

H.A.R.S. Notebook

Journal of the Hereford Amateur Radio Society

Issue No 2 • June 2016

Chairman: Nigel Hancocks G4XTF • **Treasurer:** Rodney Archard M0JLA • **Secretary:** Duncan James M0OTG
Committee: Derek Gillett G3WAG; Dave Porter G4OYX; Bob Bowden G3IXZ; Richard Langford G4FAD;
Dave Harris M0RNI; Mike Bush G3LZM; Tim Bridgland-Taylor G0JWJ; Geoff Wilkerson G8BPN

Typewriters

Club talks do not have to be directly associated with amateur radio, to be of great interest. And so it was with the talk on *Typewriters* given by Duncan, our Hon Sec, at the June meeting. Another thoroughly absorbing talk dedicated to precious machines of which Duncan has a collection of some 200!

Apparently the concept of setting text into letter form on paper, started with largely wooden-constructed machines around 1850. The many pictorial illustrations we were shown of early solutions which captured the ingenuity of the mechanisms nevertheless. The early follow-on mechanical machines, the Hansen Ball for example, are very valuable and command huge amounts of money.

Amongst the working exhibits which Duncan brought along, was a neat Corona 200 dated 1922 which was the chosen machine of the reporters of the day because it was light-weight and of largely aluminium construction. It folded down into a very small size.



And what of the QWERTY keyboard?, how did this come about since it is not the most digitally ergonomic key layout. We were told that the Remington Company who had made their fortunes and gained expertise during the American War of Independence, were already well into production of machines with the QWERTY layout when it was realised that improvements could be made. But, it was decreed to be too late, and so the QWERTY remains to this day.

(*Thanks Duncan, very enjoyable ...Ed*)

DMR

In early May a most able talk was given by Matt Porter G8XYJ who amazed everyone with his thorough knowledge of *Digital Mobile Radio*. It appears that many like-minded amateurs are forming co-operative groups to set up repeater cells on 70cm whereby a local access gives rise to country-wide coverage when a mobile moves between zones. It is a software driven system and does need to be set up accordingly. Using TDMA, each 12.5kHz segment of a channel is split into time-slots 1 and 2. Slot 1 is for local working and slot 2 is generally for UK operation.

During the course of the talk, Matt produced a handheld Retivis RT3 which will operate in this manner, for sale on ebay for £89. This included batteries and a host of accessories. A great deal, and when the unit was passed amongst the members, it was obvious that it was well engineered and very tactile. Other suitable radios start at £100 and can cost up to several times this amount.

(*Thanks Matt. For further details contact Matt on M3XTL@yahoo.co.uk ...Ed*)

The Chairman's Meanderings Through The 4m Band

Part 2



Fig 1 The Spectrum Communications 4M Transverter

In the above photograph it is easy to see the difference between the physical sizes of the two 4M transverters. However, this does not indicate how different they are. The Ukrainian unit was purchased as a kit consisting of fully constructed boards which only needed to be wired together and to be enclosed within a box. The Spectrum Communications transverter on the other hand was considerably more expensive and consisted of a number of polythene bags of components packed within the box. So, is the extra cost of the construction, and construction time involved with this unit, really worth it?, since for a few extra pound notes, the whole unit can be supplied, tested and ready to go!

Now, there is something special about "Home Brewing" in amateur radio. I, like many others, get considerable pleasure from sorting, identifying and soldering components into a circuit board. This is an intricate process that requires total concentration and "space" where the troubles of the world and family



Fig 2 Rear panel



Fig 3 Front panel

concerns, for a while, have no place. There is the euphoria of powering up the transverter for the first time and not having the white smoke of failure. This is then followed by the adrenalin rush of the first contact. All this and the learning process that is true to the ideals of Amateur Radio. What more would one want?

The road to success in "Home Brewing" is one of constant checking and careful routine in one's method. It is also a personal thing in that I always try to check values twice and solder once. Resistors are colour coded but can easily be miss-read if the colours have faded, or if the lighting is bad or if one's eyesight is fading (like mine). Hence I use a multi-meter to double check most of the component values. I cannot measure capacitors or inductors so I tend to be very careful when reading them. The same applies to transistors and IC chips where, for me, a magnifying glass becomes a very useful tool.



Fig 4 Illuminated magnifying glass

Such an item for doing this is an illuminated magnifying glass especially one on a stand which can be clamped to the work bench. These can be purchased from Hobbycraft or Maplin, who sometimes have them on offer at a reasonable price. Finally, you need to read, and follow the instructions that come with the transverter kit. In conclusion, try to remember the old carpenter's saying of "measure twice, cut once" which is just as wise in construction of this kind.

Having read the instructions the first items to be inserted and soldered were the pins

SPECTRUM COMMUNICATIONS
Incorporating Gares Electronics & G2DYM Aerials
Proprietors: Mr A. J. Nailer HNC BA G4CFY & Mrs J. R. Nailer.
12 WEATHERBURY WAY, DORCHESTER, DORSET, DT1 2SF
Established October 1978 Tel 01300 262299 International 01304 219229
e-mail: troy@spectrumcommunications.co.uk web: www.spectrumcommunications.co.uk

Transverters, single port IF drive, TRC - sl. versions

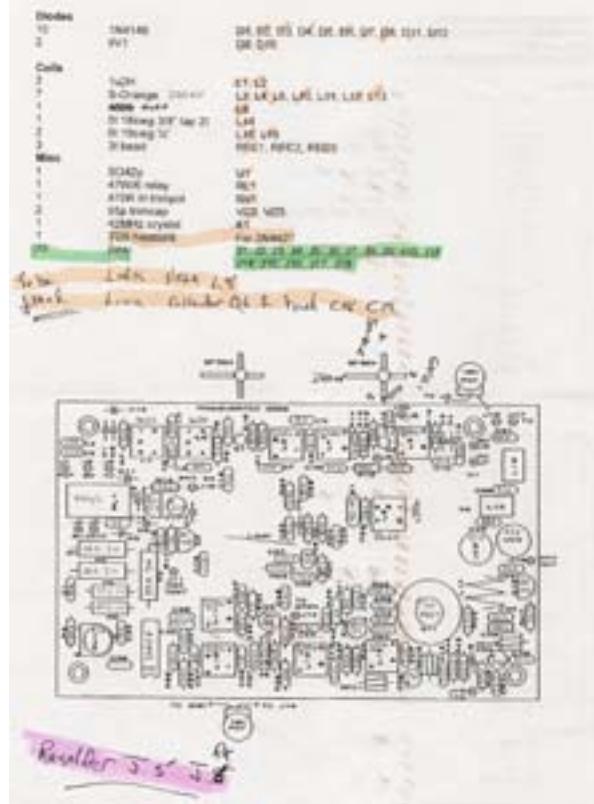
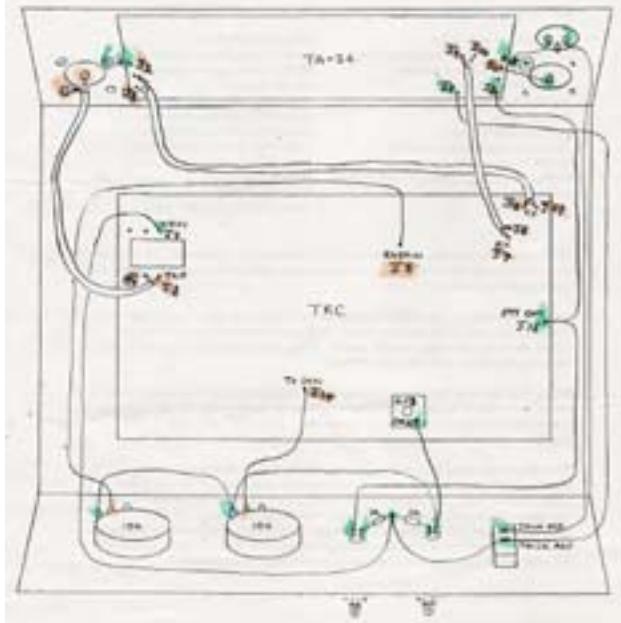


Fig 7: Layout Diagram and Component List.

Reproduced with the kind permission of Mr A J Nailer HNC BA G4CFY of Spectrum Communications

followed by the resistors, capacitors etc. following the order given in the instructions. As I soldered each item, I used a high-lighter pen to mark off the item on the components list and also on the diagram of the component layout on the PCB. This will ensure that nothing is left off the board and also enables one to carry on after a break. I do not intend to go into the technique of soldering as it is a process that is best demonstrated.

When all the components have been inserted, the board needs to be smoke-tested and the circuit adjusted and tuned. Again, following the instructions is most important especially when taking the DC voltage readings, which should be within the limits stated. Assuming

these are good, adjusting the “tune” of the receive circuit is next and may need to be repeated a number of times to get the best settings. However I had a problem when adjusting the frequency of the crystal oscillator, in that I do not possess a frequency counter. The instructions suggested an alternative method by tuning the receiver to a beacon to obtain a precise setting but I could not hear any beacons. I therefore needed to find yet another means of checking the frequency of the oscillator. I do possess a very nice IC-R7000 receiver which has an S meter that can be used to “accurately” tune onto a station by centring the analogue needle. It also has a good digital frequency display which is reasonably accurate. I therefore



Fig 5: Transverter PCB showing the component layout.

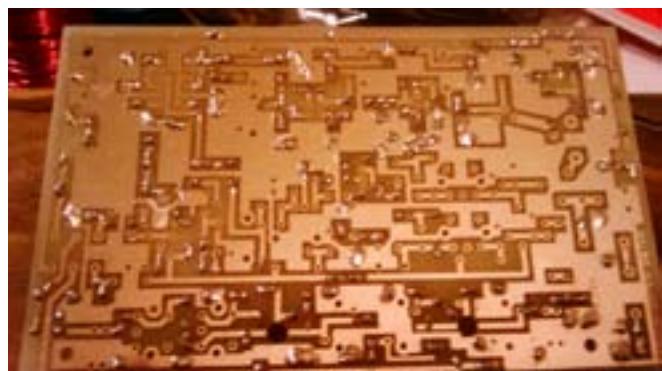


Fig 6: showing etched copper underside of the PCB

concluded if one can tune to a transmitting station accurately then the reverse should be true. One should be able to set the receiver to a frequency and adjust a transmitter to centre the S meter I thought.

This I did by setting the ICOM receiver to 70.250MHz and the driving transmitter to 28.250. The transverter was connected to a dummy load and the “Power Out” adjusted to its lowest setting before transmitting a FM carrier. Using a non-metallic tool I adjusted the appropriate coil of the transverter board while watching the S-meter on the IC-R7000. Now the purists may not agree with this method, but, the ever hopeful like me will try anything when there seems to be no alternative. May I say, at this point, Geoff G8BPN at Hill House had offered to do the adjustment using his test equipment, for which I thank him. However, there are times one needs to solve ones own shortcoming.

It was not long after completing the construction and adjustment of the transverter HARS entered the Practical Wireless 70MHz competition and this transverter was used. During setting up the equipment Geoff checked the frequency of the oscillator circuit to find it was slightly out of frequency but it was deemed not worth the effort to try and reduce the error at that time. It seemed that my non-purist method had worked OR had I just been pretty lucky? However, recently, I have been receiving reports that my FM transmissions sounded as if they were off-frequency and when checked on the ICOM receiver there appeared to be an error of approximately 1.6KHz.

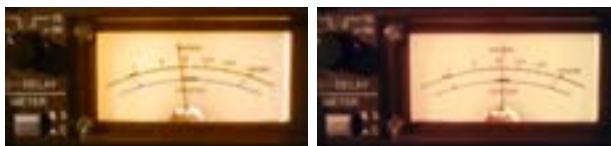


Fig 8/9 Showing frequency centring meter showing low off frequency and on frequency



Fig 10 Meter indicating receiving signal on frequency

I therefore looked for a more accurate method of correcting the error, using my only means of getting a frequency check, the ICOM receiver. From my experience of transmitting CW, which is a narrow band transmission, and using SSB reception I found the best tone is 800Hz high of the TX frequency. I checked to see if the FT 817 sent CW in a similar manner and was pleased to find it did. I therefore set up the transverter to transmit CW on a known frequency and the ICOM receiver on the same frequency plus 800Hz. The oscillator was then adjusted while transmitting CW to obtain the best tone. I then checked the centre point meter to find that it did not deviate indicating that the oscillator was close to the correct frequency required. This was subsequently confirmed by the reports received from Stuart G4VMF and Dave M0RNI.



Fig 11 Photograph showing the transverter board on the box base and the PA board on the back.

As can be seen from the photographs the transverter consists of two boards, the transverter with a power output of approximately 0.5 watts and a second board which also needs constructing, containing a power amplifier producing approximately 25 watts. The transverter also has a preamplifier receive circuit. So what is the unit like to use and how does it compare with the cheaper Ukrainian transverter?

To compare the two transverters is rather difficult in that the Ukrainian unit was already built and only required boxing. The Spectrum Communications unit (SC) needed constructing and although my initial adjustments were very approximate, it transmitted a FM signal that could be received on the “channels” section of the band. Whereas the Ukrainian model was so far off frequency it was unreadable. Its power output of 10W is more than adequate for local communications

but the frequency error 4/5KHz makes it inconvenient to use.

The SC unit on the other hand, is straight forward in that no allowances need to be made in the frequency readout as the driving-rig readout of 28.475 translates to 70.475MHz. HARS chose to use the SC transverter in the Practical Wireless 70MHz QRP competition and it was quite effective in both SSB and FM modes. Unfortunately the HARS entry went astray and therefore did not get verified by PW. When I compared the club's results with those that were published we would have been midway up the QRP section!

The SC transverter is also more convenient in that it has an adjustable power output and an adjustable preamplifier on receive. When everything is taken into account, apart from the fact that I had the enjoyment of constructing the SC transverter, it is not surprising the

SC unit is my preferred choice when on my weekly 70Mhz skeds.

I would like to record my thanks to Mr AJ Nailer of Spectrum Communications for his helpful comments and information he gave me during a rather lengthy telephone conversation. I also thank him for the kind permission to reproduce part of the instructions and diagrams that he sends out with the transverter kits. I have had the pleasure of constructing a number of the Spectrum Communication kits all of which have been successfully completed and all operated as specified.

Disclaimer: I must point out that all values quoted are approximate and not likely to be those achieved by using accurate test equipment. All comments concerning the build and operation of these two transverters are purely my own opinions.

(Thanks Nigel for a cracker of a project, expertly handled ...Ed)

Spotlight on Club Member, Derek G3WAG.

I obtained my licence in 1967 and in those days there were two types of licences Class A and B. I went for a class A licence (which covered all bands) as I felt that VHF and upwards was not for me. However, the real challenge was passing the Morse test in London. Luckily, I passed and was duly given the callsign G3WAG which was somewhat amusing as WAG was the initials of my boss at the time.

Like most amateur radio operators of that vintage we usually used ex-govt equipment for receiving and a home brew transmitter. If you look at the picture below you will see my first station. Yes, it is a mess but I was pleased with it all back then. Being single and living with my parents I did have limitations with aerials; that is another story.

My shack consisted of a home-brew transmitter (top band only, CW and AM), and for receiving I had both an RCA AR88 and a Hallicrafters SX28 communications receivers. For frequency control, I had Class 'D' Wave meter and a homebrew field strength meter, all the other bits and pieces were just for show. I used a WW2 19 Set for 80 Metres (not in



the picture), which I modified to increase the power output, but it caused too much TVI so I was limited to times when there was no TV transmission.

I enjoyed those days and my best DX contact was a GM late one Friday night on CW, the day I got my licence, I was over the moon! I was living in Enfield those days.



My current shack is shown above.

My current station consists of the following:

- Yaesu FT-2000 with Pan adapter for HF and 6 Metre (100Watts)
- Yaesu FT-736R VHF / UHF Multimode (25Watts)
- The HF Antenna is a home-brew Windom 2 and 6 Metre home-brew antenna
- Vertical Collinear for VHF / UHF Local FM operation.

Apart from all the usual aspects of amateur radio my main interest is in Antennas.

Designing, making and optimising; I get a great 'kick' out of this. Data modes is my secondary interest and I am frequently trying all manner of things in this field. I did write my own RTTY software for the BBC micro many years ago, but have not ventured into writing anything more complex apart from controlling my current rig from the PC.

I have always been a radio amateur at heart and passing the RAE (Radio Amateurs Exam as it was in days gone by) has been one of the best qualification I have achieved; it has been a real 'door-opener' in my professional career. I worked with many military establishments world-wide and revealing my interest would instantly break any barrier, it was fantastic. The first time this happened was when I was attending the British Army Equipment Exhibition in Aldershot during 1985 (I think). It was VIP day and I was setting up some equipment for demonstration (HF frequency-hopping radios), when a voice came from behind me "Excuse me sir", turning around thinking to myself, I am busy, I was surprised to see His majesty (the late) King Husain of

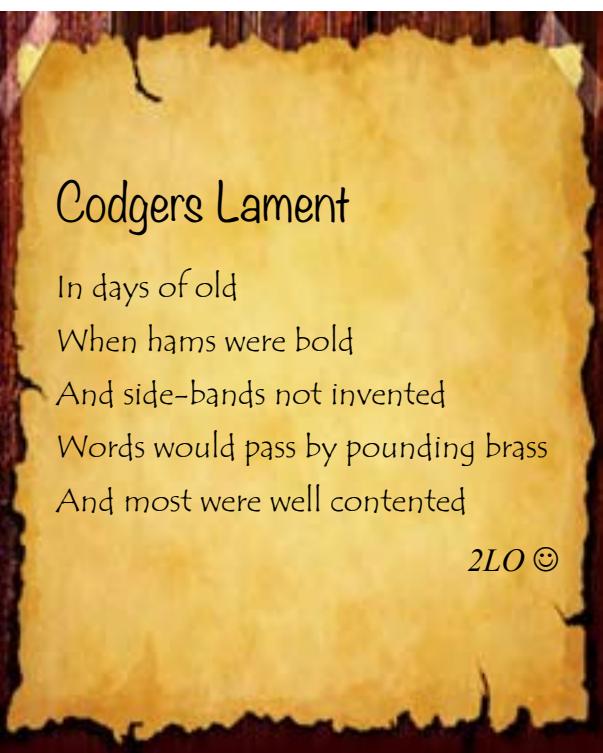
Jordan (9JY1) standing there. After short delay he apologised for disturbing me and he said " I saw that you were a member of the RSGB (wearing a badge) I could not resist coming over for a chat". We had about 5 minutes chat about amateur radio, but as soon as his minders realised that he had wandered away, and was talking to me, I was suddenly surrounded by about six bodyguards. Furthermore, my senior management had noticed that I was talking to the king and another 6 to 8 individuals surrounded me. Well, that killed the conversation! So we shook hands and went our separate ways. I have had a number of experiences with other dignitaries around the world and all because of amateur radio.

I am planning to change my equipment in the near future as SDR and other technologies are fast becoming available.

My biggest challenge currently is getting back to speed on CW, so see you all at the other end of the band. Although the bands are very noisy, I very much enjoy 40 metres and 2 metres SSB, plus when the Sporadic E is about, working 6 metres.

Derek G3WAG

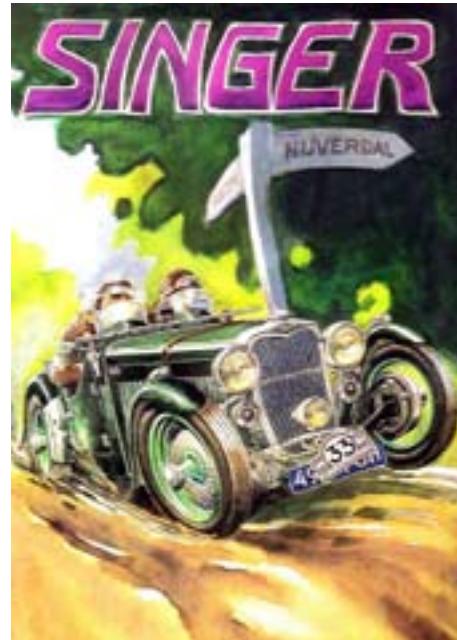
(A very nice shack Derek, thanks. Glad to know that I wasn't the only QRM back then... Ed)



Two Old Singers go to France

David Thomas, G4OGW relates how, with friend John, 2E1CWP and respective wives, Pat, M3OGW and Elaine, 2E1CWX, they took two 1930's Singer cars for a summer trek in France ...complete with ham radio gear of course!

Gin and tonic, fish and chips, Morecambe and Wise, some things seem made for each other. For me, it's travel and amateur radio operation. Even now, at eighty, setting up and working portable stations in new and sometimes challenging venues still gives me a buzz. So when XYL Pat (M3OGW) and I decided, along with our friends, John (2E1CWP) and Elaine (2E1CWX) to make a trip in the venerable Singers to France, while the rest of the party were concerning themselves with ferry crossings and routes, my mind shifted to thoughts of rigs and antennas.



The design of the 1935 Singer (AHP 904) made very little provision for luggage, most of the room behind the two seats being taken up with a 15 gallon slab petrol tank and two – yes two – spare wheels! During the 24 hour Le Mans event in bygone days you were allowed to change wheels, but only if you carried them with you. By removing the back seats, John's 1934 green four seater (EJ 4050) offered a better prospect in that respect, but after loading spares and clothes space was at a premium.

A recently purchased Buddipole antenna packed with some accessories in its custom made zipped bag of only 24 x 6 x 4 inches was bungeed, together with its tripod, onto the luggage rack of our car. I decided to take along an Icom 706 Mk IIIG, a very neat mini paddle, the diminutive MFJ-902 travel tuner and half-wave end fed wire antennas for 40 and 20 metres, together with quarter-wave wire counterpoises. When all was packed and while no one was looking, I covertly slipped an FT 817 into the clothes bag on the basis that

it is always easier to obtain forgiveness than permission. All that remained was to provide a means of mobile communication. Two metres would have been the natural choice, however C.E.P.T countries required that the licensee should be in possession of a full "A" licence in order to be allowed reciprocal operation. We scratched our heads and decided that PMR446 – a licence-free service which operates throughout the EEC on 446 MHz – was the answer. The Motorola hand-holds fitted with WEP-300 earpieces worked a treat car-to-car on the move, providing an effective range of over two kilometres and were to prove invaluable for emergency, navigational and refreshment stop purposes.

Pat had rented a Gite in St Medard, a very small rural village situated in beautiful countryside between Bordeaux and Agen and had booked us on the overnight ferry from Portsmouth to St Malo. The plan was to complete the 400 miles to St Medard by way of small roads in three easy stages, with



overnight stops in Logis or bed and breakfast accommodation, then spend a week sampling the excellent wine and food in the Lot et Garonne region before making a leisurely four day return by way of minor roads to St Malo and the ferry home.



Man proposes, God disposes. Forty miles from home our car blew a head gasket. My son Gareth came to the rescue with an 'A' frame and we were towed home, tails between our legs. However, within 90 minutes John, engineer extraordinaire, had removed the cylinder head, replaced the gasket, re-timed the engine and we were ready to roll. Unfortunately, by this time we had no hope of catching that night's ferry. Pat leaped into action and in a very short space of time had not only booked us on the next day ferry from Portsmouth to Caen but also arranged accommodation for the evening of our arrival on French soil. We were back in high spirits but the downside was that we now faced a longer trip on the Froggy side to be completed in two days rather than three as originally planned. Two hundred miles a day in a modern car is, of course, a piece of cake but flat out at 50-70 miles an hour in an open Singer with a solid chassis and leaf springs is an entirely different ball game!

Next morning we made the ferry with time to spare, enjoyed a splendid meal on board and stayed that night in Caen. Two days and 400 miles later the antennas were erected in St Medard. As anticipated, the drive had been quite a foot-down motorway slog, enlivened by a little bit of tight sphincter time as our offside front tyre blew to shreds whilst flat out overtaking a French truck on the peage. The weather remained excellent on this leg of the trip, sunshine and blue skies with temperatures in the 30's. A good nights sleep followed by

one of John's "Full Monty" breakfasts and we were ready to go on air.

Despite indifferent HF conditions over the next seven days the Buddipole proved a pleasant surprise. European stations received at 589 on 40 metres often returned signal reports of 589 and 579. I was amazed by the performance of this shortened loaded dipole standing only some 2.45 metres above ground level. I can only assume that the high Q loading coils supplied contributed greatly to the efficiency of the system. Although designed to operate on 40 metres through to 2 metres, by removing the coils supplied and replacing them with 80 metre coils from a different manufacturer it was possible to operate on that band also. Turning around 3.5 MHz was a little tricky but the problem was easily overcome by the use of the MFJ travel tuner, with the inductance set at E on the scale, the antenna on 5 and the transmitter around 6 the SWR dropped to a very comfortable 1.5 to 1. Assembly was quick and easy, all in all a great bit of kit. An added advantage of this set-up not mentioned in the manufacturer's notes is that a combination of the supporting tripod and a large fishing umbrella makes a wonderful sun shade, so very useful when undertaking roadside picnics. I note that W3FF is now offering a longer 16'



mast which collapses to 37 inches, no doubt I shall shortly be adding this to the collection.

Meanwhile surreptitious early morning CW operation with the 817 and earphones, using a half-wave end-fed from the bedroom window provided a useful contribution to the mounting number of stations worked. Previously I had used a neat little parallel circuit employing toroidal cores, based on an idea by M0AJL which appeared in G QRP – the club journal SPRAT. However, on this occasion the MFJ travel tuner was employed to match the high impedance at the end of the half-wave wire to the 50-ohm output of the transceiver. I find this arrangement very convenient when travelling, particularly when air travel is involved, as 34' of wire (for 20 metre operation together with a suitable quarter wave counterpoise takes up very little baggage space and can easily be dropped down from a hotel window (I put a tennis ball on the end to act as a spacer against the wall) or strung up to the nearest tree. All too soon it was time to make the return journey which we completed in easy uneventful stages



enjoying beautiful weather, lovely food and more than an occasional slurp of the local wine.

So here I sit amid a pile of completed QSL cards and fond memories. Pat tells me that the next destination for us GOTYs (Getting Older Thinking Young) is a September trip taking in Dallas, Vancouver, the Rockies and the St Juan Islands. She has completed all the arrangements with her usual high degree of competence, but of course as we all know, the most important issues to be addressed are where can I stash the FT817, ATU, paddle key, antennas...!

(Thanks David. A great trekking story in every way ...Ed)

Dear Member

Please note that the Journal will be issued bi-monthly and the December issue will be special.

Please think about submissions/projects you might like to send in, such as that 7MHz crystal receiver for example!!

General topics and key words are listed below.

Members projects	Events	Training
Members station	Notices	QRP/QRO
Construction	Help	Illustrations
Items wanted	News	Photographs
Items for sale	DX	Early radio
Hints and kinks	Militaria	Restoration

Please submit anything and everything to topix@hars.wagnet.co.uk or talk with Mike at the Club meetings.

73s es GDX, G3LZM
Mike Bush (Editor)

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HARS Chairman's Letter
(Or an Old Man's Ramblings)

Nobody told me that when I continued as Chairman this year I would be expected to be a writer. However, I feel that when one of my strengths. However, I feel that when one is part of a group, team or club one should try ones best to support the aim of the majority. In the case of HARS, it is the enjoyment of radio and all the many facets of the friendships that develop through the common interest of sending information wirelessly to others around the world.

The idea of HARS club "journals" as a source of information for activities, reviews, or comments on activities the reader might like to make not hold back as there are articles to continue. If there are articles to continue.

Have you any reviews or comments could write about or comment recently purchased or coming

Moonbounce
By Bob G3JXZ

Hi all, I must tell you days with my plan working. However, which is the FT-50 watts or so of the magic WSJT Joe Taylor / the below the electronic the EMF

DMR

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Typewriters

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Apparently the concept of setting text into letter form on paper started with largely wooden-constructed machines around 1850. The most pictorial illustrations we were shown of early solutions which ensured the ingenuity of the inventors nevertheless.

The early follow-on mechanical machines, the Hansen Ball for example, are very valuable and command huge amounts of money.

Amongst the exhibits which Duncan brought along was a real Concertina 200 dated 1922 which was the chosen machine of the reporters of the day because it was light in weight and of larger aluminium construction. It folded down into a very small size.

And what of the QWERTY keyboard? how did it come about since it is one of the most digitally dominant key layouts? We were told that the Remington Company who had made their fortunes and earned exercise during the American War of Independence, were already well into production of machines with the QWERTY layout when it was decided that it needed to be too large, and so the QWERTY remains to this day.

(Thanks Duncan, very enjoyable ...Ed)

During the course of the talk, Matt produced a handheld Revox RT3 which will set up in this manner, for a mere £89. This model had batteries and a host of accessories. A great deal, and when this was passed amongst members, it was obvious that it was well engineered and very tactile. Other suitable radios start at £100 and can cost up to several times this amount.

(Thanks Matt. For further details contact Matt on MAZTL@yahoo.co.uk ...Ed)

Page 1

Drones and Amateur Radio

Drones are everywhere nowadays. But, how might such a craft be used in radio? Surprisingly, it seems, to good effect but currently with limitations. A particular scenario would be in-the-field contesting, pure DX and experimentation on selected bands by hoisting the antennae vertically into the air.

So what drone workhorse might be required? There are many to choose from but for illustration purposes consider the DJI Phantom 3 Quadcopter which is available for under £400. This unit comes with a camera and will easily lift 500gms. By removing the camera further endurance and gains can be achieved.

Here are two opposite ends of the spectrum to look at.

For top band (1.8MHz) you could hoist 132 feet of wire into the air which would be a quarter-wave base-loaded into ground. The first thoughts were that simple RS multistranded flexible hook-up wire such as RS 724 4204 might be used. This comes in 100m reels with a reel weight of 1kgm but 100m translates to 330 feet and only a third of this would be needed so the lift required would be approximately 330gms. But what about aluminium wire? A reel of 46m of .71 single-strand (328ft) weighs only 50gm and is available from wires.co.uk for approx £4.



For 144MHz the set-up will be quite different. A simple suspended vertical dipole and a wide -band transponder would be needed..., an intriguing design challenge. The drone will quite happily soar to 122m (400ft, the maximum legal height allowed) for the DX of the day. But, when carrying radio, the copter, we are told, should be tethered.

Whereas the drone has to be piloted it will, at the push of a button, ascend to a specific height. Unlike a balloon which will gust out of vertical, and de-tune, the drone can be caused to stay on station. Sadly, endurance is limited to about 20 minutes but is surely sufficient for that special DX contact experiment after which it can be retrieved for a battery replacement.

Another consideration is that the drone is radio controlled and therefore steps might have to be taken to avoid interference with its control link. Other drones are very effectively controlled via infra red.

Tadpole

Remarkables

Congratulations to Steve G1YBB on his May 144MHz contest results.

Section AL											
Pos	Callsign UBNs										
1	G1YBB/P	IO82LB	101	17,190	32	550,080	1,000	GM4JTJ	511	5	Hereford ARS
2	G4HGT/P	IO93BV	120	17,114	32	547,648	988	M0HJO	410	10	
3	M0GAV/P	IO93EH	88	13,393	40	535,720	976	DM8MM	577	10	Sheffield & DWS
4	G4ODA	IO92WS	46	11,098	47	521,606	965	OZ1ALS	705	10	Spalding & DARS
5	G0EAK/P	IO93NI	98	11,881	41	487,121	953	F1BHL/P	446	10	Worksop ARS
6	M0ICR	IO91SO	87	12,358	39	481,962	941	E13KD	535	10	Drowned Rats RG
7	G8HXE/P	IO83RO	85	14,160	31	438,960	929	F1BHL/P	493	10	Travelling Wave CG
8	M0ICK/P	IO83ON	74	11,658	35	408,030	918	F1BHL/P	494	10	Bolton Wireless Club
9	M1EYP/P	IO83WE	95	10,889	36	392,004	906	GM4JTJ	386	5	Tall Trees CG
10	G7LAS/P	IO82PN	97	11,496	31	356,376	894	ON5AEN	483	10	Travelling Wave CG
11	GW4ZAR/P	IO83JF	75	8,732	36	314,352	882	GM0BKC/P	372	5	Tall Trees CG
12	2E0RET/P	IO93FE	87	10,340	29	299,860	871	E13KD	472	10	93 CG
13	2E0DXK/P	IO93FG	78	9,017	33	297,561	859	F1BHL/P	442	10	Worksop ARS
14	G8DMU/P	IO94BB	83	11,163	25	279,075	847	ON5AEN	518	10	Ossett ARO
15	M0RKX/P	IO92BA	55	7,640	36	275,040	835	GH4SNA	393	10	Travelling Wave CG

Note that Steve has entered as HARS in the GROUP listing. (Thanks Steve....Ed)

Ryan Ing, a 6th Form student at John Masefield High School in Ledbury, has undertaken a project which involves sending a balloon to high altitude (100,000ft) with a payload which will measure temperature, humidity, and capture a video on the way up. When the balloon eventually “pops”, the payload will descend by parachute. The launch date is expected to be sometime in September.

(Good luck Ryan, a great project. Please keep us all posted ...Ed)