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Baltimore, Maryland — The Amateur Radio Club of the National Electronics Museum will air special event stations, W2ZM, from 1300-2200 UTC Saturday, December 2 and 1300-2200 UTC Sunday, December 3. Additional operations from December 4-10 possible. Frequencies include 7.041, 7.241, 14.041, 14.144 MHz. Website: <http://w2zsm.us>.

Mesa, Arizona — The Superstition Amateur Radio Club will hold the Superstition SuperFest 2017 on Saturday, December 2 at Mesa Community College, 1833 W. Southern Avenue. Email: <info@superstitionsuperfest.org>. Website: <www.superstitionsuperfest.org>. Talk-in on 147.925 MHz (PL 107.2). VE exams, ARRL card checking, special event station: K7A, GO7A station, and fox hunt.


Madison Heights, Michigan — The L’Anse Creuse Amateur Radio Club will hold its 45th Annual Swapfest on Sunday, December 3 at Madison Place, 876 Horizons Drive NE. Contact: Michael M. K8RO, 2855 Norton Lawn, Rochester, MI 48307. Email: <k8ro@arrl.net>. Website: <www.nllrc.org>. Talk-in: 147.08 (PL 100). VE exams.

Plant City, Florida — The Florida Gulf Coast Amateur Radio Council will hold the 42nd Annual Tampa Bay Hamfest and Electronics Show and 2017 ARRL Central Florida Section Convention on Friday, December 8 and Saturday, December 9 at the Strawberry Festival Grounds-Expo Building, intersection of Lemon Street and W. Palmetto Avenue. Website: <www.tampabayhamfest.org>. Talk-in: 145.410 (PL 131.8). VE exams. DXCC / WAS / ARU / VUCC card checking.

Cheltenham, Maryland — The Prince George County ARES will hold the Second Annual American Legion PGCEA SantaFest on Saturday, December 9 at the American Legion YouFood Camp, 9201 Surratts Road. Email: <sclverb@hotmail.com>. Website: <http://pgares.org/santafest/>. Talk-in: 145.230 (PL 110.9). VE exams.

Minden, Louisiana — The Minden Amateur Radio Association will hold the MRA Christmas Hamfest on December 16 at the Minden Civic Center, 520 Broadway. Website: <http://mindr.net>. Talk-in: 147.300. VE exams.

Peralata, New Mexico — The Valencia County Amateur Radio Association will host a special event station: K8YJ from 0900-2300 UTC Saturday, December 9 and 1450-2300 UTC Sunday, December 10. Talk-in: 146.970 (PL 141.3). VE exams.

Greenwood, South Carolina — The Greenwood Amateur Radio Society will hold the Greenwood Hamfest on Saturday, December 13 at Piedmont Technical College-James Medford Family Event Center, 620 North Euclid Road. Contact: Dave Davison, AI4W. Email: <ai4w@arrl.net> or <wy1x@arrl.net>. Website: <www.w4gwd.org>. Talk-in: 147.165 (PL 107.2) or 433.900 (PL 107.2). VE exams.

PHOENIX, Arizona — The Thunderbird Amateur Radio Club will hold the Thunderbird Hamfest 2018 on Saturday, December 15 at the Northwest Community Church, 16615 N. 43rd Avenue. Email: <hamfest@k7ci.org>. Website: <www.w7bc.org>. Talk-in: 146.700 (PL 162.2) or 446.150 (PL 100.0). VE exams, DXCC card checking.

Schertz, Texas — The San Antonio Radio Club will hold the 2018 San Antonio Radio Fiesta on Saturday, January 13 at the Schertz Civic Center, 1400 Schertz Parkway. Contact: J.C. Smith, N5RSX, (210) 522-6167. Email: <n5rsx@arrl.net>. Website: <http://w4sc.org>. VE exams, card checking.

The Creek Valley Amateur Radio Federation will hold its 22nd Annual Hamfest on Saturday, January 13 at the Tri-City Career Center, 15676 State Route 691. Contact: Jeramy John Pershing, KC8ZL, 2855 Norton Lawn, Rochester, MI 48307. Email: <kc8zld Finally, the Ham Radio University Amateur Radio Club will hold its 19th Annual Ham Radio University on Saturday, January 20 at the Pennington Student Activity Center, 1350 North General Pershing Street. Contact: Tyrone Burns, N5XES, <n5xes@arrl.net>. Website: <www.selarc.org>. Talk-in: 147.000 (PL 107.2), 145.300 (PL 107.2), or 444.250+ (PL 107.2). VE exams.

Quartzsite, Arizona — The 21st Annual QuartzFest will be held from Sunday, January 21 through Thursday, January 25. We are interested in DXCC / WAS / VUCC / ARRL card checking.

Ft. Collins, Colorado — The St. Charles Illinios — The Wheaton Community Radio Amateurs will hold the WRCA 51st Annual Mid-Winter Hamfest on Sunday, January 21 at the Kane County Fairgrounds Expo Center, 525 S. Randall Road. Contact: WCRAC, P.O. Box QSL, Wheaton, IL 60187-1055. Phone: (630) 923-5447. Email: <info@wcrac.org>. Website: <www.w4wrc.org>. Talk-in: 145.31- (PL 107.2). VE exams.

Jackson, Mississippi — The Jackson Amateur Radio Club will hold the Capital City Hamfest and 2018 Arrl Delta Division Convention on Friday, January 26 and Saturday, January 27 at the Jackson MS Convention Center, 207 Mississippi Street. Contact: Larry A. K8JOS, GM RY Young, KS0JJ. Email: <hamfest@kmsham.org>. Website: <http://hamfest.msهام.org>. Talk-in: 146.16+ or 146.34+. VE exams, DXCC / WAS / VUCC card checking.

St. Louis, Missouri — The St. Louis Amateur Radio Club will hold Winterfest 2018 on Saturday, January 27 at Gateway Center, One Gateway Drive. Contact: Rebecca Carroll, K9CJI, (314) 496-7271. Email: <kc9cij@slsrc.org>. Website: <http://winterfest.slsrc.org>. Talk-in: 146.970 (PL 141.3). VE exams, DXCC / WAS / VUCC card checking.

(Continued on page 64)
New Ham Bands Occupied and Busy

The two newest ham radio bands — 2200 and 630 meters — are open for general amateur use and are already being well-used. It appears that the first approval letters from the Utilities Technology Council (UTC) — which must sign off on notices that individual hams intend to use the bands — arrived on October 13, and some stations immediately got on the air. Amateurs wishing to use these bands must notify UTC and wait until an approval letter is received or until 30 days go by with no response before getting on the air.

CQ MF/LF Editor John Langridge, KBSNJ.D, reports that a record-setting 630-meter QSO of just over 7,457 miles (12,002 kilometers) was completed on October 17 between Larry Moltor, W7IU, in Quincy, Washington, and Roger Crofts, VK4YB, of Queensland, Australia using the JT9 digital mode. John says the previous record was 7,333 miles (11,802 kilometers), set in 2016 between VK4YB and Steve McDonald, VE7SL, in Mayne, British Columbia (630 meters has been authorized in Canada for several years).

Meanwhile, the ARRL Letter reports that some denial letters have been received as well, including at least two amateurs who had been operating on the new bands under experimental licenses without reports of interference to power line carrier (PLC) systems, which share these frequencies in some locations. The FCC rule granting U.S. amateurs access to these bands prohibits operation within 1 kilometer of power transmission lines on which PLC is in use.

On a related note, the ARRL says updated amateur frequency charts showing the new bands are now available for download, in several formats, from <http://bit.ly/2xhkUjF>.

ARRL Completes Mission in Puerto Rico; Vice President Pence Visits Hams

The nearly two dozen radio amateurs sent by the ARRL to help re-establish communications in hurricane-wrecked Puerto Rico completed their mission there in mid-October and returned home after about three weeks of deployment on the island. According to the ARRL Letter, the hams’ initial mission was to collect outbound health and welfare reports and feed them into the American Red Cross’s “Safe and Well” system, but when they arrived, they found the communications infrastructure in such bad shape that they were redeployed to provide communications for hospitals while other volunteers handled the Safe and Well messages.

On October 6, the hams working at the Puerto Rico Emergency Operations Center — which had been set up at the San Juan Convention Center — got a visit and a pep talk from Vice President Mike Pence. CQ Emergency Communications Editor Walt Palmer, W4ALT, provides a comprehensive report on amateur radio hurricane relief activities throughout the Caribbean and U.S. Gulf Coast in his column in this issue, which begins on page 65. In addition, we are posting audio of Walt’s interviews with two major players in the emergency response on our website at <www.cq-amateur-radio.com>. See this issue’s highlights page for direct links.

Milestones: Senate Confirms Pai, Trachtenberg

The U.S. Senate has confirmed FCC Chairman Ajit Pai for a second term as a commissioner, retroactive to last July, when his previous term technically expired. Had the Senate not acted on the nomination, he would have had to leave the Commission at the end of December. The vote was 52-41, with most of the “no” votes based on Pai’s opposition to so-called “net neutrality” rules. Pai is also a strong proponent of broadcast radio.

The Senate also confirmed David Trachtenberg, N4WWL, as Principal Undersecretary of Defense for Policy. According to the ARRL Letter, Trachtenberg is also National Planning Coordinator and Northeast Division Director for U.S. Air Force MARS, and an active member of the Pentagon Amateur Radio Club. He owns a national security consulting firm called “Shortwave Consulting,” whose website — which says the company is “currently dormant” — explains that the name comes from Trachtenberg’s early interest in shortwave broadcasting, which led him to his career in national security matters.

Milestones: N4AA, G3IOR, Silent Keys

CQ DX Hall of Fame member and former CQ magazine DX Editor Carl Smith, N4AA, became a Silent Key in October at age 77. Carl was also the owner of DX Publishing and publisher of QRT DX and DX Magazine and one of the co-founders of the W4DXCC Convention (which happens to be featured in this month’s DX column, beginning on page 89).

Amateur satellite pioneer Patrick J.A. Gowen, G3IOR, became a Silent Key over the summer. He was 85. According to the AMSAT News Service, Pat was a co-founder of AMSAT-UK, served as a board member of AMSAT-NA and was a longtime satellite columnist for independent British ham magazine Practical Wireless. Gowen was also the first person to work 100 DX entities via satellite (although he was 4th to get all the confirmations to secure the satellite DXCC award); he and W2RS made the first transatlantic handheld-to-handheld QSO — via satellite, of course — and it was Pat who discovered that AMSAT OSCAR-7 had come back to life in 2002 after decades of silence.

HamSCI Workshop in the UK

The first HamSCI, or Ham Radio Science Citizen Investigation, meeting outside the United States was held in October in the United Kingdom. The workshop, which brought together both hams and professional scientists from the U.S. and Europe, was held just before the Radio Society of Great Britain’s annual convention. The sessions focused on collaboration between hams and scientists, using amateur radio-gathered data in scientific studies and ham radio uses of space science instrumentation. U.S. participants included Lead HamSCI Organizer Nathaniel Frissell, W2NAF; former World Radio Online columnist Carl Luetzelschwab, K9LA; and MIT Haystack Observatory Atmospheric Sciences Group Leader Phil Erickson, W1PJE.

IRU, SARL Look to Ham Radio’s Future

The president of the International Amateur Radio Union (IARU) told delegates to the association’s Region 1 general conference in September that amateur radio must broaden its scope in order to appeal to the next generation of prospective hams, and the South African Radio League (SARL) has offered some specific recommendations.

According to the ARRL Letter, IARU President Tim Ellam, VE6SH/G4HUA, told the group representing amateur radio societies in Europe, Africa, and the Middle East that his personal observation is that many younger amateurs are interested in ham radio primarily as an (Continued on page 78)
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ARRL: Circling the Wagons

Just what is the ARRL is afraid of? The League’s top leadership appears to be continuing and expanding its efforts to centralize decision-making in Newington and to closely control the flow of information about the organization and its activities. In doing so, it is changing the nature of the organization and depriving members in certain divisions the opportunity to choose their representatives.

Historically, ARRL leadership volunteers around the country have been given a significant amount of autonomy in how they carry out their roles and in the relationships they build with local and regional leaders of served agencies. The staff in Newington served primarily as a resource, offering assistance as needed and guidance as requested. This made a lot of sense, as needs varied in different areas and a “one-size-fits-all” approach would not be effective.

Over the last year-and-half, though, that model of decentralized decision-making has been changing, as the League’s new leadership has worked consistently to consolidate power and stifle dissent. It started in June of 2016, when the ARRL’s executive committee removed the Eastern Area Chair of the National Traffic System from both that post and his elected position as Eastern Pennsylvania Section Manager, allegedly for communicating with officials of the Federal Emergency Management Agency (FEMA) on behalf of NTS and making commitments on behalf of ARRL without authority. League headquarters followed up by “temporarily” assuming direct control of making leadership appointments in NTS, whose top staff had traditionally chosen their own leaders. Many of those top-level traffic handlers then resigned in protest and formed a new organization for passing long-haul traffic outside of ARRL auspices.

A few months later, the League board’s Elections and Ethics Committee disqualified a sitting director from seeking re-election, apparently based on actions taken after the ballots were already in the mail. Rather than cancelling the election and putting out a new call for nominations, however, the League simply declared that the director’s opponent — a former director who had been defeated two years earlier for re-election — had been declared elected, although it was never clear just who elected him. Members in that division were never informed that their incumbent director had been disqualified, or why. It is noteworthy that this director was a strong proponent of greater openness in League decision-making; and the actions taken to keep him from seeking re-election were taken in secret.

This past January, the ARRL board codified that secrecy when it adopted a new “Policy on Board Governance and Conduct of Members.” This new policy required that directors and vice directors publicly support all actions taken by the board — even if they opposed those actions prior to their adoption — and prohibited them from disclosing any individual director’s vote on a matter — even their own vote — without express board permission.

Next, this summer, the Elections and Ethics Committee was at it again, this time disqualifying a sitting vice director from running for director and again not telling the division’s membership. Rather, there was only a cryptic statement in a news release that the incumbent director had “qualified for re-election.” We have learned that the vice director was disqualified for allegedly failing to disclose a conflict of interest, but that when he asked for specifics about that supposed conflict, his requests were ignored. In addition, he requested a hearing by the full board on the disqualification — as he is allowed to do under the ARRL by-laws — but his request was denied. To the best of our knowledge, he has not yet been told what the alleged conflict was that prompted his disqualification.

Finally, as Hurricanes Harvey, Irma, and Maria ravaged various parts of the Caribbean and U.S. coasts, local ARRL Public Information Officers were essentially told not to talk with the media about ham radio activities but rather to direct all media inquiries to ARRL Headquarters (which, at the time, was without a media relations manager). In addition, headquarters shut down the League’s public relations reflector, which had been a very useful tool for PIOs to compare notes and for Newington to provide guidance in their dealings with the media.

The impression one gets here is of an organization that perceives itself to be under siege and is circling the wagons to more effectively defend itself. But from whom? Who is the enemy? Its members? Its leadership volunteers who have devoted thousands of hours of personal time and more to carrying out their assigned roles? Its own elected officials who might not agree with actions taken by the majority of their colleagues? People seeking elected office who might disagree with the top leaders?

Just who is the enemy and what are the folks in Newington and on the board’s executive committee so afraid of? And why all the secrecy? These are questions that League members need to ask themselves and their elected representatives; and they need to make sure they are not denied the right to vote for who those elected representatives will be. It’s happened twice in the past year and a half; it’s likely to happen again. How long will the members allow it to continue?

Technology Special

If it’s December, it must be time for our annual Technology Special, and as usual, we examine some of the most interesting and innovative ideas in amateur radio technology today. We start with the use of WSPR — K1JT’s Weak Signal Propagation Reporter software — to analyze changes in HF propagation during last summer’s total solar eclipse. We tell you how to use GPS satellites to set your computer clock during portable operations (especially important for some digital modes and for contest logging). And we introduce a program that will let you transmit a complete schematic diagram over the air, using virtually any mode of transmission, even CW!

There’s more, of course, along with a comprehensive review of the ham radio response to the summer’s hurricanes in Texas, along the Gulf Coast and in the Caribbean, including first-person reports from Puerto Rico and Dominica.

Happy Holidays

As always, we hope that your holiday celebrations at this time of year bring added light to your days as we pass through the darkness of the winter solstice, along with good DX on our wintertime bands, which now include 630 and 2200 meters. (By the way, in case you don’t think DX is doable on these bands, check out our news page for a report of a 12,000-kilometer (7,450-mile) two-way QSO on 630 meters between Washington State and New Zealand!)

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Radio amateurs are curious and collaborative by nature. The total solar eclipse on August 21, 2017 (Photo A) presented a perfect opportunity to exercise those qualities and we seized it. HamSCI, the Ham Radio Science Citizen Investigation group (HamSCI.org), encouraged ham participation to collect data about the effects of radio wave propagation during the eclipse. Eclipses have stimulated curiosity from the first published measurements of eclipse temperature changes in Boston, Massachusetts in 1834 up to modern measurements of ionospheric total electron content (TEC)\(^1,2,3\). Even after many eclipses have been studied, we remain curious about what ionization processes occur in the atmosphere, how long they last, and how they affect propagation\(^4,5,6,7,8\).

We were curious enough to collaborate by collecting data before, during, and after the event. We were not sure what, if anything, we would observe or whether it would help the larger scientific study, so we decided just to gather data from WSPRnet.org (Weak Signal Propagation Reporter Network) on several bands from 630 meters to 40 meters. Our geographic distribution also provides different perspectives on the event (Figure 1). Six stations were located within the path of totality: ACØG and NVØO in Missouri, KK4XO and AJ5E in South Carolina, and WS4S and WA4UCE in Tennessee. Four stations peripheral to the eclipse are WB5WPA and KD6RF in Texas, south of the totality axis, and W1EAA and K1EHZ in New Hampshire, north of the axis.

WSPR, or Weak Signal Propagation Reporter, is a very low-power beaconing mode developed by WSJT author Joe Taylor, K1JT (see October 2017 “Zero Bias” for more on K1JT –ed). Stations using WSPR transmit brief digital messages on a regular basis while alternately listening for similar signals from other stations. Received “spots” are gathered on the internet, at WSPRnet.org, and plotted on a map that shows band openings at any given time, along with the strength of the received signals.

Questions
Although we did not know exactly what the data might show, previous eclipse studies stimulated several questions:
1. Which amateur bands might be affected by propagation changes?
2. Where should we focus our attention, because equipment is limited and diverse across our stations?
3. How much baseline data would we need before and after the eclipse to identify propagation changes?
4. Are there ground wave and skywave effects that could mask eclipse effects?
5. How strong and long-lasting might eclipse effects be?
6. How is propagation affected along and across the axis of totality?
7. How large is the area affected?
8. What propagation mechanisms might be related to an eclipse?

Approach
We decided to focus WSPR activity on 630, 160, 80, and 40 meters. Some of us had been using WSPR for a while so we had baseline data before the eclipse. We were coordinating...
observations on WSPR before the eclipse and we collected data for several days afterwards. The study area is bounded by our stations and the stations we heard on WSPR. It covers approximately the eastern half of the United States, with overlap into southern Canada. Data are biased necessarily by WSPR station locations, which are not uniformly distributed.

Our concept for eclipse propagation is based on conventional understanding that D-layer absorption during the day inhibits skywave propagation on 160 and 80 meters. The D layer absorbs 40-meter signals at low angles, but high-angle signals may pass through to the E and F layers. For example, Figure 2 compares WSPR signals on 160, 80, and 40 meters with sun elevation relative to the horizon on August 20th, the day before the eclipse. Signals on 160 meters decreased rapidly at dawn and 80-meter signals were not heard after about 25° sun elevation, whereas 40-meter signals were heard throughout the day. When the eclipse disrupts the D layer, propagation on 160 and 80 meters should be enhanced.

There are at least two major differences between normal day-night-day transitions and eclipse light-dark-light transitions. Normally, there are gradual changes in energy impacting the ionosphere and in solar noise during dawn and dusk on a hemispheric scale. During an eclipse, more abrupt energy and solar noise transitions are focused on a small band as the moon passes between the Earth and sun. D, E, and F layers are all affected to varying degrees and at varying radio frequencies due to the effects of photochemistry and ionizing radiation.

Data
We downloaded more than 179,000 receiving spots from WSPRNet.org as the basic data set to explore our questions. This article addresses what we heard. We also generated more than 157,000 WSPR transmissions, most of which are yet to be analyzed. With so many data points, we needed an efficient way to screen for eclipse effects. We used graphs of signal/noise against time of day for screening. The 160-meter band seemed like a priority candidate for eclipse effects so we started our analyses on 160, followed by the other bands.

160 Meters Along the Axis of Totality
Data on 160 meters are shown in Figure 3. Data at ACOG, NVOO and KK4XO (Figure 3A) in the path of totality had clear propagation enhancements. Because daytime propagation on 160 is so limited, it is easy to identify any extended propagation during the eclipse. We focused initially on the spots heard at ACOG and NVOO in Missouri because their location had the potential to hear stations from 360° whereas stations nearer the coast were limited to landward azimuths.

Ten different stations were heard at ACOG and NVOO, which are 195 kilometers (121 miles) apart. Five of 10 stations were heard at both ACOG and NVOO. The stations heard have azimuths between 55° and 283° from the listening stations. Distances from listening stations varied between 486 and 1157 kilometers (291 and 719 miles, respectively). These results indicate no preference for a particular tra-
jectory along or across the axis of totality, nor a preference for a particular skip distance, at WSPR low-power outputs. What does stand out is the timing of all eclipse spots between 18:16 and 18:40 UTC at NVØØ and between 18:32 and 18:52 UTC at ACØØ. Seven of nine eclipse spots at KK4XØ were heard between 18:26 and 18:34 UTC. Eclipse totality across the area occurred between 18:09 and 18:45 UTC. Therefore, the eclipse propagation observed at these three stations was timed closely to maximum darkness. These results for 160 meters formed a framework that guided our approach to examining data for other stations on 160 and on other bands.

160 Meters Across the Axis of Totality
The 160-meter spots heard at other stations were filtered according to the parameters determined at ACØØ and NVØØ. Stations within 400 kilometers (248 miles) were removed to leave only stations beyond typical ground wave and NVIS (Near Vertical Incidence Skywave) propagation range. The time window for data assignment to the eclipse category was adjusted to 18:00 to 19:00 UTC. Eclipse propagation then became clear, as shown in Figure 3B for WB5WPA and KD6RF, peripheral to totality in Texas. No eclipse enhancement was observed at K1EHZ (Figure 3C) at 65% totality in New Hampshire.

WS4S was heard by W3PM on 160 during daylight hours with a marked enhancement during the eclipse as shown in Figure 3D. WSPR tracks time to within a few seconds, and the response time of propagation to the eclipse is illustrated clearly. Peak darkness occurred at 18:30 UTC in Nashville, Tennessee, near WS4S. Referring to Figure 3D, the lower green dot is 18:26 UTC and the upper one is 18:34. Peak signal/noise occurred at the next several orange dots, corresponding to 18:38, 18:42, and 18:46 UTC, respectively. By 19:06, the signal/noise peak had passed and signal/noise decreased thereafter. Propagation enhancement lasted for 20 minutes, from 18:38 to 18:58 UTC, which is comparable to the 20-minute duration at ACØØ and 24 minutes at NVØØ.

80 Meters
We took a similar approach with 80-meter propagation, except that the distance filter was moved out to 600 kilometers (373 miles) to exceed typical ground wave and NVIS propagation distances. Eclipse-related spots were heard at ACØØ in the path of totality (Figure 4A). Eclipse spots were also heard at KD6RF, WB5WPA (Figure 4B) and W1EAA (Figure 4C) peripheral to totality. The eclipse spots stand out as stronger signal/noise levels, but there are still low-level spots observed on the other days during 18:00 to 19:00 UTC. No spots were heard at K1EHZ (Figure 4D), only 2 kilometers (1.2 miles) from W1EAA, which is puzzling because K1EHZ heard many spots at other times of day.

Signal-to-Noise Variability and Patchiness
S/N differences between spots received at two stations simultaneously could help characterize propagation variability and
patchiness in the ionosphere. For discussion here, we distinguish between variability and patchiness. Imagine cubes of ionosphere 10 kilometers on a side. Variability is change within a cube and patchiness is the difference between cubes. WSPR data do not distinguish between the two, but such differences probably exist.

We compared 101 spots of skywaves heard at two pairs of stations simultaneously before the eclipse. W1EAA and K1EHZ are 2 kilometers apart, and WB5WPA and KD6RF are 162 kilometers apart. The data in Figure 5 suggest two things:

First, the y-intercept of the regression line could represent systematic differences between the two stations. If so, there seem to be systematic differences in sensitivity with W1EAA being about 4 dB more sensitive than K1EHZ, and KD6RF being about 6 dB more sensitive than WB5WPA. This is likely due to equipment and terrain differences and other factors that are fairly consistent.

Second, the distribution pattern of data points around the regression lines and the correlation coefficients, $R^2$, illustrate propagation variability and patchiness. The range of signal/noise is greater between the stations 162 kilometers apart than between the stations 2 kilometers apart, as might be expected. This amount of variability and patchiness before an eclipse could also be present during an eclipse.

### 630 Meters and 40 Meters

We analyzed 48,000 spots on 630 meters and 68,000 spots on 40 meters. Figure 6A shows an interesting propagation pattern at three stations on 40 meters, but no spots indicating eclipse enhancement or interference. Although we thought it important to make observations on 40, routine daily propagation on 40 meters does not usually involve D-layer absorption except at shallow incidence angles. Data from 152 kilometers to 3,535 kilometers (94 to 2,196 miles) on 630 meters (Figure 6B) do not show eclipse enhancement, either. One spot at 19:06 UTC from 150 kilometers (93 miles) is intriguing but not definitive.

### WSPR's Benefits and Limitations

WSPR is a digital mode with very low RF output power that detects signals down to -30dB signal/noise. WSPR software allows the percentage of time transmitting to be varied, with a default of 20%. A random factor exists, so — when set to 20% — transmitting occurs for 2 minutes out of 10 minutes on average. However, the window for hearing 160-meter eclipse spots at ACQG, NV0O, and WS4S was 20 to 24 minutes. At KK4XO, 7 of 9 eclipse signals were heard during 8 minutes. Therefore, transmitting only 20% of the time can be quite limiting compared to the event time scale. A solution for studies of short-term events in the future would be to have dedicated radios transmitting at 100% and some radios receiving at 100% to generate more frequent data.

WSPR signals are reported as signal-to-noise ratio, which means the result could change when either the signal level or the noise level changes. Solar noise decreased during the eclipses in 1991 on 145.8MHz and in 1994 on 436.5MHz. During the 1999 UK eclipse, signal strength from a 600-watt

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**Figure 4. Results on 80 meters.** Shaded area approximates eclipse period. A: Spots heard by ACQG in the path of totality. B: Spots heard by WB5WPA and KD6RF on the periphery in 80% of totality. C: Spots heard by W1EAA on the periphery in 65% totality. D: Spots heard by K1EHZ on the periphery at 65% totality and 2 kilometers from W1EAA.
beacon decreased and noise moderated slightly on 7.0125MHz. However, in the case of WSPR, software author Joe Taylor, K1JT, says eclipse-induced changes in solar noise contributing to background noise level will be negligible at HF. Any difference in signal-to-noise ratio can safely be ascribed to changes in signal level.

On the day of the eclipse, connections to the WSPR server timed out many times, perhaps due to a large number of users. It is not clear whether some spots heard at receiving stations may have been lost because they were not uploaded on the first attempt.

Conventional Model

Our data are consistent with the conventional explanation that the D layer collapses quickly during the eclipse, allowing E-layer or F-layer skip during the darkest period. The D layer then reforms as the eclipse passes. As shown in Figure 7, in addition to D-layer disruption, during the 1999 UK eclipse, critical frequencies decreased in the E and F layers.

The over-simplified sketch in Figure 8 illustrates the moon’s shadow cast at an angle to the Earth’s surface. The angle is equal to the sun’s elevation angle, which depends on latitude. Therefore, the affected portions of the D, E, and F layers may be offset according to latitude so they are not aligned directly above one another. Importantly, D, E and F really are layers with significant depths of ionized molecules that reflect, scatter, and absorb energy in complex patterns.

In this example, a transmitter outside the path of totality and roughly perpendicular to it sends a signal through the D layer that reflects off the E (green line) or F layer (blue line) between it and a receiver. Therefore, the D-layer gap could extend from the transmitter to the receiver. The D layer could absorb a signal on the way up or on the way down (red line). Few natural phenomena are homogeneous. Propagation vari-

Figure 5. Signal/Noise compared for 80-meter spots heard at two stations simultaneously on August 20, 2017. A: W1EAA and K1EHZ (2 kilometers apart). B: KD6RF and WB5WPA (162 kilometers apart).

Figure 6. A: Spots of AJ5E on 40 meters, illustrating variable propagation patterns but no eclipse enhancement along the axis of totality (ACOG) or on the south (KD6RF) or north (K1EHZ) periphery. B: 630-meter spots at KK4XO did not show eclipse enhancement except for one intriguing data point at 19:06 UTC on 8/21 that is not definitive. Shaded area approximates eclipse period.
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ability and patchiness occur regularly, as we have all observed while operating.

**Propagation Area**

The data encouraged us to estimate the size of the affected area. The distance from ACØG within totality to W8AC to the northeast of totality is 969 kilometers (602 miles). The data also show 744 kilometers (462 miles) from NVØO within totality to K5KJ to the southwest of totality. Both W8AC and K5KJ are in regions of about 80% eclipse totality. The distance between W8AC and K5KJ is 1,670 kilometers (1,037 miles), which can be taken as a rough estimate of the diameter of an eclipse gap in the D layer centered on the axis of totality.

If the distance between stations on the opposite outer edges of propagation is 1,670 kilometers, then the D layer gap needs to be at least 1,670 kilometers, which we round to 1,600 kilometers (approximately 1,000 miles) because it is an approximation. The D-layer gap may be as wide as the outer edges of 80% to 85% eclipse totality.

The length of the propagation gap in the D layer along the axis of totality can also be estimated from the data. NVØO heard W4WCC near totality in Tennessee, 1,063 kilometers (660 miles) away. Both ACØG and NVØO heard WS4S at 633 kilometers (393 miles) and 830 kilometers (516 miles), respectively. All stations heard were southeast, along or near the axis. These distances for axial propagation are roughly comparable to the distances for perpendicular propagation from the axis to the periphery. The total axial propagation diameter should be twice the distance between stations, assuming axial propagation operates similarly to the northwest of ACØG and NVØO as it did to the southeast.

For simplicity, our estimate of the D layer gap is a circle about 1,600 kilometers (1,000 miles) in diameter, centered on the eclipse axis and moving at about 2,400 to 2,700 kilometers per hour (1,490-1,675 mph) from northwest to southeast. The shadow covers an area of about 5,000 km² (1,930 mi²) at any particular moment. At 2,400 kph, the shadow darkens 1.5 gap diameters/hr or 7,500 km²/hr (2,896 mi²/hr).

On 80 meters, W1EAA in New Hampshire — at about 65% eclipse totality — heard spots from 603 to 1,470 kilometers (375-913 miles). Several spots were heard towards the end of the event, between 19:00 and 20:00 UTC. These observations suggest a D-layer gap for 80 meters that may be wider or patchier than for 160 meters.

**Responses to Our Original Questions**

1. Based on normal day-to-night differences in propagation, we thought the low bands would be most affected, so we
operated on 630, 160, 80, and 40 meters. The results show the bands most affected by the eclipse were 160 and 80 meters. Our data did not show effects on 40 meters, although 40-meter increases and decreases were found during the 1999 UK solar eclipse. The 630-meter band was not affected, according to our observations.

2. We used our regular gear, which was diverse across collaborators. All data analyzed had a common limit of signal/noise sensitivity at about -30 dB. Local differences in other factors such as terrain, antenna height, and antenna orientation can cause signal/noise to vary between receiving stations.

3. Although we did not begin collaborating until August 19th, the WSPR database retained our pre-eclipse baseline data back into July. We continued operating for several days after the eclipse to add baseline data.

4. The 160-meter and 80-meter data contained ground wave and NVIS data, as well as low-angle skywave data. Except for the WS4S signals heard by W3PM, we filtered out ground wave and NVIS by excluding data at distances less than 400 kilometers on 160 meters and less than 600 kilometers on 80 meters.

5. The results on 160 and 80 were stronger signal/noise during the time of the eclipse than on other days at the same time of day. The stronger signals lasted for 8 to 24 minutes, even though eclipse darkening lasted longer.

6. Our observations show that enhanced propagation extended from the area of totality out to about 80% of totality on 160 meters. The gap seemed wider or patchier on 80 meters out to 65% totality.

7. The data within our study area for 160 meters suggest the D layer gap is about 1,600 kilometers in diameter, occupying an area of about 5,000 km² at any given moment. For 80 meters, the D layer gap may be wider or patchier.

8. Our observations are consistent with a conventional propagation model. Darkening during an eclipse briefly disrupts D-layer absorption, creating gaps or patches that allow radio waves to be reflected from the E or F layers where critical frequencies are also affected. It is worth noting that the observations reported here are based primarily on WSPR spots received at our stations. We are still in the process of analyzing the data that resulted from the WSPR transmissions that we made, and will provide an update if those data show anything significantly different than what we observed on receive.

Finally, as scientists from HamSCI and other hams report their findings, it will be interesting to see how our rough estimates correspond to those made with more sophisticated techniques. Perhaps the conventional model will be updated with new information, or with new interpretations of previous information. We are curious about the outcome, just as that anonymous observer must have been in 1834, when recording and reporting eclipse temperature changes for the first time.

Notes:
An accurate computer clock is important for certain digital modes and for contest logging. How can you automatically keep it correct when you aren’t connected to the internet? K5PA says the answer is over your head…

Using GPS to Set Your Computer Clock in the Field

BY GENE HINKLE,* K5PA

It is important to have time set correctly on computer platforms so that amateur radio digital mode applications such as WSJT-X are synchronized within a second or better of each other and to allow logging programs to save the correct UTC (Coordinated Universal Time) time for contacts. Many solutions exist when connected to network infrastructures. Indeed, Windows®-based platforms can use network time servers to gather and set the computer’s time automatically.

When operating away from your shack, however, it is a different story. How can you automatically set time when your computer is not connected to the Internet? This is a situation commonly faced when operating ham radio in the field or on DXpeditions to remote areas where the internet time is unavailable or unreliable.

You can manually set the time using shortwave time broadcasts, such as WWV or CHU, where reception is available. However, there are few alternatives other than highly accurate clock standards. I was looking for a better solution that could be used at home, in the field, or during a DXpedition, and that would be automatic and foolproof.

The solution I found is to use the Global Positioning System, or GPS (Figure 1). There are readily available and inexpensive ($30 class) “hockey puck”-style GPS receivers with integrated L-band antennas available from Amazon, eBay, and other vendors on the internet. These GPS receivers have USB serial data interfaces and power is provided through the data cable. Just by adding the GPS receiver to the computer’s USB port, it is possible to read

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position and time information from the constellation of GPS satellites. An example of one GPS “hockey puck” style unit that I use is the GlobalSat BU-353-S4 USB GPS receiver (black) shown in Photo A (a full materials list is provided in Table 1 at the end of this article). This receiver has 48-channel all-in-view tracking, built-in L-band antenna, an SiRF Star IV GPS Chipset and WAAS/EGNOS support (see References). These features are simply phenomenal for the money.

The puck-style design has a magnet under the module, making it easy to stick to any ferromagnetic material. It needs to be mounted so that the magnet is at the bottom and the antenna is pointed upward. The GPS receiver must always have a view of the sky in order to see line-of-sight to the GPS constellation. The satellites are constantly moving so, as one or more leave

Table 1. Materials and Sources

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<th>Vendor URL</th>
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<td><a href="https://www.amazon.com/">https://www.amazon.com/</a></td>
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<td>2</td>
<td>Cable Matters / SuperSpeed USB 3.0 Type A Male to Female Extension Cable in Black 10 Feet / P/N 200008-BLACK-10</td>
<td><a href="https://www.amazon.com/">https://www.amazon.com/</a></td>
<td>$7</td>
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</tbody>
</table>

What is GPS?

The NAVSTAR Global Positioning System (GPS) consists of a constellation of satellites that circle the Earth twice each day and include a precise set of clocks that are synchronized by a command and control center operated by the U.S. Air Force. Each GPS satellite transmits a unique pseudorandom code at UHF frequencies that allow receivers to measure precise distance and time. By using multiple satellites simultaneously, receivers can measure latitude, longitude, altitude, velocity, and time. Although these satellites are used by the military for precise navigation and timing, civilian use has grown exponentially since the first launch in 1978.

GPS technology is now fully integrated into our personal technology such as smartphones, personal mapping, automobiles, time-keeping, etc. The technology has advanced so much that the Federal Aviation Administration now allows GPS to be used in airplane navigation under certain circumstances.

The Russian GLONASS Constellation is an alternate Global Navigation Satellite Systems that provides end-users with additional space-based resources. Many GPS receivers today can use either GPS or GLONASS system based on signal availability to provide accurate and rapid location and time information.

There is also a European system known as EGNOS, the European Geostationary Navigation Overlay Service.
Due to mounting restrictions at my home QTH, I only have a partial view of the sky but have found the GPS still performs adequately. The USB connection on the GPS module can be extended with a USB port extension also shown Photo A. I have mounted the GPS modules outside my home, approximately 15 feet away from my computer’s USB ports, without problems. [The maximum distance specification for the USB2 standard is 5 meters (16.4 feet), based on signal delay through the cable.] There are also longer extensions available with active electronics contained within the cable.

**GPS Versus UTC Time**

GPS receivers demodulate L-band microwave frequency radio signals from the constellation of satellites to calculate geo-location and time. The GPS receiver decodes these signals and uses them to create accurate time messages in the form of preformatted text strings. Each text string message serves a specific purpose, such as location information and time.

One signal message from the GPS satellite includes the difference between true GPS time and UTC time. GPS time was purposely synchronized to UTC time on January 6, 1980. Leap seconds are added to UTC time to account for the Earth’s rotation period variations over time. But leap second adjustments are never added to the GPS system. Since 1980, the leap seconds create a time offset between the two systems. For example, after the 2016 UTC leap second adjustment, GPS time was 18 seconds ahead of UTC. (See Q&A sidebar for more on this)

GPS receivers use the correction signal message to calculate UTC time from the GPS time. Local time can also be displayed by offsetting the UTC time based on the local time zone. When GPS receivers are initially turned on, they may not indicate the corrected time because the UTC correction signal message has not yet been decoded from the satellite. On a new GPS receiver, it may require up to 12 minutes to receive the correction messages before UTC time is accurately calculated. Afterwards, synchronization can appear within a minute or two.

**Software to Auto-Set Computer Time**

With the addition of the GPS receiver to a computer system, a method to read the GPS time information and automatically set the computer clock is needed. This can be accomplished using readily available computer applications such as i h, available from VisualGPS, LLC. There is other software available, such as BktTimeSyn, but I have focused on NMEATime2, based on my experiences using these applications.

NMEATime2 implements a different approach for GPS time synchronization. The program’s creator, Monte Variakojis (KE6GQO), informed me that he takes the GPS serial data message string, characterizes it, and uses it as a short-term timing reference. He does this by time-tagging the incoming message to the PC clock. He then uses digital filters and his software algorithms to create an error signal to discipline the PC clock to the incoming filtered signal. His approach gives a long-term computer clock accuracy of about 1mS.

The download path to the program is at <http://bit.ly/2wOrFZW>. The pro-
gram can be evaluated free of charge for 30 days after installation. This allows enough time to evaluate the capabilities and suitability to your application prior to purchase.

Figure 2 shows the NMEATime Properties Panel that is used to monitor the constellation of satellites during operation. The blue columns show the signal-to-noise (S/N) ratio (at the top of the blue column) for the numbered GPS Space Vehicle Number (SVN at the bottom of the column), the gray columns are satellites tracked but not used for navigation or timing and the green column shows SBAS/WAAS satellites. Sometimes the blue columns are red, indicating they are Russian GLONASS satellites. There is also information on the Lat/Long/Alt of the GPS receiver and, at the lower right, a local overhead view of where each SVN is located in the sky. These SVN locations will move over time as the satellites move in their orbits and eventually move below the horizon and disappear from the chart.

Figure 3 shows the NMEATime Panel Status tab that provides time of day (LOCAL or UTC based on the GPS receiver) that is used to monitor time synchronization status including the estimated time error each second (lower portion of green area).

Figure 4 shows the NMEATime Properties Panel that is used to monitor Loop Status for the Time Difference and the feedback Control Counter values. Ideally, the Time Difference is driven to zero over the course of time, typically to within milliseconds.

Figure 5 shows the NMEATime status panel that is used to display the time,

Q&A

Q1. How much time error can the digital modes, such as WSJT-X modes, tolerate?
A1. This is a good question. Joe Taylor, K1JT, the creator of the various modes used in WSJT-X suite of digital mode software, has stated in the WSJT-X User Manual (Section 2.0, System Requirements) that the computer time should be synchronized within ± 1 second of UTC. Practically speaking, using GPS for time synchronization provides more than enough accuracy (less than ± 1 second) and convenience to the radio operator.

Note about DT: There is a differential time (DT) heading in the WSJT-X message window showing the difference time error between your station and your QSO partner’s station. The error measured is the propagation delay between stations, transmit delay (Tx Delay setting in the WSJT-X program setup), and equipment delays. Radio waves travel in free space at the speed of light (3x10^8 km/S, so 1,000 miles is equivalent to 5.3 mS). It is not uncommon to see DT values in the tens of milliseconds to several seconds depending on where on Earth (or the Moon for the case of EME) you are located and your equipment configuration. The moon bounce, 2-way delay is about 2.56 seconds, on average.

Q2. What is the difference between GPS time and UTC time?
A2. The GPS navigation message includes the difference between GPS time and UTC. As of December 2016, GPS time is 18 seconds ahead of UTC because of leap-second adjustments made to UTC but not to GPS time. GPS receivers subtract (or add as appropriate) this offset from GPS time to calculate UTC and local time based on specific time zone values. New GPS units may not show the correct UTC time until after receiving the UTC offset message. The GPS-UTC offset field (8 bits) can accommodate 255 leap seconds. GPS time is theoretically accurate to about 14 nS. However, most receivers lose accuracy in the interpretation of the signals and are only accurate to 100 nS. The Global Positioning System (GPS) epoch was set on January 6, 1980 and was then synchronized to UTC. True GPS Time is NOT adjusted for leap-seconds.

Q3. Does using a USB port GPS interface affect time accuracy?
A3. A serial port and USB port are both serial device interfaces with a difference in hardware implementation. The bit rate is still set by the driver software and is more than accurate enough for logging purposes. If you were trying to get down to sub-microsecond accuracy, then you would need to use a GPS with a pulse per second (pps) output and synchronize to it. But for time synchronization, the GPS messages contain the time-of-day information that is used to set the clocks. This is adequate for logging programs. The NMEATime2 software provides additional accuracy by providing a closed loop-tracking algorithm to force the error towards zero. Practically speaking, the time error is about a millisecond and that is more than adequate.
Morse Express 2017 Christmas Key
Continuing a tradition that spans the millennium so far, Morse Express has introduced The Morse Express 2017 Christmas Key, which is the seventeenth in the series. This year’s key combines a traditional camelback lever with a translucent red knob and a walnut base.

The camelback provides for an elegant level transition down to the contacts but it also adds mass to the lever, giving it a smoother “feel.” That and the added leverage that you get with the trunion make it excellent for sending code.

The wires from the miniature binding posts are traced into the base and covered with a felt pad so the key will be less likely to slip, and won’t mar the table. The hardware is solid brass, highly polished and, gold plated so that it will not tarnish or corrode. Contact spacing and spring tension are both controlled by the single adjusting screw just forward of the trunion. The 2017 Christmas key weighs 2.25 ounces (60g) and measures 2-3/8 x 1-5/8 inches (60 x 40 millimeters) at the base.

The Morse Express 2017 Christmas Key is a limited edition, with a retail price of $89.95 plus shipping and handling. Each key has a label with “Christmas 2017” and a unique serial number. For more information, visit the Morse Express website <www.morseexpress.com> or call (800) 238-8205 or (303) 752-3382.

NMEATime2 Setup Procedures
The software program is extremely easy to set up once the USB com port number is known and entered. A step-by-step procedure follows:

1. When the program first starts, the USB port used by the GPS is probably not set for the program to communicate with the attached GPS receiver. Therefore, the Tools - GPS - Setup Communications tab should be selected so you can enter the com port assigned to the GPS receiver.

Figure 5. NMEATime calculated 1 sigma time error (see text for discussion).

Figure 6. Dialog for Com port settings of the GPS receiver.
2. From the dialog box, select the Port number for the GPS connected to the computer. In my case, the port number was identified as COM6 - Prolific USB-to-Serial Comm Port.

3. Next select the Baud for the GPS receiver. All receivers I have used have a communication speed of 4800. My settings are shown in Figure 6. I selected Port to COM6 and set the Baud to 4800.

4. If all goes as planned, the Status screen should indicate either searching for the satellites or time lock as shown in Figure 7.

5. The status of the program can be followed by mouse clicking on your computer tray located at the lower right portion of your computer’s screen and looking for the satellite icon image. The color of the image gives the program status as listed in Figure 8. The black area with computer icons is dependent on other programs your computer is running and your operating system. By using the color-coded icons, you can determine the program’s status.

Summary
If your hamming takes you out of internet range and you use modes or take part in activities that require a very accurate computer clock, the GPS satellite system and about $60 in hardware and software can keep your clock updated almost anywhere you go.

Internet Link References
GlobalSat GPS receiver (price class $30 online): <http://www.globalsat.com.tw/>
NMEATime2 software, sets time on PC from GPS receiver (price class $20 online with a free 30-day trial period): <http://bit.ly/2yej0S2>
NMEATime2 tested GPS receivers that have been tested with the program: <http://bit.ly/2gvV1q2>
BKTTimeSyn Software - Another application for setting time from GPS receivers: <http://bit.ly/2xzALcF>
Space Based Augmentation System (SBAS) Information: <http://bit.ly/2g3pLOn>
As demand for spectrum increases, particularly on the higher frequencies, the trend in land mobile radio (LMR) has been toward narrowbanding. The purpose of narrowbanding is to utilize less radio spectrum per QSO or, looking at it another way, more QSOs per MHz. This concept is far from new. In the early days of FM communications, channels were spaced 60 kHz apart and there was no real specification for how far from the center frequency the FM carrier could be deviated or modulated. Things eventually settled down and FM deviation was standardized at ±15 kHz. This might be considered the first narrowbanding of VHF land mobile radio. As the use of FM grew, the next phase of narrowbanding came when the FM deviation was reduced from ±15 kHz to ±5 kHz. In addition, channel spacing on the commercial VHF low band (30-50 MHz) was reduced from 60 kHz to 20 kHz, a three to one split: And the channel spacing on most of the high VHF band (150 to 173 MHz) was reduced to 30 kHz. As activity continued to increase, the channels on VHF high band were split again to 15 kHz in some areas. VHF high band was utilized by various services and each had its own frequency plan. Today, this results in a mix of channel spacing schemes. However, for a long time, the majority of the band utilized 15-kHz channel spacing, which amateur radio adopted for FM repeaters between 146 and 148 MHz.

Today, the majority of the commercial VHF high band has been split again to 7.5-kHz channels. To accommodate this even narrower spacing, conventional FM is being replaced with various digital modulation techniques, the goal being to achieve the equivalent of 7.5-kHz bandwidth per conversation. The UHF land mobile band has seen channel spacing split from 25 kHz to 12.5 kHz and now down to 6.25 kHz.

When the commercial channels are split, it is usually done in a manner that permits current users of the channels to maintain their channel center frequency but requires them to adopt a new, narrower, technology. This creates additional channels in between the existing channel centers. Figure 1 illustrates the commercial migration to narrower channels in which 25-kHz channels are each split into two 12.5-kHz channels.

For this to work properly and maintain relatively interference-free operation, all of the current users need to adopt narrowband technologies prior to the “new” channels being assigned. Figure 2 shows what might happen if some of the incumbent users fail to adopt the new technology prior to the new systems becoming operational on the split (or splinter) channels.

The user on the original center channel, having adopted narrowband technology, should continue to enjoy relatively interference-free operation. However, the two new narrowband users, along with the existing systems that have not

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Repeaters using new digital voice technologies such as DMR, D-STAR or System Fusion are much more spectrum-efficient than their analog FM cousins. But integrating narrower-bandwidth repeaters into existing band plans is a challenge. K2ATY has studied the issue and proposes one solution.

**Narrowbanding – Amateur Radio Style**

**BY ALFRED T. YERGER, II,* K2ATY**

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adopted the new technology, will now experience interference due to the overlap of their signals.

**Amateur Radio Narrowbanding**

Amateur radio is also experiencing its own form of narrowbanding. With the advent of digital mobile radio (DMR) under names like MotoTRBO, D-STAR, System Fusion, etc., we are seeing a rapid growth of new systems on the VHF and UHF bands that occupy significantly less spectrum than existing analog FM systems. DMR (which we’re using generically in this article) conserves spectrum in two ways.

First, each station occupies half the bandwidth of conventional FM. Figure 3 illustrates how two DMR signals can exist in the space previously occupied by one FM signal. Currently in the FM portion of the 70-centimeter amateur UHF band, repeaters are spaced 25 kHz apart. DMR stations, on the other hand, can be spaced 12.5 kHz apart.

In addition to the narrow bandwidth of DMR, through the use of time division multiple access (TDMA), each station can also support two simultaneous QSOs. This results in a 400% increase in spectrum utilization, giving us the equivalent of a 6.25-kHz channel bandwidth. In other words, one DMR QSO for every 6.25 kHz of spectrum as compared to one FM QSO for every 25 kHz of spectrum.

**Amateur Narrowbanding Issues**

In commercial systems, the move to narrowband technology is usually driven by changes in regulations requiring systems to implement a new technology by a certain date. Now this doesn’t happen without some pain and anguish, but there is nothing like a deadline to get things done. In amateur radio, we have a different motivation. Our change to narrow bandwidth technologies is driven by our desire to experiment with new technologies, accommodate more systems, reduce interference, and take advantage of new features offered by the new modes. Yes, the commercial users have some of these same desires but hams lack the extra push created by changes in FCC rules. In fact, FCC rules often hold us back while we wait for new emissions to be approved for use in the amateur bands.

All of this means that our migration from one technology to another will be slower and that not everyone will want to adopt the new modulation. As such, while supporting and encouraging the new, we need to be considerate of both the old and the new in our band plans.

**Amateur UHF Band Migration**

For the purposes of this discussion we will use the 70-centimeter amateur UHF band as an example (2 meters has some other issues that we will address later). As indicated above, repeater frequencies at 440 are generally 25 kHz apart. In most metropolitan areas, there are very few open channels to accommodate new systems, so when a DMR repeater is constructed, it is often replacing an existing FM system. The FM system likely operates on a frequency that
has been coordinated by the local coordination council and it is logical that the DMR users would want to utilize the same channel center frequency. In Figure 4, we show three hypothetical frequencies with 25-kHz spacing. The X represents the MHz portion of the frequency. For this example, the value of X is not really important. The diagram illustrates the channel utilization when the repeater on X.0500 MHz (the middle channel) changes from FM to DMR.

When the repeater on X.0500 changes from FM to DMR, additional spectrum is made available on either side. The problem is that the space on either side is too small for another DMR repeater and way too small for an FM system. If we continue to follow this “commercial” type migration plan, we will run into the same problems described above and illustrated in Figure 2. While this sometimes happens in commercial migrations, it is eventually resolved once everyone is onboard with the new technology. In amateur radio, on the other hand, there is no guarantee that the systems on X.0250 MHz and X.0750 MHz will adopt a narrowband technology. This doesn’t make them bad people. They may stay on FM or eventually adopt a different technology, such as a 4-slot TDMA, that also has 6.25-kHz equivalent spectrum utilization but their footprint around X.0250 MHz or X.0750 MHz might remain unchanged. For DMR to be effective in increasing spectrum efficiency, we need a way to recover the extra space.

The extra space between the DMR signal and the existing FM signals can be recovered by offsetting the DMR signal by 6.250 kHz, either up or down, within the original 25-kHz channel. This makes space for a second DMR system. Figure 5 illustrates two DMR signals, one at X.04375 MHz and the other at X.05625 MHz, in the 25-kHz channel formerly utilized by the FM repeater on X.0500 MHz.

One More Issue

In the 70-centimeter ham band, we have one more issue that our commercial friends do not. This is the presence of repeaters with reverse splits. In the commercial world, UHF repeaters transmit on the lower of the two frequencies in a pair and receive on the higher frequency, for example 452.000 MHz TX and 457.000 MHz RX. When the problems of amateur frequency coordination were originally addressed back in the 1970s, there was a disagreement about whether amateur repeaters should transmit low or transmit high. Eventually, in a compromise deal, repeaters on exact 50-kHz channel spacings would transmit low and repeaters on the 25-kHz channels in between would transmit high. Those of us who disagreed with this arrangement pointed out that this placed every repeater receiver in between two repeater transmitters. However, democracy being what it is, the compromise prevailed and I have to admit that there have not been a tremendous number of problems over the years, until now. This concept of every other...
repeater pair being inverted all but forces us to avoid the commercial migration plan and adopt the offset migration plan shown in Figure 5. If we try to keep the current channel center frequencies for existing repeater frequencies being migrated to DMR, the interference shown in Figure 2 will be extremely bad. In the commercial plan, even if this interference occurs, we would be looking at repeater outputs competing with each other. With the amateur inverted frequency plan, we would be looking at repeater outputs from superior sites splashing into the receive passband of other repeaters, also at superior sites. This would create a totally unmanageable situation.

Amateur 2-Meter Migration

Earlier we said that the 2-meter band had different issues. In many parts of the country, the FM repeater frequencies above 146 MHz are spaced at 15 kHz (other regions have 20-kHz separation, which is not a problem in this regard). The 15-kHz spacing is actually a little too narrow for 5-kHz deviation FM but it has worked out OK in the long run. Now...if you split the 15-kHz channels you get two 7.5-kHz channels, which are also too narrow for DMR. I don’t know what is happening everywhere in the country (or world), but in New England, repeater coordinators are having good success with 10-kHz channel spacing on the lower end of the band from 145.000 to 145.600 MHz, with the traditional 600-kHz transmit-to-receive offset, and between 146.000 and 146.500 MHz with a 1-MHz transmit-to-receive offset.

With regard to the channels in the upper portion of the band that are currently utilizing 15-kHz channel spacing, the best plan seems to be to maintain the existing 15-kHz channel centers. Two adjacent 15-kHz channels would split nicely into three 10-kHz DMR channels but that would require the existing users of both channels to agree to migrate to DMR. However, once two adjacent channels are utilized for DMR on the current 15-kHz centers, both channels could move frequency slightly and allow for a third DMR system.

Summary and Recommendations

In the 70-centimeter amateur UHF band, the best plan for migrating to narrowband DMR is the offset plan in which DMR repeaters are spaced either 6.25 kHz below or 6.25 kHz above the existing FM channel center frequency. On the 2-meter band, current 20-kHz channels should be split into two 10-kHz channels using the same offset-type migration as on UHF, except that — in this case — the new channel centers will be 5 kHz above and 5 kHz below the old channel center. The current 15 kHz channels should remain on their existing channel centers until enough systems have migrated to DMR to allow adjacent pairs of channels to be split into three 10-kHz DMR channels. While we can’t force amateurs to do anything, I would strongly recommend that all new DMR repeaters adopt these plans when first activated and that existing DMR systems move to these plans as soon as practical. This will reduce the problem of requiring all of the users of the new systems to reprogram their radios when the inevitable frequency changes take place.

Acknowledgement:

I would like to thank Bill Barber, NE1B, for his assistance in preparing this article and all of his good work promoting amateur DMR.

Note:

Buddipole’s POWERmini is a highly portable all-in-one DC power management system and solar controller that’s a great accessory for the QRP operator or anyone operating in the great outdoors.

**CQ Reviews:**

Buddipole POWERmini

Portable Power Management System

BY R. SCOTT ROUGHT,* KA8SMA

Earlier this year, Buddipole, Inc. introduced the POWERmini, a compact, highly portable, 12-volt direct current power management system with a built-in solar charger. This device can charge a 12-volt battery via solar power, monitor voltage and current to a load (i.e. transceiver, station accessory, etc.), track voltage and current input from a solar panel, and can be used independently of a solar panel as a power distribution and battery management system. (See following review of PowerFilm Solar’s foldable solar panels. – ed)

The POWERmini can handle a load current up to 25 amps, a solar panel output of 10 amps, and is programmable for use with either lead acid or lithium ion batteries. Weighing just over six ounces and measuring 4.5 inches wide, 3.2 inches deep and 1.3 inches high, Buddipole has packed a lot of beef into a package that fits easily in your hand.

As a dedicated QRP operator who operates exclusively via battery power, I was excited to review this recent addition to the amateur radio market.

Basic Features and Layout

The POWERmini is packed with easy-to-use features that enable the user to comfortably monitor a variety of functions with a simple press of a button and glimpse at the display. The unit is well laid out with an organic light-emitting diode (OLED) display centered on top (Photo A).

The battery, solar panel and up to two loads are connected to the unit via Anderson Powerpole® connectors that are located on the left (battery and solar panel connections) and right (12-volt outputs) sides of the unit. Each connector location is clearly marked on top and the connectors are color-coded (blue/black for the battery, yellow/black for the solar panel, and red/black for the two loads) to help ensure proper polarity when making connections to the unit. A thick rubber boot (approximately one-quarter-inch thick) is wrapped around each side of the unit. The band provides a comfortable grip and adds a bit of ruggedness.

A Select (SEL) button that allows switching between three display pages (Main, System Report, and User Settings) is located beneath the OLED display. The POWERmini automatically defaults to the Main page each time the unit is powered on. Pressing the SEL button once switches the display to the System Report page and pressing it a second time selects the User Settings page. The up and down arrows (located to the right and left of the SEL button, respectively) allow the user to change default settings on the User Settings page after the SEL button is held down for a few seconds.

The Main page (Photo B) provides important system information displayed in two columns. The left column contains general battery information including voltage, load current, and the amount of current that has been provided by the battery to the load since power has been applied. Two vertical bars to the right of the digital readout provide a graphical representation of the battery’s voltage (left bar) and the amount of current drawn by the load (right bar). The vertical bars provide an easy way to determine battery status with a glance at the display. The right column provides information regarding the solar panel including output voltage, output current, and the total charge delivered by the solar panel to the battery (after connecting the solar panel). A fourth line indicates whether the battery is in charge or float mode. The POWERmini charges the battery to capacity then automatically switches to float (maintenance) mode to keep the battery fully charged without overcharging.

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The System Report page (Photo C) contains information about the system since it was powered on and erases itself each time the unit is disconnected from the battery/solar charger. This page indicates how long the unit has been operating, the peak wattage from the solar panel and how many watts were produced from the solar panel. It also displays the difference between the amount of battery charge used by the load and charge replaced by the solar panel. This is a neat feature when operating in the field for determining how much battery life is left.

The User Settings page (Photo D) provides the option to select battery type (lithium ion or lead-acid). This is an important setting and should be programmed when the unit is first powered on. The instructions do a fine job explaining the characteristics of each battery type and recommended charge and discharge voltages for each. After the appropriate battery type has been selected the first time, the unit will default to this setting each time it is powered on. This page also includes an “auto off” feature that can be enabled/disabled to shut off the system if battery voltage has fallen below the battery’s low voltage limit. This will prevent the battery from being fully discharged while operating and reducing the battery’s life (been there, done that!). The instructions provide guidance on selecting an appropriate low-voltage limit for your choice of battery. Another useful feature is the high-voltage limit, which allows the user to set the maximum voltage delivered to the load. Buddipole indicates this adjustment is intended to prevent damage to radio equipment. This setting is your “belt and suspenders” to ensure high voltage is never introduced to the equipment — thank you, Buddipole.

An LED that serves two functions is located to the right of the display. Under normal working conditions, the LED is green (or flashing green when the display is off), but if the unit detects a fault (i.e. high or low battery voltage), the LED emits a steady or flashing red. An audible alarm can also be enabled to warn of a fault.

The POWERmini is equipped with a sensor that will automatically disconnect the load if excess load current is detected (output overload). Additionally, the unit is equipped with an internal fuse in the event the load is short-circuited. Step-by-step procedures are included in the instructions for resetting the unit in the event of excess current draw and/or a short circuit at the load. Reverse polarity protection is provided for both the solar panel and battery inputs, so no worries if you make a mistake plugging in these connectors.

The solar controller can handle an input up to 10 amps (120-watt solar panel). If an input greater than 10 amps is detected, the solar charger is automatically disconnected. The controller uses Pulse-Width-Modulation (PWM) technology, which helps extend the life of the battery and ensures efficient battery charging. The controller does not support Maximum Point Power Tracking (MPPT), which is a technique to maximize the amount of current entering the battery from the solar panel. MPPT technology is generally used with solar panel outputs of 200 watts or more.

POWERmini On the Go!

I took the POWERmini on several field adventures during the review period. Prior to hitting the trail, I did a dry run in the ham shack and connected it to a 12-volt 9-ampere-hour gel-cell battery and plugged in my Yaesu FT-817. I did not connect a solar panel as it was nighttime and I used the POWERmini strictly as a battery management/power distribution system. As soon as I turned on the FT-817, I checked the Main menu on the POWERmini. Battery voltage was 12.5 volts and current draw was 0.38 amps. As I fiddled with the volume control on the FT-817 I watched the readout for the load current move up and down as the radio pulled more or less current. I then transmitted a carrier and watched the load current increase. After making a few contacts, I checked the System Report page. Sure enough, the POWERmini recorded the unit had been on for 1.6 hours...how time flies when you are having fun.

My first field adventure with the POWERmini was at a local park where I set up my FT-817, gel-cell and other...
items to make a complete portable station (Photo E). I also
took a 30-watt PowerFilm foldable solar panel to plug into the
unit. The built-in Powerpole connectors made setup quick
and easy and, for once, I felt that I had a “complete” portable
station where I could monitor battery voltage, current draw,
and had comfort in knowing I would not run low on battery
juice. After making several contacts, I noted the “Battery Use
readout (located on the System Report page) indicated I was
nearly par for power consumption and power replenishment
from the solar panel. In other words, the amount of power
consumed from the battery by the FT-817 had been nearly
replenished by the solar charger and foldable solar panel
(thank you, Mr. Sun).

I should note that although my testing of this product was
with a 12-volt 9-amp-hour gel-cell battery and QRP equipment
(pulling less than 2 amps on transmit), the POWERmini can
be used with any lead-acid or lithium ion battery-powered sta-
tion that has a current consumption of 25 amps or less.

My Likes and a Wish
One concern I had prior to powering up the POWERmini is
whether I would hear any radio frequency interference (RFI)
on my FT-817. I have a solar controller I purchased several
years ago from a popular store that sells tools by the “freight
load” and it generates noise. Based on my past experience,
I did not know what to expect. I am happy to say I could not
hear any RFI from the POWERmini on my FT-817 or any of
my other QRP rigs. This is a big deal as you cannot have fun
if you’re combatting RFI.

The LED (lit green when everything is functioning properly
and red if there is a fault) is very bright and can be a bit
annoying if using the unit in the shack at night when lights
are dimmed (as I do); however, I realized the merit of a bright
LED when working portable outdoors under sunny skies. If
the LED were any less bright, I would not be able to see it.
To reduce the intensity of the LED when using the unit
indoors, I partially cover it with a small piece of electrical tape
and all is well!

I like the OLED display! My vision is not what it used to be
and after seeing the small size of the unit, I was concerned
that I may not be able to easily read the display. The char-
acters are clear, crisp and easy to see. No eye strain like I
often have when viewing other displays of similar size…good
job, Buddipole.

My only wish for the POWERmini is that it had screw ter-
minals for cable connectors in addition to the Powerpole con-
nectors. As a ham who has been slow to make the transition
from 12-volt cigarette-style plugs and screw terminals to the
now commonly-accepted Powerpole connectors, I was dis-
appointed that I could not connect the battery and other equip-
ment directly to the unit via screw terminals. However, after
making a few cables fitted with Powerpole connectors and
using them in concert with the unit, it is obvious (to me) that
Buddipole wanted a connector with a reliable mechanical and
electrical connection that was easy to plug in and disconnect.
Although I do like the old-fashioned screw terminals, it is prob-
able time I adopted the new standard for 12-volt DC power
in the amateur community.

Final Thoughts
Without a doubt, the Buddipole POWERmini is the cat’s
meow for anyone in the market for an “all-in-one” solar con-
troller, battery management system, and power distribution
and monitoring device. My old solar controller has been per-
manently retired to a box in the corner of my ham shack for
use as spare parts. The POWERmini retails for $139 U.S.
Additional information and product ordering is available via
Buddipole’s website <www.buddipole.com/powermini.html>
or by phone at (503) 591-8001.
Recently, I had the opportunity to try several products offered by PowerFilm Solar, Inc. of Ames, Iowa, a manufacturer of thin-film, flexible solar panels and accessories. Their products are designed to be used by anyone with a desire to harness and maximize the sun’s energy in an easy and efficient manner. PowerFilm Solar has a long history of providing solutions and manufacturing equipment for military, industrial, and commercial solar applications and has taken a step into the amateur radio community. If you have attended the Dayton Hamvention® in recent years, you may have seen their booth with a variety of products geared toward consumer and amateur use.

What makes PowerFilm Solar unique and sets its solar panels apart from those of competitors is their thin construction, ultra-light weight, and ability to be folded or rolled (depending on the type of panel purchased). Since I regularly tap into Ol’ Sol for help in charging and maintaining my array of 12-volt sealed lead acid (gel-cell) batteries, I was anxious to try these products.

Let’s Talk Foldable Solar Panels
PowerFilm Solar manufactures a variety of sizes of foldable solar panels (120, 90, 60, 30, 20, 10, and 5 watts) and several types of rollable panels for consumer purchase. For this review, I focused only on the foldable varieties. Table 1 provides the measurements for each foldable panel in unfolded and folded positions, along with their weight and power rating. Photo A shows several solar panels unfolded and Photo B shows the 120-watt and 30-watt panels in their folded position.

All of PowerFilm Solar’s panels are manufactured in the United States. The solar panels are made by overlaying a metal contact with six layers of amorphous silicon onto a roll of plastic that is 30 microns thick. A layer of transparent material that acts as a conductor is then applied over the amorphous silicon with a copper strip attached to the edge of the plastic roll. The roll is then cut into individual modules that are placed onto fabric (heavy-duty canvas) and soldered together using flexible stranded wire. A laminating process is then completed to fuse the entire package together. Each panel is finished by adding a top piece of fabric, sewing the modules and top/bottom layers of fabric together, and adding a waterproof Delphi automotive power connector. Grommets are also installed along the perimeter of the fabric (Photo C).

Each panel undergoes a series of quality checks during assembly and is tested when finished to ensure it meets specifications. A video highlighting the construction process is contained on PowerFilm Solar’s website <www.powerfilmsolar.com>. All solar panels manufactured by PowerFilm Solar have an operating voltage of 15.4 volts.

CQ Reviews:
PowerFilm Solar Foldable Solar Panels
and the LightSaver Portable Solar Charger

BY R. SCOTT ROUGHT,* KA8SMA

Table 1: Foldable Solar Panel Characteristics

<table>
<thead>
<tr>
<th>Power Rating / Current</th>
<th>Dimensions (Unfolded)</th>
<th>Dimensions (Folded)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 Watt / 7.2 Amps</td>
<td>55” x 87”</td>
<td>14” x 14”</td>
<td>6.5 pounds</td>
</tr>
<tr>
<td>90 Watt / 5.4 Amps</td>
<td>55” x 68”</td>
<td>11” x 14”</td>
<td>5 pounds</td>
</tr>
<tr>
<td>60 Watt / 3.6 Amps</td>
<td>48” x 52”</td>
<td>14” x 7”</td>
<td>3.2 pounds</td>
</tr>
<tr>
<td>30 Watt / 1.8 Amps</td>
<td>47” x 25.5”</td>
<td>13” x 7”</td>
<td>1.8 pounds</td>
</tr>
<tr>
<td>20 Watt / 1.2 Amps</td>
<td>32” x 30”</td>
<td>13” x 7”</td>
<td>1.3 pounds</td>
</tr>
<tr>
<td>10 Watt / 0.6 Amps</td>
<td>21” x 22”</td>
<td>10.5” x 4”</td>
<td>0.75 pounds</td>
</tr>
<tr>
<td>5 Watt / 0.3 Amps</td>
<td>24.5” x 10.5”</td>
<td>3.3” x 10.5”</td>
<td>0.5 pounds</td>
</tr>
</tbody>
</table>

Note: Current value is typical and may vary due to light spectrum, temperature and other effects.
(under sunlit conditions), which can charge a 12-volt gel cell or similar battery type (a charge controller is recommended when charging batteries). Amorphous silicon is used as the solar absorbent material because it has several attributes that allow the panels to be lightweight, flexible, temperature-resistant, and generally collect more solar energy in lower light situations than other technologies (i.e. crystalline panels). This is very beneficial when working under partly sunny skies and aids in portability.

The foldable panels are mounted on heavy-duty canvas that is double stitched, and in some locations, triple stitched (Photo C again). My XYL (a long-time quilter who is very particular about stitches) inspected the stitching and gave it a “thumbs-up.” The canvas is divided into squares with each square containing a solar module. The squares are pre-folded, making the whole panel easy to fold and unfold. Unfolding the panel is accomplished in a matter of seconds. It took me approximately 30 seconds to unfold the 120-watt size panel, situate it on the ground, and plug in the included power cable to run a portable station.

Folding the panel takes less than one minute. To fold the solar panel, you disconnect the power cable from the plug, fold the panel inward (so the solar cells are facing each other), fold the panel inward again so there is one row of squares (row with exposed flap), then fold each square on top on of one another downward to the flap. The fold lines remove any guesswork on how to fold the panel. When finished, the flap is wrapped around the panel and secured in place with Velcro that is sewn onto the panel (Photo D). Setup and take down could not be any easier or faster.

I have used large crystalline solar panels in the past that need to be fastened together, set up on tripods and then oriented toward the sun for maximum efficiency — a venture that takes a good 10 or 15 minutes to complete, not to mention the burden of transporting the panels to your destination. The PowerFilm Solar panels are designed to be placed flat on the ground or any other surface you see fit, such as the top of a canopy, tent, or other (nearly flat) surface without the need to orient it toward the sun for maximum efficiency. As an experiment, I hung the PowerFilm Solar 30-watt panel vertically in my southern exposure, second-story ham shack window and connected it to a Buddipole POWERmini (see accompanying review—ed) to charge a 12-volt, 9-amp-hour gel cell battery that I use to run my Yaesu
FT-817. For one week, I operated each night for two hours and let the solar panel recharge my battery the following day. Each day (including days that were partly cloudy), the panel recharged the battery to its full potential. I admit I was surprised that enough sunlight was captured each day to sufficiently charge the battery and put the charger controller in float status. I should note my experiment was conducted in August when more sunlight was available during the day than at other times of the year. Trying to charge a battery using this setup in January may render a different result. Each foldable panel is equipped with a built-in blocking diode that allows you to leave the panel connected to a

Photo C. Close-up of grommet, fabric, and stitching on the panel.

Photo D. Velcro on panel flap and power plug.
battery-operated system without concern that the panels might drain the battery during periods of low or no light. PowerFilm Solar recommends using its foldable panels under dry conditions; however, if a panel is subject to light drizzle or brief rain shower, the panel can reportedly be wiped dry with a clean cloth. It is not recommended the panel be submerged or left outdoors on a permanent basis where it will be subject to precipitation. The foldable solar panel is designed to withstand temperatures below freezing, so Winter Field Day is not a problem for those hardy enough to venture outdoors in January. PowerFilm Solar’s line of rollable panels is designed to be waterproof and used in the marine industry or in wet environments.

Accessories and Other Items
Each solar panel comes with a power cord equipped with a plug to insert the cord directly into the unit and a female power port adapter (cigarette lighter socket) on the opposite end. The female power port adapter allows you to plug in to the unit (using a male cigarette lighter plug) and customize your own connectors for connection to equipment. A variety of optional cables that are pre-wired to specific types of connectors (i.e. alligator clips, O-rings, Power Pole connectors, etc.) are available from PowerFilm Solar. Also available is a 15-foot extension cord for longer runs and a daisy chain for connecting two solar panels together in parallel to produce more current output (up to 20 amps).

Probably the most interesting (to me) product line available from PowerFilm Solar is its OEM modules. The OEM modules are available in a variety of sizes, shapes and configurations and are designed for the do-it-yourselfer (DIY) who wants to design and construct his/her own solar-powered charger for a particular application. The modules are durable and can be soldered on their ends for attaching positive and negative wire terminals (Photo E). A black film overlays a copper strip on each end of the module. The film can be scraped away with a sharp knife or removed with the tip of a hot soldering iron. I suspect a DIY ham could find a variety of uses for these modules.

The Best for Last – Per My XYL
As I unpacked the box of solar panels and accessories sent from PowerFilm Solar, my XYL had one eye on her smartphone and the other on the box I was unloading. To my sur-
Like and Dislikes

I really like the durability and ruggedness of the foldable panels. Unlike the crystalline solar panels I have used in the past, the foldable panels can be dragged over rough surfaces, set on rocky outcrops, and if necessary, easily hung or suspended without the worries of breaking or scratching a panel.

Final Comments

PowerFilm Solar has a real winner with its foldable solar panels. American ingenuity with top-notch construction and craftsmanship tucked in a small, lightweight package that can charge a 12-volt battery system and power electronic devices in a portable setting — amazing. Although I was only able to get out for a few field adventures with the foldable panels, I truly believe these panels will stand the test of time and offer the amateur radio community a solid source for solar power. Additional information and product ordering is available via PowerFilm Solar’s website <www.powerfilmsolar.com> or phone at (888) 354-7773.

www.cq-amateur-radio.com

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Here’s a unique program from SV3ORA to permit hams to easily draw schematics and other diagrams and then exchange them over the air in virtually any transmission mode.

**Schematix**

BY KONSTANTINOS GIANNOPOLOUS,* SV3ORA

During my HF RF experiments, I usually find myself in situations where I need to draw my designed schematics. In fact, at the time I develop my circuits, I draw them block-by-block and then I test each one. If a block fails, I discard it; if it works satisfactorily, I keep it and move ahead.

Schematix is a program I have developed to help me in this aspect of the ham radio hobby. I could use freely available CAD (computer-aided design) programs, but most of them, while quite capable, are also quite complex to learn. My intention was to produce software that would be straightforward to use, even for a child with basic electronics knowledge. I mostly thought about older hams, though, who quite often find it very difficult to learn how to use a complex CAD program. Complexity is a disadvantage if you want to do a simple thing.

When the basic drawing part of the program had been written, I thought it would be nice if one could use this program to send his schematics to his ham friends through radio around the world. So, a quite simple mechanism for being able to do this simply was developed.

The “Schematix” software is intended for use by radio amateurs to draw simple schematics, PCB layouts, and diagrams quickly and easily, and to efficiently send these to other hams via Morse code, voice using a phonetic alphabet, or any text mode.

Apart from drawing, there is a variety of ways in which these schematics can be exported or imported. Schematix has been designed with simplicity in mind, so anyone with basic electronics knowledge can immediately use it, without much effort or documentation reading.

Schematix is written in HTML and Javascript, which has several advantages:

- It can run live from a webpage, without any need to download, or as an offline standalone application when downloaded to your computer.
- It is multi-platform, meaning that it can run on any operating system (Windows, Linux, etc.) as long as there is a Javascript-enabled browser installed (Firefox preferred).
- It is widely open-source, since the code is immediately available to anyone. Any distribution of the application automatically distributes the source code, since it is the actual source that is distributed, no binaries, no executables, no installation to your PC.
- The application can be modified easily using a simple text editor, without the need for special installed tools or compilers on your computer.

Radio amateurs are encouraged to take the code, modify it, and create something even more useful to the ham community. The way Schematix operates, is not limited to schematics, so simple PCB drawings and diagrams can be added.

**Why Use Schematix?**

There are not many ways one can send a schematic over the air today, using the low bandwidth required on HF. The most obvious way is to export the schematic generated by a CAD program as an image and then use SSTV, digital SSTV, radio-FAX or another image-based mode that allows for image conversion to audio tones. Then transmit these audio tones using your SSB, FM, or AM transceiver. While this is OK, there are several problems with this approach:

- Unnecessary data is being transmitted, so data efficiency is low. Using such modes, you transmit the same amount of data (so it takes up the same amount of time), whether you transmit a full-color or black & white image, or even a plain image. There is no distinction between such things.
- A voice (SSB/AM/FM) transmitter is required (usually expensive to buy or complex to build). CW or any other on/off keying mode is just out of question.
- Bandwidth efficiency is low, since an SSB/AM/FM transmitter is used and audio tones that occupy most of the bandwidth are sometimes also used (SSTV).
- Data is very prone to errors, since analog tones are all that is sent. Since they are of infinite state, a decoder cannot distinguish between an error and the actual data.
- An error in one area of the schematic image requires a request to retransmit the whole image, for the error to be corrected.
- None of these modes are human-oriented; a computer is always needed for sending and receiving schematics.

Most of these problems arise because an image is supposed to be sent, which can be a picture of a schematic or any other photo. Schematix restricts the type of data to be sent to letters and numbers only; you cannot send an image with it. Although the end result is an image, no actual image is sent. There are also some rules about size and the way you draw your schematic and label the components. However, Schematix has significant advantages over other modes:

- A voice (SSB/AM/FM) transmitter is not required. Any on/off keying mode, including CW, can be used. This allows

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This article is adapted from a more detailed version on the author’s website, <www.qrp.gr>
Want to enjoy your favorite operating frequency during this Holiday season? Look no further... Alinco has a radio that's perfect for making the most of your budget. With a wide selection of easy-to-operate, multi-band desktop, handheld and mobile radios, Alinco delivers maximum value for your amateur radio enjoyment.
sending schematics over the air, using cheap homebrew transceivers or powerful, but cheap and power-efficient switching-mode amplifiers (Class-E).

• Bandwidth efficiency can also be high if CW, PSK, or similar modes are used, since these modes occupy minimum bandwidth.

• Data efficiency is high, as only usable symbols are sent, not blank spaces. Also, the fewer components your schematic has, the less data is sent. This is not limited by the total schematic size, but only by the number of components on it. Also, when you use CW, the more common components in the schematic are assigned to shorter Morse code characters, so the efficiency is maximized.

• Data is not so prone to errors, because it is digital and it is presented by finite states of audio tones, carrier-switching or phase-shifting (depending on which mode you use).

• Received errors can be easily detected, since they are presented in the received schematic as blank components, broken components, wrong components, or duplicated components.

• An error in one area of the schematic does not require a request for retransmission of the whole schematic, but just the specific area where the error is.

• Errors can be corrected by the user in some cases, without asking for retransmission, by looking at the received schematic consistency. It is analogous to (but not the same as) the Feld-Hell mode, in which errors can be corrected by the human brain, without the need for retransmission.

• Finally, it is human-oriented. A computer is not necessary for drawing, sending, or receiving schematics. CW or a phonetic alphabet can be easily used, in combination with encoding/decoding printout tables.

Basic Operation
To try Schematix, go to my website, <www.qrp.gr>, click on the Schematix link and select the option to test the program online. Alternatively, you can
download the program to your PC, unzip it, and run the file “index.html” inside the program folder. This will open up your browser and run the Schematix application (Figure 1).

As the program loads, you will see the symbols in the top frame clunk in. Once it has fully loaded, you should see a table of available symbols at the top of the page, with the currently chosen symbol displayed above it. There is also an option for selecting different functions. You will also notice a blank area at the bottom of the page, which is indexed by letters. This is where your diagram will be drawn. If your browser pops up any messages related to blocked content, you must choose to allow this blocked content in order for Schematix to run correctly.

The first thing to do to draw a schematic is to select the symbol that you want from the top table. Put the mouse pointer over any of the symbols in the table and click it (Figure 2). The symbol that’s isolated above the table (currently selected component) should change to the symbol in the table that you have clicked.

If it doesn’t work, try a few more times. If you can’t make it work, you might need to enable Javascript. If it just absolutely refuses to obey, you may need to upgrade your browser.

Now that you have selected the symbol you want, you can place it anywhere in the drawing area below the table of symbols. Put the mouse pointer where you want the symbol to be placed and click. The symbol should drop into that spot.

The drawing area is a table. You can place only one symbol in each cell of the table. For convenience, the drawing area is indexed into lines and columns (A-Z), so that you know in which cell a component is placed. The alignment of the components in the table is automatic and the size of the table cells is fixed. You can’t place a symbol halfway between one cell and another. This is why, when you place a symbol, it seems to magically line up with the other symbols in the drawing (Figure 3).

To experiment, proceed to place some resistors or capacitors or whatever you want in your circuit. Now comes the process of hooking them up. In other programs, you just start drawing in wires. In Schematix, you have to place the wires as though they were symbols. In the table of symbols, you will find straight wires, elbows, tees, and one kind of cross.

To draw a straight wire that crosses more than one cell, you have to place a straight-line symbol in each cell. When you want to turn a corner, you select the appropriate elbow and place it. If you need a tee, just select it and place it. These wires connect the middle of the sides of the cells (Figure 4).

The component symbols are also designed so they connect to the middle of the sides of the cells, so the wires and the components automatically line up. This auto-alignment of components is useful for older people with vision problems, but it has also been proven very quick and effective when drawing.

When you place a symbol that you don’t want by mistake, you can erase it by selecting the blank symbol in the upper left corner of the table and clicking onto the symbol you don’t want. Also, if you want to change a symbol to a different one, just select the desired symbol in the table and click on the previous one to replace it.

Additional symbols appear in row 4 of the symbol table. To get the extra symbols to appear in row 4, click on the appropriate component type in the “More components” table on the right. For example, if you want to draw with vacuum tubes, click on the ”Tube” keyword. Symbols for a diode, triode, tetrode, and pentode will appear in row...
4. You can now select these symbols and place them just as you would any other symbol.

The components labeled "LABEL" and "MARKER" are used for two special functions. The "LABEL" is used for labeling your components (more on this later) and the "MARKER" symbol is used twice between one or more components you have previously drawn, to select them. Then copy/cut and paste them in a different location. Please read the documentation inside the program, if you want to learn how to use the MARKER symbol. This function is useful if you want to copy, move or delete large areas within a schematic.

It is important to note that markers are not symbols that must be exported or saved. They exist only to be used by the copy/cut/paste functions and they disappear after these functions have been correctly used. Please ensure there are no markers left in your schematic prior to clicking "Utilities" or any save function. You may erase a marker just as you would any other component.

Hints on Schematic Drawing

Note that if your screen resolution is not very high, not all lines or columns (A-Z) may appear in the drawing area. If you draw small schematics, this may not be a problem, but if you draw larger ones, it might be. If not all columns appear in the drawing area, you can make them show by horizontally resizing your browser window. If not all lines appear in the drawing area, you can make them show by resizing the

Figure 5. If your screen resolution is low, it's possible to increase the display area of the schematic table by dragging up the boundary with the top menu area (which will then be smaller). Note the double arrow circled in red that appears when you are changing a window boundary.

Figure 6. After you've drawn your circuit and inserted the word "LABEL" next to each component, you then use the boxes at the top of the UTILITIES screen to enter the value for each label. The boxes are identified by the location on the grid of each LABEL that you've inserted.
bottom drawing area frame. Note that this will reduce the size of the top symbols frame (Figure 5).

If you still can’t make all lines and columns appear, you can zoom out your browser’s window view. In many browsers, a quick way to zoom in/out is to hold down the left CTRL key on the keyboard while simultaneously scrolling the middle wheel of the mouse. If this can’t change the zoom level, you can zoom in/out from the browser preferences. See your web browser’s documentation on how to change the zoom level.

Controls
The controls area contains different functions which are useful when drawing your schematic. I will only briefly describe their operation here. For more extensive information, please read the documentation inside Schematix.

The Left, Up, Right, and Down functions move the whole schematic in these directions. Take care not to move the schematic to positions exceeding the boundaries of the drawing area, because you may lose drawn components. The Copy, Cut, and Paste functions are used in conjunction with the MARKER symbol explained above. The Clear function deletes the whole schematic. The Save and Recall functions constitute a simple way of temporarily saving your schematic (in a cookie) or recalling a previously saved one. You can think of this as an “undo” function, but you have to manually save your schematic when you want it. The List function allows you to save or recall your schematic in a text list, which is useful for saving it as a text file. The Display function simply displays your current schematic in a new window. Then you can print-screen it or save it as an HTML file. The Charts link leads you to useful tables and documents, which you can use to draw/encode/decode schematics without the use of a computer. For those of you who are interested in this capability, please read the documentation, where it is explained more thoroughly. The Utilities function leads you to another page, where you can enter components’ values, import/export your schematics for exchanging them over the air, and more.

For your convenience, there is a little help symbol “[?]” right next to each function. If you click that, you are redirected to the relevant section of the documentation that explains the current function.

Labeling Components
Drawing a schematic in Schematix is a two-step process. First, you complete the drawing of your full schematic, as described above, and only then do you enter the components’ labels. You cannot enter labels as you draw your schematic, only when you fully complete its drawing. Also, you cannot come back and edit a schematic once you have entered component labels.

If you click the “LABEL” icon in the components table, you should be able to place the word LABEL in the drawing area next to the component you want. You must do this for each component in your schematic that you want to label.

The actual labels (component values) will be added later on, using the “UTILITIES” function. This function replaces the LABEL words next to your components with the actual values that you will enter.

Utilities
After you have finished editing your schematic, click Save or save it to a list, then click the UTILITIES function. This will cause the symbols table to disappear and the utilities frame to appear in the top frame. The schematic should still be in the bottom frame.

Figure 7. When the schematic is finished and you click on Export data, a window will appear that either shows you the encoded data or highlights errors and tells you how to fix them.
The most useful functions on the Utilities page are: **Import data**, **Export data**, **Display**, **Generate html**, and **component labeling**, which is described below.

The labels (component values) are entered in the form fields provided in the top utilities frame (Figure 6). Again, labels may be assigned to components only after completion of a schematic drawing and before using the “**Generate html**,” “**Display**,” or “**Export data**” functions.

Schematix restricts the way in which labels are entered in the form fields. This is done for compatibility with the “Export data” function. The rules are simple, but must be followed. Labels must be:

- Greater than 2 and no more than 6 characters; or if they are only two characters, at least one of them must be a digit.
- Single character labels or empty labels are not allowed.
- Special characters (such as “+”) are not allowed; only letters or numbers without spaces between them.

Also, to be compatible with the **Export data** function, labels

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**Figure 8.** The schematic recreated at the receiving end, after pasting the received text into the box at the top of the screen and clicking on **Import data**.

**Figure 9.** Here is a schematic diagram drawn using Schematix that will be transmitted using various modes and speeds in order to compare results.
with decimal values are automatically converted to non-decimal values. For example 4.7K is automatically converted to 4k7. So keep these things in mind when assigning label values, but do not worry too much, because the program automatically warns you of any errors, and allows you to correct them.

The number of label input fields, which are displayed for you to enter data, is automatically adjusted to match the number of LABEL images in your schematic. Before each label input field, its line and column letters are displayed, so that you know which label in the schematic you are editing. For example, a letter pair “fm” before a label input field would place the text you type into that input field in the cell at the junction of line “F” and column “M” in the lower table.

For your convenience, note that the schematic is scanned for LABEL symbols, starting at the top left of each line and proceeding to the right. When it gets to the right margin it moves down and does the next line of symbols. Thus, the order of the label input fields follows this pattern.

**Display Labeled Schematic**
The Display function displays your schematic, including your labels, in a new window, to check if everything is OK, before exporting it.

**Generate HTML (Including Labels)**
The Generate HTML function generates HTML code for your schematic, including its labels. It can be used as an alternative method to save your schematics, but your saved schematics must be inside the Schematix folder in HTML form.

**Exporting Schematics (Export Data Function)**
The Export data function is used to export a schematic and its labels in a
form that is efficient for sending this schematic over the air to other hams. With the schematic displayed in the bottom frame and all its labels filled in on the form fields in the top frame, click Export data to export the schematic (Figure 7). If there is an error in the labels, a pop-up window will be displayed, telling you where the error is and how to correct it. If there are no label errors, a new window will open, containing the exported data text. (This is text, not a diagram.)

Select all text in that window and copy it. Then paste the copied text inside your favorite sending program, to send it over the air, using your favorite mode. Figure 7 shows the Utilities page with the form filled in, and the popup window with the code generated, after clicking the Export data function.

**Error Detection and Correction**

In Schematix, some form of error detection—and in some cases, correction—can be performed without data retransmission or additional data overhead. Humans can be used to correct the data to some extent. Error detection is done automatically, as well as by humans. The error detection is partially due to the rules of component labeling. Additionally, it depends on the available components in the Schematix library, as well as schematic inconsistency that can only be noticed by the user. I will use some examples below to illustrate.

If a word is less than four characters long, the program knows an error has occurred, but it does not know if the error is in the part of the word that refers to the position of the component or the part that refers to the component/label, so the symbol is ignored. These errors are shown as blank blocks in the schematic and in some cases they can be spotted by the user when looking at the overall schematic for inconsistencies (e.g., blank blocks where they shouldn’t exist).

In some cases, the user can guess the component behind the error and correct it by clicking Import data (Figure 8), a text box is displayed in the top frame. Copy the text you have received from your favorite receiving program and paste it into this text box. Then click Import data on that page. The imported schematic will appear in the bottom frame.

You can repeat this process as many times as you like, by clearing the text box using the Clear form link and pasting your data text into the box again. Figure 8 shows the Import page and some data that has been pasted into the form. This data “reveals” the schematic at the bottom frame when the Import data link is clicked.

**Importing Schematics (Import Data Function)**

The Import data function is used to import a schematic and its labels, that has previously been transmitted to you over the air by another ham.

By clicking Import data (Figure 8), a text box is displayed in the top frame. Copy the text you have received from your favorite receiving program and paste it into this text box. Then click Import data on that page. The imported schematic will appear in the bottom frame.

You can repeat this process as many times as you like, by clearing the text box using the Clear form link and pasting your data text into the box again. Figure 8 shows the Import page and some data that has been pasted into the form. This data “reveals” the schematic at the bottom frame when the Import data link is clicked.
it without asking for a resend. For example, if a continuous straight wire is broken at some point, the user can easily guess that this point should be a wire connected to the rest of the wire. Another example may be a label with a value of “1k” and no nearby component. It’s reasonable to assume that a resistor should be somewhere nearby, and that the blank cell is where it should be.

In another example, when the first two characters of a word appear to contain at least a number, the program knows an error has occurred and the current component/label is ignored. This error is also shown as a blank space in the schematic and is again up to the user to spot and correct it.

Let us now consider an example in which a word that has been received, is four or more characters long and its first two characters do not contain numbers. Based on the Schematix labeling rules, the word consistency is correct. In this case, the first two letters of the word represent the line and the column of the component/label in the table and the remaining characters represent either the component or the label value. However, there is no way to check whether an error has occurred in the actual component types or label values. Despite this, there are two things that can be done to spot an error.

One is by the user doing manual error checking/correcting, by looking at the overall schematic for inconsistencies, as described above. The other is done automatically by the program and it refers to the special case in which a component is received which does not exist in the Schematix library. In this case, it is certain that an error has been received and the missing component is shown in the table as a broken image.

Another example is if, due to an error in location data, two components are placed in the same cell. The program will put them both there, leaving it up to the user to try to correct, the error. In some cases, by looking at the schematic, the user might be able to decide which of the two components better matches the current cell. (You will also need to figure out where the other component belongs, but there’s a good chance that cell will be blank. – ed.)

Keep in mind that error detection is different from error correction. In the current version of Schematix, there is no automatic data error correction implemented. This has been done on purpose, to minimize the data that has to be transferred over the air. However, as noted above, there may be cases in which you might be able to correct an
error by simply looking at the schematic for inconsistencies.

In case the user (or the program) spots an error in an imported schematic that cannot be corrected by either of them, you can ask for retransmission of data from your ham friend. However, you do not need to ask for retransmission of the full schematic. Due to the way Schematix is made, you can instead request retransmission of data for specific cells. Just let your ham friend know which cells you have not received correctly (line and column letter of the cell on the grid), in order to retransmit them to you.

**Drawing and Exchanging Schematics Without a Computer**

There may be various reasons why one may not have a computer available. For example, some might consider the cost, although this is not a big issue for computers today, as nearly everyone already has one. Another reason may be the extra weight and size, but more importantly the power requirements, if one has to carry a computer along when operating outdoors. While a simple homemade transceiver might draw a few tens or hundreds of milliwatts, a laptop would draw a few watts. Another reason may be the need for weatherproof equipment, and a computer usually isn’t.

Schematix allows drawing, sending and receiving schematics, PCBs and diagrams even without the help of a computer, as it has been designed to be human-oriented. This is a unique feature that is possible because of the design of the drawing and the exchanging mechanisms. Although drawing and exchanging schematics without a computer is more time-consuming, it can be done with a little patience. Note that you can only use CW or phonetic alphabet modes, if you do not have a computer with you, since these are the only human-oriented operating modes. If you are interested in this nice feature,
please read the details in the Schematix documentation.

A Note About Using Schematix On-Air
Schematix is intended for use by radio amateurs to efficiently send their previously drawn schematics to other hams via Morse code or any other mode. The text that is being sent over the air is encoded, but not encrypted. This is an important distinction.

An operator may listen to the CW stream and write down the decoded letters, but they will mean nothing to him, so they may appear to be encrypted. But this is not the case. Unless the operator
knows how to interpret this data to have meaning for him (i.e., translated to a schematic), he does not know whether this data is encrypted or encoded. However, by just looking at the data, he may notice that some of it makes sense (for example 2n2222). This is a way to notice that this data is Schematix data.

However, to be compliant with FCC rules and "just in case," I would advise you to include some text at the beginning or/and the end of your transmissions along the lines of "the data can be decoded using Schematix" or even including a link to my website, <www.qrp.gr>. This will also help new hams to correctly identify and decode this data.

Comparison to Other Programs/Modes
The easiest way to see why using Schematix may be superior when sending schematics over the air is to consider an example and compare it with other modes/programs. Let's consider a schematic that has been drawn using the Schematix editor (Figure 9).

This schematic has been exported as an image, using the print screen button and pasting into Paint, then saving as a low-quality JPG file. The size of the image file is 53 Kb.

If this file was to be encoded to text (Figure 10) and then sent using the DataText program I have developed (available on my website), 75093 characters would have to be sent on the air. It would probably take hours or even days to send this via CW and even the slightest error would make the data corrupt, so that retransmission would be needed.

However, if Schematix is used (Figure 11), the number of characters is reduced to about 750, including the spaces between words. An error anywhere in the characters would result in corruption of a specific part of the schematic, not the whole schematic. Sending the 750 characters at 25 wpm CW would take about 5 minutes and 18 seconds. Of course, the time will vary based on your sending speed.

If we send the same data using BPSK-31 (Figure 12), without sacrificing any bandwidth compared to CW, it will take 2 minutes and 37 seconds. Using BPSK-63, again without sacrificing any bandwidth compared to CW, will take 1 minute and 19 seconds.

If we sacrifice the bandwidth a bit and use RTTY-50 (Figure 13), the same number of characters can be send in about 2 minutes and 21 seconds. Again, time relates to the speed of sending, so if using RTTY-75, this can be even faster.

Comparing Schematix to SSTV is also interesting. Of course, I have not tested all the SSTV modes, but I have chosen between the extreme ends, the fastest but lower-resolution mode (B/W8), a commonly used one (Martin1) and the slowest but higher-resolution FD290.

Using B/W8 to send the same image (Figure 14) would take only 8 seconds, but the resolution is only 160x120 and the image is severely cropped. Trying to scale the image down to 160x120 results in severe loss of schematic information.

Using Martin1 to send the image (Figure 15) would take 1 minute and 54 seconds, but the resolution is only 320x256 and the image is still cropped. Trying to scale the image down to 320x256 again results in loss of the schematic information.

Using Martin1 to send the image (Figure 15) would take 1 minute and 54 seconds, but the resolution is only 320x256 and the image is still cropped. Trying to scale the image down to 320x256 again results in loss of the schematic information.

Using PD290 to send the same image (Figure 16) would take 4 minutes and 50 seconds, and the 800x616 resolution is still not adequate to fit in the whole image without scaling, so the image is cropped again. Trying to scale the
“Schematix is intended to add a new feature that had been missing from the radio amateur community until now.”

image down to 800x616 results in an image that is distorted, but the schematic information can be distinguished. However, given the noise on reception, which directly affects the received image quality, all the image information might not be able to be recovered.

Comparing Schematix to Wefax (most commonly used for sending weather faxes) is interesting as well. Using WEFAX576, the same image has been sent in 6 minutes and 24 seconds. This is a relatively broad signal and is still susceptible to corruption from noise, QRM, or changes in propagation.

To summarize, the same schematic has been sent in different ways with the following results (listing mode, transmission time and notes):

- **Datatext**: Days, very bandwidth efficient (CW/PSK), not tolerant of errors, not practical.
- **Schematix via CW 25 wpm**: 5:18, very bandwidth efficient, quite tolerant of errors.
- **Schematix via BPSK31**: 2:37, very bandwidth efficient, quite tolerant of errors.
- **Schematix via BPSK63**: 1:19, very bandwidth efficient, quite tolerant of errors.
- **Schematix via RTTY-50**: 2:21, bandwidth efficient, quite tolerant of errors.
- **SSTV B/W8**: 8 sec, bandwidth inefficient, cropped image, not practical, not very tolerant of errors.
- **SSTV Martin1**: 1:54, bandwidth inefficient, cropped image, not practical, not very tolerant of errors.
- **SSTV PD290**: 4:50, bandwidth inefficient, cropped image, short of OK when scaling, not very tolerant of errors.
- **WEFAX576**: 6:24, bandwidth inefficient, not very tolerant of errors.

**Conclusions**

This idea is something never tried before, as far as I am aware, at least not in this way. In that sense, I would greatly appreciate your comments, positive or negative, so as to improve the program and make it more usable.

Apart from the documentation and the current article, a short video has been created at <http://users.sch.gr/giannopk/Schematix.mp4> where the basic operation of the program is demonstrated.

I would love to see hams use the program on air and comment to me. I would encourage you to try it with members of your local clubs as well. Either way, Schematix is intended to add a new feature that had been missing from the radio amateur community until now.

**Notes:**

1. Schematix has been developed by the author, based on a previous program written by Jim Osburn, WD9EYB.
2. FCC rules restrict transmission of messages “in codes and ciphers intended to obscure the meaning thereof...” (§97.113(a)(3)]. Since there is no intention to obscure the meaning of the data, this restriction does not apply in this case. However, it is advisable to include some plain text as the author suggests, in order to remove any doubts. – ed.

For a brief video demonstration of Schematix in use, visit <http://users.sch.gr/giannopk/Schematix.mp4>. 

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For a brief video demonstration of Schematix in use, visit <http://users.sch.gr/giannopk/Schematix.mp4>.

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Nine-volt batteries (the rectangular type) are the main-stay for operating older portable radio equipment. The original high-voltage batteries for old military radios are now unobtainable. The replacement batteries are usually made up of 9-volt batteries that are soldered together in series (Photo A). Some high-tech switching power sources are available as an alternative, but batteries still prevail.

During a recent test of the PRC-6 military radio (banana-shaped 6-meter handheld) from the Korean War, there was a catastrophic failure. The radio just quit working on top of Pike’s Peak (elevation 14,115 feet). Cold temperatures and high altitude were suspected to be contributors to the failure. Similar failures have been seen in the BC-611 walkie-talkie (WWII), which uses 12 9-volt batteries all soldered in series for the high voltage. My PRC-6 has 11 batteries in series.

Cracking the Case
Back at the Baker Street Failure Analysis Lab, internal inspection revealed that one of the batteries had failed. It had an open connection. The manufacturer had recently changed the internal construction of these batteries and now they have crimped terminal connections, which can cause open connections to the internal cells. Soldering to the battery termi-
nals to wire them in series has been the normal practice, but with this new construction, it can cause an open circuit. Nine-volt batteries have been soldered together for years without these kinds of failures. The older MN1604 batteries had six small cylindrical cells (AAAA) in a cordwood stack and the lead wires were spot-welded to the top terminals (Photo B). They could withstand soldering very well.

Using 9-volt battery sockets is one way to prevent these terminal failures but it adds two more crimps, two more snap connections and more solder joints per battery. It also makes the battery a big jumble of wires. But the only reliable way to use these new cells in a stack is to connect to them with sockets; do not solder to the terminals.

The new “MN1604B4” (package marking) battery construction technique found in the failed battery used six flat cells that were stacked and encased in a plastic sleeve. The flat lead ribbons used to connect the flat cells are welded to the back and top plates, but not welded to the top terminals. The connection there is just a press-fit crimp. Other battery manufacturers (e.g.: p/n 23-853) are also using the same flat cells with crimped terminals. The good news is that the Durecell “copper/red” Quantum battery (QU1604B) has six cylindrical cells and spot-welds. It will be good for soldering.

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**Tubular or Flat?**

It is easy to find out which cells are in your battery; just peel the top edge of the case at the fold (Photo C) and you will see either flat cells or tubular cells. Then press the case back together and you can still use it.

One special battery assembly technique used was made by cutting the case off the battery, cutting the lead ribbons off and then soldering fly wires to the face plates of the battery stack (Photo D). This makes a smaller and more reliable battery.

Analysis of which cell style (cylindrical/flat) is best is still ongoing. There have been a lot of reports on the web about this battery exploding, but that did not happen in this case.

There are small LiIon cells (Case size 14500, 14-millimeters diameter and 50-millimeters long) available that could replace these alkaline batteries. A stack of 25 LiIon cells in series would give 100 volts. I have six of them in my KX1.

That is going to be my next battery build.

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The CQ World Wide WPX RTTY Contest (CQ WPX RTTY) offers 48 hours of non-stop DX chasing fun. Whether you are competing for awards, looking for a few new band-countries, or simply filling the logbook, the CQ WPX RTTY Contest has something for everyone. Check out the Tribander/Single Element and Rookie Overlay Categories for even more chances to win a certificate.

Contest Basics
Working stations is easy. Exchange and log signal report and a progressive serial number beginning with '001', e.g., DL1ABC 599 123 123.

Contacts are only valid on the 3.5-, 7-, 14-, 21-, and 28-MHz amateur bands (no WARC bands), and may only be made using 45.45-baud, 170-Hz shift Baudot RTTY (no PSK or other keyboard modes).

Scoring
Final score is based on QSO points earned for each contact times the number of multipliers worked.

Multipliers are each unique callsign prefix, which is the letter/numeral combination forming the first part of the callsign. This prefix multiplier is counted once per log, not on each band.

Contacts with other continents count three points each. Contacts with the same continent, but different country, count two points. Same-country contacts count one point. In addition, these contact points are doubled for contacts made on the 3.5- or 7-MHz bands.

Don’t worry about calculating your score; the contest log-checking program will do that for you when you submit a log.

Entry Categories
The competition is divided into Single Operator and Multi-Operator categories. All entry categories may use QSO alerting, i.e., all entries are “Assisted” whether QSO alerting is used or not. Single Operator categories also offer two additional Overlay categories, which may be entered IN ADDITION TO the normal Single Operator category.

Single Operator (all bands or any single band) – only the one operator finds, makes, and logs all contacts.

• High power: Up to 1,500 watts
• Low power: 100 watts or less
• QRP: 5 watts or less

Tribander/Single Element Overlay – Allows the use of a multi-band, multi-element antenna with one feedline for the 14-, 21-, and 28-MHz bands, plus a single element antenna for each of the 3.5- and 7-MHz bands. One example is a 3-element tri-band antenna for 14, 21, and 28 MHz plus an Inverted-V wire dipole for 3.5 MHz and another one for 7 MHz. Another example is a single-element, multi-band vertical antenna for all 5 bands or a fan dipole of single element dipoles for each band using a single feedline.

Rookie Overlay – Open only to operators who were first licensed as radio amateurs less than three (3) years before the date of the contest. Indicate date licensed in the soapbox field of your log.

Multi-Operator – More than one person is involved in operating the station.

Single-Transmitter: This category allows one transmitter to work any station. It may change bands as many as 8 times per hour. Note: A second transmitter may be used to work multipliers only. This category has some very specific restrictions so please read the full rules carefully.

• High power: Up to 1,500 watts
• Low power: 100 watts or less

Two-Transmitter: Allows the use of two transmitted signals on two bands. Each station may change bands as many as 8 times per hour.

Multi-Transmitter: Allows the use of one transmitted signal on each band.

Awards
Electronic certificates will be made available for everyone who submits an entry. Handsome plaques may be sponsored for the top finishers in each category. Unsponsored plaques may be purchased by contacting the contest director.

Submitting Your Log
Electronic logs should be in the Cabrillo format. Upload your log on the Web at <www.cqwpx.com/logcheck/>. The website also includes a utility to convert your ADIF format log file if needed. See full rules for instructions regarding paper logs.

All entries must be sent WITHIN FIVE (5) DAYS after the end of the contest: No later than 2359 UTC February 16, 2018.

Resubmitting an entry after the deadline will result in it being considered as a late log.

Only one entry is permitted for each callsign. Any log submission will replace any previous submissions.

Full Rules
The complete rules of the CQ WPX RTTY Contest are available in different languages on the Web at <www.cqwpxrtty.com/rules.htm> and in English on the CQ magazine website at <http://www.cq-amateur-radio.com>. Please review the rules and the frequently asked questions before the contest. Questions may be submitted by email to <questions@cqwpxrtty.com>.
Announcing:

2018 Nominations Open for the CQ Amateur Radio, DX, and Contest Halls of Fame

Each year CQ recognizes those who have made significant contributions to amateur radio in general, and to DXing and contesting in particular, creating three categories of awards. Nominations for all three Halls of Fame open on January 1, 2018 and will close on March 1, 2018.

CQ Amateur Radio Hall of Fame

Amateur radio operators have been responsible for many advances in communications technology, and entire industries have been built on the foundation of amateur radio experimentation and activity. In an effort to recognize outstanding amateurs and their achievements, and help the public appreciate the far-reaching and longstanding value of amateur radio in our society, we have established the CQ Amateur Radio Hall of Fame. Nominations for the 2018 “class” are now open. Members of the 2017 “class” were announced last May and appeared in the July issue of CQ.

The CQ Amateur Radio Hall of Fame honors those whose technical or other accomplishments have helped propel amateur radio forward, or whose achievements in other areas of life have helped improve ham radio’s reputation simply through association. Nominees for the CQ Amateur Radio Hall of Fame will be judged on the basis of qualifying in one of two broad areas: Those individuals — whether licensed amateurs or not — who have made significant contributions to the amateur radio hobby; and those radio amateurs who have made significant contributions to society in general. Nominees must have made significant contributions of nationwide or worldwide impact.

Nominations for the Amateur Radio Hall of Fame may be made by clubs, organizations, or individuals. State your candidate’s name, where to contact him/her if still living, for which category you are nominating him/her, and a brief one- to two-paragraph description of this person’s accomplishments. Please include your name and contact information as well. Email to <hall-of-fame@cq-amateur-radio.com> or mail to CQ Amateur Radio Hall of Fame, 17 W. John St., Hicksville, NY 11801. The official nomination form is on the CQ website <www.cq-amateur-radio.com>. Please indicate in your email subject line for which hall of fame the nomination is being submitted.

CQ DX and Contest Halls of Fame

Nominations for the CQ DX Hall of Fame and the CQ Contest Hall of Fame recognize those amateurs who have made major contributions to DXing and contesting, respectively. The activities and accomplishments that qualify one for membership in these elite groups involve considerable personal sacrifice and can usually be described by the phrase “above and beyond the call of duty.” Nominations for the Contest and DX Halls of Fame may be made by clubs, organizations, or individuals, and must be submitted by March 1 of each year to be considered.

A maximum of two (2) people may be inducted into each hall of fame (DX and Contest) each year. Nominations for the CQ Contest and DX Halls of Fame should be directed to CQ DX Hall of Fame or CQ Contest Hall of Fame, 17 W. John St., Hicksville, NY 11801; or via email to <hall-of-fame@cq-amateur-radio.com>. Please indicate in your email subject line for which hall of fame the nomination is being submitted.

If you feel someone has earned this recognition, please submit a nomination. Please don’t assume that someone else will nominate the person you may have in mind. Nominations from past years will not automatically be carried over.

We will announce this year’s selections at the Dayton Hamvention® in May. Please help us recognize these “ham radio heroes” whose contributions have helped shape our hobby, our nation, or our world. Remember, the nomination deadline for all three CQ Halls of Fame is March 1, 2018.
Thomas Wolfe’s novel, *You Can’t go Home Again*, which was published in 1940, described, among other things, the changing American society. While I do not plan to go into a discussion of his novel, I would like to paraphrase the title to “Maybe You *Can* go Home Again” as it relates to amateur radio. Since the novel was published in the 1940s and I became interested in electronics and radio roughly in the 1950s, I think the time element is close enough to make some comparisons.

When I started experimenting with a few #6 dry cells obtained from a friendly burglar alarm serviceman (who replaced them monthly in my father’s small grocery store as was the method used then), I was quickly taken in by the “fun” I had lighting small lamps, configuring toggle switch puzzles and becoming familiar and enchanted with electricity. I wrote about some of this in several past columns and actually had some books on the subject published in the 1980s. I also started collecting components from the many radios that were discarded at the time in favor of newer, smaller “tabletop” models that were making their appearance. There were no transistors, integrated circuits, or printed circuits in those days, but vacuum tubes such as the type 30, 44, 80 and other similar ones with large 4-, 5-, and 6-pin bases and matching sockets were commonplace. You could easily see the inside of many of them and actually recognize their filaments, grids, and plates. In fact, just by looking through the glass envelope, you could almost understand how they worked. Components such as resistors and capacitors were easy to see, handle and work with, and most other components were easily recognized as to what their function was. Since there was no internet, any education I had came from books (some of which I mentioned in a previous column this year), radio and electronics magazines which were quite popular at the time and, of course, extensive hands-on “playing around.”

Anyone who has looked at books such as the *Radio Amateur’s Handbook* from the ’40s, ’50s and ’60s, and similar magazines of the time, will see multitudes of projects from very simple ones to the more complex units that were designed, built, and operated by amateurs. The influx of store-bought equipment had not started to any great degree yet and there were many more actual builders than so-called “appliance operators.” All kinds of unique housings and construction methods were in use from a simple “chassis” made of orange box construction (two 2 x 4 side legs and two 1 x 2 x 8 component mounting strips spaced so that a tube socket would fit as shown in Figure 1) to breadboards made of brass wire brads hammered into a piece of wood as shown in Figure 2 to which components were then soldered. The wooden base was probably cut from an actual wooden board that was used then to knead flour when making bread (hence the term “breadboard”). Yes, those were the days!

Things began to change as time went on. With the huge amount of surplus components left over from World War II, companies such as Heathkit and Eico began to offer kits of components to assemble all sorts of electronic projects, many aimed at the growing amateur radio market. This made it easy for homebrewers to build more sophisticated equipment and the amount of “almost” homebrew equipment swelled. These kits were good in the sense that, in many cases, their instructions clearly explained what you were building and how it worked. True ingenuity, however, suffered to some degree as everything was provided from chassis to components (sometimes even hook-up wire and hardware), fully-screened front and rear panels and enclosures, but nevertheless, you still built something. I clearly remember, and will probably never forget, the thrill of contacting someone with equipment I had built, cutting my fingers on the tin can shields I needed and the many burns from I got from my Weller soldering gun.

As the end of the century was approaching, however, many in the amateur community had become or were on the verge of becoming appliance oper-
ators. True, there were some who continued the hands-on portion of the hobby (and still do), but the majority these days do not and from some of my experience and discussions with fellow amateurs, there are many who have no real idea of how it all works (or care?) as well. Supposedly, they did pass their license exams legitimately, but sometimes I wonder.

Can we ever go back to those days again? Because of the complexity and constantly changing nature of today’s technology, the quick answer is probably no. However, if you look at where we are now compared to where we were then, the difference between what we knew then with respect to the state of technology and what we know now (with respect to today’s technology) is probably fairly similar. Will we go back to being homebrewers? A good question since the growing “Makers Movement” seems to encourage the building of things by amateurs, and not just in the amateur radio field. In fact, I understand that booths teaching soldering at the various “Maker Faires” are quite popular, so this is encouraging. Just how this will ultimately compete with a tiny cell phone that can enable one to communicate (and actually see) almost anyone on the planet is hard to predict. The excitement of communicating with someone unknown and with something you have built with your own two hands, however, cannot ever be equaled, in my opinion, with equipment that has been built by others, no matter how clever.

Now that it is the end of another year, I want to wish all of my readers the very best for a happy and healthy New Year. In these troubled times, I still believe that amateur radio can go a long way toward helping promote understanding between peoples with widely varying lifestyles but with common hopes of peace and prosperity.

– 73, Irwin, WA2NDM
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by Jack Hudson, W9MU & Jerry Luecke, KBSTZY
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Australian Senate Nixes ABC’s Return to Shortwave

Let’s shovel out a few shortwave-lets which have fallen recently:

~ The Australian Senate has rejected a proposal to restore shortwave services at the Australian Broadcasting Company (ABC), which calls to mind LeRoy Jethro Gibbs’ (on TV’s N.C.I.S.) and his Rule 51: “Sometimes you’re wrong.”

~ WRMI apparently suffered some damage during Hurricane Irma. All of its frequencies were down at least briefly, with 9955 kHz being the last frequency to return to service. The Kashi (China) and Nobeljas (Spain) sites have also been dealing with technical problems, although those were not storm-related issues.

~ Need to log Armenia? A good opportunity might be Radio Mi Amigo, which now airs via Yerevan from 1700-1900 UTC on 11845.

~ It seems that China’s Xizang PBS (Tibet) has been off the air for a couple of months. At least the 60-meter outlets have been down for maintenance. China National Radio’s Network 17 (the Kazakh Service) has returned to activity after a long silent period. It’s kind of surprising, considering the extent of China’s extensive broadcasting operation, that there aren’t more such cases of downtime.

~ The BBC World service has added several new languages including: Afan Oromo, Amharic, Gujarati, Igbo, Korean, Marathi, Pidgin, Punjabi, Serbian, Telegu, Tigrinyam and Yoruba. Some of those should trigger your MS Word spell-check.

~ That unidentified on 5940 we had a month or so back turned out to be the new, official station of the Ethiopian Somali State called Radio Deegaanka Itoobiya (DDSI). It’s been noted in Ethiopian Somali from 0400-0510, 1300-1500, and 1810-2000 UTC.

~ A new German shortwave broadcaster is the European Shortwave Radio Service from Winsen in Lower Saxony, running tests as follows: 1200-1400, 1600-1800, and 2000-2200 UTC on 3975; 1000-1200, 1400-1600, 1800-2000 UTC on 6160. No transmission language noted. The station can be emailed at <3975@shortwaveradio.de> or <6160@shortwaveradio.de>.

~ KTWR in Guam celebrates 40 years of broadcasting with a new QSL card, which should be available now.

~ KBS Radio has replaced 7125 with 9880 for English at 1400-1600 UTC and 9785, 9835.

~ Ralph Perry notes a possible new Bolivian station on 5935. I'm uncertain as to the time but it’s likely audible in the evening or early morning.

~ I’m seeing reports of greatly improved modulation out of Radio Havana Cuba and Radio Rebelde. Hmm...RHC, while you’re working on your audio, why not look into whatever it is that’s causing those “sonic attacks?” Is someone there aiming at our diplomatic people?

~ Mongolian Radio has reactivated 4895.

The Sked Shed

The Voice of Turkey in English for the A-17 broadcast season:
0300-0400 on 6165, 9515
1630-1730 on 15520
1830-1930 on 9785
2030-2130 on 9620
2200-2300 on 9830

Leading Logs

Your shortwave broadcast station logs are always welcome. Please be sure to double- or triple-space between the items, list each logging according to the station’s home country and include your last name and state abbreviation after each. Also need-
ed are spare QSLs, station schedules, brochures, pennants, station photos and any other SWBC material you think would be of interest. The same holds for you amateur radio operators who also listen to shortwave broadcasts. You, too, are also most welcome to contribute!

Here are this month’s logs. All times are in UTC. If no language is mentioned English is assumed. After you’ve read the printed logs, you will find more online at <http://cqpluslisteningpost.blogspot.com>.

ARMENIA—Radio Mi Amigo relay, 1845 via Gavar at 1740 with many rock songs, RMI jingle at 1812 and a male DJ. Off at 1900 with brief IS. (Cooper, PA)

BOLIVIA—Radio Mosoj Chaski, Cochabamba, 3310 at 1005 with song in Spanish, female DJ, later male. Recheck at 1100 had man giving long monologue. (Cooper, PA)

ETHIOPIA—Amahara State Radio, Addis Ababa, 6090 at 0250 with O/C, Amharic announcements at 0300. (Strawman, IA) 0317-0342 with instrumentals rising above the noise floor. Caribbean Beacon not there. Man/woman speaking in Amharic, but eventually losing the noise floor battle. (D'Angelo, PA)


INDIA—Athmik Yatra Radio, 15235 via Nauen with man speaking in (I) Lepcha. (Brossell, WI)

INDONESIA—Voice of Indonesia, 9525 at 1948-2009. Surprisingly heard at this hour. Pops and snippets of English at top-of-the-hour. (Delibert, MA)

Malaysia—Radio Republik Indonesia, Palembang (Kalimantan), 3325 with Indo pops. RRI ID at 1257. (Sellers, BC)

MALI—Radio Diffusion du Mali, 5995-Bamako at 2200 with man speaking in Arabic, instrumentals in bg, music interlude and station ID, woman’s vocals and woman reading the station ID, another French ID at 2230. (Cooper, PA)

MYANMAR—Myanmar Radio, 5985 with a drama in Burmese at 1306, a couple of love (?) songs at 1315. (Sellers, BC)

Voice of the Tigray Revolution, 5950-Addis Ababa at 0322 with deep-voiced male announcer and usually great HOA music. (KB2DMD, PA)

PAPUA NEW GUINEA—NBC-Madang, 3250 at 1145 with female announcer speaking in Tok Pisin. (Sellers, BC)

NBC-Bougainville, 3260 with music and female announcer at 1159 with announcements, then back to music. (Sellers, BC)

PERU—Radio Tarma, Tarma, 4775 at 1995 with lively song, male DJ talks about the selections. (Cooper, PA)

Radio Logos, (p) Chazuta, 4810 at 1025 with man talking in Spanish, song with several male singers. Quite a bit of OTH QRM. Needed LSB mode. (Cooper, PA)

SOLOMON ISLANDS—SIBC, at 1145 with a pop song, Bible devotion at 1153. Off suddenly in mid-hymn at 1157, another day off at 1157, midway through a Christian devotional. Too bad they haven’t adjusted their timing. (Sellers, BC)

ZANZIBAR—ZBC, 11735 at 2013 with woman speaking in Swahili. (Brossell, WI)

Who Goes There?

I’m hearing LA music on 5049.2 at 2250, possible ID at 2254. Some of the music sounded Andean, (Delibert, MD). It appears now that this one may be Radio Yura in Potosí, formally using 4717, now reactivated—GLD

I’m hearing an unid at 0325 on 5927 (sandwiched between Gene Scott on 5930 and WHRI on 5920) with 2 men...
The “new” Argentinean RAE confirmed for Cooper its new relay site via Okeechobee, Florida.
Ham Radio Weathers the Storms

Beginning with this issue of CQ magazine, we are proud to announce a new podcast feature available via the internet. EmComm Overtime will feature interviews with amateur radio newsmakers. Visit <INSERT WEB ADDRESS HERE> to download these in-depth and informative interviews.

The power of Mother Nature proved to be as awesome as ever the past few months. The Caribbean Basin was pummeled by not one, but three major hurricanes; the West Coast suffered devastating fires and amateur radio was at the ready and on-the-air.

Hurricane Harvey
On August 25, 2017, Hurricane Harvey came ashore along the eastern Texas coast as a category 4 hurricane. With no significant steering currents, the storm sat along the coast, dumping rain of biblical proportions in major Gulf Coast cities.

Ground Zero for Harvey was the coastal town of Rockport, Texas, just northeast of Corpus Christi. But due to the sheer size of the storm, its outer bands were felt in Houston, 150 miles away. Bands of heavy rain trained ashore (In meteorology, train denotes repeated areas of rain, typically associated with thunderstorms and hurricanes), delivering a U.S. record 60.58 inches of rain with winds topping 130 miles per hour (Source: National Weather Service).

Harvey's total rainfall concentrated over a 20,000-square-mile area represents nearly 19 times the daily discharge of the Mississippi River, by far the most of any tropical system ever recorded, reports Texas state climatologist John Nielsen-Gammon. Hurricane Harvey caused 90 deaths as of this writing, as well as an economic loss of $70 to $200 billion, with a large portion of the losses sustained by uninsured homeowners.

A number of amateur radio nets began daily operations, tracking the storm and relaying information and health and welfare messages. In the United States, amateur radio played an important role during Harvey by providing reliable emergency communications to the various served agencies with which ham groups work. Interoperability gave the hams an advantage by permitting them to move from one operating area to another and, through relatively simple programming, allowing them to join the local network.

Using lessons learned from Hurricane Katrina, emergency management, served agencies, and local infrastructure have hardened their resources to make them more immune to failure in the wake of major storms. This hardening may have diminished the role of amateur radio during Harvey in the more populated affected areas. Mike Urich, KA5CVH, a public information officer for the Amateur Radio Emergency Service in Harris County, Texas, reports the majority of traffic consisted of health and welfare messages.

Hurricane Irma
Hurricane Irma was an extremely powerful and catastrophic hurricane, the strongest observed in the Atlantic since Wilma in 2005 in terms of maximum sustained winds. It was the first Category 5 hurricane to strike the Leeward Islands, followed by
Hurricane Maria only two weeks later. It was also the most intense Atlantic hurricane to strike the United States since Katrina in 2005, and the first major hurricane to make landfall in Florida since Wilma.

Irma took aim at islands in the Caribbean, producing hurricane-strength winds on many islands and making a brief landfall on Cuba before heading to the U.S. mainland. Florida officials called for the mandatory evacuation of millions of people in her path. The first landfall in the continental U.S. came to the Florida Keys. A storm surge of 12-15 feet and winds of 130 mph swept the islands. Key West suffered severe damage (Photo A). The storm then wobbled to finally make a second landfall near San Marco Island as a category 3 with winds sustained at 115 mph.

Ham radio operators who remained in place were the first to provide “ground truth” and situational reports.

**Hurricane Maria**

Hurricane Maria was regarded as the worst natural disaster ever in Dominica (Figure 1) and caused catastrophic damage and a major humanitarian crisis in Puerto Rico, as well as being the tenth-most intense Atlantic hurricane on record. As of October 10, at least 93 people are known to have been killed by the hurricane: 48 in Puerto Rico, 30 in Dominica, 5 in the Dominican Republic, 4 in the contiguous United States, 3 in Haiti, 2 in Guadeloupe, and 1 in the United States Virgin Islands. Maria wrought catastrophic damage to the entirety of Dominica, which suffered an island-wide communication blackout.

We have detailed reports from both Puerto Rico and Dominica, along with summaries of activity by SATERN (Salvation Army Team Emergency Radio Network) and the Hurricane Watch Net.

**Puerto Rico**

Following a glancing blow by Hurricane Irma just two weeks prior, Hurricane Maria made landfall on Puerto Rico on Wednesday, September 20. Sustained winds of 64 mph with gusts to 113 mph were reported in San Juan, immediately prior to the hurricane making landfall on the island. The storm surge brought floods throughout the island and many structures lost roofs. Virtually the entire Puerto Rican power grid was damaged or destroyed and the entire island was without power for weeks. Authorities expect total restoration of electric power to take several months.

With a near total loss of communications, both on and off island, the American Red Cross (ARC) put out a call for volunteers to travel to the American territory to establish and assist in the massive relief endeavor. Mario Bruno, KB1DAV, is the regional CEO of the American Red Cross Connecticut/Rhode Island Section. He traveled to San Juan representing the ARC, along with members of the American Radio Relay League emergency communication team. They
arrived to find conditions primitive. Mario told *CQ* it was virtually impossible to get information from many areas in Puerto Rico. Health and welfare requests were moving through several hurricane and SATERN nets. The ARRL provided equipment and volunteers to begin gathering local ground truth, assist strike and task forces, local electric power authorities and Red Cross distribution and recon teams (*Photo B*). To hear the entire interview with Mario Bruno, visit <INSERT WEB LINK HERE>.

Dominica

Following the destruction of thousands of homes, most supermarkets, the water supply system and communications systems, many of Dominica’s residents were in dire need of food, water, and shelter for days in Maria’s wake.

U.S. ham Brian Machesney, K1LI, and his wife, Michelle Guernard, had a personal relationship with the people of Dominica. They took it upon themselves to establish a coordinated response to gather and deliver much-needed ham radios and support equipment to the island nation. Contributions in the amount of $30,000 through a GoFundMe campaign as well as donations from several companies including radios, antennas, solar chargers and batteries, were flown to Dominica and distributed to the island’s ham radio operators (see *Photos C-F*).

Three cheers to the Yasme Foundation, Yaesu USA, Foundation for Amateur International Radio Service (FAIRS), Dominica Airlift — Angels to Eden, Hurricane Maria Dominica Amateur Radio Communications Facebook Page and the Caribbean Emergency and Weather Net for their participation. To hear the entire interview with Brian Machesney, visit our *EmComm Overtime* site at <INSERT WEB ADDRESS HERE>. Also, visit <http://bit.ly/2yvMjC1> on Facebook to learn more about Dominica Amateur Radio Communications (DARCI).

SATERN

The Salvation Army Team Emergency Radio Network (SATERN) has been very busy on the air. The following report is from Ken Gilland, AV6SV:

*Photo B. Radio room in San Juan, Puerto Rico, where hams dispatched by the ARRL helped Red Cross teams communicate across the island. (Courtesy of Mario Bruno, KB1DAV, American Red Cross)*

*Photo C. Brian Machesney, K1LI (L), and pilot Dave Bridgham load a plane full of ham gear and other supplies to be flown to Dominica to help restore communications with the outside world. (Photos C-F courtesy of Michelle Guenard)*

*Photo D. Oscar, J72OS, operates from Dominica’s emergency operations center.*
SATERN first activated for Hurricane Harvey & then Irma. Following right after Irma, hurricane Maria struck the Caribbean & then Nate pounded the Gulf States. SATERN activated the International SATERN 20-meter SSB Net for Maria, in the DELTA II mode, on Monday, September 18 & operated from 1400 Zulu (UTC) to 2300 Zulu every day until September 29. After 10 days, most of the outgoing messages occurred in the afternoon. So SATERN switched to an abbreviated activation from 2000 Zulu to 2400 Zulu which started on September 30th. SATERN continued to receive health & welfare messages from Puerto Rico. SATERN’s activation was discontinued on October 10. This has been the longest SATERN activation since hurricane Katrina, 22 days & approximately 200 hours of on-the-air monitoring. The International SATERN SSB Net was activated as Hurricane Maria approached many of the same Caribbean islands that had been devastated the week before by Hurricane Irma and, to some extent, by Hurricane Harvey the week before that. Although Hurricane Maria was only a category 1 storm the day before the net was activated, it rapidly intensified to a category 3 by the time of activation, becoming a monster category 5 hurricane by the end of that day. As is known now, Hurricane Maria had a devastating impact on numerous Caribbean nation islands such as Dominica, as well as the U.S. Virgin Islands & Puerto Rico. Both Dominica & Puerto Rico lost all electrical power & communications capabilities as Maria rampaged through them. Message Traffic: On Wednesday, 20 September, both the International SATERN Net & the Hurricane Watch Net began to receive damage & situation reports from the U.S. Virgin Islands & Puerto Rico. Although the U.S. Virgin Islands were heavily damaged, it was apparent that they had some limited communications capabilities & other resources. All of the Puerto Rican operators, however, reported that there was an island-wide power & communications blackout. It was reported that amateur radio seemed to be the only communications that were operational & that was somewhat limited. The SATERN Net also began to handle numerous outbound Health & Welfare messages with the help of many operators who came on frequency to assist. SATERN received information that amateur radio operators on Dominica planned to operate an email service to handle health & welfare messages as soon as they could get their radios set up. All of this information was forwarded throughout the day to both the Eastern Territory & National Headquarters (NHQ). NHQ, in turn, forwarded this information to (FEMA’s National Response Coordination Center or NRCC) which, according to National Disaster Services Specialist, recognized the contributions of The Salvation Army & SATERN in its situation reports. SATERN Net Controls and the many relay stations have passed many health & welfare messages from the Caribbean back to families and friends in the United States. Several of us who have relayed messages to loved ones in the U.S. have heard the called party break down and cry. Another lady said the news that she received was the first word she had heard from her family in five days. Another relay station had the privilege of notifying a family who was overjoyed to hear that just after hurricane Maria had passed, they got word of a new baby boy (grandchild), that was born in Puerto Rico and that the parents were doing well. SATERN has made many people in Puerto Rico, the other Caribbean islands, and their relatives in the U.S. very happy. ARRL and the Red Cross: On September 24th, the American Red Cross asked the ARRL for assistance with relief efforts in Puerto Rico. Fifty radio amateurs were deployed to Puerto Rico, along with 20 ICOM IC-7200s, external antenna tuners, wire antennas, batteries, and some 20 handhelds, all contained in waterproof cases. ARRL supplied all of the equipment. Its purpose was to help record, enter, & submit disaster-survivor information into the Red Cross Safe & Well system. In the nearly 75-year relationship between ARRL and the American Red Cross, this is the first time such a request for assistance on this scale has been made. These Red Cross-deployed hams are sending messages back into the United States using WinLink HF transmissions to various Radio Mail Server (RMS) sites. As a back-
up, SATERN provides an SSB link back to the U.S. for the deployed Red Cross teams. The SATERN Team: With each of the activations, we have only about a day to setup a schedule of net controls. To minimize the burden on any one individual, net controls are asked to spend no more than one hour a day running the net. This has required a large group of volunteer net controls on very short notice. To get these volunteers, SATERN, ARRL, MARS, Hurricane Watch Net, Maritime Mobile Service Net, & several ARES groups broadcast a request to their members. We finally received a pool of about 50 volunteers, some seasoned professionals and some with very little experience. All have performed very well, have always showed up on time, and handled many messages. I am very proud of this diverse group of “professional” (not amateur) radio operators. The net controls are assisted by perhaps a hundred or more relay stations from all over the United States, Canada, and a couple of south-of-the-border hams. It was these dedicated relay stations that generally picked up and passed the traffic from the Caribbean. Most of the messages were received by stations in Florida, Georgia, Arkansas, Texas, New York, and even in California. On two different evenings, Puerto Rico was received locally (Northern California) at S9 +10 dB. We have also managed to recruit several hams who speak Spanish, so our calls into Puerto Rico and the rest of the Caribbean are often broadcast in two languages.

Satern has received many comments from individuals and other amateur radio operators, expressing what a professional and beneficial operation SATERN has provided to those in need during this disaster. This is a testament to the hundreds of hams that have volunteered their time, equipment, and talents. SATERN Headquarters, National Headquarters (NHQ), and FEMA are very pleased with what they have accomplished.

Hurricane Watch Net (HWN)
The Hurricane Watch Net was established in 1965 following Hurricane Betsy, the first U.S. storm resulting in over $1 billion in damage. She is also known as “Billion Dollar Betsy.” The Hurricane Watch Net activates for all hurricanes that are a threat to land in the Atlantic and as needed in the Eastern Pacific. Normally, the net will go into full activation whenever a storm is within 300 statute miles of land and moving towards that land. On occasion, it may activate the net for tropical storms or hurricanes before they reach the 300-mile zone if requested by the National Hurricane Center. As a storm approaches land, and at landfall, the net collects ground truth observations of wind speed, direction, wind gusts, barometric pressure, flooding from storm surge and any other information that might assist the forecasters of the National Hurricane Center get a better picture of the storm.

These are just but a few of many stories coming from a very busy Atlantic hurricane season.

“Life is what happens when you are busy making other plans,” –Allen Saunders.  – 73 de W4ALT

P.S.
Kudos to the American Radio Relay League and the American Red Cross for springing into action by deploying equipment and manpower to the people of Puerto Rico. Additional kudos to Brian Machnesney, K1LI, and his wife, Michelle Guenard, for their efforts to gather and deliver desperately-needed communications equipment to the people of Dominica. These actions support the humanitarian side of amateur radio.

–W4ALT
Puerto Rico Hurricane Aftermath
When Hurricane Maria ravaged Puerto Rico in early October, amateur radio operators were called in from many different areas to assist in many ways. Although the storm is now long gone, the destruction and need for assistance are still present. Volunteers have been asked to stay on as long as they can because there is still so much work to be done.

Many of the amateur radio operators were sent to nine hospital locations, which included a team of volunteers from the American Red Cross with local radio amateurs covering the gaps.

Local hams have successfully passed much of the traffic to net control, which is responsible for forwarding the information to the right agencies. Much of the traffic concerned urgent requests such as ensuring that the necessary inventory at each of the hospitals is kept up and servicing the power and water utility requests.

Other hams provided assistance in a number of areas, such as relocating resources around the island to better meet communications needs, installing repeaters, collecting and entering Red Cross “Safe and Well” data, acting as navigators, reunification workers, and anything else that is needed.

Help came in from all over, including the Garden School’s Amateur Radio Club, K2GSG, in New York City, which has been taking radiogram messages to send to New Yorkers’ family members in Puerto Rico. The club of approximately 20 members is led by its faculty advisor, John Hale, KD2LPM, who was trained in emergency messaging this summer and had a chance to put his new skills to good use. (See this issue’s Emergency Communications column for more on the amateur radio response in Puerto Rico and Dominica.—ed.)

[ARRL News, Southgate Amateur Radio News]

Bangladesh Amateur Radio Exams – First in Four Years
The Bangladesh Telecommunication Regulatory Commission (BTRC) recently conducted amateur radio service licensing exams for the first time in four years. Originally, plans called for having an exam every month beginning in 2008. The 2013 exam drew 160 hopefuls with 147 passing the exam.

More than 250 candidates participated in this year’s exam — the most in the history of the Bangladesh Amateur Radio League (BARL). Results weren’t available as of press time, but BARL anticipated an approximately 95% pass rate.

The Bangladeshi government has only allowed ham radio operations since 1991, although there have been provisions in the past to obtain special permission to operate during natural disasters.

Net Activated to Handle Mexico Earthquake Traffic
The FMRE National Emergency Net (Red Nacional de Emergencia) on 7.060 MHz was activated due to a magnitude 7.1 earthquake centered 75 miles southeast of Mexico City in mid-September. In addition, 3.690 and 14.120 MHz, IRLP reflector 9200 channel 08, and EchoLink were also available for ham volunteers working with disaster relief.

After receiving information from FMRE President Al Tomez, XE2O, the ARRL News reports that participation from Mexican radio amateurs has been excellent. FMRE is Mexico’s national amateur radio association. One of its representatives was stationed in the emergency operations center in Mexico City. A mobile communications center was established south of Mexico City where communications were disrupted, and a second mobile communication unit was deployed to serve the outlying communities. Tomez said that most of the traffic involved missing persons.

The quake occurred on the exact 32nd anniversary of the 1985 Mexico City earthquake that killed approximately 10,000 people. The September 2017 earthquake occurred just two hours after a national earthquake drill was held to commemorate the 1985 quake.


Emergency Response to Monsoons in India
While Hurricane Harvey was pounding Texas, one of the worst monsoons in decades was moving into India, Nepal, Bangladesh, and Pakistan, eventually causing over 1,000 deaths. One of the hardest-
So many people showed up to take Bangladesh’s first amateur radio exam in four years that it took three photos to display the whole group! (Courtesy of BARL)
hit areas was Mumbai, India, where flooding brought transport to a halt and electricity was cut off. Teams of amateur radio operators under the direction of Jayu S. Bhide, VK2JAU, assisted not only with emergency communications, but also pitched in to help in any way they could, such as bringing food and resources to those stranded by the flood. Shelters were so overcrowded that many residents offered shelter in their homes.

Although the region frequently deals with monsoons during the season from June to September, the flooding this year was unusually severe.

[USA Today and Amateur Radio Newsline]

CCARC Celebrates 60th Anniversary

The Central Coast Amateur Radio Club (CCARC - VK2AFY, VK2EH, and VK2WFD), located in New South Wales, Australia celebrated its 60th anniversary in October. The inaugural meeting in 1957 was attended by 37 people. The club conducts license classes and exams, is involved in contests, supports Australia's WICEN emergency communications group, and the annual Scout and Guides Jamboree On The Air (JOTA) held in October. CCARC is also affiliated with the Wireless Institute of Australia and Amateur Radio NSW.

CCARC sponsors the largest gathering of hams in the southern hemisphere, the Wyong Field Day, which is not actually a Field Day as some of us are used to, but is very similar to the Dayton Hamvention®.

CCARC also provides analog and digital voice plus ATV repeaters covering 6 meters to 23 centimeters.

[Amateur Radio Newsline and CCARC website]

Cooperation Between Countries Produces New Communications Satellite

The Iskra-5 CubeSat 1-U, a small satellite developed by cooperation between Russian and Indian students, was set to be transported to the International Space Station and then deployed by a Russian cosmonaut performing a space walk. The satellite is designed to provide amateur radio communications, including SSTV (slow-scan television) that will capture and transmit images from space.

The Iskra-5 CubeSat 1-U was built by a program known as Space Kidz India, consisting of 20 students from the Moscow Aviation Institute in collaboration with nine youngsters from various cities in India. Indian students designed the outer cube of the satellite while the Russian team concentrated on the subsystems. A ground station in Russia will keep track of the relevant data while orbiting for a period of three to five months after its launch.

The project marks the 70th anniversary of diplomatic relations between the two countries.

[Times of India]

Youth from Ukraine and China Develop Ties at Ham Camp

A resort in a well-forested area north of Kiev, Ukraine, was home to young hams from Ukraine and China, including 55 youngsters from the South China Province of Guangdong, while they participated in an amateur radio direction-finding event. The 10-day event for young hams kicked off with a welcoming ceremony at the Chinese Embassy in Ukraine’s capital city of Kyiv (Kiev).

To overcome the language barrier between China and Ukraine, all participants were to communicate in English. The summer camp was the first of its kind for the two countries.

[Amateur Radio Newsline]

Canada Looking to Add to 60-Meter Allocation

Canada has proposed adding the international allocation of 5351.5 to 5366.5 kHz - based on proceedings from the 2015 World Radiocommunication Conference – to the existing five “U.S. compatible” 60-meter band “channels” currently being used that were allocated by the Canadian regulator Industry Canada in 2014.

As of presstime, Canadian regulators were seeking comment on the proposed changes. The responses would then be tabulated over a 60-day period, and the amateur radio regulations would have to be updated before any changes take effect. Keep reading this column for further updates.

[Amateur Radio Newsline]

In Closing

Besides receiving your news and photos for this column, I have also been enjoying your personal emails just to say hi! If you have no news to report this month, just send an email to say hello and let me know you’re enjoying the column. Who knows, I might hear you calling CQ (not the magazine!) someday and it would be great to recognize your callsign from your email contacts. Thanks again for all your support. Spread the word at your next club or organization meeting, and get everyone involved to include CQ magazine in your news releases. Send your stories, news, photos, and suggestions to <aa6ts@cq-amateur-radio.com>.

73 de AA6TS
This month, I am going to wax philosophical. I’m not trying to be preachy, but last January I urged readers to resolve to undertake something new in amateur radio. I offered some ideas throughout the year. Now that 2017 is coming to an end, I’m curious if you made the resolution to try something new and, more importantly, did you accomplish it?

Where Do I Wish to Go?
I rhetorically ask this question because I feel success is the byproduct of having a plan. The plan’s details are dictated by the amount of enthusiasm, time, and funds that can be devoted to it. As with any good plan, there should be a map or chart to indicate progress. Knowing your location on the map gives a sense of direction and purpose. Otherwise, operating without some type of a plan is like being a jellyfish and going where the currents take you, or like a wind vane that points in the direction of the prevailing wind. This is fine, if that’s your plan; namely, a “laissez-faire” approach to our hobby. My main concern with this approach is that it’s all too easy to lose enthusiasm and stagnate while being left behind in the fast currents of technological advancements.

Get Busy Living
I am reminded of the powerful quote from the movie, “The Shawshank Redemption,” in which the character Andy is telling Red about his dream of going to Mexico. Red reminds Andy that he’s here (prison) and Mexico is there. Andy responds by telling Red that life comes down to two simple

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choices, “Get busy living or get busy dying.” Andy’s point is to have a goal and then take steps, however measured and small, towards accomplishing that goal.

A personal goal in amateur radio could take a while, such as earning top spot on the DXCC Honor Roll, working 5-band DXCC, Worked All Zones, or getting involved with OSCARs (Orbiting Satellites Carrying Amateur Radio). It could mean trying digital radio, WinLink, grid hunting, or upgrading your license. What is the status of your work bench and test gear? Have you tried any of the new digital oscilloscopes or spectrum analyzers? Perhaps your goal is to read a ham radio book from cover to cover and become more acquainted with the topic.

Getting busy living doesn’t have to be about trying a new mode. It could also mean becoming more active with the amateur radio community. Participating in ARES and public service events comes to mind. Even better, how about getting others more involved with the hobby or helping them earn their licenses? That kind of effort is called leadership and it’s contagious. Finding like-minded folks working towards the same thing is exciting. Best of all, that excitement breeds success when the group is having fun while learning from its failures and celebrating its successes.

**BARS**

One such ham radio group having fun is a small, but dedicated St. Louis club of VHF, UHF and microwave enthusiasts called BARS (Bi-State Amateur Radio Society) (Figure 1). BARS exists to share ideas, test benches, and skills to improve the members’ ham radio knowledge and on-air practices. Although, this group (Photo A) is primarily interested in microwaves, it became apparent that the higher costs associated with the equipment dissuades many hams, even those with a strong interest, from getting into the “nosebleed” bands. In addition, there aren’t any commercially made “off-the-shelf” rigs available for purchase.

Some DIY (do it yourself) is required to get on these bands. Okay, well, maybe more than just “some” DIY, but that’s the challenge. Fortunately, Paul Wade, W1GHZ (Photo B), developed and released a low cost 10-GHz transverter board (Photo C) to get more hams involved by making the microwave bands more affordable and accessible.<http://bit.ly/2gpvwK8>. BARS members decided to purchase four of these boards, build them over the winter months, test them, and make them available to others for MAD (microwave activity days) and contests.

A basic handheld connected to the transverter along with a simple 10-GHz horn antenna (Photo D) will produce a 10-GHz FM signal. BARS hopes to
introduce other hams to the fun and excitement of the microwave bands without breaking the bank. These “loaner rigs” will whet the appetites of others interested in this aspect of the hobby. Will these rigs perform as well as the transverters produced by Down East Microwave or Kuhne Electronics? No, but W1GHZ didn’t intend for his boards to perform as well, but rather to give reasonable performance at an introductory level and a relatively low cost.

So, What’s My Point?
The point isn’t trying to get more hams on the microwave bands. It’s that BARS has a goal and a plan to develop it, thanks to the fine work of W1GHZ, to allow more amateurs to personally grow by expanding on previous knowledge without it costing a small fortune.

It doesn’t have to be only about microwave technology. Ham radio has an abundance of topics from which to draw inspiration.

Clubs should seriously think about year-end goals and how to better serve and include members. Perhaps you can be the change and share your expertise with the club. You don’t have to be an expert, but you just have to be willing to share. Sharing and collaboration are the hallmarks of growth. Or you can start a new, local net that fills a need, such as “Stump the Experts,” “Messaging Handling Training Net,” or a “CW Practice Training Net.” The sky is the limit. All that is needed is a will and a way.

Your Score
So…after reviewing last year’s activity, what was your score? I never wish to be one of those folks who doesn’t practice what he preaches, so your editor tried two new digital modes, MSK144 and FT8, and I am glad that I did.

I also read a new book on grounding by Ward Silver, NØAX (great informative book, by the way) and a book on oscilloscopes. After reading that book, I purchased a new 200-MHz digital oscilloscope for my workbench and I’ve used it to demonstrate the inverse relationship of frequency and wavelength. As frequency increases, wavelength decreases. I used an audio frequency generator on my smart phone along with an external speaker and the oscilloscope to demonstrate the relationship and I could hear the “oohs” and the “aaahs” from the audience. Hearing as well as seeing makes for believing and a great learning tool.

Get Busy! Stay Involved!
“Get busy living” is a good ham radio philosophy. Enthusiasm, time, and discretionary funds are the limiting factors in this equation. However, I’ve found that “if there’s a will, there’s a way” comes true more often than not. Don’t underestimate yourself or the power of positive thinking. Two or more enthusiastic hams can make a difference (Photo E). Getting involved opens new doors and more insights. Involve yourself with others. Attend ham radio conferences and forums as one of your personal ham radio goals. You’ll be glad that you did! Thank you for reading CQ.
I often get a new kit to try out and see if it is “ready for prime time.” This month’s new kit was ready to go when I got it. There have been so many simple code practice oscillator kits over the years that another one might make your eyes roll. But this Code Trainer kit designed by Steve Weber, KD1JV, is definitely different. Steve is well-known for his Mountain Topper kits and for such great kits as the Weber Tribander and the KD1JV Survivor 75M SSB transceiver kit.

The KD1JV Code Trainer from QRPGuys is different from most code practice kits. The Code Trainer is just that. It is useful not only with a straight key, but is also able to be used with a paddle as a keyer. Note that it is not able to be connected to a radio for keying the radio. Rather, this kit is both a simple straight key oscillator and an iambic keyer that can be used with a paddle to learn how to send and receive code with either a straight key or a paddle. Yes, receive!

The Code Trainer has a function that sends random characters that include letters, numbers, and punctuation. The speed at which they are sent is adjustable, as is the speed that can be sent with a...
paddle. There is an included LED that is optional to install on the board that indicates keying. This can be used to help teach code to people who are hard of hearing or serve as a visual reinforcement to the sounds of the code. The reason the LED is an option is that it increases the current draw from the battery, shortening its life. A single CR2032 3-volt lithium coin type battery common to most car remotes powers the Code Trainer. The battery is not included in the kit as shipped, so you will need to get one before assembling this kit.

Assembly of this kit is fast for experienced builders, and most beginning builders can complete it in an hour or so. The low parts count makes for quick assembly and the directions are quite clear. There are only five capacitors in the kit, and they are all of the same value, so there is little problem getting them installed. Only two resistors, one glass diode and one LED make up the rest of the wire-ledged parts. The three buttons, two jacks, trimpot, and battery holder round out the kit, along with the IC, main power switch and jumper pins. A set of four stick-on rubber feet serves as the base for the unit. The heart of the Code Trainer is an 8-pin preprogrammed processor. This IC is very easy to install. Just ensure the little dot on the IC matches up with the “1” on the board which signifies where Pin 1 on the IC belongs.

I found the assembly to go quite quickly, and the Code Trainer fired up right away, sending an “S” when it boots up with a straight key connected and a “P” if a paddle or no key is connected. Similar to other QRPGuys kits such as the SOTA paddles and keyers, the Code Trainer has the basic operating instructions printed on the bottom of the PC board along with markings on the top of the board for jumper placement and power switch status, as well as key and headphone jack identification. I used earbuds with my kit, but any stereo headset with a standard 1/8-inch, 3-conductor stereo plug will work. If you would like a much louder sound for use with a group, you can use a 1/8-inch stereo cable to connect the audio output into an amplified speaker. Many inexpensive small Bluetooth speakers have a 1/8-inch input jack for directly connecting a non-Bluetooth device to the amplifier’s input. This arrangement is ideal for a group code class. There is a trimpot on the board for adjusting the volume level for earbuds or headphones or for adjusting the drive level to the amplified speaker.

A bonus with this kit is its very low price! The Steve Weber-designed kit is only $15 and can be ordered from <www.qrpguys.com>. While you are waiting for your kit to arrive, be sure to pick up a CR2032 battery so you are ready to test your kit!

**Kits for the Holidays**

With the holidays at hand, here are a couple of gift-giving suggestions for your favorite kit builder (if that’s you, you can just leave the magazine open to this page in some conspicuous spot!):

The X-Tronic 3020-XTS Soldering Station is an amazing bargain for under $50. It is a thermostatically-controlled variable-temperature soldering station with lots of extras. The 3020-XTS holds its temperature steady to ±2° Celsius. This makes it ideal for kit-builders as it keeps delivering the correct amount of heat without overheating or cooling too much to make a good connection. The digital display shows the set temperature as well as the progress towards that setting. There is an automatic sleep mode that cools the tip until it is being used again if left idle for an extended period.

The completed Code Trainer, ready to test.

The bottom of the Code Trainer board reveals operating instructions printed on the board (before I cleaned the excess flux!).
adjunct to other, possibly unrelated, interests — rather than its traditional aspects — but urged member societies to “embrace these individuals in their activities and … promote amateur radio as meeting their needs, rather than promoting the historical view of what amateur radio has to offer.”

The South African Radio League, responding in a commentary in its online SARL News, said amateur radio “needs a renaissance (and) the first step is to break away from this hobby attitude and to realize that it is an amateur radio science with which to experiment, research, and pioneer. Secondly, the amateur radio service should broaden its field and include radio astronomy for future space communications,” adding that a “wider radio field enhanced by the latest radio technology will be more exciting, attractive, and have a far greater appeal to the new generations with their open and inquiring minds.” This change in approach, the SARL concluded, “could extend the lifespan of amateur radio … for another 100 years.”

ARRL Foundation Accepting Scholarship Applications
The application window for scholarships administered by the ARRL Foundation is now open, with a deadline of January 31, 2018. The foundation administers several dozen scholarships and adds five new ones this year, according to the ARRL Letter. All applicants must be licensed amateurs and some scholarships have other specific requirements. For more information, see the ARRL Foundation’s scholarship webpage at <www.arrl.org/scholarship-program>.

Satellite Roundup
AMSAT’s Fox-1B satellite, also known as RadFxSat, was scheduled for launch by NASA on November 10 (well after this issue’s deadline). The ARRL reports that it is one of four cubesats traveling as secondary payloads aboard the Joint Polar Satellite System-1 mission launch. It carries a 435/145-MHz FM transponder.

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The AMSAT News Service is cautioning users of high-duty cycle digital modes — such as FT8 or MSK144 — to be very careful of power levels used on transmissions made via satellites, as a high-power signal can affect all other users of a satellite transponder. AMSAT suggests possibly avoiding the use of these modes on satellites due to problems encountered by other users.

The SSB/CW linear transponders on China’s CAS-4A and CAS-4B satellites were turned on in mid-October, according to the AMSAT News Service. Uplink frequencies are 435.220 MHz for CAS-4A and 435.280 for CAS-4B. Corresponding downlink frequencies are 145.870 and 145.925 MHz. Each has a 20-kHz passband.

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Ham Radio Industry Notes
CQ welcomes Frank Perry as its new Advertising Manager. Frank has worked for many years selling advertising to the advertising industry, so he is up to date on all the latest trends and techniques.

The ARRL has a new Communications Manager. Dave Isgur will handle the League’s media relations efforts. He was previously director of media relations for the University of Hartford, according to the ARRL Letter.

Finally, Universal Radio has a new home. The ham and shortwave radio dealer moved in mid-October from its Reynoldsburg, Ohio, location to a new and “more efficient” facility at 651 Lakeview Plaza Blvd., Suite B, in nearby Worthington, Ohio. The company advises that its web and email addresses, phone number, and store hours all remain the same.

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Note: Due to a delay in getting all of the kits needed to work on the SB-200 featured last month, the continuation of the series on the Harbach kits for restoring and improving that amplifier will resume next month. Enjoy the holidays and 73 to you and yours!

— 73 DE KONEB
An Effective 10- to 20-Meter DX Antenna for Space-Limited Locations

BY BOB HOUF,* K7ZB, GUEST COLUMNIST

The simple 15-foot vertical antenna shown mounted on the railing of our second-floor deck (Photo A) has produced nearly 200 countries worked around the world, including VQ9s in Chagos and 3B8s on Mauritius in the Indian Ocean; TXØDX on Chesterfield Reef; VKØMM on Macquarie Island in the Antarctic region; BQ9P on Pratas Island off Taiwan; ZM7ZB on Chatham Island in the South Pacific, along with FOØAAA on Clipperton, 9MØOO on Spratly Island in the South China Sea, JT1CO in Mongolia and, well, you get the idea. What I hear, I can usually work with this little wonder and its small size and profile make it feasible for use in many deed-restricted neighborhoods or other limited-space settings.

A radio amateur friend and antenna designer came up with a simple design for a 10-meter vertical, which another friend and I modified to make work for the 14-, 18-, 21-, 24- and 28-MHz ham bands. Its performance surprised us — and perhaps you, too — if you are looking for a simple, inexpensive DX antenna that really performs well.

The basic concept is to put up a piece of aluminum tubing with a telescopic section held by a small hose clamp to adjust the height. By attaching the center conductor of a coax feed line to the tubing, and the shield of the coax to a couple of radials from the base of the tubing, you can load the vertical across quite a broad range of frequencies.

Of course, with a vertical element of approximately 15 feet this is a non-resonant antenna for the bands of intended operation. I did some basic EZNEC modeling and chose this length to allow the system to be tuned to resonance with an antenna tuner (ATU). Since the SWR in an antenna system of this type will be relatively high, an antenna tuner unit will definitely be required. You may need an external ATU if the one in your transceiver can’t handle the impedance mismatches involved.

I drive my transceiver (which has a built-in ATU) through a 500-watt amplifier, which then drives a high-power ATU to the antenna. I put the SWR/power meter between the amplifier and ATU to ensure a good match for the amp, and in cases where I run barefoot without the amp, I can still use the ATU to assist the transceiver’s tuner in ensuring a good match. In this way, everything is matched for maximum power output: From the transceiver to the amp, and amp to the antenna. And, even though the SWR is high at the feedline and the antenna, it doesn’t matter because the system is matched with the ATU. (Well, actually, it does matter in terms of overall signal output but the matching network assures that the transmitter “sees” a 50-ohm load and continues to put out full power. –ed)

Photo B shows the center conductor of the vertical connected to an SO-239 female coax connec-

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I used two pieces of insulated #14 AWG solid copper wire to provide a stiff means of attaching the connector to the metal bracket. Note that there is no true earth ground connection to this antenna. The ground side of the coax connector simply connects to the hardware bracket, to which the two radials are connected. The bracket looks like a simple piece of offset metal used to mount a small flagpole or the like.

The base of this vertical is 14 feet above ground, so this antenna effectively behaves like an elevated ground plane antenna. Return currents for the vertical flow in the two radials and the conductivity of the soil at the antenna location is less of a factor in its operation than if it were ground-mounted.

The two 15-foot radial wires are held to the bracket with a large sheet-metal screw, so the bracket is connected to the coax shield. Electrical isolation from the center conductor of the coax connected to the vertical element is provided by an insulating rubber sleeve. This is a piece of neoprene fuel line chosen because the dimensions fit the aluminum rod inserted into the lower 14 inches of the aluminum tubing (more on that later).

However, we found the electrical isolation properties of neoprene fuel line leave a little to be desired at the high SWR of this system. After driving this vertical with 500 watts at high SWR in the middle of one of the DX contests, I punched through the insulation, thus discovering the original 10-meter antenna design was intended for lower power and lower SWR! This problem was solved by wrapping the neoprene sleeve with several layers of Teflon® tape (the kind you buy for plumbing work at the hardware store). I also added a couple of layers of electrical tape (600-volt rating) for an additional margin of insulation.

These modifications are shown in Photo C with the vertical tubing removed — you simply add the tape over the sleeve. The vertical element is then secured to the bracket by a pair of hose clamps of suitable size.

A construction detail shown in Photo C is the solid aluminum rod that fits inside the lower 14 inches of the main 8-foot length of tubing. The solid rod is inserted at the bottom to ensure a good tight connection for the sleeve. This rod end can be drilled with a blind hole for a self-tapping sheet-metal screw to secure the solid copper wire from the center conductor coming from the SO-239. The tubing is secured to the rod with a hose clamp just above the top of the bracket.

A tip for ensuring good clamping force with hose-clamps and hollow tubing is to slit the tubing about two inches up from the bottom on opposing sides with a hacksaw. This will allow the clamps to grip tightly enough to prevent slippage. Also, insert a solid piece of rod about 8 inches long inside the smaller-diameter telescoping tube at the top of the vertical to prevent that tube from collapsing. The upper telescoping tube is adjusted to 15 feet in overall length to give proper loading across all bands.

Photo D shows the completed vertical attached to the railing with the coax looped about six times to give some measure of RF choke action to keep RF from returning to the shack on the braid. I secured the coax loops to the railing support with plastic wire ties to provide stress relief for the connector.

You can also see the tubing and small hose clamp just above the neoprene sleeve along with the two larger hose clamps gripping the sleeve and rod to the bracket.

It is quite easy to remove the vertical tubing element and stow it when you are not operating, thus fulfilling the need for an unobtrusive HF antenna. All in all, a cheap and effective radiator for the higher HF bands.
Welcome to the December QRP column. December marks the beginning of winter — that time of year when I stash my backpack, walking stick, and portable antenna in the rear of my closet for safekeeping until spring when warmer weather returns. Winter also brings the low bands (40, 80, and 160 meters) to life, providing nighttime entertainment and fun into the wee hours of the morning. This month we focus on 40, 80, and 160 meters, three bands often overlooked by the QRP operator for chasing DX, contesting or good old fashioned ragchewing. QRP operators often shy away from the low bands due to excessive static (atmospheric noise) and a belief that an amplifier is necessary to work DX; however, with a little knowledge of when to operate and some general antenna information, the QRP operator can have a great deal of success and even earn CQ’s Worked All Zones (WAZ) and/or ARRL’s DXCC award on one or all the low bands.

Low Band Propagation and Quirks

Atmospheric noise presents the greatest challenge to operating on the low bands, whether operating low or high power. During spring, summer, and early fall, thunderstorms generate noise (static crashes) that sometimes make these bands inoperable (at least for me). I learned early on (soon after I was licensed as a Novice in the early 1980s) not to operate 40 and 80 meters when thunderstorms had been forecast in my region of the country. The static crashes that pulsed through my Drake 2-B receiver’s speaker were as loud and annoying as the chattering of the “Russian Woodpecker” that would suddenly appear on my frequency. Since thunderstorms are not common during winter months (especially in northern latitudes), the lower bands provide a quiet, static-free nighttime playground for operating QRP. Eighty meters, and even more so 160 meters, are so quiet during winter nighttime hours it is a bit eerie. If you have not experienced how quiet these bands are in the winter, you owe it to yourself to do so.

The 160-meter band, referred to by many hams as “Topband,” is nestled just above the AM broadcast band at 1.8-2.0 MHz and is a true nighttime band. During daytime hours, the ionosphere (more specifically the D layer) is highly energized with electrons from Ol’ Sol that prevent radio waves at low frequencies from passing through to the higher F layers (F1 and F2) that are necessary for long-distance propagation. This is known as D-layer absorption. As a result, 160 meters is strictly a local band by day and comes to life (for DX) after sunset. For the QRP operator, the best opportunities for DX contacts are between midnight and sunrise, after the D layer has lost its electron intensity and becomes a weak layer (no absorption). Working DX on 160 meters is not for the faint of heart and is the ultimate challenge — in my opinion — for the QRP operator. Be prepared to put in some time and effort, but the feeling of accomplishment after snagging DX with a few watts on 160 meters is worth the effort. Also, count on losing some snooze time as late nights and early morning wake-up calls are part of the equation for chasing DX on Topband. One-sixty is not a band to be overlooked during contests. Those who work contests know multipliers are worth more than individual contacts and can mean the difference between winning or losing. Contacts made on 160 meters during major contests are like bonus points, since many QRPers do not operate on or have an antenna for Topband.

Eighty meters, like 160, has significant D-layer absorption during the daylight hours. However, at night, when the D layer dissipates, the band opens and allows low-power stations equipped with a suitable antenna to add DX stations to their logbooks. I have had good DX on 80 meters (CW and SSB) using a 380-foot diameter horizontal skyloop that varies from 30 to 80 feet above ground. During recent CQWW DX contests, I worked several large contest stations in Europe on 80 meters and attribute part of my success to the monster antenna arrays, high-end transceivers, and patience of the radio operators on the other end of the contact. It sometimes takes a few tries to make the exchange and successfully log the contact, but it is worth the effort.

Forty meters is a popular band for many hams as it is nearly always open somewhere, day or night. The level of atmospheric noise heard on 80 and 160 meters during the summer months is generally less on 40, allowing DX stations to better hear QRP signals at this time of year. DX is plentiful on 40 meters during winter nighttime hours and is the band of choice for the QRP operator not experienced in low-band DX. Be sure to include this band during contests as loud DX stations work all night on 40 meters.

Low Band Antennas

Erecting an effective antenna for use on “Top Band,” much less 80 and 40 meters, can be a challenge simply due to the physical size of the antenna required. A half-wave dipole cut for the 160-meter band is roughly 260 feet in length (130 feet for each leg). My residential lot is 100 feet by 180 feet, making it impossible for me to erect a dipole for 160 meters (at least without asking permission from one of my neighbors to run wires over their...
Another factor is antenna height, as it is difficult to achieve a height of a half wavelength or more on 40, 80, or 160 meters for best performance. My multi-band horizontal skylight does a fine job on 40 and 80 meters, but lacks the length and height to be an effective radiator on 160 meters.

One of the simplest antennas to erect for low-band operation, especially for 160, is the Inverted-L (Figure 1). The Inverted-L functions as a bent vertical and consists of a wire that is supported as high as possible (perpendicular to the ground) before it is bent and run parallel to the ground surface. A tree, tower or other high object can be used to support the wire. The vertical run of wire should be hung as high as possible. The formula $234/frequency$ (in megahertz) is used to determine the length of the wire. This will equate to approximately 130 feet for 160 meters. At my QTH, I have a 40-foot tree that supports the vertical portion (wire) of my Inverted-L antenna. The wire bends at the top of the tree where it runs 90 feet (parallel to the ground) away from the tree. The end of the wire is fastened to a rope and secured to a second tree to keep it parallel to the ground.

A ground system (radials) is an important element of this antenna and as many radials as possible should be installed. The radials are connected to the outer braid of the feed line (50-ohm coaxial cable) and should be one-quarter wavelength long; however, radials of random length also work. My radial system is modest due to lack of space. I use No. 14 insulated wire for radials and have two 130-foot radials that snake around the yard and six additional radials that range between 20 and 40 feet in length. I bury all my radials just below the ground surface.

A variation of the Inverted-L is the T-Vertical (Figure 2). Like the Inverted-L, a wire is raised vertically as high as possible but instead of one wire bending away from the antenna, two wires of equal length form a “T” at the top of the antenna and run parallel to the ground away from the antenna in opposite directions. The two wires at the top of the antenna need to be the same length, each equaling one-half the length of the total length of the wire minus the vertical length. For example, a 130-foot length of wire (for 160 meters) raised vertically 40 feet in the air would have two wires 45 feet in length (130 - 40 = 90; 90/2 = 45) attached to the top of the antenna and run parallel to the ground opposite of one another, forming a “T.” A radial system also needs to be employed with this antenna.

A longwire antenna can provide good results if sufficient real estate is available for running a long run of wire. To be effective, longwires must be at least one wavelength long. If space is tight, the wire can be placed in a zig-zag pattern (“Z” configuration) to spread the wire across the lot. An antenna tuner is also necessary to provide a match between the antenna and transmitter. The longwire should be strung as high as possible and away from other objects.

An 80-meter dipole fed with open-wire line (i.e. ladder line, window line, or twin lead) in concert with an antenna tuner can be used as a multi-band antenna covering 80-10 meters. If space is a consideration and there is only room to hang one antenna, the 80-meter half-wave dipole may be the ticket. This antenna has length and height issues that limit its use as an effective radiator on 160 meters;
however, I know some hams who successfully use inverted-V dipoles for QRP on 160. They have squeezed these antennas onto their lots by getting the center point as high as possible and let the legs droop to the ground. Where there’s a will, there’s a way!

Separate TX/RX Antennas
One important note regarding antennas for Topband: Hams who regularly operate this band often have separate transmit and receive antennas. Separate antennas for transmit (a vertical) and receive (a Beverage) can provide the extra “umph” needed to make a contact. Some hams have multiple Beverages to facilitate weak-signal reception in more than one direction. If you have not spent a great deal of time on the low bands, my suggestion is to first try one antenna for transmit/receive (such as the Inverted-L) prior to spending time and money (we QRPers are frugal) to erect Beverages, 4-Squares or other types of antennas specifically designed for the low bands. Although these types of antennas help work DX, they are not a necessity for low-band operation.

Bringing it Home
QRP on higher HF bands (10, 15, and 20 meters) is a lot of fun when sunspots are plentiful and conditions are good, but do not short-change yourself the fun of working wintertime QRP on the low bands. The quietness of these bands during winter coupled with DX is a dream. With a good antenna and little persistence, you may turn you into a low-band QRP junkie.

For those who are up for a Topband challenge this winter, the CQ World Wide 160-Meter CW contest is the last full weekend in January and SSB is the last full weekend in February. These weekends are prime time (dead of winter) for operating on 160 meters. Both contests also have a QRP-only category! (See announcement in November issue and complete rules on the CQ website or cq160.com.)

Finally, for those who cannot wait for spring to return to get out of the shack and work portable, Winter Field Day is January 27 and 28, 2018. I am planning to pull my backpack and portable antenna from the closet, trade my walking stick for snowshoes, and get outdoors to enjoy some wintertime operating...QRP-style, of course. This event is sponsored by the Winter Field Day Association. Visit <www.winterfield-day.com> for more information.

Until February, stay warm and 73
For the past several summer Sporadic-E seasons, Gene Shea, KB7Q, of Bozeman, Montana, has been activating rare grids on 6 meters in the western U.S., delighting many FFMA chasers. He expanded his capabilities to include 2-meter and 70-centimeter EME (earth-moon-earth) and has been active from Hawaii, South Dakota, Iowa, Nevada, Wyoming, and Alaska, as well as many rare grids near his home QTH in Montana and across the border in Canada.

Gene’s one-man effort necessitates that he keeps it simple. Over time, Gene has assembled a small but effective portable 2-meter EME station that is easy to assemble and has proven to be very reliable for portable moonbounce. The equipment includes an Elecraft K3 transceiver with internal transverter, a W6PQL solid-state power amplifier (SSPA) at 800 watts, and a pair of 9-element Yagis with a low noise preamp, all powered by a 2-kilowatt generator. It takes less than an hour to set up the two Yagis with manual elevation/azimuth control. On 70 centimeters, the EME station is a 500-watt SSPA to a single Yagi.

The operating locations he chooses are almost always rare, attracting lots of callers. As Gene says, “It is good to be DX.” Experience has shown him that, eventually, periods of unfavorable Faraday will change for those willing to wait and, when he can operate at a location for multiple moon passes, Faraday rotation becomes even less of a factor. During two trips earlier this year to Yellowstone Park, DN44lw, Gene worked 57 stations on 2-meter EME and 17 stations on 70-centimeter EME over a combined 12-hour period — a very efficient operation!

Over the past few years, Gene has helped a number of stations achieve the Worked All States award, noting that “nothing is more fun for me than hearing I’ve just completed a contact with someone for his 50th state for the 2-meter WAS award.” He went onto to add that he and his wife, Joyce, seek out interesting and scenic places to camp along the way, which just adds to the enjoyment.

Gene’s blog contains a section on Portable EME Tips and Techniques – 6M/2M/70-centimeter moonbounce from the field using KISS techniques. See <http://portableeme.blogspot.com/>. He offers excellent advice regarding AC power solutions, methods of supporting the antennas, sequencing, and preamp protection.

So… if you have thought about 2-meter or 70-centimeter EME but have yet to give it a try, take a page or two out of Gene’s book. No need to travel to a far off or rare state, as plenty of fun can be had from your driveway, backyard or patio. Look for Gene in...
February, not taking his own advice, as he will be QRV from Curacao in the Caribbean as PJ2T on 2-meter EME.

On the Bands
Although scientists do not know the underlying reasons, the equinoxes are a time of an increased solar activity, resulting in increased chances of aurora in September and October as well as March and April. Data collected over the past 75 years suggest that the geomagnetic disturbances that cause auroras are almost twice as likely to occur in spring and fall compared with winter and summer. An X9.3 flare, the largest in the past 10 years and of current solar cycle 24, occurred on September 6th just prior to the ARRL September VHF Contest. Despite that the $K_p$ index was at 6 or higher for several periods, the event produced little AU on 50 MHz and above.

Fall weather patterns often result in tropo openings and such was the case in mid-October when the "red blob," as it is affectionately called, was evident in the Midwest and South and later along the East Coast (see Figure 1). A sample of what was worked on 2 meters in the Midwest/South included: KE8FD, EM64jv, worked W9VHF in EN71lf at 730 kilometers/453 miles; N4OGW, EM53nk reported copying the W8MQW beacon (144.288 MHz) located in EN72ur at 1,109 kilometers/689 miles and W8MIL, EN74ic, worked KF4WE in EM56nl at 901 kilometers / 560 miles.

FT8 and Band Planning
This summer saw the overwhelming acceptance of the new WSJT-X FT8 mode on 50 MHz and now VHFers are taking advantage of the mode on 2 meters, 222 MHz, and 70 centimeters. The increased level of activity has started the discussion as to what frequencies are best for use as FT8 calling frequencies on those bands. The challenge with
any VHF and above band plan has always been formulating a plan given the wide geographical area in question with its disparity in regional activity and practices. Two meters presents the biggest challenge since the bottom end (144.000 to 144.100 MHz) is allocated for CW only, with EME and meteor scatter conducted in the next 50 kHz of the band. On the East Coast during a contest, SSB/CW QSOs can be found anywhere between 144.150 and 144.240 MHz and sometimes higher. The microwave ops, particularly the 10-GHz ops, have used 144.260 MHz for liaison, and the beacon band begins at 144.275 MHz. Two things are sure in 2018: FT8 activity will continue to increase on 2 meters and whatever band plan is decided upon — "officially" or otherwise — someone or some group will disapprove.

Notes:
1. The Fred Fish Memorial Award is issued in memory of W5FF, the first amateur to have worked and confirmed all 488 Maidenhead grid squares in the 48 contiguous United States on 6 meters.
2. Faraday rotation causes linearly-polarized signals (e.g., horizontal or vertical) to change polarization as they travel through the ionosphere.
KFF: County Hunting Meets NPOTA Meets WWFF

Special Honor Roll: All 3077 Counties
Jesse R. Larsen KA7ICF USA-CA #1261
September 18, 2017

The ARRL’s National Parks On The Air (NPOTA) program created a good deal of interest in 2016 by partnering with the U.S. National Park system to celebrate its 100th anniversary. This created a large group of participants who became familiar with the large number of nature parks and historical sites that are located in the United States.

When the program ended at the end of 2016, there were still stations looking for and finding activators of national parks. County hunters soon recognized that contacts could be increased if they combined the county identity with parks, especially if a cross-reference could be made to provide location information that could give credits towards both programs. Thanks to the efforts of KA2LHO, K2MF, and about 10 other county hunters, they produced a website that does address this need <http://bit.ly/2xKg6HI>, along with a new award program, the KFF County awards.

This list helps the activator and chaser of national parks, historic parks, Antarctic stations, national wildlife refuges, wildlife management areas, waterfowl production areas, wetland management districts, natural areas, national rivers, ecological preserves, national seashores, national memorials, and much more. The scope of the program boggles the imagination. There are approximately 4,400 such “entities” on the list. These are locations where park and counties are found together. There are also parks/preserves located in the middle of the Pacific Ocean, or at the South Pole, but not associated with counties of any kind, since there are no roads (or people) there.

American WWFF Award: Parks on the Air (KFF)
There has long been an organized group in Europe, the World Wide Flora & Fauna, which has developed a loosely centralized program that promotes ecological- and nature-friendly awards.

USA-CA Honor Roll

<table>
<thead>
<tr>
<th>Count</th>
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<th>Callsign</th>
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</tr>
<tr>
<td>1000</td>
<td>KA7ICF</td>
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<td>1500</td>
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<td>KA7ICF</td>
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<tr>
<td>3000</td>
<td>KA7ICF</td>
<td>1286</td>
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</table>

The total number of counties for credit for the United States of America Counties Award is 3077. The basic award fee for subscribers is $6.00. For nonsubscribers it is $12.00. To qualify for the special subscriber rate, please send a recent CQ mailing label with your application. Initial application may be submitted by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 1, 2000. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 12 Wells Woods Road, Columbia, CT 06237 USA. DX stations must include extra postage for airmail reply.

You may have heard participants on 14044 and 14022 kHz. In recent years, WWFF’s programs and influence have led to 49 affiliated countries, principally in Europe, but also including Israel, Madagascar, Algeria, Japan, Argentina, Brazil, Kazakhstan, Canada, Australia, India, Indonesia, Venezuela, and New Zealand. Now, the U.S. has joined the WWFF program with a program called

The KFF States Award is based on how many states that contain national parks you have contacted. This certificate is sent when you reach 35.

*12 Wells Woods Rd., Columbia, CT 06237
E-Mail: <k1bv12@charter.net>

www.cq-amateur-radio.com
An amalgam of the county hunters and NPOTA led to almost 4,400 entities to contact for the KFF-County Award. Here is certificate for 500. A list of entities is available here <http://bit.ly/2xKG6Hf>.

National Parks on the Air (KFF) under the leadership of Jason Johnston, W3AAX.

How does it work? The WWFF maintains a database, similar to LoTW (Logbook of the World), except that the data it stores is composed entirely of the accumulated logs of activators, who make contacts with parks and nature preserves in member countries scattered all over the world. In order to earn awards, you need to make contacts, register as a user, and receive a password for access. There is no charge, although voluntary contributions are welcomed. When you receive your password, you will then receive QSO information, and you will know that your applications are based on facts literally in your backyard. You may not be a new country, but there’s definitely the chance that you may be running small pile-ups.

URL for the USA KFF website: <https://wwff-kff.com/>
URL for the WWFF website: <http://wwff.co/about/>

The Basic Awards for KFF:

<table>
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<tr>
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<tr>
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<tr>
<td>Silver Award</td>
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<tr>
<td>Gold Award</td>
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<td>Diamond Award</td>
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<tr>
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<tr>
<td>Enrubio Award</td>
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<tr>
<td>Ouachita Mountain Goldenrod</td>
<td>300</td>
</tr>
<tr>
<td>Stenogyne Kanehoana Award</td>
<td>400</td>
</tr>
<tr>
<td>Howell’s Thelypody Award</td>
<td>500</td>
</tr>
<tr>
<td>Texas Wild Rice Award</td>
<td>600</td>
</tr>
<tr>
<td>Wiggins’ Acalypha Award</td>
<td>700</td>
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<tr>
<td>Georgia Aster Award</td>
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<tr>
<td>Rafflesia Flower Award</td>
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</tr>
<tr>
<td>Western Prairie Fringed Orchid</td>
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</tbody>
</table>

KFF States Awards
This award requires you to have hunted or activated a specified number of states. The award levels are: 7, 14, 21, 28, 35, 42, and all 50 states.

Late Shift Awards
A novelty award, requiring that an activator has submitted proof of having 10 WWFF activations with at least 10 QSOs between 00:00z and 12:00z or that a Hunter has submitted proof of having made any 50 QSOs from any KFF entity between 00:00z and 12:00z.

We’re always looking for tips on new and interesting awards. If you run into any, please use my email address: <k1bv12@charter.net>.
This past September, I was pleased to attend the W4DXCC DX and Contest Convention in Pigeon Forge, Tennessee (Photo A). This was my third visit to W4DXCC. If you haven’t gone to a DX convention, here is a little overview of what they are all about with a focus on Pigeon Forge. There are more pictures this month than text! They tell the story better than words!

Over the years, I have occasionally gone to DX conventions. I have been to W9DXCC outside of Chicago twice, and the International DX Convention in Visalia, California, once. Although there is always a strong presence of DXers at the Dayton Hamvention®, I wouldn’t consider it a true “DX” convention because that isn’t its prime focus. A DX Convention is usually all about DX. Sometimes it will also cater to contesters since there is usually

*Email: <n2oo@comcast.net>*
2018-2019 CQ Amateur Radio Calendar
In this year’s calendar you’ll find the usual array of interesting and diverse Amateur Radio Operator’s shack’s from various locations across the country, along with some special event pictures.
As in the past, this year’s 15-month calendar (January 2018 through March 2019) includes dates of important Ham Radio events, major contests and other operating events, meteor showers, plus important and popular holidays.

Only $12.95 + s/h
(USA $3; CN/MX $5; All Other Countries $10)

DITS and DAHS
The ABC’s of Morse Code Operating
By Ed Tobias, KR3E
This small but solid guide is the perfect read for those interested in learning or improving CW operating techniques!

Within its pages you’ll find:
• The secret of becoming a proficient CW Operator
• Where and how to practice, practice
• Straight Key or Paddle?
• Adjusting your Straight Key or Paddle?
• Contests, Events, DXing . . . and more!

6 X 9 Paperback - Only $15.95 + s/h
(USA $3; CN/MX $5; All Other Countries $10)

The Amateur Radio DX Handbook
By Don Miller, W9WNV
Whether an “old-timer,” a newcomer, or a prospective DXer, this 50th Anniversary reproduction provides a “look back” and offers W9WNV’s invaluable DXing insight.

Here’s a look inside this classic:
• Amateur Frequencies and the DXer
• The DX Station
• Working DX From the Home Station
• Mobile DXing
• DXing From Rare Locations
• QSLing
• DX Contests . . . and more!

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CQ Communications, Inc.
17 West John St., Hicksville, NY 11801
516-681-2922; Fax 516-681-2926
http://store.cq-amateur-radio.com

The WPX Program

<table>
<thead>
<tr>
<th>Mode</th>
<th>Frequencies</th>
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<tbody>
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<td>3828 . . . Z33RW 3829 . . . 6B6KX 3827 . . . KH3FK 3830 . . . SP3MK 3828 . . . JM1GHT 3831 . . . 1BDKX</td>
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</table>

A strong carryover between both groups. But the main focus is always DX.

W4DXCC is a little unique in that it has also been successfully running a “Ham Radio Bootcamp” on Fridays for the past few years. The day-long programs center on general topics about DXing, QSLing, contesting, digital modes, etc., all having to do with “active” ham radio with a slant towards DXing.

Photo D. Rob Lindsay, W6MRML, and Joe Pater, W6GEX, gave a great presentation on JT65 and FT8! (N2OO photo)

Photo E. There was a “homebrew” table with a variety of homebrew projects displayed. Here is a multiband HF transceiver by Vlado Karamitrov, N3CZ. (N2OO photo)
5 Band WAZ

As of October 15, 2017
1961 stations have attained at least the 150 Zone level, and
966 stations have attained the 200 Zone level.

As of October 15, 2017

The top contenders for 5 Band WAZ (Zones needed on
6 or other if indicated)

CHANGES shown in BOLD

<table>
<thead>
<tr>
<th>Callsign</th>
<th>Zones Needed</th>
<th>Zonal</th>
<th>Callsign</th>
<th>Zones Needed</th>
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<td>9A5I</td>
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<td>A8SA</td>
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<td>U4ALY</td>
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<td>Z5ZAL</td>
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The following have qualified for the basic 5 Band
WAZ Award:

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<th>Date</th>
<th># Zones</th>
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<tbody>
<tr>
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Updates to the SBWAZ list of stations:

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<tbody>
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New recipients of 5 Band WAZ with all 200 Zones confirmed:

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<th>Callsign</th>
<th>Date</th>
<th>All 200 #</th>
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</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Please note: Cost of the 5 Band WAZ Plaque is $100
shipped within the U.S.; $120 all foreign (sent airmail).

Rules and applications for the WAZ program may be ob-
tained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager,
John Bergman, KCSLJ, 125 Deer Trail, Brandon, MS
39042-9409. The processing fee for the SBWAZ award is $10.00 for subscribers (please include your most recent
QSO mailing label or a copy) and $15.00 for nonsub-
scribers. An endorsement fee of $2.00 for subscribers and
$5.00 for nonsubscribers is charged for each additional
10 zones confirmed. Please make all checks payable to
John Bergman. Applications sending QSL cards to a QSO
checkpoint or the Award Manager must include return
postage. KCSLJ may also be reached via e-mail:
<kcslj@cq-amateur-radio.com>.

The WAZ Program

ALL BAND WAZ

Mixed

9086 .......... HB8BQ, 9068 ............ W4KNC

SSB

5369 .......... DL4FAP

CW

841 .......... EA7JB

EME

17 .......... HB9Q, 40 Zones

SINGLE BAND WAZ

6 Meter

127 .......... JE1BMJ, 40 Zones

17 Meter CW

119 .......... SP2BMX

160 Meter

490 .......... KO5PVC, 31 Zones

Rules and applications for the WAZ program may be ob-
tained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager,
John Bergman, KCSLJ, 125 Deer Trail, Brandon, MS
39042-9409. The processing fee for all WAZ awards is $6.00 for subscribers (please include your most recent
QSO mailing label or a copy) and $12.00 for nonsub-
scribers. Please make all checks payable to
John Bergman. Applications sending QSL cards to a QSO check-
point or the Award Manager must include return postage.
KCSLJ may also be reached via e-mail:
<kcslj@cq-amateur-radio.com>.

www.cq-amateur-radio.com

sors even host some local high school kids who come to take their license exams at a VE session (Photo B). Generally, Friday is for the basics. But I must say that most of the old timers enjoy the presentations, too! I know I did. On Saturday, the prime focus is on the more serious topics of any DXer’s interest such as DXpeditions (Photo C), contest strategies, low-band antennas, and so on. The digital modes fell into more than one of the presentations with a strong emphasis this year on the new FT8 mode (Photo D).

But most of all, conventions provide a chance to make some new friends as well as to hang out with old friends from years past. There is ample time between programs to wander into the vendor area and check out the latest gear — or maybe something homebrew (Photo E) or vintage (Photo F), or head down to the lobby and socialize. Some attend-
ees bring along their wives, who gather in groups and wander the land of Pigeon Forge, which includes a multi-
titude of shops, entertainment and, of course, “Dollywood.” Plus, if I might add, some ridiculously good food as well (Photo G).
On Friday night, a huge DX gathering descends on Calhoun’s Restaurant, which is a local rib and BBQ restaurant, for dinner and DX socializing. On Saturday evening there is always a big buffet banquet dinner with some great food from Calhoun’s. This year’s keynote speaker was Martin Jue, K5FLU, of MFJ Enterprises, who gave an eloquent speech detailing his humble beginnings creating MFJ (Photo H). It was an eye-opening and most interesting introduction into how Martin started and grew MFJ into what it is today.

And no convention would be complete without DOOR PRIZES. There were plenty to go around. It seems that the major manufacturers understand that DXers are active hams, and as such, always get asked for information about an assortment of amateur radio products. As a result, there were...

**what’s new**

**SOTABeams Click2Tune for ICOM**

If you use an ICOM HF radio with an antenna tuner or amplifier, you may have noticed the lack of any straightforward way to send a low power carrier for tuning. This can be a big problem if you use a narrow-band antenna such as a magnetic loop that needs frequent re-tuning. SOTABeams has a solution with its new Click2Tune for ICOM system that provides you with complete and reliable control. It transmits a low-power carrier (user selectable level on some radios), without any need to change the mode, and for as long as you press the button.

SOTABeams said it engineered the unit to fit nicely in your hand and even trialed three types of buttons before finding one that had the right size and feel. Click2Tune for ICOM works with any radio that supports their auto-tuner. Tested on: IC-7300, IC-7600 (ant. 1), IC-7100, IC-730, IC-746 (ant. 1), IC-9100 (ant. 1), IC-706 (all variants), IC-703, and 746.

The Click2Tune for ICOM is available as a kit or ready built with a suggested retail price of $10.64 (Europe) or $8.86 (worldwide). For more information, contact SOTABEAMS, 2nd Floor, Paradise Mill, Park Lane, Macclesfield, SK11 6TL UK. Phone: +44 (0) 7795 517513. Website: <www.sotabeams.co.uk>.

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And no convention would be complete without DOOR PRIZES. There were plenty to go around. It seems that the major manufacturers understand that DXers are active hams, and as such, always get asked for information about an assortment of amateur radio products. As a result, there were...
several major prizes available at W4DXCC. First, as a surprise, Martin, K5FLU, donated a HyGain BOLP 1013 Log Periodic beam as the door prize for the banquet. There were four different raffles for equipment donated by ICOM (IC-7300), Yaesu (FTDX-1200), Elecraft (KX3), and Flex Radio ($500 off coupon). These tickets were pulled at the end of the banquet, so it was pretty suspenseful waiting to see who won. Well, guess what? N2OO won the Yaesu FTDX-1200 (Photo 4)! YES! I did my HAPPY DANCE!

The raffles create a pot of funds that are then used to support appropriate DX and contest activities. INDEXA, NCDXF, the N1DG Baker Island DXpedition, the YO9Z Bouvet DXpedition, the Tennessee Contest Group, and the ARRL Frequency Defense Fund were presented with funds this year.

Other DX Conventions

Many of the DX conventions follow similar formats. I don’t expect all of you to go to the W4DXCC Convention in Pigeon Forge, Tennessee. But if you ever get a chance to go to one in your neck of the woods, I highly recommend doing it. Here are just a few to check out.

- The International DX Convention in Visalia, California is sponsored by either the Northern California DX Club or the Southern California DX Club (they alternate years). See
<www.dxconvention.org/>. It works out having Visalia located somewhat in central California so the venue remains the same (Visalia). This is the granddaddy of DX conventions in my honest opinion. It draws a huge crowd from all around the globe. Every DXer should try to go at least one time. It is held in April every year.

- The W9DXCC DX Convention, <http://w9dxcc.com/>, is held in Schaumburg, Illinois just outside of Chicago every September. This has become a very popular DX convention over the years. I attended this one two times and hope to return again some time. It draws a big crowd of DXers from all over the country, especially the Midwest.
- The Pacific NW DX Convention moves around to different locations each year. This year’s will be held in Vancouver, BC Canada. See <http://pacificnwdxconvention.com/>.
- Also check out the Asia Pacific DX Convention (Japan) at <www.apdxc.org/>.

Other worthwhile “conventions” that have a fairly serious DX component include:

- The Dayton Hamvention <www.hamvention.org>. DXers and contesters usually stay at the Crowne Plaza Hotel downtown, where the contest dinner is held; or the Dayton Marriott where the DX dinner is held.
- The Boxboro Amateur Radio Convention in Boxborough, Massachusetts <www.boxboro.org> has a DX/contest dinner and appropriate forums.
- Hamcom <www.hamcom.org> is held in Irving, Texas in June and has a good contest and DX representation.
- And last but not least, there is Friedrichshafen in Germany <http://bit.ly/2uQeAOQ>, the biggest ham radio convention in Europe. I have never been there but have heard wonderful things about it. It is now held in early June and it must have a pretty decent DX contingent as well.

There are probably more worthwhile DX and/or contest-related conventions around the globe to check out. I’ll gladly provide more info if passed along to me in the future.

So, enjoy the pileups! But if you have never been to a DX Convention, think about giving one a try! For sure, Visalia, W9DXCC, and, of course, W4DXCC are my favorites.

– See ya’ll in the pileups! de N2OO
As the openings on 20 meters shorten with the days, contesters pile up the firewood and turn to the low bands for DX activity. Single-band contests provide an opportunity for all-band capable stations to spend the weekend concentrating on a specific band of interest. As the sunspots continue to decline, more wires and receiving verticals are being deployed on 160 meters in the quest to increase contest QSOs.

This month’s 160-meter contest provides an entire weekend of activity perfect for trying out improvements that may have been made for low-band operation. The 10-meter contest is not so active at this point in the sunspot cycle, but nevertheless offers an opportunity to learn about “bent path” propagation to Europe (over Africa) and paths open to South America and the Pacific that often are there no matter the sunspot count. The openings are just shorter and more erratic during the low point of the cycle. For both contests, we note below some applicable rules changes, particularly with regard to a new ARRL 5-day log submission deadline.

Below we also reprise a package of changes to the ARRL’s general contest rules. These were announced in September QST and comprise significant changes in addition to the shortened log submission deadline.

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**Calendar of Events**

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<tbody>
<tr>
<td>Jan. 6-7</td>
<td>EUUCW 160m Contest</td>
<td><a href="http://bit.ly/2y5EB">http://bit.ly/2y5EB</a></td>
<td><a href="http://www.qrparci.org/contests">www.qrparci.org/contests</a></td>
</tr>
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This information also appears monthly on the CQ website.
The CQWW 160 CW contest follows at the end of January. The CQ contest is more DX-oriented and attracts many international competitors. One change this year is that paper logs no longer will be accepted for scoring. Only electronic Cabrillo logs will be accepted. **Paper and electronic formats other than Cabrillo will be accepted as check logs.** Please submit your CQ 160 Cabrillo logs by email to <160CW@cq160.com> or <160SSB@cq160.com>, as appropriate.

Finally, we look at the final WRTC 2018 team selections announced on October 1. The selections for the three youth teams are especially impressive. Watch the video linked below and see if you can copy as well as YO8TTT! We look forward to seeing these teams in Germany in July.

**ARRL 160-Meter Contest**
The ARRL 160-Meter Contest comes at an ideal time propagation-wise. While forecasts never can be relied upon, barring some unforeseen solar event, this year is expected to offer much better than average propagation on the band. The ARRL contest enjoys intense participation from North American competitors, but operators in other areas are also invited and provide some interesting opportunities. European openings should be longer than during recent events.

The ARRL 160 contest is CW-only and starts at 2200 UTC (5 p.m. EST) on Friday, December 1. It runs until 1600 UTC (11 a.m. EST) on Sunday, December 3. Activity almost always starts off with a bang. At least on the U.S. East Coast, breaking the 100/hour mark in the first hours is unusual. The contest ending on Sunday morning allows for some family or private time after the event.

This year, logs are due five days from the end of the contest. This is a new ARRL rule that applies generally to all ARRL contests. The rules specific to this year’s event are found at: <www.arrl.org/160-meter>. The full (expanded) results for last year’s running is at: <http://bit.ly/2ySSXmJ>.

**ARRL 10-Meter Contest**
Serious competitors and 10-meter aficionados will be on the band for the ARRL’s annual 10-meter contest, held the weekend after the ARRL 160-meter contest. It will run from 0000 UTC December 9 until 2400 UTC on December 10.

At this time of the sunspot cycle, conditions on 10 meters are not expected to be record-making. However, much of the U.S. and Canada usually can be worked, and signals from the deep south — Argentina and Brazil in particular — almost always make it through. More challenging is working a couple of Europeans while beaming Africa and maybe a couple of stations in the Pacific around 1800-2000 UTC (from the U.S. East Coast). While not exactly a VHF contest in nature — the skip is more reliable and longer than on 6 meters — much of the time the band can sound like six. Also, the openings are widely variable as to what areas are being heard and can be quite short in duration.

CW and phone both are allowed in this contest. Enter CW only, phone only, or mixed. However, this year for the first time, dual CQs are **PROHIBITED**. One no longer is permitted to alternate CQs on CW and then SSB as a result of the new general rules adopted by ARRL, discussed below. Of course, traditional SO2R is still permitted — calling CQ on one mode and while listening/working on the other mode.

Also, note that the new log submission deadline is 5 days. Complete rules specific to this contest are at <www.arrl.org/10-meter>.

The 2016 contest’s expanded results give a good idea of what to expect this year. See <http://bit.ly/2yTO8cW>. Last year, about 70% of all QSOs reported occurred on Saturday. But one never knows — it might be Sunday this year. Part of the fun.

**New ARRL Contest Rules**
In September QST (p. 91), ARRL Contest Branch Manager Bart Jahnke, W9JJ, announced changes to rules that apply generally to ARRL contests. These include the 160- and 10-meter contests discussed above.

It is necessary to understand that the ARRL rules applicable to any single contest consist of three different sets of rules: General rules, rules for contests below 30 MHz, and rules applicable to the specific contest. Above we link to the contest-specific rules, but certain aspects of each ARRL contest are governed by either of two additional rules sets. General rules applicable to all contests are at <http://bit.ly/1UFyeUq>. Rules applicable to all HF (30 MHz and below) contests are at <http://bit.ly/1Oz2oE2>.

Effective in September, the ARRL made the following changes to the rules generally applicable to all contests:

- Logs are to be submitted online. The email submission of logs will be eliminated at some future date. The online submission tool is found at: <http://bit.ly/1OqDOj>.
- Log submission deadline generally is five (5) days after the end of the contest. Extensions for good cause may be requested from the manager of the ARRL Contest Branch any time before the deadline.
- Submitted logs will be made public.
- Logs may be withdrawn up to ten (10) days following the log deadline.
- Entrants competing for awards are “encouraged” to include the frequency for each QSO.
- Operators of remote stations in the U.S. must have an appropriate FCC license.
- Multiple CQing within the same band is prohibited, regardless of mode. (Only one CQ frequency permitted in the IARU and 10-meter contests even though they are multi-mode contests.)
- U.S. operators in Canada are reminded that the portable callsign places the location prefix after the callsign, that is, K3ZJ/VE1 (not VE1/K3ZJ). Same with regard to Canadian stations operating in the United States, the U.S. identifier must follow the Canadian callsign.
- **Sweepstakes Exchange:** “the callsign must be sent as part of the exchange, i.e. ‘W1AW, number 123, alpha, W9JJ, 79, CT.’”
- **Club competition:** Clubs must submit eligibility lists before the contest to have their club results included in the results. Calculation of club scores will be based exclusively on the club list submitted. (Clubs should refer to <http://bit.ly/2ySVLQz>.)

**CQWW 160 CW Contest**
The CQWW 160 contests are great opportunities to tweak 160-meter antennas and equipment. This is of increasing importance to all-band operators. As the sunspots decline, contact and multiplier totals move upward on the 80 and 160 meter bands. The 2018 CQ 160-Meter CW Contest will be held from 2200 UTC Friday, January 26 until 2200 UTC Sunday, January 28. The SSB running will be from 2200 UTC Friday, February 23 until 2200 UTC Sunday, February 25.
Stateside operators should note that stations in ITU Region 1 (Europe, Africa, and North Asia) generally are prohibited from operating below 1810 kHz. So if you are calling CQ when the band is open to Region 1, PLEASE call above 1810! This will avoid a lot of frustration on both sides of the Atlantic and possible disqualification for the Region 1 operator if he calls you. In my experience, most stations capable of crossing the Atlantic with good signals know it, and know the likely times for band openings as well.

One change to the rules this year: Only Cabrillo logs in electronic format will be accepted for scoring. Paper logs and other electronic log formats will be accepted only as check logs. The deadline remains five (5) days after the contest. For CW, the deadline is 2200 UTC on Friday, February 3, 2018. For SSB, the deadline is 2200 UTC on Friday, March 3, 2018. Email Cabrillo logs to <160CW@cq160.com> for CW and <160SSB@cq160.com> for SSB.

Complete rules for the 2018 CQ 160 contest, both CW and SSB, are at <www.cq160.com/rules.htm>.

WRTC 2018 Names Competing Teams

Precisely on schedule on October 1, the WRTC 2018 Organizing Committee announced the 63 teams that will be competing in Germany next summer. There are four more teams than competed at WRTC 2014 in Boston. The complete list of WRTC 2018 competitors, including both team leaders and the partners that they selected, is at <http://bit.ly/2ylGp6>.

My quick review of the list found 19 of Boston’s 59 teams returning intact, and a total of 51 of the 126 participants who competed in Boston returning. Several more of the 2018 competitors competed at championships before Boston. (Note: These numbers may be slightly off since they are based merely on my quick review, and do not include any competitors who may have changed calligns in the years after WRTC 2014.)

In our August 2017 column, we published the list of those qualified to be team leaders based upon the WRTC 2018 qualifying scores and ranked by the organizing committee. Two team leader qualifiers selected another qualifier as a teammate, opening up two slots for the next-high scorer. This resulted in SM5AJV qualifying in place of LY4L, who rejoined WRTC 2014 teammate LY9A. Similarly, DL4NAC qualified in place of DL1IAO, who also rejoined his WRTC 2014 teammate, DJ5MW.

Three other qualifiers appear to not have applied. Runner-up 4X6FR gained the team leader slot that SB4AGN won, and runner-up JH5GHM gained JH4UYB’s slot. Finally, N4TZ was awarded the slot won by W9RE. We should also note, at least in passing, that several other team leader slots were not awarded to the area’s high-scorer due to the operators being disqualified in one of the underlying contests.

As one would expect, the list of team leaders and the partners that they chose is full of calligns that every active contestor will recognize. Among the selected teams is the returning father/son team of Jeff, VY2ZM, and Pat, KK6ZM. They will be joined by the father/daughter team of Holger, ZL3IO, and Xenia, ZL4YL. This father/daughter team was pictured in this column in October 2016, on page 101. By the way, Holger lived in the area of Germany where the competition is being staged before moving to New Zealand. I also spotted two YLs in addition to Holger’s daughter, Xenia: Sandy, DL1OQ, and Irina, DL8DYL, competed as a team in Boston and will be competing again in Wittenberg, albeit with different partners this time.

To complete the list of 63 teams, WRTC 2018 also named the youth and wild card teams on October 1. The organizers reported receiving seven applications for youth teams, defined as competitors for youth teams, defined as competitors who will be under the age of 18 years. These were CE2MVF (9,107 points), YO8TTT (7,254 points) and YV1DIG (6,687 points).

YV1DIG was selected in thanks for his leadership of the underlying contests. Matthias, CE2MVF, was introduced to CW contesting from stateside during his visit to NR4M during the CQ WPX CW contest this past May. Coincidentally, WRTC veteran YO3JR also spent the contest at the NR4M multi-multi station. The NR4M team outscored all other stations in North America.

Alex, YO8TTT, is very active in a variety of contests and often worked as YR8D. He also is a very high-speed competitor in the High Speed Telegraphy (HST) competitions in Europe (IARU Region 1). A video is available on YouTube that depicts him demonstrating approximately 60 wpm using a simulator. Alex demonstrated HST during one of his trips to LY4A for a contest and a video of his demonstration has been posted to YouTube. It can be viewed at <http://bit.ly/2kYGMP1>.

To compete the list of 63 teams, WRTC 2018 also named the youth and wild card teams on October 1. The organizers reported receiving seven applications for youth teams, defined as competitors who will be under the age of 18 years at the time of competition. The youth team slots went to the three applicants with the highest qualifying scores during the WRTC qualifying period. These were CE2MVF (9,107 points), YO8TTT (7,254 points) and H8BRT (5,056 points).

All three of these youngsters are impressive contestors. Matthias, CE2MVF, was introduced to CW contesting from stateside during his visit to NR4M during the CQ WPX CW contest this past May. Coincidentally, WRTC veteran YO3JR also spent the contest at the NR4M multi-multi station. The NR4M team outscored all other stations in North America.

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Tomi, HA8RT (also HA9T), has participated successfully in the European HST championships in addition to being an avid contestor. He is very active in Youth on the Air (YOTA) activities and has participated in several of the summer YOTA camps. He also has operated at 9A1A multiple times during the Youth Contest Program (YCP). There are two pictures of him in this column for August 2016, on pages 85 and 86, with the other YCP operators at 9A1A.

It is noteworthy that the youth contest teams bring superb CW skills to the table at a time when some are lamenting a perceived demise in CW operating. I don’t know one way or the other, but it is clear that these kids know CW better than most of us! Try copying the CW in the above-referenced video if you don’t believe me.

The five wild card slots were awarded to UN9LW, 9A7DX, ZL3CW, YV1DIG, and K1DG. UN9LW missed qualifying outright by a mere 24 points during the 2-year qualification process. Similarly, 9A7DX was just 94 points from the qualifying score in his competitive region. ZL3CW was selected for having “the cleanest log of high scorers.” YV1DIG was recognized based upon his excellent scores behind all the DXpeditions that visit CQ zone 9. Finally, K1DG was selected in thanks for his leadership of WRTC 2014 in Boston and, not coincidentally, as champion at the first WRTC in 1990 in Seattle.

We look forward to seeing these and all the other teams in Germany next summer.

—Until next month, 73, Dave, K32J
Cycle 24: A Last Hurrah?

A Quick Look at Current Cycle 24 Conditions
(Data rounded to nearest whole number)

**Sunspots:**
Observed Monthly, September 2017: 26
12-month smoothed, March 2017: 16

**10.7 cm Flux (current):**
Observed Monthly, September 2017: 92
12-month smoothed, March 2017: 79

**Ap Index:**
Observed Monthly, September 2017: 19
Twelve-month smoothed, March 2017: 12

You can see the result in this month’s reported monthly Planetary-A Index, which is much higher than the previous month.

December HF Propagation

The autumn DX season is in full swing. Listeners throughout the northern hemisphere are actively chasing medium wave (MW, also referred to as MF, medium frequency) DX of AM broadcast stations from all over North, Central, and South America, as well as from Europe and Asia. Amateur radio operators are taking advantage of MF and HF DX, too. This is the season when it is easier to catch such

<table>
<thead>
<tr>
<th>Day-to-Day Conditions Expected for December 2017</th>
<th>Expected Signal Quality</th>
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<tbody>
<tr>
<td>Propagation Index</td>
<td>(4) (3) (2) (1)</td>
</tr>
<tr>
<td>Above Normal:</td>
<td></td>
</tr>
<tr>
<td>1-4, 11-17, 25, 28-31</td>
<td>A</td>
</tr>
<tr>
<td>High Normal:</td>
<td>A</td>
</tr>
<tr>
<td>10, 20, 22-24, 26-27</td>
<td>B</td>
</tr>
<tr>
<td>Low Normal:</td>
<td>B</td>
</tr>
<tr>
<td>21</td>
<td>C</td>
</tr>
<tr>
<td>Below Normal:</td>
<td>C</td>
</tr>
<tr>
<td>5-6, 8-9</td>
<td>C</td>
</tr>
<tr>
<td>Disturbed</td>
<td>C</td>
</tr>
<tr>
<td>7, 18-19</td>
<td>C</td>
</tr>
</tbody>
</table>

Where expected signal quality is:

- A—Excellent opening, exceptionally strong, steady signals greater than S9
- B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.
- C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.
- D—Poor opening, with weak signals varying between S1 and S3, with considerable fading and noise.
- E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the propagation index associated with the particular path opening from the Propagation Charts appearing in The New Shortwave Propagation Handbook by George Jacobs, W3ASK; Theodore J. Cohen, N4XX; and Robert B. Rose, K6OKU.
2. With the propagation index, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a propagation-index of 2 will be good on December 1 through December 4, poor or with no openings on December 5 through December 9, then fair on December 10, and so forth.
3. Alternatively, the Last Minute Forecast may be used as a general guide to space weather and geomagnetic conditions through the month. When conditions are Above Normal, for example, the geomagnetic field should be quiet, and space weather should be mild. On the other hand, days marked as ‘Disturbed’ will be riddled with geomagnetic storms. Propagation of radio signals in the HF spectrum will be affected by these conditions. In general, when conditions are High Normal to Above Normal, signals will be more reliable on a given path, when the path is supported ionospherically.
difficult signals because it is when conditions are most favorable to the propagation of this spectrum of the radio frequencies. HF DX is hot, especially on the mid- to low-HF bands from early evening until late at night, and then again from early morning through noon. December 21 at 16:28 UTC marks the start of winter, with the Sun sitting at its yearly southernmost point in the sky. This is the Winter Solstice, the day with the shortest daylight period of the year for observers situated north of the equator (see <http://bit.ly/28NqzTn>).

Long hours of darkness make for a less-energized ionosphere. Since the lowest D-layer is less ionized during the winter, there is less absorption of medium wave and lower shortwave frequencies by the D-layer than during the summer. Because of this, medium-wave frequencies are propagated better by the E- and F-layers during the winter. Additionally, the seasonal decrease in weather-related noise makes it easier to hear weaker DX signals on lower frequencies. With wintertime thunderstorms being few and far between, there is a lot less storm-related static and noise.

Geomagnetic activity also tends to quiet down during the winter months. The most active geomagnetic seasons are centered on the two equinoxes, in the spring and autumn. We are also approaching the bottom of the current solar cycle, and that means very few flares occur, and therefore, very few if any SIDs (we used to call these shortwave fadeouts). The seasonal quieting and the approach of the solar cycle minimum period results in more stable and reliable propagation on the shortwave spectrum, especially on the lower frequencies.

December is well enough past the autumnal equinox and its associated peak of auroral activity to support transpolar propagation. With this overall reduction of geomagnetic activity and the decrease of radio signal absorption comes more stable high-latitude propagation. Medium-wave DXers enjoy catching broadcast station transmissions from over the North Pole. Shortwave DXing over high-latitude paths becomes exciting, even if the higher frequency bands might be dead. This is true on the amateur radio HF bands, too.

Figure 1. The sun erupted with an X8 solar flare, one of the largest of the current solar cycle, on Sept. 10, 2017. Its source was the same sunspot region that produced an X9 flare the week before. We show this in two wavelengths of extreme ultraviolet light at the same time and each reveals different features. Both are colorized to identify which wavelength was observed. The coils of loops after the flare are the magnetic field lines reorganizing themselves after the eruption. (Courtesy of Solar Dynamics Observatory, NASA)

Fairly good DX openings are expected on 20 to 15 meters, remaining open towards the west during the early evening. Seventeen meters will be open at times, but the hottest daytime band will be 20 meters. Expect early morning openings in all directions until about an hour or two after sunrise and then the band should remain open into one place or another through the day until early evening.

When conditions are good (days with low geomagnetic activity, and higher solar sunspot activity), 20 through 15 meters are likely to remain open towards the south and west from early evening until about midnight.

The best band for around-the-clock DX will be 30 meters. For the SWLer, 25 meters continues to be an excellent band for medium distance (500 to 1,500 miles) reception during the daylight hours, with longer distance reception (up to 3,000 miles) possible for an hour or two after local sunrise, in the late afternoon and early evening.

From midnight to sunrise, 40 through 30 meters promise some of the hottest nighttime DX during December. The first DX openings should be toward Europe and the east during the late afternoon, then move across the south through the hours of darkness, while remaining open into most parts of the world. Just after sunrise, openings will be more in a westerly direction. Low seasonal noise will make DXing a pleasurable endeavor.

For short-skip openings during December, SWLers should try 90 through 41 meters during the day for paths less than 250 miles, and 90 down to 120 meters at night for these distances. This equates to 80 through 40 meters for the amateur radio operator.

For openings between 250 and 750 miles, try 40 meters during the day, and both 90 and 120 at night. For distances between 750 and 1,300 miles, 30 meters through 20 meters should provide daytime openings, while 40 down to 80 will be open for these distances from sunset to midnight. After midnight, 80 meters will remain open out to 1,300 miles until sunrise.

Try 30 and 40 meters again for about an hour or so after sunrise. For contacts between 1,300 and 2,300 miles, look for openings to occur on 20 through 17 meters, with fewer on higher bands, during the daylight hours. From sundown to midnight, check 40 through 20 meters for these long-distance openings, and then check 40 down to 80 meters from midnight until sunrise. Try 40 and 30 meters again for an hour or so after sunrise.
DX openings on 160 and 80 meters during the hours of darkness and into the sunrise period, with considerably decreased static levels, are a sure bet during the longer hours of darkness in the northern latitudes.

Look for openings toward Europe and the south from the eastern half of the United States and towards the south, the Far East, Australasia, and the South Pacific from the western half of the country. Eighty meters should peak towards Europe and in an easterly direction around midnight and then open in a western direction with a peak just after sunrise. The band should remain open towards the south throughout most of the night.

**MF, LF, and VLF DX Season**

This time of year is also when we experience an improvement of radio wave propagation below 500 kHz and the medium-wave broadcast band. The MF broadcast band refers to the frequencies between 530 kHz and 1750 kHz.

The low-frequency (LF) spectrum is the band of frequencies between 30 kHz and 300 kHz. Very low frequencies (VLF) are those ranging between 3 kHz and 30 kHz, though the practical lower edge of the VLF band starts at 10 kHz. Medium frequencies (MF) range from 300 kHz to 3,000 kHz. Our two newest amateur bands here in the United States are at 135 kHz (LF) and 472 kHz (MF).

Radio waves in the low- and very-low-frequency (LF and VLF) spectrum propagate differently than those of the MF and above.

Between 300 kHz and 520 kHz, the lowest part of the MF spectrum and just below the MF broadcast band, the characteristic of propagation is a mix

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**Figure 2.** A large sunspot was the source of a powerful solar flare (an X9.3, possibly the most intense of Sunspot Cycle 24) and a coronal mass ejection in September. The flare was the largest solar flare of the last decade. Data from the SOHO spacecraft shows the large cloud of particles blasting into space just after the flare. Note: the bright vertical line and the other rays with barred lines are aberrations in our instruments caused by the bright flash of the flare. The first image is a composite of three wavelength images (all in Extreme Ultraviolet, and artificially colored for our viewing), 304, 211, and 171 Angstroms. The second image is a composite of 94, 335, and 193 Angstroms. (Courtesy of Solar Dynamics Observatory, NASA)
between those of the lower HF spectrum and those of LF. We typically refer to the VLF and LF bands as the longwave (one word) band. During the winter, we can hear medium-frequency transmissions over much greater distances than during the summer season.

When is the best time to look for MF DX? The general rule is to start in the early evening and to continue through the night and into the early daylight hours. As sunset approaches, the ionosphere starts to change. Distant propagation is more likely when the D-layer recombines and signals begin to punch through to the E- and F-layers. Most broadcast stations in the United States change from high power to low power after their local sunset.

If you listen to the signals from broadcasting stations just before their local sunset time, their higher power will propagate well because of the characteristics of nighttime ionization. Thus, the idea is to maximize the degree of darkness at the station (and consequently, along with the signal path from them to you) while they’re on daytime power and pattern. The exception to this would be those cases where the power difference is small or none, but the nighttime pattern is more favorable to you.

At the same time, any station to the west that has a favorable nighttime signal in your direction (in other words, they have significant night power and no deep null antenna pattern aimed at you) is a potential sunrise target. D-layer absorption increases rapidly when in direct sunlight, and east of you begins to ionize, while the west is still dark and free of D-layer ionization.

For a period around your local sunrise, the relative strength of stations to the west of you increases, while eastern stations will start to fade, allowing the western stations to emerge from underneath. On rare and exciting occasions, this period will last long enough for some western stations to go to their higher power and nighttime pattern. Here, as with sunset, the time of the month can also be critical, as the more darkness on the path, the better.

As sunrise times get later in the fall, the end of the month is preferable. In the spring, the beginning of the month is better. The longest hours of darkness fall toward the end of December on the 21st. However, the shortest day of the year is not the day when the sunrise is latest and the sunset earliest. The latest sunrise times at mid-latitudes are right around December 20th, while the earliest sunset times are usually between December 5th and 10th. This means that December can be viewed as an “autumn” month regarding sunrise DX, but the best operating time will still be after midnight to catch this shower. The radiant rises early, but the best operating time will still be after midnight local time. This shower also boasts a broad maximum, lasting nearly one whole day, so no matter where you live, you stand a decent chance of working some VHF/UHF signals off a meteor trail. For a complete list of meteor showers in December, visit <www.imo.net/calendar>.

A secondary seasonal peak in sporadic-E ionization should also result in some short-skip openings on low VHF between distances of about 800 and 1,300 miles. A rare occurrence of aurora during days of stormy geomagnetic activity is possible, providing some unusual short-skip openings on low VHF.

There is considerably less likelihood for transequatorial (TE) VHF openings during December but look for a possible opening between the southern states and locations deep in South America. The best time to look for this is between about 8 and 11 p.m. local time.

Current Solar Cycle Progress

The Royal Observatory of Belgium, the world’s official keeper of sunspot records, reports a monthly mean sunspot number of 26.2 for September, significantly higher than the 19.9 for August 2017. The mean value for September results in a 12-month running smoothed sunspot number of 15.5 centered on March 2017. Following the curve of the 13-month running smoothed values, a smoothed sunspot level of 18 is expected for December 2017, plus or minus 14 points.

Canada’s Dominion Radio Astrophysical Observatory at Penticton, British Columbia reports a 10.7-cm observed monthly mean solar flux of 92.0 for September 2017, much higher than 77.9 for August 2017. The 12-month smoothed 10.7-cm flux centered on March 2017 is 78.6. A smoothed 10.7-cm solar flux of about 77 is predicted for December 2017. The geomagnetic activity as measured by the Planetary-A index (Ap) for September is 19, a small jump up from 12 in August 2017. The 12-month smoothed Ap index centered on March 2017 is 11.5. Geomagnetic activity this month should stay level at about the same activity as seen in November 2017. Refer to the Last-Minute Forecast for the outlook on what days we might witness degraded propagation (remember that you can get an up-to-the-day Last-Minute Forecast at <http://SunSpotWatch.com> on the main page).

Don’t forget to check out this columnist’s educational tweets on Twitter.com; you can follow @hfradiospacexw <https://Twitter.com/hfradiospacexw> for hourly updates that include the K index numbers, as well as @NW7US <https://Twitter.com/nw7us> which will provide the daily dose of educational tidbits about the Sun and propagation. You can also check <http://SunSpotWatch.com> for the latest numbers. Additional educational material is at <http://SunSpotWatch.com/swc>.

I welcome your thoughts, questions, and experiences regarding this fascinating science of propagation. You may email me, write me a letter, or catch me on the HF amateur bands.


I will be keeping my ears to the radio, hoping to hear you on the air. Happy DX! 73, Tomas, NW7US
Food for Thought:

Is your radio club growing? If not, take a close look at the prescriptions offered by this longtime ham and marketing pro who’s helped double the size of his own radio club in the past three years.

A Manifesto on Sustaining and Growing Amateur Radio Clubs

BY EDWARD J. EFCHAK,* WX2R

In 1995, Robert Putnam wrote a seminal work on civic and community participation. Bowling Alone analyzed how America had become disconnected from social organizations that previously had created a healthy civic structure. While the number of people who participated in activities (such as bowling) had grown in overall numbers, the number of people who took part in organized clubs (or bowling leagues) had decreased in both size, influence, social interaction, and civic discussion.

This trend in declining organized group membership has continued. America is a far different place than it was in the latter part of the last century. Today, “membership” has continued to morph into digital social networks or differing forms of social interaction such as the Maker Movement.

From what I have learned from anecdotal evidence, membership in amateur radio clubs has continually fallen over time while the overall licensed amateur population has increased (although far from the rate of overall population growth). The gap in new hams converted to members of local clubs has fallen victim to interest attrition (get a license and do nothing with it), internet community alternatives, the decline in inter-personal social interaction, a decline in direct mentoring and guidance, and a lack of a focus on the types of people who might become more engaged hams and club members.

Why has this happened? Considering that most clubs are fraternal organizations, they behave much like tribes. The marketer Seth Godin has pointed out that tribes are stuck. “They embrace the status quo...create little of value...and are sort of boring.” So it’s not surprising that many clubs are failing.

Changing the Status Quo

Yet there is evidence that clubs can continue to grow. I have been part of a “legacy” amateur radio club founded over 60 years ago that has doubled in size over the last three years. The Fair Lawn Amateur Radio Club (located in New Jersey, just outside of New York City) numbered about 60 members in 2015 and has increased in size to about 130 as of this writing.

“Is there a formula for success? I believe that there may be a secret sauce and these seem to be the ingredients:

• It’s all about marketing. If you really want to grow, you have to go to the market. Create the story of your club that both your members and your prospective members will believe in. Identify the types of people who are relevant to what your club does well. Don’t wait for new members to come to you. Engage new members and prospects with programs, content, and activities.
• A club may be (usually) a non-profit organization; but it is a business nonetheless. Treat it like one. The fact that you have a balance sheet and a membership number that could go to zero by maintaining the status quo should be a call to action. Struggling clubs often overlook this. The guillotine does indeed focus the mind.
• A growing club requires a strong leader who can manage the group’s activities, has a “vision” for what needs to be done and has a plan (see below) to get it done. Build a team around that leadership. As Godin says, “The secret of leadership is simple: Do what you believe in. Paint a picture of the future. Go there. People will follow.”

• ‘It’s having a plan — both for marketing and the business. That’s putting the direction in writing, speaking with data and communicating it to the membership. Each January, our club does a member survey that asks about personal interests, club direction, and the willingness to participate. We have used that data to plot our growth, direct monthly programs, create activities and content that (hopefully) engage the membership — especially new members — to build early camaraderie and later retention. Considering that finding new members can often be difficult, member retention is critical. The lifetime value of a member to your club, both in member activity as well as its financial impact, will absolutely surprise you.
• While we’re on planning, plan to grow. Start a movement today to become remarkable. Too many clubs are resigned to growing smaller over the next few years or in just being satisfied with the status quo. Marketing done well is about all

* email: <eefchak@gmail.com>
The author is president of Customers by Design, a marketing intelligence company <www.customersbydesign.com/>; and ARRL NNJ Section Public Information Coordinator.

“The needs of the seekers are different from those of the believers.”
We are very pleased to announce the publication of the 2018 edition of World Radio TV Handbook, the bestselling directory of global broadcasting on LW, MW, SW & FM.

The Features section for this 72nd edition contains articles on an Anipodean Journey, Receiving Noise, Radio Romania International, A New Voice of Hope, and Radio Voices from the South Seas, as well as equipment reviews and other articles of interest to radio amateurs and DXers.

The remaining pages are, as usual, full of information on:

- National and International broadcasts and broadcasters by country with frequencies, powers, languages, contacts, and more, including Clandestine and other target broadcasters.
- MW frequency listings by region. International and domestic SW frequency listings, and DRM listings.
- International SW broadcasts in English, French, German, Portuguese & Spanish.
- Reference section with Transmitter locations, DX clubs, Internet Resources, and much more.

Available December 2017

www.wrth.com

SOME COMMENTS ON WRTH 2017

I am delighted to learn that the latest edition of the WRTH will soon be off the presses and on the tables of DX enthusiasts everywhere. Your continuing effort on this most critical publication is very much appreciated – Bill Matthews, USA.

Thank you for your amazing book. This is my second year as a DXer and the second edition of the WRTH I've purchased. I'll be buying the new volume every year from now on! – John P. Zavacki, USA.

I am an SWL and wanted to congratulate your entire team for publishing the fantastic edition of WRTH 2017 which I have received today – Anirudh Sharma, India.

I just finalized the order for my copy of WRTH 2017. I've been purchasing WRTH for the last 20 years and I always found it a very useful tool for an old SWL like me – Alessandro Roscini, Italy.

This year's 71st edition continues WRTH's reputation as a comprehensive exemplary reference book for the radio listening audience. It remains the very best, most authoritative reference book for the radio and television hobbyist – Gayle Van Horn W4GVH, Teak Publishing, USA.

Please keep up the good work with the Book. Many SWLs are waiting every year for WRTH. I make sure I have a copy one way or another. Flicking through the pages of WRTH, when I hear a shortwave or mediumwave station, still thrills me – Dimitrios Valaris, Greece.

Thanks for the incredible things you do to help the world listen to each other – Melvin Calvert, USA.

Another brilliant edition for 2017. The handbook is superb as always – Steve Rawdon, New Zealand.

I like WRTH as it is – John Komdat, USA.
about growth. It’s about the future. If your club belief system is that you are small in size and with limited geographic reach (“this little hobby club in East Podunk”) believe me, that is what you will remain and that is what you will become.

• When recruiting potential new members always remember that the needs of the seekers are different from those of the believers. It is true for churches and it is true for amateur radio clubs. “What worked in connecting with your dad is exactly the opposite of what will work with you,” says Mark DiMassimo, CEO of ad agency DiMassimo Goldstein (DIGO Brands). “Brands need to change because the target audience changes, and new ones need to be born every time. Success with one generation can actually make it harder to create success with a new generation.” Substitute the word “brands” with “clubs” and you get the picture. Learning what your potential members really want rather than retelling the tale of what got you interested in the hobby may not be the easier path but, in all probability, will be the more successful one.

• Be contemporary, exciting, and relevant. Our club had a visitor at Field Day this year who had first participated in the event back in 1935 (he is 95). He noted that it hadn’t really changed. Stop and think about that from the marketing/publicity perspective. It hasn’t changed in over 80 years. Radio has changed. Those who come into the hobby today are different. Maybe it is time to blow up Field Day in the story you tell to visitors if your club is still focused on the rules rather than on appearance and opportunity.

• Since we are looking to attract those who are seeking our “product,” we need to also remember that it’s always about being externally facing. Too many clubs remain insular, focusing on themselves and not projecting the wider opportunity that our hobby has to offer. This is hard for many clubs because it goes against the grain of what clubs usually do. Outreach matters. There is no excuse in getting a message out. In today’s digital environment, every organization is a media company. Look to leverage that advantage.

• Be a part of your “community.” Talk to other organizations like Kiwanis, Lions, school groups, etc. Show up at street fairs. Be part of Maker Faires. Reach out to other groups and look for synergies. Tell your story and build relationships. It’s not just about public service in the traditional sense, it’s all about community relationships and providing the most good to a community beyond our usual boundaries and comfort levels. Participate in local activities that are highly visible (not behind the scenes), so when people come up and ask about ham radio with the usual “I can’t believe that you still do that ...” you can say “yes we do ... and here is why it is better than ever before.”

Finally, remember nothing is permanent. In order to be successful, clubs must be constantly nurtured and fed to continue to grow. As Godin noted, “you don’t have enough time to be unhappy or mediocre ... it’s pointless and painful.”

Growing a club is hard work and life is short for both clubs and ourselves. But let’s get started.

“Food for Thought” articles represent the opinions of their writers on topics of interest and/or importance to the ham community, and do not necessarily reflect the views of CQ magazine. They are published in the interest of promoting discussion of pertinent topics. Reasonable reader responses are encouraged and will be gladly considered for publication.
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