PCARA Update

Spring spree

Here are some of the events we have coming up for the Spring…

- PCARA has taken a club table at the Orange County Amateur Radio Club **Spring Hamfest** on Sunday April 24, 2016 at the Town of Wallkill Community Center, 2 Wes Warren Drive, Middletown, NY. If you have any items for sale, please feel free to bring them along. For more details please visit the OCARC web site at http://www.ocarc-ny.org/.

- There is a **Skywarn** training session being offered by the Putnam Emergency Amateur Repeater League (PEARL) at 7:00 pm on Tuesday April 12, 2016 at the Putnam County Department of Emergency Services in Carmel, NY. Details can be found at PEARL's new web site address: http://pearlk2put.org/.

- The **PCARA FM Simplex Challenge** is scheduled for Saturday May 7, 2016 (rain date May 21st). Karl, N2KZ proposed the idea and offers more details in his article found in this month's edition of the *PCARA Update*.

- The next **PCARA Foxhunt** is to take place on Saturday May 14, 2016, on *CQ Magazine* Foxhunting Weekend. We will be starting from the Beach Shopping Center in Peekskill, NY at 3:00 pm, and will be led on our adventure by Mike, N2EAB. At the conclusion of the hunt we will be meeting at a local restaurant of the Fox's choosing. As always, ALL ARE WELCOME! Rules to follow. Please consider joining us.

Bob, N2CBH demonstrates his homebrew antenna support stand and portable radio system at the March meeting. For more details see page 14. [K2DMV pic.]

You may have noticed that there's a **new net** in town. Following a suggestion from Lovji N2CKD, a **Technical Net** has started on the 449.925 MHz machine following the Old Goats Net on Thursday evenings. Any thoughts or comments regarding format, day, or time are most welcome. While we are talking about nets, how would you like to try your hand at **directing the weekly Old Goats Net** on Thursday evenings? If you are interested in giving it a try, please let us know.

Thanks to Karl N2KZ, PCARA now has an entry on the Peekskill Field Library **Community Network** site, see: http://peekskilllcn.net/2016/01/08/peekskill-cortlandt-amateur-radio-association/. This is the second site Karl is managing for PCARA. The other is the PCARA Facebook page at http://www.pcara.org/pcarafacebookpage.html. Awesome work Karl. Thanks and Kudos!

Several events will need more discussion including Field Day on June 25-26, Hudson Valley Expo on August 6 and Church of the Holy Spirit's Golden Jubilee Festival on May 15. Our next regularly scheduled meeting is on April 3, 2016 at 3:00 pm at New York-Presbyterian / Hudson Valley Hospital in Cortlandt Manor, NY. I look forward to seeing each of you there.

- 73 de Greg, KB2CQE

PCARA Officers

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  Greg Appleyard, KB2CQE; kb2cqe at arrl.net
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-N2KZ

Simplex Challenge

Height **is** everything. We will prove this adage Saturday afternoon, May 7th starting at 2:00 pm! Everyone is invited to reach great heights to try their luck. The quest is *simple.* We will be testing our ability to communicate VHF and UHF without the aid of repeaters. All you need is a simple HT and a *very* high place. Join us for our very first *Simplex Challenge* event!

Simplex is the most basic form of radio communi-

Simplex Challenge.

cation: Point-to-point using a variety of output powers and antennas. If you ever wondered just how far your handheld HT can be heard, this is your big chance! Malcolm, NM9J will be joining me atop Perkins Drive on Bear Mountain as coordinators of the event. We will first complete a roll call via the PCARA repeater on 146.67 MHz to develop a list of participants. Then the fun begins!

Malcolm and I will call everyone, in order of check-in, to initiate and verify contact on simplex. High atop locations all over the Peekskill area, PCARA members will be readying and assembling stations to the best of their ability. Each lofty location will attempt to reach the Bear Mountain host station using the simplex frequency of 146.565 MHz. After being recognized by the hosts, the real challenge begins: Try to contact everyone else one-to-one via simplex.

Every station will have an opportunity to try to contact every other station participating. Westchester, Putnam and Rockland Counties will all be represented. Building on past experiences operating from atop Bear Mountain, it's very possible to attract passerby casual contacts from hundreds of miles around. You never know what might happen!

We will save the best part for last. After all contact possibilities are exhausted, the Bear Mountain hosts will then make one last round robin call with a new twist: Everyone will operate with as little power as possible. A special award will be given to the person who reaches the longest watt-per-mile ratio. Example: 200 milliwatts traveling 20 miles would be 100 miles per watt. It might even get better than that! Just think how far you could go with a full five watts!

Our members will be ready for contacts far and wide — for miles and miles around! Here are some of the locations where members might be perched ready for simplexing: Bear Mountain, California Hill, Dicker-

Map showing high spots in the Peekskill area from web site "Lists of John", as suggested by Al, K2DMV. Try this link: http://www.listsofjohn.com/mapf?lat=41.29&lon=-73.95&z=13&d=y

son Mountain, Cat Hill, Indian Hill, Pikes Peak in Peekskill, Storm King Mountain, Jacobs Hill, Anthony's Nose and Appalachian Way in Fishkill. We may even have recruits checking in from Long Island. And when it is all said and done, we will gather at a local restaurant to compare notes and experiences. Simply put, it should be quite an event!

Want to join the fun? Just drop a line to our new events e-mail address: *pcaraevents 'at' gmail.com* so we will know to expect you. Think about a good high spot where you can perch, make sure your batteries are charged and standby for adventure! We would love to have your company! You will be amazed how far your HT can go! Even if you don't have a transceiver, make sure you listen in! See what *you* can hear on 146.565 MHz FM! By the way, the rain date for this event will be Saturday, May 21st also starting at 2:00 pm. Also, please listen in to The Old Goats Net, Thursday nights at 8:00 pm, on the PCARA 2 meter repeater at 146.67 MHz for up-to-the-minute details and updates about the Simplex Challenge!

Feeling Foxy

Only one week later, on Saturday, May 14th, PCARA members will be jumping into their cars and hitting the streets in search of another elusive fox! Springtime means radio direction-finding foxhunts, so here is your opportunity to catch one! We will be gathering at The Beach Shopping Center, off Route 6 in Peekskill, starting at about 2:30 pm. The quest? Mike, N2EAB, will be somewhere out in the wilderness trying to avoid and deceive us in an attempt to not be caught. Will we find him? Only time will tell. Tally ho!

Standard equipment for foxhunting usually includes a hand-held transceiver, a Yagi or other directional antenna, an in-line attenuator to weaken very

strong signals, a really good set of maps and good luck! If you have never been on a foxhunt, please drop by and we will get you started. Your hunting speed and efficiency improves greatly if you are working as a team of two or three people all in one car. The rewards are great fun! The first and second teams to find the fox will be awarded an attractive certificate for their skill. The first person to find the fox during this hunt also becomes the next fox to hide during the next hunt!

Take a look at page 7 of our May 2015 *PCARA Update* newsletter for the previous rules. You can find it at: http://home.lanline.com/~pcara/docs/pcud0515.pdf.

More Events

PCARA events are limited only by your imagination. Look at all the ideas that our members suggested during a recent Old Goats Net: National Park activations, Show and Tell events at monthly meetings, donating sets of ARRL amateur radio books to local libraries, new membership drives and fundraising, advertising our foxhunts to other clubs, electronic construction project get-togethers with youngsters (like the Boy Scouts) and more direction finding challenges. Our club can come alive with your help. Any ideas?

HD Radio Update

It has been 14 years since HD Radio was first introduced to America's airwaves in 2002. I have casually watched its evolution in wonder. Recently, I had the opportunity to re-visit this technology via a state-of-the-art JBL sound system installed in a 2016 Toyota Prius. Broadcast radio is changing so fast, it is hard to keep up with it!

The AM version of HD Radio is showing a slow but steady decay. From my location, on the east coast of Northern Westchester, there are only three AM HDs left on the air: WCBS 880, WINS 1010 and the new station in Rockland County WRCR 1700. WCBS is a part-time HD station that turns off its HD encoding when they cover sports and sometimes during night-time hours. WRCR lowers its power significantly, from 10 kilowatts to just 1 kilowatt, at night from sunset to sunrise. None of these three stations lock into HD mode regularly. They often drift in and out of HD and jump between different levels of bandwidth conditioning to temper down noise and still maintain a listenable signal.

Adding to this show, the JBL radio has a considerable buffer recorder to fill in the gaps while it switches between modes. Don't be surprised if you hear a word or two twice. It is the buffer doing its job! It will also record up to 20 minutes of programming that you can replay if you missed something or wanted to hear it again. All of this is remarkable technology, but the continual increase of QRN is really destroying AM broadcast as a viable medium.

HD Radio on FM is also quirky and spotty. Unless you have a transmitter dominantly strong and 'in your lap,' the reception also continues to switch between analog and digital. Trying to listen to a HD Radio sub-channel, such as WCBS-FM 101.1 HD-2 relaying the audio of WCBS-AM 880, is frustrating. It is a continual game of 'now you hear it, now you don't!' With no analog signal to revert to, if you can't lock the HD digital signal, all you hear is silence.

Toyota's JBL sound system is shown receiving HD Radio station WCBS HD-2 on 101.1 MHz. [N2KZ pic.]

This new generation of auto-radio sends one distinct message to its users. Terrestrial broadcasting is 'so yesterday.' Although it offers dozens and dozens of satellite radio stations to listen to, you also have the option of listening to multitudes of radio stations via the Internet and apps like iHeart Radio.

If that is not enough, you can also use services like Slacker and Pandora for content you can customize to your taste. Of course, you can connect your Android or iPhone into the system, via hardwire or Bluetooth, and listen to anything the world has to offer using apps like TuneIn and Radio.com. I listen to stations I first met while in France, like NRJ and Frequence3, as if they were broadcasting from Peekskill. Audio via the Internet is now so stable and crystal clear that you can travel nearly everywhere and never get blacked out. Songs on your iPod and iPhone are available, too. So, what would you like to listen to? Let me think!

For people who really like to explore music, or like to follow the foreign press or want to aurally visit places far away and across the sea, this technology is empowering. Remembering the good old days of short-wave radio, you are reminded just how miraculous this technology can be. Every station on the web can be truly international without bounds. Who is listening? Possibly the entire world! All I can say is 'Wow!'

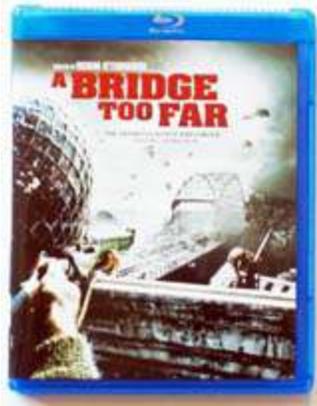Until next month, happy trails from N2KZ 'The Old Goat.'

A bridge to the past

While living in the U.K. I used to work for a multinational chemical company. This situation continued after my move to the USA. From time to time, I had to visit various company sites in Europe including **Arnhem** and **Deventer** in the Netherlands, plus sites in Germany.

At the time of my first visit to Arnhem, the city housed our company headquarters and the corporate research center. Outside the company, Arnhem is better known for the role it played in World War II. This was all brought home to me by a second viewing of the 1977 movie "A Bridge Too Far". I had originally seen this film in England on its first release, almost 40 years ago. The more recent viewing on Blu-ray ties historic events to places in Holland that I visited.

Blockbuster movie

The movie "A Bridge Too Far" is set in September 1944, three months after the D-Day landings had taken place in northern France. By then, the Allies had progressed into Belgium and were about to push forward into German-occupied Netherlands. An ambitious plan, code-named "Operation Market Garden" was drawn up to penetrate 60 miles into the Netherlands. American airborne forces would capture the strategic bridges at **Eindhoven** and **Nijmegen** while British and Polish airborne forces would capture the bridge over the branch of the Rhine at **Arnhem**. At the same time, ground forces would be driving north from Belgium along the 60+ mile route via Eindhoven and Nijmegen to Arnhem in support of the airborne troops, with the ultimate aim of a rapid push into Germany's industrial heart in the Ruhr valley. The bridge at

Map showing significant towns and rivers in the movie "A Bridge Too Far".

Arnhem would have to be held for at least two days, before ground troops could arrive to support the airborne personnel.

L to R: Lt. General Browning (Dirk Bogarde) explains Operation Market Garden to Major General Taylor (Paul Maxwell), Major General Urquhart (Sean Connery), Brigadier General Gavin (Ryan O'Neal) and Major General Sosabowski (Gene Hackman).

The movie was filmed forty years ago in 1976, on location in Britain and the Netherlands. This was the era before *Star Wars* and computer generated imagery (CGI) — so all events had to be recreated on the ground or in the air, then **filmed** with real cameras by director Richard Attenborough. This makes for an overall realism that can be missing from modern movies with their computed landscapes and impossible camera movements.

Based on the book of the same name by Cornelius Ryan, the movie "A Bridge Too Far" shows the planning and initial success of Operation Market Garden. Unfortunately subsequent problems delayed both the paratroopers dropped into Arnhem and the ground forces driving north from reaching the small airborne force led by Lt.-Colonel John Frost (played by Anthony Hopkins in the movie) that was holding the north end of the Arnhem Bridge. Isolation and lack of supplies led to their subsequent overrun by German forces, with many imprisoned or killed.

One of several reasons for failure—as depicted in the movie—was poor **radio communication** between troops on the ground in and around Arnhem. These radio problems have been described by John Frost, by Major General Robert Urquhart (played by Sean Connery) and by others involved in the operation. John Frost was one of the military consultants on "A Bridge Too Far".

Heavyweight equipment

Some of the radio equipment employed at Arnhem is visible in the movie. The main radios used by British airborne forces were Wireless Set No. 22 and Wireless Set number 68, both manufactured in Britain by Pye Ltd.

Wireless Set No. 22 was dropped by parachute or installed in Jeeps, which were then landed in gliders. The set ran off a 12 volt lead-acid battery using a vibrator power supply, producing CW, MCW or AM signals

in the range 2 - 8 MHz with a power output of 1 watt, for a current consumption of 2.2-4.6 amps. Secondary batteries provided 10 - 30 hours use, depending on ampere-hour capacity, with a gas-powered generator for subsequent recharging. The front panel of Wireless Set 22 is similar to the more familiar Wireless Set No. 19, which was capable of higher power and installed in armored vehicles. The 22 set was bulky with its separate power supply, while the steel construction made it heavy, for a total weight of 58 pounds. Three men were needed to carry its separate components across the ground.

Wireless Set No. 22 was a 13-tube transmitter/receiver for field and mobile use, producing 1 watt RF on 2 - 8 MHz.

Wireless Set No. 68 was the "low-frequency" version of back-pack Wireless Set 18. The lower frequencies were intended to provide longer range. Coverage of set WS 68**P** was 1.75 - 2.9 MHz, while WS No. 68**R** covered the higher frequency range of 3.0 - 5.2 MHz. Output power was only ¼ watt (that's right, 0.25W), AM or CW. The radio had separate receiver and transmitter sections and was powered by a **dry battery**, providing 3 volts for the filaments and 162 volt high tension (B+), tapped at 12 volts for grid bias. One dry battery could power the set for 8-12 hours operation, then it had to be replaced with a fresh battery.
Construc-

Wireless Set No. 68 was a man-portable transmitter/receiver housed in a steel backpack with canvas cover. RF output was ¼ watt on 1.75 - 2.9/3.0 - 5.2 MHz.

tion was in the form of a pressed steel case which acted as a rucksack with canvas cover and straps attached. The transmitter slid into the lower part of the case above the battery, with the receiver sliding into the upper part. Overall weight was around 30-34 pounds.

Join the net

Radio stations with a separate transmitter and receiver have to be "netted" — something we have almost forgotten how to do in modern amateur radio. "Netting" means setting the transmitter to the exact same frequency as the receiver.

The receiver and transmitter of Wireless Set 22 and Wireless Set 68 were both governed by free-running variable frequency oscillators — though the WS 68 also had provision for an optional crystal oscillator on transmit. Once an operator had tuned-in the headquarters control station by careful adjustment of the receiver, he would depress the transmitter 'net' button. This applied power to the transmitter master-oscillator *only*. The VFO control knob was then adjusted for an audible beat note between local transmitter frequency and the incoming signal from control. The transmitter was "netted" onto the control station when there was zero-beat (lowest audio frequency) between the master oscillator frequency and the incoming signal. Remaining controls on the transmitter could then be adjusted for maximum power output. All stations in the net had to go through this procedure before communicating with control. And since the vacuum tube oscillators were prone to drift, sets had to be re-netted from time to time.

In Wireless Set 68, the tuning dials could be locked down with a mechanical screw once they had been set. Wireless Set 22, like Wireless Set 19, had a tuning dial with a mechanical "flick" scheme which allowed the oscillator and antenna coupling adjustments to be rapidly changed between two previously preset frequencies, marked 'blue' and 'red'.
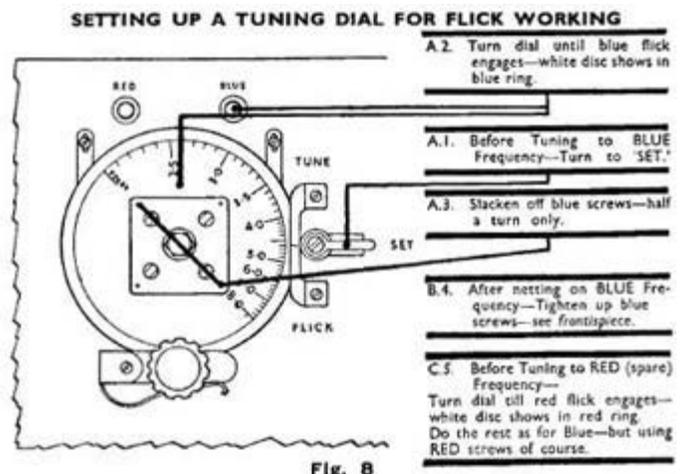

Diagram from WS 22 Instruction Manual shows how to adjust for 'flick working' between two preset frequencies.

As part of the preparation for Operation Market Garden, Royal Signals personnel would take the sets from storage and pre-tune controls to the anticipated net frequencies. Unfortunately, according to Lt. Colonel Frost, the shock of a parachute landing would often put these carefully pre-set radio frequencies "off-net".

Lightweight antennas

Various antennas could be used with these radios. The backpack 68 set was supplied with twelve copper-plated steel tubes which could be assembled into a vertical antenna 6 -10 feet high. The 22 set was supplied with a 12 foot sectional rod antenna for mobile use and a 16-to-34 foot vertical antenna for ground-station use. Both radios could also be connected to wire antennas. According to contemporary handbooks, the expected range with each type of antenna was as follows:

Vertical steel tube antenna attached to side of Wireless Set No. 68.

WS 22 mobile / fixed set (average daylight conditions)

Antenna	Range AM	MCW	CW
12 ft rod on the move	15-30 miles	25-35 miles	30+ miles
34 ft rod stationary	30-40 miles	35+ miles	35+ miles
140 ft wire	50+ miles	50+ miles	50+ miles

WS 18 / WS 68 back-pack set

Antenna	Range AM (CW about twice as far)
10 foot rod	5+ miles
6 foot rod	2 – 5 miles
'Ground aerial'	1 – 3 miles (most favorable condx)

From my own experience, operating 160 meter mobile during the 1970s, the WS 22 range looks optimistic for a mobile radio with only **1 watt** RF output. Transmitting on my TW Communicator at 6 watts AM output with a resonant helical whip antenna, mobile range was around 15-20 miles over open ground. For fixed station to fixed station work with wire antennas, range was about 30 miles.
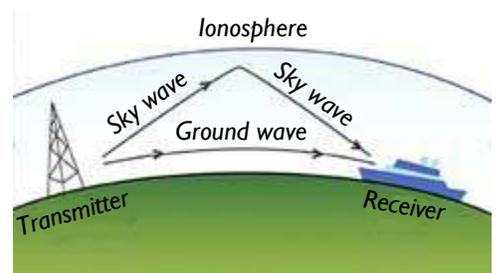
Handbook range for the backpack WS 18/WS 68 also looks optimistic for a ¼ watt transmitter with such a small antenna. The 6 foot and 10 foot rods are much shorter than a quarter wave at 2 MHz and would have very low radiation efficiency. Ground coupling would be dependent on the operator's position — which might be walking, running or lying prone while under attack.

The maximum range of a WS 68P is usually given as 3 miles. An estimate of actual range was made by Wally G3JKV, who built a modern version of the tube AM transmitter, then fed it into different antennas. An 8 foot whip on 2 MHz gave maximum range of about 3 miles, a 12 foot whip about 5 miles and a 66 foot wire gave over 9 miles. (*Horsham ARC News* March 2006.)

Local working on 160 meters and 80 meters depends on **ground wave**, where the radio frequency energy hugs the ground and is able to roll over hills and other obstacles. Ground wave is highly dependent on the conductivity and dielectric properties of the actual medium between stations — a salt marsh or sea-path are best. This mode of propagation requires vertically-polarized antennas with a reliable connection to ground. At night, condi-

Ground wave propagation over salt water.

tions change significantly as sky wave propagation joins in, increasing the interference from distant stations.

Arnhem report

Arnhem lies in the eastern part of the Netherlands, fifty miles southeast of Amsterdam. The River Nederrijn curves through the southern part of the City, which is also a major rail hub. The German border juts into the Netherlands and is only 15 miles distant. Most of the Netherlands is flat, but the land around Arnhem north of the river is hilly, rising to a maximum of 300 feet.

The ultimate objective of Operation Market-Garden was to take and defend the single road bridge which crossed the Nederrijn River, near the center of Arnhem. The Royal Air Force studied the surrounding area and decided that the only location suitable for a combined para-

Aerial view of modern Arnhem with John Frost Bridge in the foreground.

chute drop and glider landing of ~9000 men plus supplies was in an area to the far west of Arnhem

carved out of forest. Unfortunately, drop zones and landing zones were up to **8 miles** away from the bridge, with much of the route through forest.

Significant locations for the planned 1944 Arnhem landing, overlaid on a contemporary map.

Signals personnel realized that the 8 mile distance was beyond the range of their low power backpack radios, but their concerns were ignored by operation planners. This is rather different from the movie screenplay where Major Steele, played by Stephen Moore, first tells Lieutenant Cole: "I just don't believe these damned radios are strong enough to carry the 8 miles from the drop zone to Arnhem Bridge." But then he does not take up the matter with his superiors — "Well if anyone rocks the boat it's not going to be me."

Signals Officers Lt. Cole and Major Steele (right) discuss the range of the radios they are working on for Operation Market Garden. A WS 22 is visible, upended on the bench.

Another concern was that the British Army had fallen behind other services in its radio development, so their 1940s-vintage radios with free-running oscillators needed skilled operators for reliable operation on phone or CW. Because of a shortage of signalers, ordinary soldiers were sent on a one-week radio familiarization course, without any CW training.

A further worry was the need for a continuous supply of dry batteries for the 68 sets and recharging of lead-acid batteries for the 22 sets using a gasoline generator.

At the landing zone, Major General Urquhart (Sean Connery) asks Corporal Hancock (Colin Farrell) whether his loss of radio communication and missing Jeeps would be helped by the Corporal's offer of a cup of tea. Note the Wireless Set No. 22 installed in the Jeep at right.

21st Century View

Spurred by popularity of the 1977 movie, interest is still high in the reasons for Market Garden's failure. Recent studies using modern techniques provide greater insight. In 2004, John Berry of ATDI Ltd published a White Paper with a "Modern Day Technical Analysis" of communications at Arnhem. Information was gathered on the radio nets in use on Day 1 and Day 2, including the frequencies involved (around 2.2 MHz and 3.8 MHz), and the equipment— Wireless Set 68 with ¼ watt output or WS 22 with 1 watt output and 12 foot antennas. These figures were fed into radio modeling software supplied by ATDI. The results were summarized in a table showing probability of communications for the various radio paths in use on Day 1 and Day 2.

The author concludes that communication on Day 1 between Division HQ at the drop zone and John Frost's 2nd Parachute Battalion on the Arnhem Bridge *should* have been possible using 22 sets. However the nets using 68 sets would have had a low chance of success due to the distances involved. On day 2, when Divisional HQ had moved from the landing zone to the Hartenstein Hotel in the village of Oosterbeek, reducing distance to the bridge to three miles, all nets should have been possible — though in fact there were still difficulties.

Major John Greenacre of the British Army wrote a subsequent article in 2006 analyzing the ATDI paper. He suggests that the reason communication problems persisted on Day 2 was that 2nd Battalion on the Arnhem Bridge was only using a low power WS 68P back-pack for their link to Divisional Headquarters rather than a higher-power WS 22. Even when a 22 set became available, there was a further problem because Divisional Command Net decided to change frequency to avoid heavy interference. Unfortunately the Bridge was still out of touch and unaware of the frequency change. John Greenacre shares the view expressed by

Lt. Colonel Frost, played by Anthony Hopkins (center) approaches Arnhem bridge. His wireless operator (Geoffrey Hinsliff, right), is carrying the WS 68 on his back.

adjutant of divisional signals Lewis Golden — that procedural mistakes were more to blame than equipment failures for the breakdown of internal radio communications for the British Airborne Division at Arnhem. (*Echoes from Arnhem* by Lewis Golden, published 1984 by William Kimber.)

Do the experiment

Modeling software for antennas and radio propagation can be useful for professionals and amateurs alike. But we all know that what really matters in the light of an elegant theory is the **actual** performance in practice. A real-life test of radio propagation in modern-day Arnhem has been described by Tom Robinson, G0SBW in the pages of RSGB's monthly journal. (*RadCom*, February 2005, pp 36-37.) The test was inspired by an earlier G0SBW article describing "pedestrian mobile" operation with an HF Backpack. The radios employed in Tom's earlier pedestrian mobile work were the Yaesu FT-817 and Icom IC-703, which is the 10W low-power version of the IC-706. (*RadCom*, June 2004, pp 22-23)

G0SBW operates pedestrian mobile from the UK.

G0SBW was approached by Dr. Brian Austin, G0GSF in his capacity as radio consultant for the *History Channel* series *Battlefield Detectives*. We have encountered G0GSF previously in the pages of *PCARA Update.* During his time in South Africa as ZS6BKW, Dr. Austin devised a computer-optimized version of the 'G5RV' antenna that provides a low VSWR on **five** HF bands — without the need for an antenna tuner. See *PCARA Update,* July 2009 pp 6-7.

Brian Austin wanted to re-enact WWII communications at Arnhem for the *Battlefield Detectives* TV series using actual WS 68P radio sets. Unfortunately, working

sets were not available in the UK so he approached Tom, G0SBW to see if his pedestrian mobile setup could be used. Tom G0SBW and Peter G8BLS (SK) arranged assembly of two modern sets using tubular steel backpack frames and Icom IC-703 radios, one of which was loaned by Icom U.K. The antennas were 11 foot ex-Army whips with homebrew loading coils for 160 and 80 meters. The same antenna could also be used on 6 meters — to test a further theory. The Icom radios were set to ¼ watt or 1 watt output, AM mode to match capabilities of the 1944 WS 68P and WS 22. On location in the Netherlands, the team was able to compare these sets with an actual working WS 68P supplied by Jan v d Riet and Dutch Amateur Gerrit Siebers, PA0GSB.

Jan v d Riet and Gerrit, PA0GSB adjust their original Wireless Set No. 68P in the woods near Arnhem.

The modern Icom backpack radios could easily communicate across short distances of about 1 mile near the landing zone using just 0.25W AM, but they had difficulty hearing the elderly WS 68P through a wooded area. When one of the Icom backpacks and the WS 68 moved to the north end of Arnhem bridge where 2nd Parachute Batallion was located in WWII, there was a much higher noise level and no signals could be received at the bridge over a three mile path from Divisional HQ at the Hartenstein Hotel. In the reverse direction, with a quieter location, signals were audible at the Hotel from both the Icom backpack and the WS 68P.

Further tests over a 3 mile path employed by the 2nd Parachute Battalion on their 8-mile march from the drop zone to the bridge showed more difficulties with 0.25 watt power output due to a high noise level near the river. Signals were slightly improved by changing to 1 watt output.

Tom Robinson G0SBW concludes that low power AM communication on 160 meters is heavily dependent on distance, ground clutter and background noise level. He experienced the same sort of difficulties as the 1944 airborne troops when moving from open ground to wooded areas, suggesting that the choice of inadequate portable equipment rather than poor performance of the operators was responsible for the communication

Peter G8BLS tests reception with the IC-703 backpack radio near the John Frost Bridge in modern Arnhem.
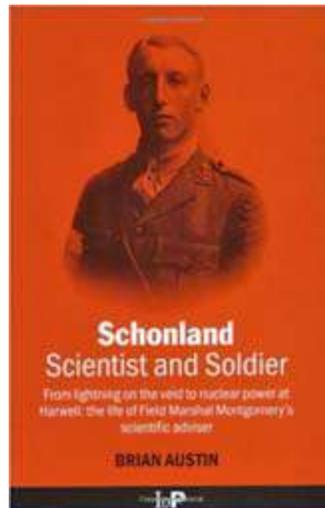
problems experienced.

You can watch the TV episode showing these radio tests on YouTube. *Battlefield Detectives: Market Garden Part 1* is at: https://www.youtube.com/watch?v=2CexO9TgWTI . The radio tests appear in Part 3.

Beyond line of sight

Interestingly, when the IC-703 backpacks were changed over to 6 meter FM at a power level of 0.5W, communication was **much better** on all paths. No doubt this was caused by a combination of more efficient antennas, lower noise levels and better propagation at 50 MHz compared with 2 MHz. At the time of Operation Market Garden, VHF-FM radios were just being introduced for short-range troop communication, but only for U.S. forces.

Dr. Brian Austin, G0GSF comments on this sad state of affairs in his book "Schonland, Scientist and Soldier" (CRC Press 2001). Lt. Colonel Basil Schonland was Scientific Adviser to Field Marshal Bernard Montgomery, but his recommendation to the UK War Office to employ 30-50 MHz VHF communication for ground troops working beyond line-of-sight distance fell on deaf ears.

G0GSF also points out that longer distance radio links during Project Market Garden (e.g. 12 miles to First Airborne Division HQ near Nijmegen) could have failed as they were in the zone between ground wave and sky wave. The year 1944 was at a minimum point in the sunspot cycle, requiring use of lower-than-usual frequencies for sky wave propagation. The short vertical antennas in use were less suitable for sky wave. Long horizontal wire antennas such as a Windom would have helped with the NVIS (near-vertical-incidence skywave) propagation required, but they were out of the question for troops marching or driving into a battle zone.

My own experience suggests that an end-fed 240 foot horizontal half wave wire antenna, 30 feet in the air will easily outperform a quarter wave for night-time sky-wave coverage on 160 meters. I have also found that mobile MF operation is affected by large metal objects, overhead wires and noisy trams.

Hotel encounter

During one of my visits to Arnhem in the late 1970s I was staying at a hotel in the city center and went down to the lobby. I noticed a number of UK veterans were present and asked if their stay was connected with the wartime events some 35 years earlier. The

Hotel in Arnhem near the train station.

answer was — yes, they had regular reunions in the town with other survivors of that terrible battle. There they were — not actors in a movie — but real people who had been through the experience of combat, losing many of their comrades in the struggle to hold the bridge. (Their last reunion took place in 2014, the 70th anniversary of Arnhem.)

A few years later, I was visiting Deventer, located 25 miles northeast of Arnhem, My employer at the time had a manufacturing site and research laboratory in Deventer. I was told that filming of the Arnhem bridge scenes in "A Bridge Too Far" actually took place in Deventer, mainly because Arnhem was laid waste by German forces during Operation Market Garden. Much of historic Arnhem had to be rebuilt after WWII, including the famous bridge and all the buildings in the neighborhood. Deventer's bridge across the River Ijssel was more suitable as it is of a similar design, with authentic old buildings around it (not to mention our old Research Lab!) The nearby Postillion Hotel in Deventer has photos of the movie stars and production on display.

How would you do it?

Returning to our part of the world, just suppose

the normally friendly folk across the river in Orange County have turned nasty and are threatening to close the Bear Mountain Bridge. Your job is to transport 9000 parachute troops from Westchester County into Orange County to take and defend the bridge. Unfortunately, there is no suitable drop zone nearby, so your troops will have to be parachuted into Woodbury, 8 miles from the bridge. How would you arrange communications for their march using modern equipment?

Perhaps you were thinking of issuing 2 meter handi-talkies — but the bridge is out of simplex range from the drop zone because of terrain. Maybe you could use a suitable repeater — but they are all under control of the Orange County people on their west side of the river. My suggestion would be to fly a mobile repeater several thousand feet up from Camp Smith in a helicopter — or perhaps employ a multi-band HF/VHF transceiver with battery pack like N2CBH constructed. (What would you do? Cell phones are *not* allowed.)

Now imagine you have entered a time warp and the only equipment available is the vacuum tube technology and steel-cased radio gear of the 1940s. This has to be dropped by air or flown in using gliders then **carried eight miles** from Woodbury to the Bear Mountain Bridge.

Real-life radio testing of WS 68P near the John Frost Bridge in Arnhem.

What would you do now? That old-time equipment is 10 times heavier and 50 times less efficient at producing RF than our modern radios. And it's tuned to 2 MHz AM. Best of luck!

Thank goodness there have been no further hostilities in Western Europe after World War II. And things are still peaceful on the east and west sides of the River Hudson.

References

For more information on WS 22 see:
http://www.pa3esy.nl/military/gb/army/WS22/html/ws22_set-gb.html
http://pa0pzd.com/army-navy/british-wireless-sets-and-receivers/wireless-set-no-22-2/

… and for a description of WS 18 / WS 68 use see:
http://www.lawlerbrown.com/page-42.html

- NM9J

Raspberry Pi — media player,
photo viewer, amateur radio, Part II - N2CKD

Following his earlier article on the Raspberry Pi in PCARA Update *for March 2016, Lovji N2CKD describes further adventures with this inexpensive microcomputer.*

The Raspberry Pi 2 Model B can be used as a low-cost dedicated computer for media streaming. Play music from Internet radio sites and watch YouTube videos in your browser — or use the device as a media player. For instance, you can stream music and simultaneously view photos stored on a USB memory device. The Pi's HDMI 1080p video and audio quality is excellent.

Credit-card-size Raspberry Pi 2 Model B has an HDMI socket for digital video/ audio output and an analog audio jack.

VLC media player

The Raspbian operating system on the Raspberry Pi comes with a media player called OMXPlayer. This is a Linux command line player with no graphical user interface (GUI), so it is difficult to use. But there are several other GUI-based media applications available for the Raspberry Pi. I downloaded a player called VLC media player, which is a free, open source cross-platform application that plays most multimedia files as well as DVDs, audio/video CDs and various streaming protocols. It can play files, discs or streams and runs on many platforms including Windows, Linux, Unix, Mac OS X, iOS and Android. It is completely free with no spyware, advertisements or user tracking.

I downloaded VLC media player from their website at http://www.videolan.org/vlc/ — or you can download and install to the Pi using the Linux command line: `sudo apt-get install vlc`. After installation, the application should appear in the desktop GUI menu under "Sound and Video". *[You may need to adjust items visible in the Raspberry Pi menu using Menu → Preferences→Main menu editor. – Ed.]*

After installation of VLC on the Raspberry Pi, I was able to play music and view photo albums from my USB memory stick. Within the VLC application I changed to the Playlist (View→Playlist) then scrolled down to the Internet section which shows a list of sources including 'Icecast Radio Directory' and 'Jamendo Selections' — with many Internet radio sta-

tions to choose from. I listened to radio stations in the VLC list, then found more Internet radio stations using the Pi's own Web Browser. I connected to radio web sites at http://www.radionomy.com and http://www.internet-radio.com/. I tried a radio

Using VLC media player to listen to music from Internet sources. [N2CKD pic.]

station in the UK that played with good clarity and signal quality. Some of the other radio stations were scratchy and distorted and some were loud and clear. I guess it is a combination of streaming speed, Wi-Fi signal strength, RAM memory and CPU speed.

[If you are using the Raspberry Pi's analog audio/video jack and cannot hear anything, you may need to force audio output to the 3.5mm jack using: `sudo raspi-config`*. You can then test audio output using:* `speaker-test –c2` *– Ed.]*

VLC is open in a window at left while the Raspberry Pi's Web Browser is open at right to http://www.internet-radio.com [N2CKD pic].

Next, I decided to view a photo album. Since I do not have a CD/DVD drive attached to the Raspberry Pi, I downloaded a set of .jpg files from my computer hard drive to a USB memory stick then plugged it into the Pi. I located the pictures within VLC, which then ran them as a continuous slideshow. While the photos were being displayed, I added music by opening a web browser window and connecting to an Internet radio station link. Now, I had streaming music to go along

with the slide-show. Opening two windows allowed me to switch between viewing a photo album, or adding/changing music selections from different Internet radio stations.

Kodi Media Center

In the middle of writing this article I discovered another very popular media player called **Kodi** which is also a free, open source media center application for playing videos, music and pictures. It runs on Linux, Windows, Mac OS X, iOS and Android. I downloaded Kodi using the following Raspberry Pi Linux commands: `sudo apt-get update` followed by: `sudo apt-get install kodi`. Once installed, Kodi Media Center should show up in the Raspberry Pi desktop menu under **Sound and Video**. For more information on Kodi please see their web page at https://kodi.tv/download/. I found that both Kodi and VLC work well as media players, but I now recommend Kodi player to view pictures — I do not use VLC to view pictures any more.

How to use Kodi

Open Kodi player, a horizontal menu appears listing: PICTURES – VIDEOS – MUSIC – PROGRAMS – SYSTEM. Select 'Pictures' then select the USB drive that will be listed after you plug in a memory stick with your downloaded pictures. This opens up another list of all the files, music and pictures stored on the memory stick. Select the folder with your pictures and all the .jpg pictures

Kodi home screen.

are displayed. Click on the left sidebar (little arrow) which opens up a picture manager where you can select options for "View: Sort by: Sort: Filter". Also listed is "Slideshow". Click on it and you can view a slideshow — or individually view each picture. Kodi presents it very well with fade-in and pan/zoom animation. These instructions may seem complicated — but they are not. Like any new application one just has to get used to the steps. Kodi also has an excellent system information screen under System→System Info.

Initially I had used VLC to play music from a memory stick and chose radio stations that appeared in the VLC Internet menu. But I found that Internet radio
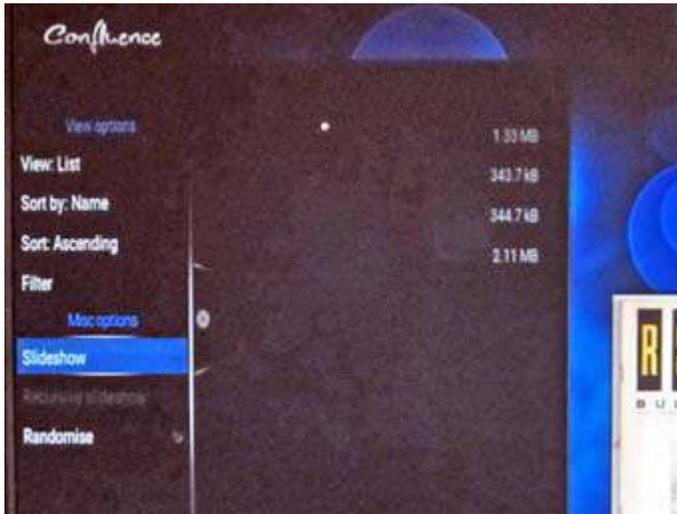
Selecting Slideshow from Kodi's sidebar menu (left side).

selections chosen in the web browser are just as good. So now I use Kodi to view pictures as a slideshow, then open a browser window and select an Internet radio station for music. That way you can view the pictures with or without music.

Due to its low cost, the Raspberry Pi is widely used as a dedicated media server, freeing up your main home computer for other tasks. I set up a photo viewer in my room to show photo albums and play music to relatives and friends. While you can always install a media player on your home computer, tablet or notebook, you can't do it for such a low cost as with a Raspberry Pi. The Pi operates flawlessly, is lightweight and portable for easy setup and works off a micro-USB power supply.

Package manager

If you prefer a graphical user interface to the command line method of installing software, you can also download/install software packages such as VLC, Kodi etc. using the Synaptic package manager. Type the command line: `sudo apt-get install synaptic` . Synaptic is an excellent software package manager for installing, managing and updating software, including Fldigi and other amateur radio-related packages.

Amateur Radio — data modes

Many amateurs use the **Fldigi** application from W1HKJ to operate PSK31, RTTY and other data modes on their Microsoft Windows desktops and notebooks. See http://www.w1hkj.com/ . A Linux version of Fldigi is available for installation on the Raspberry Pi. I recently lost the ability to use Fldigi on my Windows-based laptop due to a computer virus so I decided to replace the laptop and try running Fldigi on my Raspberry Pi. I downloaded the Linux-based Fldigi application using the Linux command line:

`sudo apt-get install fldigi`. During installation the terminal screen shows the amount of space in megabytes required by the application. Answer 'yes' and it will install. After installation, Fldigi appears as a Ham Radio entry in the menu of the Raspberry Pi desktop GUI. Click on the Fldigi choice to launch the application and customize it with your call sign, etc.

I connected my Raspberry Pi to the transceiver using a Tigertronics **Signalink™ USB** integrated sound card interface. For details see: http://www.tigertronics.com/ . I used a standard RJ-45 cable for connection to the radio and a USB cable to connect the SignaLink to the Raspberry Pi. I was then able to see the panoramic waterfall display in Fldigi to visualize incoming signals.

SignaLink USB

For data modes like PSK31, setting optimum transmit and receive audio levels is critical in order to generate a good clean signal. One way is to use a potentiometer in the cable between transceiver and Raspberry Pi — for example the SignaLink USB has its own separate gain controls for TX and RX signal levels. Another way is to use the QASMixer package which is available for the Raspberry Pi. QASMixer is a desktop mixer application for the Linux sound system ALSA. It does a fine job of adjusting sound levels from 4.0 dB to -102 dB via a PCM playback slider control. To install QASMixer, type the Linux command line: `sudo apt-get install qasmixer` and follow the prompts. Upon installation the QASmixer will appear under the Sound & Video option in the desktop GUI menu.
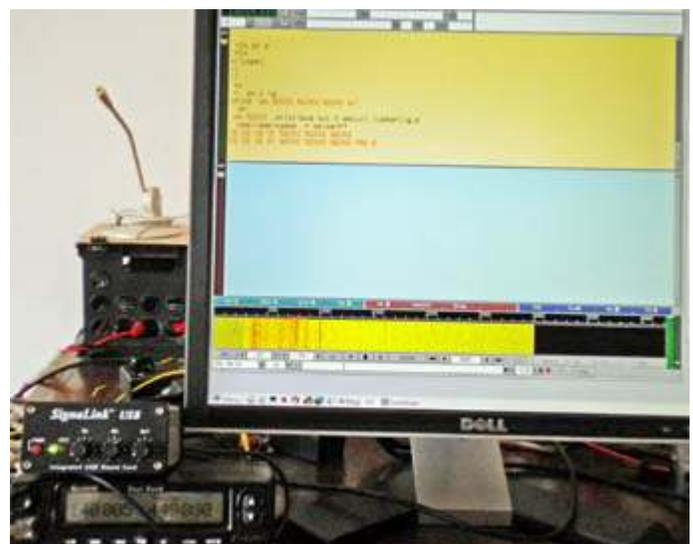
Raspberry Pi running Fldigi software for digital modes. Note the SignaLink USB and transceiver lower left. [N2CKD pic.]

I began on-air tests of Fldigi with my 2 meter FM rig and the SignaLink. (My HF transceiver is in the basement where I had previously used the Windows version of Fldigi.) Next I tested Fldigi with the Raspberry Pi on the HF bands. There were plenty of stations on 20 meters, plus a few on 40 meters and 17 meters. So I can confirm that the Linux version of Fldigi works well on the Pi.

Because the Raspberry Pi model 2 uses HDMI or analog audio out, it is not easy to get audio in, so an external USB sound card works well. A Raspberry Pi with Fldigi software, sound-card and suitable transceiver could make an excellent QRP data station. Enjoy operating PSK31 with the Raspberry Pi.

Amateur Radio - more Pi applications

You can use the Raspberry Pi web browser to look up call signs on QRZ.com (http://www.qrz.com/) and to send electronic QSL cards via eQSL, http://eqsl.net/qslcard/index.cfm .

There is an article on the Raspberry Pi on page 48 of the April 2016 *QST*. It seems the Raspberry Pi is a perfect fit for the ham shack.

- 73 de Lovji, N2CKD

License Class

A free two day amateur radio license class sponsored by **Mount Beacon ARC** will be held on Saturday & Sunday, May 14 and 15. Location: Dutchess County Office of Emergency Management, 392 Creek Road (near Dutchess Community College), Poughkeepsie, NY 12601. For pre-registration and details, call William Baker, KC2LIX on 845-235-2048 or visit http://www.arrl.org/courses/poughkeepsie-ny-12603-1

This is a two-day intensive class for the Technician Level Amateur Radio license. A licensing exam will be given as part four of the day-two session starting at 1:00 p.m. — $15.00 fee required. The preferred book for the course is: *ARRL Ham Radio License Manual,* third edition.

Mount Beacon ARC's Spring Hamfest is scheduled for Sunday June 5.

Errata

Apologies for a couple of mistakes that crept into the March 2016 issue of *PCARA Update,* where we had a mix-up between milli (10^{-3}) and micro (10^{-6}).

In the article "Essential$_2$ cores", on page 13 of the March newsletter, please correct "55 mH" to "55μH". Further down the page, please change "3.43 millihenries" to "3.43 microhenries".

- *Ed.*

Aerial work

How would you maintain an antenna if it was attached to the side of a 107 foot water tank with no walkway around the edge?

The answer is that you would rent a large crane, then take your tower workers up to the antenna site in a man-basket, suspended from the crane's jib.

These photos were taken in late March while work was underway at the Benefield Boulevard water tank near the top of Jacobs Hill.
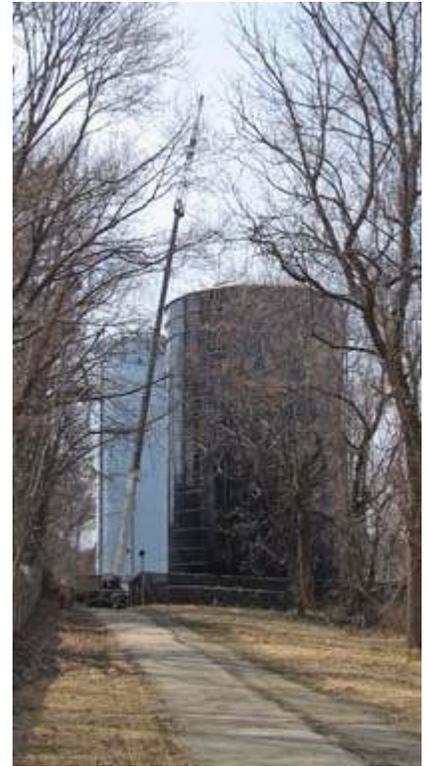
Truck mount crane from Costanzi.

Antenna workers make adjustments on the NE side of Benefield Boulevard water tank. Note the dangling hardline below the basket.

In late 2015 the City of Peekskill approved a request from Westchester County to improve reliability of the County's radio system for first responders and public transport radio. The County would replace two existing 9 ft high antennas on the water tank with 18 ft dual-feed antennas and install a new 11 GHz dish for linking its critical radio sites. The recent work pictured above may be in connection with this upgrade.

A funny thing happened

while walking my dog, Part II – N2CBH

More recycling

Last month I wrote about how I re-purposed a porta-ble tire inflator into a power source for my QRP radio. This month's installment was inspired by the QRP project. It occurred to me that having a portable HF antenna would be a nice accessory for the FT-817. Once again, I gathered up several items not intended for radio use.

Bob's portable setup was described in PCUD, March 2016.

Since removing my HF rig from the old car, I had a collection of **Hamstick antennas** designed for mobile use, which were beginning to collect dust. They are base-loaded whip antennas, tuned to each of the HF
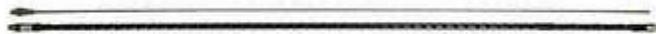
Hamstick-style HF antenna for 40 meters features a 4 ft fiberglass helical loading coil and 4 ft adjustable steel whip.

bands and more or less resonant, not requiring a tuner. My collection starts at 80 meters and goes on up to 10. The only one I do not have is for 12 meters.

Agri Supply 36" sprinkler stand is threaded for ½" fittings and sprinklers.

Back to the collection of stuff. I was trying to figure out what to do with a **sprinkler stand** that was left behind from a landscap-ing project. We actually used it as a sprinkler until the mechanism broke. I nearly put it out for bulk pickup but something told me — this thing had another life just waiting. Then it hit me! I could use it as a portable stand for the Hamstick antennas. The sprinkler stand was designed to be set into the sod and held in place by the soil. This would be perfect for a temporary installation.

After removing the broken sprinkler nozzle, all I needed to do was secure some sort of mount at the top to accept the antennas — which use a twist-lock system similar to a BNC connector. I had picked up a right angle SO-239-to-stud mount a while back. They are commonly avail-able at Hamfests and truck-stops for about $5.00. The bracket secured easily to the 0.5" heavy-wall pipe.

I had a heavy-duty spring left over from the old car that was pressed into use on top of the mount. I could have got away without the

SO-239-to-stud mount attached to sprinkler stand. [N2CBH pic.]

Heavy-duty spring mount left over from Bob's previous mobile installation.

spring but it should provide a little give in case of a high wind. Mounting the antenna on top would put the feed point approximately five feet above ground level.

I considered how I would attach the feed line and decided to use a short length of RG-58/U cable inserted through the inside of the pipe. This would serve two purposes. First it would keep the line from getting beat up during transit and, secondly, the pipe would act as an electrical shield for the coaxial cable. With the feed point that high in the air there could be some re-radiation from the antenna onto the coaxial cable's outer conduc-tor. (When radiation is impressed on the shield by proximity to the radiator itself, a choke balun is often effective.) I terminated the pigtail coming out of the bottom of the pipe with a PL-259 con-nector. A female barrel connector would allow connection to a longer cable to go over to the rig.

The next step was to come up with a bracket that could be mounted just under the feed point to attach some ground radials. I planned to use three wire radials, approximately 60 feet in length. This would cover 80 meters and up. The plan is to have three coils of insulated wire all attached to the bracket so that once you find a good spot to operate

Spring mount with coaxial cable fed through pipe.

from, you simply place the stand, connect the coax and unfurl the radials. Plastic tent pegs would hold the radials down. The attachment point for the radials is another aluminum L-bracket salvaged from an SO-239 antenna mount. Drilling three holes and installing three bolts and nuts would secure the ground radials.

L-bracket mounted below feed point for attachment of radials.

The whole setup should take less than 10 minutes to place and connect — and can just as quickly be stowed when operations are concluded.

Checks and conclusions

A few final thoughts on this project. I was able to re-purpose a bunch of old stuff to create something new and useful for field operation. While the antenna mount is more or less portable, the legs cannot be folded so the stand is a bit bulky — but it straps easily to a roof rack or can be put in the back of an SUV. Of course I could have skipped the whole exercise and used a dipole, but a wire antenna would require a more complicated setup using trees or other ways to support it. Because the Hamstick-type is a resonant antenna, no external tuner is required, simplifying operation and keeping the equipment count down.

Since building the radio power pack and antenna stand, I had a chance to try it all out a few weeks back. Unfortunately I chose a rather raw day to do it, but I was able to get the antenna set up in the back yard and connected to the rig. In 45 minutes, I managed to make several contacts on 40 and 15 meters, including a station in Spain on 15 meters.

Bob, N2CBH (left) describes his recycled sprinkler stand and portable radio set at the March 2016 meeting.

Keep in mind this was with **5 watts** and the antenna described in this article. Of course I swapped out the 40 meter antenna for a 15 meter antenna. I also tried 17 meters and could hear a lot of stations but had no luck in working anyone. A warmer day should provide more opportunities to work stations with this portable set up.
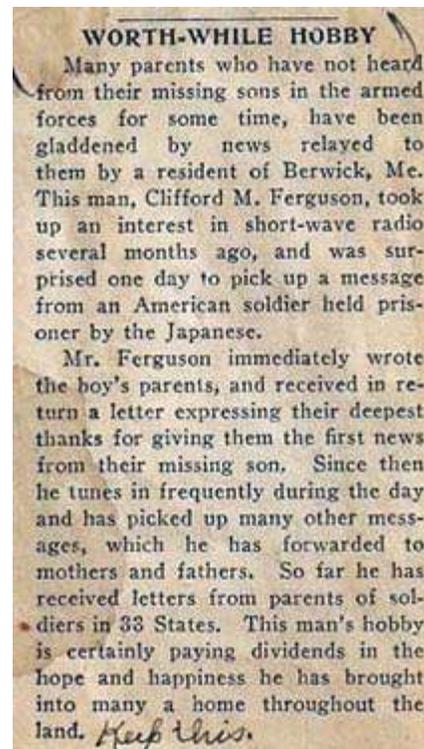
- Bob N2CBH

I never knew... - N2EAB

Having just had the opportunity to read my grandfather's journal I learned that I was not the only one in the family to be a short-wave enthusiast. Within the journal is pasted a newspaper clipping from 1945 describing my great uncle Clifford's 'Worth While Hobby'.

I can recall only visiting him once with my parents while a youth of 5 or 6 years of age.

Not having yet been bitten by the radio bug at that time, (that would come a few years later after assembling and listening to a Cub Scout crystal radio set), I was unaware of any radio equipment in the confines of his home.

Further reading unveiled a bit more about the man, he was a WW I veteran, serving as Assistant Bandmaster of the 126th infantry army band. A graduate of Kent's Hill Seminary and the Boston Conservatory of Music. He taught clarinet and saxophone at Towles of Boston and later had been a restorer of antique china and porcelain.

WORTH-WHILE HOBBY

Many parents who have not heard from their missing sons in the armed forces for some time, have been gladdened by news relayed to them by a resident of Berwick, Me. This man, Clifford M. Ferguson, took up an interest in short-wave radio several months ago, and was surprised one day to pick up a message from an American soldier held prisoner by the Japanese.

Mr. Ferguson immediately wrote the boy's parents, and received in return a letter expressing their deepest thanks for giving them the first news from their missing son. Since then he tunes in frequently during the day and has picked up many other messages, which he has forwarded to mothers and fathers. So far he has received letters from parents of soldiers in 33 States. This man's hobby is certainly paying dividends in the hope and happiness he has brought into many a home throughout the land. *Keep this.*

1945 clipping found in the journal of N2EAB's grandfather about Mike's Great Uncle Clifford.

- Mike, N2EAB

Peekskill / Cortlandt Amateur Radio Association

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Newsletter contributions are always very welcome!
Archive: http://home.lanline.com/~pcara/newslett.htm

PCARA Information

PCARA is a **Non-Profit Community Service Organization**. PCARA meetings take place the first Sunday of each month* at 3:00 p.m. in Dining Room B of NewYork-Presbyterian/Hudson Valley Hospital, Rt. 202, Cortlandt Manor, NY 10567. Drive round behind the main hospital building and enter from the rear (look for the oxygen tanks). Talk-in is available on the 146.67 repeater. *Apart from holidays and July/August break.

PCARA Repeaters

W2NYW: 146.67 MHz -0.6, PL 156.7Hz
KB2CQE: 449.925MHz -5.0, PL 179.9Hz
N2CBH: 448.725MHz -5.0, PL 107.2Hz

PCARA Calendar

Sun Apr 3: PCARA Meeting, Hudson Valley Hospital Center, 3:00 p.m.

Hamfests

Sat Apr 16: Splitrock ARA N. Jersey Hamfest, Roxbury Senior Center, 72 Eyland Ave., Succasunna NJ. 8:00 a.m.
Sun Apr 24: Orange County ARC Spring Hamfest, Town of Wallkill Community Center, 2 Wes Warren Dr., Middletown, NY. 8:00 a.m. PCARA **Club Table.**

VE Test Sessions

Apr 2, 9, 16, 23, 30: Westchester ARC Radio Barn, 4 Ledgewood Pl, Armonk, NY. 12 noon. Pre-register with M. Rapp, (914) 907-6482.
Apr 10: Yonkers ARC, Will Library, 1500 Central Park Ave, Yonkers NY, 1:00 p.m. Pre-register with John Costa, WB2AUL (914) 969-6548.
Apr 14: WECA, Westchester Co Fire Trg Cen, 4 Dana Rd., Valhalla, NY. 7:00 p.m. S. Rothman, (914) 949-1463.
Apr 18: Columbia Univ VE Team ARC, 531 Studebaker Bldg, 622 W 132nd St, New York. 6:30 p.m. Alan Crosswell (212) 854-3754.
Apr 24: Orange County ARC Hamfest, Town of Wallkill Community Center, 2 Wes Warren Dr., Middletown, NY. 9:00 a.m. Joseph DeLorenzo (845) 534-3146.
Apr 26: West Point Cadet Academy, Jefferson Library, 758 Cullum Rd, Rm JH401, West Point NY. 6:30 p.m. Pre-register with M. Sherburne (845) 938-5580.

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