

County Hunter News

March 1, 2008

Volume 4, Issue 3

Welcome to the On-Line County Hunter News, a monthly publication for those interested in county hunting, with an orientation toward CW operation.

Contributions of articles, stories, letters, and pictures to the editor are welcomed, and may be included in future issues at the editor's discretion.

The County Hunter News will attempt to provide you with interesting, thought provoking articles, articles of county hunting history, or about county hunters or events, ham radio or electronics history, general ham radio interest, and provide news of upcoming operating events.

We hope you will enjoy the County Hunter News. Feel free to forward, or provide links. Permission is given for copying or quoting in part or all provided credit is given to the CHNews and to the author of article.

County Hunter Nets run on 14.0565, 10.122.5, and **7056.5**, with activity nights on 3556.5 on Tuesday evenings around 8-9pm Eastern Time. Also, with low sunspot activity, most of the SSB activity now is on 'friendly net' 7188/7185 KHz. The cw folks are now pioneering 17M operation on 18.0915. (21.0565, 24.915.5, and 28.0565 when sunspots better). Look around 18135 or 18.132.5 for occasional 17M SSB runs.

You can see live spots of county hunter activity at ch.w6rk.com

For information on county hunting, check out the following resources.

The USCA award is sponsored by CQ Magazine. Rules and information are here: <http://countyhunter.com/cq.htm>

For general information FAQ on County Hunting, check out: <http://countyhunter.com/whatis.htm>

MARAC sponsors an award program for many other county hunting awards. You can find information on these awards and the rules at:

http://countyhunter.com/marac_information_package.htm

The CW net procedure is written up at:

<http://www.wd3p.net/ch/netproc/netproc.htm>

There is a lot more information at www.countyhunter.com . Back issues of the County Hunter News are available at www.CHNewsOnline.com

De N4CD (email: telegraphy@verizon.net)

Notes from the Editor

1) **South Central Mini-** the big news of the month was all the activity surrounding the Mini in Weslaco, TX. About 75 folks headed toward the Best Western Inn for the warm weather and good fellowship. Folks came from WA, CA, MI, NY, IL, and all over the country. There were thousands of mobile runs and hundreds and hundreds of counties run on all bands and all modes. Conditions weren't super great on 20M with many short runs, and not much better on 30M, but things were going full tilt on 40M with 1000 mile plus skip. Many mobiles stayed on 40M to be able to work the other mobiles most of the time.

Joyce, WB9NUL, was sweating as once again management had changed just before the convention, but all seemed to go off with few hitches. The facilities were good, and the hotel staff made everything fine, other than the wireless internet was being changed and folks had to use the public terminal to get their emails. Everyone seemed to get a room with no problems even though the place was quite full. There are lots of restaurants nearby.

The weather cooperated with temps in the 80s most days and no rain. Very enjoyable, and several county hunters used the outdoor swimming pool – still a bit chilly, but not bad in the warm sun. On Thursday, there was the Chuckwagon dinner, on Friday many made a trek to Mexico to do some shopping, and Saturday had the General Meeting, Antenna Forum by Barry, W9UCW, and CW meeting hosted by Norm, W3DYA. There was nothing

that sparked any interest and the general meeting and cw meeting were over quickly.

Folks enjoyed the dinner on Saturday night, and most departed on Sunday headed home, running counties along the way. There is a good chance that the mini will be in Weslaco in 2009.

2) Other Monthly happenings - Towards the end of January, Dave, KE3VV returned from a stay in FL, running north through dozens of counties in GA, SC and NC, and putting them out on 40M SSB and on the cw bands. Ed, K8ZZ, took a trip to ARK running a good part of that state on 40M and the cw bands. Conditions were relatively good for both of them on their trips. The weather was not as good, with snow/ice storms to contend with in ARK. Ed, K8ZZ, had some problems with the screwdriver antenna getting crudded up with road grime and not working. He took it through a car wash several times to get it back into working condition.

Rich, K0RCJ, was putting out counties from the big rig. Tim, KD5CXO took a trip to south TX headed toward the mini from ARK a few weeks ahead of time to enjoy South TX weather.. Terry, WQ7A, headed from WA to TX via CA to escape the bad weather on the west coast. Bill, KM1C, made a trip up to OH, putting out some nice rare counties through VA and WV.

Guff, KS5A and NN9K got together to go mobile in the MS QSO Party. Guff ran single op effort putting out lots of counties. There were a few other mobiles including NO5W and W5XX to make it a good.

3) Needs listing. The K3IMC website allows you to enter needs to complete various awards. Some people only list states in which they need just a few counties. Others might enter 15 or 20 in a state when they get down to several hundred needed. If you only list 20 or 30 needs, but actually need 100 or 200 or 400, you might consider entering a 'comment' saying that you need 300 overall, but have only listed needs in states with less than 5 or 10 or whatever other criteria you are using.

The needs pages allow mobiles to plan routes that hit counties for which folks have posted needs. That doesn't mean that others don't need half or all of a state, but gives you a relative index of scarcity, and helps clean up the 'last few' in a state for people.

4) **CEPT Reciprocal Operating** - from ARRL News Bulletin, courtesy ARRL, Newington, CT

“European Reciprocal Licenses Now Limited to Advanced and Extra Class Licensees (Feb 4, 2008) -- The European Conference of Postal and Telecommunications Administrations has revised its table of equivalence between FCC amateur licenses and the CEPT license. Effective February 4, 2008, *Recommendation T/R 61-01 (as amended)* now grants full CEPT privileges only to those US citizens who hold an FCC-issued Amateur Extra or Advanced class license. This means that those US licensees who hold an FCC-issued General or Technician license are no longer eligible for full operating privileges in countries where CEPT-reciprocal operation had previously been permitted. US Novice class licensees have had no reciprocal operating privileges under the CEPT provisions. These changes are the result of a re-evaluation of US and CEPT license classes equivalence by the CEPT's Radio Regulatory Working Group at its meeting January 29-February 1, 2008 in Basel, Switzerland.”

Rock Bound

A while back there was a comment about ‘rock bound’ on the K3IMC forum with regard to ‘crystal controlled’ transmit frequency control. It seems some of the newer folks had never heard that phrase before.

From the 1950s, when the Novice class license was created, to the 1980s, folks with this license class had to use a quartz crystal to control their transmit frequency by FCC rules. If they wanted to be able to operate on more than one frequency in a band, they needed multiple quartz crystals. If they wanted to be able to operate on multiple bands, they needed to obtain crystals for each different band. If, for example, you had novice band crystals at 7187 and 7177 KHz (yes, that was the cw novice band back in the 50s and 60s), you were ‘rock bound’ on those two frequencies. With luck, you would call CQ, tune up and down a few KHz for an answer, and sometimes someone would answer – maybe 2 KHz above as the closest crystal the answering station had was 7179 KHz. Most novices had only a few of them. Back in the 1960s, I remember sending off \$1.50 (plus

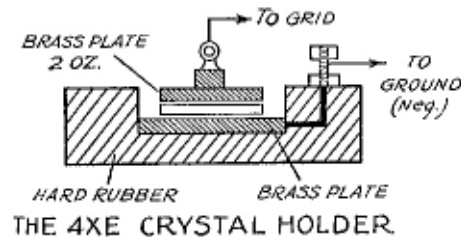
postage) to Texas Crystals to buy one as a teenager. That's about how much I got for cutting grass on two lawns, or shoveling snow after a major storm on a neighbors driveway/sidewalk. That was more than the minimum wage, which was around \$.80/hour then.

When ham radio started, people used oscillators with simple L/C tuning arrangements. Hopefully they were somewhere 'in the band' and hams often relied on a 'wavemeter' or used their somewhat calibrated receivers to determine the transmit frequency!

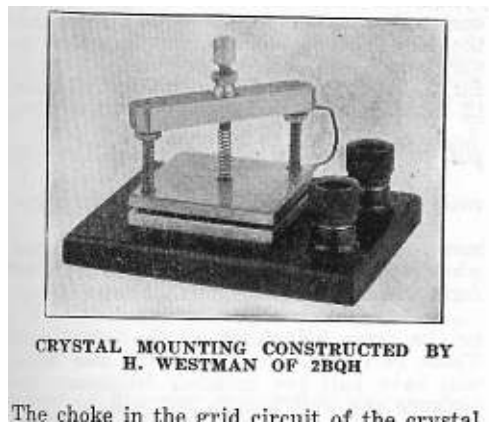
One of the hot topics in QST Magazine during the mid 1920s was the use of crystal control. You had to grind your own crystal blanks, after you sawed off some suitable quartz rock, then make a holder for the crystal.

Here's some illustrations from the January 1926 issue of QST.

tor the output of which is supplied as ex-



When you made such a unit, it might look something like this:



Most hams of the time were still using transmitters where the frequency was set by simple tuned tank circuits!

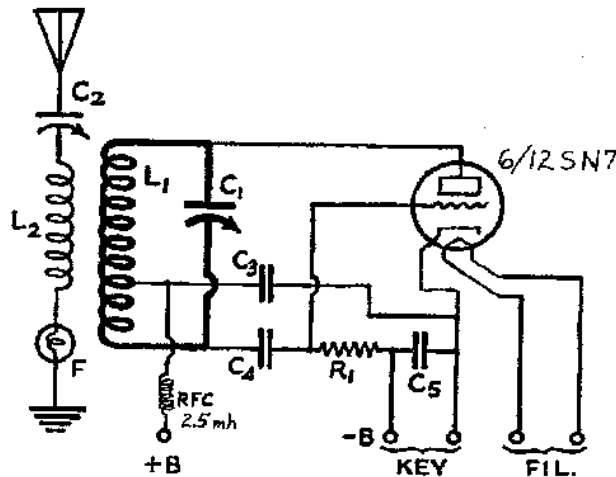


FIG. 2. — THE TRANSMITTER CIRCUIT — A HARTLEY ARRANGED FOR SERIES PLATE FEED

- C₁ — 500- μ fd. (.0005- μ fd.) receiving condenser.
- C₂ — Same as C₁.
- C₃ — .005- μ fd. fixed mica condenser.
- C₄ — 250- μ fd. (.00025- μ fd.) fixed mica condenser.
- C₅ — .005- μ fd. fixed mica condenser.
- R₁ — 15,000-ohm resistor.

F — Flashlight bulb.

L₁ — 18 turns of No. 12 enamelled wire on 2½-inch form, spaced to occupy 2½ inches.

L₂ — 25 turns of No. 12 enamelled wire on 2½-inch form, spaced to occupy 1¾ inches.

This is an early ham transmitter circuit circa 1932 — that was used in the 20s and 30s. Capacitor C1 set the frequency of the transmitter — and it tended to drift as the components heated up! Plate meter? Nope. You tuned C2 to get the flashlight bulb in the antenna circuit to be the brightest.

Even into the 1970s, hams were required to be able to establish the edges of the ham band via secondary frequency determination to insure they were operating in the band — often using a ‘crystal calibrator’ — such as 100 KHz crystal, with the harmonics zero beat against WWV, and then used to determine every ‘100 KHz’ marking on a receiver dial accurately. Even if

you had transmit crystals, you needed a secondary way of measuring frequency to satisfy the FCC.

In the 1950s, there were a few 'kit' rigs that new novices could buy if they didn't want to try to homebrew a transmitter. Here are two examples from the 1950s.

About the least expensive way to get on the air with a commercial kit was the Ameco AC-1 transmitter. It had a single 6V6 tube circuit – crystal controlled naturally, and on a good day put out 5w or so on either 80 or 40M. Thousands and thousands were sold. About \$14.95 in the 50s.



Ameco AC-1 Transmitter – plug in Crystal at left

Heathkit was just starting at this time. One of the first kits was the AT-1 Novice transmitter – it used 3 tubes and ran 50w input. The novice license limit was 75 watts INPUT. (one tube was the rectifier in the PS).



Heathkit AT-1 (from the LA5KI website)

Note the transmitter required a quartz crystal be put in the crystal holder at the lower left hand side of the front panel.

When you were lucky enough to pass your general test, and no longer wanted to be rockbound, you might save up some money and send off for a Variable Frequency Oscillator – a VFO such as the Heathkit VF-1



Heath VF-1

This let you move anywhere in the ham band with your transmitter. In the more expensive transmitters, the VFO was built in – but novices still had to operate it with a crystal in the transmitter.



Typical Crystals (from N4CD collection)

Knight Kit, EICO, Hallicrafters, Johnson, and many others quickly offered crystal controlled rigs for novices. So off we go on the start of ham radio use of crystals (xtals) to determine their transmit (and sometimes receive) frequency.

Early History

The piezoelectric effect was discovered by Pierre and Paul-Jacques Curie in 1880. It remained little more than a laboratory curiosity for three decades - until Madam Curie devised several instruments utilizing the piezoelectric effect. One of these was the piezoelectric voltmeter. Another was the piezoelectrometer which later became the basic instrument used by Pierre and Marie Curie in their work which then led to the discovery of Radium. Otherwise, further developments had to await the invention of the triode vacuum tube.

After the Curies, the first application of the piezoelectric effect was made by Prof. P. Langevin in France in 1917. Langevin used X-cut plates of quartz to generate and detect sound waves in water. His object was to provide a means for detecting submarines and his work led to the development of SONAR and to the science of ultrasonics. (That later led to things like 'ultra sound' for medical diagnostics in the 1990s)

His work stimulated others. One who became interested was A.M. Nicholson of the Bell Telephone Laboratories. He observed the reaction of the resonant xtal on the driving circuit and applied for a patent on it.

In 1919 Cady used a quartz xtal to control the frequency of an oscillator. It is generally accepted that Cady was the first to use a quartz xtal to control the frequency of an oscillator circuit.

Both Nicholson and Cady used devices which we would call monolithic resonators having two sets of electrodes on the same crystal. It remained for Prof. G. W. Pierce of Harvard University to show, in 1923, that a quartz plate with only one set of electrodes could be made to control the frequency of an oscillator circuit using only one vacuum tube. Pierce's circuit has probably been used more than any other quartz crystal oscillator circuit.

Like many inventions, the theory of how things actually worked was not understood by its inventors until Prof. K. S. Van Dyke showed in 1925 that

the two electrode piezoelectric resonator is the electrical equivalent of a series resonant circuit shunted by a capacitor. He was able to relate the electrical parameters of the equivalent circuit to the physical properties of the crystal itself.

In 1923 the Bell Telephone Laboratories established a quartz laboratory and the General Electric Company did the same in the following year.

One enterprising individual who recognized the potential of the quartz crystal unit was August E. Miller. In 1923 he left the optical business where he had become an expert in grinding quartz lenses to go into the business of making quartz crystal blanks for amateur radio operators or "hams" - the only market which then existed for the new device. Crystals actually made to frequency costs about \$50 in 1925 dollars then! (or about \$2500 equivalent today) Very expensive in 1920s – so blanks let hams do all the grinding themselves for \$4. Imagine a ham back then hack sawing out a small piece of a larger quartz crystal, and then using carborundum powder on a glass plate spending hours and hours grinding it, and more hours making a homemade crystal holder!

Ham bands were getting crowded, and with simple tuned circuits that drifted all over the place, it was difficult to have QSOs not interrupted by others drifting all over the band as their circuits changed frequency due to temperature or heating of the units themselves. Imagine trying to meet someone for a sked 'somewhere' in the 20M phone band without out a good way of telling exactly where you and the other station were? Many articles in QST in the 1920s dealt with making your own crystals, moving crystals in frequency, and naturally, crystal controlled transmitter designs.

In 1926 the A. T. & T. radio station WEAJ in New York City became the first radio station in the United States to control its frequency with a quartz crystal unit. Within a few years all radio stations in the USA went to crystal control thus providing another small market for quartz crystal units.

During 1927 Prof. Gerald Fox of the University of Iowa spoke to a convention of "hams" on the topic "The Piezoelectric Properties of Quartz". His talk stimulated some of the hams to try to make their own crystal units.

In January 1930 QST published an article by J. Herbert (Herb) Hollister entitled "Debunking Crystal Control" in which he pointed out "its utter simplicity" and described how a ham could make his own crystal unit.

Quite a few manufacturing operations sprung up – to keep hams and commercial stations supplied. Two way commercial business and public safety radio – then on the ‘very high frequencies in the 30-50 MHz range after moving up from just above the broadcast band (1600-1800 KHz), used crystal control for both transmit and receive. The industry got a tremendous boost in WW2 with millions of crystals required for military radios.

The decision to make large scale use of crystal control in military communication systems was made late in 1939. The US Army had always rejected it – the government is slow to change technologies. . In the summer of 1939, during field maneuvers in Tennessee, comparative tests were made of FM vehicular radio equipment, with and without crystal control.

About the same time some crystal controlled equipment, captured from the German Army by the British, was evaluated. The result of these tests was the decision to convert all military radio equipment to crystal control was about two years before Pearl Harbor Day (Dec. 7, 1941) and after the war in Europe was already under way. Before WW2, the entire crystal industry was very small. Suddenly there was a demand for millions of crystals and existing manufacturers were strained to the limit – that included Motorola (maker of the famous Walkie-Talkie TM and other VHF equipment used in WW2) – plus all the small manufacturers for ham radio. Everyone stepped up production to meet wartime requirements.

After WW2, surplus crystals (which could often be moved in frequency by industrious hams) were cheap and readily available on many frequencies - many in the ham bands. (Ham radio was also totally shut down in WW2). Surplus gear, such as the famous ARC-5 series transmitters, the ART-13, the BC-610 were also available in large quantities giving ham radio a great source of equipment to get back on the air – much of existing equipment had been purchased from hams for war use (hams were off the air).

In the early 50s, the FCC did not trust the novices to have the technical ability to keep their transmissions within the fairly narrow novice CW bands and required crystal control be used. Back then, about 10% of the total questions on a typical novice test including things like:

#1) Joe Ham has a 50 watt transmitter – he buys a 0.01% tolerance crystal for the low end of the 40M CW band. What is the lowest frequency he can

buy and still be assured of being in the ham band by at least 1 KHz?
(multiple choice).

#2) The best 'cut' for a stable oscillator frequency crystal is: (fill in the blank or multiple choice)

#3) Draw a diagram of a Hartley Oscillator or pick out the schematic from many.

#4) The type of oscillator shown in Fig 1 is : a) Colpitts b) Hartley c) Pierce

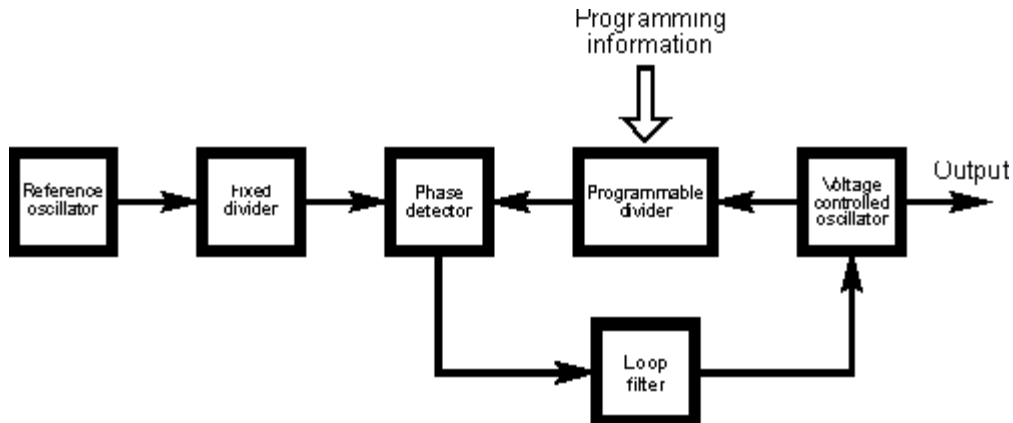
With the advent of synthesized radios (which still have a crystal in them to set the reference frequency for the synthesizer), that restriction was eliminated in the mid 1970s, and all license classes could use VFOs (variable frequency oscillators). Immediately, all new rigs ceased to even have a crystal socket, and came with VFOs or the equivalent built in.

Many of the Novice rigs of the 1950s/1960s/1970s including companion VFOs which could be added when the operator upgraded to General. Heathkit, Eico, Lafayette, Knight, and many others provided matching cabinet style external units. Even the Collins KWM transceiver had a 'Novice Adapter' unit to allow crystal control transmit – and perhaps now the rarest Collins accessory for collectors to find! Not many were made.

As it turns out, at this time, the growth of 2 meter FM resulted in dozens of new FM transceivers – of which the first generation were all crystal controlled just like the commercial FM units ! If you wanted to get on 146.94, you had to buy both a transmit crystal and a receive crystal to put your radio on that frequency. Regency made one of the first – you could put up to 16 crystals in it! (and spent a lot of money in the process). If you wanted your local repeater frequency, you had to buy crystals for it! You now see these radios at hamfests for a few bucks.

It wasn't till the mid 1970s that the first synthesized two meter radios appeared – eliminating the need for buying crystals per channel. Your radio still had a quartz crystal in it! (for the synthesizer). Your ham rig today for HF has a quartz crystal in it.

The 'crystal' in a modern rig is used as a reference frequency – everything is generated from it. Here is a simple diagram of a basic synthesizer.



A crystal is used as a reference oscillator. Let us say it has a 1 MHz crystal for this example. We want to have a synthesizer that tunes 5-5.5 MHz for our transceiver. We can start by dividing the 1 MHz frequency by 1000, which gives us 1 KHz output from the fixed divider.

We now take a voltage controlled oscillator (VCO) – as we vary the voltage on the control lead to it, it will move from below 5 MHz to above 5.5 MHz. Let us say we want to set it to be on 5.100 MHz exactly. We take the output from the VCO and send it to a programmable divider. In this case, we program it divide by 5100. This can be done by thumbwheel switches (as in the first synthesizers for 2M radios), or by a microprocessor connected to a shaft encoder which is turned by your tuning knob on the front panel of a radio. The divide ratio is set at 5100. Whatever frequency comes out of the VCO is divided by 5100.

If the VCO is initially sitting at 5.000 MHz, and gets divided by 5100, the result is less than 1 KHz. The phase comparator(frequency comparator) takes the 1 KHz reference signal, and compares it to what it sees coming from the programmable divider from the VCO. An error signal is generated which goes around via the 'loop filter' which then swings the VCO voltage, changing the frequency of the VCO higher. When the VCO frequency is exactly equal to the reference frequency established by the xtal oscillator and divider, there is no more 'error' and the VCO is exactly on 5.100 MHz. At this point, the phase locked loop is 'locked' to the correct frequency.

If you change the programming ratio by 1, from divide by 5100 to divide by 5101, you change the frequency by 1 KHz in this example. The VCO will now ‘lock’ on 5.101 MHz. This is a very simple example and your transceiver likely tunes in 0.1 KHz steps (old ones like the first solid state radios) or in 0.01KHz steps (10 Hz) which you hardly notice unless you go looking for it.

A modern transceiver may have multiple synthesizer loops and loops within loops to accomplish what we all expect these days in our ham rigs – all controlled by little microprocessors and shaft encoders (the tuning knob) or memory positions.

In addition, the older rigs with analog conventionally tuned VFOs may have crystals for the mixing function – your VFO tunes one frequency range all the time (maybe 5-5.5 MHz analog using an L/C circuit, but the signal is mixed against other stable frequencies to get it to the various ham bands (Heathkit, Drake, Collins, etc), and to generate upper and lower sideband injection frequencies. In a typical Heathkit like the SB-100, there were about 8 or 10 crystals used in the unit.

Crystals were used for receiver filtering. By using various combinations of crystals, you can make a narrow crystal filter for improved selectivity. The filters in your ICOM mobile radio use crystals and the ‘cw filter’ is a narrow filter made with several quartz crystals. The latest new radios with DSP do not have crystal filters any longer – it is all done in software. But you still have reference oscillator crystals – that need hasn’t gone away!

So if you think crystals have gone away for other things, look no further than your PC. Or your wrist watch. Inside your PC (and likely every other high speed electronic device you have including your color TV set, wrist watch, cellphone) there is a quartz crystal with high probability. In a PC, it sets the clock speed of the PC.

“Rock bound” was the term that novices used – as they often only had a few frequencies they could get their transmitters on. They yearned for the day when the general class license came, and they could use a VFO to get right on the frequency of the station calling CQ! Or be able to call on the empty frequency just down the band.

It was an interesting part of communications history and is still with us today in a big way – just different. All the radios have crystals – but it really

doesn't tie you down to just a handful of frequencies. Unless you have a vintage transmitter from the 40s/50s/60s without a VFO, or an early 2M radio that took crystals, you won't even think about 'rock bound' as you'll be able to operate anywhere in the bands.

W8JJ, Tim, Visits Texas

During mid January, Tim, W8JJ, had a business trip to Texas. While here, he was able to get out two days for county hunting, running a loop to the east from Collin, TX, and then a loop out to the west.



Tim, W8JJ, in the rental car in Texas

From Tim:

“During my short stay in Texas I managed to attend a professional conference in the Dallas area and put out 21 counties traveling just under 800 miles. I have not totaled the contacts yet but I managed to put most of them out on 40 SSB and 40, 20, 30, and 80 CW. I must say that I had the best time on 80 CW – It was a blast to work everyone on this band starting in the late afternoon until bed time. I flew from Flint on Friday and returned Tuesday afternoon. During the trip I also managed to have an eyeball QSO with Bob, N4CD, which included a lunch featuring authentic Texas BBQ.

Many of you may recall the struggle that I was having getting my magnet mount system with multiple resonators to tune properly during the testing phase prior to my departure. The issue was easily resolved by adding a choke balun at the IC-7000 antenna output to control common mode current. Larry, W0QE, was very helpful in diagnosing this problem and recommended about 8-9 turns of RG8X on a ferrite toroid (Available from Amidon Part # FT-240-43). After installing this choke my problems were instantly resolved. I was able to tune 4 resonators on the rental car in about 5 minutes.

I must say that the rental car experience exceeded my expectations as well. I requested a Japanese vehicle as my past experience suggests that these vehicles are quiet as a tomb for ham radio (with the exception of a hybrid model I suppose). Thus, I ended up with a Nissan Altima 4 door sedan which provided an excellent operating environment both inside and out with zero noise on all bands operated. I’ve installed rigs in 3 Hondas and 1 Nissan and I will not drive anything but a Japanese vehicle for this and other reliability and quality reasons.

I’ll be doing a photo presentation at Dayton this year about this trip with a focus on CHN airline travel, rental cars, equipment and packing tips, temporary mobile installations, dual GPS systems (TomTom plus laptop software), and multi-band/mode operations as it relates to county hunting using a rental car. I can’t wait to find an excuse to fly someplace else and put out more new counties. Thanks to everyone who worked me and especially W0QE for his pre-trip assistance and KB6TAL for his tireless NCS efforts on multiple CW frequencies throughout the weekend and the regular gang on 40m SSB.

73 and I hope to see everyone in Dayton.”

Aiming for 60 GHz

In the beginning, radio technology was at the KHz range – several hundred KHz in frequency. Over time, by the 1920s, folks got up finally to the ‘short waves’ of the MHz range – 1.5MHz and above. By the 1930s, folks were using “UHF” equipment on 40 and 50 MHz! WW2 saw rapid advances to the low GHz ranges up to 10 GHz or so for radars.

The FCC allowed low power use of several bands – at first, radio control at 27 MHz. Then the use of 72 MHz area. In the 1970s/80s, cordless phones were assigned frequencies at 49 MHz. These came under ‘Part 15’ rules and other sections that allowed things like microwave ovens, diathermy machines, wireless microphones, etc.

In the 1990s, Part 15 devices moved up to 900 MHz. When that got crowded, some moved up to 2.4 GHz. Computer networking (wireless modems) rapidly used 2.4 GHz, and then 5.6 GHz for even faster link speeds. Each advance was allowed only the creation of inexpensive circuitry that could be utilized at each new higher frequency band.

Now scientists and engineers are trying to figure out how to make circuitry work at 60 GHz. You can send tens of megabits per second at 5.6 GHz, maybe up to 100 MHz, but what happens when you want faster and faster and faster link speeds? Gigabit speeds!

The 100 microwatt Ultra Wide Band power limits also restrict how far and how fast you can send data at these frequencies.

People have looked at ‘light’ but it at the moment is restricted in speed by how fast you can modulate infrared light emitting diodes. So now the area at 60 GHz with a 7 GHz wide band is being studied intensely. Today, only expensive Gallium Arsenide military technology works there, and it is power hungry. Researchers are trying to figure out how to get silicon circuits to work there. The Group trying to come up with ‘standards’ for wireless

personal networks, “The Wireless HD ‘ wants to be able to link disc players, video cameras, game consoles, laptops and other devices at rates of up to 5 GB/sec, fast enough to transmit a whole HD movie in less than a minute.

At these frequencies, antennas are about the size of the head of a pin for unity gain. It may be possible to build phased array type antennas on microchips to get the gain – right now link distance is measured in feet, and 60 GHz signals are stopped by any solid object.(even sheets of paper). You would need many repeater devices around – operating at flea power levels – to reach any distance.

At 60 GHz, an antenna will receive 1% of the power that an antenna will do at 6 GHz. IBM has made prototype silicon-germanium devices that can work over 8 feet at a 1 GHz rate. Others are trying to get CMOS, which is currently only able to make it halfway there, up to those frequencies. Naturally, circuit design where wavelengths are incredibly small, and interconnections between ‘components’ microscopically small, it is a real challenge to design “ICs”. Devices might need 10 milliwatts of power to communicate, and that is currently not possible. The next generation of 45 manometer CMOS chips may get close to being able to do that.

The eventual goal is to do away with any need for interconnecting cables. Every device talks to every other device at 60 GB. No “plug cable A into device B and connect to the back of device C”. Cables will go the way of buggy whips. At least that is the vision at the moment. If so, radio will have gone from spark gap at a few bits a second at 60-500 KHz to 60 GigaHertz with 5 gigabit data rates in 110 years or so, and consumer products may really be ‘wireless’.

More links to 60 GHz technology

http://domino.research.ibm.com/comm/research_projects.nsf/pages/mmwave_sixtygig.html

<http://www.terabeam.com/solutions/whitepapers/benefits-60ghz.php>

http://bwrc.eecs.berkeley.edu/Research/RF/ogre_project/

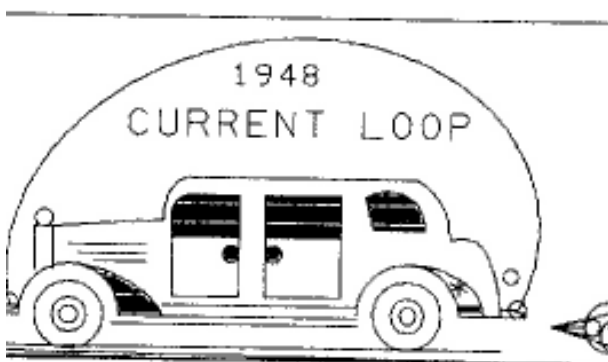
The Beginnings of HF Mobile Radio

One day when mobile activity was not too high on cw, I stumbled across another book in the N4CD library. After the past few articles in the past few issues of the CHNews dealing with the creation of two way communications by Marconi, then the history of ham radio up to the mid-1920s, it looked like a history of mobile radio operation might be in order. The book “40+5 Years of HF Mobileeering” by Don Jonson, W6AAQ, published 1993, is an excellent source of info on antennas going back to the 50s!

The date to remember is July 15, 1948. On that date, the FCC for the first time authorized mobile operation on the 3.8, 7.0, and 14 MHz bands. Prior to that, stations could operate portable, or use 5 meters. Hams were authorized the use of those bands after midnight local time on that date.

Needless to say, several enterprising hams were all set to be ‘on the air’ at 0001 local time. Don, W6AAQ, was one of the first. Within a few weeks, there were a dozen or more on the air in CA on 80M (3995) while they commuted back and forth from work. One of the biggest challenges of operation on 75M is a good antenna. All the development of new antennas and systems focused on that band.

One of the first tried and used was the Current Loop antenna, which was constructed by joining several 50 cent surplus military whips to create about 28 feet of antenna. The loop arched over the top of the vehicle from bumper to bumper. Link coupling was used to couple to the transmitter tank circuit.



Typical Early CA mobile set up – 80M

Needless to say, the problems of driving through tunnels, keeping all the whips connected together, and other considerations rendered this initial design as too impractical for most to use.

The first ‘conventional’ antennas to show up were surplus military whips with base loading. Field strength measurements quickly showed this was much inferior to the current loop system. Perhaps they were getting 2% efficiency with base loading as every county hunter today realizes after attending a W9UCW “Antenna Seminar” at the annual conventions and TX mini.

It wasn’t long before an amateur supplier offered a center loaded higher efficiency mobile whip – the Master Mobile . The coil was only about 1 inch in diameter and was close wound with very small wire. It was covered with about a two inches metal can – closed on top, probably for weather protection. The ‘canned’ coil vertical outperformed the base loaded antenna, but not by much. Hams soon discovered if they turned the can facing upwards, the field strength went up. They then experimented with larger coils and spacing of turns. All sorts of configurations showed up. W6MRM had a pie-wound honeycomb flat coil that looked like a flying saucer. Later, he would build the final amplifier tube into the base section of an antenna!

Master mobile quickly came out with the Improved Master Mobile – the can was gone. They also supplied mounts, motor driver roller inductors and a Z match. Today, this still provides good competitive performance to the new antennas.

W6VJS is credited with the first air wound coil, made from commercial coil stock - #14 wire spaced 10 turns per inches for a total inductance of about 150uH. Field strength readings went off the scale, and the folks figured they were on to something.

Hams before WW2 didn’t know what coax was – everyone used balanced feeders, or hooked the antenna directly to the antenna terminal (or matchbox terminal). Even during WW2, most airborne military gear for HF didn’t use coax – the antenna was brought right to the radio in the ARC 5,s, ART-13s, TCS, and dozens of other rigs. In the early days of ham radio mobiling, the term ‘SWR’ hadn’t been invented yet. Everyone used field strength of the

antenna radiation as an indicator, and you watched how well your antenna was working by observing the final plate current, or a dashboard mounted FSM (field strength meter).

Bob Harrel, W6FNC, designed an antenna with an internal wiper inside a coil in a fiberglass lower section (from his experience with boat antennas). The wiper was connected to the lower half. As the top whip was raised or lowered, it would short out a corresponding length of coil. In that manner, the antenna could be resonated at any frequency from 75 meters to 10 meters. He didn't do the paperwork, and lost the design rights to it – which could have made him a bunch of money had he done so.

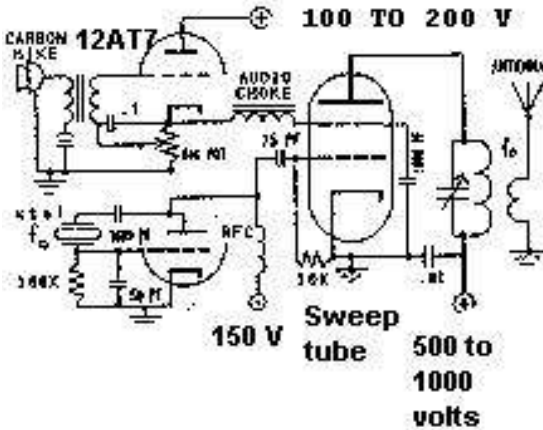
Someone passed on the idea and it became the Webster Band Spanner.

Various schemes were used for matching and lots of work was done on 'top hats' and optimizing coils, making things work on different bands.

Most of the transmitting equipment in those days was liberated military surplus gear. The aircraft units like the ARC-5 transmitters, which you could buy used for \$6, or new for \$8, had VFOs that were stable enough on the low bands. One could modify it for ham use in less than an hour. They required high voltage, and like the military, hams used dynamotors (a combination of motor-generator on a single shaft in a single housing) to get that HV. If you tried to run much power, you had to try to upgrade your car system, as cars back then on 6V didn't have that much spare capacity to provide all that current for the radios.

In the early 50s, commercial converters and some amateur mobile gear started to show up. For low power, you could run a vibrator power supply, but for moderate or high power, you only had a choice of dynamotors. Those cost \$5 to \$15 then.

In the fall of 1950, Bob Carter, W6NTU, designed a simple two-tube transmitter that was AM modulated and quite efficient power wise. The circuit is below. It used a 12AT7 – one half was a crystal oscillator which drove the final amplifier, and the other half was an audio amplifier using a carbon microphone. Television sweep tubes were usually used in the final, and as bigger and better sweep tubes became available, more and more power could be run. Thousands of these were constructed by home brewers.



Of course, with VFOs, the matching to antennas became a problem. If you were on 75M and tried to QSY very far, the antenna match would not be good more than 10 KHz away. Not a problem if you only had one transmit crystal and only operated on one frequency, but now if you had a VFO, you needed some type of system to change the frequency of the antenna. Thus began a long series of steps to wind up with the current 'screwdriver' type antennas.

Most hams who wanted to be able to QSY and continue operating wound up with some sort of adjustable matching unit at the base of their center loaded antenna. There were many ‘motorized’ designs of roller inductors turned by simple motors with limit switches, controlled from the front of the vehicle by up/down switches. One commercial unit was the Master Matcher.

Mobile receivers often consisted of converters, such as the Gonset Super 6 (and later Super 12) as talked about in previous articles in the CHNews on old mobile radios. The standard car radio was set to one frequency, and the converter mixed incoming ham bands down to that IF frequency.

SSB came in during the 1950s, but mobile stations were very slow to migrate. It wasn't till the 1960s that mobile operation slowly moved to SSB.

By that time, dozens of antenna configurations had been tried. There were half a dozen suppliers of parts for mobile antennas

It wasn't until the 1970s that someone took one of the Webster Bandspanners and tried to automate changing frequencies from inside the vehicle. The first system was hydraulic! Unfortunately, the sensitivity of getting things within a turn on 75m was too difficult at the time on this antenna design. The first screwdriver as we know it appeared in 1990.

So that's a bit of history on early mobile radio. Lots more should you come across a copy of Don Johnson's book at a hamfest for a few bucks. Definitely worth it for the info in it!

Nanotech News

Stanford University researchers have made a discovery that could signal the arrival of laptop batteries that last more than a day on a single charge.

The researchers have found a way to use silicon nanowires to give rechargeable lithium ion batteries--used in laptops, iPods, video cameras, and mobile phones--as much as 10 times more charge. This potentially could give a conventional battery-powered laptop 40 hours of battery life, rather than 4 hours.

The new batteries were developed by assistant professor Yi Cui and colleagues at Stanford University's Department of Materials Science and Engineering.

"It's not a small improvement," Cui said. "It's a revolutionary development." Citing a research paper they wrote, published in *Nature Nanotechnology*, Cui said the increased battery capacity was made possible though a new type of anode that utilizes silicon nanowires. Traditional lithium ion batteries use

graphite as the anode. This limits the amount of lithium--which holds the charge--that can be held in the anode, and it therefore limits battery life. Silicon anodes have the "the highest theoretical charge capacity" according to Ciu's paper, but they expand when charging and shrink during use: a cycle that causes the silicon to be pulverized, degrading the performance of the battery. For 30 years, this dead end stumped researchers, who poured their battery life-extending energy into improving graphite-based anodes.

Mini Trip Reports

From the K3IMC Forum

1) KE3VV:

4 1/2 Days, 77 Counties, 2099 Miles, and about 130 Gallons of gas and a LOT of fun. Thanks for all the contacts and the fixed stations that helped with announcing and relays. Lots of 40m SSB and CW contacts, with a few on 20 SSB and CW, and a very few on 30m CW (no one there much of the time), with a total of more than 2,000 contacts!

The weather was a bit of a challenge (and stretched the trip out a day to avoid the ice north of GA-SC), but no real problems other than the LOUD thunderclap that shook the motel in SC and woke me up at 2:30 AM.

One highlight was finishing the few VA counties left for RAN ALL VIRGINIA... and beautiful weather in VA on Saturday to do it.

I also give the F-150 a real test on noise with the ICOM-7000 and DSP speaker. The only real noise problem was power lines, not the truck, and I was able to hear all of the 22's and 33's with and without relays... can't complain about that! The F-150 is also a delight to drive on a long trip... better even than my old 84 Caddy or 96 Gran Marquis... and sitting up high is a real bonus, especially in the rain or heavy traffic.

This trip was also mostly on back roads, which takes a bit longer, but is a LOT more fun. Some of the stuff that folks put out in their yards to "decorate" is just AMAZING... and you don't see that on the Interstates.

Thanks again until next time.... 73, Dave KE3VV”

K8ZZ:

4063 miles.. 166 counties. Tnx to all the NC who helped me. Special tnx to N9FJ/M who was NC many times from the mobile. WOW! Sorry I could not do all bands all modes.. AR counties were small and a lot of narrow secondary roads. Safety first. I ran into snow and antenna icing conditions the last 3 days of the trip. Sorry I did not run more but I was in a blizzard from noon on. My antenna was icing up and stopped twice at car wash to de-ice.

I am going to rework my antenna system for things I learned on this trip, cuz there will be a lot more.. Tnx for ur patience on CW as the pileups were hard to manage, drive, log, navigate and operate. I had a GREAT time..

73 Ed K8ZZ

W0QE:

Stats for trip from CO to NC to VA and back to CO (Jan.13-24):

167 transmit counties (163 unique)

4097 miles putting out counties

6335 contacts on 80/40/30/20/17/15 CW and 40/20 SSB

1.55 counties per mile

Nearly 900 contacts on 80m CW

Number of contacts in order of bands: 40CW(most), 40 SSB, 30CW, 80CW, 17CW, 20CW, 20SSB, 15CW(fewest)

High points of the trip:

- 1.) Missed all the really bad weather
- 2.) The big antenna and all the equipment worked great
- 3.) Plenty of folks to work everywhere and very little rest time. Gave out

thousands of band/mode counties to folks.

4.) Worked 37 contacts from Cooper, MO (21 states, 2 Canadian provinces, and CU2JT in the Azores).

5.) Worked many new folks on both CW and SSB.

Low points of the trip:

1.) This pace of making contacts on so many bands is not sustainable. While fun I am really tired now.

2.) Stopped only a couple of places for a few minutes so I ended up running out of some counties.

3.) I'm sure I missed some folks by operating on more bands and by not taking relays.

Now to the big question:

I had promised my wife/navigator/logger that if the radio went with us we would not stop to put out counties on county lines. This put me in a predicament so I needed to adjust my operating. I did not actively look for relays on CW and instead operated on 6 bands. I hoped that by operating on 6 bands on CW would give everyone the best chance at contacts. Previous trips back east in 2003 netted about 3000 contacts and in 2006 netted about 4500 contacts under better band conditions so by not taking relays the QSO count was definitely increased. Perhaps my mobile skills account for some of the increase but taking relays really slows things down.

W3DYA –LA QSO Party - from an email

The WX and roads were good. I was mostly on I-20 with detours a few miles North and South to access the county lines of nearby counties. I did not have a driver, and did not operate much while driving, especially on the roads off I-20.

I only operated during daylight hours, about 9 out of the twelve hours. My antennas were for 80, 40, 20, 15 and 10M. As usual, 20 and 40M were the primary bands, and I wound up with 492 contacts and about 88,000 points.

I activated 14 counties and averaged about 35 contacts in each.

Band totals: 80=12, 40=206, 20=271, 15=2, 10=1.

I only heard two LA stations, both fixed, and only one QSO each. Chuck, NO5W, was apparently the only other mobile but I never heard him at all. I was happy with the response from non-LA stations; a nice group made up mostly of county hunters but a few regular contesters showed up and a few new calls.

Conditions seemed to be pretty steady all day, especially on 40M, with some QSB. On 20M the PA (Netherlands) contest was a small problem for the first few hours with some good signals. On 40M the problem was QRM from an RTTY contest all day. But it was worse the last couple of hours and I had trouble finding a clear spot. The contest frequency was 7040, but I was asked to move to 7070 and that worked very good for the last two counties.

Overall, it was a good contest and I plan to try it again next year. I didn't post my intention on the website until Friday, because I wasn't certain I'd make it. But Chuck, NO5W, did get the word out early and I think his PR helped attract a good crowd.

[De N4CD – The LA QSO Party was well publicized in QST, CHNews, and similar publications. It takes just a few mobiles and fixed stations to have a good one!]

What's in the Trunk?

Peak Oil News

1) Charles Maxwell – Energy Investing Analyst

A growing chorus of voices is screaming for the United States to undertake a Manhattan Project-type program to wean America off its oil dependency. But as Charles T. Maxwell, the “dean” of Wall Street’s energy analysts, looks into the future, he deeply fears that Washington won’t do anything to head off the oil crisis he sees rapidly developing starting in 2010. He says

this will make the financial crisis he fears even worse. Also, because Washington will be seen by angry voters (who will be paying \$12 to \$15 for a gallon a gas) as the cause of their “Nightmare on Main Street,” Maxwell sees the American political system being shaken to its roots.

Princeton and Oxford-educated Maxwell believes that if the Democrats are in power, their core constituencies – farmers, workers and intellectuals – will be ranged against one another, resulting in an impasse. If the Republicans are in power, he expects whatever “solution” they come up with to be politically untenable because it will be premised on people with money continuing to consume as before, with the have-nots expected to do without.

Seeing no chance of a timely political response to America’s looming oil calamity, Maxwell expects an oil-induced financial crisis to start somewhere in the 2010 to 2015 timeframe. He said that, unlike the recession the U.S. appears to be in today, “This will not be six months of hell and then we come out of it.” Rather, Maxwell expects this financial crisis to last at least 10 or 12 years, as the world goes through a prolonged period of price-induced rationing (eg, oil up to \$300 a barrel and U.S. pump prices up to \$15 a gallon), while waiting for new technologies that can wean nations off their oil dependency to take hold in the marketplace. (It will take time to change over the world’s one billion or so oil-consuming cars and trucks.)

As this combined oil and financial crisis worsens, Maxwell would not be surprised if the U.S. government started functioning the way it did in World War II, when the democratic dialogue was often put on hold so that unilateral decisions could be made by people given special powers. He described them as little tyrants who will be able to cut off debate, effectively weakening the democratic process. Not a pleasant prospect, Maxwell emphasized, but one that may be unavoidable in the oil-scarce world that’s coming.

2) Sakhalin

“Exxon's Sakhalin output to fall sharply in 2008

MOSCOW, Feb 6 - Exxon Mobil's Sakhalin-1 project will cut oil output sharply this year, a project partner said on Wednesday amid a gloomy outlook for Russia's overall production this year due to stagnation in West Siberia.

Sakhalin-1, which reported peak production of 250,000 barrels per day early last year, will cut annual average production by over 25 percent this year - much steeper than expected - as the field is getting depleted. “

Peak production of 225,000 barrels per day, which we saw last year, has passed. Russia, the world's second-largest oil exporter, increased output by 2.3 percent last year to 9.87 million bpd with the growth coming mainly on the back of higher Sakhalin-1 production. January output fell by almost 1 percent to 9.78 million bpd due to lower production in West.

The neighboring Sakhalin-2 last year postponed the launch of year-round production in a move further souring the outlook for Russian output. Both of these are the only ‘new’ fields that Russia has added. All their other producing fields are tired, old giants that have been producing for 50 years and are about to go into steep declines or are already there.

WHY is Sakhalin-1 decline important? A little history of oil production in Russia. Russian oil production peaked in the late 80's and was about to go into decline.

The fall of the USSR caused oil production to crash by about 50% to bottom in the late 90's at a much faster rate than a natural decline would have had. In the early 2000's oil production started to recover, but only about 70% of the crash in the early 90's.

Over the last few years Russian production was growing slowly, and western Siberia (Sakhalin) was the reason. Much of Russian production comes from very old fields (50 years) and are quite depleted. **The gains from Sakhalin has masked the true state of the old Russian fields where most of their production is coming from.**

The world's projections (IEA, EIA, CERA) for world oil production gains has Russia as a source of increasing production. Without these Russian gains the projections for the next few years **all these projections are worthless.**

The second problem with a drop in Russian production is that internal demand for oil in Russia is increasing, and if production drops, exports drop even faster.

This news item may be the key stone to a major turning point to the world's second largest producer, right up there with the Saudis. It is a bigger story than the North Sea rolling over, of Mexico rolling over, or Kuwait Borgan going into decline. The only possible bigger story in world's oil production is if/when we learn that the Saudis production is decreasing.

3) South Africa – A country imploding

A while back, James Kunstler wrote a book called the Long Emergency, which dealt the the consequences of 'peak oil' and other scare resources. You might look to the situation in South Africa for insight of what might be ahead. (from his blog – a letter received from someone in the country)

“South Africa has been flung full tilt into a Premature Long Emergency. In the up market suburbs, not least to say generally all over the urban landscape, there is not a 1km (1/2 mile) strip of tarred road that is not full of potholes (huge gapping holes, across which vehicles cannot drive), the roadside curbs are disintegrating, the road maintenance programmes over the last 10 years have failed to maintain the roads in a serviceable and passable state. The nation is gripped in a crisis of rolling power outages caused by the incompetence of highly paid government ministers and their charges. The news of the weekend is that the nation is in dire straits with the supply of clean, drinkable water to households and business alike. We are faced with unusual weather patterns, floods at the moment, high rain fall for the Summer, the expectation of an early, long cold Winter.

The Power Emergency

The rolling power outages are resulting in about a 25% national power outage per month. The ramifications of this can be related directly to an income loss of the same amount, retail supplies are being interrupted and from a security point of view it is dangerous to shop in malls. The Electricity Supply Commission – ESKOM are indicating a forced reduction on power usage by 10%, further, the mines have been told not to work on Fridays. There are revenue and cost implications here that extend beyond the obvious monthly figures. What of the power saving measures that may in turn lead to greater problems, the mines are unable to pump excess ground water from the shafts, the maintenance programmes are due to suffer. And what of the

safety indications, miners are protesting the possibility of being caught underground or in lift shafts as the random power cuts hit the service grids.

It is not only that ESKOM have not maintained or expanded their operations in the last 15 years, but the next big whammy is that there is no coal to keep the power stations running...at most times, there is a couple of months supply of coal onsite for electricity operations, today there is hardly a few days supply. Incidentally the reason given for this catastrophe is that the trucks delivering the coal have been unable to get to the power stations as the road infrastructure has deteriorated- potholes again. In the Afrikaans language: 'slaggate' – a direct translation to 'slaughter holes'. As this is written, we wait for the next couple of days to see the effect of the 'coal emergency'.

THE WATER EMERGENCY

At some point the effect of the power emergency on water and sanitation supply should be considered and this would be part of the roll out of unexpected events resultant of the collapse of the power supply, but the water board have usurped the power supply with homegrown problems of their own... So here we have it, 43% of the dams have safety problems and are in danger of collapsing.

THE FROG IN THE POT

And what of the people's reaction? Complacency does not even come close, the nation is either brain dead or ignorant, or just plain 'frog in a pot' of water with the temperature rising.

The first reaction to the power emergency took the form of a rush for candles, refilling of gas bottles and the purchasing of generators (if you could get them). Then the complacency set in, business learnt to sit through power outages, retail shops were forced to close their doors for a few hours a day. There was and is a shortage of food supplies, food went bad in the fridges and had to be thrown away. It was kind of charming in a strange kind of way, to eat dinner by candle light and forgo the 'soapies' on TV.

Traffic lights were out over a large number of suburbs and delays in getting to business meetings became the norm. The schools are unable to teach a full day's lesson. The internet service providers and the mobile phone

companies' frequently have service delays or are just plain 'off line'. The battery runs out on your laptop and that's the days productive work is over until the power is back on...Patients in ICU or undergoing operations, as the power grid went down, were at risk of and did, die.

As we head into February, it will be interesting to see the economic figures; theoretically the revenue generation for the period should be down by at least 25% or something similar to the power outage percentages.

And just as we were wondering how the effect, implications and opinions of an emergency would pan out into daily life, what the tell tail signs would be... it happened, all of this is the short space of about 2-3 weeks, the realization dawns that it has begun, the country is experiencing and living through the beginning of the Long Emergency, rather unexpectedly and certainly too prematurely.

I proffer that the events in South Africa, tragic as they are, as they play themselves out, will give a good indication of the events that the USA and other countries will realize in the years to come as The Long Emergency' comes to pass."

Pictures from the South Central Mini

I headed down to Weslaco from Collin County, and put out a few counties along the way. The weather cooperated. I took a bunch of pictures in Weslaco, and here are the first part of them. More each issue as space allows!



NW10, Lou, USACA #779

Lou is on CW.



Frosty, W0FP, USACA #1135

Frosty runs mobile on SSB, but chases counties on SSB and CW from home!



KF5AT, Joe USACA #623

Awards

MARAC YL #181	K5GE, Gene	1/25/08
7 th Time #10	WD9EJK, Paul	1/29/08
Bingo II #46	KA0SHC, Larry	2/10/08

March Events for County Hunters

It looks like a couple good QSO Parties coming up. Let's hope the mobile activity continues. (Extracted from the ARRL Contest Corral.)

March 1-2 ARRL DX Phone Contest – good weekend to avoid the SSB bands for QRM.

March 8-9 Idaho QSO Party RS(T) and S/P/C www.nt4tt.com

March 8-9 Oklahoma QSO Party RS(T) and OK county or S/P/"DX"
www.okdxa.org

March 9-10 Wisconsin QSO Party S/P/C or WI county www.warac.org

March 15 10-10 Mobile QSO Party - Call, name, county and S/P/C, 10-10 number www.ten-ten.org

March 15-16 Virginia QSO Party- Serial and VA county/city or S/P/C
www.qsl.net/sterling/VA_QSO_Party

March 29, 30 CQ WPX SSB Contest RS and serial www.cqwpvx.com – good weekend to work some band counties, and not try to be out mobile on SSB that weekend!

Upcoming Conventions

Michigan Mini – April 17, 18, 19 Traverse City, MI – Holiday Inn West Bay. Rooms are \$72, with \$10 extra for pets. Come on out and enjoy the fellowship at this annual get together.

Dayton Hamfest – May – County Hunter Forum and Dinner

National Convention – Visalia, CA – July 10-13