Radio ZS

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September - October 2009
September - Oktober 2009

Museum Jan Corver
Verticals vs Horizontals
Die Hallicrafters Storie

Amateur Radio - Communication Technology in Action

Amateur Radio... Professional Technology

amateur• n. 2.a. one who cultivates anything as a pastime
radio• n. 1. the transmission and reception of radio-frequency electromagnetic waves

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Front Cover / Buiteblad

"Shack in a Sack" - Sam, ZS1SAM, Deon, ZS1AFU, and John, ZS1JHG, on Elsies Peak near Fish Hoek. The rig is an ICOM 706 running 5 watts into a homebrew buddipole, using Hustler mobile resonators. Photo by Retia, ZS1AFV. Go to page 23.

"Shack in a Sack" - Sam, ZS1SAM, Deon, ZS1AFU, en John, ZS1JHG, op Elsiespiek naby Vishoek. Die radio is 'n ICOM 706 met 5 watt uitset na 'n tuisgeboude buddipole, wat gebruik maak van Hustler mobiele resonators. Foto deur Retia, ZS1AFV. Gaan na bladsy 23.

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In this issue / In hierdie uitgawe

CQ de ZS1YT

At the end of September it was cut-off time for those members who had not yet renewed their membership for 2009/10. It is with regret that we have to bid those members farewell who have decided not to do the right thing and stay part of the National body for Amateur Radio in South Africa.

A huge thank you goes to those of you receiving Radio ZS this month. This is an indication that your membership is up to date and you are supporting your hobby in full.

It is still almost 5 months to the next SARL AGM in April 2010. The closing date for nominations for councillors to serve on the SARL council is 30 November 2009. According to the SARL constitution, provision is made for 15 councillors. Let us be brave and have more than 15 nominations this year! This will result in a ballot which will ensure that an election will be conducted enabling the SARL to have a full council of elected members.

I hereby urge each affiliated club to nominate at least one councillor for next year!

On the regulatory front, the SARL is in constant communication with ICASA and the Department of Communication. DoC has recently released their draft Spectrum Policy document. I trust that those of you who wanted to submit some input with respect to this document, have done so. The SARL is looking forward to this final document.

Die wêreldbeker-sokkertoernooi is net om die draai en die roepsein ZS10WCS is reeds vanaf 1 September aktief op die lug. Klubs kon aansoek doen vir die gebruik van hierdie roepsein op ‘n maandelikse grondslag. Ek wens Boland Amateurradioklub geluk, gedurende September is 2 639 kontakte met die roepsein ZS10WCS bewerkstellig. Ek wens ook die klubs wat in die komende maande hierdie roepsein op die lug sal sit voorspoed toe en vertrou dat hulle net soveel genot uit hierdie “eenmaal in ‘n leeftyd” gebeurtenis gaan put.

Suid Afrika se nuutste toevoeging tot satelliete, Sumbandilasat, is

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(CQ de ZS1YT from page 5)
gedurende September gelanseer. U kan gerus op http://www.amsatsa.org.za/ gaan kyk na 'n opname van die lansering. Die amateurradio-loonvrag beloof om binnekort vir amateurs regoor die wêreld genot te verskaf.

Ek sluit af deur elkeen van u te vra om een van u amateur vriende te oorreed om by die SARL aan te sluit. Slegs met genoegsame ondersteuning kan die SARL namens amateurradio praat!

Groete van hok tot hok, Rassie ZS1YT

SA Amateur Radio Development Trust Awards Recipients Announced

At a gala function held in Midrand on Wednesday 24 June, the South African Amateur Radio Development Trust presented the annual Radio Amateur of the Year and Construction awards.

Announcing the 2009 winners, Executive Chairman of the Trust, Hans van de Groenendaal, ZS6AKV, said that it is important to celebrate successes and to recognise radio amateurs who make a major contribution to the hobby. He thanked Nokia Siemens Networks for their continued support. They are setting an example to industry to go beyond sport sponsorship and recognise opportunities in science and technology.

Dennis Green, ZS4BS, was presented with the **NSN Radio Amateur of the Year Award** in recognition of his dedication to the development of Amateur Radio and his contribution as editor of two communication channels: Radio ZS and HF Happenings. He was recently re-elected as a Councillor of the SARL and Secretary of the IARU Region 1 and continues to make a major contribution to the continued development of amateur radio in South Africa and Internationally.

The **Garth Milne Technology Award** was presented jointly to Andrew Roos, ZS6AA, and Hannes Coetzee, ZS6BPZ, in recognition of their design and development of the Amateur Payload on SumbandilaSat which is due to be launched on a Soyuz Rocket from Baikonur.

The **NSN Amateur Radio Community Service Award** was presented to Francois Botha, ZS6BUU, in recognition of his dedication, as National HAMNET Director, to the development of Amateur Radio as a support communication service during emergencies and disasters.

The Annual Construction competition sponsored by Multisource was won by Carson McAfee, a second year student at the University of the Witwatersrand who built a Quadra Helix Antenna.

Visit to the Museum Jan Corver for Amateur Radio in Budel, The Netherlands

by James Durand, ZR6JBD

Having been delayed coming home by salt mine activities and having to spend the weekend in Holland before flying to Poland, I was looking for something "HAM" to do. I was contemplating going to Den Haag (The Hague) and as any good IT person will do, I called on my friend Mr Google to see what sort of Amateur Radio information in Den Haag they knew about. Much to my surprise up came a link to the Jan Corver Amateur Radio Museum, PI9JC, www.jancorver.org. This was too good to be true.

According to their website they are only open on the 1st and 3rd Saturday of every month. I consulted the calendar and my luck was holding.

Tomorrow was the 3rd Saturday of September. A quick phone call to Cor Moerman, PA0VYL, confirmed that they would be open the following day.

I quickly arranged a rental car through the office for Saturday and borrowed a TomTom GPS and was ready to go by close of business on Friday. This was going to be my first ever driving experience on the RIGHT side of the road. But, hey we are from Africa. How hard can it be?

Budel lies about 160 km from Amsterdam and the A2 highway runs right past it, and it is only about 5 km from the Belgian border. According to the GPS it should have taken a little over an hour and a half to get there. However reality was a different matter. Due to road works, some very complicated upgrades that confused the TomTom (there are

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Figure 2. Cor, PA0VYL, beside the RX-1 Receiver, TX-1 Apache Transceiver, SB-10 SSB Adapter, HX-10 Marauder SSB Transmitter

(Museum Jan Corver from page 7)
even signs that warn you that your navigational aids are now useless), it took me a little over 2 hours to make the journey.

What a pleasant surprise. Budel is the quintessential Dutch village. I found the museum as per the instructions from the website, confirmed by the GPS, without any problems. I was warmly welcomed by Cor and he then proceeded to show me around the current exhibition of Heathkit equipment. I am too young to have experienced Heathkit in it's heydays, but have read a lot about it and was intrigued. The Heathkit exhibition is scheduled to run to at least the end of the year.

Talk about passion for the hobby and old things radio. The museum stands in part of Cor's garden. He is retired and this is a labour of love. It is not a very big place, but it is immaculate and very well presented and he makes a very good cup of coffee. At lunch time his wife made us a plate of typical Dutch sandwiches of cold meat, cheese and buttermilk to drink.

Figure 4. PIC Based Enigma Replica

Cor was busy assembling a PC board at the museum station when I walked in, and after lunch this led to a whole different dimension of the museum. The collection that preceded the current Heathkit one was one on World War II radio and specifically spy / resistance radio equipment. It transpired in the conversation that Cor has been an avid collector of this type of equipment for over 40 years. He showed me a DVD of the collection, and let me make a copy. Fascinating stuff.

Back to the PC board assembly I mentioned a little earlier. It turns out that it is a PIC based Enigma coding machine that an international group of interested enthusiasts have put together. They also sell it at the famous Bletchley Park museum shop in England.

I promptly put down my money for one. Cor was unfortunately out of stock, but they shall deliver a kit at our Dutch offices in a couple of weeks for me. I shall do a follow up article on the project when completed.

The museum also has a small warehouse on the outskirts of the town where they refurbish commercial radio equipment for sale to ama-

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(Museum Jan Corver from page 8)

teurs. If you are into the more antique side of radio, this feels like an Aladdin's cave. Personally I could almost feel the history. The appropriate modification kits are also being used to generate funds for the museum. See their website for more details. They also have a very extensive inventory of old radio tubes and anyone in need of old tubes is welcome to contact Cor, and they will gladly see whether they can assist.

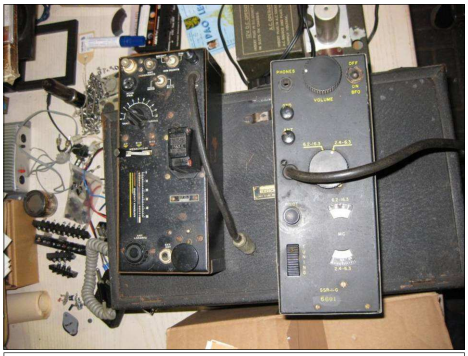

Figure 3. USA Spy Transmitter and Receiver circa WW II

Figure 5. Part of the Museum Jan Corver warehouse

In closing I would HIGHLY recommend a journey to Budel if you are interested in real amateur radio history. By appointment, Cor will also open the Museum on other days, other than the 1st and 3rd Saturdays of the month. I sincerely hope that I will not be the only South African radio amateur that has ever visited the Jan Corver Museum in Budel.

Verticals vs Horizontals – an old controversy

Gerrit de Vente, ZS6DV

In the Radio ZS magazine Volume 62 No 2, dated March/April 2009, there is an article about "The 4X4 Slimtenna"

Eli Kovo, 4X4LH, wrote the article and it was a reprint by courtesy of "AntennaX Online" magazine issue number 119.

Before describing his 4X4 Slimtenna, Eli gives us some background motivation as to why he pre-

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(Verticals vs Horizontals from page 9)
fers vertical above horizontal antennas.

One important aspect of his decision refers to the limiting factors of amateur radio operations. Not every radio amateur has space and money for high elevation masts and high gain antennas.

Eli continues and says we should *"direct our efforts at the proper use of antennas, evaluating their radiation efficiency and getting to know the behaviour of the ionosphere."* Indeed a very important statement.

Having considered the above, Eli then states that *"he came to the conclusion that the very best way to reach efficiently a distant station for a QSO of not less than 10 to 20 minutes is to use vertical antennas with no more than 150 to 200 Watts".*

A bit further on Eli makes a comparison between vertical and horizontal antennas. He says, "*a three or four element Yagi concentrating its power in a narrow horizontal pattern, its vertical "take off" suffers from a high radiation angle of 30 degrees, losing a lot of dbs in excessive number of hops to the ionosphere, while a good vertical monobander reaches the DX station with less hops and almost the same strength".*

Somewhat further in the article, Eli makes five statements with respect to poor antenna loading and the fifth statement is of interest to us.

It says *"the ionosphere acting as a mirror, absorbs some of our signal as a payment for its services, swallowing 8 to 10 db (for each) hop of our miserable signal, arriving at the DX station with less than 1 watt."*

Finally, Eli lists three advantages of the Slim Jim Antenna and the first one reads as follows:

"The driven element that combines the efforts of the two half waves in phase, in a rather restricted space with about 3 dbd gain and an incredible 8 degree take off firing angle towards the horizon – almost parallel to the ground". (Underlining, G de Vente)

So far the extracts from Eli's article.

The question we have to ask ourselves is this: Are the statements Eli makes in his article correct and is a vertical antenna indeed a better performer than a horizontal antenna in all circumstances?

To answer these questions we need to refer to the basic antenna principles which are described in many RF Antenna Engineering books but the ARRL Antenna Handbook or RSGB Radio Communication books are sufficient for our purposes.

Therefore, let us look at some of Eli's statements as indicated above.

Let us start with the three or four element Yagi antenna that has a narrow horizontal beam and a take off angle of 30 degree resulting in many hops.

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This is true for a horizontal antenna at λ/2 above ground level but not for higher elevations.

The horizontal beam of the three or four element Yagi is actually about 60 degrees wide at the 3 db points and the vertical beam is at least 15 degrees at the 3 db points and therefore not as narrow at all.

That means the ionosphere is illuminated by an elliptical pattern of which the horizontal beam width is at least 60 degrees and vertical beam width is at least 15 degrees. However, the actual area illuminated on the ionosphere is much more because it reaches the ionosphere at an oblique (incident) angle.

Narrow horizontal and vertical radiation patterns can only be obtained with large broad side stacked arrays like the Curtain arrays. These Curtain arrays are mainly used by shortwave broadcast stations and have take off angles below 10 degrees with at least 20 db gain.

Eli also refers to the ionosphere as a mirror that swallows about 8 to 10 db of our signal and leaves less than 1 watt at the DX station.

The ionosphere is indeed a mirror but because the rays are not actually reflected but refracted, there is indeed attenuation of the signal taking place. We know that the refraction process can absorb from 0 to 20 db depending on the behaviour of the ionosphere at that particular moment in time but the actual attenuation is unknown.

However we do know that rays returning from the ionosphere and reflect on average soil will attenuate about 3 db whilst reflection on the sea results only in 0,5 db loss.

No wonder that the long path communication is used very effectively by radio amateurs because of the hops spending most of their time reflecting on the oceans.

Eli then refers to a miserable signal of less than 1 watt arriving at the DX station.

I understand he refers to a very small signal entering the DX antenna. However, if we consider a power density of 1 watt per square meter at the receiving antenna, this will result in about 146 dbμV and in radio amateur terms this is an extremely strong signal on the S-Meter of approximately 112 db above S9.

One of Eli's other statements refer to his Slim Jim antenna having an incredible 8 degree take off angle and almost parallel to the ground.

Is it true that a vertical antenna will always have a 8 degree (very low) take off angle and as result thereof will a vertical monobander therefore reach the DX station with less hops ?

The answer to the above question is yes and no. Why?

Firstly the answer is No, because vertical polarized antenna radiation patterns are very much dependant on the near and far field reflective mediums. When the reflective medium is average soil, the

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low angle radiation energy undergoes serious attenuation up to an angle called the Brewster angle. This Brewster angle varies with the so-called reflection coefficient of the medium and is normally around 15 degrees.

That means the bottom of the vertical radiation pattern cannot be lower than 15 degrees and we get a take off angle very close to horizontal dipole antenna situated at about λ/2 elevation. What is more is that the peak of the vertical antenna radiation pattern is about 6 db down from the horizontal dipole.

Secondly, the answer is Yes, only and only if the near and far field constitutes sea water as the sole reflective medium, then the incredible low take off angle of 8 degree that Eli was referring to becomes a reality.

Obviously horizontal antennas also suffer from poor soil resistivity in the near field and that causes attenuation of the electromagnetic waves and a subsequent rising of the take off angle.

For anyone who is in possession of the ARRL Antenna Handbook 20th edition, there is an excellent description including radiation patterns showing the difference between vertical and horizontal antenna's for different reflective mediums in chapter 3.

On a final note, just a few remarks.

Vertical antenna's will outperform Horizontal antennas when seawater is the sole near and far field reflective medium, assuming both antenna's at low elevation of about λ/2.

At higher elevations, the horizontal antenna can provide a similar or even better performance.

We have seen that radiation patterns are very much dependant on the near and far field conditions. Most radio amateurs living in urban areas do not have the privilege of having large clear flat areas of at least 150-metre radius surrounding their antennas. In built-up areas, the electromagnetic waves will undergo multiple scattering as they reflect against all the surrounding houses and other objects.

Therefore, the radiation pattern of your back yard antenna situated in a built-up area will certainly not be equivalent to the nice shaped radiation patterns that are shown in antenna books or magazines.

Most static interference resulting from lightning discharges and local electrical interference is vertically polarised and is therefore an added impediment for vertically polarised antenna operators.

Maybe some of our local radio amateur colleagues that have played around with vertical and horizontal antennas can share their findings with us.

References:

1. ARRL Antenna Handbook 20th Edition August 2003
2. RSGB Radio Communications Handbook, Fifth Edition, Volume 2, October 1978

Amateur Radio – the most versatile hobby on earth

Unified Amateur Radio

By Victor P du Preez, ZS6EA, http://www.amateurradio.co.za/

The statement ***"Amateur Radio – the most versatile hobby on earth"*** seems to be a wild one, would you not say? Most people do not even know what Amateur Radio is about - they have never heard of it. Some think it has something to do with the CB fad of the past. For most, it is even stranger when we start talking about *"Ham Radio,"* the other name for the hobby, or "Radio Ham" or even stranger, the place where you do the hobby - *"my Ham Shack."*

An interesting thing always happens when somebody puts the question*: "Now what do you do for a hobby?"* The more remote the acquaintance or stranger, the more interesting the immediate comments and discussion that follows. Hesitantly answering: *"Oh, I am a Radio Amateur"*; mostly hoping that the other party might know what I am talking about; never saying, *"I am a Radio Ham"* - for then surely all is lost. Nevertheless, usually all is lost in any case. *"A Radio Amateur! - eh, uh, one of those guys that talk over the radio and go - ten four, my good buddy – yeah, I've heard about you guys – strange lot".* It is then that you feel you want to avoid the topic.

If the answer is, *"Oh, a Radio Ham, do you know Jimmy? You know, he lives in Prieska? - he is also a Ham, clever bloke, builds his own radios too!"* then the conversation could pan out as an opportunity. However, either way, you should take the opportunity and talk about this great hobby; explain to the world what they are missing. We, as Radio Amateurs, ourselves, are to blame for what people think of us, what people know about us and how the world perceives what the hobby is all about. What the world should know is in our own hands.

This is very strange to me: I mean, the hobby is about communication - yeah.... yeah, I know, there are many facets to the hobby (mostly technical), but one of the main components is the art of communicating. How then, through all these years, can we not communicate to the world what Amateur Radio is all about? If we say that *"Old Man"* Marconi was the first radio amateur, my goodness me, that was more than a hundred years ago and still we are in limbo: the world does not know who and what we are! Do we ourselves know who and what we are?

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Listen to some of your fellow hams (myself included unfortunately): *"Amateur Radio is teetering on the brink of extinction", "the Internet is our downfall, it is going to wipe Amateur Radio off the map", "Morse code is Amateur Radio's enemy, get rid of it", "We are going to loose frequencies, we must use it or lose it", "Belong to the Radio League! Why? What can the radio league do for us Amateurs?"; "Clubs are not for me, those cliques and all the in-fighting, no thanks."* On and on it goes, and through these arguments, we are wasting a lot of energy on more and more negativity.

We have to stop this! Rather think about this great hobby for what it really is, and shout it out to the world at each and every opportunity. Think of how nice it would be to have each and all immediately knowing about Amateur Radio when it is mentioned anywhere, in any circumstance and to anyone.

As the Obama's of the world say, *"We can do it, yes we can!"* For that to be, we will have to be a unified force and work together during the next hundred years.

This is the first in a series of articles that Victor, ZS6EA, has submitted for publication.

Protection of our equipment.

Fred Scheepers, ZS1FCS

We as amateur radio operators are proud of our equipment and take very good care of it. Our toys are quite expensive and none of us would like any breakdown of it, especially if it could have been prevented by adhering to a few basic rules. Most of us know that sinking feeling when something bad happens and we know that that happening could have been prevented!

Let me start with connecting an antenna to the rig. The antenna is our connection to the outside world and the antenna is usually mounted outside as high as possible. Remember that the antenna could become charged with static electricity and connecting the antenna to the rig can cause this static charge to be applied to the sensitive front end of the receiver and will then discharge into the rig and may cause damage to the sensitive receiver. Before connecting the antenna lead to the rig first short the centre conductor of the antenna to a good ground. Any static charge will then be dispersed to earth and not to the rig. This procedure is simple and fast and may save your rig! During thunderstorms many of us disconnect the antennas from the rig, but

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how may of us make sure that the antenna is discharged before reconnecting it to the rig? Keep in mind that not only thunderstorms but something as simple as wind blowing can also cause the antenna to be come charged with static electricity! It is a good habit to always discharge the antenna before connection to the rig. Be careful when handling an antenna lead that has been disconnected for a while, touching the centre conductor of a charged antenna can give you quite a hefty kick. Ask me, I once did it and not only did I get a nice kick, I instinctively jerked my hand away and upset a cup of steaming hot tea over my lap. Why I then suddenly became fluent in a strange language still remains a mystery to me!

Some of us have what is called an antenna selector switch. Please remember this is exactly what it is, an antenna selector switch NOT a rig selector switch! This switch is used to switch between antennas, connecting the selected antenna to the rig. Do not use this switch to switch one antenna to a selected rig. Doing this is as good as playing on the undertaker's stoep! The rig that is not selected still remains connected to the switch and unless the switch has an excellent RF isolation between it's ports, some of the transmitted RF may just appear on the antenna input of this rig. This RF appearing on the antenna input of the unused rig may just be that rig's funeral song! The purpose of the antenna selector switch is to select one of two or more antennas to one rig only. I repeat: Never use an antenna selector switch to connect one of a few rigs to the antenna. With the old valve transceivers this could sometimes be done but with the modern equipment it is asking for problems, even if the unused rig is switched off!

If you are using an antenna switch to select between antennas, please make sure that the selector switch places a short to ground on the unselected antennas. If it does not do so you may just have a statically charged antenna discharging into your rig when you select it. Most of the cheaper antenna selector switches do not ground the unselected antenna and also have a very poor RF isolation between its ports. Be very careful!

Next let us have a quick look at fuses:

What is a fuse? Is it just something that is so unimportant that it can safely be done without and thus just something devised to make your life miserable? No not at all, a fuse is very important. It is meant to be the weak link in the chain and is used as the best known and simplest defensive tool to protect your equipment.

A fuse is nothing else than a thermal switch to break an electrical circuit when the current increases to a certain value. This seems very simple, but remember when something seems simple, it most often is not, so do tread carefully!

A fuse is there to protect circuits

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from the heating effect of excessive currents and is connected in series with the circuit it has to protect. The failure of fuses to work effectively has a lot more to do with what happens after the fuse has blown than with the fusing process itself. Now Voltage comes into the picture. Yes, a fuse is meant to blow at a certain Amperage, so what has Voltage got to do with it? 5 Amp at 5 Volt is still the same as 5 Amp at 500 Volt. Yes, that is so, but when the fuse ruptures, the EMF of the source appears across the fuse terminals. It now becomes very important what the EMF (Voltage) is. I will come back to the EMF a bit later. Let me first explain the criteria of a fuse.

A fuse must have a small thermal capacity so that it can heat rapidly and melt before damage is caused to the circuit it protects. The fuse thus needs to be made from a thin gauge of wire. Thin wires have a high resistance and cause a voltage drop. This voltage drop generates heat encouraging the fuse to blow. When the fuse has to blow it is actually melting. It not only melts but vaporizes! Now when the fuse is vaporizing it can cause an ionized and conducting media. This can keep, by way of an arc, the current flowing. When the arc is quenched the vapour cools, depositing fuse metal over the surrounding area and this may even re-establish a conducting pathway!

A blowing fuse in a low voltage circuit is not very likely to sustain an arc, but should this fuse be in a high voltage circuit, an arc is far more likely to be maintained. This brings us back to the EMF of the circuit! So yes, Voltage does play a role after all!

Another very important factor is whether the circuit to be protected is resistive or capacitive. An inductive circuit, even at a very low voltage, can generate enough voltage to set up an arc. In a capacitive circuit a very large current can be supplied for a short time helping an arc to become established. This brings me back to my statement that often when something seems simple, it is not really so simple at all!

It is important to understand the markings on a fuse. When replacing a fuse it is very important that an exact equivalent is used for the replacement. Yes, it is easy to repair a blown cartridge fuse. You simply drill a little hole in the end caps and replace the molten wire with a new piece. Hang on, it is not that simple! Remember there is now a deposit of fuse metal inside the glass tube. The repaired fuse will conduct, yes that is so, but if it has to blow again it will be adding to the metal deposit increasing the chances of forming a conductive path or an arc. Again, NOT so simple, thus never repair a blown fuse, throw it away and replace it with a proper replacement fuse. A new fuse does cost less than a new piece of equipment!

Speed of operation is another important factor. Some circuits are very intolerant of overloads and the protecting fuse has to rupture very

(Continued on page 17)

(Protection from page 16)
quickly to be of any use at all.

Some circuits will have to be fitted with a slower acting fuse. Here the fuse has to wait and see whether there really is a fault condition compared to an acceptable transient. As an example of this is the rush-in of current when some equipment is switched on. Equipment using large value of reservoir capacitors like power supplies comes to mind in this instance. These capacitors present a virtual short circuit until they are charged up. Equipment like this should to be fitted with some sort of time or anti-surge fuses. Many a blown fuse labelled as blown because the fuse got tired can be attributed to the in-rush of current.

Fuses are made and tested under standards laid down by instances like the Underwriters Laboratories (UL), the Canadian Standards Association (CSA) and the International Electromechanical Commission (IEC). These fuses are batch tested and marked as follows:

Super Quick Acting (FF): Used for protecting semiconductor circuits where Quick Acting fuses are too slow

Quick Acting (F) Also known as a Normal Blow: Used in circuits not subject to surges or transients. Some are filled with a filler to help quench arcs.

Medium Time Lag (M): Will withstand small transients or surges found in normal operation.

Time-lag (T) Also known as Slow Blow: Intended for use in circuits with high rush-in currents.

Super Time-lag (TT): Similar to T type but with an extended time before rupturing.

Fuse Ratings

The current-rating marked on the fuse is the maximum current loading. Fuses marked with IEC should be selected so that the normal current equals the fuse rating. Fuses marked UL should be rated 25% more than the normal circuit current.

The voltage marked on the fuse refers to the maximum it can safely clear a short circuit. It can be used at any voltage not exceeding the marked voltage rating.

The Breaking Capacity refers to the maximum short-circuit current the fuse can safely interrupt without the risk of exploding.

Fuses are tested normally at a temperature of between 20 to 25 degrees C.

As fuses are thermal devices you must realize that the temperature of their surroundings affects fuse performance. Remember that when a fuse is running in a place close to heat, it will blow at a lower current. A fuse running hotter than the test temperature will rupture more readily and thus the operating temperature have to be taken into account. A fuse fitted inside the engine compartment of your car will blow easier than one fitted inside the passenger compartment. This means that the fuse rating has to be de-rated if operational in a hot area.

(Continued on page 20)

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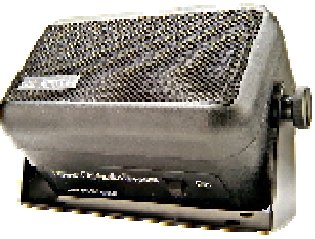

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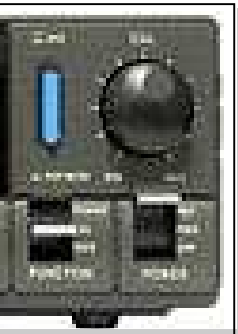

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(Protection from page 17)

For example a fuse rated at 1,6 A at 20 degrees C will have to be replaced with a fuse of 2 A should it be used in an ambient temperature of 70 degrees C.

In conclusion please take note that a fuse is a very important defence against damage to your equipment and should never be bypassed or replaced with a value higher than stipulated by the manufacturer of your equipment.

Die Hallicrafters Storie *[deel 1]*

Ean Retief, ZS1PR, Durbanville, Boland ARK

In this two-part series, Ean Retief, discusses the origin and history of the Hallicrafter radio's. Read about William ("Bill") Halligan, the man behind the Hallicrafters.

Here in South Africa, many a model S-20R, S-40B and S-28 were to be found in a radio shack.

Baie van ons (veral ouer) lede sal bekend wees met die Hallicrafters radios. Modelle soos die S-20R, S-40B en natuurlik die S-28 was redelik algemeen in SA. My eerste kennismaking met "kommunikasie-ontvangers" was dan ook met Hallicrafters en tot vandag toe het ek nog 'n liefde vir hulle.

William ("Bill") Halligan is in Boston (Massachusetts) gebore op 8 Desember 1898. Hy het kleintyd al met radios ge-eksperimenteer en in 1913 op 14-jarige leeftyd word hy 'n radioamateur met die roepsein 1AEH (in daardie dae was daar nie voorvoegsels vir verskillende lande nie, want kontak was beperk tot redelike kort afstande). Later van jare was sy roepsein W9AC.

Sy eerste werk op 16-jarige leeftyd was as marine radio-operateur op toerskepe wat tussen Boston en ander kusstede geseil het. Met die VSA se toetrede tot die eerste wêreldoorlog dien hy as radio-operateur op die slagskip USS Illinois. Na die oorlog skryf hy in by die Ingenieurswese Fakulteit van Tufts-kollege in Medford, Massachusetts, maar kon nie sy studies voltooi nie weens finansiële probleme (onthou, 1920/22 was die eerste depressie). Hy kry egter toelating tot die VSA militêre akademie te West Point maar verlaat West Point na twee jaar om in die huwelik te tree met Katherine Fletcher. Dus, hoewel hy nie sy studies voltooi het nie, het hy etlike jare van studie agter die blad gehad.

Bill en Katherine het huis opgesit in Boston waar hy as bestuurder van verkope vir die "Tobe Deutchmann Korporasie" gaan werk het. In 1923 het hy opdrag gekry om 'n klein radiowinkeltjie in die middestad van Boston te open. Bill noem toe die plekkie "The Radio Shack" – Dit

(Na bladsy 21)

(Hallicrafters vanaf bladsy 20)
was die begin van die ketting wat vandag oor die hele VSA versprei is ("Radio Shack Corporation").

In 1928 is Halligan na Chicago verplaas en in 1933 bedank hy by Deutchmann om sy eie klein radiofirma te stig. Hy het met 'n klein kantoortjie en 'n bietjie kapitaal begin. Die voorstel van "Hallicrafters" deur 'n vorige kollega was vir hom heel aanneemlik, want hy was van plan om 'hand-geboude kwaliteit-("crafted") radios' te bemark. Dit het seker moed gekos want dit was in die tweede ('groot') depressie,

Maar daar was een groot bult wat hy nog moes oor voordat hy 'n radio op die mark kon bring: RCA ("Radio Corporation of America") was op daardie stadium die houer van die VSA-patentreg op byna elke nuttige radiotegniek. Enige firma wat dus 'n radio wou vervaardig het in daardie probleem vasgeloop. 'n Lisensie moes eers van RCA verkry word, wat duur was. Alle aspirant radiovervaardigers in die VSA het op daardie stadium in die feitlike monopolie van RCA vasgeloop.

Bill het begin om ontvangers te ontwerp en dan het die Silver-Marshall-maatskappy hulle vervaardig en verkoop, want hulle het reeds 'n RCA-lisensie gehad. In 1936 slaag Bill daarin om die Echophonemaatskappy, wat op die rand van bankrotskap was, te koop. Echophone het ook die nodige lisensie van RCA gehad. Hy kombineer die twee firmas in een, hoewel hy die naam Echophone as 'n aparte handelsnaam behou het vir latere gebruik.

Die hele lisensieprobleem het gelukkig later verdwyn toe Arthur Collins (Collins Radio Co) vir RCA in die hof aangevat het oor hulle patentregte en lisensie. Die hof het beslis dat RCA se patente net geldig is op spesifieke tegnieke wat hulle ontwikkel en patenteer het. Dus as een voorbeeld: As RCA 'n sekere buis gepatenteer het, dan is die buis en die kringtoepassings van daardie buis hulle patent, maar dit maak nie dat hulle patentreg het op alle buiskringe wat in radios gebruik word nie! Daar was voorheen 'n soortgelyke saak in die VSA toe Henry Ford (Ford Motor Co and others) vir Seldon aangevat het oor sy 1877 patent vir 'n motorkar. Seldon het ook lisensiegelde van elke motorvervaardiger in die VSA verlang. Seldon het selfs 'n motor gebou (toe sowat 30 jaar later) om aan die hof te demonstreer dat sy 1877 patent nie net 'n teoretiese ontwerp was nie. Dit het darem "hik en snik" 'n entjie in die straat voor die hof geloop. Daardie hof het toe ook beslis dat Seldon se patent net toepaslik is op die motorontwerp wat hy in 1877 gepatenteer het en nie op alle "automobiles" nie.

Baie gou was Hallicrafters (veral onder radioamateurs) bekend vir sy hoë-kwaliteit ontvangers. Senders het nou ook gevolg. Die "Skyrider" en "Super-Skyrider" (model SX-9) het veral die firma goed gevestig. Vir die BHF-entoesias het die SX-10 ("Ultra Skyrider") in 1936 verskyn. Dit was die eerste kommersiële klaargeboude BHF-ontvanger wat radioamateurs kon koop. Hallicrafters se beste ver-

(Na bladsy 22)

(Hallicrafters vanaf bladsy 21)
koopsmanne was die gebruikers wat die radios veral 'oor die lug' geprys het.

'n Interessante radio wat vandag 'n gesogte versamelaarsitem is, was die "Skyrider Diversity" van 1938. Dit was twee kompleet ontvangers langs mekaar in dieselfde kabinet. Elkeen het van sy eie antenne gewerk en so kon die effek van kwyning teëgewerk word. Dit was 'n unieke ontvanger en Hallicrafters was die enigste firma wat op daardie stadium so iets vervaardig het. Dit was egter 'n redelike groot stuk apparaat omdat dit nog voor die dae van miniatuurbuise en transistors was. Wyle Herman Wessels, ZS6AM, sou daarna verwys het as 'n "Herniaphone"!

Nog 'n interessante ontvanger was die S-36A wat die SX-10 vervang het. Dit was 'n "UHF Receiver" wat van 28 MHz tot 143 MHz ingestem het en geskik was vir Gelykgolf, AM en FM. Die FM-bandwydtes kon geskakel word en die stel was met 'n groot meter toegerus wat mens kon skakel tussen S-meterfunksie en as deviasiemeter. Omdat dit so 'n lekker groot meter was kon mens mooi op 'n FM-sein instel. Die voorkoms was identies aan die SX-28, so die twee was mooi "pasmaats" in 'n hok. Dit het ook 'n goeie luidspreker en baie mooi audio gehad. Die stel was een van die eerstes wat die sogenaamde RCA "Akkerbuise" met lae interelektrodekapasiteit in die RF-stadium gebruik het. Die term "Akker" verwys na die buis wat soos 'n akker (van die boom) gevorm is.

In die begin van die tweede wêreldoorlog het die Britte tot die besef gekom dat die Luftwaffe "navigasiestrale" (gebaseer op die Lorentz-sisteem) gebruik met uitsendings bo 30 MHz om hulle bomwerpers na teikens in Brittanje te lei. Dit was dus dringend nodig om eerstens te bepaal of die seine werklik bestaan en, indien wel, dan gereeld vir die "strale" te monitor.

Die Britte het 'n S-36A geneem en dit in 'n Avro Anson gemonteer. Nou nie so maklik soos dit klink nie, want die S-36A het net op wisselstroom gewerk en die Anson se elektriese stelsel was gelykstroom. 'n Omsetter, motor-generator, moes ook in die vliegtuig ingebou word. Nog geen elektroniese omvormers in daardie dae nie!

Dit is vinnig gedoen en teen skemeraand is die Anson uit onder bevel van eskaderleier Buckle en hulle het twee "strale" gevind wat minder as 300 meter wyd was en wat op 'n vliegtuigenjinfabriek van Rolls-Royce gekruis het.

Die volgende dag het 'n amptenaar van die Lugvaartministerie met staats-aankoopdokumente die amateurradiohandelaars in London besoek en almal se voorraad S-36 radios opgekoop. Die is hoofsaaklik langs die kus op hoë punte geïnstalleer om te monitor wanneer die stelsels aangeskakel word en waarheen die strale gerig word. Die lugmagmuseum in Kaapstad het een

(Na bladsy 23)

(Hallicrafters vanaf bladsy 22)
van hierdie ontvangers wat nog in goeie werkende toestand is.

In 1938, bring Hallicrafters hulle vierde sender op die mark. Dit was die HT-4, ‘n baie goeie amateurbandsender. Hoewel die sender groot was, soos meeste senders van daardie jare, het Hallicrafters die bakwerk van motorplaat (“Automotive sheet-steel”) gemaak wat dit heelwat ligter gemaak het as mededingende senders. Die HT-4 was ‘n groot sukses.

Met die uitbreek van die tweede wêreldoorlog in 1939 was die VSA nog neutraal, maar Hallicrafters het reeds begin om meer en meer radios vir militêre doeleindes te vervaardig. Die groot kliënte vir hierdie produkte op daardie stadium was Brittanje en Frankryk.

Met die Japanese aanval op Pearl Harbour in 1941 het die VSA-regering besef dat hulle ontoereikend voorberei was vir ‘n oorlog. Bill is tuis besoek en daar is ooreengekom dat Hallicrafters nou uitsluitlik vir militêre gebruik sal produseer. Produksie van die HT-4 sou voorkeur geniet. Bill se eie HT-4 is net daar en dan uit sy hok gekoop vir verskeping na Pearl Harbour om vernietigde toerusting te vervang.

Die HT-4 met dekking buite die amateurbande is as die BC-610 sender by die duisende vervaardig. Die SX-28 is in baie vorms vervaardig waarvan die SCR-281 en SCR-299 die mees algemene is.

Gedurende die oorlogsjare kon mens sien dat Bill, as ‘n eertydse verkoopsbestuurder, nie ‘n belangrike les van bemarking vergeet het nie, naamlik dat al kan mens nie jou mark op ‘n gegewe oomblik bevredig nie, jy moet sorg dat jou teikenmark jou nie vergeet nie. Reg deur die oorlog het Hallicrafters advertensies in radiotydskrifte (veral QST) geplaas wat vertel wat hulle produkte doen en beloftes van “interessante nuwe ontwikkelings” belowe het na die oorlog. Hulle het ook artikels geborg in radiotydskrifte wat goeie stories van suksesvolle verbindings gedurende militêre operasies vertel het, natuurlik met die hulp van Hallicrafterstoerusting! Terugkerende oud-gediendes het ook vertel van situasies waar Hallicraftersapparaat tot hulle sukses bygedra het.

Dit is interessant dat Harley Davidson wie se totale motorfietsproduksie ook deur die oorlogspoging geneem is, dieselfde gedoen het deur gereeld in tydskrifte soos “Popular Mechanics” volbladadvertensies te plaas. Kolonel Tom Parks het so twintig jaar later dieselfde gedoen gedurende die tyd wat Elvis Presley diensplig gedoen het. Hy het opnames wat voor die tyd gemaak is vrygestel en feitlik weekliks publisiteit materiaal versprei oor hoe dit nou met Elvis gaan. Sodoende het die teikenmark nie van Elvis vergeet nie.

Deel 2 om te volg....

Rapid Deployment Amateur Radio

By Eddie Leighton, ZS6BNE

The "Shack in a Sack" has been given an "Extreme Makeover!"

Hans, ZS6AKV, and I were on our way back from Cape Town where we had attended the last RTA (Radio Technology in Action) program for 2009 and did our presentations there. The previous evening, during supper, we had discussed the latest initiatives in operating an amateur radio station in the field. We both agreed that it would be good to have a more professional name for the initiative.

It was at 12 000 meters above ground, when Hans came down the isle, "Have you thought of a name yet, Eddie?", "No not yet …" I replied and carried on thinking of a name. When we landed at Oliver Tambo airport, just after close on a two-hour flight, I spoke to Hans, "How does "RaDAR sound? ", "Rapid Deployment Amateur Radio." RaDAR was born there and then! Just to confirm, I sent an email to Hans the following morning asking if I could "Run" with the new name. Hans gave me his full support.

Originally, the idea involved operating on foot and away from any vehicle or building but that excluded others also prepared to operate in a portable fashion and so the concept was refined. The following list gives an idea of what RaDAR entails.

Guidelines

It is *desirable* that the RaDAR operator be able to:

- Operate an amateur radio station away from any building or vehicle, but it is not a prerequisite.
- Carry equipment, radios, antennas, masts, food, water and shelter to the final destination, in a vehicle, on foot or wheelchair.
- Determine accurate position and grid square to six digits. A map or GPS can be used.
- Provide power without relying on any third party. This can be in the form of solar panels, batteries or generators
- Communicate in a professional, accurate and effective manner. Good voice procedure is imperative to get the message through, clearly and accurately.
- Be self-sufficient. The RaDAR operator should be able to operate on his own without relying on any third party.

(Continued on page 25)

(RaDAR from page 24)

RaDAR subdivisions, "On foot," "Mobile" and "Fixed."

Logos

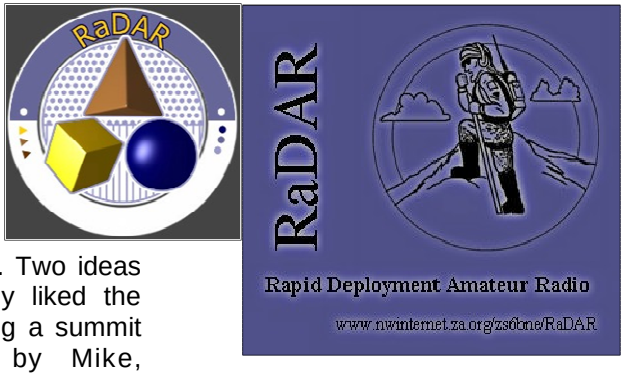
It is always good to have a logo identifying the initiative, graphically. Two ideas were put forward. Many liked the "Radio Amateur" climbing a summit originally submitted by Mike, ZS6MEG. A comment from Andries, ZS6VL, "Maybe because I like the association between hiking and amateur radio and nature, the old one appealed more to me. The concept behind RaDAR remains great."

I also liked the "old" logo. RaDAR has somewhat changed a little though expanding from an "On foot" operator to include other stations but emphasizing rapidly deployed, easily movable (objects), Amateur Radio stations.

A website was started for the RaDAR concept. The URL is http://www.nwinternet.za.org/zs6bne/RaDAR/ and is regularly updated.

Public relations

An activity like RaDAR can attract attention from people passing by. An idea to have a "Business card" on hand came to mind and so the RaDAR business card was born! This card includes all contact information and the blood group of the RaDAR operator, a very good suggestion by Mike, ZS6MEG. Radio operators can get injured too!



Working together with other organisations

A valid question was asked on the SARL Forum by Jack Chomley, VK4JRC. How does the RaDAR concept fit in with Hamnet? Hamnet is an organisation. RaDAR is a concept supported by radio amateurs interested in being able to set up an amateur radio station anywhere and quickly! Hamnet could use radio amateurs with this type of readiness. Hamnet is affiliated to the SARL and the SARL supports the RaDAR concept! We are all just one happy family.

A practical exercise

The company I work for, had a lot of fun on 4 September 2009, it was "Casual day." Each year, various departments decide on a theme. This year, the guys in the IT department decided on "Vietnam" and guess what, I was to be the "Radio guy." SO! It was an ideal opportunity to make it look authentic and include Amateur Radio. I set up an Echolink gateway (Alinco DR135 and Sound card interface) ZS6LRK-L at home,

(Continued on page 26)

(Continued from page 25)
accessible via Echolink. I was active, fully functional, from 07:40 to 08:00, before the MD decided on the winning theme. The local frequency used for the Echolink gateway, was 145,500 MHz Simplex, (yes I know, it is National call) I set up an APRS I-Gate as well (Yaesu FT847; KAM-XL and UI-View32).

My FT817ND was used for voice communications and TH-D7A(g) for APRS together with a Garmin Legend GPS for position information, as ZS6BNE-9. No calls were received via Echolink, being a difficult time of day for most, but I connected to the "Echotest server" and a machine replied from AMERICA! APRS worked great, also "Machines".

The exercise was a success. There was a weak link here though; it relied on the Internet and ADSL lines at the home QTH! In a real disaster situation, this infrastructure may no longer exist but it was OK for a demonstration of what Amateur Radio can do in rapid deployment of amateur radio communications.

The first "Official" exercise

Heritage day is 24 September 2009. Many stations are active with the Heritage Day Sprint.

An advert was placed on the SARL Forum for a special spring 2009 event that was organised for 24 September. It is a weekday and public holiday (Thursday) with all the "Heritage day" stations!

The time for this Spring RaDAR events was between 14:00 - 17:00 CAT. Activity between 7,000 to 7,025 MHz for CW and 7,060 to 7,100 MHz for phone. The power levels - as little as is required for a "Comfortable" QSO.

The exchange was the operator's call sign, a RS(T) signal report, a serial number commencing with 001 and a 6-digit grid locator, keeping in line with the "Heritage day" stations.

Calculating a Link Budget [part 2]

By Frank van Wensveen, PA3GMP / ZS6TMV

Part 1 published in the July/August issue

Satellites and moon bouncing

In another practical example of line-of-sight communications, we try to receive the OSCAR-51 satellite "Echo" using a hand-held radio and a hand-held antenna with a gain of

(Continued on page 27)

(Link Budget from page 26)
10 dB. Let us start with the satellite's FM transponder mode Down Link. Echo will produce a minimum power of 1 Watt (+30 dBm) on 70 cm. The transmit antenna system has a net gain of 2 dB (i.e. cable losses, etc. have already been subtracted). The path loss at maximum range (3 000 km) is 155 dB. We should allow an extra 3 dB loss for polarisation mismatch and another 1 dB from travelling through the ionosphere.

A typical 70 cm hand-held is rated at -120 dBm for 12 dB SiNAD. So we have:

1. Satellite TX power (minimum) = 30 dBm = 30 dBm.
2. Satellite TX antenna gain = 2 dB = 32 dBm.
3. Path Loss = 155 dB = -123 dBm.
4. Misc. loss (polarisation, ionosphere) = 4 dB = -127 dBm.
5. Receiver antenna gain = 10 dB = -117 dBm.

This is just above the minimum for a useable signal.

At minimum range (800 km) the path loss reduces to 143 dB, which will result in a signal of -105 dB into the receiver. So Echo in FM mode will be able to be received on a dual band hand-held with a hand-held Yagi antenna; easily when the satellite is directly overhead, and just barely when the satellite is just over the horizon.

Now let us try a moon bounce QSO at 145 MHz. We will do it the old-fashioned way, using a CW transceiver, key and the human ear rather than a computer with PSK-31. The surface-to-surface distance between the earth and moon is assumed to be 370 000 km. For a moon bounce QSO our signal will have to traverse this path twice. Furthermore, the moon is not a perfect mirror, which means that much of the signal is being scattered rather than being reflected back to earth. Also, the moon will only intercept a tiny fraction of the beam; most of the signal will travel past the moon and into space. Then there are polarisation mismatches and some ionospheric absorption. All in all, the practical path loss for a moon bounce QSO at 144 MHz is around 252 dB!

Let us assume a "big gun" at the transmitter end, pouring 1 kW of RF power into a phased array of 16-element Yagi's with a total gain of 20 dB. A good quality coaxial cable is being used, but the size of the array and the height of the tower require a lot of cable. Let us assume the total loss of cables and such comes to 3 dB. This leaves us with the following:

1. Transmitter power: 1 kW = 60 dBm = 60 dBm.
2. Transmitter antenna gain: 20 dB = 80 dBm.
3. Transmitter loss = 3dB = 77 dBm.
4. Path loss = -252 dB = -175 dBm.

Now what do we need at the receiver end to receive the echo's from the moon? We are trying to receive a weak CW signal, so we

(Continued on page 28)

(Link Budget from page 27)
do not necessarily need 12 dB SiNAD (as we would need for FM). Let us assume that the trained human ear can still fish the dots and dashes out of the noise when we feed a -140 dBm signal into our receiver. That means that in order to receive the echo's, we need to throw 35 dB of gain into the mix, plus enough additional gain to make up for cable losses, etc.

Assuming a similar antenna array (4 phased Yagi's with a total gain of 20 dB) at the receiver end, and again 3 dB of loss in cables and the like, the second half of our link budget is:

5. Receiver antenna gain = 20 dB
   = -155 dBm.
6. Receiver loss (cables etc) = 3 dB
   = -158 dBm.
7. Amplification we need to provide = 38 dB = -140 dBm.

So we either need a very sensitive receiver (so that we can detect the dots and dashes at less than -140 dBm into the receiver!) or we need an excellent pre-amp! Another option is to use better cable in order to reduce the losses in that link of the chain. Here an important factor is the frequency on which the cable is used, as cable loss increases with frequency. On the lower HF bands there is nothing wrong with using RG-58, for example, since at those frequencies cable losses are relatively insignificant. On VHF and UHF, though these losses become much higher, and in this particular moon bounce example a few dB can make the difference between hearing a station and hearing only noise. Another obvious solution would be to increase the gain of the antenna array (more and larger antennas) or to replace Morse code and the human ear with a digital mode that will allow weak signal communications at much lower power levels into the receiver, such as PSK-31.

Link budgets, reciprocity and antenna's

One look at the components of a link budget makes it clear that while some components of the link budget are reciprocal, the entire link budget itself is not. For example, the path loss is a factor of distance and frequency, but not of direction, which proves that the propagational path (be it a line-of-sight path or a non-line-of-sight path) has similar properties in both directions of the link. The path loss of a given propagational path between, say, Africa and Europe will be exactly equal in both directions.

This is not necessarily true for other factors in the link budget, though. Transmitter power may (and often will) be different at both sides of the link, and the same goes for receiver sensitivity. Transmitter low pass filters, receiver band pass filters, antenna tuner circuits or balun cores that may saturate on transmission but not on reception are all examples of factors that apply to the link budget in one direction but not in the other. Also local noise levels are

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an important factor: if the local QRM level at one side is high, that receiver may very well require 20 dBm or more in order to produce a decent audio signal.

Antenna considerations play a role here, too. It is well known that some antennas are more susceptible to local QRM than others. Closed-loop antennas such as the folded dipole, the quad or the delta loop are known for their 'quiet' reception characteristics, while an open dipole is much "noisier". This is due to the fact that these antennas handle the near field differently. While the antenna itself is reciprocal, i.e. it has the same gain and radiation pattern for transmission as for reception, it is important to keep in mind that an antenna does not exist in a vacuum. Local factors such as QRM add to the mix of signal and noise that the antenna eventually feeds into the receiver. If the local "noise floor" for reception is high, the receiver requires a stronger signal into the receiving antenna in order to produce a decent audio signal. This effectively makes the receiving station (as opposed to just the receiver itself!) less sensitive, and as a result the total link budgets in both directions end up being significantly different.

When to calculate a link budget

Making QSOs is generally a matter of "let us try and find out". Is there anything wrong with that? Of course not! However, there are cases where a little bit of forethought can save a great deal of trial and error. For example, when setting up a digipeater for packet radio or APRS, it is important to know whether the repeater can actually connect to its neighbouring nodes reliably. When trying to work a satellite one has to know whether or not the available transceiver and antenna equipment is sufficient and, perhaps even more importantly, when it is not necessary to invest in expensive elevation rotators and low noise preamplifiers! Microwave enthusiasts may end up working out a link budget more often than not before trying to make a difficult QSO.

In non-amateur applications a properly calculated link budget can save a lot of trouble as well. Wireless computer networking applications such as WiFi or HSDPA (in South Africa known under the brand name iBurst™) use frequencies in the GHz range where the link path is relatively short, and sufficiently close to line-of-sight to make a fairly good prediction on the network's coverage area based upon the minimum signal strength to be delivered to the wireless device.

While radio remains subject to a lot of factors and may always give surprising results, working out a link budget can often save a lot of needless effort and disappointment. A few minutes of thought can save hours or days of work. Try it. You may be surprised.

How to Build a Box for your Icom 706/703

John Green, ZS1JHG

No carpentry skills? Welcome to the club. You can build a box for Field Day and portable events for your IC 706/703.

I needed a frame of reference to get the box size, and then it struck me what about the box the radio is packed in.

This then gave me my starting dimensions, now how to build the box? What about using the "Meccano" method.

Starting with the base all side front and back panels are attached using right angle two hole steel brackets, which are bolted onto the base and panel. The panels were butted onto the base to maximize the size of the base. The lid of the box sits inside the side panels and fits flush with the top. This also makes the box more ridged. The lid is attached with flush mount hinges so as not to push the lid forward out of alignment. Note**.** The hinges must be bolted on, do not use screws.

Inside of box showing L bracket for battery and mobile mount. Note felt on inside of mobile mount brackets. Note the black felt on the front panel lipped over from covering the inside of the panel.

The front panel was cut in half at 55 mm, the other half of the front 100 mm was attached to the lid.

The measurements of the box are as follows:

Base and Lid 300 mm wide by 275 mm deep

Side panels (two) 300 mm deep by 155 mm high

Rear panel 300 mm wide by 155 mm high

Front panel 300 mm wide by 55 mm and 100 mm (cut into two

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sections)

The wood used was 12 mm multi-ply, chosen for strength and lightness. Remember if you use wood of a different thickness then your base and lid sizes must be adjusted to allow the front and rear panels to sit flush

So to do this you need to subtract from the 300 mm depth the thickness of your Front and Rear panels plus 1 mm for fitting clearance. Example: Plywood 9 mm thick: 300 mm width less 9 mm (Front panel) less 9 mm (Rear panel) = 281 (1 mm has been deducted for clearance).

The clasps (coach clips) are stainless steel and the carry handle made of brass on my box. (Plastic handles are not recommended). Note the handle must be bolted on, do not use screws

The battery holder was made from a strip of thin tin bent into an L bracket to fit the size and shape of the Gel 12 V 7 amp hour battery (see photo). Size 90 mm high by 70 mm long and 35 mm wide. Add on for mounting lips about 30 mm (i.e. 15 mm +15 mm)

The lid is held up with a hook and eye, simple and effective.

Close up of panel attachment brackets.

The lid, its hinges and brass handle and view of front two-piece panel with coach clasps.

You do not have a mobile bracket for your radio! No problem make your own from two L brackets and a strip of hardboard (Masonite) 6 mm thick, 80 mm wide and 190 mm long. I made my L brackets 60 mm high by 80 mm deep, the base 30 mm wide.

Hint: Mark out one bracket to fit the mounting holes on your radio or borrow a mobile bracket from another radio amateur. Place the two L brackets back to back and mark the mounting holes on the second bracket. This will ensure the sides are the same. Now bolt the L brackets to the radio and place onto your hardboard, centre on the hardboard and mark the outside position of the L brack-

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ets base. Drill four holes in the L brackets and hardboard, bolt together and attach your mobile mount to the radio. (Make sure your battery is mounted in the box before proceeding).

The radio with the mounting bracket attached can now be moved about on the box base to find the best position that will allow the faceplate to be removed and rear antenna access. Mark the position of the mobile bracket at its best placement, remove the radio and drill through the mobile mount and box base and insert bolts (see photo).

I realise I have laboured this section, but having built a nice box you do not want to ventilate the base with lots of trial and error mounting holes.

I lined the inside of the front panel with black material for added protection to the radio faceplate on removal and refitting.

You cannot cut wood straight! Neither can I. Mark out the panels on your sheet of Plywood allowing about 3 mm for the saw blade width between each panel or take it down to your friendly hardware / lumber store. They will cut the panels out for you nice and straight for a small fee. Paint or varnish to your taste and you are done.

Additional Hints:

It is essential to add feet to the base to clear the bolt heads. If the box needs to be packed in the minimum space, then use a fold over type handle.

Customise your box by adding a removable cut-out hatch on the rear panel to access the rear antenna and plugs of the radio.

Remember the box is bolted together so it is easy to remove a panel and make any mods at a later stage.

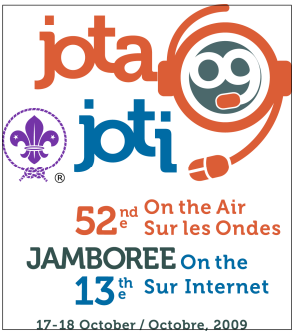
Reminder. Use only nuts and bolts in your construction, the only place screws may be used is in the bottom half of the front panel and then use four long thin screws to attach the side panels to the lower front panel and also glue the bottom only of this panel to the base.

The mobile mount L brackets can be lined with thin black felt on the insides to prevent your radio from being scratched. (recommended)

Bottoms can be beautiful, showing how the panels are butt mounted to the base. Note the bolts of the mobile mount and feet to clear the bolt heads. Bolt with washer is from the battery L bracket.

The Museum Piece

Dave Gemmell, ZS6AAW, with the Old Timers



The reader may have noticed that since the last issue of RADIO-ZS, The Museum Piece and Radio Scouting have been combined. There are two reasons, which, on the surface, seem to be contradictory but are not! a) To save space and b) I have not been receiving much input for Radio Scouting from the Readers.

Therefore, from now on Radio Scouting write-ups will be tagged on at the end of The Museum Piece.

The Air Show at Swartkops, 12 September 2009

Cliff, ZS6BOX, and I did a small amount of operating from the Wireless Room, that well-known brick building close to the "Friends Club House." Not nearly enough but, at least, ZS6MUS, was on the air.

Hangar 3 - progress at the SAAF museum

Many thanks to the efforts of Frans van Nieuwkerk and Cliff, ZS6BOX, work on the "Wireless Hut" in Hangar 3 has progressed fairly well. Frans has been a member of the Friends of the SAAF Museum for more than ten years. He is keen on radio and I am working on him to go for the RAE.

The hut still is a "shell" but at least we can lock the two doors and the front wall does not "swing" from the "eaves" either! The bottom edge of the wall had to be replaced and the beam bolted to the floor. Again, many thanks Franz and Cliff.

We would have liked to operate from the Wireless Hut but the main problem was what type of antenna and where to erect it?

There was a wire fence and posts, which may have been used to support an inverted-V antenna.

The Canberra bomber presented another constraint to the mast height, as it was also too close. It is just on the other side of the hangar doors. However, the main concern was 2 or 3 telephone lines connecting the Flight Line Control (cum Commentary Box) which ran parallel and above (4 metres) the same fence.

In my opinion, a good chance of causing QRM to the "Flight Line Safety System." Therefore, yours truly "chickened out" and set up ZS6MUS in the Wireless Room. Gentlemen, my apologies!

Similarly, I really get concerned when the "scale models" fly around!

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(The Museum Piece from page 33)

Some of them priced in the region of R10 000.

The next events to look forward to are:

3 Oct SAAF Museum Flying Training
10 Oct Silver Queen Air Race
17/18 Oct Jet Scale Models National Championships
7 Nov SAAF Museum Flying Training

Radio Scouting

I hope that there will be no strikes so this issue of Radio ZS has reached you before the big event. Therefore, I have included the JOTA/JOTI web addresses below.

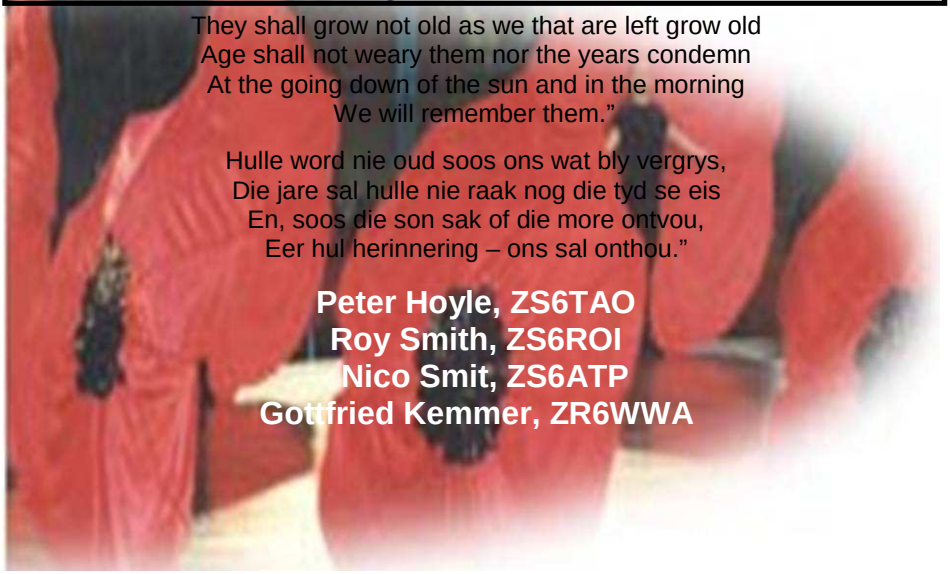
a) www.scout.org WOSM website for general scouting information
b) www.jota.sub.cc JOTA only website
c) www.joti.org JOTI only website

Once again I ask you radio amateurs to help out with this event. Remember if you were a Boy Scout or your wife a Girl Guide then try to organise a Former Scout/Guide station. If you cannot arrange a station for the Scouts/Guides, please consider hanging around on the bands to demonstrate your favourite mode.

The more observant of you may have noticed that change from page 32 to page 33 the Editor referred to your column as Dave's Ramblings. Whose fault is that? Yours, dear Reader!! So let me have some comment from you chaps.

Address information for your inputs dave@zs6mus.org.za and/or davegemmell@bmknet.co.za, and PO Box 77, Irene, 0062 and tel 012 667 2153

Silent Keys Stil Sleutels



They shall grow not old as we that are left grow old
Age shall not weary them nor the years condemn
At the going down of the sun and in the morning
We will remember them."

Hulle word nie oud soos ons wat bly vergrys,
Die jare sal hulle nie raak nog die tyd se eis
En, soos die son sak of die more ontvou,
Eer hul herinnering – ons sal onthou."

Peter Hoyle, ZS6TAO
Roy Smith, ZS6ROI
Nico Smit, ZS6ATP
Gottfried Kemmer, ZR6WWA

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