bows on a very basic bosun's chair to paint the starboard side anchor. This worked well, the crew on deck lowering me when required as I gradually worked my way down the anchor.

However, when I finished, and yelled out to be pulled up, something happened and I dropped suddenly, ending up at water level with my booted feet actually in the water. There was a lot of yelling up on deck when suddenly I shot up unexpectedly without any warning with the result that I was dragged up across the wet paint of the anchor. And do you think I could get that grey paint off the front of my work uniform? No! I received some strange looks from inspecting officers for the rest of my time in the Navy.

### HMAS *Sprightly*

The trip back to Sydney in HMAS *Condamine* was uneventful. However, I was not back at HMAS *Penguin* for very long before I joined a small group and we embarked on an unusual vessel, HMAS *Sprightly*, once again as trainee seamen and not as trainee telegraphists.

**HMAS *Sprightly* was 44 m in length and had a top speed of 16 knots (30 km/h).**

HMAS *Sprightly* was an ocean going rescue tug built in the US in 1942 and was re-commissioned into the RAN in 1953. Like many US built WWII ships her surface decks were wooden not steel. Also, there were no hammocks on board *Sprightly*! I slept on a camp stretcher on the Mess deck. I must say I would have preferred a hammock!

For a couple of days we played 'silly beggars' in an exercise employing a number of Navy ships up and down the NSW coast. During the exercise a couple of GPVs broke down, both at night, and one of them came close to drifting on to some rocks.

It was very interesting to see a competent and experienced tug crew go about their business and to marvel at the competence of the Captain, a 72 year old Lieutenant Commander in the RANR (Royal Australian Naval Reserve). It was also the only time that I was to use a radio 'for real' during my time in National Service.

At about midnight, while trying to get a line to the disabled GPV drifting close to the rocks, the Captain, knowing a bit about me, handed me a BC-611 'Walkie Talkie' and told me to talk to the GPV. Never having used a BC-611 before, and never having been trained in Navy voice communications, nevertheless I bumbled my way through the exercise and we managed to get the tow working in time to save the GPV before she grounded on the rocks.

Each day at 1600 hours at the end of the afternoon watch and the beginning of the dog watches, the 72 year old Captain would put on a show for his crew. He would come up on to the bridge with his single shot .22 rifle, a crew member would toss a bottle into the sea, everyone would wait until it had drifted about 100 metres away from the ship and then the Captain would shoot at it. Very rarely did he miss the bobbing bottle with his first shot.

Another interesting experience on *Sprightly* was being 'buzzed' by a Sea Fury from HMAS *Albatross* as we sailed a few miles off the coast east of Nowra. I was on deck at the time as the Sea Fury flew past about 50 m out on the port side about 20 m above the relatively calm sea at close to its top speed of 400 knots (740 km/h). The pilot repeated this manoeuvre several times before peeling off.

Disembarking from *Sprightly* at Garden Island we rejoined the rest of our Class at HMAS *Penguin* for a few days before being bussed down to Nowra to HMAS *Albatross*.

I was only at *Albatross* for a few days before I was on the move again.

### HMS *Telemachus*

My Class was given little warning. We were told to have an early night, then were woken at 2.00 am, given an early breakfast, put on a bus with our kit (minus our hammocks, once again) and taken to Jervis Bay.

There we were informed we were joining the British submarine HMS *Telemachus*. *Telemachus* was anchored out in the bay and we were taken out in a motor launch. Again, only four of us at a time because of the rough seas.

**HMS *Telemachus* was 84.3 m in length and 1,560 tons submerged. Launched in 1943, she was diesel powered, had a range of 8,330 km at 20 km/h surfaced, and carried 17 torpedoes. Even when surfaced, the greater part of a submarine is below water.**

The water in the bay was quite choppy and the only way we could board the submarine was at the bow. While the bow of the larger submarine slowly rose and fell about 2 to 3 m, the bow of the much smaller launch was bobbing up and down the same distance quite quickly. A couple of British sailors with safety lines attached caught our kitbags as we tossed them across and dumped them down the forward hatch, and then it was our turn.

We had to judge when the slowly moving bow of the submarine coincided with the bobbing bow of the launch and jump. And this in the dark, barely lit by a lamp from the submarine. I jumped and sprawled on all fours, hugging the wet bow of the *Telemachus* then edged towards the conning tower and scrambled down the forward hatch.

I found out later that on the final trip of the launch to deliver the last of my classmates to the submarine, the launch collided rather heavily with the submarine and stove in much of its wooden bow.

Life was interesting on board *Telemachus* which was a Royal Navy WWII diesel T-class submarine based in Sydney to assist the RAN in anti-submarine training and, of course, the crew were all Royal Navy

**A closer shot of the conning tower and 4 inch (100 mm) deck gun of HMS *Telemachus* as I left her for the last time.**

personnel. One of the first surprises was that at sea the crew all wore very casual clothing such as football shorts and jerseys, etc, even the officers. We had only been on board a few minutes when one of our Class tapped a crew member dressed in a tattered shirt and shorts on the shoulder and asked, "Mate, can you tell where the b----y heads are?".

"Do you know who I am?" came the indignant reply in a plummy voice.

"Nah! And I don't b----y care, mate. I just need the heads in a hurry!"

"Well, for your future information, I am the Captain! And the heads are in that direction!"

Unlike the RAN, which was a 'dry' Navy at the time, the RN was not. At 1600 hours each day each rating was served his tot of rum. But not the Nashos! For some time from 1600 hrs on, the entire submarine was filled with the sickly sweet smell of rum.

For several days we took part in sub-hunting exercises well out in the Pacific. The hunting pack consisted of, I believe, the Australian warships HMAS *Anzac* and HMAS *Vengeance* in conjunction with HMNZS *Black Prince* and an RAAF Lockheed Neptune 'sub hunter'.

*Telemachus* was submerged at 80 feet below the surface, the sub hunters would switch off all of their search devices for half an hour, *Telemachus* would head off in an undisclosed direction at her maximum underwater speed of 9 knots (20 km/h) and then the searchers would switch on their gear and start hunting.

When they eventually found *Telemachus*, they would drop a standard Mills bomb or hand grenade over the side. On hearing the hand grenade explosion in the water, *Telemachus* would fire a Very flare signal. On seeing the flare rise out of the sea, the hunters would switch off their search gear and the game would begin all over again.

*Telemachus* was still using a WWII vintage TR-1143 as its Ship-to-Air communications radio. At the time of the first hunt I was on my hands and knees in the tiny submarine radio room trying to find out why the transmitter driver output was not getting to the PA. The *Telemachus* was rigged for silent running and everything was very quiet. All of a sudden there was a loud bang, just as though someone had struck the hull of the submarine right alongside where I was with a sledgehammer. I must have jumped several inches off the deck. It was the sound of the hand grenade exploding some distance away as the first of the searching warships found us. If that was the effect of a puny (in comparison to a depth charge) hand grenade exploding, I would hate to be in a submarine if they were dropping depth charges for real!

Another vivid memory of my voyage on *Telemachus* was when we were returning from the exercises out in the Pacific on the surface. I was one of only half a dozen Nashos who were allowed up on to the conning tower for a while. As we cruised along at about 12 knots (22 km/h) with the sea washing over the deck, a pod of dolphins was swimming along with us, seemingly easily keeping pace with the submarine.

As they swam alongside, several on either side, they were taking it in turns to jump out of the sea across the deck just forward of the deck gun to the other side. As one would leap across from starboard to port, a moment later another would leap from port to starboard. It went on for several minutes before they all peeled off and swam away. A magnificent sight!

After berthing back at Garden Island in Sydney Harbour and returning to HMAS *Penguin* for several days, we travelled by train back to Melbourne and then down to Crib Point and back to HMAS *Cerberus*. It was a long journey sitting up in second class with the then change to a different gauge railway at the NSW/ Victorian border. Magnificent though Albury station may be, it was not very welcoming in the middle of a cold, Spring night as we waited to change trains.

Eventually, back at *Cerberus* our training continued at an accelerated pace for our exams. This was broken only by some 'bull-ring' training for our participation in a Remembrance Day Parade in Melbourne. As the 'senior service' the Navy led the parade.

We marched in formation down Swanston Street, over Princes Bridge and along St Kilda Road to the Shrine. By that time the Lee Enfield rifle with fixed bayonet was getting rather heavy on our left shoulders. Our Air Force and Army co-marchers were envious of the shiny chrome-plated bayonets that the Navy broke out only for such ceremonial duties.

Then the exams and we all passed the 14 wpm receiving and sending exams and were awarded the Telegraphists cloth badges for the sleeves of our uniforms. We were finally qualified as Navy Telegraphists. But we still had had no training in operating wireless equipment!

I guess that didn't much matter. We were at the end of our six months of National Service. When we left HMAS *Cerberus* for the last time on the steam train for Melbourne, we were posted to the inactive RANR (Royal Australian Naval Reserve) for the next four years. Then our 'active service' was all over.

Under Government legislation we all had our jobs to go back to, but not all were as lucky as I was. My employer, the now defunct State Savings Bank of Victoria, had made up the difference between my Navy pay and my Bank salary.

Looking back on my National Service days from a distance of 60 years, I believe it was a great thing for a group of young 18 and 19 year old youths. It taught us many things and helped us grow from boys into young men. I have never had any regrets about my time and experiences in National Service in the RAN. ar

# An unsolved mystery

**Brian Endersbee VK3WP**
RAOTC member No 1491

**This is a story of serious research into round-the-world echoes in the ionosphere. It took several years and, with encouragement by the late Prof Jack Ratcliffe (a disciple of Rutherford), our article on the observed data appeared in the *Journal of Atmospheric and Terrestial Physics* in 1989. Jack Ratcliffe FRS was at the Cavendish Lab at Cambridge. He was head of the Radio Research Section set up to study the ionosphere. However the mystery remained unsolved.**

Some very simple experiments by Jack VK3SP and myself (which any ham operator could do easily) showed other unexplained insights into the conundrum. It would be great if modern hams could take up this challenge!

In late 1980 on 20 metres I worked a station in a southwest direction near Warrnambool and heard strange echoes on the signal. I was very intrigued about this and on 29th December 1980 I worked Frank G6JY at Newcastle upon Tyne and discussed it with him.

Frank was very interested as he had researched propagation at the Marconi Research Labs in Chelmsford in his early career. I noted in my log: "Frank suggests the mode is ducting between F1 and F2 layers, and injection via scatter. This path would be slightly shorter than chordal hop". Chordal hop is a 'whispering wall' effect.

Jack VK3SP became interested and from then on we had 20 m 'skeds' (VK3SP, G6JY and VK3WP) discussing how to make accurate time measurements of pulses between the UK and Australia to see if we could separate out propagation modes. Jack searched the academic literature and found some very useful articles on the subject.

Due to previous work in the PMG research labs, locking the atomic clock at 59 Little Collins Street, Melbourne to VNG at Lyndhurst via 20 pound copper cable, and also locking the frequency and time labs across Australia via carrier systems, I worked out a very simple method to synchronise the sending and receiving of pulses between our stations. I well remember the week when I constructed three small circuit boards for each of us. My youngest daughter was born on 21st February 1981, and now that paternity leave had come in I had a week off with my mother helping out.

The key to the design was to take the 15.625 kHz line oscillator signal from a working TV set, multiply by 8 to 125 kHz, and then divide down to 500, 50, 10 or 1 Hz. The TV line oscillator is stable to better than 1 in 10,000 million. As it is the same standard in the UK and Australia, we had a free precision frequency standard, which kept our time bases in step for as long as required.

The 500, 50, 10, or 1 Hz pulses could be varied from 1 ms down to a minimum of 0.35 ms for the transmitted pulse width. A digital countdown circuit was used to provide a controlled delay for triggering the time base of the CRO to measure the received pulse delay. The countdown was set by small thumb-wheel switches on the edge of the little circuit board. This was Peter VK3AZL's contribution and he called me the 'Croydon Woodpecker'.

Jack and I synchronised our time bases using the VNG Lyndhurst ground-wave on 7.5 MHz while in the UK Frank used the Rugby MSF ground-wave on 60 kHz.

Taking account of the accuracy of the time signals, and the design of the apparatus in use, synchronisation to better than 0.1 ms was achieved. Corrections were made for the ground-wave delays for VNG and MSF. Also the delay in the IF filter of the receiver was measured. Because of the very smooth group delay response in the IF filter of Jack's Collins receiver he lent it to me. It was connected to bypass the IF of my Kenwood TS-520S. Both SSB (2.8 kHz bandwidth), and AM (5 kHz bandwidth) modes could then be used for the measurement of received pulses.

By late March 1981 the circuit board was installed in our three stations. For four years, often several times a week, measurements were made based on the leading edge of the pulse - the shortest path of the composite signal. The pulse was broadened by small changes in ionospheric pathways. Measurements were done on 14 MHz long path in both directions and 28 MHz short path, also in both directions. At this time the sunspot cycle was near maximum.

Over the four year period it was very disappointing that there were no observations of separate delays for multi-hop and round the world echoes. The measurements were remarkably stable on both frequencies and in both directions. The published paper showed pulse average transit times for the period near the sunspot peak between January and May 1982 as follows:

28 MHz - 58.8 ms Newcastle, UK to Melbourne.
58.9 ms Melbourne to Newcastle, UK.
14 MHz - 80.5 ms Newcastle, UK to Melbourne.
80.4 ms Melbourne to Newcastle, UK.

By 1985 it was becoming difficult as we were well past the sunspot cycle peak. However, we were determined to continue. So my next job was to design a computer controlled averaging device which allowed up to 5000 pulses to be superimposed and the result displayed on a CRO and also stored on tape.

If you add one pulse to another the noise power increases by 3 db, but the signal increases by 6 db so the overall S/N improves by 3 db. If you superimpose 10 pulses the S/N improves by 10 db, and so on. At 500 pps repetition rate for 10 seconds, 5000 pulses will be averaged, resulting in an improvement of 37 db. If the transmit power is 400 W and the receive and transmit antenna gains are 9 db (a TH6 beam is 9.5db), the result will be 128 Megawatts for 0 db dipoles at each end!

Home computers were in their infancy, so it was a 'home brew' job. A Motorola 6809 processor chip was used because it had 16 bit word length. Memory was three 2 k 6116 static RAMs (6 k) with a three volt battery, diode coupled to keep the data alive with a few micro-amps when power was switched off. An audio tape recorder driven with special software became the long term memory.

Programming to RAM was done from a hexadecimal keypad, with a soldering iron in one hand, and a pencil in the other. Doug VK3UM had an early Southwest Electronics home computer and at his shack I would type all the hex words (0 to 9, A to F) into his 'Dynamite' programme which would blast it into assembler code and do a printout!

These experiments were done with G6JY sending pulses and VK3WP receiving as only one averaging computer existed. It was a quite moving experience to see a very noisy and fuzzy pulse suddenly zoom up into a perfectly noiseless pulse.

We continued up to the late 1980s but never saw anything different from the early measurements. Even with this high degree of averaging there was still great variability in waveform and little evidence of any separation into components corresponding to different pathways.

### Now to the sequel!

On Saturdays during the 1980s, simple experiments were done by Jack VK3SP at Donvale and myself, VK3WP at Croydon. Using a 2 metre talk link, we began with 14MHz, one sending in one direction and the other receiving in the opposite direction. We measured definite round the world echoes with 140 ms delay. No doubt at all. These echoes were only in NE-SW directions. We could transmit NE and receive SW or vice versa.

Strangely, it all started in 1980 due to echoes from the SW! The only other echoes ever observed were in a northerly direction with delays of about 40 ms. We deduced that this was via the ionosphere, reflected from waves on the sea north of Darwin, and then back again. We repeated measurements for three years on 14, 21 and 28 MHz. The strongest echoes were on 21 MHz and on this band we heard very occasionally a second time round and once a third. The best time was about noon. We never heard signals from countries in the middle of the path.

### So the unsolved mystery is:

- Why are RWE's NE/SW and around the time of midday?
- Would the direction be different elsewhere on the globe?
- Is the propagation mode chordal hop or something else?

It would be wonderful if today's amateur operators in Australia could examine RWEs NE-SW and see if they still happen. One station sends with a Morse key and the other just listens. Even better would be to ask overseas amateur friends to see what happens in their part of the world. This might provide insight leading to solution of the mystery.

### Post script, solving the mysteries

In *Amateur Radio* for December 2012 there is an article describing the operation of an amateur band chirp radar (see A Martin, *Adventures with a bistatic chirp and CW radar*, pp 10-19.) The article describes, in part, the use of the chirp radar for accurately measuring the propagation time for the round-the-world signals which provides an answer for the third question.

Because of the accuracy of the chirp time measurement, the modes of the RTW signals were easily derived and show an F layer guided mode is predominant on 28 MHz. The accuracy of the measurements was sufficient to deduce the height of the dominant propagation layer as well.

The other two questions are easily answered by using a program called 'Ham Cap' (see http://www.dxatlas.com/HamCap/). Many different conditions can be simulated using this program. By setting it to long path and adjusting the other parameters, RTW propagation is easily investigated. In particular, set the DX location to be close to your home location and the RTW path will be calculated. The angles of departure and arrival are also easily seen for any time of day, sunspot number and so on.

Good luck and have fun.

### Jack O'Shannassy MBE VK3SP
### 05.12.1921 - 05.05.2010

Awarded the MBE for his work in setting up communication and television for the 1956 Olympic Games in Melbourne.

Former Council Member of the Royal Flying Doctor Service (Victorian Section)

Member of the Kelvin Club.

For many years Jack was Chief Radio Engineer at PMG/Telecom. He headed up radio when microwave multichannel radio was set up all over Australia. This was an enormous development replacing the old 12 and 24 channel open wire systems with 960 channel systems in the early installations. These systems needed line-of-sight repeaters which had to be powered in remote areas across the Nullabor and through the deserts to Darwin and outback Queensland. When Cyclone Tracy wiped out all communication to Darwin the microwave radio systems with their huge towers did not fail - it was a leaking roof at the Darwin Post office!

Jack was a Life Member of the Australian Rhododendron Society. He had a huge number of 'Rhodos' on his property at Donvale. In retirement he continued developing new Rhododendron strains. He gave me a 'Donvale Pearl' which has been in my garden for 25 years.

### Professor Frank Farmer OBE G6JY
### 18.9.1912 - 16.7.2004

At King's College, Cambridge, Frank did research into 'Ordinary - Extraordinary' ray splits in radio-wave propagation in the ionosphere, and was awarded a PhD in 1937. He continued radio propagation research at Marconi Wireless Telegraph Company in Chelmsford.

In 1945 he was appointed hospital physicist at the Radium Centre, Royal Victoria Infirmary, Newcastle. From his experience in radiotherapy he pioneered the design of linear accelerators for cancer treatment. He developed a device for determining the X-ray dose delivered to patients, the Farmer Dosimeter, which became the standard instrument in radiotherapy departments worldwide, and is still in commercial production. In 1964 he founded the Northern Regional Medical Physics Department.

In 1978 he was appointed OBE for his achievements in the application of science to medicine.

In retirement in his 80s he delivered food to those in need on his bicycle. I visited him at his home in Newcastle, UK in September 1999. He was still using our little time-base circuit board to regulate pendulum clocks for his friends. On leaving I asked him the best way to get back to the freeway. He said, "I'll show you". Next thing he was on his bike and we couldn't keep up with him in our car. He had to wait for us at each intersection. Finally he waved us to where the freeway was.

When we got home in November I worked him on 20 m when the temperature was near zero in Newcastle. I remarked that the bike must now be hung up in the shed. His reply was that he was still delivering lunches regardless of the weather. He was then 87!

ar

# RAOTC members list

as at 6[th] February 2016.

**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* |
| L | Ernie Hocking | VK1LK | 1260 |
| A | Andrew Robertson | VK1NRO | 1611 |
| | **New South Wales** | | |
| | Don Hunt | VK2ADY | 1141 |
| L | Alex McMurray | VK2AEV | 586+ |
| | Jim Brown-Sarre | VK2AGF | 1640 |
| | George Paterson | VK2AHJ | 1333* |
| L | Ben Mills | VK2AJE | 832+ |
| L | Jim Patrick | VK2AKJ | 1003 |
| | Alan Whitmore | VK2ALA | 1381 |
| | 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 |
| | John Marland | VK2BJU | 1399* |
| L | Ray Gill | VK2BRF | 1592 |
| L | Phil Orchard | VK2BTT | 1285+ |
| | Lex Brodie | VK2BYA | 1638 |
| | Dave Rothwell | VK2BZR | 1414 |
| | John Clark | VK2CF | 903* |
| | 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* |
| L | Glen Millen | VK2FC | 1180 |
| L | Nick Perrott | VK2FS | 1327 |
| | Ted Dean | VK2FUP | 1201 |
| | Ray Davies | VK2FW | 1563* |
| L | Gary Baxter | VK2GAB | 1504 |
| L | Barry Mitchell | VK2GGA | 1456 |
| 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 | 1384 |
| L | Pat Leeper | VK2JPA | 1629 |
| | Kevin Parsons | VK2JS | 1586 |
| | Graeme Scott | VK2KE | 789* |
| | Greg Hilder | VK2KGH | 1375 |
| L | Ken Nisbet | VK2KP | 989* |
| | Barry Wood | VK2LA | 848* |
| | Larry Hazzard | VK2LPH | 1512 |
| L | Ian Paterson | VK2MW | 810+ |
| L | Tom Sanders | VK2MY | 1393 |
| L | John Gaynor | VK2NCE | 1475+ |
| L | William Spedding | VK2NLS | 1394 |
| L | George Hodgson | VK2OH | 544 |
| L | Mike Rautenberg | VK2OT | 1335 |
| L | Peter Mair | VK2PF | 1318 |
| L | Stephen Pall | VK2PS | 758* |
| L | Roger Conway | VK2RO | 1255 |
| | Trevor Hoodless | VK2RU | 1673* |
| L | John Bennett | VK2SIG | 939* |
| A | Robert Ward | VK2TAX | 1625 |
| L | Robert Taylor | VK2TR | 1469 |
| | Trevor Thatcher | VK2TT | 1080* |
| | Ray Wells | VK2TV | 1076 |
| L | Eric De Weyer | VK2VE | 1253 |
| L | Keith Sherlock | VK2WQ | 1138+ |
| | Tony Rowe | VK2XAJ | 1575 |
| | Brian Rodgers | VK2XFL | 1608 |
| | Jack Hodge | VK2XH | 1605 |
| L | Richard Cortis | VK2XRC | 1474 |
| L | Bill Hall | VK2XT | 812+ |
| | Ron Cameron | VK2XXG | 1410 |
| L | Noel May | VK2YXM | 1345 |
| | 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 |
| | Ray Hardimon | VK2ZZK | 1536 |
| | **Victoria** | | |
| | John Adcock | VK3ACA | 114* |
| | 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 |
| | Nick Lock | VK3ANL | 1621 |
| | David Waring | VK3ANP | 1037 |
| | Bill Babb | VK3AQB | 904 |
| L | Kevin Connelly | VK3ARD | 1035+ |
| | 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 |
| | John Mitchell | VK3AXE | 957 |
| L | Rod Green | VK3AYQ | 1380 |
| L | Jim Payne | VK3AZT | 993+ |
| | Jock Mackenzie | VK3BAA | 1619 |
| L | Roy Thorpe | VK3BAM | 1323 |
| | Carl Dillon | VK3BBW | 1618* |
| | Tim Humphery | VK3BCN | 1620 |
| L | Brian Tideman | VK3BCZ | 1184 |
| | Mike Goode | VK3BDL | 1610 |
| L | Digger Smith | VK3BFF | 1424 |
| | Peter Cossins | VK3BFG | 1257 |
| B | 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 |
| L | Clem Allan | VK3BVI | 1073* |
| | 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 |
| | Geoff Tresise | VK3CNX | 1240 |
| 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 | Mark Harris | VK3EME | 1574 |
| L | Stewart Day | VK3ESD-ex | 905 |
| | Ellis Pottage | VK3FG | 1087* |
| | Dave Bell | VK3FGE | 1339 |
| | Noel Ferguson | VK3FI | 1416* |
| B | Blayne Bayliss | VK3FIS | 1412 |
| L | Ernie Walls | VK3FM | 1401 |
| | Peter Lord | VK3FPL | 1590 |
| L | Ray Taylor | VK3FQ | 1216 |
| L | John Brown | VK3FR | 1407 |
| | Bob Bird | VK3GEB | 1602 |
| | Geoff Wilson | VK3GJW | 1658* |
| L | Lee Moyle | VK3GK | 1363 |
| A | Max Morris | VK3GMM | 1265 |
| | Wayne Collyer | VK3GMV | 1503 |
| | 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* |
| L | Tim Hunt | VK3IM | 504 |
| | Ian Palmer | VK3IN | 1643 |
| | Lindsay Allen | VK3IQ | 1674 |
| | Jim Mannon (Sr) | VK3IY | 1635 |
| L | Barry Gauntlett | VK3JB | 267+ |
| | Ray Proudlock | VK3JDS | 1585 |
| L | Graeme Mann | VK3JGM | 1274 |
| | Ray Lenthall | VK3JH | 1663 |
| L | Anthony Rogers | VK3JIA | 1287 |
| | 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 | Brenda Edmonds | VK3KT | 797 |
| 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 |
| A | David Davies | VK3MHV | 1293 |
| L | Rob Whitmore | VK3MQ | 1352 |
| | Peter Young | VK3MV | 1400 |
| L | Graeme McDiarmid | VK3NE | 1485 |
| | Ken Jewell | VK3NW | 1650* |
| L | Neville White | VK3NZ | 1343 |
| L | Alan Baker | VK3OA | 1646 |
| | Bill Miller | VK3OI | 1598 |
| L | Ron Fisher | VK3OM | 103* |
| 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+ |
| | Ian Hocking | VK3QL | 1594 |
| | Ray Dean | VK3RD | 1577 |
| L | Darrell Edwards | VK3RE | 1185 |
| A | Ron Sutcliffe | VK3RS | 1425 |
| L | Peter Wolfenden | VK3RV | 1484* |
| | Ray Wales | VK3RW | 1471 |
| L | Damien Vale | VK3RX | 1239 |
| L | Sarah Dowe | VK3SD | 1535 |
| | Laurie Bain | VK3SJ | 1600 |
| 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 | Doug McArthur | VK3UM | 1490* |
| 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 | Mike O'Burtill | VK3WW | 1123* |
| L | Ian Keenan | VK3XI | 1527 |
| L | Ian Simpson | VK3XIS | 1071 |
| | Ted Egan | VK3XT | 721* |
| | Drew Diamond | VK3XU | 1140 |
| | Gordon Bracewell | VK3XX | 1122* |
| L | Derek McNiel | VK3XY | 1370 |
| | Tim Robinson | VK3YBP | 1617 |
| L | Brewster Wallace | VK3YBW | 1126 |
| L | Eric Day | VK3YHN | 1398 |
| L | Terry McIntosh | VK3YJ | 1532 |
| 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 |
| | Geoff Angus | VK3ZNA | 1482 |
| | Cal Lee | VK3ZPK | 1510 |
| | Eric Gray | VK3ZSB | 1451 |
| | Leigh Tuckerman | VK3ZTU | 1468 |
| | Bill Adams | VK3ZWO | 1356+ |

### Queensland

| | Name | Call | No |
|---|---|---|---|
| | Alan Simpson | VK4AAE | 727* |
| L | Tom Ivins | VK4ABA | 1382* |
| | Ian Saunders | VK4ACU | 1390 |
| | George McLucas | VK4AMG | 1675* |
| L | Harold Cislowski | VK4ANR | 1550 |
| | Roy Stephens | VK4ARS | 286* |
| A | Glenn McNeil | VK4BG | 1633 |
| | Ken Finney | VK4BKJ | 1176* |
| | Brian Winterburn | VK4BOW | 1670 |
| 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 |
| | John Buckland | VK4DBJ | 1422 |
| | Dale McCarthy | VK4DMC | 1465 |
| L | Merv Deakin | VK4DV | 1230* |
| | Ron Goodhew | VK4EMF | 1516 |
| | 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 |
| | Ken Duncanson | VK4JUD | 1596 |
| L | Gordon Loveday | VK4KAL | 707+ |
| L | Andy Beales | VK4KCS | 1579 |
| L | Norman Fiori | VK4LD | 1296 |
| | John Horrocks | VK4LJ | 1362* |
| 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 |
| | Bill Lochridge | VK4WL | 1379* |
| | Bill Gibbings | VK4WO | 1372 |
| | Bill Flannery | VK4XO | 1137 |
| 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 |
|---|---|---|---|
| L | Terry Franklin | VK5AAL | 1430 |
| L | Jack Peatfield | VK5AF-ex | 822+ |
| | Mike Hall | VK5AGI | 1615 |
| | Jack Crawford | VK5AHI | 1397 |
| | 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 |
| | Jeff Farmer | VK5GF | 851 |
| L | Paul Spinks | VK5GX | 1214 |
| | Harro Krause | VK5HK | 1275 |
| | John Casey | VK5IJ | 859* |
| L | Ian Sutcliffe | VK5IS | 1355 |
| L | Ted MacKenzie | VK5KBM | 1389+ |
| | Trevor Niven | VK5NC | 946 |
| L | Keith Metcalf | VK5ND | 1537* |
| | Bryan Scott | VK5NOS | 1202 |
| L | John Butler | VK5NX | 1120 |
| | Tony Wilkinson | VK5PBB | 1453 |

| | Name | Call | No |
|---|---|---|---|
| A | Ron Zimmermann | VK5PCZ | 1449 |
| | Trevor Greig | VK5PTL | 1601 |
| L | Ivan Huser | VK5QV | 477* |
| | Rob Gurr | VK5RG | 1500* |
| L | Darcy Hancock | VK5RJ | 584+ |
| L | Ron Coat | VK5RV | 1000 |
| | Colwyn Low | VK5UE | 1361* |
| | Bill Thomas | VK5VE | 1321 |
| | Ron Holmes | VK5VH | 1299+ |
| L | Ian Werfel | VK5VJ | 968 |
| | Noel Schahinger | VK5VT | 1636* |
| | Bill Coates | VK5WCC | 1199 |
| | Colin Luke | VK5XY | 1168* |
| | Hans Smit | VK5YX | 1517 |
| | Adrian Waiblinger | VK5ZBR | 1614 |
| | Ian Maxted | VK5ZIM | 1562 |
| | Peter Temby | VK5ZJ | 1229 |
| L | Peter Whellum | VK5ZPG | 1479 |
| | **Western Australia** | | |
| | Brian McDonald | VK6ABM | 1508* |
| L | Bob Sutherland | VK6ABS | 1483* |
| | Mark Barnett | VK6ACB | 1665 |
| L | Barrie Burns | VK6ADI | 1273* |
| | Barrie Butler | VK6AF | 1091 |
| | John Farnan | VK6AFA | 1409 |
| L | Mark Bussanich | VK6AR | 1334 |
| | Tony Argentino | VK6ATI | 1591 |
| | 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 | 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 |
| | Wayne Johnson | VK6EH | 1660 |
| L | Don Newman | VK6EY | 1558+ |
| | Max Faulkner | VK6FN | 1064 |

| | Name | Call | No |
|---|---|---|---|
| | Gerry Wild | VK6GW | 1112* |
| | Phil Hartwell | VK6GX | 1494 |
| | Bob Howard | VK6HJ | 1623 |
| A | Wayne Fiddes | VK6HWF | 1429 |
| L | Glen Hufner | VK6IQ | 1072* |
| L | John Farnell | VK6JF | 1297 |
| | Chris James | VK6JI | 1587 |
| | Jim Preston | VK6JP | 1121 |
| 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 | 1124 |
| 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 |
| | Keith Bainbridge | VK6RK | 1664 |
| L | Graham Rogers | VK6RO | 1302 |
| L | Ron Collier | VK6RT | 1440+ |
| L | Phillip Bussanich | VK6SO | 1247 |
| | Barry O'Keeffe | VK6UP | 1487 |
| | Don Truscott | VK6UT | 1212 |
| | Alan Mead | VK6VA | 1649 |
| A | Joe Page | VK6VO | 1340 |
| | Bill Rose | VK6WJ | 1463 |
| L | Geoff Green | VK6XB | 1261 |
| | John Tuppen | VK6XJ | 1525 |
| L | Roy Watkins | VK6XV | 1181 |
| | 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 |

| | Name | Call | No |
|---|---|---|---|
| | **Tasmania** | | |
| | Allen Burke | VK7AN | 1270 |
| | Tony Bedelph | VK7AX | 1676 |
| | Frank Beech | VK7BC | 1522* |
| L | Nic Chantler | 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 |
| | Bob Geeves | VK7KZ | 907 |
| L | Rex Moncur | VK7MO | 1298 |
| L | William Maxwell | VK7MX | 1418 |
| L | Peter Dowde | VK7PD | 1554* |
| | Bob Reid | VK7RF | 1666 |
| L | Richard Rogers | VK7RO | 908 |
| | Trevor Briggs | VK7TB | 1316 |
| L | Winston Henry | VK7WH | 1526* |
| | Ken Woskett | VK7WO | 1626* |
| L | Paul Edwards | VK7ZAS | 1324* |
| | John Jongbloed | VK7ZJJ | 1584 |
| | **Overseas** | | |
| | David Dunn | G3SCD | 1252* |
| L | Ira Lipton | WA2OAX | 1344* |
| L | John Wightman | ZL1AH | 1507+ |
| L | Martyn Seay | ZL3CK | 1159 |

## Membership statistics

| | |
|---|---|
| 204 | Life members |
| 254 | Full members |
| 4 | Associate Life members |
| 18 | Associate members |
| **480** | **Total membership** |
| including | |
| 108 | Licensed 50 years or more |
| 30 | Aged 90 years or more |

ar

# New RAOTC members

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

| Name | | Callsign | No | |
|---|---|---|---|---|
| Bob | Reid | VK7RF | 1666 | F |
| Chris | Holliday | VK7JU | 1667 | F |
| Dennis | Sillett | VK3WV | 1668 | F |
| Ivan | Brown | VK3ASG | 1669 | F |
| Brian | Winterburn | VK4BOW | 1670 | F |
| Peter | Savage | VK6YV | 1671 | F |
| Dudley | Donovan | VK6KBY | 1672 | A |
| Trevor | Hoodless | VK2RU | 1673 | F |
| Lindsay | Allen | VK3IQ | 1674 | F |
| George | McLucas | VK4AMG | 1675 | F |
| Tony | Bedelph | VK7AX | 1676 | F |

# Silent keys

It is with regret that we record the passing of:

| | | |
|---|---|---|
| Jim | Bywaters | VK5OM |
| Keith | Alder | VK2AXN |
| Jack | Spark | VK3AJK |
| Gerry | Sabin | VK2AGS |
| George | Lance | VK3DS |
| Max | Meallin | VK3ATK |
| Doug | Dowe | VK3FDUG |
| Cyril | Roberts | VK6OE |
| Ray | Rutledge | VK3ZQ |

# Obituary

## Douglas George Dowe VK3FDUG

**RAOTC member No 1616**

The RAOTC has lost another old timer and with his passing on 9th November 2015 we have also lost a lot of oral history of Australian Radar in WWII.

Douglas George Dowe was born on 5th December 1923 and grew up on a farm near Tenterfield in the northern NSW tablelands. As a school boy he befriended a local saddler who was known as 'The True Tenterfield Saddler' and who also owned the local radio dealership. He taught Doug some basic radio principles after the shop closed in the evenings. Doug was enthralled by being able to pick up distant radio stations after the sun went down. As he became more knowledgeable he built a crystal set and then built a radiogram for his parents.

Like many farmers' sons he was sent to a boarding school, St Johns, at Armadale, New South Wales. Here he won a scholarship to Mentone Grammar School where he matriculated. Doug's first job was with Standard Telephones and Cables in Sydney assembling and testing radio equipment. When WWII broke out he joined the RAAF and was sent to the Radio School in Point Cook. Doug was top of his class so he was transferred to Richmond, NSW to learn the new secret radar technology. By the time he completed the course he was a sergeant. During the war he had postings to various Early Warning sites in Australia, New Guinea and Borneo.

After the Japanese surrender Doug served with British Commonwealth Occupation Forces to investigate Japanese radar systems which he believed were inferior to ours and British equipment.

Doug continued to serve in the RAAF and was seconded to the US Airforce where he received instruction to train others back home in the newest developments in radar and the Ground Control Intercept equipment.

He worked on numerous radar equipment and reached the rank of Warrant Officer. Doug left the RAAF in 1960 with highly regarded qualifications. The CSIRO Division of Atmospheric Physics at Aspendale snapped him up for a senior technical officer position. Here he built and continued to develop a specialised atmospheric research radar. After 20 years there, he left and formed his own consulting business.

When he retired he made time for restoring old gramophones and radios. Doug was a foundation member (No 2) of the Historical Radio Society of Australia and restored many a Bakelite radio to its former glory in appearance and working condition.

Earlier on, when television was first broadcast in Australia, he converted about 300 American sets to the Australian standards (TVs sets were much cheaper in the US). He also found time to build two Holden station wagons from parts he acquired.

Several years ago at an RAAF radar reunion, Rolfe Fox (SK and an RAOTC member) suggested that Doug come to the Moorabbin and District Radio Club (M&DRC). Doug had serviced some amateur transceivers in the past and the Club had a few WWII RAAF radio men in it. At this time he also joined the

**Doug at a recent RAAF radar reunion.**

RAOTC and thoroughly enjoyed reading *OTN Journal* and attending the luncheons.

Doug typically became quite involved and served as vice president of the M&DRC and obtained his own amateur radio licence, VK3FDUG, one of the oldest persons ever to do so. He took part in many of the Club's activities including presenting several talks on radar and his WWII experiences. He would often bring in a piece of hardware, usually from a WWII radar set, for an impromptu 'show and tell', much to the enjoyment of the members. He rarely missed a meeting or a function.

Doug made a determined effort to keep fit. He did weight training at home to maintain strength and up to two years ago he used to swim in Port Phillip Bay with his wife Sarah. Their favourite beach was at Timaru in New Zealand.

Doug retained a keen wit, an impish sense of humour and was a logical thinker with extensive knowledge. He could be very philosophical and spiritual. He was a man with great determination, to the point of being obsessive, but he could also be kind and generous.

He is survived by his wife Sarah and his children from his first marriage, Robert, John, David, Peter and Wendy, and four grandchildren.

Rest quietly old fellow.

***Ron Cook VK3AFW***
***RAOTC member No 824***

ar

# Wireless Hill

**Clive Wallis VK6CSW**
RAOTC member No 1289

**About 10 km south of Perth City, and 7 km east of the port of Fremantle in Western Australia, lies an area of high ground once known as Yagan's Lookout, named after a well-known and respected Aboriginal leader in the early days of the Swan River Colony, killed by white settlers in 1833. Were Yagan alive today he would have from his Lookout, 43 metres above sea level, a commanding view of the port, the city across Melville Water, and the Indian Ocean stretching away westward as far as his eyes could see. Little could he have known that this spot would one day become home to one of the most powerful coastal wireless stations in Australia.**

Today, if you ask most Perth inhabitants to direct you to Yagan's Lookout, they would shake their heads and look bemused. But ask where Wireless Hill is and they will tell you straight away how to find this pleasant, elevated parkland with its wildflowers and grand views from lookouts set above some old concrete blocks which "must have served some purpose long ago". Indeed they did!

The Wireless Telegraphy Act, 1905, gave control of all wireless communications to the newly formed Federal Government. In turn, the Government delegated this to the Postmaster General's Office who became responsible for the licensing and control of all wireless communications and all wireless apparatus within Australia.

In 1909 the Government decided that, in the interests of maritime safety as well as gathering intelligence on any hostile forces seen within Australian waters, wireless telegraphic stations should be established around the coastline and that, as far as possible, merchant ships should be equipped with wireless apparatus.

Australasian Wireless Ltd, Sydney, the Australian agents for Telefunken, Germany, won the tender to install, on behalf of the Postmaster General, wireless stations at Perth and Sydney, and in 1910 AWL was granted a licence to conduct wireless telegraphy tests with ships at sea. The following year this first 'coastal station' was established in Sydney in the Hotel Australia on the corner of Castlereagh Street and Martin Place with the aerial mast attached to the hotel's chimney. Tests showed that the transmitter had a range of 300 miles (520 km).

At that time the Telefunken and British Marconi companies were in strong competition for the world telecommunications market. Marconi sued Australasian Wireless Ltd for infringement of its patents. The dispute was settled when, in 1912, the companies agreed to exchange patents, and Australasian Wireless Ltd merged with the Australian branch of Marconi to form Amalgamated Wireless (Australasia) Ltd in July 1913.

In 1912, the first equipment at Wireless Hill was a Telefunken 25 kW quenched spark transmitter built by AWL.

Although the dispute was not settled until 1912, in accordance with the government's plans of 1910 work had already commenced in 1911 on the building of a permanent network of coastal wireless stations. Two high power stations of 25 kW were begun, one at Pennant Hills near Sydney and the other at Applecross[1] just south of Perth, plus a number of low power stations at other locations around the coastline.

These were to be established initially at Melbourne, call sign POM, Hobart POH, Brisbane POB, Adelaide POA, and then, a little later, at Thursday Island and Port Moresby. These were joined in 1913 by further stations in Darwin, Mount Gambier, Rockhampton, Cooktown, Townsville, Flinders Island, Wyndham, Broome, Roebourne, Geraldton and Esperance.

The network was completed by 1914. All stations operated on 500 kHz and the aim was to ensure that all ships in Australian waters would be in contact with at least one station at all times. The range of the spark transmitters was soon increased to 700 km by day and at least 1,500 km at night.

In Perth, clearing of the land and construction at Yagan's Lookout began in late 1911. Less than a year later, on 30th September 1912, work was completed and the Applecross Wireless Station, call sign POP (Post Office Perth), was declared open. Pennant Hills, Sydney's high power station, had opened just a few weeks earlier on 19th August, operating under the call sign POS (Post Office Sydney).

The PO prefix was short-lived. Under the new Radio Regulations drafted at the first International Radio-telegraph Conference held in 1906, call sign prefixes were to be allocated on a world-wide basis. From early 1912 the prefix letter V had been used in many British Commonwealth countries honouring the memory of Queen Victoria who had died in 1901, and the IRC confirmed this tradition by allocating Australia the prefix block VH-VK. Within a few weeks of POP becoming operational, Perth Radio's call sign was changed to VIP. Simultaneously, Sydney Radio became VIS along with similar changes to all other coastal stations.

In 1912, the first equipment at Wireless Hill was a 25 kW quenched spark gap transmitter of Telefunken design built by AWL, with a locally built crystal detector receiver which used galena (the main ore of lead, and a semiconductor) obtained from the then active lead-mining centre of Northampton, one of Western Australia's earliest settlements. The mast was

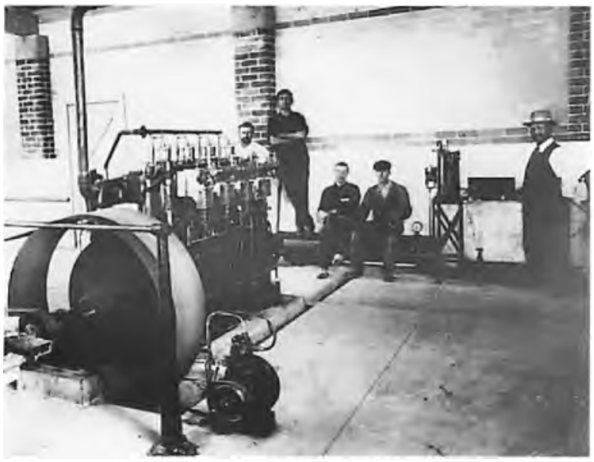
**The 120 m tall, steel, guyed aerial mast at Wireless Hill, circa1912.**

**One of three 200 ton concrete guying anchor blocks for the steel mast, circa1912**

a 390 ft (120 m) tall steel structure supported by three guy-wires, each anchored to one of three 200 ton concrete blocks (see above).

Power came from a diesel driven alternator housed in a large brick-built Engine House, while a second smaller building, the Operators' House, housed the wireless equipment. A third building for general storage was added in around 1915.

A road, Radio Drive, running northwards from the station buildings to the bottom of the hill led to Hickey Street where four cottages were built as staff accommodation. Radio Drive no longer exists but is believed to have been the first macadamised road in Perth.



**The diesel engine with the drive belt to the alternator, circa 1912.**

**The Operator's Hut, which housed the wireless equipment, in 1912 with a concrete guy wire mooring to the left.**

Following the outbreak of WWI in 1914, the Royal Australian Navy took over the command and operation of the coastal network from the PMG and in 1916 replaced the original equipment at Wireless Hill with a more powerful 60 kW Poulsen arc transmitter and a valve receiver.

Early in the war, the Applecross Wireless Station proved its worth. After receiving an emergency signal from the Cocos Islands giving the position of the German light cruiser SMS *Emden*, VIP relayed the information to the Australian light cruiser HMAS *Sydney* (see photos on next page) which was escorting a troop convoy close to the Cocos Islands.

**VIP's Operator Room, date unknown.**

A German landing party from the *Emden* had attempted to put out of action the cable station on Direction Island, one of the Cocos (Keeling) Islands, now part of Australia. While the landing party was still ashore, *Emden* was attacked by *Sydney* and, in the attempt to escape, *Emden* ran aground on North Keeling Island where its remains still lie today. The Battle of Cocos, as we now call it, took place on 9th November 1914 and is one of Australia's most famous sea battles of WWI.

The Navy relinquished control of Perth Radio in 1920 when the PMG once again took over the reins, but in 1922 the Australian Government granted AWA exclusive rights to operate the Coastal Radio Service.

During the 1920s VIP was equipped to transmit voice as well as Morse. Nevertheless, Morse code was still used as the primary communications medium for

**HMAS *Sydney*, circa 1914.**

**SMS *Emden* under way in 1910.**

long distance messages up until the station closed in 1968[2]. In 1921 the station exchanged signals with SS *Aeneas* over a distance 9,000 kilometres, the longest distance for any Australian station at the time.

In 1927 a directional antenna system was erected by AWA as part of the Imperial Wireless Chain to link together by radio all the countries of the British Empire. Applecross's 'beam wireless' antenna extended the transmission range sufficiently to allow direct communication between Australia and England, and the station became a feeder for international telecommunications traffic.

In 1930, warning lights were fitted to the 390 foot (120 m) mast in compliance with an amendment to the Air Navigation Act, 1920, requiring all structures of or exceeding 200 feet (61 m) above ground level to be so equipped.

By 1934, the station was powered by externally supplied three-phase power with the original diesel-driven generator kept for emergency standby use. In 1942, during WWII, this was removed and the upgraded and more extensive wireless equipment transferred from the smaller Operator's House to the much larger Engine House, now renamed as the Transmitter Hall.

With the outbreak of WWII in 1939, the Royal Australian Navy again took over control of the Applecross Station, along with all other coastal radio stations in the country.

After the war, the newly formed Overseas Telecommunications Commission (OTC)[3] inherited all facilities and resources from AWA, including Perth Radio and all other government wireless stations, and in 1947 took over from the PMG the responsibility for all international telecommunications into, through and out of Australia.

**Photo of the concrete base of the original 120 m mast with sway insulator, taken in 1912.**

That same year, 1947, three timber distribution towers were constructed at Wireless Hill to feed newly erected rhombic antennas.In early 1960 two further rhombic aerials were installed to provide communications with the US rescue aircraft that flew continuously over the Indian Ocean whenever NASA was conducting a Project Mercury space mission, America's first human spaceflight program, which ran from 1959 to 1963.

In 1962, improvements in communications technology obviated the need for the original 390 foot (120 m) steel lattice mast and it was replaced by one just 46 m high.

In May 1967, OTC began to transfer operations from Applecross to their new international radio station at Gnangara, about 20 km north of Perth, and in July 1968 operations ceased at Wireless Hill with the remaining masts then being removed. 34 years later, on 30th June 2002, HF radio operations from Perth Radio VIP at Gnangara ended along with those of all the other Australian coast radio stations.

The Applecross Wireless Station was used continuously from 1912 until 1968, enabling for the very first time wireless communications between the east and west coasts of Australia, between the mainland of Australia and shipping up to 1,600 km into the Indian and Southern Oceans, to Antarctic bases, and between Australia and the rest of the world.

However, Wireless Hill was not just the home of VIP. From 1931 to 1950, Perth's oldest commercial radio station, 6PR, transmitted from Wireless Hill with its studios down in Barrack Street in the City, while Perth's first Police Radio transmitter, VK1, was also there in the late 1920s, operated remotely from Police HQ in Roe Street and talking to the City's two Bentley radio-equipped patrol cars[4].

Western Australia's first television service,TVW7, was broadcast from Wireless Hill in 1959. Today the Hill

**The AWA transmitter for 6PR at Wireless Hill in 1931.**

is the home of Capital Radio FM 101.7, part of the Capital Radio Network, plus the inevitable cell phone tower, both taking advantage of the high ground.

Amateur radio has played a significant role in the preservation of Wireless Hill. Following Perth Radio's vacating of the site, the WA VHF Group assisted the City of Melville Council in purchasing the land, now a public reserve, and proposed the establishment of a museum. This materialised as The Wireless Hill Telecommunications Museum which opened in 1979 as part of Perth's sesquicentennial celebrations.

The museum, which used to contain a superb collection of historic radio, television, radar and other electronic equipment to remind us of the early days of wireless in Western Australia, was closed in 2014 for refurbishing. It re-opened on 17th May 2015 but for the moment the emphasis seems to be more on ANZAC memorabilia rather than telecommunications. Perhaps this will change in the future.

The very active WA VHF Group is the largest licence holder and operator of terrestrial VHF, UHF and SHF beacons in Australia and for several decades has held its monthly meetings in one of the refurbished VIP buildings, with over 600 meetings being held there to date. Wireless Hill is also the home of the 2 metre VHF information beacon VK6RIB on 145.575 MHz, which continuously transmits current information such as club news and amateur radio activities, including the latest RAOTC bulletin repeated every few hours for a week after the first Monday of the month.

Today, Wireless Hill is a recreational and bushland area covering about 40 hectares. The circular road

**This building was originally the Engine House, then the Transmitter Hall, and is now home to the Museum and the WA VHF Group.**

**A concrete mooring for the 120 m steel mast is now a lookout.**

surrounding the old Perth Radio site has been named Telefunken Drive with the access road to the buildings called Spark Gap Close, but Radio Drive down to Hickey Street is gone. I wonder how many visitors know the story behind the streets' names?

**Wireless Hill today, Telfunken Drive with Spark Gap Close leading to the buildings.**

Would Yagan have approved of what happened to his Lookout? He was a progressive man and wireless communication surely beats message sticks and runners - but who knows what he might have thought!

## Notes

1. Wireless Hill is actually in Ardross, once part of Applecross but now a suburb in its own right within the City of Melville.
2. Although officially decommissioned in 1967, it seems some traffic was being handled in 1968 during the transition to Gnangara.
3. The Overseas Telecommunications Act 1946 resulted in the creation of the OTC. Ownership of the Coastal Radio Service was transferred from AWA to this new organisation on 1st October 1946.
4. Detective Sergeant Dowsett, father of Jim VK6XP, was a regular crew member in these cars.


## Acknowledgements

- City of Melville website.
- Battye Library.
- State Library of WA.
- Wikipedia.


ar

# The wireless of another Wireless Hill

**Clive Wallis VK6CSW**
RAOTC member No 1289

**This is a simple 'cut and paste' article taken from the Australian Government's Department of the Environment, Australian Antarctic Division website. The much abbreviated story of Wireless Hill, Macquarie Island, ties in with the establishment of the ring of Coastal Radio Stations around Australia, outlined in my previous article about Wireless Hill, Perth.**

Douglas Mawson's Australasian Antarctic Expedition (AAE) of 1911-1914 was the first to establish an Antarctic radio link, at a time when radio technology was just over ten years old.

The expedition established two stations, one at the main base of Cape Denison, Commonwealth Bay, and the other at Macquarie Island on what became known as Wireless Hill, wireless being the more often used term for radio in those days. There was also a receiving-only station established at the Western Base station on the Shackleton Ice Shelf.

The wireless equipment chosen by the expedition was the German-made Telefunken 1.5 kilowatt 'spark' transmitters. The Macquarie Island telegraphists, Charles Sandell and Arthur Sawyer, used Morse code operated on high frequency.

The Wireless Hill station made the first transmission of the expedition to another receiver on the island on 17th January 1912, the day Captain Scott and his party reached the South Pole. The first 'outside' communication was on 13th February 1912, with Sydney radio and the ships *Ulimaroa* and *Westralia* of the Huddart, Parker Line, and HMS *Drake*.

Hobart Radio came into service in March 1912 and the team at Macquarie Island learnt the disappointing news that Amundsen had arrived in Hobart, after being the first to reach the pole.

The Wireless Hill station was quite successful sending nightly weather reports to Wellington, New Zealand, but it was not until April 1913 that communication with Commonwealth Bay was finally established.

**The De Dion engine house.**
***Photo by Charles Sandell.***

Radio operation needed power, so an engine house was built a short distance from the radio shack on the top of Wireless Hill. This was known as 'De Dion House', as the engine that drove the generator was a French water-cooled De Dion-Bouton. The De Dion engine was the world's first internal combustion engine to be manufactured in large numbers from 1895, and set the design standards for the first motorcycle and car engines.

**Aerials on Wireless Hill, Macquarie Island.**
***Photo by Charles A Sandell.***

At the end of 1913, the Wireless Hill station was transferred from the Australasian Antarctic Expedition to the Australian Meteorological Service and the station equipment was left on the island, possibly with the intention of the station being reopened.

Douglas Mawson himself visited the Wireless Hill station during the British and New Zealand Antarctic Research Expedition (BANZARE) visit of December 1930. At this time the De Dion engine house and wireless shack was still intact. Mawson's diary entry for 2nd December 1930 states, "There was little of the equipment inside of any use, and such as still useable is antiquated, so of no practical value".

Today nothing remains except the stumps of the radio masts on Wireless Hill, plus a long section of one of the radio masts in the collections of the Australian Antarctic Division headquarters in Kingston, Tasmania.

**Telephone between Shack and Wireless Station.**
***Photo by Charles A Sandell.***

### References

• Doug Twigg (December 1994) Polar Radio 1912 Style, *Aurora Magazine*.
• Allan Moore (December 1997) Fifty Years of Australian Radio Communications in the Antarctic 1947-1997, *Aurora Magazine*.
• Jacka & Jacka, Editor, *Mawson's Antarctic Diaries*.

ar

# The lowdown on VLF

**Gerry Wild VK6GW**
RAOTC member No 1112

**How many of us have all of a sudden become aware of the fact that they have made a horribly wrong decision? That very thing happened to me back in 1969 when I was driving with my family and towing a loaded camper along a lonely red dirt track in what I presumed was the direction of the town of Exmouth on the North West Cape.**

We had stopped for petrol at the Minilya Roadhouse and, on asking the way to the town, were told to, "Watch out for a dirt track on your left and a sheet of corrugated iron with Exmouth painted on it a few miles further on". This we duly found and had been travelling many miles without any signs of habitation or wildlife, just red dirt covered with spinifex and the occasional tall anthill.

I was at the point of making the decision to turn around before we reached the 'point of no return' when, out of an approaching cloud of red dust, there appeared a left-hand drive VW Beetle! That was the only vehicle we saw until striking the sealed bitumen road near Learmonth airport.

If we had not seen it, I would not have enjoyed working for 13 years at the Harold E Holt Base with its electronic wonders and meeting so many interesting people.

The decision to leave my employment as a transmitter technician at a Perth TV station had not been an easy one as we had just moved into a newly built house and the job was very good. However, I felt I needed something a bit more interesting than just sitting down looking at a small screen and writing logbook entries of meter readings.

On arrival at Exmouth we stayed at a caravan park until our household effects arrived a few days later and we were installed in the house allocated to us. I was then given a very lengthy and detailed tour of the Base.

The Base consisted of three main areas known as Areas A, B and C.

Area A was the VLF site, Area B the HF site and Area C the Receiver site situated to the south of the town near the airport, connected by microwave to the Communications Centre on the Base.

I was initially employed at Area B with the responsibility of helping to maintain, along with US Navy technicians and another Australian civilian, the large numbers of 10 and 40 kW transmitters plus two 250 kW monsters!

**Antenna riggers working on part of the extensive VLF antenna system on the roof of the VLF building.**

Duties also included assisting the civilian antenna maintenance crew with technical problems occurring with the many different types of antennas in use, including conical monopoles, rotating log periodics, switchable vertical reflectors and rhombics. Other duties were looking after the VHF communications system comprised of vehicular mobiles and handhelds. There was never a dull moment!

On my first tour of the Base I really could not believe my eyes when I saw the VLF towers and the massive grey concrete monolith located in the centre of them. It was some time before I was sent to work there in a relief capacity when the resident Australian technician was on leave. I first of all had to 'learn the ropes', as they say, and it was certainly 'mind boggling' with everything being on such a vast scale and of such high power.

Such a high powered device needs quite complex supporting systems to operate efficiently. I

**The 'massive grey concrete monolith' located at the centre of the VLF site, Area A, at the Harold E Holt Base at Exmouth in 1973.**

**Tower Zero of the Trideco VLF antenna system which consists of 12 towers grouped around this 13th central tower. Each of the towers is 304 m in height.**

will endeavour to explain them, but please bear in mind that it is over 33 years since I was last there and that some changes will have been made since then although I have been made aware of one or two.

The VLF spectrum is considered to extend from 10 to 30 kHz and, since the advent of radio, this range has been used for communication. However, using these frequencies has meant very high power, huge antenna systems and costly infrastructure.

Up until about 1926, transatlantic radio communication was conducted at VLF and LF frequencies using single sideband and ICW modes. The use of HF, with inherent lower cost and physical size, meant the steady demise of earlier systems. They did not just fade away, however, because it was found that when HF become unreliable due to ionospheric and auroral disturbances, the low frequencies were less affected.

Propagation of VLF/LF radio energy has relatively low ground-wave attenuation and is done by reflection of the sky-wave component back to the earth with very little penetration of the ionosphere, even at extreme angles of incidence. Long distance transmission is achieved by reflection between the earth's surface and the low regions of the ionosphere at heights between 60 and 90 km. Many countries in the northern hemisphere make use of this phenomenon, especially those with maritime connections.

During my time at sea as a Radio Officer I can recall copying the British Post Office station GBR on 16 kHz (750 kW) in the south Atlantic to get daily time signals for checking chronometer rates. Around Xmas time, commercial traffic directed to ships at sea became very heavy and an LF station on 143 kHz was often put into service to pass traffic lists and telegrams. I believe there are still quite a few European broadcast stations operating on long wave (LF) between 159 and 273 kHz.

At a frequency of 20 kHz, sea water has an approximate attenuation of 1 dB/foot, the attenuation increasing rapidly as the frequency is increased. Various navies have utilised this fact to communicate with submarines. During WWII the German Navy used a very high powered VLF station known as Goliath to communicate with their U-boats and the station could be copied worldwide.

The VLF station at Harold E Holt communications station is one of many spread around the globe, including those located in the continental United States, Hawaii and Japan. It has the designation AN-FRT67 and is capable of transmitting 2 MW between the frequency range of 15.5 to 27.5 kHz. To give some idea of coverage, this station can be heard in the North Atlantic and the others can be heard in the Indian ocean. NWC (the callsign of the VLF station) was originally designed for ICW FSK teletype operation but was later converted to the four channel VERDIN system (VERDIN is a system using time division multiplexing which converts four channel TTY into a single bit stream, processes it, and then converts it to modulate RF signals in the 14 - 60 kHz range).

To house a transmitter of such power requires a large two storey building containing many complex operating systems so I will endeavour to explain them simply by listing the main ones, for example Power Supplies, RF Generation, Antenna Design, Cooling Systems, and Safety Systems.

### Power Supplies

AC power is supplied from a nearby 12 megawatt power station at a voltage of 4,160 volts, 3 phase, 60 Hz. A dual power feed is supplied for redundancy and better

**The VLF operating console at Exmouth in 1973.**

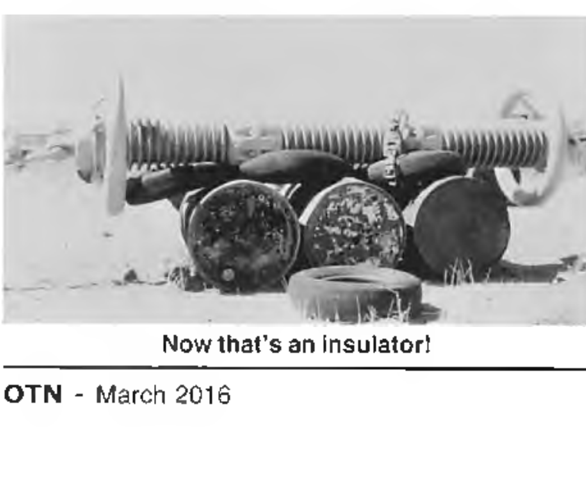
**A maintenance crew working on insulators forming part of the VLF antenna system in 1972.**

regulation for different power switching configurations. Primary power distribution is at 4,160 volts through circuits controlled and protected by air circuit breakers. This voltage is fed by step regulators to duplicate, step up oil filled transformers and then to duplicate three phase rectifiers for the PA plate voltages.

A similar system is used to supply a lower DC power for the intermediate power amplifiers. Secondary power is at 460 volts, fed by step down transformers. At one stage, mercury vapour rectifiers were used, but problems associated with arc-overs and non-conduction caused by improper cooling resulted in solid state rectifiers being substituted.

The PA plate supply filters and associated oil filled transformers are all located on the lower floor of the building. The filters are very simple in construction because of the three phase power supply and the high mains frequency. Also installed in the same location are devices known as Ignitrons.

These are very important items as they are used in what is known as a crowbar circuit. If an arc is detected in one of the PA valves, a monitoring device in the grid circuit causes the Ignitron to fire, shorting out the PA plate voltage. At the same time a trip voltage is sent to the air circuit breaker in use causing it to open, thus immediately removing the high voltage. When such a thing occurs, a thunderous explosion emanates from the air breaker as the load is removed. Unlucky is the poor person who happens to be nearby at the time!



**Now that's an insulator!**

Power for the various equipment switching functions is supplied by 70 volts 60 Hz provided by motor generator units powered by the 460 volt secondary supply. A DC power control circuit provided by banks of Nicad batteries is employed for the control of the HV primary air circuit breakers.

### RF Generation

The frequency generators are synthesised and highly stable, being referenced to Caesium Beam reference standards. Their RF output is fed to the pre-Intermediate power amplifier, comprised of three stages of air cooled screen grid valves giving an RF output of approximately 2 kW.

The fourth stage, the Intermediate power amplifier, has a pair of 6696 60 kW dissipation water and air cooled triodes producing an RF output of approximately 100 kW.

There are four Power Amplifier stages operating in Class C, each requiring 20 kW drive to give 500 kW output. PA grid circuit protective bias is provided by a three phase half-wave rectifier. Operating bias is generated by rectification of the grid excitation.

Ten type 6696 water and air cooled triodes are installed in each PA, eight being used in push-pull parallel with the other two being used as spares. The grid tuned circuits use variometers and mica capacitors to adjust for resonance.

The amplifier tank tuning unit consists of a large toroidal coil constructed of flat copper strip tuned by oil filled variable capacitors. Power is coupled out of the PA tank by means of a low impedance link wound around the toroid coil inductor. Depending on the number of PA amplifiers selected to be active, switches select the number of turns in the coupling coils to maintain an output impedance of 20 ohms. The variable elements of both grid and tank circuits in each PA are provided in duplicate.

Provision is made for off-air testing of each amplifier by air cooled resistive dummy loads for the pre-IPA and IPA stages, whilst one water cooled load of 500 kW capability is provided for the PA stages. Any of the four PA stages can be switched to the load, but only one at a time.

A T-network of capacitance and inductance transforms the transmitter output impedance of 20 ohms to the antenna input impedance of 12.5 ohms.

A large control console was originally installed on the main floor of the building facing the amplifiers' cabinets to remotely control switching and tuning of the various amplifiers plus full metering facilities. I understand that this has now been modernised but I should imagine it would still provide the same functions as before.

### Antenna Design

Identical tuning and matching components are installed in each of two huge, separate, Faraday shielded, air conditioned structures known as Helix houses. Either of these can be selected for use by means of remotely controlled contactors.

The antenna is tuned by six, vertically mounted, variable inductors and one fixed in series, connected between the antenna feed point and ground. Air driven range switches select combinations of these inductors to provide tuning over the range of frequencies in use.

**A US sailor climbing one of the variometers in a Helix house with Litz wire visible near his feet.**

The reactance of the selected loading inductances transforms the input impedance of 12.5 ohms down to the radiation impedance which varies with frequency.

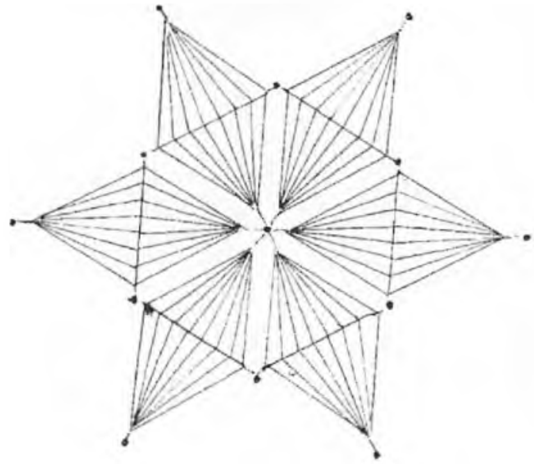
A point worth noting here is that the supports for the inductors in the Helix houses are made of a specially treated, non-conductive, impregnated wood or porcelain and that compressed air is used to drive the large range switches rather than electrically driven devices. The reason for this, of course, is that no extraneous cabling of any sort can be allowed in such an RF environment.

To reduce losses, Litz wire is used in the construction of the inductors. (Litz wire is a conductor composed of a number of fine, separately insulated strands which are woven together to increase Q by increasing the effective surface [RF conducting] area and at the same time reducing DC resistance.)

Feed-through bushings connect the Helix house output to the antenna down-lead assembly. To reduce the chance of flashovers, these bushings are pressurised to 30 psi with sulphur-hexafluoride, an inert, non-flammable, high dialectric gas. At a power output of 1 MW the antenna current at this point is in the vicinity of 1,760 amps.

These bushings feed the junctions of six individual four-wire cage leads on the roof of the building. These

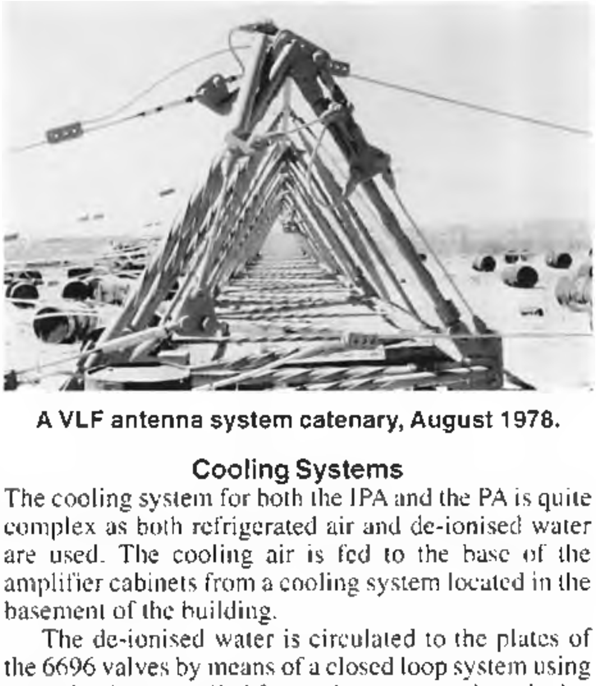
**The author inside a Helix house in 1973.**



**A plan view of the Trideco antenna system.**

four-wire cage leads are joined to each individual top hat panel down-lead fan.

The antenna system is known as a Trideco, as it is composed of 13 towers, 12 of them grouped around a central tower known as Tower Zero. There are six discrete, diamond shaped, top hat panels. Each of these panels is capable of being individually lowered to the ground for maintenance.



**A VLF antenna system catenary, August 1978.**

### Cooling Systems

The cooling system for both the IPA and the PA is quite complex as both refrigerated air and de-ionised water are used. The cooling air is fed to the base of the amplifier cabinets from a cooling system located in the basement of the building.

The de-ionised water is circulated to the plates of the 6696 valves by means of a closed loop system using ceramic pipes supplied from a large reservoir tank also located in the basement. Heat energy from the valves is transferred to a recirculating fresh water system and then to a salt water heat exchanger. This heated saltwater is then discharged into the close by sea.

Because of the station's geographical location and the high humidity, the entire building is air conditioned.

### Safety systems

Due to the presence of high voltages and RF radiation hazards, much attention has been paid to the safety of personnel. A very extensive and complicated key interlock system is used to prevent access to any energised circuits. When the HV air circuit breakers are energised, no equipment doors can be opened. To be accessed, the equipment must be shut down and the HV turned OFF. ar

# Marshman radios

**Ian Godsil VK3JS**
RAOTC member No 1220

**Whilst preparing an RAOTC monthly broadcast earlier this year, I was talking to my cousin in Bacchus Marsh and she asked if I had heard of the Marshman Radio? On answering, "No", she volunteered to get some information from the local library. I thank the Bacchus Marsh Historical Society and Mrs Joy Michalski for the following information.**

For non-Victorian readers, the town of Bacchus Marsh is about 50 km west of Melbourne in the old Ballarat gold mining district of the 19th and 20th centuries. It is named after William Bacchus, one of the pioneering settlers. Today's population is just over 17,000 people and there are three primary schools, a secondary college and a fee-paying independent school.

In July 1994 a Mr Geoff Hine visited Mr Bob Butler and here is his summary of that visit:

"On Saturday, 17th July I spent a pleasant afternoon with Mr Bob Butler at his Gisborne Road home, gathering some history of the commercial radio receivers built and sold by his Arbee Supply Company in Bacchus Marsh during the early post-war period 1948 to 1953.

"With a pre-war interest in and knowledge of radio, Bob's wartime duties included keeping the civilian radio sets in operating condition within the area from Melton to Ballan. These were essential for providing government information quickly throughout each district via the local broadcasting stations.

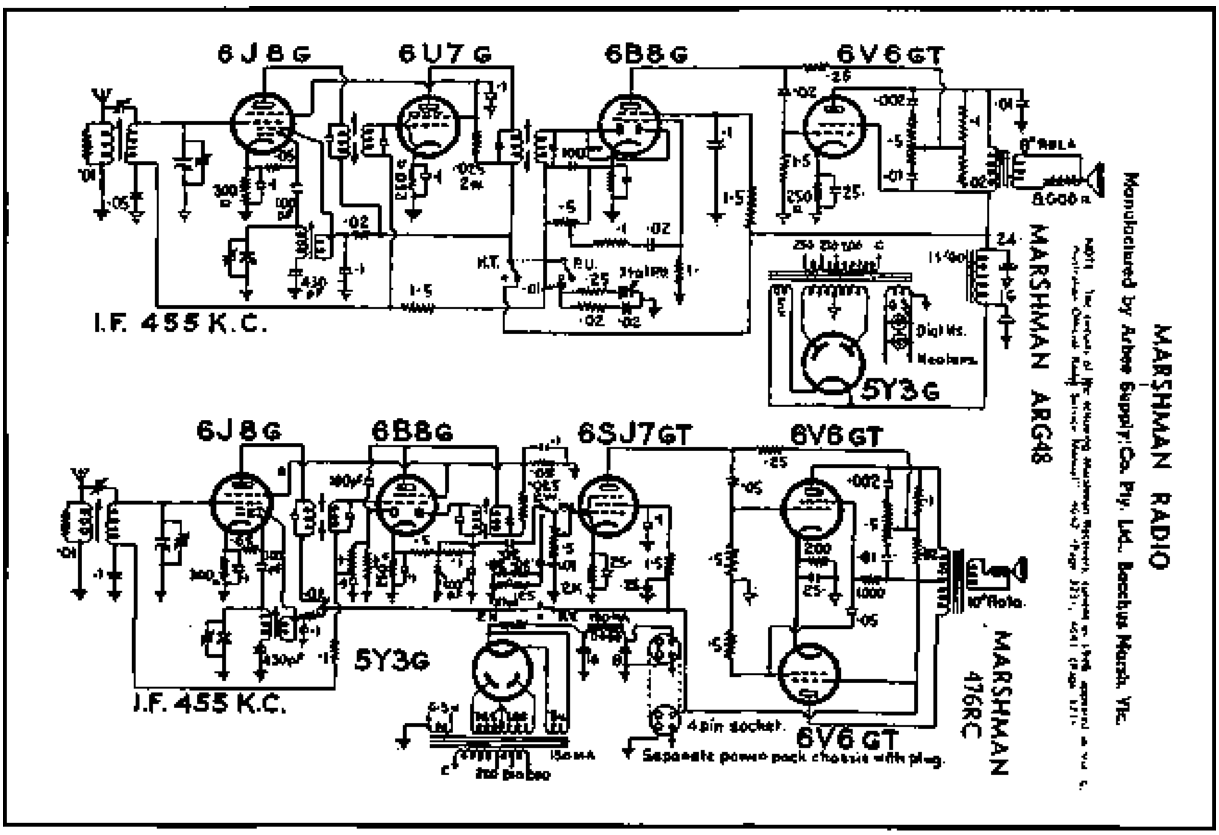
"After the war, Bob formed the Arbee Supply Company, with a board including Laurie Hine and Tom McMahon, with about 40 local and 10 outside shareholders. A small factory was built behind 130 Main Street, Bacchus Marsh, now the site of the Farm Shop. The engineer was Jack Kling and the workforce included Theo van Alkemade and Les Crowe.

"Wholesale distribution throughout Victoria was handled by the big electrical firm of Noyes Brothers. Noyes also marketed their own 'Seyon' brand radios. Cabinets were built by a specialist firm, H Gage and Co of Richmond, an inner eastern suburb of Melbourne.

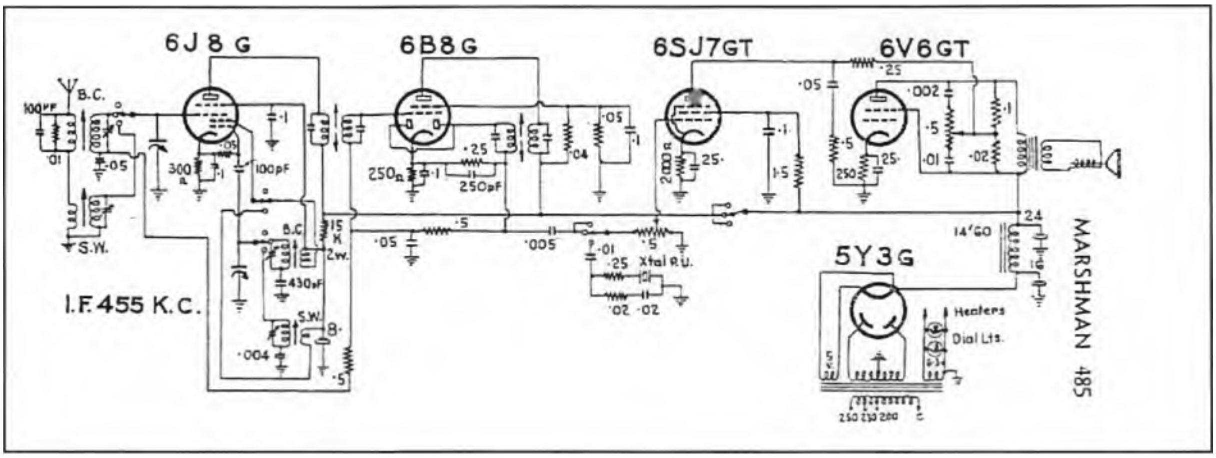
"Production of the Marshman Radios continued for about five years, when the large firms AWA, Kreisler, Philips, etcetera had their production lines operating and small-scale production of radio sets became uneconomical, after which Arbee continued in business as a retail shop."

As can be seen from the circuit diagrams, the radio design was fairly standard for the period, using easily obtainable 6.3 V octal base valves including the 5Y3G rectifier which was then generally replacing the identical, but four pin, 80.

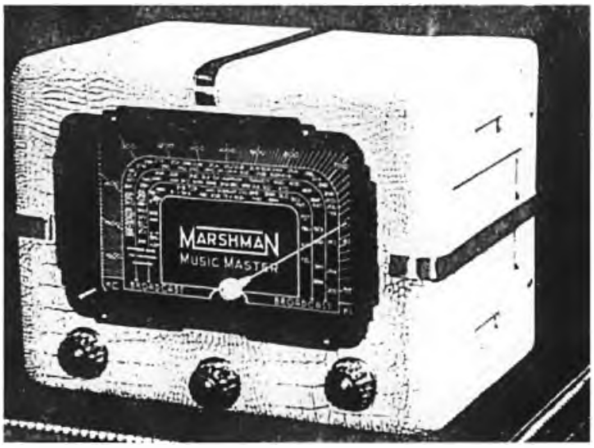
The ARG48 set appears to have been a radiogram, whilst the 476 RC set with its push-pull set of 6V6G output valves, large 10 inch speaker and provision for




**Circuit diagrams of the Marshman ARG48 (top) and the Marshman 476RC.**




**Circuit diagram of the Marshman 485 radio. No doubt these old valve circuits will bring back nostalgic memories to many of our oldtimer readers.**



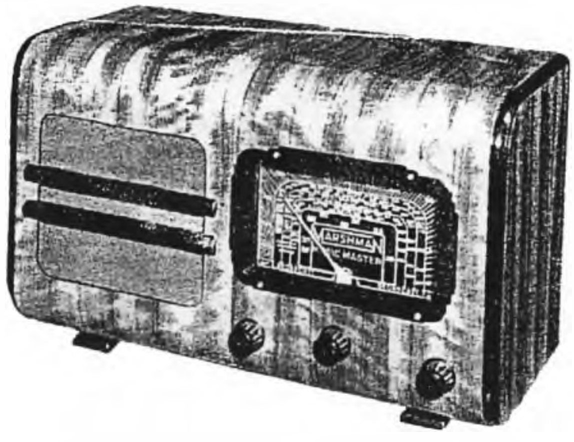

**A Marshman four valve reflex superheterodyne receiver in a leatherette covered cabinet.**

an alternative DC power supply, would seem to have been a top-of-the-range radio.

The 485 was a dual-wave set covering the normal 550-1600 kc (now kHz) Broadcast Band and probably the 6 to 18 Mc (now MHz) Short Wave band and had provision for a record player connection.

The apparent intrusion of stations 1YA, 2YA and 4YA in the Victorian section of the tuning dial is due to these stations being New Zealand broadcasting stations able to be picked up by normal receivers in the eastern States during the late afternoon and evening. I wonder how many readers can remember situations like this on the AM broadcast band in the early post WWII years?

Apart from the models mentioned in this article, Arbee also developed a small portable radio built into a lady's leather handbag, but only a few of these were made. Small multi-valve radios only became practical with the wartime development of miniature 1.5 volt valves such as the 1T4, 3V4, etc.



**The same model Marshman mantel radio as above but in a polished timber cabinet. Both models had five inch speakers.**

**A Marshman Music Master Table Model radio manufactured by Arbee Supply Company, Bacchus Marsh, in 1950.**

This article was included in the March 2015 RAOTC monthly news and information broadcast. In the evening during the 80 metres call-back, Dave Parslow VK3AIF, RAOTC member No 1552, commented that there was another company in the area that made radios for the CFA (Country Fire Authority) under the brand name 'Waldon'. The men involved were a Mr Roly Richie (not a licensed amateur) and a John Campbell who was a licensed radio amateur.

This was just the sort of information I had in mind when, in the broadcast, I asked for members to check with their families and friends for similar news on any small local radio manufacturing businesses that had existed in their area in years gone by. ar

# Little mouth, big ears

**Clive Wallis VK6CSW**
RAOTC member No 1289

**Towards the end of 2014 I rediscovered a 40 metre double sideband QRP transceiver that I had built in 1981 but which had not been entirely satisfactory. The VFO had a tendency to drift and the PA's linearity left something to be desired.**

Back in those days amateurs were more tolerant of rigs that drifted a little during a QSO so, despite its shortcomings, I had quite a number of successful contacts with its three watts (or thereabouts) of RF output and its direct conversion receiver. However, at that time I was working for a living, spare time was limited, and the project was shelved.

Following retirement in 1993, we moved from Sydney to Perth. While the 'good gear' was quickly set up once again in the new QTH, many bits and pieces were simply tucked away in a cupboard to perhaps come in handy one day, the QRP DSB rig amongst them. It was to lie there for many years and, like Sleeping Beauty, was only rediscovered after a long rest.

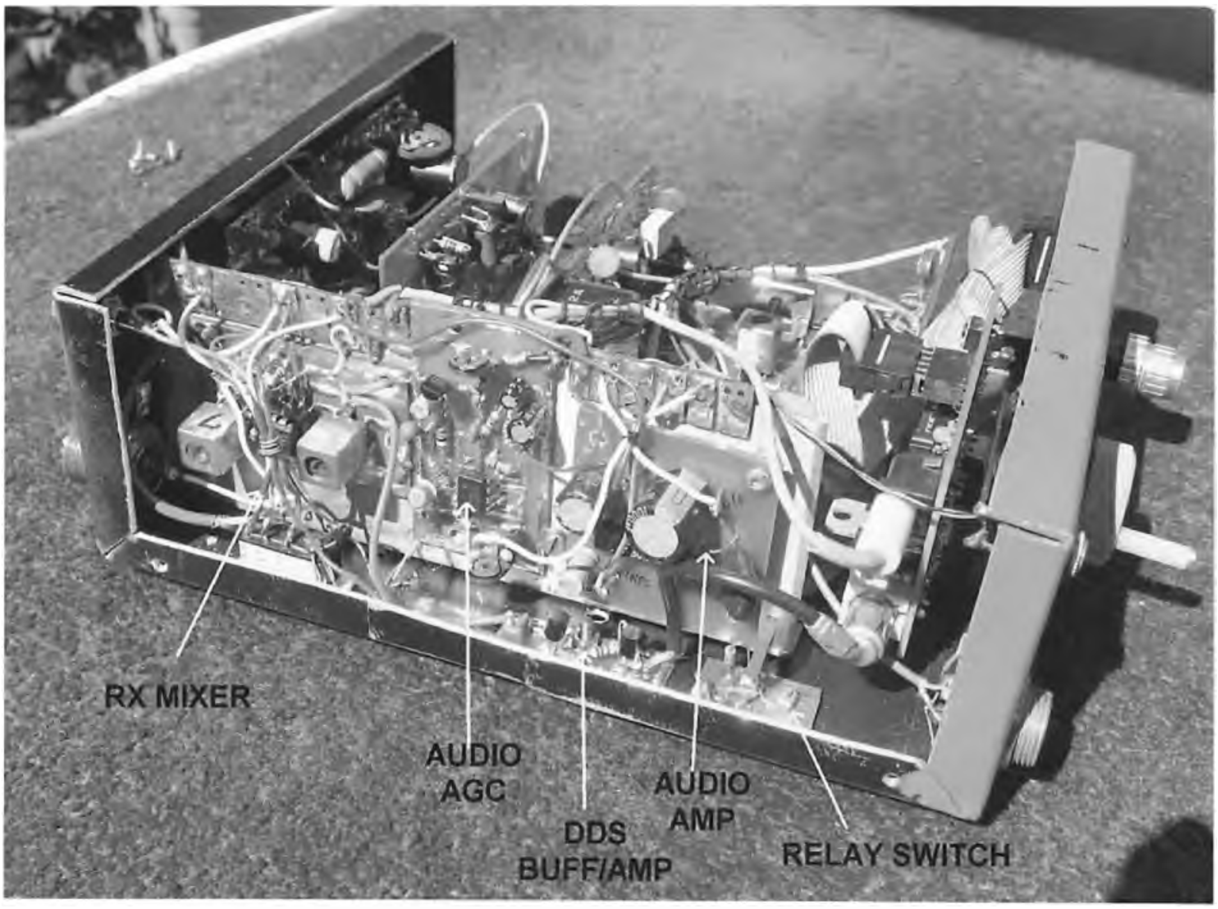
Unlike Sleeping Beauty though, it certainly didn't get a kiss to re-awaken it! Applying 13.8 VDC, however, did the trick bringing it back to life at once and, surprise, surprise, all the smoke stayed in all the components. Sadly, neither the drift nor the slight PA distortion had benefitted from all this time in bed.

With leisure time now in greater supply, what it did get was a new VFO and a re-worked PA. The inductance-capacitance VFO was replaced with a ceramic VXO running at half the final operating frequency which, when doubled, covered about 160 kHz of the 40 metre band with commendable stability. A revised biasing system made the PA much more linear.

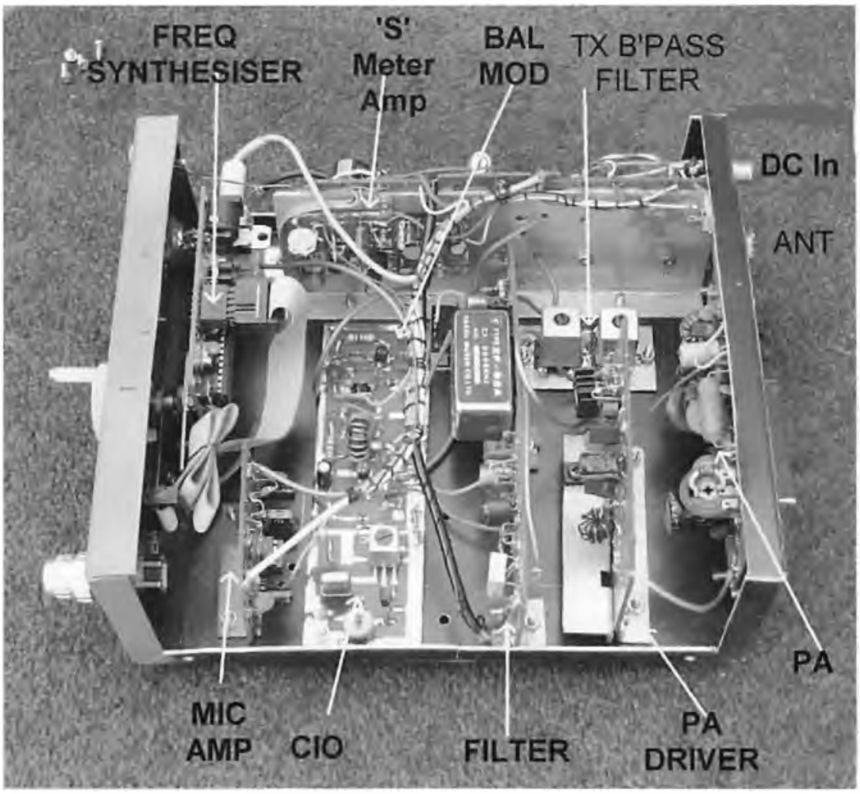
For several weeks I had a lot of fun with this little set and many contacts didn't realise it was a DSB signal unless they deliberately looked at the opposite sideband to see how good the opposite sideband suppression was. What they found, of course, was an USB signal identical to the normal LSB one. There were a few complaints that the signal was wide. Being DSB it would be! Quite legal, but it did upset one or two operators.

The direct conversion receiver was very sensitive but couldn't really cope with strong adjacent signals, sometimes making life difficult. Nevertheless, I was surprised at how well the rig worked: given reasonable band conditions, making contact over many hundreds of kilometres was no problem. Then the question arose in my mind, how about brewing a proper SSB QRP transceiver?

A decent crystal filter would be essential but an eBay search indicated that even second-hand ones were surprisingly pricey. I gave thought to building a




Inside the QRP rig showing the main receiver boards.




**Looking down on the QRP transceiver with the top cover off showing the placement of the main boards.**

programming such a device was really beyond my ability.

An internet search turned up a few possibilities but the one I settled for was a DDS kit offered by Doug Pongrance, N3ZI, Las Vegas, Nevada. There were cheaper alternatives but I opted for this one because it seemed the most versatile, had wider frequency coverage than most of its competitors and, should I ever decide to build something more adventurous than a mono-band QRP rig, had the best potential. The kit arrived by post quite quickly and took only a couple of hours to assemble.

So here we were. With a DDS brain and a really nice filter for its heart, all I had to do was build a body around these two vital organs. As with my DSB transceiver, in the true amateur tradition of short arms and deep pockets, I was determined to create this SSB version from salvaged components and only purchase new items where nothing suitable could be found in my junk collection.

ladder filter but some experiments with a number of 10 MHz crystals yielded less than satisfactory results.

Then, glory be, lying in amongst my junk I found a Yaesu Musen XF-92A 9 MHz crystal filter which I vaguely recalled liberating from an old CB set many, many moons ago. Regrettably, there was no sign of the associated CIO crystals.

But wait, there's more!

Tucked away in another junk box was a crystal labelled 9 MHz. Plugging it in to my GDO indicated that with a bit of luck it could be persuaded to oscillate at 1500 Hz either side of 9 MHz, potentially enabling both LSB and USB to be generated. But what about a really stable HFO to mix with it to produce the required 7 MHz signal? Nowadays, direct digital synthesis or DDS had to be the way to go, but home-brewing and

**The home brew case contructed by the author for the 'little mouth, big ears' QRP transceiver.**

Fortunately, this junk collection included a wealth of old printed circuit boards rescued from dead or dying equipment, including old Tait, Barrett and Philips transceivers, computers and a variety of other 'come in handy one day' junk. (My XYL would differ over the use of wealth to describe these precious items, but then beauty is indeed in the eye of the beholder!)

At the outset, I suppose there are two ways to guesstimate the size of a finished scratch-built product; you either estimate the likely shape and size of a box required to house the works and then cast about for a suitable one, or you happen to have a likely looking box and you somehow squeeze all the bits in.

A metal chassis and casing would be necessary for proper screening but none of the usual suppliers had anything ideal, and my junk box failed me. So I ended up rolling my own from a piece of aluminium sheet cut from the lid of the casing of an old valve amplifier.

The resultant chassis can be seen in the photo. A suitable cover was fabricated from sheet steel cut from an old computer case. A sheet metal worker would fall about laughing at my work, but it's surprising what you can do with a vice, angle iron and a bit of determination.

My preference for home-brew projects is to use 'inverted pcb' construction whereby components are soldered directly onto the tracks of a hand-drawn pcb. This obviates drilling the board and allows circuit changes to be made quite easily, yet is mechanically quite sound. It's similar to paddy-board but a little neater.

Similarly, each stage of the scratch-built project is made as a separate board, much as a block diagram would be drawn. Again, this allows for easy changes to be made should a particular stage not function as desired. For example, initially I had some trouble obtaining adequate carrier suppression in the

# Bernie Gates Shavers Net

This rather oddly named net has been operating every day except Sunday for some 56 years in Western Australia and must be one of the longest running nets in Australia.

It began in late 1959 or early 1960 when three friends, Allan Buckie VK6AB, Bernie Gates VK6KJ and Herb Wanke VK6XO began a daily net in south-western WA starting at 8.00 am. Bernie and Herb both operated radio and TV businesses, Bernie's in Albany and Herb's in Katanning, while Allan was a commercial traveller.

John VK6JY, who knew all three back in the 1960s writes, "VK6AB was a traveller for a Perth firm called Tedco on the North side of the old Perth Railway Station in Wellington Street. They sold me a 50 foot telescopic tubular mast and a Channel Master TV rotator in 1964 for my first VHF station in Melvista Avenue, Claremont. When he died in about 1965, I bought his 4-section 40 foot (12.2 m) bolt-up mast and still have it and that 50 foot (15.24 m) pop-up. He was also the first amateur I heard on air back in 1959 - AM!

"Allan used to milk the Shavers Net for 'orders' for the Katanning and Albany shops each morning when a road trip down the Great Southern was imminent. Last minute items would get added in. Well, that's the reason for the Net to be created but I do not know when it started."

The story goes that, as well as being partial to a drop of '807 electrolyte', Allan was a bit of a speedster, causing Tedco to fit his van with a speed governor, and most likely Allan used a war surplus WS19 amplitude modulated transceiver for his amateur mobile communications. Allan died in the mid-1960s

It appears that many SWLs listened in and the starting time gave rise to the name Shavers Net.

The late Bernie Gates VK6KJ in his radio shack.

though sometimes it was referred to as Bernie's net. In 1992, when Bernie became seriously ill, it was suggested that the net be renamed Bernie's Shavers Net. Following his death it became the Bernie Gates Shavers Net in honour of his memory.

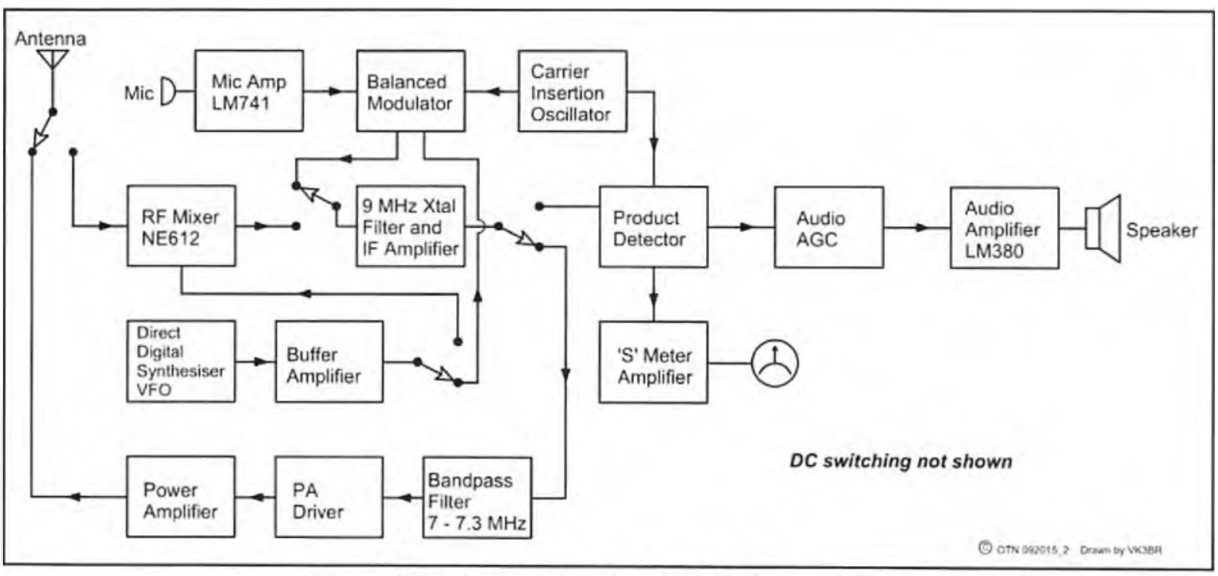
Today the net operates on either 3.605 or 7.105 MHz depending on the time of year and propagation, starting at 8.00 am WST (0000 UTC) sharp. Although a nucleus of regular operators from Perth and the south west of WA form the core participants, it has become more of a 'natter' net. Everyone is welcome to join in and amateurs visiting WA are encouraged to 'drop in'. *OTN* readers who are 'grey nomads', or who are just visiting WA, may wish to bear this in mind!

A booklet entitled *The Bernie Gates Shavers Net*, written by John Cox VK6NJ in 2005, contains a detailed account of this net and of Bernie VK6KJ in particular. It is hoped to publish more of it in a future *OTN*, but meanwhile any readers with memories of the net's early days are earnestly requested to tell us what they recall.

transmitter balanced modulator board due to component layout; it was a fairly simple matter to replace that board with one having a better layout which gave satisfactory results. This would have been almost impossible had a single pcb been used for the entire circuit.

I make no claim to be radio engineer but, over many years of home-brewing, have developed a gut feeling for what is likely to work and build my circuits accordingly.

Rather than slavishly copying any one design, this little transceiver arose from various circuits cherry-picked from the internet, *ARRL Handbooks* and excellent publications such as *Solid State Design for the Radio Amateur*, and *Amateur Radio Techniques*, etc, adapted to my needs.




Signal flow chart for the 40 m SSB QRP transceiver.


**The author's homebrew 40 m SSB and DSB rigs alongside each other.**

Rather than give a blow-by-blow description of each circuit board, I've included a couple of annotated photos showing the major components, plus a block diagram. One slightly unusual feature is the inclusion of audio automatic gain control rather than the more usual method of controlling IF amplifier gain. This was done to simplify the switching and control of the IF amplifier, common to both transmitter and receiver.

Unlike complex, modern, commercially made transceivers this set has but two controls, tuning and volume. The tuning step is normally set at 100 Hz but can easily be changed to any interval from 1 to 1000 Hz simply by pressing on the tuning knob. Receiver incremental tuning (RIT) is also available as an option. No provision has been made for CW but could easily be arranged.

The end result has been gratifying. Apart from making regular appearances on the local 40 m Bernie Gates Shavers Net (see sidebar on the previous page) where it has held its own against other participants using the more usual 50 - 100 W transceivers, regular contacts of 400 km or more are being made. Audio quality is reported as good to excellent.

The receiver is sensitive, selective and generates little internal noise. I don't have any accurate performance measurements as such but on direct comparison tests it is every bit as sensitive as my Icom IC-728 transceiver and I've not had any inter-modulation problems with strong adjacent stations.

No rig would be complete without a matching microphone. Mine is another homebrew job built around a noise cancelling electret which once graced the interior of a motor car as a hands-free mobile telephone microphone back in the dim distant past when mobile phones were operating on about 500 MHz. I'm not too sure about its electrical characteristics matching anything, but the colour certainly matches that of the QRP rig's casing if only because the paint came from the same spray can.


**The QRP rig complete with home brew matching microphone and 'S' meter.**

An interesting six-way QSO took place on Tuesday, 14th April 2015 when I was working Mark VK6BSA/m driving between Esperance and his home in Condingup and Peter Parker VK3YE/p VK6 joined in. Readers will recognise Peter as the author of many interesting articles published over the years in the WIA journal *Amateur Radio*.

Peter was operating portable from South Mole, Fremantle, using homebrew QRP with 5 W into a half-wave end-fed wire. Soon we were joined by another Peter, VK6FUN, operating from North Baandee (about 40 km NW of Merredin), then by John VK6JY from Albany, after which Trevor VK6ATB from near Pemberton popped up followed by Ian VK6LCT from Toodyay. Approximate direct distances from my Perth QTH are; Esperance 650 km, South Mole 30 km, N Baandee 220 km, Albany 400 km, Pemberton 285 km, and Toodyay 100 km. Signals all round were Q5 and up to S9 - not bad for 'flea' power.

There is something immensely satisfying about contacts made with a homebrew rig with just enough RF to light a 12 V dial bulb. Maybe I should name it Jerboa…little mouth and big ears!

**A Jerboa, a long-tailed leaping desert mammal with a little mouth and big ears.**

ar

# Conquering the tyranny of distance

**Herman Willemsen VK2IXV**
RAOTC member No 1384

**In 1928, Charles Kingsford-Smith's 11,585 km flight across the Pacific Ocean was the first successful use of wireless on an epic long distance flight never attempted before. Nowadays passengers take it for granted that it only takes 14 hours to fly from California to Australia in a comfortable Boeing 747, with all its conveniences.**

But in 1928 it took Charles Kingsford-Smith and his three aircrew more than 83 flying hours in their aeroplane *Southern Cross* to cover the distance between the same points. Taking into account the rest and fuel stops at Hawaii and Fiji, their journey took nine days.

The *Southern Cross*, built in the 1920s by Dutch aviation pioneer and aircraft manufacturer Anton Herman Gerard Fokker, was a giant Fokker VII tri-motor monoplane with a wingspan of 22.1 metres. On its record breaking flight the plane's registration markings were '1985'. It was re-registered upon arrival in Australia as G-AUSU, followed by VH-USU[1].

Charles Kingsford-Smith, or 'Smithy' as he was widely known, was the Captain and pilot of the *Southern Cross*. His co-pilot was fellow Australian Charles Ulm. The other two crew members were Americans, namely navigator/engineer Harry Lyon and radio operator James Warner. The *Southern Cross* was made of a spruce and plywood frame, covered with Irish linen.

It had an open cockpit with a windshield but no toilet or cooking facilities. On its long flight the crew had to make do with sandwiches and coffee from a thermos. Their cane seats were not secured to the floor and they did not wear seatbelts. They had to endure loneliness, fatigue and very cramped conditions, far worse than even 'cattle class' on a Boeing 747.

Situated in the cockpit was the very large fuel tank, which was put behind the pilot and co-pilot's seats and did not allow much remaining space for them. The navigator and radio operator had to fit in on the other side of the fuel tank.

All four crew members were apparently heavy smokers but, of course, smoking was banned because of the fire risk.

**The crew of the *Southern Cross*, left to right: Harry Lyon, navigator; Charles Ulm, co-pilot; Charles E Kingsford Smith, MC, AFC, Captain and pilot; and James Warner, radio operator.**

Smithy was aware that the general public's perception of long distance flying over the Pacific was viewed as, "suicide or at least a reckless flirting with death".

This proved to be correct, as on their journey they were faced with lightning, turbulence, torrential rain, blind flying, equipment breakdowns and fuel shortages, as well as the physical discomfort described earlier.

Compared to today, their navigational aids were primitive and contact with the outside world was by Morse code only. If their plane ditched, there was no worldwide network of Search and Rescue (SAR) authorities they could call upon.

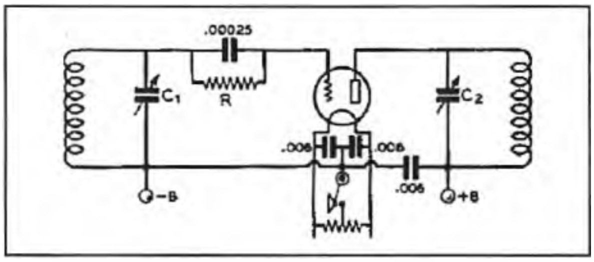
The plane did not have an intercom system; nobody could hear each other because the noise of the three 220 hp motors and the howling of the wind through the rigging was absolutely deafening.

Therefore, the men had to resort to writing notes to each other, which were passed back and forth on the end of a spiked stick to avoid them being blown away by the wind.

Due to the effect of this high noise level, all four men were totally deaf for some time after making their landing in Brisbane.

The communications and navigation equipment on board the *Southern Cross* consisted of four compasses the principal of which was an Earth Inductor remote reading compass which Smithy swore by, a marine sextant, and wireless equipment as follows:


**The *Southern Cross* landing at Brisbane after the record breaking flight.**




**The *Southern Cross* TPTG transmitter circuit.**

1. A 50 watt HF transmitter on 33.5 metres (8,955 kHz). It was a Tuned-Plate-Tuned-Grid (TPTG)[2] circuit with a UV-211 triode transmitting tube. RCA UV-211 radio valves were known for their reliability and ruggedness. The HF transmitter used a quarter-wavelength trailing wire antenna eight metres long.

2. A 60 watt MF transmitter on the international maritime distress and calling frequency of 600 metres (500 kHz). It used a quarter-wavelength long trailing wire antenna 122 metres in length.

3. An emergency 60 watt MF transmitter on 500 kHz, which was completely waterproof so that it could operate under water for eight hours if the plane should ditch in the ocean.

I assume that the MF transmitters were also simple radio circuits, possibly also of a Tuned-Plate-Tuned-Grid (TPTG) or a Tuned-Not-Tuned (TNT) design.

There were three receivers, which shared a common audio amplifier; an MF receiver; an HF receiver; and a beacon receiver.

The 122 m long MF transmit trailing wire antenna acted also as a receive antenna. Both the MF and HF phosphor-bronze slim-line antennas were trailing wire-type reel antennas. In flight they were unwound from the antenna reel and fed via a Bakelite insulator tube through the fuselage to the outside.

A lead weight, called a fish, and weighing about 1 kg, was attached to the end of the trailing antennas. Before landing it was necessary to wind in this trailing wire otherwise the fish, after striking the ground or water as the plane came down, would bounce and could cause serious accident by striking the propeller, or damaging the fuselage, fouling the controls, injuring personnel or getting stuck on a perimeter fence. Sometimes, during a forced landing, there was no time to reel in the antenna and it was simply cut adrift.

**The *Southern Cross* antenna reel and Bakelite insulator tube.**

The transmitters and receivers were powered by two egg-shaped, wind-driven, DC generators with a constant speed propeller. The generators were attached to both sides of the plane just below the cockpit. For emergency power, a hand-cranked generator was available for when the plane was on the tarmac or when the wind-powered generators failed.

Throughout the voyage, the *Southern Cross* was not only in communication with merchant ships and warships, but also with coast radio stations in the USA (San Francisco), Hawaii, Fiji and Australia. AWA's Receiving Station at La Perouse, overlooking Botany Bay, was in constant QSO with the *Southern Cross* from the time she left San Francisco until she reached Australia.

Even when the *Southern Cross* had left Hawaii, the shore station at San Francisco still had contact with the aircraft. This transmission covered more than 8,000 km, the longest distance over which messages had ever been sent and received from an airplane in flight.

This record was shattered when Bloemfontein in South Africa reported on the same day a clear reception of R/O Warner's wireless message. The distance between Bloemfontein and the plane was 20,000 km or 2 ½ times further than the distance between the plane and San Francisco.

**Radio operator Jim Warner using the wireless equipment aboard the *Southern Cross*.**

For the first time ever, the progress, problems, challenges and drama of airmen and their plane were transmitted to a worldwide, news hungry media. Radio and newspaper reports were all made possible by the CW transmissions from R/O Warner's on-board wireless equipment. The wireless accomplishments of the *Southern Cross* were widely recognised as the first successful continuous radio communications on a long distance flight.

By the way, the original *Southern Cross* is now preserved in a special glass hangar near the international terminal at Brisbane Airport.

A full-sized, airworthy replica of the *Southern Cross* is located at the Historical Aircraft Restoration Society (HARS) at Albion Park, NSW. This

**A later photo of the *Southern Cross* with the VH-USU registration.**

replica was built in the 1980s and is the largest known replica aircraft in the world. Unfortunately, in 2002 the *Southern Cross* replica lost a main wheel upon take-off at the airfield at Parafield, SA, which resulted in damaging its right wing tip upon landing.


**The *Southern Cross* replica's right wing under repair at HARS.**

This massive wooden wingspan is at present under repair at HARS at Albion Park. One day soon the *Southern Cross* replica will fly again.

**Acknowledgement**

• HARS, Albion Park, NSW.
• Clive Wallis VK6CSW

**Footnotes**

1. When the *Southern Cross* landed at Eagle Farm on 9th June 1928, its '1985' registration was the original American registration mark. Aircraft operating in Australia continued to be registered against the British nationality mark until 1929 when they were transferred to the new Australian Registry. Until 1929, British based aircraft had the prefix G-E; Canadian G-CA; New Zealand G-NZ; and Australia G-AU followed by a further two letters for 'Colonials' or three letters for British. From 4th July 1928 to 3rd July 1929, *Southern Cross* was registered as G-AUSU. It was re-registered as VH-USU on 5th April 1931, so it appears that either there was a period when it remained on the British register or it was unregistered. Given Smithy's impecuniousness, the latter could well be the case. *Southern Cross* is now displayed in Brisbane in its original trans-Pacific livery including the '1985' registration marks. The registration VH-USU is currently retained by the Historical Aircraft Restoration Society for their *Southern Cross* replica.
2. For TPTG and other 1920s' transmitters, see websitse < http://members.shaw.ca/ve7sl/tnt.html >.

ar

# Cat's in the cupboard

**Max Shooter VK6ZER**
RAOTC member No 1431

**"Cat's in the cupboard and can't see me",* but I can certainly hear it.**

What has this line from a childhood rhyme got to do with radio? Here is the rather cunning tale. Back in the 1950s an amateur of considerable technical and practical ability was in the possession of a BCOP and was employed as the control operator in a well known and popular radio station in Perth, WA.

Perth was in those days a very quiet little city; after about six in the evening it went very quiet indeed, all the shops and milk bars closed, only the picture theatres and a few eating places remained open.

In radio stations, management had gone home, so too had sales reps, copy writers and all - only the announcer and control operator were present to keep things going on the late shift until the station closed around midnight. Our radio operator decided to enliven things. He had earlier hidden speakers in a number of cupboards around the studio and brought leads out of his control panel where he had a recording of a plaintive cat meow.

After the announcer had made his announcement and set the turntable spinning and the microphone off, the cat could be heard calling from a cupboard. The announcer went looking for the cat but, before he could find it, the record was coming to an end and he had to dash back to his desk and microphone whereupon the cat obediently went quiet.

After the next announcement was made and another record was spinning the cat started calling again but this time from a slightly different place. This went on for some time with the hapless announcer running to and fro in an abortive effort to find the cat until he realised there was no cat.

Another late night shift and time for another diversion. This station ran a late night news session with news from around the city. The news was introduced by the recorded chimes from the Town Hall clock and the procedure went like this. The chimes were played by the control operator then faded out and the announcer would open his mouth and intone "Here is the evening news courtesy of ...... ..". But what if the chimes kept going! Anything for a bit of fun!

* "Cat)in the cupboard and can't see me" is the only line I can remember from a rhyme that the girls would recite as they played some elaborate rope skipping game, circa 1930s.

ar

# The d'Arsonval movement

**Clive Wallis VK6CSW**
RAOTC member No 1289

**No, it's not some new crack-pot political party or a medical term for some dreadful bodily malfunction! Indeed, I hope most readers will immediately recognise d'Arsonval as the name associated with all those old-fashioned moving coil meters you were once so familiar with and which are now faithfully reproduced as liquid crystal images on your latest transceiver! Imitation is the sincerest form of flattery, of course, but there is an interesting story behind your (real) moving coil meter.**

Although man has been aware of natural electricity such as lightning for aeons, it's probably fair to say that our modern understanding began in the early 1600s. That's when the English scientist William Gilbert described the electrification of many substances and coined the word 'electricity' from the Greek word for amber. Many regard Gilbert as the father of modern electricity, while many others who followed, such as Cavendish, Coulomb and Franklin - to name but a few - built up ever more knowledge.

In 1800, Alessandro Volta described the voltaic pile, the first modern electrochemical battery to provide a reliable, steady source of electricity. This was a significant advance on the short-lived static electricity stored in Leyden jars used by Franklin and others. But, though these early batteries were of great value in electrical experiments, some means of measuring their 'galvanic' capacity was lacking. Galvanic, of course, derives from Luigi Galvani, the Italian who, in 1791, discovered that an electric current would make a dead frog's leg muscle jerk.

In 1811, the Danish physicist Hans Christian Oersted (1777 - 1851) published an important paper suggesting a fundamental link between electricity and magnetism, but it was not until 21st April 1820 that the link was proven.

Figure 1 - The Schweigger multiplier galvanometer.

During a lecture on that date, by chance Oersted noticed a compass needle deflected from magnetic north when an electric current from a nearby battery was switched on and off, confirming a direct relationship between electricity and magnetism. Shortly thereafter more intensive investigations showed that an electric current produced a circular magnetic field as it flowed through a wire. It was this field that caused the compass needle to deflect.

Later that year, on 16th September 1820, the German physicist Johan Schweigger (1779 - 1857) demonstrated the first known practical galvanometer. He created this instrument, which not only detected the flow of small amounts of electric current but did so in a reproducible way and could indicate the relative strength of the current, by wrapping a coil of wire around a graduated compass. The coil, known as a multiplier (see Figure 1), intensified the magnetic field created by the flowing current thereby much increasing the galvanometer's sensitivity.

His device caught on and was copied by many other scientists. Within a few years the term galvanometer was in common use to describe an electric current sensing device. However, these early instruments relied on the earth's magnetic field to provide the restoring force to the compass needle and had to be carefully aligned and levelled before they could be used.

An improvement came in 1825 with the introduction of the astatic magnetic needle galvanometer by Leopoldo Nobili (1784 - 1835). He eliminated the effect of the earth's magnetic field on the needle by using a pair of needles mounted parallel to each other, but with the poles reversed (see Figure 2). This arrangement had a net magnetic dipole moment of zero and thus had no preferred direction in the earth's magnetic field. The lower of the magnetic needles was inside the coil which carried the current under test and alone experienced a torque due to the resulting magnetic field; however, the scale was still non-linear.

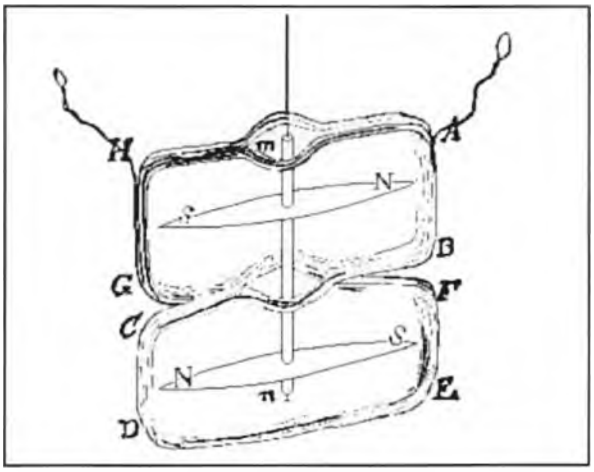



**Figure 2 - The essential features of Nobili's astatic galvanometer of 1825.**

A further development was the tangent galvanometer first described in 1837 by Claude-Servais-Mathias Pouillet (1790 - 1868), who later employed this sensitive form of galvanometer to verify Ohm's law. The illustration of the Milvay instrument (see Figure 3 on the next page) shows the principle.

Current flowing in a coil wound on a circular former, and placed in the vertical plane around the compass,

**Figure 3 - A vintage tangent galvanometer by Milvay.**

creates a magnetic field which deflects the compass needle away from its normal north-south alignment, the deflection varying with the strength of the current. The idea was widely copied and many such devices were built in various shapes and sizes.

However, the tangent galvanometer had fundamental drawbacks.

Like Schweigger's multiplier galvanometer it relied on the horizontal component of the earth's magnetic field to restore the needle to zero and therefore had to be aligned with the earth's magnetic field prior to use. The degree of needle deflection with change in current was not uniform; the greatest rate of deflection for a given change of current occurred only at 45 degrees to the earth's field, when the field due to the coil was exactly equal to that of the earth. At greater or lesser currents the needle's angular change for a given change in current was less, making large or small current measurements difficult.

A substantial improvement came with the development of the mirror galvanometer by William Thomson[1] (1824 - 1907), patented in 1858, but based on an original invention by the German physicist Johann Christian Poggendorff (1796 - 1877), much of whose important scientific work was related to electricity and magnetism. Instead of a compass needle, Thomson's device (see Figure 4 below) used a thread to suspend small magnets to which was attached a lightweight mirror. Using the mirror to deflect a beam of light onto a scale greatly magnified the galvanometer's sensitivity; alternatively, the magnets' deflection could be observed directly through a microscope. The following is adapted from a contemporary account of Thomson's instrument:

"The mirror galvanometer consists of a long fine coil of silk-covered copper wire. In the heart of that coil, within a little air-chamber, a small round mirror is hung by a single fibre of floss silk, with four tiny magnets cemented to its back. A beam of light is thrown from a lamp upon the mirror, and reflected by it upon a white screen or scale a few feet distant, where it forms a bright spot of light. When there is no current on the instrument, the spot of light remains stationary at the zero position on the screen; but when a current traverses the long wire of the coil, the suspended magnets twist themselves horizontally out of their former position, the mirror is inclined with them, and the beam of light is deflected along the screen to one side or the other, according to the nature of the current. If a positive electric current gives a deflection to the right of zero, a negative current will give a deflection to the left of zero, and vice versa."

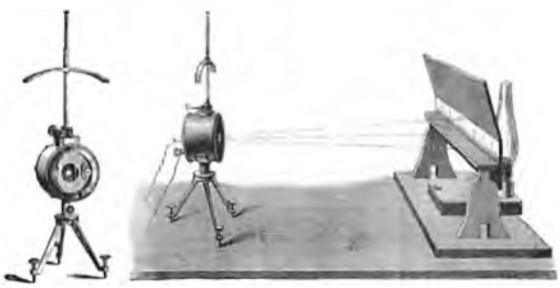


**Figure 4 – The Thomson mirror galvanometer.**

Some idea of the sensitivity of Thomson's galvanometer can be gleaned when you realise that one was used to detect the signals sent via the first transatlantic cable, opened in August 1858, between Ireland and Newfoundland, a distance of about 2,000 miles. Fairly low voltages were used for signalling, at least at first, and there were no repeaters along the way, yet sufficient power remained at the receiving end to operate a Thomson instrument (see Figure 5).

**Figure 5 – Thomson mirror galvanometer as used on the first transatlantic cable. Note the bar magnet to cancel the earth's magnetic field.**

Positive voltages represented dots and negative ones dashes, causing the mirror to swing a beam of light left or right, the Morse characters being interpreted by an operator. Transmissions speeds were very slow but a lot quicker than sending a message by boat! Sadly, the cable insulation failed after only three weeks' operation.

Disadvantages of these early magnet-based instruments were that they were affected by any nearby magnets or magnetic material and deflection was not linear with change in current. Nevertheless, their current detecting ability allowed Georg Simon Ohm to formulate in 1827[2] the now familiar and fundamental Ohm's Law, later confirmed by Pouillet.

A huge advance came in 1882 when two Frenchmen, physicist Jacques-Arsene d'Arsonval (1851 - 1940) and electrical engineer Marcel Deprez (1843 - 1914), developed a galvanometer which used a stationary magnet and a moving coil wound with fine wire, suspended at either end by lightweight wires which provided both the electrical connection to the moving coil as well as the restoring torque. A tiny indicating mirror was attached to the coil.

Importantly, an iron tube between the magnet's pole pieces defined a circular gap through which the coil rotated. This gap produced a consistent, radial magnetic field across the coil, giving a more linear response throughout the instrument's range. The concentrated magnetic field and delicate suspension made these instruments sensitive; d'Arsonval's initial instrument could detect ten microamperes.

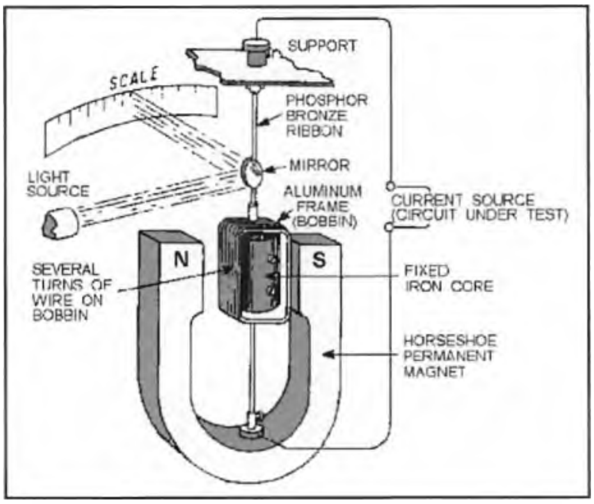



**Figure 6 – A basic Deprez-d'Arsonval galvanometer.**

The line-drawing of an early Deprez-d'Arsonval galvanometer (see Figure 6), accompanied by the following text, illustrates the device: "In the Deprez-d'Arsonval dead-beat galvanometer, a moveable coil is suspended between the poles of a strong, permanent U-magnet that is fixed. The coil consists of many turns of fine wire the terminals of which above and below serve as the supporting axis. Within the coil is an iron tube that is supported from the back, and that serves to concentrate the magnetic field. The passage of current turns the coil and sets it so that its plane encloses a larger number of lines of force. This movement of the coil turns the mirror by means of which the angles of deflection are read with a telescope and scale."

Although d'Arsonval and Deprez[3] set the scene for today's moving coil galvanometer, it was Edward Weston who refined it. Edward Weston (1850 - 1936) was an English-born American chemist who not only revolutionised the science of electroplating but also included amongst his other notable achievements the invention of constantan, manganin, and the Weston cell used as a laboratory voltage standard, as well as being president of the American Institute of Electrical Engineering in 1888.

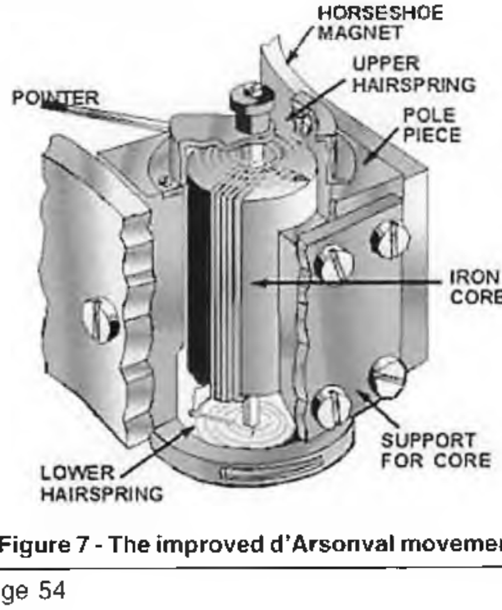



**Figure 7 - The improved d'Arsonval movement.**

Importantly, in 1888 he founded the Weston Electrical Instrument Corporation which would achieve fame for its voltmeters, ammeters, ohmmeters, watt meters and frequency meters, all helping to revolutionise the measuring of electricity. Most were based on the d'Arsonval movement though some were moving iron or moving vane types[4].

Weston transformed d'Arsonval's movement by replacing the fine wire suspension with a pivot, and then providing that pivot with spiral springs similar to those of a clockwork wristwatch or clock balance wheel hairspring (see Figure 7).

These springs provided both the restoring torque to the pivot as well as the electrical connections to the moving coil. The coil itself was wound on a lightweight former made of conductive metal such as very thin aluminium, the current induced in the metal acting as a magnetic damper to provide an almost dead-beat coil movement with very little oscillation or over-swing.

Additionally, Weston not only invented a way to stabilise the magnet's magnetism to preserve long-term accuracy but also designed a very narrow circumferential slot with a minimal air gap through which the coil moved, improving the meter's linearity. The final touch was to replace the mirror and light beam with a long but lightweight knife-edge pointer travelling over a calibrated scale fitted with an anti-parallax mirror.

In 1888, Weston patented his much improved meter and laid the foundation for today's portable, relatively rugged meters which are usually unaffected by mounting position, and which were almost universally adopted until the introduction of digital meters. Even now, for some applications the d'Arsonval type meter has advantages over a digital one, especially when reading fluctuating signals such as an S-meter, or when peaking tuned circuits.

As any *OTN* reader knows, all measuring instruments will draw some energy from the circuit under test, and the higher the impedance of the circuit being tested the more the test instrument's current draw (loading) will affect the accuracy of the reading. Although cheaper, less sensitive instruments were popular for workshop use, much effort went into making d'Arsonval movements which gave full scale deflection for a few microamperes of current yet were rugged enough for general use, but these tended to come with a high price tag and needed careful handling.

No doubt some *OTN* readers could tell tales of woe here! It's no wonder that the versatile, less easily damaged and cheaper digital meter now finds favour in the workshop, but the good old moving coil meter has given us decades of faithful service and is not quite ready to be retired yet.

**Notes**

1. Knighted in 1866, created Lord Kelvin in 1892.
2. Ohm's law first appeared in Ohm's famous book published in 1827, *Die galvanische Kette, mathematisch bearbeitet* (The Galvanic Circuit Investigated Mathematically).
3. Rather like Yagi and Uda, co-developers of the Yagi beam antenna, Deprez's name seems also to have 'slipped off the radar'.
4. A quick eBay search will reveal scores of Weston meters of all types, from very old to new, available for purchase. Weston's main US factory was in Newark, NJ, closing in 1974.

ar

# Development of a repeater network for East Gippsland

**Bob Neal VK3ZAN**
RAOTC member No 1030

**During 1977, a number of amateurs centred on Bairnsdale began negotiations to establish a second Club in Gippsland. An agreement required the approval of the Victorian Division of the Wireless Institute of Australia and the agreement of the Eastern Zone of the Wireless Institute of Australia. With the boundaries for the recruitment of members agreed upon, the inaugural meeting of this new Club, to be known as The East Gippsland Zone of the WIA, was held at Sale on 26th June 1979.**

The area designated for this new Club was the region east of Sale, which included a large area of sparsely populated and mountainous country east of Bairnsdale through to the NSW border. At the time VHF repeaters were becoming popular for local and mobile communications for members and visiting amateurs, so our Club sought and obtained licences for two VHF repeaters.

One repeater, VK3REG, with an assigned frequency of 146.650 MHz, was established at Donald's Knob (near Cann River) during 1985 on a Police Department site. It consisted of a modified Philips 828 transceiver and a locally assembled VTAC (VHF Technical Advisory Committee) controller with a 12 volt battery and mains powered battery charger. It was connected to a two antenna system mounted on an adjacent tower.

The other repeater, VK3REB, with a transmit frequency of 146.900 MHz, had also been licensed during 1985 for use at Mt Nowa Nowa on an old wooden fire watch tower. But, because of redevelopment considerations at this site, a temporary installation of this repeater equipment was arranged at Nungurner on an ESSO tower using a two antenna system with a modified Philips 828 transceiver and a VTAC controller. Power was available from ESSO batteries.

During the late 1980s, the redevelopment of the Nowa Nowa site began with the erection of a 50 m steel tower adjacent to the Telstra tower and a proposal was put to the site manager to allow the Victorian Division of the WIA to buy our way into the site and establish a permanent location for our VK3REB repeater. It was negotiated that our Club would meet the cost of providing safety facilities on the tower and would provide on-the-ground help for two or three days to assist the riggers installing the co-axial cable for all users.

The Victorian Division of the WIA made a formal application to the site manager (Victoria Police) in July 1991 to use the tower and one of the site buildings to house our equipment. The VK3REB repeater was moved from Nungurner to Mt Nowa Nowa in September 1991 and began operation with the same equipment but with a standby battery and a mains operated battery charger. A two-antenna system was installed on the tower with a 4.5 dB gain antenna at the top and a 3 dB collinear mounted some 20 m below. This site is now fitted with a Club constructed duplexer and remains the main repeater for the East Gippsland repeater network.

Also during the early 1990s a proposal was put forward by the Victorian Division of the WIA to permanently link the East Gippsland repeaters, and in the *1992 Call Book* it was announced that links would be established between Mt Nowa Nowa, Donald's Knob and Mt Hotham.

It was clear that the two-antenna system was not appropriate for all of these proposed repeaters and, with a frequency allocated for a portable VHF repeater, there would be a need for four VHF duplexers. The arrangement selected was to use notch filters with three cavities in each path from the repeater radio. We needed a total of 24 cavities, no small task for a small Club with less than 20 members.

The major item would be approximately 40 ft (12.7 m) of 4 inch (10 cm) diameter copper pipe. Fortunately, this was donated by one of our members and cut to short lengths for each cavity. Many other smaller items were needed as shown in the detailed diagram Fig 1. Several members had lathes and other metal working

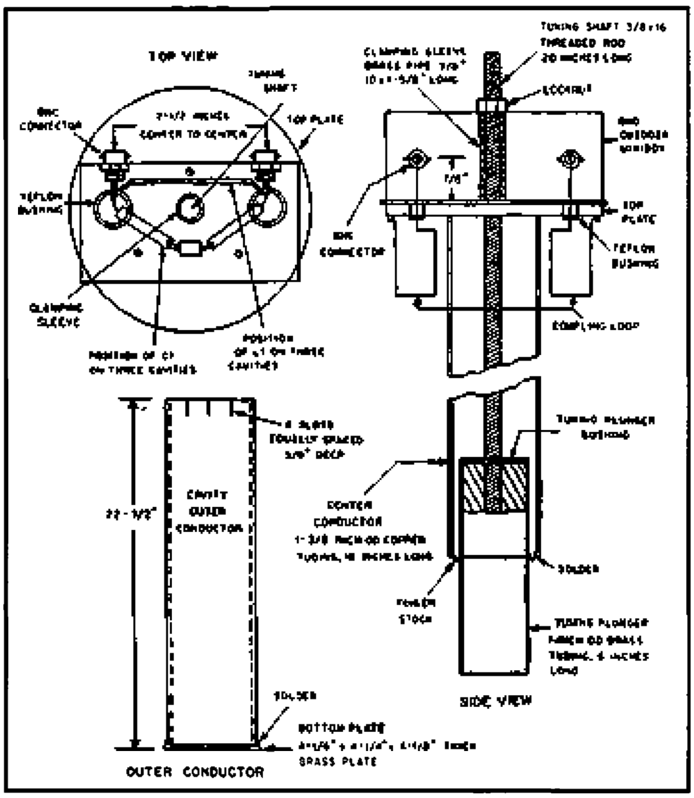


**Fig 1 - Details of a cavity for the 2 m duplexer.**

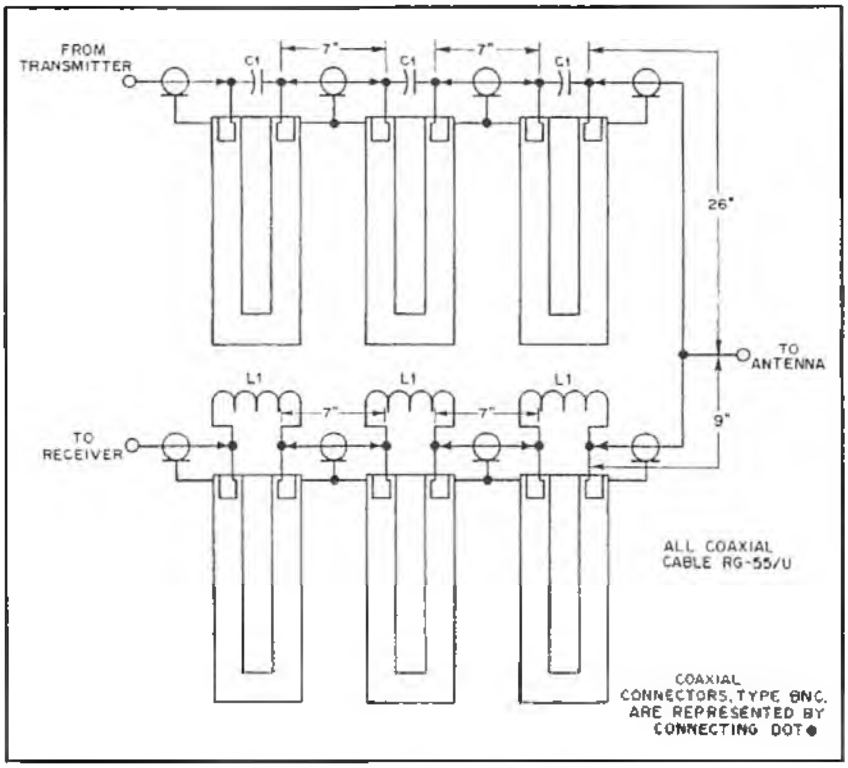



**Fig 2 - Diagram of the six cavity duplexer.**

machinery, so tasks were allocated for the production of all of the small items which finally came together for assembly at one point.

After all internal surfaces were polished, six cavities were assembled ready to be tuned and this was done in the ZCG Scalar factory where we had access to their antenna analysers. Firstly, each cavity was tuned on the transmit frequency as a band pass filter. When all appeared satisfactory, we went about adding inductance across three units and a capacitor across the other three units.

Each unit was then retuned so that three units had a notch at the transmit frequency and the other three units had a notch at the receive frequency. In each case this notch represented an attenuation of approximately 35 dB. The six cavities were assembled as shown in Fig 2.

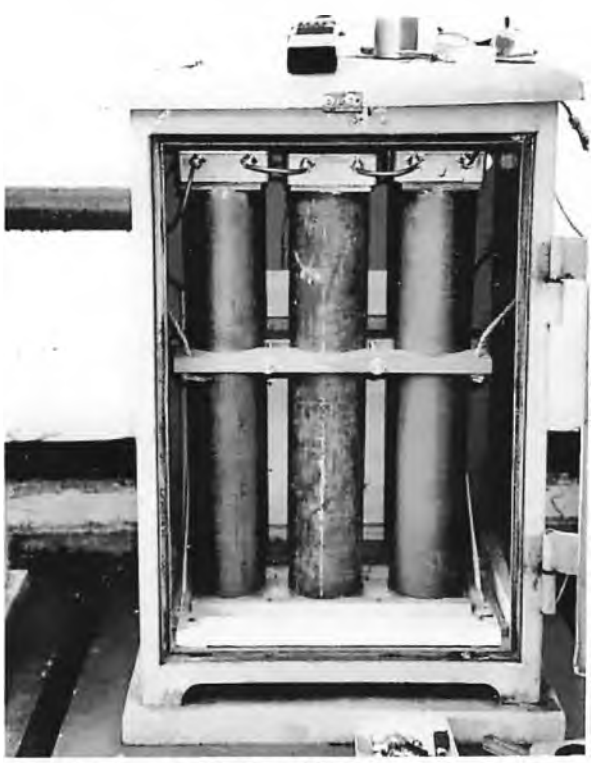
The overall measurements of the assembled duplexer showed an attenuation of approximately 95 dB in each path with an insertion loss of a little less than 2 dB in the pass bands. The remaining duplexers were assembled over the next few years as repeater sites were developed and several of these duplexers have been in use for up to 15 years without further attention.

While sites to the east were being assessed for VHF repeaters, another radio group, the Gippsland Repeater Association (GRA) UHF CB Repeater Club was negotiating the establishment of UHF repeaters in areas such as Mt Taylor near Bairnsdale, Mt Cann near Cann River and Maramingo Hill near Mallacoota. An agreement was negotiated with GRA for our club members to have access to their sites in exchange for our Club providing technical support to maintain the GRA repeaters.

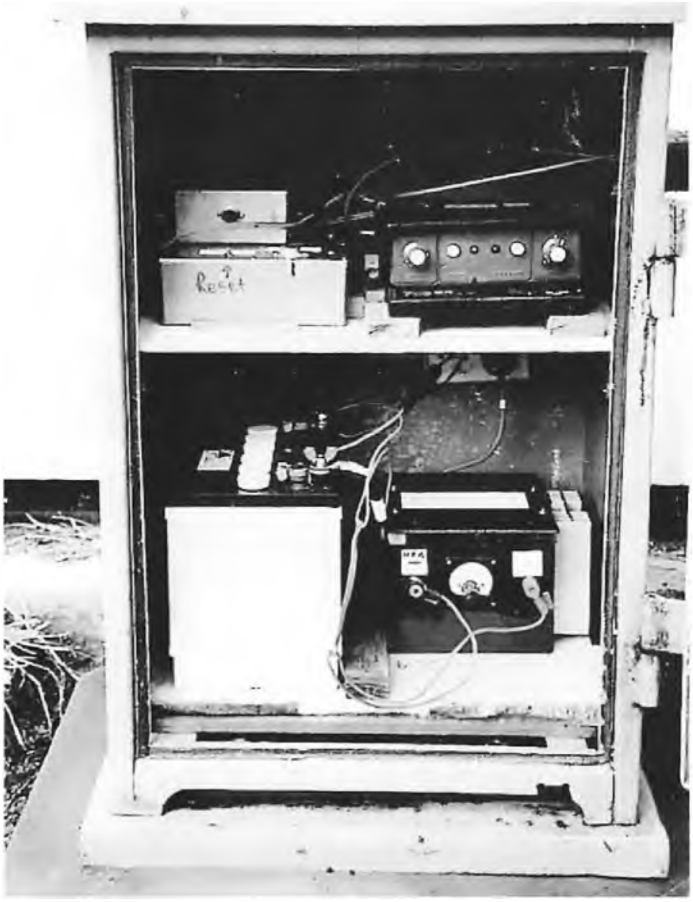
Stand alone repeaters east of Bairnsdale in this sparsely populated area would be of little value and with the direction from the WIA to have these repeaters permanently linked, the selection of additional repeater sites had to consider the ability to provide UHF links into the main system at Mt Nowa Nowa. In investigating these sites, a repeater VK3RGO on 147.050 MHz was established at Mt Livingstone (near Omeo) and operated for some six months. However, its coverage to the more populated areas was not up to expectations and this unit was withdrawn on 23rd December 1992. Another site at Mt Johnson (near Buchan) was also trialled for several months, but proved to be unsatisfactory and the equipment was also withdrawn from this site.

In 1991 the Victorian Division of the WIA invited Clubs to participate in a joint proposal to establish a VHF repeater at Mt Hotham, where a new communications building was to be constructed. Rex VK3VL had donated a repeater radio and duplexer, and our club provided a VTAC controller and antenna. The cost of the site was to be shared between the Eastern Zone, the East Gippsland Zone and the Twin Cities Radio Club at Shepparton.

Because of a severe snow season, delays occurred in having the new building completed and an agreement was reached to provide temporary housing for the amateur radio equipment in the base of the fire watch tower with the antenna mounted on an adjacent wooden pole. The repeater began operation in January 1992 with a single folded dipole antenna and our club provided the maintenance over a number of years. The site provided a wide coverage over most of East Gippsland and over the border into NSW.



**The duplexer cabinet and the six cavity duplexer.**




**The repeater equipment cabinet containing the Philips 828 radio controller, battery and power supply.**

Eventually, restrictions were being placed on our ability to access the site and the repeater was withdrawn in 2003.

In 1994, the repeater VK3REG on 146.050 MHz was moved from Donald's Knob to Mt Cann (GRA site) to check the coverage from this site and to establish that a UHF link would have a clear path to VK3REB at Mt Nowa Nowa in accordance with the WIA plans. It soon became clear that this site met all our needs for a new permanent repeater. It was subsequently officially registered as the new site for VK3REG on 146.050 MHz. Mt Cann is a GRA solar powered site so our club was required to provide additional solar panels and additional battery capacity to ensure a reliable power supply for both GRA and amateur repeaters.

At a later date, a simplex UHF linking system was installed between Mt Nowa Nowa VK3REB, Mt Cann VK3REG and Maramingo Hill VK3REM, and the system was arranged so that on receiving the 'Broadcast Tone' the repeater timers would be bypassed and the Mt Cann repeater would be closed down (to conserve solar power) while allowing the broadcast to pass to Maramingo Hill repeater.

To assist with the extra power demand at Mt Cann, our club provided two additional 48 watt solar panels. These were temporarily installed on site in December 2005 but were stolen shortly afterwards. An application was made to the WIA for a grant to replace these solar panels and this was approved in July 2006. An 80 watt solar panel was installed at a working bee at Mt Cann in October 2006 and, with a team of 13 members on site, the project was completed in one day, this time with much more secure fixings (see photo).

The agreement with GRA to have access to their sites gave us the opportunity to establish a UHF repeater at Mt Taylor near Bairnsdale. It was expected that this repeater could provide a site for linking other VHF repeaters. A UHF Philips 828 was converted to a repeater, a controller was purchased from Lara Electronics, a duplexer was purchased from RFI and, with an antenna donated by ZCG Scalar, the repeater was put into service with a link to Mt Nowa Nowa in April 1995.

Subsequent trials to provide a link to Mt Cann were unsuccessful as the UHF path was unreliable. The link to Mt Nowa Nowa has been closed, but the Mt Taylor repeater remains as a stand-alone repeater for the Bairnsdale area; however, facilities remain on this repeater to allow linking to Mt Nowa Nowa.

A further move to extend our repeater network along the Princess Highway and provide a service to Mallacoota in the east of the state began in 1998 with our Club obtaining permission from the Police Department to have access to their site at Maramingo Hill (adjacent to the Telstra tower) to install a VHF repeater. The Victorian Division of the WIA arranged for a frequency of 147.150 MHz and the call sign ofVK3REM. The site is more than 250 km from our home base at Bairnsdale so travel to and from the site for delivery of material and future maintenance represents a major task. Support for the development of this site from the Victorian Division of the WIA came as a subsidy to our travel costs.

The repeater system was assembled in Bairnsdale consisting of two metal cabinets bolted to two concrete slabs held together with steel bars. The equipment consisted of a converted Philips 828 radio, a VTAC controller and power supply in one cabinet and the duplexer in the other cabinet (see photo). The assembled system was operated at Bairnsdale for several weeks.

When all appeared well, the concrete slabs and cabinets were conveyed to the site for fixing to the levelled ground, with permanent power wired from the adjacent building. Next, a collinear antenna was cabled at the top of the police tower and a six element beam was mounted lower on this tower for the link to Mt Cann. This work took several visits as on-site work time was limited because of the three hours travel time in each direction. Finally, a visit was made to install the operating equipment, but it soon became evident that local interference was causing problems within the Philips 828 receiver.

The equipment was brought home and trialled for another week but could not be faulted. A second visit to the site with this equipment confiermed that the Philips 828 receiver was not suitable for use at this site. At the time Philips 900s were available cheaply so a repeater was developed from two of these units and this combination has operated satisfactorily at this site over a number of years.

The controller at Marimingo Hill has been replaced with the Lara Electronics controller because it allowed us remote access to monitor this repeater operation over the two links. The VTAC controller previously used at Marimingo Hill is now attached to the UHF repeater VK3RTU at Mt Taylor. Recent checks at this site with a Philips 828 receiver indicate that the previous interference is no longer present.

During 2010 the Philips 828 radio at the Mt Taylor UHF repeater was replaced with a Philips 815 base station with some improvement in performance.

In April 2008 the Philips 828 repeater at the Mt Nowa Nowa repeater was replaced by a Tait T355 receiver and a Tait T356 transmitter converted to a repeater. As well, the link to Mt Cann was replaced by a Tait T300 repeater modied for link operation.

The project to develop this linked repeater network has been spread over some 15 years with most members contributing to its success. On-site work gave members an opportunity to visit these remote sites in East Gippsland and to gain an understanding of the functions that occur within the equipment of a linked repeater system.

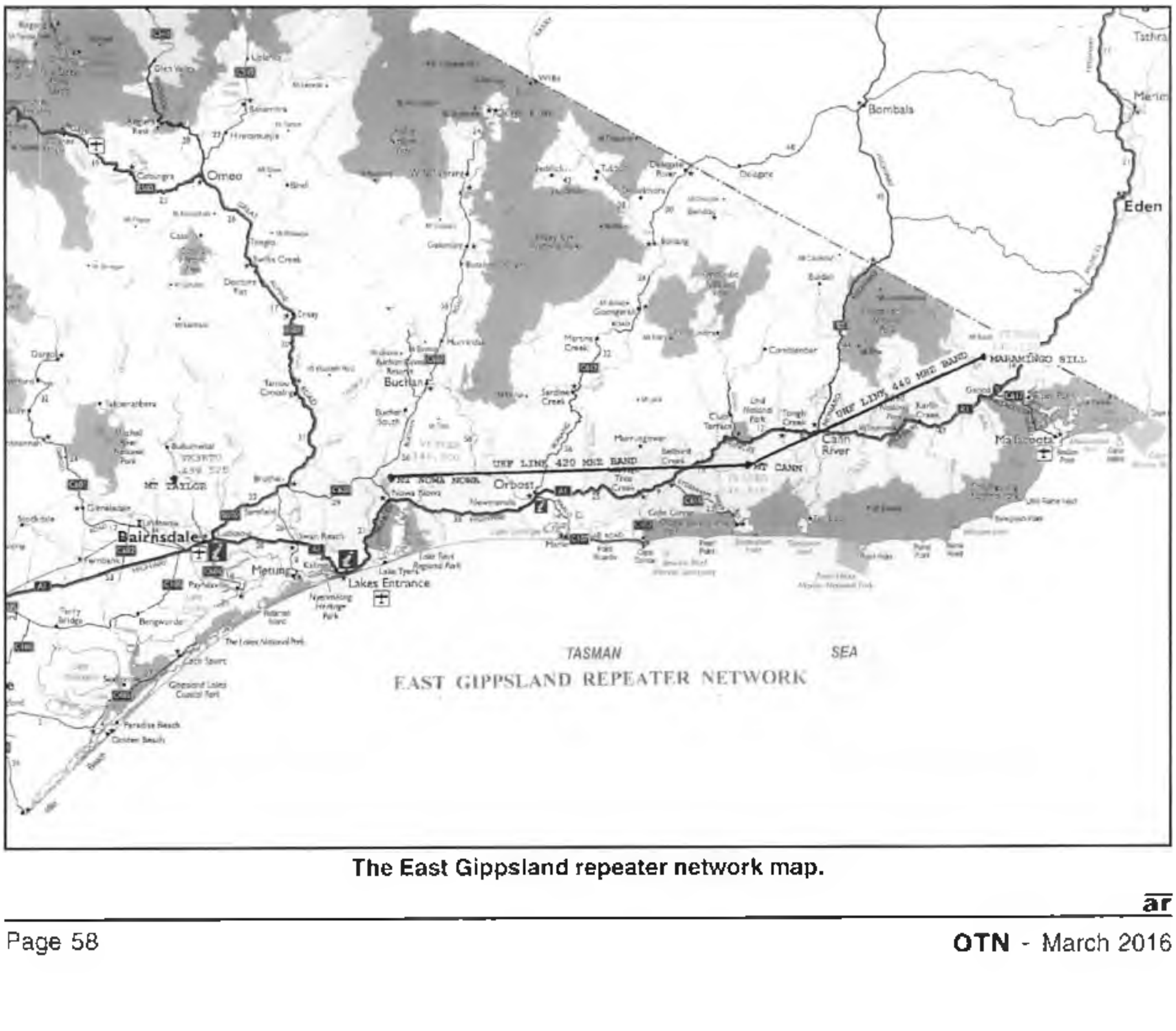
We had 13 members make the two hour travel to Mt Cann to assist in installing of our last set of solar panels (see photo). Members have contributed many hundreds of man-hours in preparing and installing equipment, and travel has amounted to several thousand kilometres over the past 15 years in establishing this repeater network over a sparsely populated area of Eastern Victoria.

Equipment modifications have been done by members and, with the exception of a donation of some antennas and a grant for the replacement of some stolen solar panels, all funds have come from member's contributions.

**The Mt Cann repeater VK3REG.**

One of the major tasks was the construction of four sets of six cavity duplexers from raw materials which continue to provide a satisfactory service. Licence fees for the three VHF repeaters, and an annual fee for the Mt Nowa Nowa site, are paid by Amateur Radio Victoria. Our Club pays the licence fee for the UHF repeater VK3RTU at Mt Taylor. There are no site fees or power costs for the GRA sites at Mt Taylor or Mt Cann and the Police Department site at Maramingo Hill is free.

This network of three linked repeaters along the Princes Highway in East Gippsland (see map below) provides a continuous communication service for amateurs from Sale to the NSW border and beyond in this sparsely populated area of Eastem Victoria.




**The East Gippsland repeater network map.**

ar

# What was in the mystery box?

**Ian Godsil VK3JS**
RAOTC member No 1220

**A few months ago I came home to find a box outside my front door. Of course, the inevitable questions to be asked were, what were the strange electronic objects in the box, and what were they doing at my front door?**

I could see that they were objects with aluminium bases and sides, but they looked home-brew. "Ah," I thought, "someone has seen my antennas and has brought me something electronic." But I was then puzzled as to who in a Retirement Village would be thinking along those lines.

It was a few weeks before I did anything about the mystery box, and then I thought that it may be interesting to set it up as a 'What is it?' at the February RAOTC Committee meeting to be held at my home.

The first person to arrive looked at the display and simply proclaimed, "Its old". As the other committee members arrived, they also looked but mostly said simple things or nothing at all until finally Jim Gordon VK3ZKK picked up the items in the box, examined everything and announced that they could have been built as teaching aids for electronics students some years ago when vacuum tubes were still in vogue. So what are we talking about?

If you look at the photo below you will see two large vacuum tubes each mounted on ceramic bases on a chassis and enclosed in separate painted aluminium cases open at the front. They are each very neatly constructed, with wiring underneath done in a most professional manner. Each has a transformer, one or two potentiometers on the front panel and a large tube as the focal point, and each is fed from 240 Vac mains.

On the backs of the glass tubes is green writing which is almost impossible to read from the front. Fortunately, they came out easily enough to reveal one tube with a flat black plate surrounded by filaments and grids, and marked "Type AV 25 Demonstration Triode".

**The mystery box as it arrived at the author's front door.**

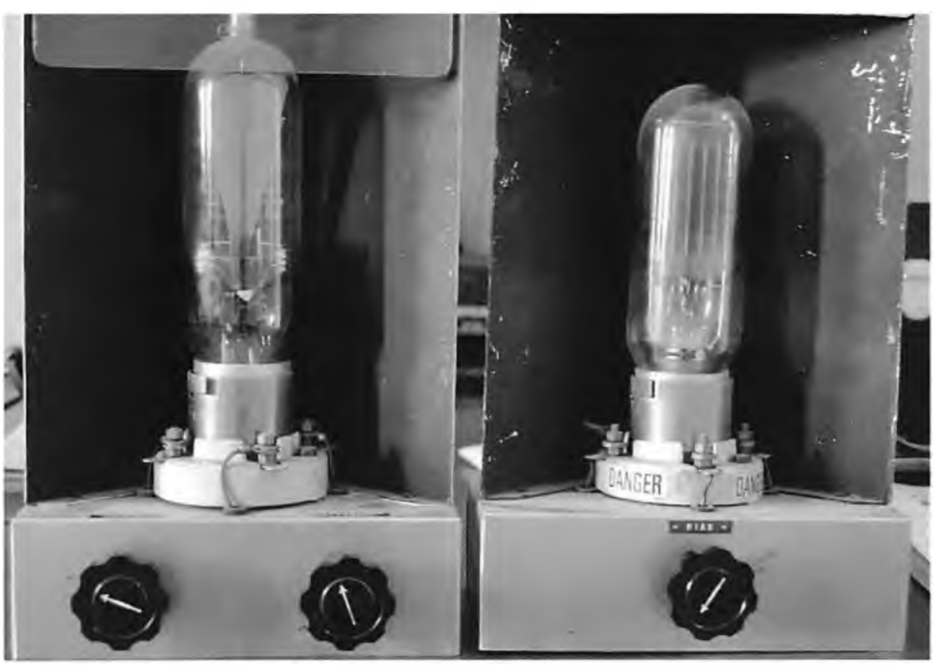
The other had a long, slightly curved concave plate and filament, and revealed the words "Type AV 43 Demonstration CRT."

So the mystery was solved!

As Jim VK3ZKK had said, they were teaching aids to show to a class how a tube functioned by varying voltages to control electron flow within the tube.

The AV 25 glows a dim green when heated and the knob is turned to the left; but as the knob is rotated, a series of green bars appears at the rear of the tube, varying in width with the amount of voltage applied. Presumably this demonstrates the operation of bias effects.

The AV 43 also produces a green glow, but this time it is as a vertical line in the centre




**The two large vacuum tubes mounted on ceramic bases on a chassis each and enclosed in separate painted aluminium cases open at the front.**

The Type AV 43 CRT tube with power applied. The partially obscured knobs are 'Focus' and 'Deflection'. In colour, the lightish grey elongated triangle of light commencing from roughly the centre of the glass portion of the tube envelope and proceeding to the top right, is a vivid green.

The Type AV 25 Triode with power applied. The knob at front is labelled 'Bias'. In colour, the rectangle of light in the top part of the glass envelope is a bright green and the four vertical bars are a brilliant green.

of the concave-shaped plate. Changing the Voltage and Deflection controls on the front varies the width of the green line to a wider beam that will swing from side to side.

Is there a sequel to this mystery gift?

Yes. One day there was a 'ding' at the front door and the Village Maintenance Manager greeted me with, "Did you get the box I left for you?"

At first I did not connect him with the tubes, but he said that he had once been with Telstra and that he came by these gadgets when he left. He had done what I suspected and associated the antennas with someone who had some sort of electrical knowledge.

The other sequel is that Jim Gordon, who is no longer Officer-in-Charge of the Army Signals Museum at Watsonia, Melbourne, but who is still actively involved with the Museum, will take them for the display there.

So, like all mystery gifts, the riddle was solved and a good home will be found for these electronic artifacts.

ar