# Sidebands

The Newsletter of the EAST GREENBUSH AMATEUR RADIO ASSOCIATION

W2EGB

www.egara.club

June 2023



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# A Memorial Day to Remember Aboard the USS Slater

Memorial Day was a special one for more than a dozen EGARA members who operated Special Event Station WW2DEM aboard the USS Slater Museum Ship on Sunday, May 28th. The ship is the last World War Two Destroyer Escort still afloat and restored to her original wartime configuration.

Russ and Justin working on their 100 contacts

The club operated a total of four transmitters during the event from 8 am to 4 pm, including the ship's vintage 1940s rig. Despite the bands being less than ideal, a total of 149 contacts were made. Although 80 and 40 meters brought only a dozen or so contacts, the majority were made on 20 meters, as it offered the best conditions during the day. QSOs were made across America and Canada, including California, Nevada, Florida and Nova Scotia. Confirmed contacts will be sent a Special Event QSL card upon request by sending the club a self-addressed, stamped envelope.

Steve checks out the Slater's 1940s wartime transmitter

The day's big performers were Justin Cummings, KG2RG, and Russ Greenman, WB2LXC. Together they teamed to log 100 contacts on 14262 khz using both CW and SSB modes. In addition to the EGARA team, Navy veteran Ed Bell, WD2ERB, of Queensbury, attended as a guest operator and scored better than a dozen contacts during his stint on the air. The 20 meter band remained in good shape throughout the day and a number of pileups took place as hams worked to get the WW2DEM Special Event Station call into their logbooks.

The highlight of the day came when the Slater's radio supervisor, Steve Syrotynski, W2TRH, fired up the ship's 1940s wartime transmitter for operation on the 80 meter band in AM mode on 3875 khz. Club Secretary Steve VanSickle, WB2HPR, made contact from his home in Troy, as did Justin Cummings from his residence in Albany.

The USS Slater was busy itself throughout the day, with regular tours running on the ship. Each stopped at the vessel's radio room to get a first-hand glimpse of the club's Special Event Station in operation. EGARA members took time to explain what was taking place and to provide a quick overview of how Amateur Radio works.

EGARA Check Presentation

Once the event was over, EGARA President Bryan Jackson, W2RBJ, and Board Member Russ Greenman, WB2LXC, presented the USS Slater Museum with a $100 donation from the club. In addition, Club Secretary Steve VanSickle donated $40 to the Slater's Restoration Fund.

**Photos by Dave Gillette, KC2RPU, and Bryan Jackson, W2RBJ**

## In This Issue



**Next Membership Meeting - June 14, 2023 - 7 pm - Field Day Prep**

# Field Day -- Testing Our Skills


Field Day is rapidly approaching once again, giving Amateur Radio operators in the United States and Canada a chance to practice their skills as they work to contact as many stations as possible on the 160-, 80-, 40-, 20-,15- and 10-meter HF bands, as well as all bands 50 MHz and above. Hams also learn to operate in abnormal situations in less than optimal conditions. This year's event will take place June 24-25 and EGARA will participate as it has for many years in the past.

This highly anticipated event dates back to 1933, when F.E. Handy, W1BDI, came up with the idea for International Field Day. It was an absolute hit among the ham radio community. Since then -- with the exception of during World War II -- Field Day has taken place every year during the fourth week of June and remains the most popular event in amateur radio to this day.

But Field Day is much more. It is an exercise in practicing community outreach, emergency preparedness, and technical skills. It is a time when many aspects of amateur radio come together to highlight the many roles we can play. While some operators view it only as a contest, other operators and groups -- such as EGARA -- use Field Day to practice their emergency response capabilities. It is an excellent opportunity to demonstrate amateur radio to the organizations that we might serve in an emergency and to the public in general.

The contest portion of Field Day has two purposes. The primary purpose is to test the individuals or groups ability to plan operations that cover an entire 24-hour period. This tests operator endurance and showcases the number of operators available and trained for a group shift operation. The secondary purpose is to demonstrate the technical proficiency of the station and individual(s) that have been quickly thrown together in order to make the contacts. A well-constructed station will be capable of emergency operations in rough conditions as well as making many contacts during Field Day.

Field Day is also often used to attract publicity for amateur radio. Again this year, our club will contact local media and other interested parties and invite them to visit or even to participate. We hope to simultaneously demonstrate different operating modes including single-sideband (SSB) voice, Morse code, older and newer digital modes (RTTY, PSK31, and FT8, among others) and even two-way communication via amateur radio satellite.

Field Day is also a learning event. Unlicensed and Technican-licensed operators who have little or no HF experience are teamed with higher class hams to get a taste of what it is like. Club Elmers are also available mentor to assist with using the equipment provided.

The term Field Day refers to setting up a station "in the field", meaning setting up a temporary station to send and receive communications in an unfamiliar place. This practice prepares operators for emergency situations so they can react and communicate to the rest of the world no matter where they are physically located at the time of an emergency. There is a separate category for the many home stations that participate as well. EGARA is fortunate that the Masonic Lodge where it regularly meets also fills the bill as a Field Day location.

The EGARA membership meeting on June 14th will center on Field Day preparations, including operating plans and sign-up sheets for those who plan to participate.

So, save some time on June 24 and 25 to be part of this annual event. And remember, Field Day is also a celebration of sorts. It's the perfect time to celebrate amateur radio's contributions to society and the improvements ham radio has added to the world.

# Remembering the Mechanicville Tornado

## Amateur Radio Provided Emergency Communications When Systems Failed

On Sunday, May 31, 1998, a severe weather outbreak occurred across the northeast United States. The severe thunderstorms produced 20 tornadoes within a two hour drive of Albany, along with hundreds of damaging wind and large hail reports. This was an extreme severe weather event by Northeastern standards, similar to events that occur in the Great Plains of the United States. This outbreak is locally known for the F3 Mechanicville, NY tornado, but there were three additional tornadoes confirmed in the Albany forecast area. Fortunately, there were no fatalities caused by the Mechanicville twister thanks to emergency warnings issued by local broadcasters and observations relayed by Amateur Radio operators in the affected areas.

There were five fatalities and 127 injuries associated with 32 tornadoes across the Northeast. Additionally, there were 264 reports of wind damage and 84 reports of hail (3/4" or larger). Sixty-eight people were injured in the Mechanicville tornado alone. It is believed that accurate and timely severe weather outlooks, tornado watches and tornado warnings contributed to no lives being lost in the Albany forecast area. Many people who survived the tornadoes, when interviewed, stated that they had received the watches and warnings and took shelter when they saw the storms approach.


**EGARA Club President Bryan Jackson reporting live on NewsChannel 13 after the tornado hit Mechanicville on May 31, 1998**

Severe weather was anticipated the day before by the Albany National Weather Service (NWS) office, which issued statements on Saturday afternoon outlining the potential for significant severe weather the next day. About half of the NWS office staff was on duty that Sunday. This included an electronic technician to help ensure equipment functionality, and staff to operate the amateur radio equipment and provide emergency communications. The NWS office in Albany lost both power and telephone communications at times during the event. In addition, the NOAA Weather Radio in New Scotland, NY was knocked off the air by storms. Some EAS activation was done by local television and radio stations. Some warnings were relayed to county EOCs by Amateur Radio due to communication outages.

WNYT-TV, Newschannel 13, was among the broadcasters interrupting regular programming throughout the day to provide updates and warnings. When the Mechanicville tornado hit, the first reporter on the scene was EGARA's club President Bryan Jackson, who was a reporter for the station at the time. He and photographer Louis Tortora were on the Northway near exit 12 when the tornado passed directly in front of them about 1/10th of a mile down the highway.

"Suddenly there was this massive black shape moving directly in front of us and we realized it was the tornado," said Jackson. "We pulled off the exit and found Route 67 completely blocked by phone poles, trees and all kinds of debris. We managed to get into a local neighborhood and saw homes that had been ripped open and their roofs torn off. It was absolutely surreal."

Jackson's memories of the twister and its aftermath were the subject of a one-hour special report on WNYT that was broadcast on May 24th.

The severe storms resulted in tens of millions of dollars in damage to homes and businesses, and extensive forest damage. Power was out to over 130,000 customers at the storm's peak, while 12,000 were without power for over three days. Cloud to ground lightning rates over the region reached 15,000 strikes per hour and fires started by lightning were reported.

A lot has changed since that day in 1998. Back then the warning process could take many minutes since the forecaster had to manually type out the warning after the warning decision was made. Today, software allows the NWS forecaster to issue a warning in less than a minute from the time the warning decision is made. Finally, in 1998, the warnings had to be manually read and recorded for playback on NOAA Weather Radio. Today, software translates NWS warning text into speech for airplay. However, Amateur Radio still remains an important component, providing first-hand observation of weather events, as well as emergency back-up communications.

# On the Beam
## News & Notes

### New RF Exposure Evaluation Rules Now in Full Effect for Amateur Radio ARRL Ready to Help

ARRL The National Association for Amateur Radio provides free, comprehensive resources to help radio amateurs ensure they are compliant with the new RF exposure rules imposed by the FCC.

The rules now require amateur radio operators to perform station evaluations, as the Amateur Radio Service is no longer categorically excluded from certain aspects of the RF exposure regulations. That means Amateur operators can no longer avoid performing an exposure assessment simply because they are transmitting below a given power level.

While the exposure limits were not changed when the new rules took effect in 2021, the requirement to conduct an evaluation was made more broadly applicable to Amateur licensees. A two-year transition period was implemented to allow existing amateur licensees to conduct evaluations and make any changes necessary to ensure that their station complies with the exposure rules. As of May 3, 2023, the transition period ended. All licensees must now conduct evaluations of their current station and reassess compliance when making changes to their stations that would affect exposure going forward.

The ARRL website features an RF Exposure page with resources, such as an RF exposure calculator, the entire RF Safety section from the 100th Edition of the ARRL The Handbook, a video explaining the topic, FAQs about the subject, and more. These tools and resources are available to the public without an ARRL membership or website account.

ARRL members who need additional technical resources can access the League's Technical Information Service, and the experts within the ARRL Lab.

## FCC 2-2 Deadlock to be Broken with 5th Commissioner

The President Biden nominated Anna Gomez to be the fifth FCC Commissioner. The NAB has voiced its support of Gomez.

If confirmed, she will break the 2-2 deadlock that has prevented some initiatives FCC Chairwoman Rosenworcel has wanted to accomplish.

At the same time, Biden has renominated Democrat Geoffrey Starks and Republican Brendan Carr to continue as FCC Commissioners for another 5-year term.

## Saving AM Radio

Both Houses of Congress introduced the *AM For Every Vehicle Act*, seeking to mandate AM radios in cars sold in the USA. The NAB endorsed the bills, as did the National Association of Farm Broadcasters. The bills would require the government set rules for AM radios within a year.

Some automakers have already responded: Ford has announced that they have decided to include AM radio in all their 2024 vehicles – and offer a software update to any Ford EV without AM.

Meanwhile, there's no word yet on how the FCC might handle existing RFI from EVs already on the road. There is also concern that the growing number of EVs already on the road will, along with LED traffic lights, etc., continue to erode AM coverage to a point where the band may be killed.

# EGARA May Meeting Minutes

- **The May meeting of the EGARA was called to order by President Bryan Jackson, W2RBJ, at 7:00 PM. There were 24 members in attendance at the Masonic Temple. After a round-robin introduction, the raffle was conducted, and several prizes were given out.**
- **Considerable time was taken to discuss plans for the upcoming hamfest on June 3rd. Volunteers are needed to staff the event and participate in setup, cleanup, and to run the kitchen. A sign-up list was circulated and 17 members committed to help out. Sponsors have donated many nice prizes, and the grand prize will be $500. The Hamfest was not listed in QST due to a change in League directors, but is in the Hamfest/Convention listing in QST. KJI Electronics will attend.**
- **A VE session is scheduled for June 10th at the East Greenbush Library. This will be the last opportunity to take the General Exam based on the current question pool.**
- **Field day is planned for June 24-26th. 2 stations will be operated using batteries and a generator.**
- **The ARRL has proposed a dues increase and members are encouraged to participate in the membership survey.**
- **The club will operate a special event station aboard the USS Slater from its dock in Albany on May 28th, Memorial Day weekend. Club volunteers will make contact on AM, SSB, and CW using vintage US Navy gear as well as more modern equipment. A special QSL card will be sent to commemorate the event. A news release will be made. Steve Syrotynski, W2TRH will coordinate the station activity.**
- **Recognition was given to Dave Gillette, KC2RPU for his collection of bottles and cans, for which he has obtained deposit money and returned to the club coffers.**
- **The club celebrated 25 years last month, as was noted in the current issue of Sidebands.**
- **Members are encouraged to list items for sale in the Buy/Sell/Swap want ads in the newsletter.**
- **Lodge maintenance is performed on a monthly basis, with grounds keeping as required. Please make sure all windows and doors are secured.**
- **No officer reports were given.**
- **Following the business meeting, KD2TAI, Hisen, showed his latest invention, a compact multifunction computer with SDR and GPS. A slide show was part of the presentation – illustrating the state-of-the-art design and assembly, as well as the capabilities and specifications. Some components were fashioned using CAD and Laser cutting technology. The unit has a built-in power supply and will operate for 4 hours on battery power.**
- **Refreshments were enjoyed by the membership. The meeting was adjourned at approximately 8:40 PM.**
- **Minutes recorded by Secretary Steve VanSickle, WB2HPR.**

# The History of Ham Radio: Treaty

**Chris Codella, W2PA, author, John Pelham, W1JA, editor, Phil Johnson, W2SQ, editor**

**(Editor's note: By special arrangement with the authors, Sidebands is pleased to present this multi-part series on the history of ham radio. Subsequent chapters will be published in future monthly editions of the newsletter)**

Amateurs in the United States had waited years for a new legal and regulatory structure for radio as they watched, witnessed and withstood an arduous, frustrating legislative process. In summer 1927, just as they were absorbing the impact of the new radio law, an international conference was set to convene in Washington. No one knew what to expect. In principle, it could all be thrown up in the air again were the US to be a signatory to a new international radio treaty.

ARRL Secretary Kenneth Warner weighed the issue as he pondered the nature of amateur radio on his editorial page in QST. Ham radio was different from other hobbies in that it provided a service ready for use by the country in times of emergency—natural and war time. Amateurs volunteered their time, bought and built their own equipment, maintained their stations. Their experiments benefited the companies from which amateurs purchased equipment and parts, and invented radio technologies and techniques which the companies could then commercialize. And it was thought, perhaps naively, that direct contact between amateurs of different nations might, in some small way, help foster international good will and possibly even avoid war. With all that in mind, Warner asked, "Isn't it clearly the duty of every enlightened Government—or, if you please, isn't it clearly to its selfish interest—to see that adequate privileges are given its radio amateurs, in order that these benefits may redound to the State?" Hams hoped the conference members would agree.

Like the US had been before the Radio Act of 1927, the world was stuck back in 1912—at least as far as radio law was concerned. The upcoming conference's main purpose would be to revise the London Convention of 1912, the last time such a meeting had taken place. Involving hundreds of representatives from all over the world, it would likely run for weeks. Commerce Secretary Herbert Hoover planned to lead a fourteen-person American delegation supported by a staff of perhaps two dozen more.

In advance of the conference, an international organizational bureau assembled a "Book of Proposals" contributed by the international delegations, which was then translated and published by the US State Department. A ponderous volume "the size of a Sears-Roebuck catalog," according to Warner, only a small portion pertained to amateur radio. The American delegation's contribution strongly supported the protection of the amateur bands as already allocated in the US, but did not prescribe how individual countries' governments must support the service, leaving it up to them to decide. This was probably the way things would go, since none of the proposals suggested that band allocation should be done by country or geographical region, or in any way other than by service type. Most proposals were much more restrictive on amateur operation than the one from the US.

Britain continued to advocate the use of two-letter call sign prefixes to indicate nationality and DE as the sole intermediate instead of the IARU system of country-dependent intermediates. Annoyed by this (he favored the system of country-designated intermediates that had been briefly in use), Warner described the situation as a British intent to "foist on the world its dizzy policy," and "for no good reason" too! Ironically, later in the same issue carrying his complaint, an article identified its authors using the IARU intermediates, but in exactly the way the British were proposing: as a prefix appended (albeit in lower case letters) to the front of their call signs. In fact, this had already been a common practice on the air for some time.

The Conference consumed the full attention of the League as the board and headquarters staff digested the Propositions pour la Conference, as the Bureau's tome was titled. Participation by the League was a given and individuals had already been named to serve on the delegation, another recognition of amateur radio's role as a peer of the other radio services. ARRL Vice President Charles Stewart was appointed as a technical advisor to the American delegation's committee on technical matters, Warner would present an analysis of proposals related to amateur radio, and both were appointed to the committee on shortwave allocations. Both the US Army and Navy had endorsed the League's participation as well, a direct result of the successful cooperative work the League had undertaken with the military.

The possibility of losing the newly established US amateur allocations was naturally the greatest threat American amateur radio faced at the conference. Briefly challenged by broadcasting interests, 20 meters was expected to safely remain with amateur radio primarily because of its harmonic relationship to the lower-frequency bands, which were also considered safe from attack.

(continued on page 7)

## History of Amateur Radio...

Thus, the US would probably propose that the 80-, 40- and 20-meter bands be assigned to amateur radio worldwide. And in mid-September as the conference prepared to convene, the American delegation further added the 5- and ¾-meter bands to their proposal.

Warner accompanied ARRL Canadian General Manager Russell to meet with his government's delegation and that of the United Kingdom. The British had been meeting in Canada with the other British dominions to discuss and plan for the conference. They peppered Warner with questions about the environment for amateur radio in the US, such as the size of the amateur population (now around 16,000), the privileges they enjoyed and their relationship with the government. They gave him over an hour to present his full story. Warner was surprised by how little the British delegation, a group with absolute authority over all radio in the UK, knew about amateur radio—practically nothing at all, in fact—and wondered how it could be "that our amateurs over there have been so backward about introducing themselves to their officials! It seems that our amateurs over there are 'scared to death' of their officials and have just about never made any clean-cut representation before them. We don't know why this situation should exist. We thought them quite approachable and open-minded – they were not antagonistic, they were merely abysmally uninformed."

What he perceived as affability would later prove illusory.

Warner and Russell asked for their support and, while the officials did not commit to anything, they assured the two League officers that British amateurs would be supported fairly. "We hope that this account of our adventures with the delegation will simply make the hair stand straight up on the heads of British amateurs. Get onto yourselves, you fellows over there!" wrote Warner, somewhat reassured. Based on seeing only one side, his assessment of the British amateurs' relationship with their government had missed the mark, as he would later come to understand once the conference got underway.

Stewart and Warner attended the entire conference in Washington and were joined occasionally by Maxim. Warner found the mood immediately alarming. Among the countries represented, amateur radio clearly had few friends, but opponents everywhere. Many of them had been allowing amateur operation on the basis that it was temporary, pending action by this conference. With the exception of the US, Canada and a few others, most believed that amateurs should now be severely restricted. There was acute contention for spectrum space, and state controlled radio organizations objected to amateur message traffic, seeing it as competition. Nevertheless a consensus began to form that there should at least be an amateur allocation near 150 meters and a few narrow, harmonically related bands in the shortwaves. Each country would individually set power limitations, determine whether their amateurs may communicate internationally and determine whether message traffic would be permitted.

To Warner this mostly sounded fine although he worried about the definition of "narrow." He remained pessimistic due to the overwhelming number of countries that seemed to be against amateur radio in principle and predicted that "we are going to suffer heavily." Even The United Kingdom, whom he judged as friendly when he met the group in Canada, and generally one of the amateurs' advocates at the conference, was in favor only of "spot waves" of zero width, although it was not clear how such a thing could be enforced or even exist.

Maxim's own initial assessment was not much different. Of the fifty-two nations at the conference, forty-eight of them had "no use for radio amateurs," he commented. The US, Canada, Australia and New Zealand comprised the small group of proponents who valued amateur radio, the result of years of cooperative work and contributions to radio technology by amateurs in those countries. The existence of IARU helped somewhat, but it had only been operating for two years.

Warner speculated glumly that retaining 40% of the current US allocations might be a very optimistic outcome, but 5% was his better guess. "Get ready right now, fellows, for just the saddest news you could hear short of actual extermination," he wrote heavily. Looking for a silver lining he wondered whether adversity might be what amateurs needed to promote new methods and cooperation. He was not very far off; amateurs had been through this before. But his pessimistic prediction was premature.

(continued on page 8)

## History of Amateur Radio...

Amateur radio matters were debated mainly in the Technical Committee, one of several that divided up the work at the convention. Fortunately this one had friends of amateur radio in leadership positions, including Professor A. E. Kennelly of Harvard, E. H. Shaughnessy of the British Post Office and Professor G. Vanni of Rome, president of the Italian section of IARU.

From the outset, the American delegation insisted on recognition and support for amateur radio. Surprisingly, the British delegation led the opposition, leading Warner to later apologize to the amateurs in the UK for stating in his earlier editorial that they did not know their officials. As it turned out, they knew them all too well.

The Committee on General Regulations took up the question of the nature of amateur operation. One member, US Congressman White, author of several US radio bills and an amateur radio advocate, argued against anything that would limit message traffic or content within any country, leaving it up to each one to decide on their own restrictions. One proposal went so far as to prohibit "personal or actual information" to be exchanged between amateurs, whatever that would mean.

As expected, the subcommittee on allocations drew the largest crowd, with delegates from all seventy-eight countries and territories participating. With the committee itself burdened by heavy, time-consuming, formal proceedings involving translation and recording of minutes, most of the real work took place in smaller, informal groups at night or over tea. Their members thus became known as "tea cuppers." Since these groups fostered free expression of views, they were quite effective as a back channel for negotiation, and without the impedimenta of the committee they could more rapidly reach agreements.

An eleven-member "sub-sub-committee" on amateur radio was formed at the insistence of the US delegation and Warner was appointed to it. There was general agreement—even from the British—that bands for amateurs should be harmonically related. But the size of those bands was at issue, with a vague suggestion that 100 kHz might be the right width. The general recommendations were reported to the parent Technical Committee where it then waited while the all-important broadcast allocations above 200 meters were considered.

The committee next took up the detailed discussion of the shortwaves. Warner was invited to be one of the tea cuppers in these sessions as the sole representative of the amateurs. With the weight of worldwide amateur radio resting on his shoulders, his anxiety, as expressed in his earlier editorial, is understandable. He could consult with Stewart and the others only during session breaks.

But Warner was not completely alone. Supporting him from the American delegation was Major General Charles McKinley Saltzman, Chief Signal Officer of the US Army, a driving force behind an ARRL-Army joint program. His chief of research and development, Captain S. C. Hooper, chief of the US Navy's Radio Section of the Bureau of Engineering, and Lieutenant Commander T. A. M. Craven of his staff were also members. Hooper presided over the informal sessions while Craven conducted most of the negotiations and drafted the proposed allocation plan. Warner later heaped most of the credit on these three officers, especially Craven, writing

"It may be said that he is personally responsible for the successful negotiating of the wave-length agreements embodied in the Washington Convention of 1927. What a monument to have to one's credit! The conference has praised him for it. I sing his praises too, for he was the staunch and clever friend of the amateur and in large measure we owe what we got from the conference to his skill and perseverance. These three officers let no opportunity go by to stand up for us. If we did not get all we want, it only shows the difficulty of the task and how hopeless we would have been without their help. I want to tell you amateurs that our friendly bonds with the Army and Navy have paid the richest possible dividends!"

Over the course of eight days and six meetings, the informal sessions, which averaged an attendance of twenty-five, first debated allocations for point-to-point and mobile services, then broadcasting, postponing consideration of amateur allocations until later. Warner could barely contain himself as he waited for these debates to conclude, as they often discussed segments he knew would infringe upon proposed amateur bands.

When the amateur allocations finally came up for discussion, the initial proposal was to have them all shared within the already shared bands assigned to point-to-point and mobile services. The Americans countered with a proposal for exclusive amateur allocations at 20, 40, 80 and 160 meters where years of operation had already kept those bands free of commercial operations.

(continued on page 9)

## History of Amateur Radio...

No one else seemed to like it, and no immediate agreement could be reached, so the strategy shifted to negotiating allocations one band at a time.

Smaller groups formed to discuss ideas. One sub-group of seven went to work on broadcasting and amateur allocations, with Warner again the only amateur representative and Craven the only US government representative. At Warner's urging, Craven got agreement to a non-exclusive band from 3,500 to 4,000 kc, the already operational US limits at 80 meters. Next, the 20-meter allocation was trimmed back to between 14,000 and 14,400 kHz, one-fifth its previous size, which had been determined solely by its harmonic relationship to the size of the 40-meter band, a width that could not be justified by current use. Then came discussion of the 40-meter band itself, the most popular one for nighttime international communications. The US proposal asked for 7,000 to 8,000 kHz while the British suggested only a 100-kHz total width. The group agreed on the lower frequency band edge but had trouble getting any higher than 7,200, due primarily to the existence of German and Canadian broadcasting stations already operating in the segment above. For the moment, the group settled on 7,000 to 7,225, without Warner's agreement, and moved its attention to the 10- and 5-meter allocations. The next morning the German delegate agreed to compromise and extend the band to 7,300; the British went along with moving some stations too. Still at the informal level and therefore not binding on the participants, the group agreed nevertheless that this would be their final version, stood behind the plan as a block, and therefore got it adopted by the subcommittee, the Technical Committee, and finally the plenary convention session.

"This was the largest international conference ever held in the history of the world, with nearly eighty nations represented, and they had unanimously agreed upon the partition of wavelengths from 80,000 meters to zero," wrote Warner. While the allocations amounted to agreements on where amateur operation could take place, the Conference allowed each country to decide how much space would actually be allocated, if any. But although an individual government could decide not to give amateurs any privileges at all in a given band, they would be prohibited from using it for anything else. This provision removed all motivation to curtail amateur operation based upon a desire for more spectrum for something else.

Besides determining access to band allocations, the conference also left it up to each country to assign power level limitations individually. All would have to adhere to band limits and emission characteristics, and license stations in a way that would assure the proficiency of operators.

To make unambiguous identification possible, call signs would be assigned according to the established national commercial call sign plan, which consisted of one or two letters denoting the country, and the single intermediate DE, finally eliminating the stopgap IARU intermediates to which Warner and others seemed to be so attached.

It was thought that using kilocycles (kc) for specifying frequency was better than using Megacycles (Mc) since whole numbers could be used. That way no Morse commas or periods had to be used on the air. However, Mc could be used for convenience when referring to bands. So the kilocycle was officially adopted by the convention and the US Department of Commerce.

The six amateur band allocations were specified in kc as:

| | | | |
|---|---|---|---|
| 1,715–2,000: | shared amateur, mobile, point-to-point | | |
| 3,500–4,000: | shared amateur, mobile, point-to-point | 7,000–7,300: | amateur exclusive |
| 14,000–14,400: | amateur exclusive | | |
| 28,000–30,000: | amateur and experimental | | |
| 56,000–60,000: | amateur and experimental | | |

Discontinuation of phone privileges on 80 meters was not unanimously favored and led to some understandable angst. Some even blamed the ARRL recommendation for this on "unauthorized personal views of an individual or two at Headquarters" as part of a "plan of persecution of the phone, aiming to do away with it," wrote Warner, possibly referring to Kruse, who had been phone's most vocal critic. But it had been duly voted upon by the board, and argued in favor mostly because the 80-meter band was where most message and emergency traffic was taking place. The board judged it preferable instead to more than double the phone band at 150 meters since that band's characteristics were similar and it was mostly unused by telegraphy stations, which meant less interference to phone operations. And the opening of a 20-meter phone allocation more than made up for the loss by making the possibility of international and long distance contacts available to phone operators for the first time. (continued on page 14)

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# One Man's Quest to Revive the Great American Vacuum Tube

**The prized retro audio components are mostly manufactured in Russia and China.**
**Now, a small Georgia company is rebooting US production.**
**By Roy Furchgott, Wired Magazine**

Rossville, Georgia, on the border with Tennessee, doesn't look like a tech town. It's the kind of place where homey restaurants promising succulent fried chicken and sweet tea are tucked among shuttered businesses and prosperous liquor stores. The cost of living is moderate, crime is high, politics are red, and the population has withered to 3,980.

But in the view of entrepreneur Charles Whitener, Rossville is the perfect place to stage a revival in US technology and manufacturing --albeit with a device that was cutting edge when the Ford Model A ruled the roads.

Whitener owns Western Electric, the last US manufacturer of vacuum tubes, those glass and metal bulbs that controlled current in electric circuits before the advent of the transistor made them largely obsolete. Tubes are still prized for high-end Hi-Fi equipment and by music gear companies such as Fender for their distinctive sound. But most of the world's supply comes from manufacturers in Russia and China, which after the transistor era began in earnest in the 1960s helped sunset the US vacuum tube industry by driving down prices.

Whitener, a 69-year-old self-described inventor, vintage Hi-Fi collector, and Led Zeppelin fanatic, bought and revived AT&T's shuttered vacuum tube business in 1995. The business has ticked along in the era of cheap overseas tubes primarily by serving the small market for vacuum tubes in premium Hi-Fi equipment with a model called the 300B, originally designed in 1938 to enable transoceanic phone calls.
Inspecting newly sealed vacuum tubes.


**A delicate 15-inch ribbon of nickel makes up the filament at the heart of Western Electric's current model, the 300B**

But recently US trade restrictions on Russia and China, over the former's renewed invasion of Ukraine and the latter's ideological disputes with Washington, have sent vacuum tube prices soaring. At one point in 2022, tubes that typically retailed for $10 were offered at prices over $100, says Daniel Liston Keller, who does public relations for recording industry clients. Although shipments of Russian tubes have resumed, prices remain high and the quality of overseas tubes has always been unreliable. "You have to buy 100 tubes to get 30 you like," says Justin Norvell, an executive vice president at Fender. An affordable tube for a guitar preamp is now roughly $30, meaning the company can spend about $90 to get one tube that meets its standards.

Whitener has seized on the current moment of high prices as a chance to reinvigorate his company, the US tube industry, and even the idea of what a vacuum tube can be. Western Electric is currently working on a modernized tube design, an iteration of the all-but-obsolete technology fit for the 21st century. It's an improved version of a tube called the 12AX7, which is common in guitar pre-amps and other music gear -- a market Whitener estimates is more than 10 times the size of the premium Hi-Fi business and is today served almost wholly by overseas suppliers. The recently high prices create economic cover, he calculates, to make a better version in Rossville that can be more reliable, durable, and economical than existing designs, turning the US into a powerhouse of vacuum tube technology again.

That makes Western Electric an oddball member of the swelling movement to bring technology manufacturing back to the US, assuring the supply of crucial products, such as computer chips and electric vehicle batteries, that are generally sourced overseas. The company is in the process of restructuring its factory floor with a combination of vintage and new machinery to turn out the modernized tubes, at the volumes Fender and other music companies need.

-continued on page 12 -

# Reviving the Great American Tube...

Whitener is a perfectionist. He aims to launch the 12AX7 this summer, but previous debuts have slipped. His factory is poised to make America the dominant source for audio vacuum tubes, improving the fortunes of Rossville, audiophiles, guitar heroes, domestic manufacturing, and Whitener himself, if he can "just get the damn things out the door." This landscape for the Russian tubes could change tomorrow, he concedes. "It's a Walmart world, and that's a risk."

**How Hard Can It Be?**

From the 1920s through the 1950s, the American vacuum tube industry thrived. RCA, General Electric, Raytheon, and other manufacturers competed to invent and manufacture more reliable tubes, which were needed to regulate current and boost the faint signals from analog microphones and instruments enough to drive speakers. But the arrival of transistors, then circuit boards, made tubes obsolete for most uses. American manufacturers couldn't match prices from overseas. Factories closed. Engineers moved on.

Many musicians and audio obsessives stayed loyal to the tube but increasingly got them from outside the US. Russia and China became the leading suppliers, with companies such as Shuguang Electron Group cranking out tube designs established between the 1930s and 1950s, such as the 6L6 and EL34.

**Inspecting newly sealed vacuum tubes.**

By the time Charles Whitener took a career break in 1990, the US did not make any consumer audio tubes. He thought about changing that after noticing a steady stream of ads in Hi-Fi magazines offering Western Electric 300Bs, a design from 1938 that was popular with audio enthusiasts. Whitener was looking for a new venture after using his experience in his father's yarn factory to invent a quality control system for the fiber optics industry that he then sold. "I thought, how hard can it be to make these tubes?" he says. "People are willing to pay $1200 to $1500 a pop for them."

Predictably, it was harder than Whitener thought. It took him two years to persuade AT&T, which hadn't made a tube since 1988 but still owned Western Electric, to license the brand and sell him its tube-manufacturing equipment. He set up shop in Western Electric's former tube factory in Kansas City, Missouri, where the mothballed machines were stored.

After a fortuitous meeting with retired AT&T employees on a visit to Bell Labs, Whitener combed the northeast tracking down veterans of the storied facility, Sylvania, and RCA who knew the arcana of tube-making. When his factory started production of 300Bs in 1996, almost all of his 20 or so employees were tube-manufacturing veterans.

Western Electric was up and running again, but in 2003 AT&T sold the building. Whitener moved the company to Huntsville, Alabama, a NASA stronghold with skilled workers that was convenient for his tube contracts with the Department of Defense. In 2008, he moved the company to Rossville, Georgia. It was there that he began modernizing vacuum tube designs that are more than 70 years old.

Whitener's team devised a way to apply an atom-thick layer of graphene to a vacuum tube's anode to extend its lifespan by improving heat dissipation and reducing contaminating gases. Those enhanced tubes hit the market in 2020. Quality control Whitener's former field became more automated, and he claims more than 90 percent of tubes now pass inspection off the line.

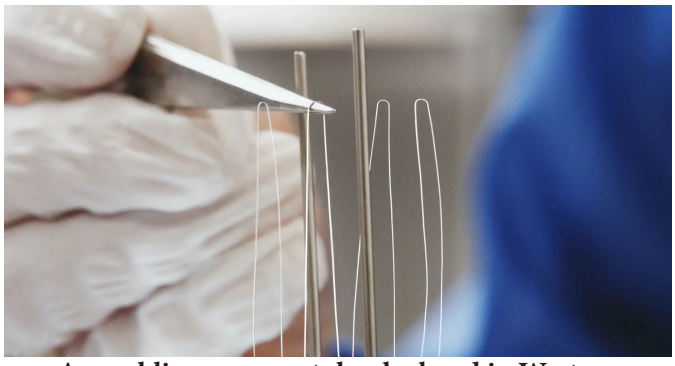
Western Electric sells pairs of 300Bs in a cherry wood presentation box with a certificate charting their performance characteristics and a generous five-year warranty. They're yours for $1,500. Copycat sets of 300Bs, offered at the same price, are sold with a 30-day warranty. Most tubes have a warranty of just 90 days.

- continued on page 13 -

## The Great Vacuum Tube Revival...

Whitener has spent more than a decade preparing for Western Electric's next act. In 2006, he won an auction for machinery and tooling needed to make 12AX7 tubes; the pieces had started life in Blackburn, England, but were then in Serbia. It took five years of legal battles with a competing bidder before the intervention of then-Tennessee senator Bob Corker and the US Embassy, Whitener says, gave him possession. (Corker, reached via a staffer, did not dispute Whitener's characterization.)

Today that equipment is being installed on Whitener's factory floor, along with additional machines shipped over from Slovakia in 2007. New machines that will automate processes like the hand-bending of wires needed to make 12AX7 tubes are being peppered in. All the while, Western Electric continues to produce 300Bs. Depending on the day of the week, the space may clickety-clack to the sound of a lathe winding molybdenum wire around side rods, or the ragged hiss of gas flames heating and sealing glass bulbs.



**Assembling vacuum tubes by hand in Western Electric's factory in Rossville, Georgia**

### Very Pleasant Distortion

The promise of better sound is, like most things among Hi-Fi fanatics, subject to vicious debate. Some hear vast differences between brands of tube, or even individual tubes of the same make and model. Others will tell you each tube is indistinguishable from the next. Most agree that tubes in general have a sound that transistors, circuit boards, and algorithms can only approximate, one often described as warm, rich, or even romantic.

"Tubes just distort things in a very pleasant way," said Daniel Schlett, a sound engineer whose Brooklyn studio, Strange Weather, is known for the analog punch it gets from tube-powered mics, amps, consoles, and equalizers. Artists who have sought Schlett's hallmark sound are as diverse as Ghostface Killah, Booker T. (of MGs fame), and The War on Drugs. "Tubes are part of the equation," Schlett says. "It's big and amplified, and it has the voodoo on it."

But voodoo is exactly the problem, say tube skeptics like Glenn Fricker, an engineer of 25 years who specializes in metal bands at Spectre Sound Studio in Ontario, Canada. He sometimes uses a 1966 amp with its original tubes, but he doubts expensive replacement tubes would improve the sound.

"As a kid we are led to believe there is some dark art in tubes which will inherently change the sound of your amp," Fricker says. But when he devised an experiment using sound canceling to reveal the audible differences between tubes, all he uncovered was "a little clicking sound" -- they were otherwise identical. He advises guitar slingers to skip the $1,300 vintage Telefunken "Diamond Bottom" 12AX7 online at Tube Depot for the $20 "JJ" brand from Slovakia. While Fricker is rooting for Western Electric, he says, "Are they going to sound any better than your dear, cheap JJs? No."

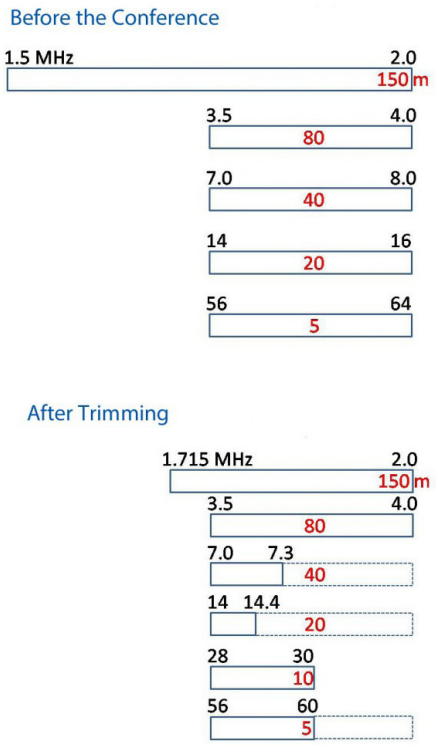
Price spikes during the recent great tube panic suggest plenty of people still believe in the voodoo. That presents Whitener with an immense opportunity. He says he aims to launch Western Electric's 12AX7, America's first new tube in decades, this summer. After that he plans to add a string of additional models, versions of the 6L6, EL34, EL84 12 AT7, and 6V6 tubes -- a lineup he calculates makes up almost 80 percent of the relevant music equipment, such as guitar and studio amps. If all goes to plan, the US could once again dominate vacuum tube manufacturing.

Whitener concedes that he's taking a big risk. Russia looks determined to keep attacking Ukraine, keeping trade embargoes in place, and China-US relations remain tense. But the geopolitics of vacuum tubes could shift again. It's unclear how loyal people might be to his US-made tubes. Whitener hopes that even if international supply prices drop, customers will stick with Western Electric after having gotten a taste of the reliably durable tubes. "They are looking for a stable product they can count on," he says. Schlett, the sound engineer. He is hoping Whitener can deliver. "My advice is please, quality control, please, please, please," he said. "I don't want to throw out 70 percent of the $180 tubes I buy. That's not OK."

## History of Amateur Radio...

While Warner's earlier pessimism was understandable at the time, "It will now be apparent," he wrote at the conference's conclusion, "… that the story of our impending demise was greatly exaggerated." With backing from the American delegation, and against the wishes of most European nations, amateurs had received recognition and privileges well beyond their expectations of only one month earlier. The official ARRL reaction would come from its board, but the HQ crew in attendance viewed the outcome as having "succeeded beyond the wildest dreams to which we were entitled at that time."

The objections of the European delegations, which came close to calling for the complete abolition of amateur radio, would need to be thoroughly examined and discussed since they might arise again in five years at the next conference. Warner condensed them into nine major points: fear of the state losing revenue due to large numbers of amateurs handling messages; European propensity to hold control over private communication; anticipated lack of control over amateur operation resulting in interference problems; desire to own all wavelengths; sensitivity to a perceived military nature to amateur radio prompted in part by the endorsement of the US military members of the American delegation; fear by state authorities of uncontrolled broadcasting of anti-state information or propaganda; reluctance to take on an additional administrative burden; and fear of the political power of large numbers of amateur radio operators. Most of these concerns amounted to governmental uneasiness with widespread access to easy communication by large numbers of individuals.




**The harmonic relationships between the amateur bands before and after trimming. They are scaled in size so that their harmonic frequencies are aligned. The red numbers indicate the position of the wavelength within each band.**

**Notice that after trimming that the 40 and 80 meter wavelengths lie outside the bands they name.**

The Conference concluded with participants signing their endorsement on 25 November 1927 after eight weeks of work by hundreds of delegates representing seventy-eight countries and other territories. For ratifying countries, its provisions would become binding on 1 January 1929, finally superseding the 1912 London Convention.

The most significant result for amateurs, from which all other provisions emanated, was international recognition of amateur radio for the first time. This was no small achievement considering that support for amateur radio's mere existence came only from the US, Canada (primarily Commander Edwards alone), Australia, New Zealand and Italy. Although the countries in direct support were few in number, not all the other countries actually participated in the discussions and therefore could not fairly be counted as definitely opposed. The active opposition consisted of Great Britain, Germany, Netherlands, Japan, Belgium, and Major Steel of Canada.

The international convention originally began in 1906 in Berlin and was chartered to meet every 5 years. It was where the term radio was first adopted internationally. Back then, governments were free to allow amateur operation at low power in whatever way they chose because its effective range did not cross international boundaries. One kilowatt was considered low power and ranges were tens of miles. But the London convention of 1912 established international rules that unexpectedly remained in effect until the 1927 convention that just concluded, the two intervening ones in 1917 and in 1922 having been canceled because of the war and its aftermath. This was the same interval during which amateur radio matured along with the development of the short waves and the radio broadcast boom. This was why all the interim regulation had been considered temporary. Increasingly an international matter, the nature of radio had changed fundamentally but had only an antiquated international treaty to guide it.

The new Convention was ratified by the U.S. Senate on 21 March 1928, meaning its provisions would go into effect in nationwide on 1 January 1929. The full, 118-page convention document was made available from the US Government Printing Office. QST published excerpts of particular interest to amateurs and it was officially accepted by the ARRL board.

(continued on page 15)

## History of Amateur Radio...

With the convention concluded, the Federal Radio Commission held a new round of hearings in January 1928 to gather information before beginning to define new shortwave allocations, and faced a barrage of opinions from a wide variety of commercial interests. They did not always know why or where they wanted spectrum, just that they wanted some. "So many people who knew nothing about radio never before assembled in the same room to talk about it," wrote Warner sarcastically in his March editorial. The world was certainly a different place than existed only a few years earlier when amateurs were relegated to the "worthless" wavelengths below 200 meters. As the commission considered allocation of "channels" as advocated by the established radio industry, it became apparent that the demand was already far exceeding the available space, based on current capabilities.

Although amateur allocations had been secured at the International Convention, the League took the opportunity to testify at the FRC's hearings and pressed for no reduction in the pre-convention allocations until the end of the year, when it would become mandatory. It further asked the commission to consider making the 160- and 80-meter amateur allocations exclusive in the US, even though internationally they would be shared. The one exception would be the existing sharing arrangement on 80 meters with the US military. The ARRL also complained about observed non-amateur use of the bands using amateur call signs, and interference caused by harmonics from commercial stations.

As spring approached, and administrative control reverted to the Secretary of Commerce on 15 March, he immediately authorized the Commission to continue, pending congressional passage of new legislation, which soon followed on 28 March and provided for the Commission to continue in their administrative role. The FRC then ordered that all station licenses issued by the Commerce Department would be terminated on 31 August and replaced with Commission licenses. This was, in part, to prepare for the new licensing of shortwave commercial stations under the international treaty. That summer, acting on a request from the ARRL, the government also reinstated the Amateur Extra First Grade License, abandoned in the spring of 1927 with only 150 holders. Considered a higher class of license, it required 20 WPM code proficiency, the same as for a commercial license, and a broader written examination. It was believed that amateurs would aspire to obtain this class of license as a distinguishing credential denoting a "superior amateur." No additional privileges came with the granting of this license.

The situation for phone operation was still unsettled as it continued to grow in popularity. Maxim came to the defense of phone operators, comparing the negative attitude of some to the similar attitude toward CW by spark operators a few years earlier. Amateurs needed to be tolerant as many CW ops were interested in phone too. And there was no threat to CW; its advantages in information conveyance remained. "Our code is as safe as the ages," he wrote, "We code men can easily afford to be tolerant."

After hearing arguments by a representative of phone operators, the ARRL board decided to recommend to the FRC that phone operation be permitted on 150 to 175 meters, on 3,500 to 3,550 kHz, reinstating half of the previous phone band, and rescind the allocation at 20 meters. The rationale for this was that "at the present state of the technique" a channel size increases with the frequency, requiring more space at 20 than at 80 for a phone signal—something like 40 kHz, it was estimated, according to "reliable engineering figures." This view would begin to change in the coming year as more stable transmitters were designed and demonstrated.

After the League made its recommendations, the FRC opened the 10-meter band to operation and adopted the modifications to the phone allocations (1,715 to 2,000, 3,500 to 3,550 and 56,000 to 64,000 kHz) before the new treaty took effect. For the time being, the other bands remained at their previous, wider limits.

The commission also defined an amateur station simply as "…a station operated by a person interested in radio technique solely with a personal aim and without pecuniary interest. Amateur licenses will not be issued to stations of other classes." As before, amateur stations were prohibited from communicating with government or commercial stations except during emergencies or for testing purposes. Amateurs were also prohibited from "broadcasting news, music, lectures, sermons or any form of entertainment, or to conduct any form of commercial correspondence."

What was once a fuzzy boundary had finally come into sharp focus.

# Hamfest 2023 Ready to Go

**EGARA's 19th annual Hamfest kicks off June 3rd and some 20 club members have committed to helping out to make it a success! Once again, the event will be held at the East Greenbush Town Park from 8 am to 1 pm.**

**This year will also feature a wide range of great giveaways, thanks to the many sponsors who have partnered with the club. Prizes include HT radios, shack accessories, gift certificates, Amateur Radio handbooks -- and a $500 Grand Prize! A list of this year's sponsors can be found on page 10.**

**In addition, the club will be serving up lots of delicious food, including its famous breakfast sandwiches, Nathan's Hot Dogs, and BIG 6 ounce burgers and cheeseburgers -- which are 50% larger than a quarter pounder. Coffee, tea, soda and water will also be offered, along with a variety of fresh muffins and snacks.**

**Admission this year will be just $8.00 and includes free parking and tailgating. Tables inside the park's climate-controlled building will be just $10 each, which also includes an admission ticket.**

**Club members will meet Friday afternoon at 4:30 pm at the Masonic Lodge to move equipment and supplies to the park. An inventory of supplies was done beforehand and everything necessary for the Hamfest was prepared and assembled to make transporting it all easy and convenient. At 5 am Saturday morning, members will arrive at the Town Park to setup and begin food preparation.**

**Hamfest is the club's biggest event of the year and proceeds are used to fund club activities and to keep annual dues as low as possible.**

# A Blast From the Past

Here's a photo from the late '60s of Chet Atkins, one of the great guitarists and musicians who helped to create the "Nashville Sound." He was also an avid Amateur Radio operator.

His call sign was originally WA4CZD, and later he was given a new one, W4CGP, reflecting his title C.G.P -- for Certified Guitar Player.

One of his favorite activities was to get on the radio on Sunday mornings with his good friend Buster Devault in Luttrell, Tennessee for a QSO.

Chet also had a mobile rig in one of his vehicles for awhile.

His distinctive picking style and musicianship brought him admirers inside and outside the country scene, and he won 14 Grammies. Atkins spent most of his career at RCA Victor and produced records for Dolly Parton, Dottie West, Perry Como, Floyd Cramer, Elvis Presley, the Everly Brothers, Eddy Arnold, Jim Reeves, Jerry Reed, Skeeter Davis, Waylon Jennings, Roger Whittaker, Ann-Margret and many others.

He became an SK in 2003.

# CALENDAR

**June 3, 2023 - 2023 Hamfest, East Greenbush Town Park, 8 am to 1 pm.**

**June 10, 2023 - 11:15 am - VE FCC License Test Session, East Greenbush Library - Contact: W2RBJ@Outlook.com**

**June 14, 2023 - 7 pm - Regular Membership Meeting, East Greenbush Masonic Lodge**

**June 24-25, 2023 - Field Day, East Greenbush Masonic Lodge**

## Pro Tip: All Conductors Aren't the Same

**One problem when purchasing cable is that many will use an aluminum core, or an aluminum core coated with copper, and try to pass that off as the same thing as pure copper.**

**Hams are often drawn to it because it appears to be the same size and style, but far cheaper. Unfortunately the aluminum core does not conduct as well as copper -- and that causes more loss.**

**This little "trick" has been common in wire used for power and speakers for many years with people purchasing 16 gauge wire and wondering why it won't handle the current it is supposed to.**

**While not as common among most top name radio cable manufacturers, many examples can be found in after market pre-made cables for CB radios, such as those sold at truck stops.**

**The East Greenbush Amateur Radio Association**

Organized in 1998, by Bert Bruins, N2FPJ, (SK) and Chris Linck, N2NEH, the East Greenbush Amateur Radio Association, an ARRL affiliate, is committed to providing emergency services, educational programs, and operating resources to amateur radio operators and residents of the Capital Region of New York State. The club station is W2EGB. The club also has several VHF and UHF repeaters open to club members and the public.


**GEAR FOR SALE**

- Acom 1500 Linear Amp w/ manual. Still in production, retails new $4500. Asking $3200.00. Contact Patrick Negus, KD2ZQR: pnegus1968@gmail.com

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- **MFJ - 941D versa tuner (2 available), $25 each**
- **Voltmeter kit, $5**
- USB signal link. $50

**Contact Don, KB2CDX at: ddm653@gmail.com**

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- **MFJ-9575,** 10 watt 75 meter LSB transceiver
- **DX Engineering,** 200 watt 75 meter bandpass filter
- **TEN-TEC 1209,** 2 meter to 6 meter transverter
- **TEN-TEC 1210** 10 meter to 6 meter transverter

**Make offers for any above**
**Contact: John Hackert, WA2JAE (518) 381-4847, Email: Wa2jae@Arrl.net or John.hackert@Reagan.com**

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- **CROWPI W/PI4** - 4G and power supply $250.00
- **DS-230 digital oscilloscope,** 2 probes & charger $75
- **MFJ Hamsticks** 40m, 20m, 15m, 10m - $15 ea. - $50 4 all
- **HQ-170 Receiver** w/ spkr-Refurb by WB2HPR $350.00
- **VIKING RANGER Transmitter** refurb by N2CJF w/ antenna relay,d104 desk mic,manuals and Augio modd, spare 6146 tubes.$350.00
- **ATAS-120A Autotune Antenna** for yaesu FT 991a compatible - used 3 mos w/cable $300.
- **COMET CF-706** Duplexer, $40.00
- **Older Military Key** W/ Leg Straps Cable & Plug For Ft-991A $40.00
- **Knight KG-6000 Tube Tester, $125.**

**Contact Dave Smith, WA2WAP at voyagerusa@verizon.net**

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- **Cobra ultra lite 80-10 dipole** 80-10m $75.00 w/ balun.
- **Heil RS 1 12' riser** brand new $ 30.00

Contact Walt, N2WJR, N2WJR07@gmail.com

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**Sell your unused gear with a free ad in Sidebands!**
**Send details to:**
**W2RBJ@Outlook.com**