



PCARA Update



Volume 22, Issue 2 Peekskill/Cortlandt Amateur Radio Association Inc. February 2021

Sound and vision

Things have been very quiet for January. 2021 started off with a **New Year's Day morning walk** in FDR Park in Yorktown which was organized by Jared KD2HXZ. Taking part in the walk were Lou KD2ITZ, Vincent KD2VAV, Malcolm NM9J, Jared KD2HXZ and *Max* (K9DOG, N2RUF, WA2MUT, or is it K9FUR?). A very nice way to bring in the New Year! Thanks Jared!



We normally would have had the **Annual PCARA Bring and Buy Auction** at January's meeting but for obvious reasons that didn't occur. All was not lost! Thanks to Karl N2KZ, we did have a series of **2 Meter Monday Night Simplex Events** on January 4th, 11th, 18th and 25th. The last two evenings were dedicated to slow scan television, with more than seven people exchanging pictures over the air on simplex FM (146.565 and 146.595 MHz). These events were a great way to see how well members could communicate without the use of the club's repeaters and improve their 2 meter coverage from home. Thanks Karl!



Some of the images received over the air during Monday night SSTV tests organized by Karl N2KZ.

Don't forget that we still have the informal **Roundtable Net** at 8:00 p.m. on Tuesdays and the **Old Goats Net** at 8:00 p.m. on Thursday evenings. These have

proven to be a great way for our members to keep in touch and stay current.

On Thursday February 4, 2021 at 6:30 p.m., Todd N2MUZ will be giving an encore Zoom presentation of "Magic of Amateur Radio." The Zoom session is being hosted courtesy of the Hendrick Hudson Free Library. If you wish to participate, please email: cmorreale 'at' wlsmail.org to register. Be sure to include a contact phone number with your registration. Please invite anyone interested in learning about Amateur Radio.

Magic of Amateur Radio

I have taken the initiative of commissioning a new embroidered PCARA patch from a local uniform supply store in Peekskill. The patch can be embroidered on shirts, jackets, and hats for a modest fee. The items to be embroidered can be purchased at the store or you can supply your own. In addition to the patch you can also have your name and/or call sign included. Details to follow.



Sample embroidered patch as prepared for PCARA.

Until we meet again, 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 neighborhood information.

Presenting Radio II

Lou KD2ITZ has announced a second presentation for potential beginners in amateur radio, to be conducted by Todd N2MUZ. Todd's first presentation, promoted by the John C. Hart Library took place in October 2020.



The new presentation is sponsored by the Hendrick Hudson Free Library and appears on the 'Programs' calendar of the Library's web site: <https://henhudfreelibrary.org>.

"This presentation led by Todd Traver, a member of the Peekskill/Cortlandt Amateur Radio Association, will teach participants how easy it is to get on the air as a licensed amateur (ham) radio operator. Registration begins January 21. Contact cmorreale'at'wlsmail.org to register. Please provide a phone number when registering."

Amateurs are welcome to join the meeting and watch the presentation, but the focus is toward individuals unfamiliar with the hobby. Remember to register!

Please share this information with anyone who may be interested. PCARA is asking for help in reaching out to other groups in the community for assistance in publicizing the event. See

PCARA's Google Group e-mail for a copy of Lou's original flier.

Please let Lou KD2ITZ know if you are able to contact organizations such as schools, scouts, veterans, fire/ambulance corps, etc.

Peekskill / Cortlandt
Amateur Radio Association
<http://www.pcara.org>

Magic of Amateur Radio
VIRTUAL PRESENTATION

Have you ever wanted to try amateur (ham) radio?
Learn more at a live Zoom meeting
Hosted by Todd Traver N2MUZ
and The Hendrick Hudson Free Library

Thursday Feb. 4, 2021 6:30pm

Find out how easy it is to get on the air
Discover what you can do as a licensed operator
Camaraderie - Community Service
Emergency Preparedness - Fun - Science - Technology

Registration begins January 21
Email cmorreale@wlsmail.org to register for Zoom Invite
Please provide a phone number when registering

FOR MORE INFO CONTACT: mail@pcara.org

Newsletter software

If this month's issue of *PCARA Update* looks a little different, it's because of a change in the software used to produce page layouts.

The December 2001 issue heralded a change of editor and a change from word processing to the desktop publishing package **Adobe Pagemaker**. This also allowed production of PDF files for e-mail distribution. Not everyone had e-mail two decades ago so quite a few copies were still being duplicated and mailed out on paper.

The February 2014 issue of the newsletter marked a change from Adobe Pagemaker to **Serif PagePlus X7**. Serif (Europe) Ltd. is a small software house based in Nottingham, England. Their PagePlus software was superseded in 2019 by a completely new 'app' designed for Mac and Windows named **Affinity Publisher**. With arrival of the New Year, your editor decided it was time for an upgrade and this month's issue has been produced using Affinity Publisher 1.8.

Affinity Publisher, Photo and Designer are remarkably good value compared with competing software for desktop publishing, photo-editing and graphics. For more information see: <https://affinity.serif.com/en-us/>.

- NM9J

Adventures in DXing

- N2KZ

It Was My Honor

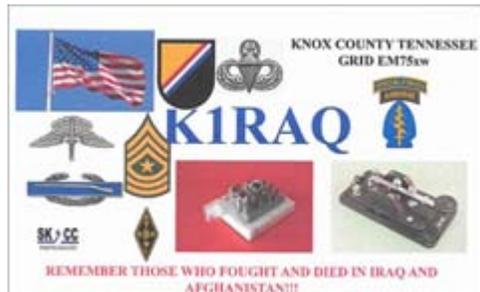
I must have had a premonition that something amazing was about to happen. I rose up from bed just before 0600 on New Year's Day ready for adventure! Not wanting to wake my family, I scooted into my office, put on my headphones and turned on my Yaesu FT-dx1200. Tuning around 40 meter CW, I discovered **Matt, K1RAQ** in Knoxville, Tennessee. I have been to Knoxville several times and have worked there, as well. We should have some things in common to talk about. Why would someone from Tennessee have a '1' vanity call sign? He heard my reply to his CQ!

What an unusual and interesting QSO it was. By the time we were done, many questions were answered and then some. These moments would become one of the most memorable QSOs ever to be added to my log-book. In all my years on the air, I have never felt so honored. This was a man who gave all his energy and strength to his country for decades... and I had the pleasure of meeting him on CW!

Matt is formally known as Acting Sergeant Major (retired) Matthew J. St. Marie of the United States Army Special Forces — one of the legendary *Green Berets*. Here is a man dedicated to endless selfless service to his country. He completed 24 years in active duty including 5 tours in Iraq.

Matt's vanity call sign is a memorial to his friends who perished in service to our country. Step back and

consider his call sign carefully: **K1RAQ**. "Iraq was a very big part of my adult life, 1991 to 2004. I lost six friends in Iraq and two in



Afghanistan. I pray for world peace and no more war every night."

Two mates stand out in his mind: Chief Warrant Officer Two – Bruce Price and Sergeant Major Mike Stack. Both men sacrificed their lives protecting their reports during times of battle. When I asked Matt if he considered himself a hero for his long service he declined and said "No. My friends that gave their lives were the real heroes."



Bruce E. Price and Michael Boyd Stack.

At 58 years old, Matt is now challenged with ongoing ailments from his exposure to Sarin nerve agent during Operation Desert Storm in Iraq in 1991. He also suffers from shrapnel in his finger, greatly reduced lung function and a failing heart. Matt has survived several heart attacks and has had his heart stop on more than one occasion. Still, I wish you could hear his inspirational positive spirit. His memory is still sharp and detailed and his recollections could fill books. Matt truly believes that every day is a gift and he will continue his quest to enjoy his remaining time on Earth.



Matt K1RAQ with his dog named Spooky.

Making the best of his hospice situation, he has created "my safe room...my own little world" where his amateur radio equipment provides access to all that surrounds him outside. A soft bed and soft couch offer him comfort. You'll find his two chihuahua mixes, Lola and Tony, nearby accompanying him with love and warmth throughout each day. Matt's guiding light is his wife Karen who is his constant companion and caregiver. Matt and Karen have been married for 37 years.

The K1RAQ shack is customized for Matt's needs. Two transceivers are centerpieces: An Icom IC-7300 and a Kenwood TS-590SG. Both make use of an Alpha Delta DX-DD single wire multiband dipole antenna. Using a MFJ-993B tuner, the DX-DD will work on 20, 30, 40 and 80 meters.



The K1RAQ shack.

Matt has hearing loss due to a close range grenade explosion and the sounds of long term gunfire and other loud noises. Understanding spoken consonants is difficult so CW has become his preferred mode. Between Matt's careful listening and the decoded type presented to him on-screen the messages from afar

make it through.

Polar-Electric MRP40 software decodes incoming Morse producing large clear type on his computer screen. Pre-programmed Morse Code macros on his IC-7300 help him through sending basic CW exchanges. He uses an MFJ-495 keyer and keyboard along with a paddle and a Hi-Mound HK-706 straight key for sending code manually during longer ragchews. As part of his legacy, Matt encourages his CW contacts to send QSL cards as he builds a collection for his family to cherish as a memento of his life. I am proud to say that my QSL has made his pack!

Matt has tinkered with digital modes like JT65, PSK and FT8 but found that they just weren't that interesting and had no soul. He really liked sending pictures via JT65 but few people participate in that mode. WSPR (Weak Signal Propagation Reporter) mode produced some great results while he was in Afghanistan. One great WSPR contact was touching base with Greenland. Using just 250 milliwatts he worked a fellow ham situated in a remote fishing village on a cliff. His QSL was memorable: "All the houses (pictured on



the front of the QSL) were painted different colors. It was really neat!"

Becoming conversant in Morse was not easy for Matt. "I had to do five words per minute and I hated Morse Code back then. We used to go to the Morse Code Lab to practice. One time, we had the headphones on and they were on 'tango.' It kept going: Dah... tango... dah... tango... and it wouldn't stop! It literally was driving me crazy and I threw my headphones down on the table and I walked out."

"My team sergeant came out and he said 'You're going to go back in there' and I said 'No, I'm not. It's driving me crazy.' He said 'I don't like this either but if you don't go back in I'm going to kick your butt!' So I did!" Matt later earned his amateur radio Technician and General tickets in 2013 using sample tests provided by the HamTest Online site,

<https://www.hamradiolicenseexam.com> .

These days, you will find Matt operating K1RAQ between 7025 and 7035 kHz CW all day long. Very early in the morning did the trick for me – at about 0600 Eastern. "I just stay on 40. I know people there and people know me!" He receives lots of contact e-mails and comments via QRZ.com that keeps him very busy. *Dragon NaturallySpeaking* speech recognition software converts his voice to text to correspond via e-mail or texts. Matt really has every base covered in his beautifully designed shack.

I asked Matt what matters in life: "Family first and then God. I have always had faith. I used to go to mass

and the altar was the hood of a Jeep. We had snipers all over the place and I thought in that setting nothing would happen because God was there. God has always been a presence and important to me."

"My family has always been important to me. Without the resilience of my wife and my kids I wouldn't have made it for five years in the infantry and 19 years in Special Forces. It takes a special family to deal with: 'I'm leaving tomorrow. I don't know when I will be back and I don't know when I will talk to you again.' It takes a special woman to put up with that."

Matt was extensively trained in the Army to be driven to sur-



Kurdish Peshmerga freedom fighters, Northern Iraq, 1991-93.

vive. His constant resistance to all that ails him only proves he is still ready and able. No place – no situation – would deter him. During his many years in the Army, Matt has served all around the world. He found himself in Germany, Senegal, West Africa, Northern Iraq and Afghanistan - and learned the local languages, too!



Matt meets President Clinton in West Senegal — 1998.

The U.S. Army Special Forces *Green Berets* are known for being impeccably trained in diverse skills. They become unsurpassed athletes, prepared for relentless superior strength and endurance. As a recruit, your first dose of this training is known as "Two Weeks in Hell." They weren't kidding! See the action for yourself on Matt's website: <https://sites.google.com/site/k4odabasecamp/>.

Try rucking: carrying heavy rucksacks (knapsacks) with hundreds of pounds of gear for endless distances. Matt once was tasked with carrying a tall and heavy officer over his shoulders. Being much larger and taller

than Matt's stature, he had to proceed as his officer's hands and feet dragged on the ground. Nothing stops *The Green Berets*.

Years of practical experience and expert schooling provided Matt with skills that literally have saved his life, time and time again. His cross-training covers all bases: Marksmanship with multiple weapons, close-range search and attack strategies, learning how to run drop-zones for parachuting using HALO (High Altitude Low Opening) skills, fast roping descents and recovery during helicopter flight, years of challenging infantry training and experience, constructing houses and learning efficient and immediate demolition and more!



High Altitude Low Opening (HALO) parachutists free fall at 13,000 feet.

Matt shared that his two most important and fulfilling skills were mastering communications and surgery as a medic. Touching base sending encrypted messages and receiving instructions from America were critical for mission success. The process was fascinating!

Using HF frequencies, messages were transmitted only after triple encryption. You would first learn your operating frequency and cut your antenna to match. If you found yourself in deciduous surroundings, you would use a jungle antenna and throw it up into a tree. In deserts and snow, you would use an end-fed doublet placed on the ground.

Next... reach for your compass and find the correct bearing to direct your antenna towards your target. From his position in Northern Iraq, Matt often reached for Fort Devens in Massachusetts. When you were all set, you typed command codes into a device attached to your radio gear to scramble the contents for security. Transmission was brief and efficient to defy interception.

This exercise would conclude after an anxious wait for a reply. Hearing five letter encrypted Morse word groups return from Fort Devens would fill him with a surge of instant gratification! Message received!

Matt's medical survival training and field surgery was forever essential to continue his life and the lives



Matt with friends in Senegal.

of others all around him. Imagine becoming proficient in self-surgery where you would learn to patch yourself after battle, how to remove bullets and shrapnel (if you could reach them,) even pulling your own teeth! During his long service, Matt delivered three newborn babies into the world!

Now Matt's medical skills are being used to save his own life. As his life continues, so does his drive to survive and adapt. "I know when I am having a heart attack and I know what to do."

Maybe divine intervention adds to his longevity. Matt should know that his strengths do not end with him but serve as an inspirational example to all of us. We should follow his spirit and always lead a noble and rewarding life.

What a remarkable and diverse career! Admire and honor his long dedication and determination. Now retired and at ease, you will find Matt enjoying 40 meter CW. K1RAQ is a hard callsign to miss. Maybe you should add him to your logbook! Give it a try!

Matt knows his body and he has created a supportive environment.



The world of CW keeps his mind active and constantly adept. "It's my little world in here. The radio is my way out. This is just what I do."

Remember the credo of The U.S. Army Special Forces: "*De Oppresso Liber*" - From Oppression We Will Liberate Them.

Now that Matt has liberated many, he strives daily to liberate himself. Pray for his continued survival. Thank you, Matt, for all you gave. We honor and salute you, sir!

Until next month, 73 es dit dit de N2KZ "The Old Goat."

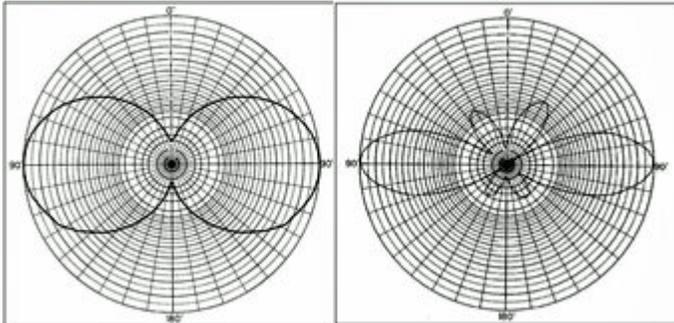


Catching Up - N2KZ

It's Simplex

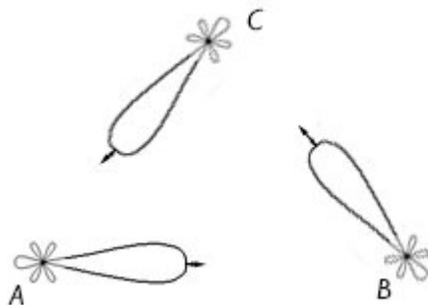
Want to have some fun? It's **simplex**. PCARA members have been meeting on Monday nights to experiment with very basic methods of communication. Just press the button and say 'hello!' No repeaters necessary. Our first two events tested our abilities to go point to point around our community using simple FM simplex.

Our experiences taught us that simplex operation thrives when you use an omnidirectional vertical antenna. Choose wisely! Depending on your terrain, you may want to choose an antenna with lesser gain that does a better job of filling gaps of coverage otherwise blocked by higher gain versions that have a flatter beamwidth. Listen to the results of your fellow hams and learn from their results. A very simple vertical antenna may be all you need to join the local simplex community!



Vertical plane radiation patterns at 147 MHz for Diamond X30A antenna (left) and Diamond X300A (right). Higher-gain X300A has a narrower vertical beamwidth.

Fully directional antennas (like Yagis) have purpose when you are contacting just one station afar. Add several stations into a group and it gets tricky. If you are within the beamwidth of the main station, you will have amiable results. Find yourself outside the beam and you may not make contact at all.



Three stations with Yagi antennas may not hear each other well when antennas are pointed to the preceding station in the net.

We also revealed how important terrain can factor into the equation. Although you can have good results by using a logical bearing towards your target, you may also find that your best transmission bearing may not be your optimum direction for reception in very, very unpredictable ways.

I live far away on the other side of Northern

Westchester from most PCARA members. Almost every-one is to the northwest of my QTH. I am about 530 feet above average terrain surrounded by rock-laden hilly terrain. Select stations (and not all stations!) in the Cortlandt Manor area were received at my QTH with much stronger signals using bearings either due north or even northeast probably using the rocky hills around me as passive reflectors. Transmit and receive may be very different in a practical setting. Transmission with these same bearings produced insufficient unusable results. I could hear stations clearly on receive, but if my transmit beam was not in their direction, I was not heard! Like I said... it is best to use a vertical omni!

Many members also discovered which antennas and rigs worked for them and which ones didn't. Some were inspired to improve their radiators for the next week's experiments.

We also became familiar with our neighborhood 2 meter simplex frequencies. Week one, Monday, January 4th, we inhabited the nationwide calling frequency 146.520 MHz. Although this was a convenient first meeting place and provided a logical place to meet, it really was not good form. Calling frequencies are made for just that... calling. Go elsewhere if you are going to ragchew with a large group for 90 minutes... OK?

Week two, Monday, January 11th, we moved a step up to 146.565 MHz. We heard a bevy of distant communications in progress seemingly speaking in Spanish without much call sign identification. It appeared that we co-existed... so we persisted! This proved to be a good compromise. We were off the calling frequency and many PCARAnS were familiar with this frequency from our foxhunt adventures over the years.

Send Us A Picture!

Vincent, KD2VAV and Lou, KD2ITZ suggested that we could try using SSTV picture transmission for the next meeting scheduled for Monday, January 18th. A fine crowd attended when we returned to 146.565 MHz. The innovative pictures created a fine display for all who copied the mail. The Scottie-2 format became the default standard as we learned about our SSTV applications. The two dominant programs were MMSSTV for Windows and MultiScan3B for Mac. Malcolm, NM9J



SSTV picture from Vincent, KD2VAV as received over the air by Karl.

found excellent further refinement using YONIQ (a Spanish version of MMSSTV.) An entertaining time was had by all. We re-convened for more SSTV exchanges a week later, this time on 146.595 MHz to avoid the ever-present distant Spanish-speaking stations on 146.565 MHz.

Stay tuned: Stay informed about our coming adventures! Watch our Facebook page at:

<https://facebook.com/pcarahamradio> or follow our new Google Groups on-line!

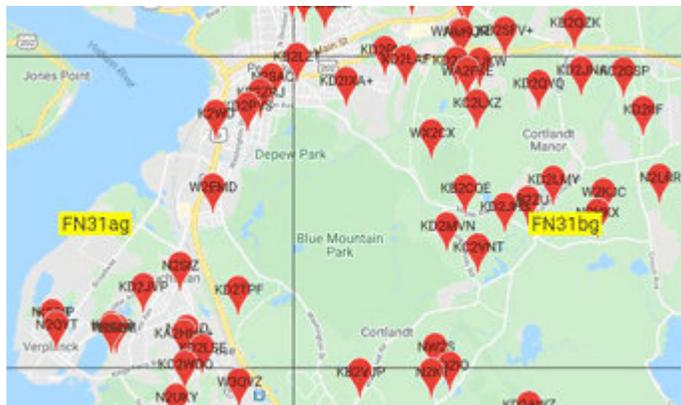
Next Monday, February 1st at 8:00 pm, the PCARA Monday night group will be meeting on 10 meter USB at 28.420 MHz for more experiments and possibly more SSTV pictures to exchange. See you there!

Meet Your Neighbors!

Joe, WA2MCR, discovered a way to reveal your ham neighbors... on a map! Enter your callsign on this web site and instantly see a detailed map of all the amateur radio operators near your QTH.

It's a fascinating resource tool authored by Ross KT1F. Try it out... get to know your neighbors.

<https://haminfo.tetranz.com/map> .



Amateur Radio license map.

Super Straight Key Night

The first of January is a sacred day for CW operators. The ARRL's Straight Key Night event is many things to many people.

Obviously, it is a time for operators to exercise their straight keys. The resultant sound is the signature of the event. Very manual keying has a distinct and unmistakable rhythm and beat.

Many people use legacy tube gear that only hits the air on this day once a year. You'll hear Heathkits, Nationals, Hallicrafters, Collins and especially homebrew gear all getting a workout. Listen along during this merriment and you may be reminded of the first steps of The Tin Man in The Wizard of Oz!

The sweetest honey in this pot is the ingredient that needs no electricity. Straight Key Night encourages all of humanity to send Morse. Jump on the air January 1st and you will hear old, old old-timers with origi-

nal call signs going back 70 years or more. Many beginners appear along with folks who haven't touched a key in decades. It is also an alumni get-together for military veterans who sent code in combat or aboard ships or as cryptographers in war reconnaissance. Let's just say: It's not your everyday crowd!

For a dyed-in-the-wool CW maven like myself, Straight Key Night is irresistible. You meet the most fascinating operators, swap the best stories, experiences and techniques and make friends you might keep forever. This year, there really was magic in the air.

My very first QSO was on 60 meter CW with Alberto, WP4L. A craftsman who makes astounding custom code keys, I ended his frustration! He had been calling CQ a long time before we found each other. We actually touched base on two



frequencies - channels 1 and 5 — 5332 and 5405 kHz. I enjoyed his call sign. Al really was a PAL.

My memorable QSOs had just begun. No Straight Key Night would be complete without working at least one pirate. This year's entry was 'Al' "K9FAT" who had a horrible fist so I could barely make out the alleged call-sign or much else! I had a couple of sympatico QSOs with operators in Florida that were very cordial and nice.

The best was yet to come! A most memorable QSO with a retired Green Beret - Matt, K1RAQ. Read all about it in my lead article in this month's PCARA Update.

Digital AM Radio

Did you ever think you could hear stereo music in perfect digital quality on AM radio? It is possible! I have been tuning in to 820 kHz at dusk when nightly sunset skip aids medium wave reception. For a short period of time nearly every evening, the signals of WWFD in Frederick, Maryland will sometimes overwhelm local WNYC-AM and will lock my car's HD



Screenshot of Karl's car radio during HD reception of WWFD on 820 kHz.

radio enough to decode their 4300 watt HD radio signal. Suddenly you will hear perfect stereo along with a

picture of the performing artist on the radio's display screen. Amazing! WWFD is one of only a very few AM radio stations in the United States that is broadcasting all of their power in digital mode making their signal particularly robust for distant reception. It is an amazing oddity in the advanced world we live in in the year 2021. Give it a try!



Daytime pattern for WWFD, Frederick MD.

What's Your Number?

Most people know it as Touch-Tone but its formal



name is DTMF — dual tone multiple frequency. Mere mortals can barely tell one number's tone from another. (It was purposely designed that way for privacy.) There is a solution for those who want to know.

Believe it or not, some cable TV networks still use DTMF tones to tell affiliates when they can run local insert commercials. I had to discover the tones of one of my client's nets recently at work and fell across this nifty app for Apple phones called simply DTMF Decoder. It worked very nicely. If you ever wanted to reveal Touch-Tone numbers, this is a great solution. Details at: <https://apps.apple.com/us/app/dtmf-decoder/id306195275>.

Until we meet again, 73 es dit dit de N2KZ "The Old Goat."



TX Factor #27

The latest edition of U.K. Amateur Radio video magazine "TX Factor" appeared at the end of 2020. In this episode, Bob McCreddie GØFGX interviews *Practical Wireless* Editor Don Field G3XTT shortly after Don's move from Reading to a new location near Wells in Somerset. Don describes his rapidly erected antennas, reminisces about his six years in the *PW* Editor's chair and looks forward to new developments in the hobby.



In a second section, Bob GØFGX shows Mike Marsh, G1IAR how to set-up a Shark RF "openSpot:2" for Wi-Fi access to a smartphone, allowing a pair of amateur radio DMR handi-talkies to communicate with each other and the world. The openSPOT2 is a stand-alone hotspot (digital radio internet gateway), designed for amateur radio. It supports DMR, D-Star, Fusion/C4M and other digital voice protocols. The openSpot2 has been superseded by the openSpot3 which now includes a built-in Li-ion battery.

In the third section Radio Society of Great Britain



Mike G1IAR looks on as Bob GØFGX shows how to set up a multi-mode hotspot for DMR operation in the latest edition of TX Factor.

General Manager Steve Thomas M1ACB describes how RSGB has reacted to the COVID-19 shutdown of 2020, sending all their staff off-site to work from home. By pursuing a video campaign with plenty of press releases and organizing remotely-invigilated amateur radio exams, the RSGB has encouraged many more people to take up amateur radio within the U.K. The effort was assisted by radio groups who created on-line training and by a continuing interest in the hobby from the media.

Episodes of TX Factor are available from their web site: <http://www.txfactor.co.uk/>. Episode 27 can be found on the TX Factor YouTube channel through this link: <https://youtu.be/flkAfQLMH-s>

From antenna to loudspeaker

Two components that loom large in amateur radio are **antennas** and **loudspeakers**. These transducers are more alike than you might think. Both convert electrical signals into waves that radiate outward. Electromagnetic waves from an antenna propagate



through air or vacuum and are not quite the same as the pressure waves emitted from a loudspeaker that depend on air.

High-quality loudspeakers are less prominent than in the heyday of vinyl records and stereo Hi-Fi installations. But they are still present in sound-bars and smart speakers and they still depend on the moving-coil mechanism invented in the 1920s. Let's take a look at some of the similarities of speakers and antennas.

Twin lead is not always the best type of cable for long speaker runs. If your loudspeakers need to operate in the presence of strong RF fields, twin lead cable can act as an antenna to pick up RF energy. The worst case might be a pair of stereo speakers with 16 foot long cables connected to a stereo receiver. In the presence of strong SSB signals on 14 MHz, those speaker cables now constitute a half-wave dipole. Rectification of induced RF voltage by semiconductors in the amplifier circuitry can then result in "quacking" noises coming from the installation.

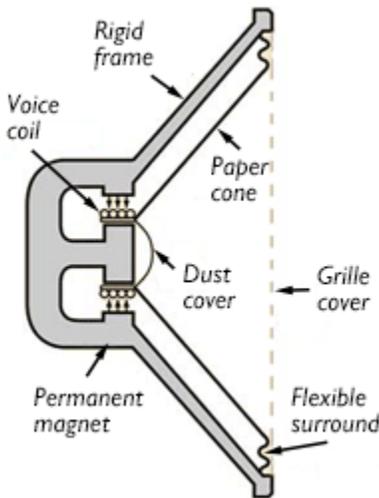
Twisted pair cable might be an improvement over flat twin — but I heard an even better idea during a 1989 talk by Ed Doubek N9RF (SK) at the DuPage Amateur Radio Club in Downers Grove, IL. Ed was an ARRL Technical Adviser and he gave a presentation on "The Ins and Outs of TVI". His recommendation was to change those twin-lead speaker cables to **shielded** audio cable or to coaxial cable. Connect the inner conductor to the "red" speaker terminal and the shield wire to the black terminal. If you are still suffering from RF pickup, then

the shielded cable could be threaded through a ferrite toroid.

The same idea can be employed with the external loudspeaker for an HF or VHF transceiver. Connection to the radio through a 3.5mm mono or stereo jack is well suited to the use of shielded cable.

Impedance matching

Every radio amateur is familiar with the concept of impedance matching of antennas. For the most efficient coupling of energy from transmitter to feed line and from feed line to antenna, impedances should be matched so that no power is reflected back. That is the



Cross section of a dynamic loudspeaker. Current through the voice coil moves the paper cone, generating air pressure waves.

Long life

Antennas and loudspeakers can both have a long life, independent of the equipment they are connected to. I have several antennas that crossed the Atlantic and they work just as well today as when new. Modern transceivers with their synthesizers and SDR capabilities are miracles of technology — but they can still work with vintage antennas whose designs might be decades old.

The same applies to loudspeakers. I have stereo speakers that are several decades old and still working well. The external speaker for my current HF transceiver is an old Wharfedale corner unit from the sixties that sounds just as good today.



Wharfedale corner speaker.

Transmission lines

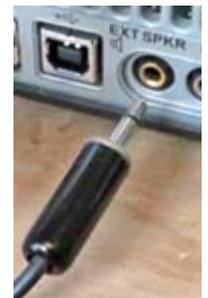
Antennas need a connection to a transceiver while loudspeakers need a connection to an audio amplifier or stereo receiver. Antennas are invariably connected



Speaker twin lead with white stripe going to the red (+) terminal.



Shielded audio cable feeding a Bose loudspeaker.



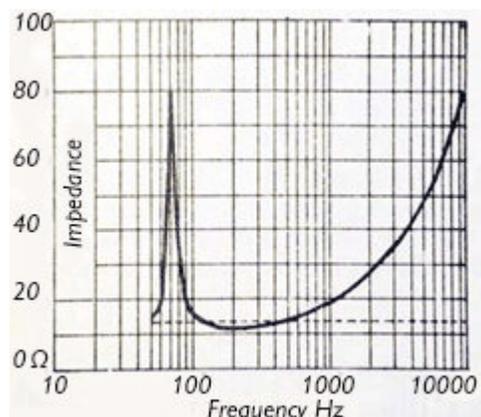
reason we use 50 ohm coaxial cable for feeding 50 ohm antennas, 75 ohm coaxial cable (or twin lead) for feeding resonant dipole antennas and 300 ohm ribbon cable for feeding folded dipoles.

There is a similar — though not identical — situation with loudspeakers. Gilbert Briggs, founder of the Wharfedale brand in 1932, was one of the first to realize that loudspeaker impedance is an important factor in the design of an efficient system for accurate sound reproduction. His Yorkshire company supplied individual drivers with impedances to match the output of vacuum tube amplifiers of the time. He also supplied early hi-fi speakers containing two different drivers for wider frequency range.



Gilbert Briggs, founder of Wharfedale.

Loudspeaker impedance is a complex property in more ways than one... nominal impedance is usually measured at the lowest point above bass-resonance or



Loudspeaker impedance varies with frequency. Peak at left is at the bass-resonance frequency. Nominal impedance is usually quoted at the lowest point above bass resonance — or at 400 Hz.

at a fixed frequency of 400 Hz. With solid state audio amplifiers, it is important to check the amplifier's rating. If the recommended impedance is 8 ohms, then it could be dangerous to connect a loudspeaker with 4 ohm impedance —

the output stage could be asked to supply excessive current at full power, damaging the circuitry.

Different impedances

When the impedance of an antenna differs from what the transmitter expects — usually 50 ohms — radio amateurs can make use of an “ATU” or antenna tuning unit. More accurately this is an antenna **matching** unit which transforms the impedance of the connected antenna system.

There is an equivalent in loudspeakers. If you are involved with public address, background music or audio paging systems you might come across constant voltage loudspeaker line matching transformers. A 4 ohm loudspeaker installed far from an audio ampli-

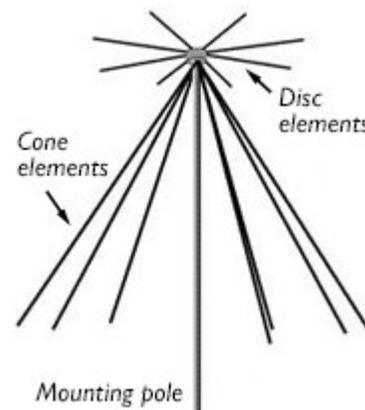
fier could lose a great deal of power when fed through 24 gauge telephone wire, which has a round-trip resistance around 51 ohms per 1000 feet. The solution is similar to AC power transmission... step up the voltage to a higher value at the source then step down to a lower voltage at the destination so the i^2R power losses in the cable are minimized. Step up and step down are usually carried out with 70 volt line matching transformers. A single cable can then run around the building carrying the 70 volt signal, with multiple loudspeakers connected to it, using different transformer taps for high and low power levels. (I was introduced to these systems in the U.K. by Messrs. G3LWK and G3UCA.) Incidentally, twisted pair phone wire has a characteristic impedance around 600 - 900 ohms.



70 volt line-matching speaker transformer.

Frequency coverage

Radio amateurs have a wide choice of frequency bands, with coverage that varies with time of day, weather, and sunspot cycle. We like antennas that cover more than one frequency band... for example tri-band beams, trap dipoles, dual band verticals for VHF/UHF and wideband antennas for scanner use. A disc antenna for the VHF and UHF bands might cover a frequency range of 50 – 500 MHz. That's a ratio of 10:1 or more than 3 octaves, where each octave signifies a doubling ($\times 2$) of frequency.



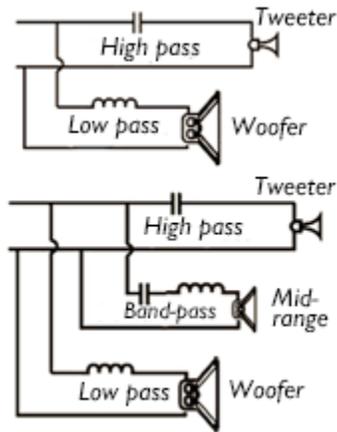
Disc antenna for VHF/UHF

Loudspeakers also need to cover a wide range of frequencies. For high-fidelity reproduction this is often specified as 50 Hz – 15 kHz as a *minimum*. This 300:1 ratio is roughly $8\frac{1}{2}$ octaves — considerably more than our multi-band antennas! Accurate reproduction of such a wide range of frequencies is difficult with a single cone — one solution is to attach a second, smaller cone to the voice coil.



Pioneer dual-cone speaker.

Another solution is to employ separate loudspeakers for each frequency range. In order to split the audio energy so that low frequencies are sent to a low-range woofer and high frequencies are sent to a high-range tweeter, a frequency-dividing or **crossover** network is employed. These networks consist of inductors and capacitors, acting as a low pass filter toward the woofer and a high pass filter toward the tweeter. The crossover frequency is



Top: simple crossover network for a two-way speaker system. Below: crossover for a three-way speaker system.

usually around 800 – 1200 Hz. More complex loudspeakers might have a mid-range driver, tweeter and woofer — requiring a three-way crossover.

There is a similar situation with antennas where (for example) you might have different antennas to cover VHF and UHF frequencies, connected to a single transceiver. The solution in this case is to employ a duplexer or triplexer to split the frequency bands. These devices can also be used to divide a dual-band antenna between two different radios.



Comet CF-4160 duplexer splits common input into 1.3-170 and 350-540 MHz.



Wharfedale Linton 3XP three-way loudspeaker with mid-range driver, tweeter and woofer.

A pair of duplexers at each end of a coaxial cable can be used to combine two different antennas over a single cable running up a tower.

A matter of size

One lesson we learn early in amateur radio is that antenna size matters, especially when transmitting. For any particular frequency, there is an optimum antenna size that will radiate efficiently, usually in the range of one quarter wavelength to one or two wavelengths long. Think of a quarter wave vertical ground plane for twenty meters which is 16½ feet tall or a G5RV antenna whose length is 102 feet or ~1½ wavelengths at 20 meters. Smaller antennas become less efficient radiators as the size is reduced — though special techniques can improve the

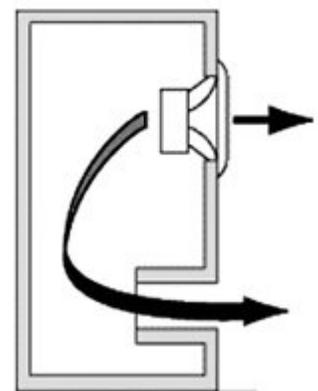
situation. For example, small transmitting loops using very low resistance copper tubing can transmit sufficiently well, but bandwidth is limited. Small loops have a circumference of 1/10 wavelength or less, that's a 2 meter circumference for the 20 meter band, corresponding to a diameter of 24". Low frequencies are harder to radiate efficiently... a half wave antenna for 2200 meters (136 kHz) would be 3400 feet long.

A similar situation applies to loudspeakers. Traditional hi-fi designs intended to cover low audio frequencies were physically large, using a woofer cone of 12 – 15 inches diameter. A flat baffle for this type of cone would need an area of at least 8 feet square. An enclosed speaker cabinet would require an internal volume of 3 – 5 cubic feet or more. These heavyweight cabinets needed two people to lift them.

Various techniques have been used to reduce the size and weight of hi-fi speaker cabinets. For example, the bass reflex design adds a vent or duct in front or rear of the cabinet, so that low frequency waves from the back of the cone *add* to radiation from the front of the cone instead of canceling it.

Since the mid-1980s optimization of cabinet design has been carried out using computer modeling. The laws of physics are still in effect and high efficiency cannot be combined with small cabinet dimensions *plus* good low frequency response — choose any two out of three — just as with small loop antennas.

Computer modeling of antennas for radio amateurs also began in the 1980s, for example MN software by Brian Beezley K6STI and ELNEC by W7EL.



In a bass reflex design, low frequency response is improved by reinforcing radiation off the front of the cone with waves from the back of the cone — that are now in phase due to bass resonance effects.

When less is more

In amateur radio, we usually restrict frequency response to the essential range for voice communications of 300 – 3000 Hz. Receivers and transceivers have filtering to match this range before sending the signal to the loudspeaker. In some circumstances, lower frequency audio (50 – 300 Hz) is also present, for example with extended SSB (eSSB) and broadcast AM reception. For these modes, a high quality loudspeaker can be an advantage.

In the case of frequency modulated signals encoded with a CTCSS or PL™ tone ranging from 67 to 254 Hz you may need a loudspeaker that *suppresses* low frequencies. This will avoid an annoying hum.

Surplus speakers by Motorola, seen at Hamfests and auction sites, have a housing that emphasizes the voice range of 300 – 3000 Hz, and work well with PL-encoded systems. Several models are available of similar appearance but with quite different impedance values. Others may contain an internal audio amplifier.



Motorola mobile speaker.

Let's go digital

When audio amplifier and loudspeaker are both housed in the same cabinet... for example in an active speaker, TV set, TV sound bar, smart speaker or smart phone... modern technology can make further improvements to the sound quality. If the amplifier circuitry carries out processing in the digital domain, digital signal processing (DSP) techniques can be applied to the entire signal path.

For example, a **smart equalizer** can compensate for variations in high frequency response of the driver and cabinet, resulting in a flat frequency response from around 1000 Hz to high frequencies. A digital amplifier with **smart SOA** (safe operating area) can allow a 50 watt Class-D amplifier to be connected to a 5 watt speaker with full power allowed on signal peaks and no compression. Only about 5% of the power



Texas Instruments TAS2557 5.7-W Class-D audio amplifier with class-H boost, speaker sense and TI SmartAmp speaker protection.

fed to a loudspeaker is converted to acoustic energy — the rest is dissipated in heating the voice coil. Smart SOA keeps coil temperature within safe limits while limiting excessive excursion of the coil to prevent mechanical damage. **Smart bass** can alter the overall response at bass frequencies to accommodate larger excursions of the coil. Using a technique known as **missing fundamental**, a small loudspeaker can be made to sound like a much larger unit by suppressing the fundamental frequency of a low musical note while augmenting harmonics. This is a psycho-acoustic effect — the music sounds full without any low bass notes actually being present.

Incidentally, the Class-D amplifier in these speaker systems can be a source of electromagnetic interference (EMI), caused by rapidly changing signals at the switching output stage.

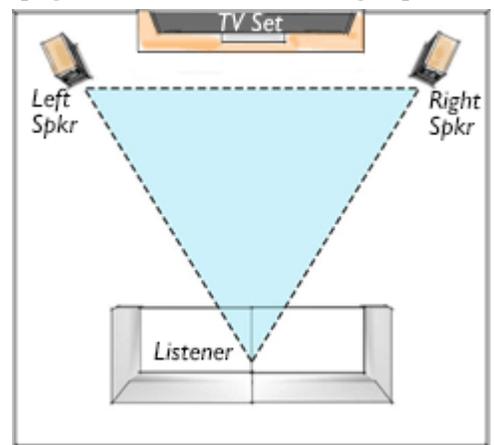
For a link with antennas, think of the amateur VLF enthusiasts who employ high-power Class-D audio amplifiers in order to radiate fractions of a watt on highly inefficient antennas for 8 kHz.

Location, location, location

There are recommendations for installing an antenna... place as high as possible to improve low angle radiation and increase distance to the horizon. Keep the antenna clear of obstructions such as house wiring, overhead cables, dry ground and other lossy materials. The top of a hill is a better place to be than the bottom of a valley. As frequency goes higher, terrestrial coverage decreases, so the need for height is more important when line-of-sight coverage is needed at VHF and UHF.

Similar considerations apply to loudspeakers. Sound waves propagate best over a line-of-sight path...

especially at the higher frequencies that characterize speech sibilants. Try to position each loudspeaker so your ears can "see" the cone. Stereo pairs should be located in front of the listener, roughly at the corners of an equilateral triangle, with the tweeters angled inward at ear-height. Don't hide your loudspeakers behind a screen, behind drapes, behind furniture or around a corner. When the path is obstructed, high frequencies are the first thing to disappear. Try to minimize room reflections with carpet on the floor and curtains drawn. If you have a subwoofer for low frequency effects it can be located almost anywhere as low frequency sounds are hard to localize.



Position stereo speakers away from the wall, at the corners of an equilateral triangle.

What can you afford?

When purchasing an antenna or a speaker system, bear in mind that you may be using it for a long time to come... perhaps through several generations of radio or audio equipment. So read the reviews and pay for a good quality unit that will bring enjoyment for years to come. Annual cost low, satisfaction high!

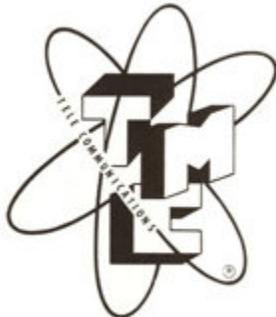
Can you think of any more similarities between antennas and loudspeakers? If so, let me know..

- NM9J

The Technical Materiel Corporation - WZ2P

Rich, WZ2P writes about his recent discoveries regarding electronics company TMC (The Technical Materiel Corporation). -Ed.

I stumbled upon a website which memorializes TMC, a local company that existed in Mamaroneck, NY as well as Nyack and other locations.



TMC Headquarters was at 700 Fenimore Road, Mamaroneck, NY. (Now occupied by Majestic Kitchens & Bath.)

TMC designed and built some of the finest AM/SSB RF transmitters and receivers from the late 1950's until the early 1990's.



TMC Model GPT-750 general purpose transmitter series featured continuous tuning from 2 - 32 MHz and provided 750 watts PEP output on SSB and ISB. It saw service in ships, civil defense installations, ham shacks and at commercial and military shore stations.

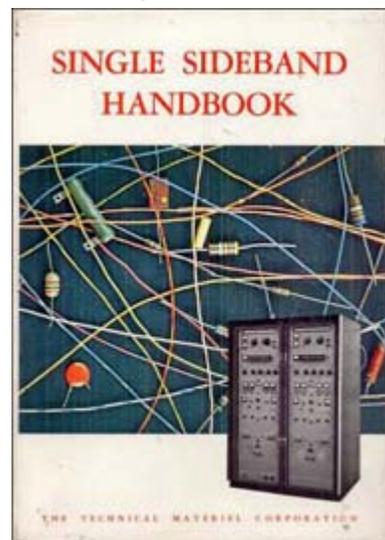
William (Bill) Henneberry KN2X* (SK) was the Director of Training at TMC in the early 1960's and was my **Elmer**. Bill lived within walking distance of my childhood home in Yonkers, NY and was an amazing teacher. *Call sign since reassigned -Ed.

Bill was a retired Navy officer (radioman WWII). He only became a radio amateur years after leaving TMC and said many times how he squandered his ability to have any equipment he wanted from TMC for free.

Bill wrote the text book "Single Sideband Handbook" for the company as a training tool. In 2000, KN2X wrote: "Our students included the CIA, the White House Signal Agency, the Navy South Pole Group, and numerous foreign governments... My operation was directly under Nick Carter. It was a good place to work."

PDF download of 'Single Sideband Handbook' is available from:

http://www.tmchistory.org/tmc_history/tmc-books/ssb_handbook.pdf



Main websites about TMC maintained by John Poulton K4OZY are: <http://www.tmchistory.org/> and <http://tmccollector.org/>. Another good link: http://www.tmchistory.org/tmc_history/tmc_history_page.htm

TMC even had an amateur radio station in the Fenimore Road location and at other sites.

- 73 de Rich WZ2P

Peekskill / Cortlandt Amateur Radio Association

Mail: PCARA, PO Box 146, Crompond, NY 10517

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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

Please monitor PCARA's **Google Group** and **websites** for news of additional activities in February.

Thu Feb 4: Magic of Amateur Radio — Virtual Zoom Presentation by Todd, N2MUZ. Starts 6:30 p.m. Register by sending e-mail (with phone no.) to: cmorreale@wlsmail.org.

Hamfests

Most Winter Hamfests have been canceled. Check with organizers before leaving.

Sun Feb 28: LIMARC Virtual Hamfest, 10:00 a.m. - 12 noon. Auctions, door prizes and presentations. Register at: <https://limarc.org/>

VE Test Sessions

Many winter VE Test Sessions have been canceled. Check with the contact before leaving.

Feb 6, 13, 20, 27: Westchester ARC, 19 Hunts Bridge Rd, Yonkers NY. 12:00 noon. Must contact VE, (914) 237-5589.

Feb 6, 13, 20, 27, 30: NYC-Westchester ARC, 43 Hart Ave, Yonkers NY. 12:00 noon. Must contact VE (646) 225-8600.

Feb 14: Yonkers ARC, Yonkers OEM, 789 Saw Mill River Rd, Yonkers NY. 11:30 a.m. Pre-reg. Walt, kd2d@arrl.net.

Feb 2021: Columbia Univ ARC. In-person VE exams are suspended. A limited number of remote video-supervised exams are available, see: <https://www.w2aee.columbia.edu/content/remote-license-exams>



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