

This issue contains a lot of ham radio history. But actually, each of us has his or her own personal history in the hobby. Ham radio has provided many things to many people, and launched many a career. Here, AK6OK shares his own ham radio story, starting at age 5!

A Personal Ham History

A Look Back on My First 60 Years of Amateur Radio

BY JEFF HILLIARD,* AK6OK

At about 5 years old, I started to realize how cool amateur radio was. My dad, Jim Hilliard, W6CGS, was my mentor. Every weekend morning, he and I talked from our home in Concord, California, near San Francisco, to my Uncle Dick, W6TCU, 375 miles away in Santa Monica, using 40-meter AM. Dad's Multi-Elmac AF67 transmitter (*Photo A*) just hummed along, with its external homebrew power supply and fixed-frequency crystal. Back in those days, the late 1950s, the transmitters generally used plug-in crystals instead of a VFO to set the frequency. And both stations weren't always on the same frequency, either, because the crystal frequencies at each end were not necessarily the same. Some guys had only one or two crystals for each band. If you wanted to change a crystal's frequency, you could disassemble the FT243 holder, remove the quartz element and, using Ajax or toothpaste, grind the crystal a bit on a piece of glass and move it in frequency. But the change was permanent.

My dad's Hallicrafters Model S-40B communications receiver was just as cool. I used to love to just sit down and turn the knobs on the receiver and listen, even though I didn't even know what I was listening to. I was so enthralled with it all that I started to soak it all in and, at about 10-11 years old, in the early 1960s, I learned the code and got my Novice license, WN6IOK. Every novice had a "N" in the prefix of his or her callsign.

My dad had a homemade tower back then, made of wooden 2 x 4s and some steel (*Photo B*). It was about 50 feet tall. He used to climb it to install and maintain his antennas. But in 1956, the tower blew down in a windstorm, narrowly missing our house. Fortunately, it never came down while he was at the top.

FCC Exam in San Francisco Office

I will never forget the FCC exam room in San Francisco. At that young age, sitting in front of the FCC examiner just terrified me. To me as a kid, just the letters F-C-C represented everything you should be afraid of in life. I knew that if I transmitted without a license or transmitted just out of the band, the FCC enforcers would be right there to arrest me and take me to jail. Forever!

The FCC examiner in San Francisco was a cranky older man and he smoked a big cigar. And when he spoke to all of us, it just sounded like a barking dog. We were on the second floor of the FCC office at 555 Battery Street with the room



Photo A. My dad's transmitter back in the 1950s was a Multi-Elmac AF-67, just like the one shown here from SM2CEW's website <<http://sm2cew.com/multielmac.html>>. It was joined by a Hallicrafters S-40B receiver.

always full of cigar smoke. And the tilting windows were always open to the street. Noise like car horns, jackhammers, and sirens were a continual distraction. And you didn't dare look at anyone else in the room during the test. Any ham from back in my day has had this experience, and I think that examiner was there his entire life. Somehow, I made it through that experience unscathed. Thankfully, those days are long gone. To pass the code test, you had to send and receive at least 1 minute of solid code without errors, with all of the noise and distractions. It was grueling to say the least.

The Novice license had a fixed term of two years and then it expired. No renewals. If you didn't upgrade before the expiration date, you were done. That prompted me to study for my General license, which I passed in time, but still had to go to the FCC office and do it all again, with the same old examiner. My new General Class call was WA6IOK. (When you upgraded, the FCC removed the N in the prefix of your call and replaced it with an A. So my previous call of WN6IOK became WA6IOK.)

The Mt. Diablo Amateur Radio Club

I always went with my dad to the Mt. Diablo Amateur Radio Club meetings at the old Red Cross building in Walnut Creek,

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Photo B. My dad, Jim Hilliard, W6CGS, on his home-built 50-foot wooden tower. (Note the heavy-duty climbing belt!). The tower came down in a wind-storm. (Photos B-E courtesy of the Hilliard Family Archives)

California. My dad went way back in the club and, as you can see from *Photo C*, he was pretty active as well. As you can also see, it was cool to have your call-sign on your black and yellow California license plate. And HF antennas on their cars were pretty common, too.

But you should have seen what kind of radios they ran in their cars. Most of the mobile radios back then were tube models because solid-state electronics just wasn't available to the average ham then. Surplus gear was becoming available in the late 1950s, such as the GE Pre-Progress line of mobile radios, using a vibrator or dynamotor driven power supply. These were UHF or VHF FM mobile radios running less than 20 watts.

For you who have never heard the term, a dynamotor (motor generator) is one way low-voltage DC was converted into high-voltage DC to run tube radios. This type of device was commonly used as a power source for mobile commercial and military radios from the days of the first mobile radios up until the late 1950s when transistors began to be used in inverter circuits to create the high voltages needed for tubes.¹ When you would key your transmitter, there was a delay of at least 1-2 seconds as the dynamotor required time to start up to supply the high-voltage DC to the finals. And on the air, you could always hear the dynamotor winding up.



Photo C. Dad was very active with the Mt. Diablo Amateur Radio Club, and the group enjoyed mobile operating. From left to right are my Uncle Dick, W6TCU; I don't know the gentleman next to him; my dad is the guy in white outfit by his car. Next is W6ASH, one of the founders of a local club in San Jose, and on the far right is Bob Richter, W6HOF.

But the radio of choice for many of the guys in the Mount Diablo Radio Club was called the Link 6000, a commercial VHF radio that included a complement of tubes in the receiver and transmitter. Dad and I installed one in our first Volkswagen Karmann Ghia.

The transceiver used vibrator technology to achieve high voltage.² Before the development of switch-mode power supplies and the introduction of semiconductor devices operating using low voltage, there was a requirement to generate voltages of about 50 to 250-volts DC from vehicle batteries. Electro-mechanical components known as vibrators were used in a circuit similar to modern solid-state inverter circuits to provide a pulsating DC which could be converted to a higher voltage with a transformer, rectified, and filtered to create higher-voltage DC.

When you parked your car, you didn't want to forget to turn off the radio. If you left it running, the Link 6000 could easily deplete your car battery in one hour or less.

T-Power

As technology continued to improve, newer solid-state mobile and base UHF and VHF FM radios started to appear on the surplus market. If you had a Motorola radio with "T-Power" or Transistor Power, the new solid-state model, you were really considered "hot stuff." And you could tell which hams were using the new radios because they had a tell-tale, high-pitched tone as they spoke. We were always in awe of the

hams who had a solid-state mobile radio. We knew that if you had T-Power, you were either "rich" or you knew someone at Motorola.

The club participated in many events each year. My most memorable was the trek on horseback over and around Mt. Diablo, a 3,848-foot mountain right there in the Diablo Valley. Club members provided communications for this annual Labor Day event to provide direction and safety to the hundreds of horseback riders. The best part was all of us hams riding in old 4-wheel drive Jeeps outfitted with Gonset Communicator Civil Defense 6-meter AM radios (*Photo D*). Many hams had these yellow Gonset radios on semi-permanent loan from the local Civil Defense organizations. We always had free run of the mountain and I always felt pretty special using my call-sign and assisting with communications while still being a kid. We also provided communications for parades and other events in the area.

The W6CX VHF Repeater

Members of the club, including my dad, built the original W6CX VHF FM repeater, made from a LINK 6000 tube transceiver, and installed it on top of Smith Hill, just outside of Walnut Creek, California. This little known 500-foot knoll was a perfect spot for easy access and great VHF coverage. We installed the repeater antenna on a windmill tower.

Controlling the Repeater

The repeater had an autopatch, one of the first of its kind in the San Francisco

Bay area. And phones then were rotary phones, not push-button phones like we have today. To access the phone system, we installed rotary dials in all of our cars. If you were one of the privileged few control operators of the day, you could dial a few digits from your car and automatically take the phone line off the hook at the repeater site. Then the pulses provided by the dial would directly access the phone network and connect the call. Technically, accessing the dial in the car simply sent a 600-Hz audible tone over the air and when you dialed a digit, the relay up on the hill would pulse the same number of times based on the digit you dialed. The club technical team fashioned up some simple logic that would take the phone off hook when a series of the correct access digits were dialed. You would hang up with a similar set of digits.

Touch Tone® Signaling

A few years later around 1963, AT&T introduced Touch-Tone®, also known as dual-tone multi-frequency signaling, or DTMF.³ The ham community was just buzzing about the new technology. But the original tone decoders, full of audio filter boards and relays, were the size of a repeater or larger. Eventually though, Touch-Tone decoders were built into a single DIP IC. Advanced Computer Controls in California created the RC-850 controller using this new decoder technology and built the most amazing repeater controller that I knew about. Hams would have to scrape together over \$2,000 (in 1980s dollars) to get the latest technology controller but it had so many functions like multiple steerable remote bases, autopatches using Touch Tones, linking, voice ID messaging, reverse autopatch, automated temperature and voltage readings, and much more. This is what caused repeaters to be so popular. Repeater controllers today are much smaller, have more capabilities, are much less expensive than ever, easy to get, and very easy to install.

Burst Tones Instead of PL®

PL® – Motorola’s trade name for CTCSS, or Continuous Tone Coded Squelch System — had not been used in amateur gear in those days but to reduce interfering stations, we would use what was called burst tones. A burst tone is a short tone, normally less than a half-second, that would start when you key up and then drop. This tone would be decoded by a filter at the repeater, indicating you were one of the club users. Not too secure, but it took care of some of the basic issues we had. If you have any old VHF or UHF radios from that time period, you probably have seen the option for a “burst” signal.

HF Radio Back in the Day

My greatest and most treasured memories of those days was the propagation on the HF bands. From 10 meters through 160 meters, the bands were on fire with S9++ signals every day on every band. And depending on the time of day, you always had someone to talk to. When I was about 14 years old, I would rush home after school and get on the HF radio. I used a Heathkit SB-101 transceiver running barefoot to a 14AVQ vertical mounted at the peak of our 2-story roof. The signals on 10 meters were absolutely stunning every day. Pile-ups were a daily occurrence. All I had to do was pick a 10-meter frequency, make a quick CQ call and sit back and wait. The biggest HF pile-ups were always from Japan, with sometimes 20-30 stations trying to work me at a time. With the current sunspot cycle conditions, I’m not sure if I will ever get to experience that rush again. It was a great time in my life. QSOs to Australia and New Zealand were a nightly occurrence, too. Just amazing propagation! And 75 meters at night

was also full of fun times. I remember a few of us younger guys harassing a net control here and there, but as I grew older, my good sense took over. The 75-meter band was a great meeting place.

A High-Power Experience

A good friend of mine — another young ham — and I used to hang out together on the bands and in person. His father worked as an engineer for Voice of America. One quiet evening, he invited me for a personal tour of the station with his dad, which I jumped at. We drove to the site and his dad walked us through the power supply room, a 500-square-foot room full of huge capacitors, transformers, and solid copper straps to tie it all together, and DANGER signs everywhere. And then the room where the finals were kept. Some of these final tubes were large enough to climb inside. It all seemed to be just a massive copy of my Heathkit SB-200 amplifier.



Photo D. One of the club activities I remember best was the annual Mt. Diablo horseback trek. Hams would take old Jeeps up along the trails to provide direction and safety for hundreds of horseback riders. We used 6-meter AM Civil Defense Gonset Communicators.

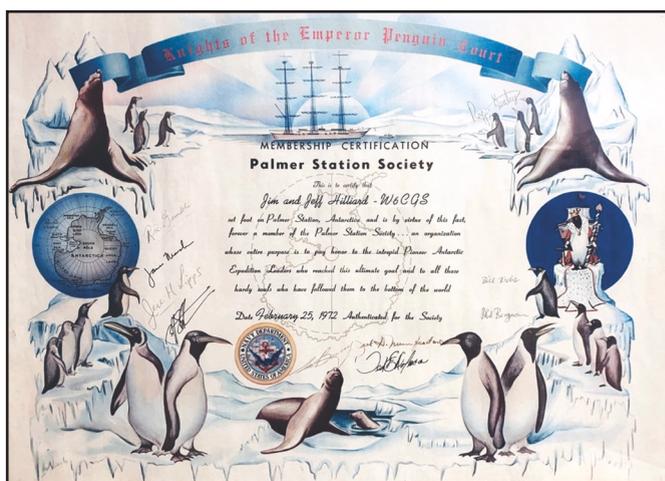


Photo E. In the early 1970s, Dad and I were presented with this certificate in appreciation of our frequent phone patches from UC Davis researchers at Palmer Station in Antarctica to family members back in California. We also used the station to let a UC veterinarian guide emergency surgery on a Palmer Station dog.

The Voice of America transmitter was off the air that evening and 20 meters was completely dead. Not a single station could be heard, even though we were listening on a huge rhombic antenna and using an awesome Collins KWM-2A transceiver, the station they had there. His dad said, "Let's call CQ on 20 meters and see what we can stir up." After a series of complicated power-up procedures, he tuned the transmitter up to 500,000 watts (yes, 500 kilowatts!) in the 20-meter band and made a single CQ call. A KL7 station in Alaska replied and we could barely hear him. He couldn't understand why we were so loud. "You are pinning my needle up here in Alaska and the bands are completely dead! What a signal!" We wrapped up that conversation quickly and shut it all down without much of an explanation.

Now, of course, all of us know that what we had done was quite illegal. But here I am almost 50 years later and I remember it vividly. What an impression it made on me and what a moment in time. I worried about that experience for many months, thinking the FCC would one day walk through my door, but it never happened.

Palmer Station, Antarctica

Since the band conditions were so good in the '70s, and living in Davis, California during my high school years, my dad and I started providing daily phone patches between UC Davis scientists and researchers at Palmer Station, Antarctica, and their families back home. We had a Mosley TA-36 beam at about 60 feet and it was just a pipeline between Davis and the South Pole every evening on 20 meters. Dad and I traded off from day to day, but it was pretty much an every-evening event for a few years. The certificate you see in *Photo E* was presented to us in 1972 in appreciation for all of the time we spent using ham radio to further science.

During one of these sessions, we heard that the onsite dog was suffering from some type of sickness. We set up a special time as the UC Davis veterinarians guided the researchers through performing critical surgery on their dog using amateur radio as their only means of communication. This 3-hour surgery was another moment in history for me, one that proved the importance of ham radio as being a needed public service.

Long-Term Impact

So where did all of this lead a young man like me? I attended general education classes in college for two years with a

major in biomedical engineering, but ended up starting a career before I ever took an engineering class. From what I learned in ham radio alone, and through some basic self-study, I became an inventor of many products like the talking elevator for Otis Elevator, and the first automated restaurant seating system now used all over the world. Strangely enough, I was also the inventor of a genetic fusion system called the Progenitor and the co-inventor and electrode designer of the process used to make many types of plants, including seedless watermelons. We developed tomatoes that contained 10% less water used to make tomato paste, saving the canning companies \$30 million a year at that time by using less fuel. But these are stories for another day.

Ham radio has been my life from a very young age. It has been a blast every step of the way and I continue to learn more and more today. From software-defined radios to the new digital

modes, I continue to learn a lifetime of information every year. And I owe it all to my dad Jim, my Elmer,⁴ who got me started early, explaining it all on a daily basis. I caught the ham radio bug and now I am the Elmer. And if your situation is similar to mine, you should be handing this important public service down to younger people as well.

Ham radio continues to thrive and the technology is just getting better. As some of the older hams are passing away, so is the history they had in their heads that was never passed forward. This rich history can't just die. Tell your story. Share the fun we have had over all of these years and get these younger people fired up like we were. When the HF bands come back, they can share in the fun knowing the history of what made ham radio what it is today.

The sunspot cycle will turn around and that awesome fun will start again. And as I see young people say all of the time on social media sites: "Wait for it!"

Notes

1. Dynamotors - <<https://tinyurl.com/s4tnmok>>
2. Electronic Vibrators - <<https://tinyurl.com/nrpfw8f>>
3. Touch Tone® Signaling - <<https://tinyurl.com/ncnoz5h>>
4. Discussion of Elmer - <<https://tinyurl.com/y9799o6b>>

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