PCARA Update

Volume 22, Issue 10 Peekskill/Cortlandt Amateur Radio Association Inc. October 2021

Not forgotten

The September **PCARA Membership Meeting** was held on Saturday September 11, 2021 in the grounds of John C. Hart Memorial Library in Shrub Oak, NY at 9:00 a.m. More than a dozen members gathered in the beautiful sunshine, on the 20th anniversary of one of the most heinous events in American history. A moment of silence was observed to remember and honor those we lost 20 years prior at the World Trade Center, the Pentagon, and in a field outside Shanksville Pennsylvania. Let us NEVER FORGET!

September's monthly meeting took place on the grass outside John C. Hart Library.

At the meeting we learned from Lou KD2ITZ that we had received a donation from Stop & Shop's **Community Bag Program** that sponsored PCARA as the non-profit for the month of August 2021. The program raised $160.00 — awesome! This is the second year that Stop & Shop has supported us. On behalf of the membership of PCARA and the community it serves, a very big THANK YOU to Stop & Shop of Peekskill! We are truly fortunate and grateful to have friends like you. At 11:00 a.m. a PCARA V.E. Test Session was held. There were two candidates: Greg KD2OLQ who upgraded from Technician to General, and Tim who became a new Technician with the callsign KD2WYY. Congratulations to both! Thanks to Verle W2VJ who acted as Team Liaison, our VEs, and the John C. Hart Memorial Library for use of their property.

On Saturday October 16, 2021 PCARA will be participating in the **New York State QSO Party** from the WA2MCR location or as a combined score of individual stations, due to COVID precautions. Please contact Joe WA2MCR if you plan on participating. The event runs from 10:00 a.m. to 10:00 p.m. EDT on Saturday. Further details are available at: http://nyqp.org/wordpress/ .

An annual event is returning this fall — the 41st Annual Harry Chapin Memorial **Run Against Hunger** on Sunday October 17, 2021 at the Croton-Harmon High School in Croton-on-Hudson, NY. PCARA and our friends at the Westchester Emergency Communications Association (WECA) have been invited back to help provide communications support. As in years past, we need volunteers to cover stations along the routes of the event. Details about the Harry Chapin Memorial Run Against Hunger can be found at: http://www.runagainsthunger.com/. Please come out and help us support a most worthwhile cause for our communities. If you are interested in helping, please email us at mail'at'pcara.org.

On Saturday October 23rd there will be a PCARA **Breakfast**, 9:00 a.m. at Downing Park Pavilion in Yorktown Heights. This will be followed by our second on-foot **Foxhunt** in FDR State Park, with transmissions starting at 10:45 a.m. Full details inside the newsletter.

Our next scheduled PCARA **Membership Meeting** is on Saturday October 2, 2021 at 9:00 a.m. on the grounds of the John C. Hart *Continued on page 2* ⇨

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Memorial Library in Shrub Oak, NY. Following the membership meeting a PCARA **V.E. Test Session** will be held at 11:00 a.m. at the library. If you know of anyone interested in taking an exam, please let them know. We've had excellent success with bringing new folks into the hobby. Let's keep it going!

I look forward to seeing each of you at the October 2nd meeting. Stay safe!

- 73 de Greg, KB2CQE

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Net night

Peekskill/Cortlandt Amateur Radio Association holds a roundtable net on Tuesday evenings at 8:00 p.m. and a directed 'Old Goats' net on Thursday evenings at 8:00 p.m. Both events take place on the 146.67 MHz W2NYW repeater, offset -0.600, PL 156.7 Hz.

Join the roundtable to find out what members have been doing or join the Old Goats with net control Karl N2KZ for news and neighborly information.

Run Against Hunger 2021

Seventh year

After a COVID pause in 2020, PCARA and WECA have once again been invited to provide communications support for the Harry Chapin Memorial Run Against Hunger, which takes place on **Sunday October 17**, 2021. The very first Run Against Hunger was organized in Croton-on-Hudson to honor singer-songwriter Harry Chapin who died in a Long Island auto-accident in 1981. For 2021 the run is being organized as a combined virtual event during October 9-16 with an in-person run on October 17th.

Sunday schedule

Timing of the races will be the same as for the 2019 event. The 5K Race/Walk starts at 8:30 a.m. This is followed by the 10K Race which begins at 10:00 a.m. The final event is the 1 mile Fun Run which begins at 11:45 a.m.. With the exception of the 'Fun Run', start and finish lines are all close to Croton-Harmon High School. l.

5K Race & Walk, 8:30 a.m. – 9:30 a.m.

The 5K Run/Walk begins near the High School and continues along Old Post Road South, down Truesdale Drive, east on Cedar Lane, then north up Nordica Drive and Truesdale Drive, through Croton Gorge and returning down Cleveland Drive to the High School.

10K Race, 10:00 a.m. – 11:30 a.m.

Starting from near Croton-Harmon High School on Old Post Road South, north on Cleveland Drive, left on Gerstein Street and right on Wood Road onto Rt 129. Left onto Batten Road, then across the New Croton Dam. Return is along Quaker Ridge Road, crossing the river at Quaker Bridge Road, then Rt.129 to Jacoby Street and returning down Cleveland Avenue to Old Post Road South and the High School.

Cub Scout Pack 28 offers refreshment to 10K runners at Water Stop #3 on Quaker Ridge Road during the 2019 Run Against Hunger.

One Mile Fun Run, 11:45 a.m. – 12:30 p.m.

The start point of this run/walk is on Cleveland Drive, just south of Veteran's Corners. North on Cleveland Drive to CET (Carrie E Tompkins) Elementary School on Gerstein Street, then back along Cleveland Drive, finishing at the High School.

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Full details of the three race routes are available at the Run Against Hunger web site, http://www.runagainsthunger.com/course/ . Maps showing location of the radio stations and water stops are available from Greg KB2CQE; just register your interest by sending Greg an e-mail using **mail'at'pcara.org**.

Please watch for announcements about possible changes to the routes and stations. Setup for Net Control at the High School should begin around 7:30 a.m. in the usual location on the driveway.

Adventures in DXing

- N2KZ

Time For Change

It happens to many of us. Your children get older and begin lives of their own. The excellent school district's taxes no longer seem purposeful. Only one bedroom is used and the refrigerator seems so empty. You are surrounded by things that no longer have any purpose. Your fixed retirement income must last a long, long time. It is time to face reality. It is time to downsize.

No doubt this is a big moment in a lifetime. You worked your entire life to build a comfortable and fulfilling world for you and your family. The time has come to move on. Let's be positive about this new beginning. Not having to work brings many, many new freedoms and possibilities. Don't wallow in sadness about change. Your life has just begun. Embrace the challenge!

No more mowers!

Consider your scenario: Your new world needs to be in a warm climate. No snow shoveling! It must be elevated away from flooding. It needs to be distant enough for privacy and have a community landscaping service. No more mowers! It would be best to have everything (or at least the master bedroom) on one floor. You want to become a part of an active community with sports, arts and entertainment. You want it all!

Make sure you are in a good state. (Maybe Delaware?) Research and discover where various types of senior retirement income are taxed the least. Which state offers the correct match for your financial portfolio? Your new home's location is important, too. Do you want to be situated along the East Coast or West Coast where domestic QSOs are reduced in favor of international stations — or — be centered in North America? More fine tuning: Do you want to be in an urban, suburban or rural setting? So many choices! Most important: Visit and become familiar with your chosen destination *before* you commit to a long-term stay!

You can tell a lot about a location just driving through it. Let your car's AM radio be your guide. The last thing you want to do is move into a neighborhood that is laden with electrical noise! Pick an unused AM radio frequency and see what you can and can not hear. If it is crystal clear, you may have a plan. If it is all buzzes and hums, run! Remember: Being situated high up on a hill and away from others is always a plus.

It also helps to consider local ground conductivity. Lots of deep moist soil is great for constructing efficient ground systems — always a delight for low band HF operators. One trick I use: tune to an AM frequency that has a strong but distant station on it (WBAL 1090 Baltimore, WBZ 1030 Boston, WHAM 1180 Rochester and WGY 810 Schenectady come to mind.) Ride around and see how well you can pick them up in the height of daytime as a great gauge of your new location's DX ability.

What about ham radio? Think about operating in a proposed new location. Are there local amateur radio clubs nearby?... and what do they offer? Do they share your interests? Will you be able to reach their repeaters? Do they offer annual Field Day events? What bands and exact frequencies will you want to be active on? Will your new antenna farm be welcomed into the community you are aiming for?

Is there a room in your prospective new home that could be used as a ham shack without considerable work and modification? Would antenna feedlines reach it without effort? Is there adequate electricity present for your equipment? Can a ground wire reach the room? Are there powerful local radio or TV broadcasters nearby that may challenge your new existence? Can local television stations be seen over-the air or will you require cable or satellite subscriptions to fill that need? (Remember television? I watched it as a child...)

Trying Not to Be Seen

When searching for a retirement home, one big consideration is becoming part of an HOA — Home Owner's Association. Many people find HOAs essential to create an aesthetically desirable environment and a means to protect the overall worth of their property investment. These are not places that allow tall support towers or even backyard wire antennas. What to do?

You can hide... literally. Great antenna farms have been built in attics. Make sure you have some sort of attic! Will a short 6 foot tall 2m/440 MHz vertical fit in your new attic? You need 18 horizontal feet for a ten meter dipole, 23 feet for a 15 meter dipole and 35 feet for a 20 meter dipole. Of course, you can fold over

ends of dipoles and try all sorts of antennas — but it's a start. Is there room in the attic to rotate a small Yagi on the VHF/UHF band of your choice? Any one of these specifications may be essential to your operating future! Also look to see if the attic is floored. It is a big help when you don't have to balance on support beams and risk traveling to lower floors in a very ungraceful and surprising manner!

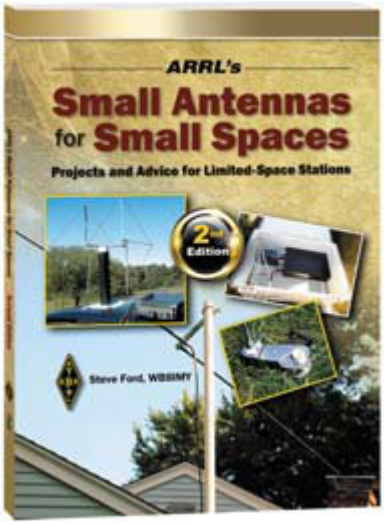
Another important tip: To remain '*under the radar*' and out of sight and neighbor awareness, it is essential to keep your operating power as low as possible. Take my example hosting the weekly PCARA Old Goats Net. I use an indoor four-element 2 meter Yagi at 5 watts to hit the PCARA repeater at a distance of about 15 miles away. Not only is my power low but it is concentrated in one direction to be most efficient. It works very well!

Years and years ago, my aunt and uncle took me to visit a friend of theirs who was a seasoned amateur radio operator in Connecticut. He lived in a small one-family house and his antenna farm was in his attic. An avid CW devotee, he used a sophisticated trap dipole called a Cliff Dweller and operated exclusively on 40 meters. I could see from his QSL card collection that he literally worked all over the world and enjoyed every minute of it!

One person I much admire, Stan Levandowski, WB2LQF, is a master creator of discreetly hidden antennas. *"Although I live within certain antenna restrictions in our retirement townhome community, I am fortunate to have the HOA's permission to have an outside antenna. It didn't hurt my case when I volunteered for the Board and was elected Vice-President. I only have one antenna and it's a good one! My antenna is a 63' MyAntenna's EFHW4010 End Fed erected as an Inverted-L."* Lesson learned: If you want to get the approval of a home owners' association, be an official on their Board! Stan is a legendary CW operator and collector of exotic Morse keys and bugs. His career as a CW op spans about 60 years, (some of those years as a Navy Radioman) so he certainly qualifies as a grand old ham!

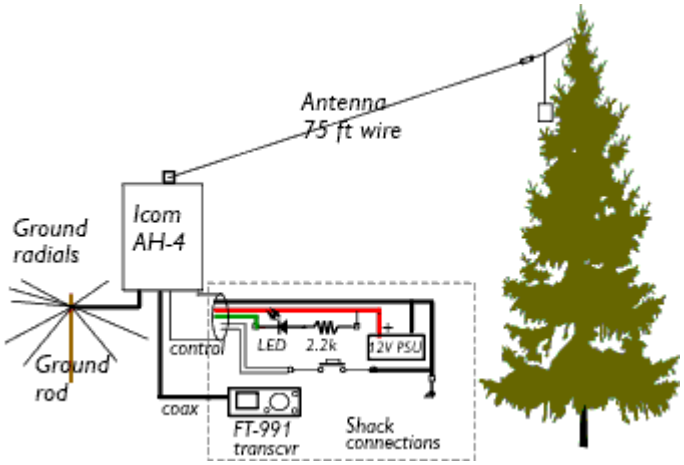
Camouflaging antennas is limited only by your imagination. Classic disguises include doubling as a weather vane, a flag pole, a funny looking tree or a farmer's electric fence. Run a stealthy wire along the edge of a rooftop or even under roofs. My recent experiments with NVIS (Near Vertical Incidence Skywave) antennas on 60 meters proved to me that a properly built dipole, mounted five feet off the ground, makes an effective radiator that can be heard at great distances. Special bonus: It is a very quiet receiving antenna, too! (See *PCARA Update* January and May 2020.) A nicely placed NVIS design might be the answer to a restricted amateur's dream! Out of sight = out of mind. Nobody might ever know that really *is* an antenna... and a good one, at that!

The ARRL offers a concise and inexpensive idea book for amateurs with space restrictions: 'Small Antennas for Small Spaces' by Steve Ford, WB8IMY. I like to think of it as a workbook to get started thinking about antennas that require very little real estate. It is a quick read at almost 50 pages long but there are some great ideas inside.



One design caught my eye after hearing about it from a friend over in Scotland. If antennas can never be seen on your property, how about antennas that can really hide? All you need is a fence! Country fence posts or a wood slat privacy fence may be all you need for mounting! Suddenly, you have a wonderful place to support a NVIS dipole. Simply put, you run your wires along the top of the inside of the fence. The coaxial lead-in can be buried under your lawn to get back to your shack. To preserve the coax from the weather, you can send it through a length of narrow PVC pipe for burial.

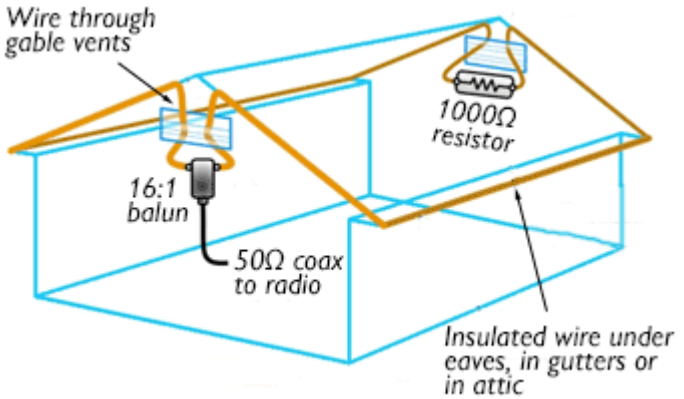
Another popular stealth antenna is the *end-fed wire*. Simply fly a long wire as high up as you can. Use a bow and arrow, potato or tennis ball shooter or other means to propel just as high as you can! It is best to isolate the top end of the wire from tree branches with an insulator and a rope down to tie it in place within reach. The long wire can go directly to your rig. Hint: Use wire with grey insulation to gently blend into the sky and out of sight. 14 gauge wire is a good compromise between strength and visibility. A group of radial wires can create a useful counterpoise ground system. An antenna tuner can either be mounted outside or inside the wall to your shack to complete the system. Fellow *PCARAn* Bob, N2CBH, built an end fed long wire and achieved stellar results.



Connection of an end-fed long-wire antenna and ground system to an Icom AH-4 antenna tuner as described by Bob N2CBH in PCARA Update for October 2018. [N2CBH diag.]

One antenna idea really caught my eye: The Broadband Butterfly Terminated Dipole Antenna (house roof version) designed by Bonnie Crystal KQ6XA. It is a fascinating and simple broadband design, custom made for hidden installation. Two equal length wires hug the outside perimeter of your house or the inside of your attic. At the far end you'll find a 1000 ohm high power terminating resistor and the coaxial feed line attaches to a 16:1 high-Z balun.

Bonnie Crystal KQ6XA.



Broadband Butterfly Terminated Dipole Antenna covers 1.8 - 54 MHz with SWR <2:1. Total wire can be any length to fit around house perimeter. 1000Ω terminating resistor should have same power rating as transmitter output. [After Bonnie Crystal KQ6XA.]

Reviews of this family of antennas seem nearly miraculous. Without cumbersome hanging traps or a multitude of elements, the BBTD performs remarkably below a 2:1 SWR throughout its bandwidth all across the HF range. The lowest usable frequency is determined by the length of the wire elements. The longer you go — the lower you go! Take a look at all of the many variants to Bonnie's amazing designs at http://hflink.com/antenna/#BBTD . You'll also find an entertaining installation video at: https://www.youtube.com/watch?v=Y473hOmif-E. I really want to try one of these! Really? An all-band antenna that works?

Final Thought

Attach a tag to each piece of your equipment in your shack. Indicate the make, model number and use of each device for someone else's reference. When a lifetime's enormous collection of interesting things needs to find new homes, these tags will make the job effortless. Also, gather all your equipment manuals into one central place for easy access and discovery. Someone will be grateful you did!

"Well, as far as retirement, everyone has to try it once." - Chris Hansen KC8ZMN

Until next month, Happy Halloween and 73 de N2KZ "The Old Goat."

Visit to Northeast HamXposition – KD2EVI

On Thursday September 8, I drove to the Best Western hotel in Marlborough, Massachusetts to attend the HamXpo. This event, which was also the ARRL New England Division Convention combined a large flea market (perhaps 1/3 the size of the Sussex Hamfest), with a scheduled 2½ day of seminars and presentations, similar to Ham Radio University that has been held on Long Island. The drive time was over three hours, approximately 3h 45m up with traffic and weather delays and 3h 10m to return.

The hotel was located on Route 20 close to the exit from I-495. There are several large chain hotels, smaller office buildings, and open shopping centers in the immediate area. The Best Western was clean and in good condition. HamXpo attendees received a discounted rate. Due to Covid precautions, housekeeping does not clean rooms daily and one has to pick up extra towels at the front desk. The restaurant in the lobby did not open until Friday evening and was only open in the evening, but the breakfast buffet is open every morning.

The Best Western Royal Hotel & Trade Center is located some 30 miles west of Boston, Mass. [KD2EVI pics.]

I had dinner Thursday evening with former PCARA members Ray, W2CH and Marylyn, KC2NKU at a nearby restaurant. The flea market opened on Friday morning, and a Skywarn seminar was scheduled for Friday afternoon. I had hoped to attend the seminar, but the presenter did not arrive and it was canceled. The indoor exhibition space included the Nashua Area Radio Society which had a large exhibit showing their various club activities such as fox hunts and satellite operations. Quicksilver Radio, RF Finder and other commercial exhibitors were present on Saturday. MFJ and Ham Radio Outlet were not there, reportedly due to concerns about COVID-19.

Ray W2CH and Marylyn KC2NKU had a flea market table.

HamXpo outdoor flea market.

The flea market was busy and vendors seemed to be enjoying good sales. There was even an Enigma machine for sale for only $739,000! I don't think it sold. Fortunately the weather was pleasant, with only a brief light rain on Saturday.

Enigma cipher machine.

After the keynote address on Saturday, I did manage to attend a seminar on satellite operation and a high altitude balloon seminar given by Max Kendall W0MXX, a young (10 year old) amateur. The balloon package was encased in a Styrofoam cooler and controlled by an Arduino. The satellite talk given by Robert Hayes KB1SWZ focused on FM satellites. AMSAT was selling copies of "Getting Started with Amateur Satellites" after the seminar. I purchased a copy and the book contains much practical information.

There were over thirty seminars and forums held on Saturday September 11, and fifteen on Sunday morning. Topics included Introduction to the NanoVNA, Emergency Communications, Portable Operation, Youth & YL forums, and Spy Radios among others. A banquet was held Saturday evening. I left Saturday afternoon after lunch, having only made reservations for Thursday and Friday nights. A complete listing of forums and other information can be found at: https://hamxposition.org. If I were to attend in the future, I would plan to attend all three days to take advantage of the forums.

- David KD2EVI

V.E. Test Session

PCARA's latest V.E. Test Session was held on Saturday September 11th in the grounds of John C. Hart Library at Shrub Oak. Mike W2IG was indisposed, so Verle W2VJ took over the role of VE Team Liaison, organizing all the paperwork under the guidance of experienced VEs Stan WA2NRV and Joe W2BCC.

Verle W2VJ (standing left) keeps an eye on candidate paperwork with Joe W2BCC (standing) and Stan WA2NRV.

There were two candidates. Encouraged by his father Skip W2ZA, **Greg KD2OLQ** from Hyde Park NY upgraded from Tech to General. **Tim Goetz** from Hopewell Junction successfully passed the Tech exam and on September 15 was granted the new call sign **KD2WYY** by the FCC.

Greg KD2OLQ (center) receives his CSCE from Lou KD2ITZ for the upgrade from Tech to General. Greg's father Skip W2ZA is on the left.

Thanks to the volunteer examiners who took part in this Test Session — to Verle W2VJ, Joe W2BCC, Lou KD2ITZ, Larry AC2QH, Stan WA2NRV and NM9J.

PCARA's next V.E. Test Session will take place at 11:00 a.m. on Saturday October 2nd, outdoors at the John C. Hart Library in Shrub Oak, following the October monthly meeting. Candidates must contact Mike W2IG using: w2igg'at'yahoo.com. - NM9J

FCC Part 95 changes

In early August the Federal Communications Commission (FCC) amended Part 95 rules for Personal Radio Services. For the CB Radio Service, a petition from Cobra Electronics Corporation supported by President Electronics was approved. This will allow **Frequency Modulation** to be added to the modes available on AM or AM/SSB CB transceivers. Power output on FM remains at 4 watts, the same as AM, with maximum deviation ±2 kHz and authorized bandwidth of 8 kHz. Equipment will still need to be type-approved and FM-capable radios for the USA market are not expected until 2022.

Across the pond, use of FM was the *only* mode allowed in the original U.K. CB Radio specification for 27 MHz introduced in 1981. AM and SSB were added in 2014 on the CEPT (European Conference of Postal and Telecommunications Administrations) harmonized channels.

President 'McKinley' transceiver for the European CB market includes AM, FM and SSB modes.

For the GMRS and FRS services, approval of a petition from Motorola will allow automatic or periodic transmission of location information where it was previously permitted on a manual basis. Corrections will also be made to medical device rules.

Ten-digit dialing

The Federal Communications Commission has adopted **988** as a new 3-digit number to be used nationwide to reach the National Suicide Prevention and Mental Health Crisis Lifeline. Area codes that already include a central office code of 988 would introduce a conflict if they continued to allow 7-digit dialing. As a result, 7-digit dialing will no longer be available in a number of locations, including New York State's 914 (Westchester) and 845 area codes. For the full list, see: https://www.verizon.com/support/residential/homephone/area-international-info/ten-digit-dialing

From **October 24, 2021**, within these area codes you will have to dial AREA CODE + TELEPHONE NUMBER for all local calls, for example 914 734-1002 for Cortlandt Town Hall. Local calls dialed with only 7 digits may not be completed, and a recording will inform you that the call cannot be completed as dialed.

Now is the time to check any devices with stored 7-digit telephone numbers including speed-dial phones, fax machines, dial-up modems (are there any left?) and alarm systems.

Digital scanner for the Manor

Nothing to hear here

A couple of months ago, Greg KB2CQE told me that Westchester County Police had been heard testing digital voice transmission. From my time commuting to Dobbs Ferry, I was well aware that the County Police keep a close eye on Westchester's Parkways, including the Saw Mill River Parkway. But after a couple of weather emergencies, I realized that my scanner was no longer receiving any mention of flooded parkways. Why had I not heard any activity?

A check with my old PRO-2035 FM scanner revealed the cause… there was activity on the WCPD high-band frequency but it now consisted of a buzz-hiss rhythm every time the carrier appeared. My more modern Bearcat scanner was staying quiet, as it was programmed to only respond on this frequency when a 192.8 Hz CTCSS (PL™) tone was present. With no sub-audible tone, the FM scanner was staying muted.

The Uniden BCT15X scanner was staying muted as it was programmed to require a 192.8 Hz CTCSS tone.

Lovji N2CKD (left) has a friendly encounter with an officer of Westchester County Police at the Church of the Holy Spirit 50th Jubilee.

What's the buzz?

I looked around to find out why Westchester County Department of Public Safety had changed its high-band mobile radios from analog to digital. A useful page on the Westchester County web site explains that:

"Westchester County is in the construction stage of replacing the County's mission-critical radio systems that presently serve the Department of Emergency Services, Department of Public Safety, and Department of Public Works and Transportation." (https://emergencyservices.westchestergov.com/radio-systems-updates)

There are training videos available on the same web page for use of Motorola APX™ 8000 portable and APX 8500 mobile radios. These are four-band analog-FM and **APCO25** / **P25** digital radios for use by public safety personnel in conventional and trunked systems. Frequency coverage is 136-174 MHz, 380-470 MHz, 450-520 MHz and the 700 MHz and 800 MHz bands. Price per radio is in the $4000+ region, rising to considerably more with all the extras!

Motorola APX™ 8500 all-band P25 mobile radio.

In a 2018 presentation on Radio Projects by WB2NHC there is a Stage 1 bullet point to replace the existing F1/F3 conventional system with new VHF P25 Phase 1 equipment. Use of P25 Phase 1 by Westchester County PD was confirmed on the RadioReference web site (https://www.radioreference.com/apps/db/?ctid=1884) where "WCPD Ch 1/2" is now shown with Mode: **P25** instead of **FMN**. (If you have a serious interest in scanning, or need to program scanner equipment using software, a subscription to RadioReference is recommended.)

P25 Phase 1

APCO Project 25 (P25) is a joint effort of the Association of Public-Safety Communications Officials and the National Association of State Telecommunications Directors to develop standards for land mobile radio, allowing emergency responders in North America to exchange critical communications between different agencies. P25 fills a similar role to Europe's "TETRA" (Terrestrial Trunked Radio) protocol. For more information about P25 see: https://www.apcointl.org/technology/interoperability/project-25/

P25 Phase 1 was completed in 1995 and specifies radio systems operating at 12.5 kHz channel bandwidth in analog, digital or mixed mode. Radios use Continuous 4-level FM (**C4FM**) modulation, similar to Yaesu System Fusion radios. P25 Phase 1 employs a symbol rate of 4800 baud with 2-bits per symbol, yielding 9600 bits per second and originally used an IMBE™ full-rate voice encoder*. Yaesu System Fusion attains a

similar 9600 bps in a 12.5 kHz channel, using the AMBE+2™ vocoder with different splits between voice and data compared to P25.

[*__IMBE™__ = Improved MultiBand Excitation vocoder, __AMBE®__ = Advanced MultiBand Excitation codec from Digital Voice Systems, Inc. (DVSI) of Westford, MA. DVSI offers software licenses and dedicated chips for these encoders/decoders.]

In C4FM, the carrier frequency *fc* is moved to four frequency offsets, representing four different two-bit combinations. Here are the values for Yaesu System Fusion and P25 Phase 1

C4FM transmission symbols

Symbol	Dibit	Deviation	
		Yaesu	P25 Phase 1
+1	00	*fc* + 900 Hz	*fc* + 600 Hz
+3	01	*fc* + 2700 Hz	*fc* + 1800 Hz
−1	10	*fc* - 900 Hz	*fc* - 600 Hz
−3	11	*fc* - 2700 Hz	*fc* - 1800 Hz

In order to transmit digital voice, the analog voice signal is converted into packets of compressed digital data using the appropriate vocoder, the bitstream is filtered then applied to a frequency modulated stage in the transmitter. On receive, the C4FM signal is applied to a discriminator stage where the bitstream is recovered and applied to a de-vocoder. These conversion processes can be accomplished with digital signal processing and allow backward compatibility with analog FM systems.

In P25 Phase 1, the IMBE vocoder operates at 4400 bits per second, with an additional 2800 bps used for forward error correction (FEC). 2400 bps is reserved for continuous digital overhead information, for a total of 9600 bps. The digital overhead can include Source and Destination ID, talk groups (TGID), network access codes (NAC) and emergency flags.

In Yaesu System Fusion, the AMBE+2 vocoder can run at either 3600 bps for mixed Voice/Data mode (V/D) or at 7200 bps for "Voice full rate mode" (Voice FR). In Voice/Data mode the remaining 4800 bps is used for transmitting call sign, GPS position data etc.

How to receive?

If Westchester County PD had changed from FM to P25 Phase 1, the next question was how to receive it. At the time of writing, other agencies in the Peekskill/Cortlandt area are still using conventional FM or trunked analog FM, which my Bearcat BCT15X scanner can cope with. But there would be a hole in coverage if the County Police was no longer audible — especially as they provide patrol services in the Town of Cortlandt.

I carried out a quick check on my Yaesu FTM-100D System Fusion radio — it could receive the digital 'noise' on 155.310 MHz, but could not decode any audio (as expected.) I checked Broadcastify, which has a number of live feeds of Westchester County agencies… but without any digital reception at the time of writing. See: https://www.broadcastify.com/listen/ctid/1884

If you have an SDR receiver that covers the VHF/UHF mobile radio bands, then it may be possible to add software that will decode P25 transmissions. See: https://www.rtl-sdr.com/rtl-sdr-radio-scanner-tutorial-decoding-digital-voice-p25-with-dsd/ and https://www.rtl-sdr.com/tag/op25/ .

I had a look at modern scanners with digital voice capability and had a nasty shock. Several models are available from Uniden and Whistler, but prices are two to four times the cost of a $170 Bearcat BCT-15X.

Portables	
Uniden BCD325P2	$340
Uniden BCD436HP	$450
Whistler WS1040*	$341
Whistler TRX-1	$513
Base/mobile	
Uniden HomePatrrol-2	$470
Uniden BCD536HP	$495
Uniden BCD996P2	$582
Uniden SDS200	$700
Whistler WS1065*	$270
Whistler TRX-2	$611

* = P25 Phase 1 only.

The low-cost **Whistler WS1065** is just $270, but it can only receive **P25 Phase 1** transmissions, not Phase 2 (more of which later). I thought the photo looked familiar and realized this is the same scanner as the GRE PSR-600 and Radio Shack PRO-197, vintage 2008. I had purchased a PRO-197 at the BARA Hamfest in 2014 — there is a review in *PCARA Update* for July 2014, p10.

Whistler WS1065 digital trunking scanner.

Come back to the shack

The PRO-197 was stored in the basement, so I found the cardboard box, unpacked the contents and tried reception on WCPD Ch1/2. Since mode was set to NFM and CTCSS tone 192.8 Hz there was no audio.

The PRO-197 can be programmed using a Windows PC connected via USB programming cable. I had a copy of Butel Software's ARC500 on my Windows 10 notebook. The Butel software can import data from the RadioReference Internet site — though this requires a subscription. I carried out a test import of RadioReference data for Westchester PD and noted the essential

characteristics for “WCPD Ch 1/2”:

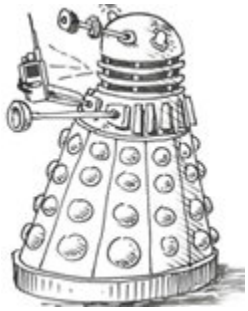
Freq	Alpha tag	SQ Mode	SQ Code	Mode
155.310	WCPD Ch 1/2	P25	154	Auto

With the SQ Mode and SQ Code changed in the ARC500 software, I uploaded data back to the scanner and began listening. Success! I was now receiving audio on 155.310 MHz. The audio quality from “Headquarters” was somewhat mechanical, even more so when mobile units were being repeated. There was no carrier hiss, no mobile flutter and no squelch tail — instead the voices appear out of nowhere and disappear just as quietly.

Radio Shack PRO-197 digital trunking scanner receiving P25 Phase 1.

I returned the PRO-197 to its place in the radio room and connected a VHF/UHF discone antenna in the loft. It has been receiving P25 Phase I successfully for several weeks.

Radio sounds rotten?


Audio quality of digital voice radios can sound robotic.

Audio quality on digital voice radios can be very different from analog FM, whether it is Public Service P25, Business Radio DMR, or Amateur Radio D-STAR / System Fusion. This is in contrast with digital audio on Compact Discs, DVD, MPEG or Internet Radio — where compression is less and bit rates are much higher, for example 1,411.2 kbps for an audio CD.

The widely used AMBE vocoders take the voice signal and divide it into short segments, with each segment represented by a set of model parameters such as pitch, voicing state and spectral envelope. Background noise is removed then the packeted bitstream modulates the transmitter. The result is a medium-low data rate of less than 8 kbps. At the receiver, the decoder carries out error correction then tries to synthesize the original voice signal — as best it can if bits are mangled or went missing *en route*. The result can sound mechanical, especially if the audio signal from the microphone was poor to begin with.

A training video from the International Association of Fire Chiefs and Motorola... https://youtu.be/SrC09IsByWM recommends the technique: **Shield – Move – Talk** where mobiles and portables should SHIELD the microphone from noise, MOVE the microphone to 1" to 2" directly in front of the mouth then TALK in a loud, clear controlled voice without shouting.

Is it legal?

Monitoring police transmissions from home is permitted in the United States provided signals are not encrypted. In New York State, equipping a vehicle with a radio receiver capable of receiving signals on police frequencies is *not* allowed, see New York State Legislation Section 397, https://www.nysenate.gov/legislation/laws/VAT/397 . Licensed radio amateurs have an exemption thanks to FCC Preemption docket No. 91-36, allowing amateur band transceivers capable of receiving other services not prevented by Federal law. See: http://www.arrl.org/files/file/pr91-36.pdf (PDF file).

For how long?

How long will a P25 Phase 1 scanner be sufficient? Going back to the County’s 2018 presentation, additional bullet points were to replace the existing **trunk system** with new UHF **P25 Phase 2** equipment and move to 700 MHz if **T-Band** would be reallocated.

Trunk calls


Westchester County radio tower on Mohansic Golf Course in Yorktown.

As explained in *PCARA Update* for September 2008, p4, a trunked radio system allows a small number of radio channels to be shared among a large number of different users, assigned to different ‘talkgroups’.

In Westchester, the county has a hybrid trunked radio system which relies on Motorola Type-II UHF technology. It provides inter-communication between Westchester’s Emergency Communications Center in Valhalla (60-Control), fire departments, ambulances, hospitals, police and buses. The system uses twelve UHF channels in the 470 MHz range — six north and six south. Locations for the northern zone include the Benefield Boulevard water tank in Peekskill, Mohansic Golf Course in Yorktown and Pinesbridge Road in Ossining.

T-Band giveback gone

The UHF T-Band of 470 – 512 MHz, corresponding to UHF TV channels 14-20, is used for land mobile radio in eleven metropolitan areas including New York and NE New Jersey. The Middle Class Tax Relief and Job Creation Act of 2012 directed the FCC to reallocate this RF spectrum so it could be auctioned off for com-

mercial use. Proceeds from the competitive bidding process would then be employed to cover the cost of relocating public safety services to other parts of the RF spectrum, including the 700 and 800 MHz bands.

Westchester County was planning to move its UHF trunked system from 470 MHz to 700 MHz if required by the FCC. Westchester's hilly topography would reduce range, requiring more base station sites. Additional sites were also needed to provide hand-portable coverage throughout the county. Motorola APX 8500 mobile transceivers were chosen for the planned upgrade as they are capable of multi-band operation on analog and digital modes, including the 450-520 and 700 MHz bands.

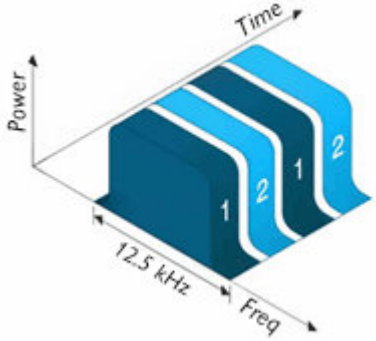
By the year 2020, relocation of existing T-Band users was looking increasingly difficult — in many areas there was insufficient RF spectrum to relocate Public Safety systems — and even if spectrum was available, the proceeds from auctioning off 470-512 MHz would be insufficient to fund relocation. So, in the "Consolidated Appropriations Act, 2021," signed into law by then-President Trump in December 2020, the FCC was *no longer* required to begin auctioning off T-Band frequencies in 2021. Instead, FCC began accepting applications from incumbent users to expand and modify their T-Band systems.

Trunking to stay on T-band

With the requirement to relocate to 700 MHz removed, Westchester's UHF trunking system will stay on T-band. The "Stage 1" plan calls for replacement of the existing trunk system's obsolete radios with new UHF **P25 Phase 2** equipment. The existing nine base station sites are having eight new sites added to improve hand-portable coverage, including "WHUD Peekskill" (sic).

What is P25 Phase 2?

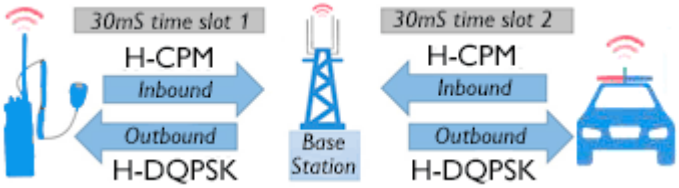
Compared with Phase 1, the P25 Phase 2 standard from 2010 adds support for digital trunking systems. Spectrum efficiency is improved to a 6.25 kHz "bandwidth equivalent" with two voice channels supported per 12.5 kHz of RF spectrum. This is achieved using the same technology as DMR — two-slot TDMA (time division multiple access), where the digital bitstream carries two different voice signals by alternating between the two sources.



P25 Phase 2 employs TDMA, with two time slots, each slot carrying a different voice channel.

Total throughput is increased to 12,000 bps by a more complex modulation scheme. Each voice channel has access to 6,000 bps — this is accomplished using the DVSI enhanced AMBE+2 vocoder's half-rate of 3,600 bps for voice data and forward error correction — similar to Yaesu System Fusion in mixed Voice/Data (V/D) mode. An additional 2,400 bps for signaling and control is employed for each voice channel.

Instead of two-way C4FM modulation, P25 Phase 2 employs two different schemes for inbound and outbound transmission between the fixed base station and mobiles. Mobile stations transmit to the base using Harmonized Continuous Phase Modulation (H-CPM), similar to C4FM, which can employ non-linear, Class C amplifiers. As part of the two-slot TDMA, each mobile sends within its own set of 30 millisecond time slots, so it is only transmitting for 50% of the time, saving battery life. This also allows reception of the base station's data stream in periods when the mobile transmitter is off. The base station transmits continuously to mobiles using Harmonized Differential Quadrature Phase Shift Keyed modulation (H-DQPSK). This method has an amplitude component and requires linear amplifiers.



P25 Phase 2 employs two-slot TDMA within a 12.5 kHz voice channel, with different modulation schemes inbound and outbound.

What is needed?

When Westchester County changes its UHF trunked radio to an all-digital scheme — possibly as soon as November — then invites other agencies to join, monitoring will require a modern scanner capable of receiving P25 Phase 2 transmissions. Suitable equipment from Uniden and Whistler is expensive — $340 to $700. Rumors suggest the high cost covers not just R&D and materials but also the license for DVSI's vocoder.

Uniden SDS200 digital trunking scanner with I/Q reception costs $700+.

If you choose a scanner from Uniden, additional digital voice modes such as DMR, EDACS ProVoice (Harris) and NXDN (Icom/Kenwood) will require purchase of additional license keys. Ouch!

- NM9J

New York QSO Party

The New York QSO Party, sponsored by the Rochester DX Association, takes place on the third Saturday in October. For 2021, this date falls on Saturday October 16th. The contest lasts twelve hours using all modes on HF and VHF/UHF bands. Because of COVID concerns, last year's club entry was a joint effort by six PCARA members who submitted individual entries so the combined score could be included in the 'New York High Score Award'. PCARA's combined score of 45,633 points placed us twelfth out of 111 club entries.

For 2021, Joe WA2MCR said he is willing to run PCARA's NYQP effort from his own location as a multi-operator "multi-one low-mixed" entry once again. For members who prefer to operate from their own stations, there is the ability to submit individual entries while nominating PCARA for "New York Club High Score". For example David K2WPM is planning to submit a multi-one mobile entry from several rare counties this time around. Please let Joe, WA2MCR, know your plans for participating in the NY QSO Party (e-mail: wa2mcr'at'arrl.net).

Verle W2VJ and Joe WA2MCR operate from Joe's sun room in the 2019 New York QSO Party.

Once again, PCARA is sponsoring two plaques — funds have been submitted by David KD2EVI for the "Multi-One Low Mixed" and "Non-New York SSB Low Power" plaques. "Multi-One Low Mixed" means: multiple operators with only a single transmitted signal, 5 – 100 watts, mixed mode (CW/Phone/Digital).

The contest starts at 10:00 a.m. Eastern (1400 GMT) on Saturday October 16 and runs for 12 hours until 10:00 p.m. that same evening. New York stations send signal report plus county, using a three-letter abbreviation for the county name. Westchester County is WES and Putnam County is PUT. Stations outside New York will send their Signal Report plus State, Province or "DX". Full rules, including the list of three-letter county codes, can be found at the New York QSO Party web site: http://nyqp.org/wordpress/

If you would like to employ the same computer logging software as seen at previous PCARA events, N3FJP's State QSO Party logging programs are available from the following page: https://n3fjp.com/stateqsoparty.html . Registration for the NY State program is $8.99, or you can register all of N3FJP's logging programs for $49.99. The N1MM Logger, https://n1mmwp.hamdocs.com/ can also be used. Set-up instructions are available at the NYQP web site under "Info you can use".

- NM9J

PCARA Foxhunt Oct 23

- Transmission: FM simplex on 146.565 MHz.
- Transmissions start at 10:45 a.m.
- All are welcome to participate.
- Participants are not allowed to enter FDR Park before 10:30 a.m. (unless meeting for PCARA breakfast at the usual location).
- Depending on the number of participants, the start times may be staggered. Participants must start in the FDR Pool Parking lot.
- Depending on the number of participants, some participants will be invited to start from a different location.
- The transmitter will be hidden within the confines of FDR Park.
- Once the event begins, participants must remain on foot, without assistance of vehicles of any kind.
- Participants are encouraged to work in groups of two or three.
- Participants who locate the transmitter should discreetly inform the event coordinator who will note the time. Avoid revealing the site to other participants who are still hunting.

Hunters report to coordinator Al K2DMV in May 1 hunt.

- The participant who locates the transmitter in the least amount of time will be invited to assume the role of fox at the next event.
- Any changes due to weather or unforeseen circumstances will be posted to the PCARA Google Group and Facebook Page.

- Lou KD2ITZ

Peekskill / Cortlandt Amateur Radio Association

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Web site: http://www.pcara.org
PCARA on Facebook: http://facebook.com/pcarahamradio
***PCARA Update* Editor:** Malcolm Pritchard, NM9J
E-mail: NM9J 'at' arrl.net
Newsletter contributions are always very welcome!
Archive: http://nm9j.com/pcara/newslett.htm

PCARA Information

PCARA is a **Non-Profit Community Service Organization**. PCARA meetings take place the first Sunday of each month (apart from holidays, July/August break and pandemics). Talk-in is available on the 146.67 repeater.

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

Masks and Social Distancing may be required.

Sat October 2: PCARA Membership meeting, 9:00 a.m., John C. Hart Memorial Library, 1130 E Main St., Shrub Oak, NY. Outdoors, bring your own chair.
Sat October 2: PCARA V.E. Test Session, 11:00 a.m., John C. Hart Memorial Library, Shrub Oak. Outdoors, see below.
Sat October 16: New York State QSO Party at WA2MCR.
Sun October 17: Run Against Hunger, Croton-on-Hudson
Sat October 23: PCARA Breakfast, 9:00 a.m. Downing Park Pavilion, 2881 Crompond Rd. (Rt 202), Yorktown.
Sat October 23: PCARA Fall Foxhunt on-foot, 10:30 a.m. Pool Parking Lot, FDR State Park, Yorktown.

Hamfests

Check with organizers before leaving.

Sat Oct 16: WRAET Hamfest, United Methodist Church, 99 Parish Drive, Wayne, NJ. 8:00 a.m.

VE Test Sessions **Check with the contact before leaving.**

Oct 2: PCARA, John C. Hart Memorial Library, 1130 E Main St., Shrub Oak NY. 11:00 a.m. Must contact Michael W2IG, w2igg'at'yahoo.com, (914) 488-9196.
Oct 13: WECA, Westchester County Fire Trg Center, 4 Dana Rd, Valhalla NY. 7:00 pm. Contact Stanley Rothman (914) 831-3258
Oct 15: Orange County ARC, Munger Cottage, 183 Main Street, Cornwall NY. 6:00 p.m. Contact Joseph J. DeLorenzo, (845) 534-3146, w2bcc'at'arrl.net
Oct 23: Mt Beacon ARC, Poughkeepsie Galleria Community Room, Poughkeepsie NY. 9:00 a.m. Must contact (845) 462-7539.

Peekskill / Cortlandt Amateur Radio Association Inc.
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