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## **Amateur Radio Insights**

By Kirk Kleinschmidt NT0Z - nt0z@stealthamateur.com

### **Did Joe Taylor K1JT Destroy Amateur Radio?**

Did Joe Taylor K1JT, Nobel Laureate and noted friend of hams everywhere, accidentally destroy amateur radio?

Having just returned from a trip in my time machine, I can unequivocally say that history attributes the death of amateur radio to Joe Taylor in the year 2017. So, yes, he did. In fact, 2018 AD marks the beginning of the "hampocalypse," and becomes known among former ham operators as 1 AT (the first year "After Taylor").

The distinguished scientist had some help, of course, but just like the "flu" epidemic of 2027 (you'll see), in which an attenuated pathogen that was only supposed to be experimental in nature escaped into the population at large and quickly replicated itself, Taylor's FT8 digital mode grew exponentially, suffocating other modes as it mushroomed beyond any practical limits.

By the time FT9 and FT10 were released - modes that allowed a small amount of real-time interaction (formerly known as conversation) - it was too late. Hams, the few who remained, refused to exchange personal pleasantries, focusing instead on machine-verified signal reports and grid square exchanges.

In 2 AT, non-machine QSOs were outlawed and rules prohibiting unattended operations at HF were rescinded worldwide. Amateur allocations were reduced to 5kHz-wide slices every 2 MHz (from dc to daylight) so computerized stations could map optimized frequency-hopping and ALE schemes in real-time. With machine-only modes, additional bandwidth was simply wasted. The CQWW contest (renamed the CQJTTWW contest) was the first major outing to offer certificates to operators who didn't even know that their computer-controlled stations had participated in the contest and had turned in noteworthy scores - the ultimate in unattended operation!

By 3 AT, AI-driven networks saw that humans were completely unnecessary for contesting and propagation mapping operations, so amateur services were disbanded worldwide. An AI from Italy, rumored to be running an illegally "high-powered" FT11 beta

processor, worked DXCC in 478 milliseconds, the fastest to date. Also of note, once occupying 48 hours, the CQJTWW contest, now worked only by competing AI participants, has been reduced to 8.5 seconds, freeing the contestant AIs to map additional ionospheric sub-modalities.

In an attempt to recreate a "freeband-like" clandestine radio system that allowed human-ham interaction on a personal level, some former amateurs began experimenting with gravity-gradient modulation and quantum entanglement transceivers - technologies that don't require, or even benefit from, FT8, FT9, or FT10 style restrictions (well, maybe FT10).

I'd like to share more, but my time in the future was limited by the power constraints of my device. If you have access to a more powerful time machine, please tell us what happened next.

### **Irreverent, but Not Necessarily Irrelevant**

Yes, my fictional narrative is sassy and irreverent but, unfortunately, it's probably not irrelevant. The number of global QSOs using Joe's FT8 "machines only" digital mode have exploded, and these effects can clearly be felt on the bands.

Although I didn't know exactly why at the time, my first exposure to the JTxx/FTxx effect was during last summer's E-skip season on 6 and 2 meters (or lack thereof). The two previous years saw plenty of SSB and CW QSOs, with a nice increase in the typical number of non-contest CW QSOs. I was working on my VUCC totals and things were looking up.

In 2017, however, traditional activity tanked. There was nobody home. I didn't know it at the time, but everyone was JTing and FTing when I was looking the other way. The lack of SSB and CW signals wasn't simply noticeable, it was incredible. And just last week I went looking for PSK31 signals, as I had been "away" from that mode for quite a while. In short, there were none. Yikes!

Several months ago columnists in CQ and QST began detailing the magnitude of the paradigm shift. I was somewhat skeptical at first, but no longer.

### **What Hath Joe Wrought?**

In a recent ARRL Letter, expert observers note the explosive growth of FT8 QSOs and the commensurate decline of just about everything else. So far, K1JT has publicly expressed surprise about how quickly his new digi-modes have taken off. But, perhaps like Robert Oppenheimer, who grew to feel quite despondent about creating the atom bomb after the devastation in

Japan, I wonder how K1JT might feel if his creations become "apocalyptic?"

Most coverage of K1JT's software creations and contributions to amateur radio's technical art have focused on the technical merits alone - which is a no-brainer. Joe's WSJT-X software suite is a bona-fide technical masterpiece.

But I'd like to take brief look at the potentially broader implications of what might happen to amateur radio as a whole in the wake of a globally disruptive event like FT8. My apologies to Mr. Taylor, as I find that equal measures of sass, exaggeration, and irreverence are good tools to highlight latent issues and spark debate!

I don't really think that FT8 will supplant all other aspects of ham radio, but the downsides of machine-only QSO technologies such as JTxx and FTxx may dramatically intersect with other issues facing amateur radio as a whole. So, let's pick off the scab a bit and dig in (in no particular order).

### **Hams Aren't Talking Anyway**

Our individual experience of amateur radio - and most everything else - is built upon our accumulated experiences, and often seems to "stand still" or "remain the same," or mostly so. But nothing really stays the same, and everything is constantly changing. The "change delta" - the apparent speed of change - is noticeable mostly when we experience jarring, disruptive change, such as 2017's "JT explosion."

With the benefit of hindsight I can see that I have been a part of the problem. As a teenage ham in the '70s who didn't have a Callbook or even a CW filter (let alone an Internet or a packet cluster), I happily sent my full name and address via slow CW to the other ops during most CW QSOs. We all did, because if we didn't, we couldn't collect QSL cards, which were required for all of the operating achievements we were all so diligently working toward! No eQSL. No LoTW. Just USPS-QSL!

Now, ragchews are still ragchews, if you can find them, but back in the day our casual, quickie QSOs, even with DX ops, always contained pleasant, friendly remarks, and operator names and locations, even if they involved Q-signals and Morse abbreviations. Casual SSB QSOs were even "wordier" with pleasantries. Whether 73, 88, HPE CU AGN, TNX QSO, GUD DX, FB SIGS, DSW, TU, GL GD, etc, outside of established contests we didn't just grind out contest-style QSOs.

But we do today, and it's a blessing and a curse. Yes, more contacts can be made (perhaps a necessity now that machine-

gun-style QSOs are driven by global packet spotting networks and year-long operating incentives such as the ARRL's grid-square thingy and CQ magazine's DX Marathon thingy), but a large measure of camaraderie and personal touches are lost.

Unlike my early years, until recently I didn't have many voice-mode QSOs because I was living (13 years) in a condo and operating with stealthy antennas at QRP power levels. I didn't want my voice to be heard coming from someone's clock radio, but I was OK with Morse dits and PSK31 warbles, as those would likely be indecipherable by mere mortals.

It's tough to successfully, consistently ragchew via SSB while running low power to compromised antennas, and I discovered soon after my teenage years that I didn't really enjoy ragchewing via CW. Contest-style operating, yes. Conversing at length, no. I don't use any repeaters, and if I need to ragchew with my local ham buddies I will call them on the phone or chat in person at Saturday morning ham breakfasts. I did do a bit of ragchewing via PSK31 a few years back, but even then I was met with an endless series of "brag files" and surprisingly little conversation! Even if the information in the brag file is interesting, it's still essentially automated if nobody's "talking." Now, PSK31 is a somewhat scarce, treasured memory...

Now that I have no practical antenna restrictions and can run power outputs up to the legal limit, I look forward to chatting via SSB - just as soon as I find a 100-W rig that I like as much as my Elecraft KX3 (or build an amplifier)! Even when I don't have to, I'm still running QRP. How many other excuses can I think of? We are slipping toward a non-conversational ham radio future, and I seem to be part of the problem!

### **Do Kids Just Wanna WSPR?**

These days, everything's about "the kids." Think of the kids who have to be driven to suburban schools in armored SUVs, who have no opportunity to play with sticks along the way (walking) or splash around a bit in a mud puddle! The poor little buggers have to deal with "Nintendo thumb syndrome" and, because of it, many couldn't hold a stick in their cramped-up little hands anyway!

I'm going to step down from this soapbox before I get carried away (actually and literally), but someone is thinking a lot about kids, and that someone is the ARRL. The League has a massive "think about the kids" initiative underway, and it's ostensibly all about making amateur radio more accessible to the smartphone generation.

We can't properly address this issue here for a variety of reasons, but I think it's interesting how FT8-style operation fits in nicely

with generations - new and old - of introverted hams who ostensibly joined a communications hobby, but don't want to actually communicate! Let me explain. Newfangled digital modes such as JTxx and FTxx use space age encoding, modulation, and DSP/decoding techniques to eke out fantastic improvements in signal-to-noise ratios that allow radio communication over propagation paths that won't support SSB or CW contacts. That's the cool part!

The downside is, taking advantage of these techniques requires long "integration" times that preclude real-time communication. Most JTxx and FTxx QSOs require accurate time syncing and back and forth transmission windows from 15 seconds to several minutes. Limited bits of information can be transmitted back and forth, but there's no chatting allowed. That's perfect for sending data back to earth from deep space, which is where the techniques originated, but not so good for real-time communication.

The only thing that keeps the entire process from being completely automated is the often-ignored FCC rule that limits unattended operation on most HF frequencies and the fact that the software has a "send" button that has to be clicked in real time every now and then by the control operator (if that option has been selected in the setup menu).

K1JT's WSPR software (weak signal propagation reporter) is similar. Many ops run their WSPR stations unattended 24/7 whether it's legal or not. Because many WSPR stations run milliwatts instead of kilowatts, the effects are minimized, but the rules are the rules, right? I would rather be shot with a BB gun instead of a .44 magnum - but I'd rather not be shot at all.

WSPR, when done right, is an amazing tool that has already added to our understanding of global propagation science and practice. It's like a public, hi-tech chirp-sounder network that can map existing propagation modes and paths in real time, while uncovering details we hadn't even imagined. But WSPR isn't really a QSO mode because the integration periods are even longer than those for JTxx and FTxx, which allow for "limited" data exchanges. Still, among hams who don't really want to "talk" anyway - these new modes may be just what the doctor ordered!

I can imagine a youngster asking a parent about joining the local after-school "ham radio WSPR club."

"Mom, mom!" the excited child exclaims, "remember when we talked about ham radio, and you were concerned about me having to talk to strangers? Well, I just learned that I can now join the WSPR club and get on the air like we talked about - and I'll never have to talk to anyone, ever!"

"Well," says mom, with a bit of a wrinkled brow, "what about interfering with the neighbors, interfering with your schoolwork - and what about those big, ugly ham antennas we looked at?"

"That's the best part, mom," says the excited child, "WSPR uses tiny power, so it won't bother anyone. And because it uses super new technology, I won't even really need an antenna! Schoolwork will still be my main focus - after online gaming - because my WSPR box talks to my game system - and it tells me where my signals have been heard and posts them on the Internet!"

Mom, now starting to smile, says, "Wow, you've really done your homework, haven't you? But, what about getting your FCC license? Won't that be difficult?"

"No way, mom!" says the still excited child, "My teacher says that, thanks to a new program by some organization called the ARRL, I can simply go to a class for three afternoons to get my WSPR license. There isn't even a test anymore. Cool!"

Far-fetched? I don't think so. If you look at historical trends, something like this seems almost inevitable. The ARRL, which seems to be switching to a kids first, "lowest common denominator" approach to everything it does, is pushing hard for increased HF privileges for Technician- class hams, for example, so they can take better advantage of digimodes and, hopefully, want to get further into the hobby by upgrading.

My sarcasm aside, a test-free WSPR-class license might actually make perfect sense (especially in middle school science classes), as long as we restrict WSPR operation (and power levels) to tiny slivers of little-used parts of existing bands (and there are plenty of them).

Is the drive to "save" amateur radio at all costs worthwhile? Does everything have to be saved and/or packaged so it's accessible to every kid, everywhere? By my standards, amateur radio license tests are already so easy to pass that they pose no barrier for the vast majority of potential applicants. I recently prepped one of my friends over a casual two-hour lunch, after which he went from civilian to General-class operator with no additional study. All without ever owning or using a radio or even keying a mic.

Taken to its logical conclusion, before long there may only be one license class - just like before incentive licensing! It took me years to fully understand that, for most things, we only truly appreciate things that require effort, time or money - or all of the above.

Modern kids are still investing time, effort, and money into the things that interest them. Video games. Coding. Software

development. Hardware hacking. Dating. Boys. Girls. Bikes. Cars. Ham radio. What do you think?

### **Antenna Here is 6-Foot Loaded Dipole**

Because of deed restrictions, etc, entire generations of hams have come up without knowing what it's like to operate with "real" antennas. I can no longer count the number of times newbies have asked me whether the small, expensive, portable antenna systems designed to be used by backpackers from mountaintops, are "good" for use at home in their backyards. Heck no, they're not good. They're horrible!

As highlighted later in this column, our antennas define our experience of amateur radio. Crap antennas equal crappy experiences overall. And while hams from my generation are dreaming about tall towers with stacks of big Yagis (already having real outdoor dipoles and loops), many newbies are dreaming about a too-low wire dipoles hidden in their backyard trees, or outdoor antennas of any type. And while they dream they're messing with what are essentially expensive non-antennas, and they're wondering why ham radio isn't so nifty.

These new hams are often surprised when I tell them that, if I could have a stack of killer antennas on top of a killer-high tower, I'd gladly trade my fancy new transceiver - any fancy new transceiver-for a 1970s Kenwood, Heathkit or Yaesu rig, which they view as anachronistic and completely useless. No questions asked. You can make up for a compromised radio, but you can't make up for a compromised antenna. Or can you?

Actually, if the machine-only aspects of emerging digital hamming can be addressed, the crappy antenna scenario can be somewhat mitigated by emerging digital technology. Technologies such as JTxx and FTxx offer 20-30 dB improvements over SSB and CW - and that's huge. Unlike the keyboard-to-keyboard digimodes such as PSKxx and MFSKxx, however, which allow conversations to take place with a 10-20 dB advantage over SSB and CW, you're still mostly in the WSPR club.

### **Teeny Bands Are All We Need**

The ARRL and other groups fight tooth and nail to preserve spectrum space, but if everything migrates to JTxx and FTxx style operation, ham bands can be tiny slivers of their former glory. Lots of digimode QSOs fit inside the space of a single SSB QSO, and because you often can't hear the signals with your ears, you have to hover around a calling frequency anyway, so who needs all that empty space?

### **No Need to Call CQ on Big Bands**

Even if the ham bands "stay big," we wouldn't need to cluster around calling frequencies if we simply have our PCs coordinate our QSOs on the Internet before automatically switching our radios to the agreed-upon frequency so our PCs can work each other and tell us all about it.

By doing so we could easily limit our QSOs to a group of "whitelisted" friends, members of a certain ham club (rifle association, sports team, political party), or hams who have sent us "greenbacks" (Bitcoins?) for our rare virtual "QSL cards." DXpeditions might be quite profitable that way, and while your robo-transceivers are churning out QSOs, you can be fishing, swimming or surfing!

Between global spotting networks, the reverse beacon network, the WSPR net, IFTTT, and PSK Reporter, etc, we can already do most of these things with existing technology, so although I'm being somewhat speculative (and more than a little sarcastic), bringing amateur radio into the "digital digital age" isn't as easy as it once looked.

### **Toward an Uncertain Future**

The future - where ham radio is going and what it's becoming - is a product of what exists now and what has already come before. Today's amateurs exist on the leading edge of a continuum that started (very slowly) a few hundred years ago with basic explorations of electricity and magnetism, but is rushing forward at an exponential pace.

This rapid evolution of technology in general isn't radio exclusive, of course, but it's still amazing to simply step back and take it all in. It's easy to "miss the magic" because we're surrounded by it every minute of every day. But even if we don't usually notice it, the technology train is barreling down the tracks at an ever-increasing pace. Ham radio is also streaking forward and, in some ways, is approaching a point of no return - an event horizon from which there's no turning back.

Unlike the equestrian arts, for example, in which riding a horse under an English saddle is substantially the same today as it was 100 or even 500 years ago, ham radio isn't the same. Spark-gap transmitters have been duly outlawed and, save for a relatively small cadre of enthusiasts, plate-modulated AM isn't heard much anymore, either. Regenerative receivers are all home-brew these days, lovingly crafted by a few caretakers who still safeguard the Major's gift. The elegant mechanical designs that made earlier radios so special - and frustrating - with ganged capacitors, clever synchronized cam-and-lever assemblies and robust mechanical dials, have all been replaced with software and programmable logic arrays.

For better or worse, amateur radio is firmly embedded in the digital domain, and if you think that emerging future systems won't supplant what we now think of as amateur radio, evolution will certainly prove you wrong!

Ham radio's first hundred years witnessed dramatic change, and in another hundred years we probably won't even recognize what ham radio has become - if ham radio exists at all. In "geologic time," ham radio will likely have come and gone in a finite, and rather small, window of evolution.

With what we know about the evolutionary progression of other technologies, species, etc, and all of the evidence we've collected to date, there's a good chance that the phenomenon we call amateur radio will have been born, matured, evolved and "died," in a 150-250 year period. Period!

And as if this isn't unsettling enough, let's not forget to marvel at the quirks of solar and planetary physics that enable radio at the fundamental level. Electricity and magnetism - still largely unfathomable even though we take them for granted on a practical level - comprise radio on a local level, but "global radio" requires an ionosphere, which is itself powered by the sun, whose output varies in mysterious cycles, etc. The list of dependencies and "coincidences" is really starting to add up! And if you take away even one part of the whole interdependent system - poof! - no radio.

Therefore, if you love amateur radio as it's practiced today, you'd better get busy enjoying it - today! - because our entire hobby likely exists in a precious, precarious evolutionary bubble, never experienced before and probably never to be experienced again.

Whether it's an inflection point or the point of no return, when you woke up today (or any day in the past few years), amateur radio was different. There's no wondering about whether it will someday be different - that day is today and amateur radio is different. Joe Taylor "caused" the present, local disturbance, but if he hadn't, someone else would have.

In the present moment, though, even if we have crossed the event horizon, amateur radio is still alive and well, and our far-off future - albeit closer than ever as evidenced by JTxx and FTxx digital technology - is yet to be determined.

The full breadth of past and present radio is available for exploring (spark gaps excepted!). We can build a classic regenerative receiver or buy a state-of-the-art synthesized radio. We can use Morse code or the most advanced computerized digital signal modulation. Or we can use a primitive regen to copy the most

advanced digital signals (perhaps stabilizing the oscillating detector via GPS?). But it won't stay that way - guaranteed!

## **NT0Z's Quest for 160-meter QRP WAS**

Last month, I updated everyone about the fate of my newly redeemed 160-meter inverted-L (a modest 25-footer over a decent set of ground radials) and my winter quest for working 160-meter QRP WAS. Actually, I tried twice, so far, to qualify in a single contest weekend. I got close-so close-each time, and this month's main column discussion turns out to be rather relevant.

Having used low, horizontally polarized dipoles and such on 160 over the years, I was stunned by how well the inverted-L worked and wished that I had figured that tidbit out a few decades ago.

My first attempt to work every US state with 5 W of RF on 160 meters took place in December during the ARRL 160-meter contest. Everything was good, including band conditions, but I came up a bit short, working 45 states (and some DX), including Alaska (one of the two "killers," the other of which is Hawaii).

I didn't hear a peep out of the Pacific, and my Alaska QSO was made at "psychic intuition" signal levels. The rest were relatively easy, but some key players were missing, including CQers from Wyoming, North Dakota, Utah, and South Carolina. Yes, South Carolina! As has been my habit, I rarely called CQ during contests in which I'm working QRP. That has been a mistake.

Still, 45 states and a bunch of Caribbean DX in one shot was a success worth celebrating. I'd use the Stew Perry contest, I thought, to finish everything off. Well, propagation for the Big Stew was less than awesome, so I only managed to fill in my missing Utah QSO. Four to go, with plenty of winter remaining.

The CQ 160-meter contest in late January offered a fresh start and fantastic propagation. As before, I was working the contest not to make the biggest possible score, but to work as many (all?) states as possible.

I managed to work 47 states this time, filling in all of the previously missing lower-48 states now that K0IDX was on from North Dakota, but missing Hawaii, Alaska, and Nebraska! Yes, Nebraska! Nobody was CQing from that state and, according to after-action reports, many contest ops had missed it too, unless they were calling CQ and someone from Nebraska had replied. That was the missing piece.

As mentioned, over the years I hadn't really called CQ when working QRP, but because of the Nebraska debacle, and because I

heard W1VT calling CQ near the top of the contest window, I decided to give it a try.

Zack W1VT was the ARRL's senior RF engineer in my QST days and, in addition to being the go-to guy for anything RF, he is also a noted QRP practitioner. I heard Zack's CQ, and it was weak. But from past experience I figured W1VT was running half a watt to some low wire antenna. He heard my single-call reply to his CQ (QRP experts have great ears, too), said hello, and handed me Connecticut.

With several hours to go, needing only Alaska, Hawaii and Nebraska, I was running out of stations to work, so I figured I'd follow Zack's lead and call CQ. I didn't expect AK or HI stations to hear my CQs, but I figured a NE station might, as signals between our respective regions had been strong throughout the contest and it was looking like that would be the only way for me to find one, anyway.

So, I programmed my logging software to call CQ via an old-fashion serial port on my PC and a home-brew opto-isolator, with me handling the paddles for everything else. On my second call, a station called me! When all was said and done I had made 350 QSOs in the contest, about a hundred of which came from my own CQs. Nebraska, unfortunately, wasn't among them.

In addition to racking up QSOs and scoring contest points, ops from two Canadian multipliers called me, VE7 and VY2, which was nice. My "20-minute adjusted hourly QSO rate" peaked at 57, which I thought was awesome for running QRP on 160 meters.

I would often call CQ five or six times between takers, but a few times, several stations were calling at once, causing a small pileup. But this time I was the "DX." It's always good to be the DX!

As it stands, assuming I can get QSLs or LoTWs from all of the stations, I need only Hawaii to complete my 160-meter WAS QRP adventure. I learned a lot along the way, but I also learned that signal levels between HI and MN are almost always puny-weak. Probably too weak for QRP CW unless the planets really align. (I thought that about working HI on 80-meter QRP, too, until I did it several times with my previous attic antenna. As with Roger Bannister's sub-4-minute mile, it's only difficult until you do it!)

I will soldier forward for the rest of the season trying to work Hawaii on CW or PSK31. But if summer static is approaching and nothing's in the log, I know what I must do - work 'em via FT8 until I can fill in that state with a "full conversation" mode.

Ouch. I suppose I will have to make a deal with the radio gods to do 10 hours of ragchewing for every state or DXCC entity I work exclusively via FT8. That sounds fair, doesn't it? Mr. Marconi? Mr. Maxim? Mr. Fessenden? Anyone?

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