The Spectrum Monitor®

Amateur, Shortwave, AM/FM/TV, WiFi, Scanning, Satellites, Vintage Radio and More

Volume 4 Number 4 April 2017

Going Portable with Amateur Radio Satellites

Plus:

Community Emergency Response Teams

Computers and Ham Radio Part 2

Motorized Ku-Band Satellite Reception

Outernet Update

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Amateur, Shortwave, AM/FM/TV, WiFi, Scanning, Satellites, Vintage Radio and More

Volume 4 Number 4 **Table of Contents** **April 2017**

Cover Story:
AMSAT Treasurer and Past President, Keith Baker KB1SF/VA3KSF, uses a Kenwood TH-78A dual-band HT and a lightweight Arrow antenna to make contacts through one of the FM amateur radio satellites from the shores of Lake Huron in Michigan. When used with a 5-watt, full-duplex handheld in an open location free of foliage (such as a beach or a field) the antenna provides enough uplink and downlink gain to successfully work the FM birds, even on passes close to the horizon. (Photo courtesy: KB1OGF)

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Dear TSM:

Send your comments to editor@thespectrummonitor.com
The Spectrum Monitor reserves the right to edit comments from readers for clarity and space availability.
Anonymous comments will not be published.

Comments, Advice, Kudos and Questions from Readers

GRE PSR-800 (left) was replaced by the Whistler WS-1080 (right) but a firmware update didn't seem to be able to be loaded into the Radio Shack branded version of the same scanner (PRO-668) until some scanner/computer programming geeks managed a work-around . (Courtesy: Universal Radio)

Radio Shack goes Bankrupt (Again)

"With news of Radio Shack filing for bankruptcy, I wonder what will happen to the Radio Shack brand of scanners?" – Michael Kudelka, St. Louis, Missouri

***TSM* Federal Wavelengths Columnist, Chris Parris, Responds:**

"Radio Shack branded scanners have almost always been manufactured by GRE. There were a few Uniden-made radios that were sold with a Radio Shack logo on the front. But, since the demise of GRE and the sale of all their scanner line to Whistler, I can only remember recently seeing the Uniden and Whistler radios sold as their own brands in Radio Shack stores.

"There has been some controversy over one of the last GRE-made scanners that was similar to the GRE PSR-800. The Whistler firmware update that would provide DMR radio reception on the PSR-800 didn't seem to be able to be loaded in the Radio Shack branded version of the same scanner (PRO-668). Apparently Whistler felt that their contractual obligations with Radio Shack did not include supporting their models with updates. Some creative scanner/computer programming geeks managed to hack together an updater program to allow radio Shack PRO-668 scanner users to load the Whistler firmware." *[Editor's note: Whistler did not respond to our inquiries regarding this reader's question.]*

FirstNet Legal Issues Saga

"As of March 1st, we have just heard that the US Court of Federal Claims has finally set a date for hearing oral arguments in the case of Rivada Mercury's challenge of the Department of the Interior's exclusion of them from the final bid process. For those who aren't familiar with it, FirstNet is a Federal Agency with a $7 billion budget that is tasked with creating a nationwide broadband Public Safety network (NPSBN). At this time, wireless giant, AT&T, remains the only publicly known entity that remains in the running for being awarded this potentially lucrative contract to build out the network over the next several years. While the details are sealed, we know that Rivada Mercury is challenging whether AT&T (or in, fact anyone else) actually met the RFP requirements, including a very onerous 30-meter coverage mapping exercise, as they did. At this time I remain critical of FirstNet for several reasons. For one, the accountability of the agency is questionable at best, with the US Inspector General finding several faults in a 2016 audit. For another, the leadership of this agency is heavily seeded with former wireless industry executives, which I believe provided the basis for favoring the 'Big 3' wireless carriers from the beginning.

"My biggest complaint, however, is the lack of transparency. The taxpayer is treated as a party with no interest or right to know, a pattern we have increasingly seen in relation to public safety communications spending and operations nationwide. It is entirely possible to effectively cater to the public interest while still maintaining administrative and operational security, but FirstNet and many large metropolitan public safety agencies have routinely shown no desire to do this. As hobbyist and communications professionals I'm sure the readership of TSM understand the problems inherit in this better than most.

"Certainly it will be interesting to continue watching the legal progression of Rivada Mercury's challenge, and after that the rollout of the NPSBN to mostly major metropolitan areas. The stated goal of FirstNet, a truly nationwide PSBN, will likely never happen, as the commercial interest in providing effective network coverage to rural areas in particular is decidedly low. It is likely too that the Holy Grail of true interoperability will remain elusive for some time to come as individual municipal interests dilute their participation in the network as currently envisioned.

50 feet of 600-Ohm W7FG True Ladder Line ($39) open-wire feed line (Courtesy: http://trueladderline.com)

(Photo courtesy of International Crystal Manufacturing Co.)

"I certainly welcome the thoughts of the editor, the editorial staff at *TSM*, and the readership on this complex and many layered topic!" -- Bill Collinson, Carmel, Indiana, Radio Hobbyist, Former US Army Communications Technician, Software Development Manager

***TSM* "Scanning America" Columnist, Dan Veeneman, Responds:**

"There will not be a terrestrial-based nationwide LTE network, due to coverage issues, as the reader notes. Too many sparsely populated areas of the country will not be reached by ground-based towers. There may be an opportunity for satellite-based coverage, but no one has presented a reasonable plan for that (yet). Although $7 billion may sound like a lot of money, it's entirely insufficient, and FirstNet has acknowledged that from the beginning. The solution was always to form public-private partnerships, where commercial entities would incur much of the construction and operational costs, while deriving revenue from paying customers. Public safety agencies would be along for the ride, presumably with priority access to the network and spectrum. Political issues have dominated FirstNet since its inception, and given the amount of money involved that is likely to continue. Personally I certainly support the call for transparency, but that is also difficult to come by in such a competitive environment as the wireless telecom market."

In Praise of Window-Line Feeds

"Such a great article, Dan! ["Transitions: Getting from A to B (or 50 to X)" Antenna Connections by Dan Farber AC0W, *TSM* March 2017]

"I wasted so much time as a new ham fiddling with antenna length calculations, coax velocity factors, and leaky, intermittent connectors. It got to be a real drag - I thought of quitting the hobby.

"My Elmer, Dave 'Shally' Shallenberger (K6VHP-SK), finally put a stop to my mathematical obsessing, and helped me build a beefy T-Network from WWII surplus parts he had. I hand wound a 2kW rated 4:1 matching transformer on the output.

"We used the 'tuna,' hung up as much wire as we could in the space I had, fed everything with window-line and I haven't looked back since!

"I run a 128-foot random dipole, a 100-foot Off-Center-Fed-Dipole daily. I use a 300-foot 'wire on the fence around the yard' for SWL. I also have a 28-foot short vertical with capacitance hat and radials on the roof; everything is fed with ladder line.

"No muss, no fuss. I use short runs of high quality coax for the dual-band UHF/VHF vertical near my shack. That's the only coax I own.

"He gave me many hours of pleasant operating and SWLing with that basic gift many years ago." -- Jim Falls

International Crystal Manufacturing Closes its Doors after 66 Years

"Anybody involved in the hobby of radio for at least the past 25-years understands what the closing of ICM represents.

"For a very young Kevin Parrish growing up out in San Francisco, the anticipation of waiting day after day for the postman to deliver that magic small white box from ICM with the crystals for his Johnson Duo-Scan crystal scanner seemed at times unbearable... The contents within that box contained the future of endless hours monitoring the next new frequency... This teenager was very high tech with his duo-scan and all eight channels... Imagine that, eight channels, WOW!

"To this day, I still have my trusty Johnson 'Duo-Scan' that works perfectly fine and a large inventory of scanner crystals... This scanner was my very first one purchased with cash from Lafayette Radio.

"Before ICM closes up shop there will be one last ceremonial crystal order... As strange as it seems, I'll be ordering crystals, one last time from my old friends at ICM for my old Johnson Duo-Scan... The cost of the 2017 ICM scanner crystals for the old Johnson Duo-Scan are much more than the old radio is worth in dollars, but there's high value placed upon my ability to revisit pleasant memories of a much simpler time in the hobby of listening to an entirely analog world, the sound of noise squelch, those red lights endlessly

Best sounding Wi-Fi radio on the market today: Como Audio's Duetto stereo Wi-Fi/FM tabletop radio ($400). (KS4ZR photo)

Sangean WFR-28 Wi-Fi radio with FM band reception. Mono audio and text sreccn: $140. (Courtesy: Universal Radio)

searching for the next transmission to stop on... Ah

"The frequencies selected will be all the NOAA Weather Radio frequencies. In the days and years ahead, the familiar glow of those red winky-blinky lights on this old crystal scanner shining brightly, even now will serve to re-kindle the pleasant memories of decades long passed being a monitor radio listener.

"The men and women at International Crystal Manufacturing Company in Oklahoma City have always been part of something special, even magical in the world of radio communications and technology. The millions of crystals they produced at 10 North Lee Street for the past 66 years still serves an ever-changing world with frequency accuracy and stability.

"Those ICM crystals and precision channel elements kept our two-way radio base stations and repeaters located high atop the World Trade Center "ON AIR" until those very last moments on a dark day in our nation's history. From other communications sites at high mountain tops or inside our broadcast studios from coast to coast, International Crystals live on and continue to serve on frequency." -- Kevin Parrish, New York City

Other Wi-Fi Radios

"Thank you for your March *TSM* article on higher end Wi-Fi radios ['*TSM* Reviews Como Audio Duetto Wi-Fi/FM Radio,' March, 2017]. I purchased an Ocean Digital Wi-Fi WR60 radio via Amazon ($125). Though not stereo sound, this receiver does have very good audio. Ocean Digital is the house brand of King Champion, who also makes the CCrane Wi-Fi radio. The Ocean Digital WR60 comes with a remote control and features FM radio." – Mike Peraaho

"I enjoy your column in *TSM* very much and have thought about getting a Wi-Fi radio for some time. The Como Audio radios you reviewed in the current issue sounds like a great radio. It is more than I would like to spend on a casual listening radio but I might be interested in something around half that price, $200.

"If you have any to recommend in that price range I would be interested otherwise I will wait and see what you might write about in a future issue on Wi-Fi radios. Perhaps Como or some other manufacture will come out with a nice radio in that price range.

"I thank you and all the contributors to *TSM* as it is my most read and favorite publication." – Bob Earl KD6UIH

Ken Reitz KS4ZR Responds:

There are several lower-priced Wi-Fi radios on the market and here are some to check out: The cheapest of all is the Aluratek from Best Buy ($80) ***http://www.bestbuy.com/site/aluratek-indoor-outdoor-wi-fi-internet-radio-black/4759207.p?skuId=4759207***

The next cheapest is the C.Crane CCWiFi: $120 ***http://www.ccrane.com/WiFi/CC-WiFi-Internet-Radio-w-Clock-Alarm-99-Memory-Presets***

Next cheapest after that is the Sangean WFR-28: $140 from Universal Radio ***http://universal-radio.com/catalog/wifi/4028.html***

The lowest priced Wi-Fi radio with a full-color screen is the Grace Digital Mondo $180: ***https://gracedigital.com/shop/mondo***

Of these, the one that will probably fill your needs is the Grace Digital Mondo. It has better audio quality than the others and the full color screen is a big plus. Check the reviews on the Best Buy website which shows that the Aluratek has some issues—the Grace Digital fared better in the reviews. At $60 more than the C.Crane and $40 more than the Sangean, you get better audio (nothing compared to the Como Audio, though) and a full color display that are worth the extra bucks.

A full look at the world of Wi-Fi radio was done last

Grace Digital Mondo $160 new on Amazon with free shipping for Prime customers, or $120 refurbished direct from the manufacturer while supplies last. https://gracedigital.com/shop/rfb-mondo. Battery pack for portable use ($40) and universal Internet remote ($15) are optional extras worth having. (Courtesy: Grace Digital)

Rich Post's S-76: "The S-76 was introduced in 1951 as a lower cost alternative to the SX-71. It was priced at $169.50 which was $30 cheaper than the SX-71 according to a Hallicrafters ad in the April 1951 CQ magazine. However, the S-76 has more in common with the later SX-100. It does not use a crystal filter or crystal-controlled oscillator but was the first Hallicrafters set to use a low 50 KHz second IF with a relatively high first IF, making for dual conversion with some very good selectivity options." (Photo and captions courtesy of Rich Post KB8TAD)

year in the April, May, and June 2016 issues by Thomas Witherspoon K4SWL that will also help. – Editor

Bob Responds:

"I went to the Grace Digital web page link in your message and actually found that they have refurbished Mondo radios for $119.99. Since my interest is to find out more about finding out more about the Internet radio experience that might be the way to go for me. I also like the portability of the Mondo as well. If I were to decide to embrace the experience more fully then I could move to a higher quality product like the Como. "Thanks for your help and info." – Bob Earl KD6UIH

The Case of the Overheating Resistor

"Upon reading Rich Post KB8TAD's "surprise capacitor" in his "Adventures In Radio Restoration" column in the March 2017 issue of TSM, Rich explains finding a resistor that looked like a molded capacitor.

"I decided to consult my copy of the 'Radio Troubleshooter's Handbook,' (1941) and found a mention of these types of resistors.

"The relevant paragraph is at the bottom left side of the page. Also of interest the paragraph regarding odd value resistors at the lower right side was something I'd never had expected to occur in radio manufacture.

"Lastly it seems I can never send a letter to *TSM* without a repair question so here goes: Recently I completed a recap and re-resistor of a Hallicrafters S-76 radio. It plays well but when checking the voltages compared to the manual my readings are about 20 volts or so low for the voltage out of the 5Y3 rectifier, 15 or so volts low into the rectifier (should be 300v to chassis) and the 150v from the 0D3 regulator about 2 volts or so low. Also I noticed the 3,000-ohm 10-watt tubular wire wound resistor (R37 if I recall) getting hot. The resistor measured at just under 3,000 ohms and I measured the voltage across the resistor and got a around 112 volts or so, which calculated to a little less than 5 watts and to me that seems well under the resistor's rating. Is it normal for resistors running at under half their ratings to still feel so hot? I set the line voltage to 117VAC as per the manual and also set all controls and switches as per the manual also.

The only thing I haven't done was to replace the 5Y3 with a new one if it is possible a weak one may run voltages low. After one hour of listening, using a bucking transformer (as recommended in a previous column), the power transformer was only slightly warm to the touch and after two hours or so it was reasonably warm but not too hot as I could still keep my hand on it for some time. Thanks so much for taking the time to answer questions it is much appreciated." – Wayne Wlocka

Rich Post Responds:

Your voltage readings are close to what the Sams Photofact reads for the S-76. Note that those voltages are lower than what is shown in the manual. Sams also indicates an overall current draw of 0.71 amps at 117 volts. Your set should about match that. Here's the URL for the Sams. **http://bama.edebris.com/manuals/hallicra/s76sams**

The 0D3 and the 3K-ohm resistor are behaving as they should within reason. With a 112-volt drop across 3K, the heat of 4.2 watts on a 10-watt resistor is well within the margin. If the resistor reads a bit on the low side it will draw just a bit more power. Changing it will extend the life of the 0D3. To reduce the heat just a bit, you can replace it with a 3K that reads a bit higher than 3K. You did not say how much lower

Left: March Mystery Movie radio is from the 1950 Columbia film serial, "Atom Man vs. Superman," Clark Kent (Kirk Alyn) and Perry White (Pierre Watkins) listen to a threatening radio broadcast from Superman's archenemy Lex Luthor (Lyle Talbot.) This same set appears in the scenes where Luthor is seen sending radio messages. Is this an actual set or a studio mockup? TSM's vintage radio guru identifies the radio as an LL-4117 made by LexCorp. Rich sent along his own screen shot (right) showing perenial Superman nemissis, Lex Luther, at the communications microphone in his HQ. (Screen shots courtesy of Eric Beheim and Rich Post)

your resistor reads than 3K, but you can try out the effect of adding a bit of resistance, for example connecting a 200 ohm 1-watt resistor in series with the existing low-reading 3K. Best wishes with the S-76, which is one of my favorite Hallicrafters band cruisers with that low second IF stage and that large S-meter. Here are some pictures of mine **http://www.ohio.edu/people/postr/bapix/S-76.htm** -- Rich Post KB8TAD

March Mystery Movie Radio Answer

Rich Post KB8TAD writes: "Re: Mystery Movie Radio in the March *TSM*. I knew right away that it was obviously model LL-4117 manufactured by LexCorp. I have attached another photo from that show. I like what appears to be a picture of the chief inventor at LexCorp (above) at his desk. I suspect anyone who likes National "N" and "ACN" dials and rack-mount power supplies can't be all bad!"

April Mystery Movie Radio

The April mystery radio (shown below at left) from the movies turns up in at least two serials produced in the 1940s. In the 1943 Columbia serial "Batman," Robin (Douglas Croft) uses it to request police assistance. Five years later, it, along with two other radios, turns up in the Metropolis Police Station's radio room (shown below at right) in the 1948 Columbia serial "Superman." Bonus points for those who correctly identify the other two radios.

TSM

April Mystery Movie radios. Below left: Robin requests police assistance in the 1943 Columbia serial, "Batman." Below right: Radios from the 1948 Columbia serial, "Superman." (Screen shots courtesy of Eric Beheim)

RF Current

News from the World of Communications

RF Current is compiled and edited by Ken Reitz KS4ZR from various news sources and links supplied by TSM readers. If you find an interesting story pertaining to amateur, shortwave, scanning, broadcasting or satellites, send a link to editor@thespectrummonitor.com

Vatican Radio Ends English Broadcasts to Asia

An article on Vatican Radio's homepage March 24 announced the end of English language transmissions to Asia, which began in 1958. Here is part of that announcement.

"The gradual phasing out of Vatican Radio's shortwave frequencies is seen as part of the reform of the Roman Curia or the central administration of the Catholic Church here in the Vatican, called for by Pope Francis. The Pope established the new dicastery or office of the Secretariat for Communications on June 27, 2015, bringing 9 media bodies of the Vatican, including Vatican Radio, under the Secretariat's direction, with the purpose of overhauling, streamlining and ultimately merging them as a cohesive unit."

The announcement directed English language listeners to the Vatican Radio English news site: **http://en.radiovaticana.va**.

BBG's New 24/7 Russian Language TV Network

This past February, the Broadcasting Board of Governors (BBG) celebrated the official launch of its new 24/7 Russian language digital network, called "Current Time." BBG CEO, John F. Lansing, wrote on the BBG blog, "Current Time digital network provides fact-based news and information produced by Radio Free Europe/Radio Liberty (RFE/RL) with significant contributions from Voice of America (VOA). Its feature programming covers topics such as business, entrepreneurship, civil society, culture and corruption. The network also airs both short- and long-form documentaries, including ones banned in Russia because of their political content."

The reason for paying attention to this event is found later in his blog post: "Current Time is the model of what is to come in the future of U.S. international media. Stay tuned."

NASA's EO-1 Satellite at End of Life

One of NASA's most successful Earth Observation missions, EO-1, has ended after an amazing 17 year run. According to a NASA press release, "EO-1 was launched on November 21, 2000 as part of a one-year technology validation/demonstration mission…The original EO-1 mission was successfully completed in November 2001. As the end of mission approached, the remote sensing research and scientific communities expressed high interest in continued acquisition of image data from EO-1." So the mission received additional funding to continue to send imagery for another 16 years. According to NASA, "Image data acquired by EO-1 are archived and distributed by the USGS Center for Earth Resources Observation and Science (EROS) and placed in the public domain."

BBG's "Current Time" Russian language Internet service aimed at a Russian audience. (Courtesy: BBG)

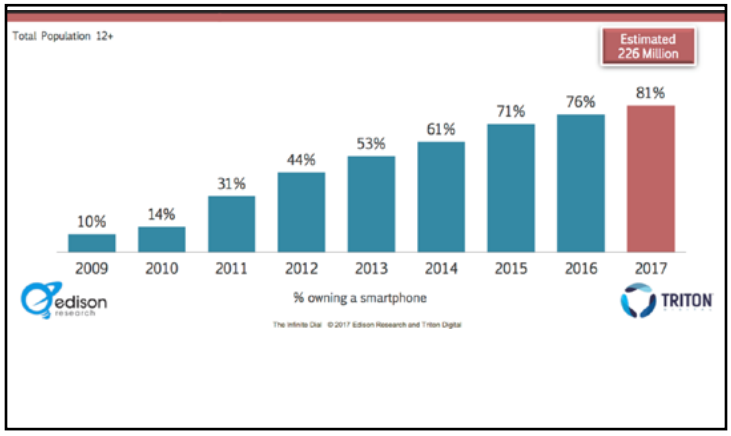
FCC OKs 100% Foreign Ownership of US Stations

At the end of February, the FCC gave its approval for an Australian couple to own 29 different TV and radio properties in the US. The percentage ownership allowed by the FCC has slowly eroded to the extent of this final ruling. The two, according to a report in InsideRadio.com, have been living and working in the US under special occupation visas for the past 10 years and were encouraged by earlier signals from the FCC to put forward their purchase of 15 full power stations and nine FM translators in three states—Alaska, Texas and Arkansas.

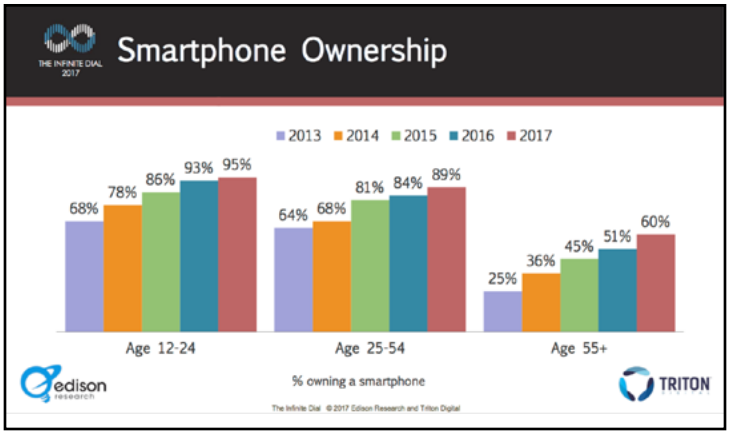
Infinite Dial Research: Online Listening on the Rise

Research numbers for the 2017 Infinite Dial Study by Edison Research and Triton Digital, published March 7, show current trends in how Americans use various media and for the first time the survey has added the category of "Smart Speaker" as a listening source. Highlights of this year's survey include:

- Podcast listening continues to grow. When it comes to where Americans listen to podcasts; 52 percent say they listen at home, 18 percent listen in their vehicle, 12



Percent of Americans who own a smartphone. (Courtesy: Edison Research/Triton)



Who owns those smartphones, by age group? As might be expected, the youngest Americans are edging to 100 percent. (Courtesy: Edison Research/Triton)

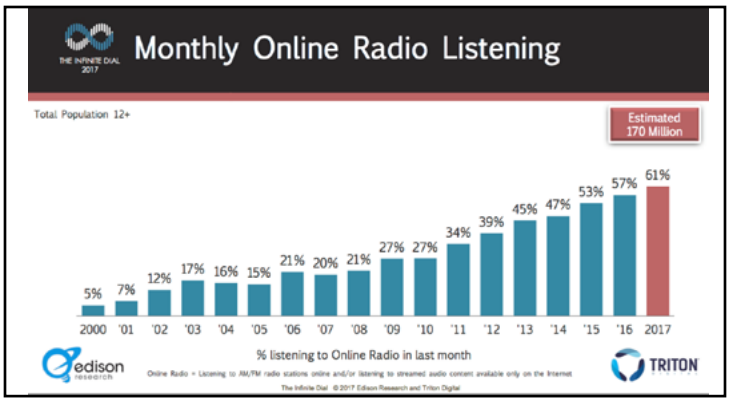
percent at work. Listening via computers has shrunk to 33 percent, with smartphones/tablets/portable devices moving to 65 percent.

- Half of Americans age 12 and up now have access to a Netflix subscription.
- The weekly online radio audience is now 140 million Americans or 53 percent of US individuals age 12 and up.
- Time spent listening to online radio has surged to an all-time high of 14 hours 39 minutes per week.
- Pandora continues to lead in the online radio space—32 percent of Americans have listened in the past month. Spotify is a strong second at 18 percent.
- Social media usage is beginning to consolidate around a few platforms with Twitter's growth rate continuing to decline—especially in the 12-24 age group.

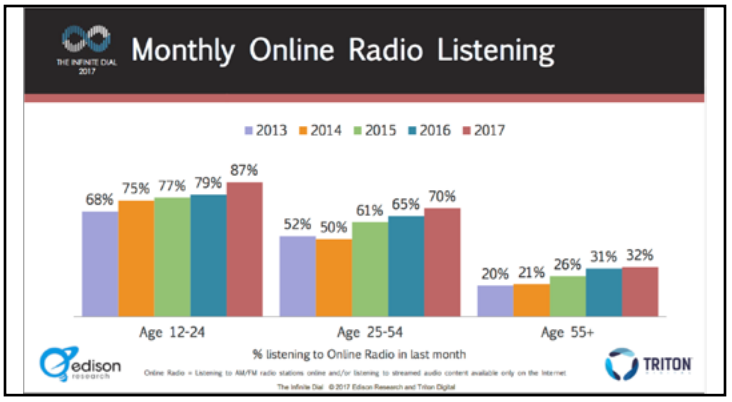
John Rosso, President of Market Development at Triton Digital said, "With 7% of Americans 12+ now owning smart speakers, such as the Amazon Echo and Google home products, this represents an extraordinary opportunity for increased consumption of Internet radio in the home. Content producers would be wise to pay close attention to this growing segment of the market."

Tom Webster, Edison's VP of Strategy said, "The significant numbers we see for subscription products, such as Netflix and Spotify, as well as the continued growth for platforms that are relatively 'advertising-light,' such as Pandora and Podcasts, reflect a continued shift in the ability for advertisers to reach consumers with traditional, interruptive forms of advertising. Advertising models are going to have to adapt, and adapt quickly, to the American consumer's increasing willingness to curate their own media mix and avoidance of traditional advertising messages."

The survey was conducted in January and February 2017 by Edison research in a national telephone survey of 2,000 people aged 12 and older using random digit dialing techniques. Interviews were 51 percent landline and 49 percent cell phone, in English and Spanish, weighted to national 12+ population figures.



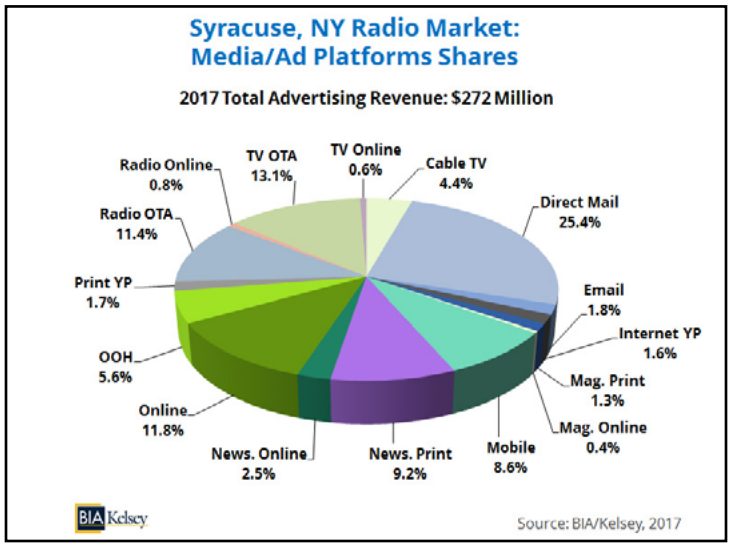
An estimated 170 million Americans are listening to over 14 hours of online radio per week. (Courtesy: Ediston Research/Triton)



Who's listening to online radio? The youngest population segment are nearing 90 percent while seniors are just about at one-third. (Courtesy: Edison Research/Triton)

BIA/Kelsey: Increased Competition Faced by OTA Broadcasters

The media consultancy, BIA/Kelsey, released results of a study of media competition in the Syracuse, New York, market, March 17. According to their online blog, "Over-the-Air radio broadcasters find themselves in an increasingly competitive marketplace for both listeners and advertis-



Competition for Syracuse ad dollars is fierce. Here's how the projected 2017 total ad revenue ($272 million) in the Syracuse market is expected to be split. Over-the-Air radio gets 11.4%. (Courtesy: BIA/Kelsey)

It's not easy making a profit in the modern radio landscape but you would think that in a national political campaign year some would have done better. (Courtesy: iHeartRadio, Entercom and Cumulus)

ers. Satellite delivered audio programming, podcasts, and Internet streaming services and online and mobile apps all provide alternatives for entertainment and information and targeted advertising messages. Now, there's evidence that the revenue value of these alternatives has caught fire."

The accompanying chart shows Over-the-Air radio stations are projected to take in just over 11 percent of total advertising money spent in the Syracuse market in 2017. Local advertising on social media in the Syracuse market exceeded that of advertising on local Syracuse radio stations. The report notes, "In fact, Google's share of the Syracuse advertising market ($29 million), by itself, will soon exceed the combined advertising revenue share of all over-the- air local radio stations ($30.2 million), as well as the share obtained by the digital platforms of these radio stations."

A Rising Tide Lifts (Most) Commercial Radio Stocks

Since April 1, 2016 the Dow Jones Industrial Average has risen almost 3,000 points. That, coupled with the nearly $1 billion dollars in radio advertising spent by political campaigns last year (up $100 million from the 2012 political campaign season), made for a mostly profitable year for radio station owners in the US.

As of the end of 2016, according to FCC data, there were over 13,000 AM and FM radio stations currently licensed in the US. Of those, 11,415 were commercial stations. While, small companies own most of the small market radio stations, ten companies own almost one-quarter of the commercial radio stations in the US. And, according to InsideRadio.com, they collect nearly 50 percent of all radio station ad revenues. The largest company by far is iHeartMedia with 850 stations among its assets. But, iHeartMedia has travelled a rocky financial road over the last few years, as has number two among station owners—Cumulus Media.

Even if you held stock in iHeartMedia, a perennial candidate for bankruptcy, you would have seen a paper profit, at least over the last 12 months. Not so for Cumulus Media. The company owns 445 AM and FM stations in 90 US markets and, somehow, despite the massive bull market and benefiting from unprecedented radio spending by political campaigns last year, this company has seen nothing but misery over the last 12 months, with their stock dropping from $4.48 to $.41 per share year-to-year.

Things could also change this year for two other big station operators, with the merger of Entercomm and CBS Corp.—expected to be approved later this year. The merger will require Entercomm to sell off 14 of its stations to avoid being over the number allowed currently by the FCC to be owned by one company in a single market. Those rules are bound to change under the new, more aggressively M&A-friendly FCC chairmanship.

Some broadcast groups did very well, indeed. Beasley Broadcast Group, which owns 45 FM and 18 AM stations, mostly in the eastern US, went from $3.51 in March 2016 to $12.35 in March 2017. Many of these companies have diversified holdings so the price per share may reflect directions of various components of the company, not just radio.

Company	Number of Stations	Stock Price Y-T-Y
iHeart Media	850	$1.01 to $3.52
Cumulus Media	570	4.48 to .41
Town Square Media	312	10.71 to 11.68
Entercomm	127	10.47 to 13.85
CBS Corp.	116	54.61 to 66.9
Salem Media	115	5.24 to 6.80
Univision	68	Privately held
Beasley Group	63	3.51 to 12.35
Cox Media Group	59	Privately held
Radio One	55	1.44 to 3.05
Hubbard	25	Privately held
Emmis	23	2.36 to 2.48

Albany, Georgia, AM Station Blown Off the Air

There's little respect for small town AM radio stations, if they're unlucky enough to be owned by Cumulus Media. As reported on WALB-TV, Albany, Georgia, March 22, WGPC 1450-AM, which first signed on the air in 1933, suffered a disaster several weeks earlier when powerful winds snapped the 175-foot tower in half and dropped several trees on the station's studio building. Atlanta-based Cumulus Radio confirmed to WALB-TV that the station's license had been "voluntarily surrender back to the Federal Communications Commission," saying that, "The likelihood that another operator would want to apply for and then operate a low-power AM station, in a small radio market is practically nil." Ironically, the station's tower had been at that same location since a tornado in 1940 devastated the city of Albany.

FCC's TV Incentive Auction: "Massive Disappointment"

Despite the cheery declaration of outgoing FCC Chairman, Tom Wheeler, that the FCC's TV Incentive Auction was a success, some business analysts believe otherwise. According to Zack's Investment Research blog from February 13, the auction "has turned out to be a massive disappointment."

In the first part of the auction, begun one year ago and completed in July 2016, US TV broadcasters had agreed to free up 126 MHz of spectrum for a huge payday: $86.4 billion. To make the system work, the second part of the auction had to generate $88.4 billion (the extra money was to offset the FCC's cost for putting on the show).

In the second stage, the FCC reduced the spectrum to 114 MHz and then knocked it down to 90 MHz with a revised price of $54.6 billion. But the second round generated only $21.5 billion.

The third stage began last December with a new target price of $40.3 billion for 108 MHz, of which 80 MHz would be earmarked for wireless use. But this stage, too, ended abruptly with just $19.7 billion bid.

In January of this year the FCC began the fourth stage of the auction with a target price of just over $10 billion for 84 MHz of spectrum—down almost $50 billion from its initial expectations. The previous spectrum auction, in 2015, collected nearly $45 billion.

Zack's Analyst Blog noted, " Low-band spectrum is essential for wireless operators as the signals can be transmitted over longer distances and through brick-and-mortar walls in cities. However, several industry experts believe that telecom operators may be unwilling to shell out such a hefty sum for low-band airwaves." Instead, Zack's suggests that such companies will take the spectrum through mergers and acquisitions of auction winners—a process the new FCC chairman has signaled he will likely approve.

OneWeb Factory Under Construction

OneWeb, the space-based satellite Internet service founded by an affiliation of billionaires, including Sir Richard Branson, broke ground on an $85 million facility in Florida, near Cape Canaveral, according to SpaceNews.com. The factory will make the 2,000 satellites expected to form the OneWeb Low-Earth-Orbit (LEO) and Medium-Earth-Orbit (MEO) constellations and should begin producing the first of those satellite by 2018. Plans call for the constellation to be completed by 2025.

March 2017 April Air Show Addendum

Brian Topolski reports, "The Patrouille de France Jet Demonstration Team is on a one month long (April 2017) tour of the United States. Listen to their communications on the following verified frequency: 340.3 AM mode. This is an air/air tactical frequency used by them during their arrival at Stewart ANGB in New York.

"I was only able to hear them for a few minutes, so make sure to keep those scanners searching for any new frequencies. Keep us updated with any and all signal reports regarding this rare listening opportunity!"

Patrouille de France Jet Demonstration Team. (Photo courtesy of Brian Topolski)

TSM

ARRL's Field Day is a great opportunity to try out different portable satellite antenna designs. Here, a pair of Arrow-style antennas are used with 75-Ohm phasing lines to achieve a "circular-like" radiation pattern. The rotator is a Yaesu G-5400 AZ/EL combo and the tripod is a DJ speaker stand, both obtained from eBay. (Courtesy: Author)

Going Portable with Amateur Radio Satellites

By Keith Baker KB1SF/VA3KSF

It's springtime here in the northern hemisphere. And, while the higher HF bands are beginning to go all but silent for the next few years, many of us amateurs, being an experimental lot, are looking for some other way to get our signals out and be heard. One of those ways is via our growing fleet of amateur radio satellites.

And, yes, I've heard all the laments that getting on the satellite is "too hard" or "too expensive" for you or that you live in a deed-restricted area that prohibits outside antennas. Or, perhaps while not being strictly prohibited, you simply don't have the room (or the spouse approval?) at your home to put up an antenna array that might make your humble abode look like a NASA tracking station.

Well, my friends, there is a way for you to get on the "birds" without breaking the bank or making your home look like something out of a Star Trek movie. And, as I have written in a previous feature in *TSM* about putting your HF operations "on the road," satellite work can also be done portably with the right combination of antennas and radios.

Going Hand-Held

Probably the easiest (and cheapest) way to operate on our satellites is via a small, hand-held portable antenna array along with one or more FM hand-held transceivers.

And, contrary to what you might believe, you don't need a super powerful FM transceiver with these antennas to work the birds. In fact, I (and many other amateur satellite operators) have sometimes met with success using just a simple dual-band hand-held radio and an antenna with just a bit more gain than the ordinary "rubber duck."

That is, over the years, I (and others) have had minimal success using an "extended rubber duck" on these transceivers to make a few contacts on our FM satellites (such as SO-50 and AO-85) on near overhead passes.

However, because the downlink output power on most of our satellites is usually pretty weak (often less than 1 watt) and because of the "capture effect" of FM signals, you'll have far better success if you can create some signal gain on both the downlink (from the satellite) as well as on your uplink (to the satellite).

Several people have "rolled their own" Yagi satellite antennas using nothing more sophisticated than a series of trimmed coat hangers mounted on a block of wood. However, for many years (and for most of my own non-permanent, portable satellite contacts) I've been using a commercially

During the first few months of 2017, I very successfully used an M2 Antenna Systems "LEO Pack" and an old Yaesu G-5400 Az/El Rotator combo at our family's rental home on Fripp Island, South Carolina. (Courtesy: Author)

AMSAT's VP of Operations Drew Glassbrenner KO4MA (left) uses a shortened Arrow antenna to show the ARRL's new CEO Tom Gallagher NY2RF "how it's done" at the 2017 Hamcation in Orlando, Florida. (Courtesy: Author)

made, hand-held antenna from Arrow Antenna of Cheyenne Wyoming.

The Arrow

The Arrow II Satellite Antenna Model 146/437 provides an impressive forward gain of approximately 10.3 dBd at 70cm and 4.6 dBd at 2 meters. Sturdily machined from aluminum arrow shafts (hence the name) this antenna actually consists of two antennas mounted at right angles to each other on the same boom…a three element Yagi for 2-meters and a seven element Yagi for 70-cm. A removable foam hand grip plus threaded horizontal and vertical photo tripod mounting holes underneath the hand grip make this a totally collapsible antenna that is also useful for terrestrial radio direction finding or portable emergency work.

With models starting at about $75, the Arrow is very well constructed and can be easily taken apart (some models even have a split boom!) for extended portable use. A somewhat more expensive version also sports a 10-Watt duplexer (or more correctly, a "diplexer") in the handle, which, if your radio can operate in full duplex mode, requires only a single feed line.

I actually own four of these split-boom and duplexer-equipped Arrow antennas and I remain absolutely delighted with their performance. One of them, along with my Kenwood TH-78A handi-talkie (HT), goes with me in my vehicle or suitcase whenever I travel. Using my Arrow and my HT, I've been able to consistently work thorough AO-85 and SO-50 down to about 10 degrees elevation above the horizon.

As of late, the Arrow is now being offered in an "Alaskan" version, which offers a bit higher gain, ostensibly for use in far northern latitudes (or if you are using really low power on the uplink). This model sports an extra element on 2-meters and three extra elements on 70-cm.

AMSAT usually carries a supply of both the Alaskan and standard versions of these antennas available via their online store on the AMSAT Web site (**store.amsat.org/catalog**). Several Amateur Radio dealers also offer various versions of the Arrow satellite antenna in their catalogs, or they can be ordered directly from the manufacturer at **www.arrowantennas.com**.

The Elk

Another variant of the hand-held satellite antenna genre is called an "Elk." This antenna sports a log-periodic design for 2-meters and 70-cm that allows for a single feed line and is available directly from the manufacturer at **https://elkantennas.com/product/dual-band-2m440l5-log-periodic-antenna**. As the boom material is manufactured from standard PVC pipe material, it is easily mounted on a photo tripod with just a few extra pieces of PVC piping from your local big-box hardware store.

Arrow on a Tripod

Because the Arrow boasts threaded receptacles under the foam grip that make it suitable for mounting on a photo tripod, a while back a good friend of mine, Art VE3GNF, was intrigued by an article in the March /April 2013 issue of the AMSAT Journal by Rick Tejera K7TEJ.

Rick wrote about an equatorial mount for satellite antennas using one designed for a small telescope and adapted for satellite tracking. Having the same interests as Rick, Art believed that he could produce a functioning system really cheap—thus, the birth of what he has come to call "The Gizmo."

Much like an equatorial astronomical telescope mount (with the addition of a small, 12-volt DC motor along with some fabricated parts) the Gizmo allows you to track the

A very effective portable satellite antenna array can be made using a pair of old Alliance (Genie) U-110 television rotators, a set of 2-meter and 70-cm "terrestrial" Yagi antennas along with a 3 or 5-foot rooftop television antenna mast. (Courtesy: Author)

The old Alliance (Genie) U-110 television rotators featured a "through the rotator" design that works well for the elevation side of an Az/El satellite rotator arrangement. However, you may have to fashion your own cross boom rotator plate. (Courtesy: Author)

satellites across the sky from your operating position with just a single movement.

I've worked a number of satellites using one of Art's Gizmos and have found that, once you set the parameters for an upcoming satellite pass, positioning the antenna array with just a single movement really helps to simplify the inherent complexities of amateur satellite tracking and operation.

Old U-110 Rotators

Another approach to portable satellite antenna arrays I've used consists of two old Alliance (Genie) U-110 television antenna rotators. The U-110 is particularly useful because, unlike most of the more modern TV rotators, the U-110 allows for a TV-mast-sized boom to be mounted right through the rotator housing. This feature, in turn, greatly simplifies mounting and operating the elevation part of your portable satellite array using these rotators.

Unfortunately, U-110 rotators are becoming increasingly hard to find, even online or in the junk boxes of flea markets at hamfests. At one time, the (pre-MFJ) Cushcraft Corporation also made a customized, boom-to-mast kit for U-110s. But, these, too, are becoming increasingly hard to find. On the other hand, if you do happen to come across two of these rotators and also have access to a machine shop, fabricating a boom-to-mast plate for these rotators makes for an interesting project.

Personally, I've had good success working through the Low Earth Orbit (LEO) satellites using a pair of standard-sized (10-element VHF and 22-element, singularly polarized UHF) arrays mounted on a metal cross-boom with a Cushcraft boom-to-mast kit. The array is rotated with two U-110 rotators all mounted on TV antenna masts and a small TV-type roof tripod.

Now, satellite purists will tell you that mounting any UHF or VHF satellite antenna with a metal cross boom protruding through the middle of the antenna elements will destroy the radiation pattern. However, I've found that rotating the antenna array elements at least 45 degrees to the boom helps to very much minimize this effect.

A Pair of Arrows

Another approach to portable satellite operation is to mount two Arrow-style antennas on opposite ends of a cross-boom and feed the dual 2-meter and 70-cm elements together with RG-59 (72 Ohm) phasing coax lines. If the two sets of antenna elements are also mounted 90 degrees from each other, this arrangement creates a "pseudo circular" radiation pattern that can help offset the sometimes deep fades one encounters in satellite uplinks and downlinks when your antennas are cross-polarized with those of the satellite. The only real downside to this arrangement is that it almost requires a more expensive rotator arrangement (such as a Yaesu G-5400 or 5500 AZ/EL combo) to rotate the array properly.

Mounting it All

Finding the right mounting tripod and mast material to mount your rotators and cross boom can also present somewhat of a challenge. However, I've since found that any number of DJ speaker stands (eBay is your friend here) or something similar to MFJ's Model 1918 tripod work just beautifully to support your portable array. For example, a few years back, our local radio club used this portable satellite antenna arrangement to good advantage during the ARRL Field Day, making several contacts on a number of both the FM and linear (analog) satellites.

The M2 "LEO Pack"

And then, like most other aspects of our wonderful am-

ateur radio hobby, there will always be those who want to do it First Class. For those folks who want to take their satellite operating to the field in style, I highly recommend using M2 Antenna System's "LEO Pack" (**http://www.m2inc.com/amateur/leo-pack**).

This antenna package consists of M2's Model 436CP16, circularly polarized Yagi for 70-cm and their Model 2MCP8A, circularly polarized Yagi for 2-meters. Either antenna can be assembled using right-hand or left-hand circular polarization, although most veteran satellite ops choose the right-hand circular option. The package also includes a three-piece boom and mounting plate that you may (or may not) need to use depending on your rotator and cross-boom selection.

During January and February of 2017, I used one of these LEO packs at our family's rental cottage on Fripp Island in South Carolina. Using a TS-2000 in the satellite mode and a Mirage pre-amplifier (their Model KP2/2m) on the 2-meter downlink (along with two lengths of about 50 feet of Belden 9913 low-loss coaxial cable) I was able to work any other satellite station I could hear. As of this writing (late February) I've since confirmed well over 50 "grid squares" toward the ARRL's coveted VUCC award from that location via their Logbook of the World (LOTW) using this setup. In short, these antennas really work well!

And, what's even more exciting is that AMSAT members can now order their very own M2 LEO pack from the AMSAT online store (**http://store.amsat.org/catalog/product_info.php?cPath=1&products_id=123**) at a somewhat reduced price from retail. If you order it that way, M2 will also graciously donate some of the proceeds from each sale to AMSAT for our satellite construction activities. Clearly, this is a "win-win" for both of our organizations.

Do I Need a Pre-Amp?

One of the questions I'm frequently asked, by budding satellite operators, is whether or not a receive pre-amplifier on the downlink side of a satellite antenna array is needed. The short (flip!) answer is, "It depends." That is, it depends on the gain in your downlink antenna, the length and type of feed line you use and whether or not there is a receive pre-amplifier already installed in your radio.

Having used many different combinations of antennas, feed lines and satellite-capable radios over the years, I've found that, unless you are using long lengths (greater than 50 feet) of higher loss coaxial cable (such as RG-58, RG-8, RG-8X or RG-213 that are better suited for HF operation) you can usually get by with using just the pre-amplifier in your radio…if it has one.

My suggestion is to simply try out the best combination of these elements that you can assemble and see if that arrangement gives you acceptable results. Most of the time, if you are using a hand-held antenna, external receive pre-amplifiers are not needed to bring your received satellite signals up to a readable level, even when using short lengths of RG-58 or RG-8X cable. But, mounting your antenna array on a rotator-equipped tripod with a longer length of higher-loss feed line may generate the need for some more receive gain on the downlink.

A portable satellite antenna array can also be used in a semi-permanent (or even permanent!) setup. My principle satellite antennas consist of an M2 Model 2MCP14 for 2-meter and a M2 436CP30 for 70-cm. The array is mounted on a metal cross-boom with a Yaesu G-5400 rotator and an MFJ Model 1921 Heavy Duty tripod. Mounting the 2-meter antenna at a 45 degree angle on the cross-boom helps to minimize interference to the circularly polarized pattern. (Courtesy: Author)

Bottom Line

Once again, it is important to remember that satellite work is weak signal work. You need to discard the "S9+" approach from your HF operations while working the birds. All that is required (if working full duplex) is that you be able to hear your own signals through the satellite with a "copyable" downlink signal, period! Anything beyond that is overkill and simply robs downlink power from others who are also just tying to be heard through the transponder.

But, just like other aspects of our wonderful radio hobby, the bottom line here is to not be afraid to use what you may already have lying around (in your garage or junk box) to experiment with different approaches to mounting and turning your portable satellite array.

And, I very much look forward to "seeing you on the birds"…from my (and your) very own portable satellite setups in the weeks and months of beautiful Summer weather just ahead.

TSM

Community Emergency Response Team (CERT), local public citizens trained to respond to a variety of emergencies, take part in a drill. (Courtesy: FEMA CERT)

Community Emergency Response Teams: Are You Ready for a Disaster?

By Alan M. Vigeant N6HPO

I grew up in New Jersey during the 1950s. I recall each Saturday, at exactly 12 noon, the air raid siren, a bright yellow Federal Signal SD-10, mounted atop a 50-foot tall power pole on the corner, would blast a one minute test—to that young boy, it seemed an eternity! You could hear the siren's wail for blocks! There were mandated, evening Civil Defense blackouts in our neighborhoods. All residents were required to draw their shades and sit in relative darkness, most times for more than an hour. Civil Defense Team "block captains" would patrol the streets, insuring that every resident complied. Over the past 60+ years, the end of the Cold War and the threat of nuclear annihilation may have subsided, but the need for citizen volunteers trained in emergency/disaster preparedness continues to be of significant value and, in the last 25 years, of strategic national importance.

The Community Emergency Response Team (CERT) is a community based resource and education organization, sanctioned by the Department of Homeland Security (DHS) through the Federal Emergency Management Agency (FEMA), an executive agency that serves as a single point of contact within the federal government for emergency management activities.

CERT is one of FEMA's premier volunteer programs. The program educates people about disaster preparedness for natural and man-made hazards that may impact their lives when least expected. CERT Academy classes are offered free to the public. In an actual disaster situation, a time when most first responder personnel will be stretched beyond their capacity, an empowered and prepared CERT team deployed to assist and support first responders, can make a measurable difference in mitigating victim mortality. Training citizens in basic life safety/disaster response skills such as wildfire safety, flood, light search-and-rescue (SAR), team organization and disaster medical operations, to assist those emergency agencies, is essential for any progressive, forward-thinking community.

History of CERT

In February 1985, then Asst. Los Angeles Fire Department (LAFD) Chief, Frank Borden [ret.], along with several city officials, travelled to Japan to witness, study and document Japan's program of emergency earthquake prepared-

ness. In fact, the 6.9 Kōbe earthquake occurred while they were in Japan. The team learned firsthand that a trained and prepared citizen population could significantly reduce the loss of life [1].

On September 19, 1985, at 5:17 A.M., an 8.0 magnitude earthquake struck Mexico City, leaving 50,000 dead and injured. The city of 8.3 million people was awash in well meaning, but vulnerable, unprotected and untrained "spontaneous volunteers." These individuals, many with untreated injuries themselves, some life threatening, in a city still very susceptible to large aftershocks, unwittingly contributed an additional 100 casualties in just 15 days after the quake. Most, if not all of these tragic losses could have been prevented had the civilian population been exposed to basic medical and search-and-rescue training. The southern half of Mexico had a history of eight major earthquakes [above 6.5] from 1957-1985.

Immediately after the Mexico City quake, the City of Los Angeles dispatched first responders to the devastated city. Equipped with tools, search-and-rescue teams, and extrication equipment, such as infrared detectors and specially trained "sniffer" dogs, the LAFD made a significant impact, although the Mexican government insisted the major share of the burden was theirs. Returning to LA weeks later, Assistant Chief Borden and the group pondered how their own city's population would respond to a similar disaster. They decided to organize a committee and submit a proposal to the city council to form what they envisioned as the Los Angeles Community Emergency Response Team. Their vision became reality in February 1986. Regrettably, limited city resources stinted the program's expansion and efficacy. Yet the tenacity of the LAFD, coupled with the devoted CERT team members, remained uniformly resolute. It wasn't until the October 1, 1987, 5.9 magnitude, Whittier-Narrows earthquake, that the wisdom of maintaining the program through "lean times" was vindicated. Six years later, FEMA acknowledged the intrinsic benefit of a trained volunteer civilian population, thus opening the CERT program nationwide. Thanks to Assistant Chief Borden, and the stalwart members of the 1986 team who believed and ultimately prevailed, the CERT program is now a permanent structure in all 50 states. Indeed, 30 countries worldwide have adopted CERT or a citizen's volunteer organization in some form.

CERT's Basic Academy Training Modules

The curriculum of each CERT module is designed to train citizens in basic life safety and emergency preparedness skills. They include, but are not limited to:
An Introduction into CERT
Disaster Preparedness/Awareness
Fire Safety/Living with Wildfires
First Aid Medical I and II/Triage
Search and Rescue
Disaster Psychology
Radio Communications [FRS/GMRS/amateur radio]

CERT logo (Courtesy: FEMA CERT)

Terrorism and CERT
Course Review, Disaster Simulation Drill, Graduation

CERT Extended Training

Various organizations, both governmental and private, offer additional classes, and modules for those individuals who wish to expand their CERT knowledge further.
NIMS/SIMS [IS-100, 200, 700, 800]
Wildland Urban Interface
Animal Rescue and Evacuation I and II
Pandemic Flu Outbreak
CPR/AED/Trauma Medical Ops
ACLS [Advanced Cardiovascular Life Support]
Active Shooter Strategy
Red Cross Shelter Operation
T-3 ["Train-the-Trainer"]
Hazardous Materials Awareness

Valley Center CERT

In late October 2003, the County of San Diego was engaged in fighting four major wildfires within its boundaries. The "Paradise" fire began in the Rincon area, a few miles west from Valley Center, in the foothills of northeast San Diego [2]. The County was hardly prepared for such a conflagration, even in the best of times; the fire literally overwhelmed and exhausted every emergency agency, ground based and airborne. There was little interoperability, so many of the agencies could not keep in radio contact with each other. There were no Memorandum of Understanding [MOU] between the [then] state fire authority, California Division of Forestry [now Cal-Fire], county government, and the three military bases within the county. While CDF air attack planes and tankers were spread very thin around the state while military resources sat idle on the tarmac. Had there been such an agreement as exists now, the military's fire fighting apparatus could have offered valuable assistance.

It was two months after that wildfire, December 2003 that the Valley Center CERT team was formed. Local citizens had had their very first taste of what real disaster conditions look and feel like. An ad hoc group of concerned

citizens led by Mary Meade and San Pasqual Reservation Fire, Chief Maxxy, were adamant about initiating a "community involved program;" a program that offered and encouraged local citizen's active involvement and participation… something like CERT. It was providential that the program was greeted and later adopted with so little resistance; a very similar wildfire, involving much of the county would once again engage the citizens of San Diego County, particularly the residents of the Greater Valley Center area, just four short years later.

On October 23, 2007, at 3:13 PM, the "Poomacha" wildfire began its 49,410 acre rampage across the northeastern part of San Diego County [3], Valley Center CERT (VCCERT) was actively engaged in "red tagging" W.U.I. properties which these trained CERT team members deemed indefensible. Each property was given a cursory exam to establish defensibility against the oncoming firestorm. In moments, a property was assessed. Parcels which had not adhered to the mandated defensible space perimeter around their home were red tagged. This permitted fire fighters, already stretched beyond their capacity, to dedicate their efforts and resources to those residential properties that were defensible. In total, the team activation lasted ten days.

By November 9, 2007, the Poomacha Fire was declared 100 percent contained; the VCCERT team had proven their abilities and confirmed the Valley Center Fire Protection District's faith and trust. In the intervening years, the ranks of our VCCERT team have grown substantially. To date we have graduated more than 500 residents through the CERT Academy. However grand the number for a community our size, there is little time for accolade. Families move away from the area and many residents become "catch and release" (those who accept Academy training, yet wish no further involvement), depleting the team's strength. We're encouraged when new families to move into the area, yet discover few have even a nodding acquaintance with what the term "wildland urban interface" implies, let alone how different their lives in it might be. This is where VCCERT can help. We much prefer to "train and retain" new residents, thus building a more confident, empowered and prepared community.

We seek public venues in which to reach out to residents unfamiliar with CERT, impressing upon them the value of the program, instilling civic responsibility and the knowledge which the CERT program provides. The program is not exclusively for disaster preparedness. It enables team members to administer basic medical assistance in emergency situations, stabilizing the situation and the individual on the spot until the first responder team arrives. For this reason, many of us carry comprehensive CERT backpacks in our vehicles.

VCCERT as a Deployable Organization

The chain of command is essential in assuring that each division is equally aware of the incident event, following directives through the command structure. This not only insures that all agencies are "on the same page" but the structure permits the swift discharge of necessary personnel, equipment and emergency supplies to the affected areas.

Jen and Kathy acted as our Scribes for the evacuation keeping track of all the evacuated vehicles and checking them in as the radio calls came in that they made it to the refuge. CERT members were along the evacuation route making sure that no residents got off the evacuation route. (Courtesy: VCCERT)

Is there a CERT Team in Your Area?

There is a quick way to determine where the closest CERT organization is to your area. Simply click on the FEMA link below and enter your Zip code. It will direct you to the closest CERT team and provide contact info: **https://www.citizencorps.fema.gov/cc/searchCert.do?submitByZip**

If you are unable to find one near you, you can always start one; there are many small towns in America that find themselves outside the district of an organized CERT team. Should this idea appeal to you, the FEMA link below offers more help in getting a CERT team started, as well as a place to get your questions answered: **https://www.fema.gov/cert-program-registration-information**

CERT, Global Issues, and Crisis Inevitability

As our population grows and climate change continues, having more and more of an educated and prepared global community will be essential in its survivability and recovery when disaster strikes.

Over eight hundred million people, about twenty-five percent of the global population, live around the most seismically and volcanically active zone in the world—the "Ring of Fire" which encompasses the whole of the Pacific Ocean. Over 40 percent of us live in the coastal areas! We who live around "the Ring's" perimeter must be constantly aware of the threats it poses. For more than 30 years we have been building safer, earthquake resistant housing and commercial structures. Each nation within this area must also strive to improve oceanic and land-based early-warning systems to help minimize the risk to life [4].

Valley Center CERT chain of command. (Courtesy: VCCERT)

In 1995, fire suppression made up 16 percent of the U.S. Forest Service's annual appropriated budget. For year 2015, for the very first time, more than 50 percent of the United States Forest Service's annual budget was dedicated to wildfire suppression. Left unchecked, the share of the budget devoted to fire in 2025 could exceed 67 percent, equating to reductions of nearly $700 million from non-fire programs and personnel compared to today's funding levels. That means that in just eight years, two out of every three dollars the Forest Service gets from Congress, as part of its appropriated budget, will be invested in fire programs [5].

With the rapid rise in global terrorism, it is becoming more incumbent than ever that every citizen knows how to respond to obvious or suspicious terrorist activity. Active shooter training is becoming more prevalent and is a highly regarded skill for everyone to obtain, particularly CERT members.

"Crisis preparation and management must be learned and practiced when there isn't a cloud in the sky." [6]

These words come from Frances Hesselbein, the CEO of The Girl Scouts of America from 1976 thru 1990, and current the CEO of the Frances Hesselbein Leadership Institute. At the remarkable age of 100, Frances speaks frequently on the subject of strategy in leadership, teaching military officers and CEOs across the country how to become more effective when confronted by challenges. Her books, each of which has some application in every CERT organization, are best sellers.

Regardless where you live in the United States or around the world, there is a history of naturally occurring weather or geologic phenomenon specific to your area. Earthquakes, wildfires, floods, hurricanes, typhoons, tornadoes, and other disasters have little if any predictability, yet each are as inevitable as the destruction they leave behind. Our interest and compassion ramps up when we see dramatic, natural phenomenon unfold on television, taking the lives and property of innocent and defenseless men, women, and children.

Valley Center CERT logo (Courtesy: VCCERT)

So, the question begs, "Wouldn't a better prepared citizenry have prevented, or at least diminished the numbers of lives lost?" Of course, it would!

"So, how can we avoid the tragic experiences of these people, so that similar circumstances are not repeated in our own lives?"

We begin by asking ourselves, "Am I prepared in my home and my vehicle to be self-sufficient for at least 72 hours?" "What if we're not at home? Will my spouse and my children know how to respond during and after the disaster?

The good news is that the loss of life need not reach staggering proportions. We can survive and even prevail, but only to the degree that we are willing to take the necessary steps now to prepare for what most assuredly lies ahead.

At one of our recent CERT academies a woman asked, "…why teach the fear, gloom, and doom regarding disaster preparedness?" I explained I didn't believe the CERT curriculum was pessimistic at all. Our academy instructs a basic awareness of current local and state natural environmental hazards; i.e. history of wildfires, earthquakes, hurricanes, and the likelihood of similar occurrences in the future. From the first minutes of CERT introduction, right through graduation [a total of twenty-four hours of directed, hands-on physical activity and spirited classroom discussion and instruction], the Academy stresses prevention and preparation before the actual occurrence. The program endeavors to convert anguish and trepidation with self-assurance and knowledge. By graduation, we hope the Academy has disabused those persons of their initial belief that, "…it will never happen to me."

CERT's Future

My wife and I have been involved with CERT since 2010 and we have both been licensed amateur radio operators for the past 10 years. We were wide-eyed, enthusiastic students back then…seven years later, we're still wide-eyed, enthusiastic students! As FEMA certified instructors in the CERT curriculum, we find that at every class, workshop, or conference we attend are new people sharing new information, discussing new ideas and new ways of doing things. Science's function is to produce accurate theories of how the natural world works; it's a never-ending cycle of unlearning

previous errors and challenging long held beliefs. As Carl Sagan wrote, "Intellectual capacity is no guarantee against being dead wrong [7]."

There are a few things that can restrain and reduce the scope and efficacy of CERT teams. An ongoing challenge is engaging new members, particularly younger members of the community, to become trained team members and eventually, CERT leaders. I recently attended CERT's 30th anniversary convention in Los Angeles. It was a three-day gathering of over 500 CERT team members from across the nation. Instructors from as far away as Guam and South Korea were present! I spoke with team managers, instructors, and firefighters; all were unanimous in their agreement that these barriers to generating new membership pose significant threats to maintaining and expanding the CERT program.

Secondly, is the mistaken assumption that any current CERT staffing level is sufficient; "They don't need me!" "What can I do?" Granted, taking the Academy training is a big step in making your family more secure when those learned skills are required. However, along with the sense of one's duty to family, shouldn't there also be a sense of duty to one's community for "services rendered"?

An "internship" of sorts should be encouraged, urged, and requested of every graduate, in reciprocity. This would help them understand how a CERT team functions in a community, how vital a community's CERT team is, and how much the team relies upon community input, ideas, guidance, and when necessary, financial support. There are many ancillary positions available for people who wish to assist and support in some way.

Website and "social media" page development and maintenance, newsletter writing, photography, fund raising, bookkeeping, office correspondence and clerical duties, using your home as a meeting place, or something as simple as speaking to promote your team to your church parishioners or local social organizations. Some CERT teams, like Valley Center CERT, are 501C (3) organizations, making financial, as well as donated goods and services tax deductible contributions! Each of these is an integral and essential part of every CERT organization. Every resident possesses some applicable skill they can offer. Contributing just a few hours each week in fellowship to share basic, yet vital team responsibilities, keeps a CERT team engaged, its support team and the population in general, informed and prepared!

In Conclusion

There is no greater benefit a community can receive from its citizens than having them involved in its operation and protection. Many of us have moved into our communities from elsewhere. We chose to live and "put down roots" there for a myriad of reasons. Yet one thread binds us all… we love our community! Otherwise, we'd leave it to move somewhere else. Yet, we haven't; no wildfire, earthquake, hurricane, flood, or tornado has been strong enough to drive us away from the place we call home.

Valley Center CERT command post staff reviewing scribe baord during 2017 Hideaway Lakes evacuation exercize. (Courtesy: VCCERT)

Since the community in which you live affords the lifestyle you currently enjoy, it must be something that you not only wish to preserve, but to see prosper and flourish. If this is true, then don't you owe it to yourself, your children, and families to become an active and integral part in supporting, protecting, and defending it?

The CERT Program offers you that opportunity! By joining CERT you provide another strong link in its formidable chain, binding neighbor to neighbor; a chain made all the greater—and stronger—with the addition of each new member. You never know what a positive difference your voice can make, or how valuable your participation and your ideas will become!

References:

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(3) Available **https://www.reference.com/science/reasons-many-people-live-ring-fire-dc0090820f93ab11**

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(5) Available at: **https://www.fs.fed.us/sites/default/files/2015-Fire-Budget-Report.pdf**

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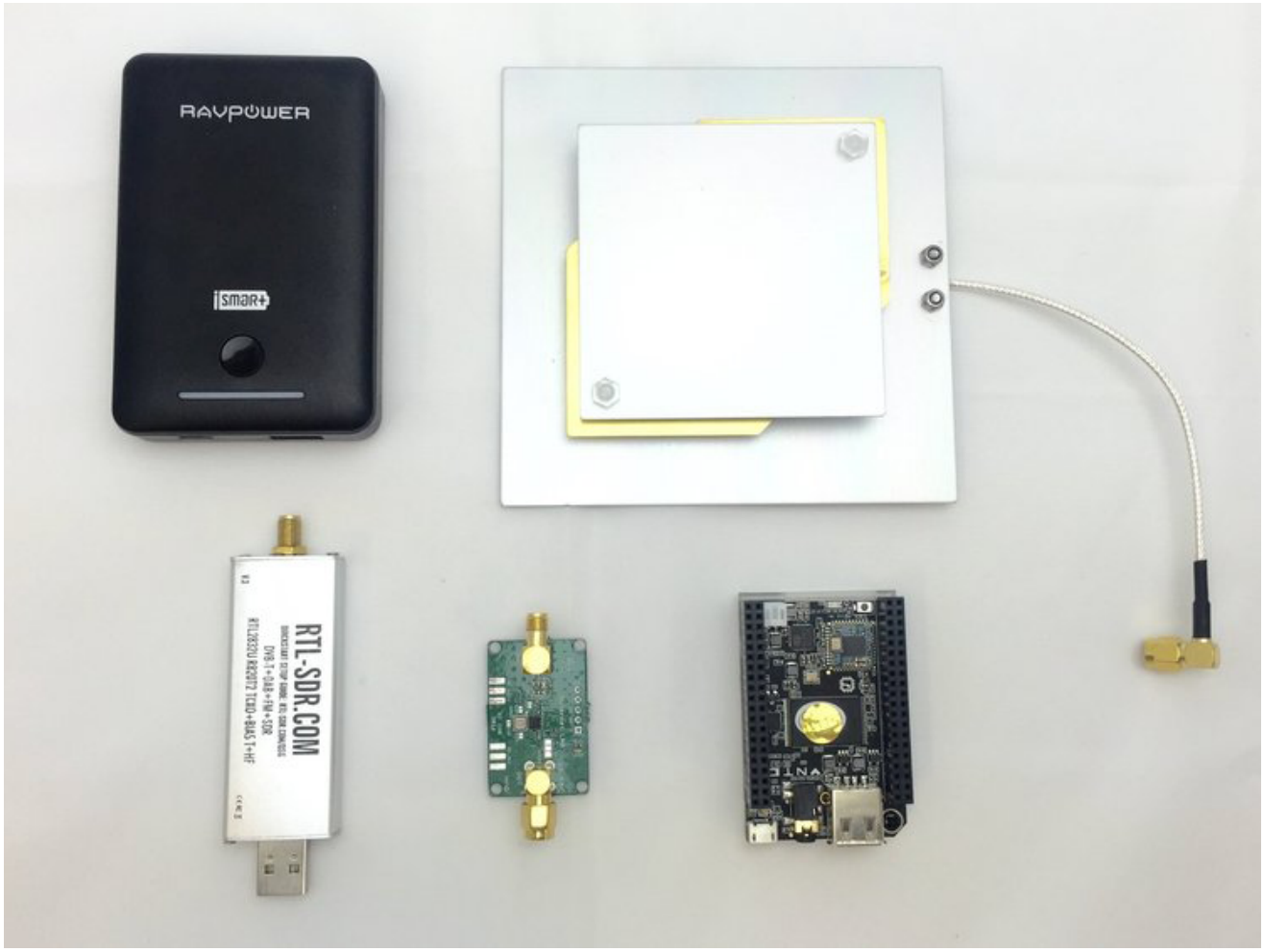


Outernet offers a Do-it-yourself L-Band receiver kit for users at any technical knowledge level, from the plug-and-play users to do-it-yourselfers. Deluxe Kit: $79 - $99 (+ shipping) Antenna, LNA, and SDR Radio, and a C.H.I.P. single board computer and optional battery for mobile power source. (Courtesy: Outernet)

Outernet Update: Free, One-Way Internet Now Via L-Band Satellite

By Kenneth Barbi

Outernet is an L-band satellite service aiming to be a "library in the sky" for all of the places in the world untouched by traditional wired Internet. Its signal, broadcast from multiple satellites, can be received from almost anywhere in the world. Outernet is currently continuously transmitting data consisting of daily Really Simple Syndication (RSS) news feeds in English, Hindi, Chinese, and Arabic.

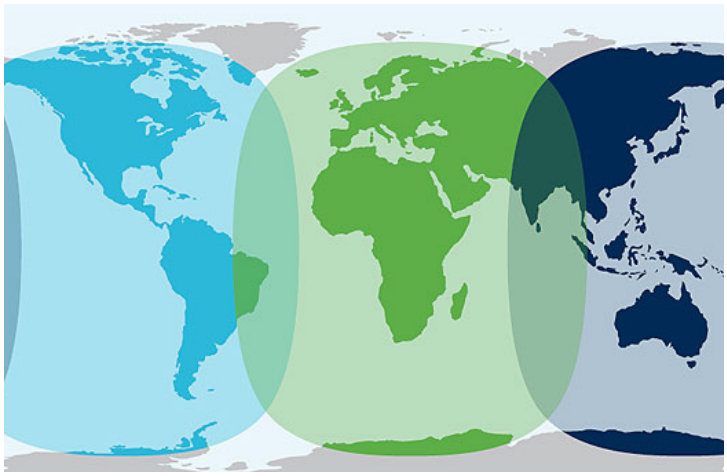
The feeds come from Voice of America (VOA), British Broadcasting Corporation (BBC), Al Jazeera, Deutsche Welle, EurekAlert!, MEDLINE, and the World Health Organization. In addition, there are worldwide weather updates from NOAA; Automatic Packet Reporting System (APRS) messages; books; images; and other data files. The service is free and can be received with a Software Defined Radio (SDR) such as the RTL-SDR, a low noise amplifier (LNA), and a 1.5 GHz antenna.

Their target audience is the people of the world not receiving Internet service. A detailed explanation of the service can be found on Outernet's web site at: **https://outernet.is/docs**

At the beginning of September 2016, Outernet terminated broadcast of its 1 GB/day preliminary data streams on commercial Ku-band satellites. They have refocused their efforts toward their flagship product—the portable L-band 20 MB/day Lantern receiver. Outernet's original Ku-band activities were detailed in my article appearing in the September 2015 issue of *The Spectrum Monitor*.

The new Lantern is very different in appearance from previous designs of Outernet L-band devices. The prototype Lantern has been made available to some project participants. But, you can buy components from Outernet's Chicago store at **https://outernet.is/products** from $79 plus shipping. Or you can order a complete Lantern receiver when they become available.

The changes in design and software are based on what Outernet learned from their Ku-band experience during the last two years.



Global coverage is made possible by using three L-band satellite-sa. From left: I-4 F3 Americas, at 98.4 degrees west (light blue); I-4 FA F4 Alphasat, at 25 degrees east (green); I-4 F3 Americas, at 98.4 degrees west (dark blue). If you are within any of these footprints, you can receive Outernet satellite signals). (Graphic courtesy of Outernet)

One of the most important lessons learned was why Ku-band wasn't working for the global community at large. Simply put, setting up a Ku-band system was a daunting task for many users in remote areas of the world. Mounting and pointing an 80-cm satellite dish was difficult. In several African installations, satellite technicians had to be deployed to do the job. With the L-band Lantern, everything you need is in one box, and pointing just requires a simple compass. Then just add power!

Another issue involved non-uniform reception patterns as Ku-band transponders often have tailored coverage beams. And, in some countries of the world, the very presence of an 80-cm satellite dish is an open invitation for immediate government shut down and operator imprisonment.

The Alpha Lantern has an internal 5300 mAh Lithium Ion battery and an external port for micro USB charging. It has an antenna beam width of 40 degrees and can be operated either stationary or on a moving platform such as a car or boat, which I have recently demonstrated in the Adriatic Sea off the Croatian coast.

Inside the box, a small CHIP computer handles all the processing. This unit operates on a global basis on L- band frequencies with signals broadcast over three of INMARSAT's eleven satellites. Reception is available on all continents and the open seas. The bitrate is 2 kbps, or 20 MB of content per day.

The three satellites are:
I-4 F1 APAC (Asia-Pacific), at 143.5 degrees east - - Frequency of: 1545.9525 MHz
I-4 FA F4 Alphasat, at 25 degrees east - - Frequency of: 1545.525 MHz
I-4 F3 Americas, at 98.4 degrees west - - Frequency of: 1539.8725 MHz

Outernet Lantern disassembled: L-band antenna is at upper left, power cord is at right. (Courtesy: Kenneth Barbi)

Alpha Lantern Components

When the Alpha Lantern is disassembled, you can see all the components neatly mounted under the cover.

Antenna

Outernet uses a small directional L-band patch antenna. The wide 40-degree beam width makes pointing easy—simply aim the Lantern in the general direction of the satellite. The antenna specifications are: 1525 -1559 MHz, 8 dbi, SMA Male connector, and 12cm x 12cm x 1.5cm, 3.5 oz.

Amplifier and Software Defined Radio

Amplifier Specifications: Frequency: 1525-1559 MHz, Center Frequency: 1542 MHz, Gain: 34 dB, Voltage: 3.0V - 5.5 V, Current Draw: 25 mA, Dimensions: 6.5 x 1.5 x 2.5 cm.

SDR Specifications: Ultra-low phase noise 0.5 ppm temp controlled crystal oscillator (TCXO), RF-suitable voltage regulator, custom heat sink; SMA female connector; SDR frequency range of approximately 25 -1700 MHz; Bias-T enabled, brushed aluminum body, 8.5 x 1.3 x 1.7 cm.

Alpha Lantern Power

The Boston Power Swing 5300 Lithium Ion Battery, supplied with the Alpha Lantern, has a capacity of 5300 mAh. It is capable of fast charging and has superior safety features. The Lantern has an external micro-USB charging port requiring a 2 A, 5-volt DC USB power supply to keep the battery charged, and to run the Lantern.

CHIP Computer

Finally, all this equipment connects to an inexpensive CHIP Linux-based computer (using an IC from Allwinner), which runs the display program called Skylark. The com-

puter also generates an internal Wi-Fi hotspot that can be received on any Wi-Fi capable device (computer, smartphone, tablet, etc.), or allow the Lantern to connect directly to your own Wi-Fi network.

Skylark

Skylark is the graphic user interface (GUI) display from which you access Outernet content. Using your computer, laptop, SMART phone or tablet connected to the Wi-Fi network over which Outernet is running, you simply open your favorite web browser, and go to my.outernet.is to find and connect to your Lantern's Skylark 1.2 interface.

Alternate Approache: Outernet in a Box

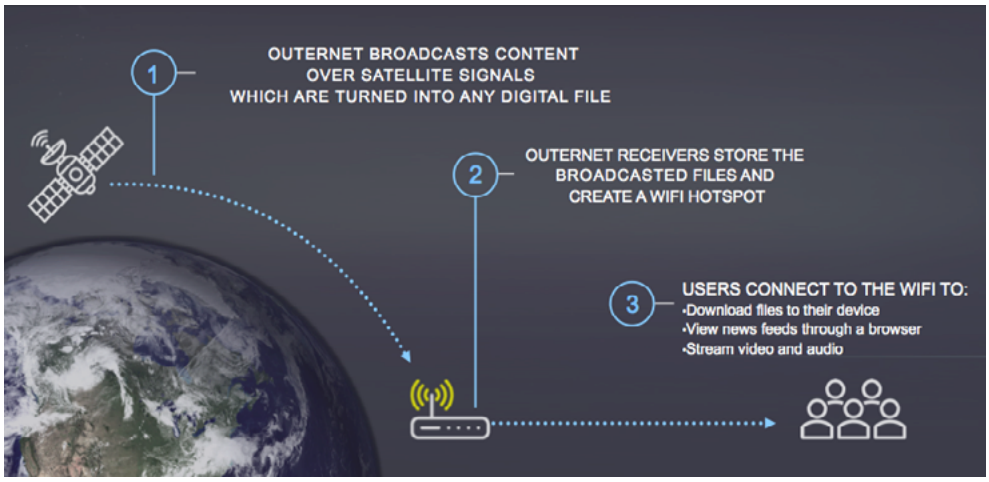
You don't need to use Outernet's hardware to receive their signals. There is another alternative—Outernet In A Box, which can run on a Windows 10, Linux, Macintosh or Solaris host. It uses Oracle's Virtual Box Version 5.1 found at **https://outernet.is/products**. With this approach, all you need is an SDR, LNA, and an antenna. Free software and instructions are available from Outernet at: **https://archive.outernet.is/images/OuternetInABox/Release_2**

After you install the Virtual Box software, you unzip the Outernet software and run it. It automatically sets itself up in your Virtual Box Linux emulation and runs. You won't get the fully visual product as with Skylark—just the downloaded files.

Outernet Broadcast Content

Outernet broadcasts face various copyright and permission issues related to the articles they transmit. Possession of a digital file, regardless of how it was obtained, does not give one the right to share and distribute it. Every work has a copyright holder who has the right to dictate how their work can be used and shared.

Unless you personally created the content you plan to upload to Outernet, you must make sure the content is openly licensed for sharing. This includes



Lifecycle of a file. (Courtesy: Outernet)

works that are in the Public Domain or have share-alike licenses, such as Creative Commons. Examples of permitted content include:

1) Public Domain works either that never qualified for intellectual property rights, or their copyright has expired (for example, a Mark Twain novel). Documents, reports, and Voice of America news articles created by the United States Government are excluded from copyright law and are considered to be in the public domain. Al Jazeera and Deutsche Welle have given Outernet permission to broadcast their RSS news feeds.

2) Creative Commons (**https://creativecommons.org**) offers licenses that allow creators and authors to communicate what rights they reserve and which rights they waive, enabling distribution of a copyrighted work.

At this time, anyone can send files (limited to 10 kB) to Outernet through Outernet's Filecast System at **https://outernet.is/filecast-center**, however, the files must conform to the above rules.

Conclusions

If you want to follow what is going on with Outernet's development, go to **https://discuss.outernet.is**, where many radio amateurs, Free-to-Air (FTA) satellite enthusiasts, and DXers are available to answer your questions. From the outset, Outernet has focused its efforts on providing information content for the part of the world under served by modern communication transmission facilities. Outernet has much to offer and is exciting to follow. I suggest you start your experiment with the CHIP computer, or the Outernet in a Box.

About the Author:

Kenneth Barbi is a retired Electrical Engineer with a degree from CCNY in NYC. He retired from the US Air Force after a 26-year career during which he specialized in HF long haul, microwave, tropo-scatter, and satellite communications. In the late 1980s, while assigned to the White House Communications Agency (WHCA), he implemented the first US government use of commercial Ku-band satellites to support President Reagan. In his final assignment at the Defense Information Systems Agency (DISA), he was the Defense Satellite Communications Systems (DSCS) Manager. He lives in Annapolis, Maryland, and can be reached at ftaenthusiast@verizon.net.

Before 1977, most home computers were kits requiring technical know-how. The TRS-80 represented a new generation of inexpensive, mass-market personal computers. It came fully assembled with a monitor, keyboard and pre-installed BASIC software, using an audio-cassette recorder for storage. (Caption courtesy of Computer History Museum; photo by Mark Richards www.computerhistory.org) The TRS-80 sold for $599 in 1977 ($2,407 in today's money).

Computers and Ham Radio: Part 010

By Cory GB Sickles WA3UVV

Last time, we covered some of the early days of big computers and the revolution that resulted in micro-computers and the hobbyist industry, as well as some of foundational electronics. With all the wire wrapping, kit building and emerging standards, one common question remained that many computer hobbyists hated to hear. "What can you do with it?"

Yes, a collection of chips with toggle switches and LED's that were blinking just weren't all that impressive to most visitors. Even when your house (shack) guests were other hams, they often walked away wondering why you didn't just put that money into a better HF transceiver or improved antenna installation.

Programming a microcomputer in binary, octal or hexa-decimal switches and keypads was a slow and error-prone exercise—often resulting in hours of debugging, to find out what you entered incorrectly. Something else was needed and it needed to be better. Coding in assembler language, a step up from directly entered op codes and data, wasn't enough. High-level languages, just like the ones some main-frames and minicomputers had, would make the job easier and would result in more interesting programs.

Going back to the Honeywell 200 I got to work with in high school, the programming language of choice was FOR-TRAN (FORmula TRANslation) a language designed for math and science applications. COBOL (COmmon Business Oriented Language) was used in most business settings, as it was especially good for billing applications and what would become known as "database" applications. Without bogging things down too much, there were other languages that found favor, such as ALGOL, PASCAL, RPG and others. However, these were typically implemented as compilers, which parsed through source code and then created machine-executable code. That was fine, as long as you had a lot of memory – which most hobbyists of the time did not.

Thankfully, there was another language known as BA-SIC (Beginner's All-purpose Symbolic Instruction Code) and it was most often implemented as an interpreter, meaning each line of source code was converted to executable code on the fly. The upside was that this required less memory

and temporary storage. The downside was your program ran slower than it would have through a compiler. As most hobbyists were more concerned with costs than speed, BASIC soon became a clear winner.

It was relatively easy to find a version of BASIC that ran in a "huge" 16 or 12K memory model, but a little trickier when limited to 8K—which had to also include your source code. The other "issue" at the time was that the prevailing version of BASIC was being sold by a guy named Bill Gates and he wanted $150 per copy. Enter a gentleman by the name of Tom Pittman and his breakthrough idea: TinyBasic. TinyBasic was available for $5 and allowed you to do just about everything that Mr. Gates' version did, within 4K of memory. There were even "reduced instruction set" versions of TinyBasic that could conceivable run within 2K, although that was somewhat 'shoehorned" in.

BASIC also was a good choice in programming because it allowed 99% of the code written in one flavor of interpreter to run on another. System calls or PEEK (memory location read) and POKE (memory location write) commands might be processor or machine-specific, but these were minor concerns.

My formal training had been in FORTRAN, but thanks to William Freas, a computer science teacher of a caliber well beyond what high school students deserved, I learned more about the concepts of how a computer worked and how it "thought" – enabling me to "see inside" the circuitry and quickly adapt the concepts from one language to another. Mr. Freas also taught (those who were paying attention) more about how to think, than merely what to think. He remains my all-time favorite teacher (next to my sister) and I was recently fortunate enough to be able to tell him so—over breakfast.

To compare the two, here's a simple count from 1 to 20 and print along the way program in three popular languages:

```
FORTRAN          BASIC

DO X=1, 20       FOR X = 1 TO 20
PRINT X          PRINT X
END DO           NEXT X
```

COBOL (from my aged memory) has a more verbose nature with:

```
DECLARE X BINARY-LONG VALUE 0
PERFORM VARYING X FROM 1 UNTIL X >= 10
DISPLAY X
IF X < 9
EXIT PERFORM CYCLE
END-IF
END-PERFORM
```

I think you get the point. The concepts are similar in nature, even if the commands to get the job done vary a bit. Back to the advent of TinyBasic. It seemed as though almost

Steve Wozniak designed the Apple II in 1977. The self-contained unit housed electronics, keyboard and power supply, with the BASIC language in permanent memory. A TV served as the display. The floppy disk drive (1978) and spreadsheet program VisiCalc (1979) made it a blockbuster. (Photo by Mark Richards, caption by Computer History Museum www.computerhistory.org)

overnight there was a plethora of programs to find and use to build others upon. More importantly to some, there were games that could be played on the same computers that previously didn't do much and left many scratching their heads at the wonderment of others.

By the time I took delivery (three month wait) of my first radio Shack TRS-80, BASIC in ROM was a common option. Here, you just turned on the computer and BASIC was available and ready. No running commands through a rudimentary monitor program, then loading BASIC on paper or cassette tape. No sir, just turn it on and BASIC was ready to go.

When my fledgling custom software design and computer accounting business (my clients were accountants, not their clients) was up and running, I was using a small 16-bit DEC PDP-11/03 (LSI-11) based, Heathkit H11 with 8" floppy disks and paper tape reader – so that input could come from several off-line Teletypes, akin to the card readers and keypunches I learned on.

The advantage of the H11 over a "real" PDP-11/03 was that the H11 came with a bundle of software, (free!) including languages. The BASIC included didn't handle floating-point numbers very well, so I ended up porting the applications I'd written for my TRS-80 to the supplied version of FORTRAN. It may be the only accounting package ever written in FORTRAN - but it worked pretty well,

With more money coming in from that, I was able to buy more ham gear and even programmed the H11 to steer my satellite antennas. Through a few "flukes of the universe" the brand-new OSCAR-7 satellite I enjoyed in the 70s is the same OSCAR-7 that's come back to life and continues to provide enjoyment, approximately 40 years later.

As my built-out TRS-80 and H11 had disk drives

attached to them, they also supported disk operating systems – TRS-DOS and RT-11, respectively. Operating systems created further compatibility between various computer platforms. While some were manufacturer specific, there were those that crossed such lines – dependent instead on processor families.

The finest example of these was CP/M, (Control Program for Microcomputers) created by Gary Kildall. While working at Intel, Gary came up with this operating system and discussed it with his employer. They stated, in essence, that they were a hardware company and had no interest in software. This left him free to own and market it through a company he later created known as Digital Research. CP/M could operate on any micro with a Z-80, 8080, 8085, etc. processor. The specifics of each computer model (I/O ports, ROM location in the memory map, etc.) could be customized and "patched" into the supplied source code, assembled into the OS with the supplied assembler and made to run rather easily.

CP/M was immensely attractive to commercial computer manufacturers. It made life so much easier for language producers and applications developers, too. With all of this portability in play, software development exploded. Certainly the commercial business sector benefited, but so did those niche markets – such as amateur radio. We saw electronic logbooks, DX databases, RTTY and CW "Glass Teletype" applications appear in ham shacks, along with games and utilities.

In a relatively short time, MP/M, a multi-user version of CP/M, was developed and found favor in many businesses. A four-user MP/M system could replace the functionality of a small departmental minicomputer—at a substantial savings. "Hardcore" multi-op contest and DX stations also implemented MP/M in customized multi-user logbook and related database applications. Such things might show up in business environments first, with hams figuring out how to reshape these ideas for our own purposes.

CP/M was certainly a standard. In micros based on Motorola 6800 or 9809 chips, you found operating systems like Flex and OS-9. Plus, there were some others that ran on Intel processors, even one ported down from the minicomputer world—Pick. Also, you could get an operating system that was processor independent—UCSD Pascal.

UCSD Pascal, AKA "Scud Pascal," applications could run on Intel, Motorola, MOS Technology and PDP-11 based systems, without modifications. The OS kernel was specific to each chip's architecture, but that was transparent to the users. The only downside of UCSD Pascal was that all this portability came at a cost—speed. While it ran equally well on many systems, it also ran with great lethargy.

When Intel released the 8086 – their first 16-bit processor that could address a (huge for the times) entire megabyte, it allowed for 16 times the amount (64K) of RAM that 8-bit systems could. Digital Research soon released CP/M-86 and Microsoft released a new set of programming languages to take advantage of the new frontier.

Introduced in 1981, IBM's first personal computer arrived nearly 10 years after others were available, but instantly legitimized the market. Unlike most previous IBM products, the PC incorporated hardware and software from other companies. IBM published design details, inspiring often superior "clones." (Caption courtesy of Computer History Museum; photo by Mark Richards www.computerhistory.org)

Meanwhile, down in Boca Raton, Florida, a rogue project was being worked on within the walls of a company that frowned upon rogue projects—IBM. IBM at that time was anything but the epicenter of free-style innovation. IBM had avoided the microcomputer market like the plague. Microcomputers were "toys" and IBM sold "real" computers. Sure, they had created small systems like the System/23 and 5150, but these were hardly what anyone would have called "personal."

Nonetheless, the announcement of the IBM PC in August 1981 shook the industry. The design team gambled and took serious chances (including almost losing their jobs) to create a system with a 8088 (little brother of the 8086) 16-bit processor, that offered up to 640K of RAM, monochrome or color displays and up to two 5.25" mini-floppy drives. It also eschewed the IEEE-696 (S-100) bus and offered its own "non-standard" (as more than one reviewer wrote) buss.

Without a doubt, the original IBM PC was a game changer.

But before the announcement, much work was being done and part of that work was establishing what operating systems, language and ready to run applications would be offered. In Bellevue, Washington, some IBM execs met with some Microsoft execs. After IBM asked to have some sig-

natures placed on an NDA (non-disclosure agreement) they explained what their computer project was and their need for an operating system.

Microsoft's response was essentially that they were a language company, not an operating system company (although they were working on XENIX – a version of the UNIX operating system for micros) and suggested that IBM might want to talk to the good folks at Digital Research.

IBM contacted Mr. Kildall to arrange for a "visit," but, of course, didn't say why they wanted to meet. As no one expected IBM to enter this arena and Gary had no idea what significance this "visit" might have, he later shrugged off the appointment and went golfing; leaving his wife to handle things when company came calling.

Again, IBM asked for an NDA to be signed. She wanted to know why and what this was all about. They said they'd tell her, as soon as she signed the NDA. She wouldn't sign the NDA until she knew what it was about. IBM left and the Kildall's still had no idea what *that* was all about.

IBM again contacted Microsoft – relaying what happened on their trip to California – asking if they knew of any other possible companies that could provide an OS. By this time, Microsoft was regretting their decision to let IBM walk away. Also, the XENIX project was running behind schedule and costs were increasing. They scheduled another meeting with IBM and essentially said "yes." The idea was that they would figure out how to do it, after getting the deal.

During some research, Microsoft found a small developer that was offering something called "DOS-86" – a disk operating system for microcomputers using the 8086 microprocessor. As the legend goes, Microsoft offered a payment of more money than the developer had ever seen before and all intellectual property was handed over for a one-time fee.

Out of this OS came what we came to know as MS-DOS and the IBM-specific PC-DOS. While IBM had an extensive legal department, they failed to see that while Microsoft had agreed to produce PC-DOS for a one-time fee, it was not an exclusive deal. Thus, what Microsoft created for IBM could also be sold to others.

There's a longer story behind all of this, but I've covered the highlights. Perhaps sometime in the future, I'll write it all up in far more detail and specifics.

The IBM PC was certainly a success. It spawned "PC compatibles" – which weren't always all that compatible – and MS-DOS compatibles, with a much greater "slop factor" when it came to running PC software. Microsoft made money off all of these platforms, plus their line of languages. XENIX was eventually finished and their big customer was Radio Shack, who used XENIX as the OS of choice for their new Model 16 multi-user computer system. Eventually, XENIX went on to be offered for other computers – including the IBM PC, XT, AT and so on.

With the IBM PC, hams who had not yet incorporated a micro into the shack finally became interested in learning more and adopted this platform – even if it was only a "compatible." More and more software was developed and much sharing of ideas happened, simultaneously. While the PC platform became the leading standard – and still is – there was another computer project going on that would eventually offer a smart alternative – the Apple Macintosh.

Introduced in 1984 and made in East Germany, the Robotron Z9001 was the first computer in a series that used the U880 microprocessor, a clone of the Zilog Z80. Many games were created for the Z9001, but the computers were mostly used in schools and government institutions. (Caption by Computer History Museum, photo by Mark Richards www.computerhistory.org)

Hams (and most people) were used to the idea that computers displayed text only, unless some special graphics board was installed. With the Apple II series, the idea of graphics being integral was at the foundation of their designs. Apple was looking for something greater (not just better) than the Apple II as the next generation of offerings. They heard of a cutting edge graphical interface running on something new that Xerox had developed at their PARC (Palo Alto Research Center) facility.

After an introductory telephone call, a few key people at Apple were granted a friendly tour of PARC and a new workstation that offered WYSIWYG (What You See Is What You Get) graphics and a new pointing device called a "mouse." The guy in charge had no qualms about answering any and all questions (no matter how technically extensive) but his female "second in command" did. She feared that they might be "giving away the store," but he did not. She was right.

After the crew from Apple left, they knew what they wanted to do with the new platform and WYSIWYG plus a mouse was at the core. When the Macintosh 128K was introduced, I'm sure the lady at Xerox had more than just an "I told you so" look on her face.

Software certainly drives hardware sales. For each new platform, there's a "killer application" that stands out as the thing that drove sales and made that computer system become a staple in certain circles. For early TRS-80 and CP/M systems, it was work processing and accounting. For the

Apple II, it was an electronic spreadsheet known as VisiCalc – allowing you to do projections and quick formulaic "what if?" computations on the fly. For the IBM PC, the spreadsheet grew up and became Lotus 1-2-3. For the Mac, it was desktop publishing.

With the advent of WYSIWYG editing and a line of printers that produced better looking (although somewhat crude by the standards of today) images, all manner of printed materials started looking better. As laser printer prices came down and feature sets increased, manuals and radio club newsletters took on a more professional look – with many pictures and diagrams possible.

Just as Apple "borrowed" from Xerox PARC, so did Microsoft "borrow" from Apple. WYSIWYG came to the IBM PC in the form of – wait for it – OS/2. I know, you were going to say "Windows" but since IBM hadn't quite learned their lesson from their previous tryst with Microsoft, they contracted with Microsoft to produce something that would allow their systems to offer what the Mac could do.

While Microsoft was quietly deconstructing the Mac – in order to produce applications, languages and such – they started taking the new knowledge and incorporated many of the concepts into OS/2. Also, they used those ideas to create – here it comes – Windows – with a few differences.

OS/2 required 8M of RAM in order to run smoothly. Windows was equally happy with 4M. Windows screen drivers were also faster. It's a short list of differences, but it gave many pause as to why the internal product ran "better" than the contracted product. I'll leave that for others to debate.

By the time all of this had happened, Packet Radio was the hot topic in hamdom. While Packet Radio was perfectly happy in a text-only world, there were other extensions that could take advantage of graphics – such as TCP/IP (Transport Control Protocol / Internet Protocol) AKA "AMPRNet," in a group of IP addresses with "44" as the first number. We know TCP/IP as the basis for the Infobahn, long before the World Wide Web made it a more enjoyable place to exchange information.

TCP/IP and Packet Radio made over the air callsign lookups and other utilities possible – including remote access to on air bulletin boards and applications on them. Certainly, 1200, 2400 and even 9600 baud circuits were not "fast," but they were fast enough. Gray-line globe representations were possible and diagrams could be passed with relative ease – as long as you had the patience.

The online computing experience required patience through much of the process. Model speeds of 300 or 1200 baud were normal at one time. Then 2400 baud went from "exotic" to "standard." Eventually, we scaled up to 9.6, 14.4, 28.8, 33.6 and finally 56 kilobaud for dial-up lines. Bulletin Board (BBS) sites popped up and allowed us to share software, exchange emails and participate in chat rooms and special interest groups. While "stock" Packet Radio was a closed, radio-only environment, TCP/IP allowed for portals to the Internet and a number of the resources it held – as long as the information being exchanged was of a non-commercial, non-advertising nature.

After the introduction of the World Wide Web, avoiding verboten content was made easier with non-graphic, text-only browsers such as Lynx. Such portals also allowed traffic to pass through faster paths, such as a satellite link across the Atlantic – known as LONNY (LONdon New York) – which allowed for real-time QSO's and possibly the first Internet enhanced digital radio.

This brings up an important point, too. Ever since personal computers arrived on the scene, nattering nabobs of negativism have bemoaned how new technology would be the death of ham radio, the opposite has been proven, time and time again. Instead of the Infobahn hurting us, we've found ways to use such tools to help up make ham radio better and more enjoyable for many.

As I've been typing this – on a Mac – I've been listening to chatter on several of my DV (digital voice) radios – with voices from all over the world coming to me via DMR, D-STAR and especially System Fusion. On my HF rig, I see simultaneous PSK contacts in progress – with most stations running 5W or less – on a day when propagation is in the non-good category. If I become curious about a callsign I've heard or someone I've just contacted, I can look them up on QRZ.com and – if they took time to write up a short biography – learn more about them and their areas of interest, enabling us to have a more enjoyable conversation.

When I go to design a Go Kit or some station accessory, I have software to assist with that design, instead of just having to sketch it out on paper. My radio clubs' newsletters are distributed electronically, saving each of them thousands of dollars in unnecessary paper, ink and postage costs. This magazine that you are reading represents a more timely news and article source than any print publication – because each issue doesn't need to be put to bed months in advance, in order to meet the schedule at the printer and mailing facility.

If I want information on a new product – which I probably heard about through one of the social media or special interest group email reflectors I subscribe to, I can immediately go to their web site – no matter the time zone or physical location – and get the information I'm looking for. If I want to see if there are any transceiver mods that will give me better keying on CW or increased audio response, it's probably out there on the Infobahn. Likewise, I can share what I know with others and Elmer to a much greater number of fellow hams than I ever could in person.

Microcomputers – driven by software of all sorts – have enhanced amateur radio to a level we could not have conceived of back in the early 1970s. The innovations upon innovations have allowed the revolution and evolution to continue to a point where we have modes and ways to communicate – on and off the air – that would remain unrealized if not for the efforts of so many.

So what's next? What lies beyond microprocessors? What would today's transceivers look like without embedded digital logic? Stay tuned for the wrap up in Part 011 and see.

TSM

Rear view of a solid multi-panel antenna with a true D-ring chain drive horizon-to-horizon motor, made by DH Satellite in Wisconsin. It's available in sectional panel design for more efficient shipping, in sizes of 3.0, 3.7, 4.2, 4.5 and 5.0 meters. (Courtesy: DH Satellite)

Motorized Ku-Band Satellite Reception

By Mike Kohl

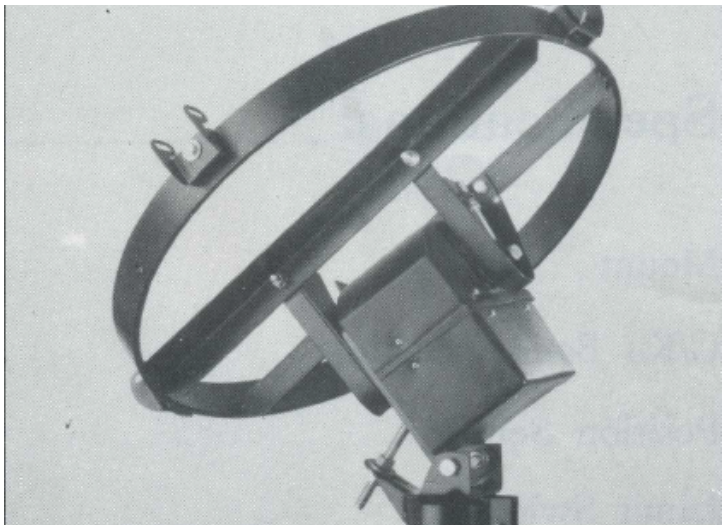
Last April we covered Ku-band reception in general, with analysis and suggestions on how to most effectively create a system for multi-satellite reception. When you do not have the real estate to install multiple antennas, the only option is to install the largest appropriate antenna that you can afford, with a reliable motor device. Should real estate be the only limitation, and dollars are not limited, one could consider a commercial installation that could be the equivalent of and draw envy from the big boys. See the rear view of a solid multi-panel antenna with a true D-ring chain drive horizon-to-horizon motor, made by DH Satellite in Wisconsin. It's available in sectional panel design for more efficient shipping, in sizes of 3.0, 3.7, 4.2, 4.5 and 5.0 meters.

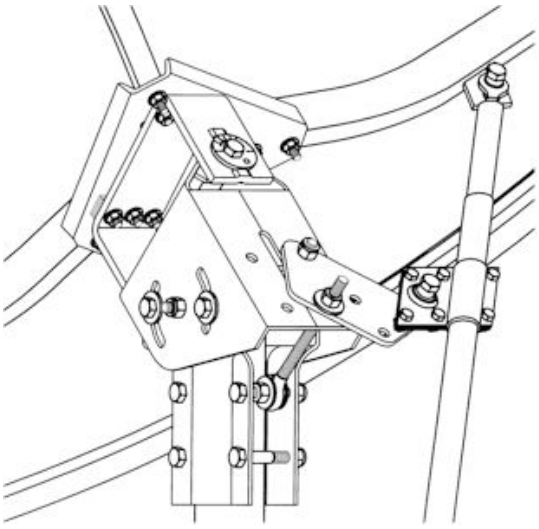
You could equip it for Ku-band only, but given the high quality in construction and the money spent, C and Ku band would be strongly suggested. Heavy materials starting from the size of the mast pipe and the amount of cement required to secure it, to the extremely stable positioning abilities of the 160-degree capable mount make this a most reliable system. This features a 60-inch diameter back ring and a travel time of under five minutes to cover 160 degrees of travel. Actuator power = 5 amperes of current. A lighter duty polar mount version utilizing a linear actuator can move the antenna with a consumer rated big dish positioner that draws up to 2 amps of current.

There are other manufacturers available, including General Dynamics-Prodelin and Challenger Antenna, which may have antenna systems suited to your requirements. Please contact the author for recommendations. If this is too rich for your blood, smaller Ku-band antennas are available. Polar mount versions are much easier to mate to a linear actuator motor drive, but those so inclined to some scrounging and fabrication on their own might consider solid offset type Ku-band antennas and adapt an existing motor system to it.

One challenge to conquer will be the need to compensate for the typical 20 to 25 degree offset angle design of offset antennas. You are not only going to have to make a relatively large diameter antenna track the geosynchronous satellite arc, but simultaneously have a way of inputting tracking declination as well as the mount elevation into the design. Polar mounts are not only going to cover less azimuth distance across the sky, but dropping elevation more than 20 degrees in comparison to a center fed prime focus antenna will shorten the amount of mount travel before the back of the antenna and mount attempt to crash into the mounting pipe.

One method of compensating is to install the offset dish upside down, with the drooping feed or LNBF device ABOVE rather than BELOW the antenna. This has its limits too, possibly doubling the number of degrees of elevation and sometimes making the LNBF unreachable without a very tall ladder. A conventional offset reflector mounted with feed on bottom side of the antenna with a true elevation almost vertical may end up with a required elevation above 50 degrees when turned upside down. Antennas with elevations above 45 degrees make it much more difficult to remove snow.





Left: AJAK Patriot antenna horizon-to-horizon mount. (Courtesy AJAK) Right: Paraclipse conventional polar mount with actuator arm connecting to the dish at the right of the drawing. (Courtesy: Paraclipse)

A prime focus solid antenna on a polar mount with a linear actuator may be the easiest design of antenna for the novice installer to successfully make track across the geostationary arc. Please remember that many polar mounts may be limited to 90 or 100 degrees of azimuth travel, depending upon length of linear actuator, and the attachment points of that linear actuator. While a relatively short distance of travel may be accomplished when attaching the linear actuator far away from the polar mount pivot point, such an installation will be far more stable and resistant to the wind when compared to, let's say, a motor drive moving end connection only a foot out from the pivot point.

Linear actuators and polar mounts may the easiest parts to obtain for motorizing a Ku-band antenna system. However, if you can locate an operational horizon-to-horizon mount built by a reliable company such as AJAK, you may be able to improve on the stability of the antenna pointing when using medium diameter antennas. The top picture above shows the light duty AJAK Patriot horizon-to-horizon mount that was originally sold for motorization of mesh antennas up to seven feet in diameter. AJAK made the motor part of the device, and as pictured, there were usually four "wing" type attachments bolted to the motor, allowing one to cut and fabricate a piece of angle steel or aluminum and pin one piece horizontally above and another below center on front of the AJAK Patriot motor.

Study the distances formed by joining these four points, and compare the distances formed between four similar holes originally drilled through the antenna surface (or carefully drill a set of matching holes). Try to use existing holes if possible.

Locate a source of angle aluminum or iron bar with 1-inch x 1-inch x 3/16-inch diameter. Measure below and have it cut to proper lengths. It is recommended to cut two box aluminum or iron pieces at least one foot longer than the distance between the pre-drilled holes formed with two side-by-side "wings." Enlarge holes to at least the same diameter, and loosely install two sets of machine bolts, four flat washers and two nuts. About 2 inches inside from the outer edges of angle material, mark for drilling at least a 3/8-inch diameter hole through each piece. Remove hardware and drill these two holes into the angle material. Reinstall and tighten with a wrench, so that you have two bars secured to front of all wing connections.

If the vertical separation distance between four holes on the wings is no more than one inch apart, cut two more pieces of horizontal material the same length as above, loosely install horizontally on back of antenna reflector after marking and drilling matching holes in metal bars to four pre-drilled holes on back of antenna. If there is further vertical distance to match holes on back of antenna with holes in wings at front of HH motor, tighten hardware securing two horizontal bars to back of antenna. Measure vertical height between holes on four wings in front of motor. Cut two more metal bars about six inches longer than this vertical height distance. Line up vertically with four wing holes and mark these metal bars to match, drilling two holes in each vertical bar. While keeping vertical distances aligned, move these two vertical bars to meet at right angles the two horizontal bars on back of antenna. Mark and drill at four intersecting points between the two vertical bars with 3/8-inch holes. Pin together with four 3/8-inch bolts of sufficient length, and four 3/8-inch nuts. Tighten.

Now carefully cut some 3/8 inch threaded rod into 18-inch lengths. Suggest splitting two 36-inch pieces.

Install loosely through the outer four holes using above threaded rod, (16) 3/8-inch nuts and at least 8 flat washers (unless you wish to use 16 to cover both sides of all connections). You may have to slightly enlarge the holes to allow full adjustment, so confirm how easily things move in and out before tightening all hardware.

Top of the antenna will need to be pushed out for the number of degrees of declination for your area, as compared to a straight line formed by the four "wings". Digital angle finder suggested for precision, unless you have lots of time for playing and guessing.

Latitude & Declination 60 = 7.5 55 = 7.1 50 = 6.7 45 = 6.1 40 = 5.6 35 = 5.1 30 = 4.4 25 = 3.8

Assuming you have declination set correctly, set elevation while at due south to pick up due south satellite.

Remember to check antenna manufacturer's declination specification, as elevation will be that many degrees lower at due south, than when viewed with a prime focus antenna.

A regular polar mount such as the simple Paraclipse shown above will work in a similar manner, as long as the declination is set normally and the elevation is lowered to compensate for use of offset antenna.

During the 1990s, Italian manufacturer IRTE introduced a dual axis motor in a miniature device that used a single coax to alternately send an up/down command that moved an elevation motor, followed by a second command to move the azimuth motor. DC voltage to the receiver was shut off during the process, and returned to the center of the coaxial cable to power the LNBF once motorization was completed.

An elegant but simple solution that sold well in Europe and Asia, but may have been ahead of its time in America. Soon afterwards IRTE developed a DiSEqC motor, which is pictured below. It included a horizon-to-horizon motor mounted on a pipe (anywhere from 2 to 3 inches outside diameter), with an offset dish mounted on a small pipe at the top of the motor. This device included a polar mount, and was made in the standard HH90 model, as well as a heavier duty H-120. It was also private labeled and sold by Fortec, which was the North American distributor. A very reliable motor that became very popular during the early 2000 decade. Models are still available by special order from select suppliers.

Atlanta-based DMS International worked with a company called Moteck, and produced something similar called an SG-2100. Unlike the above IRTE unit, the motor was on top, and the mounting mast pointed downward. It was pretty reliable, and was quite capable of continuously moving offset antennas in the 4-foot-120 cm diameter range. One thing that took a bit of getting used to was the mounting method BELOW the motor. The author did not like this design in situations such as the Paraclipse 90-cm Millennium antenna, sold in the early 2000s, that had a tab inside the top of its mounting head, that needed to be trimmed off with a powered metal saw, otherwise you used a competitor's cheaper mount that had one or two U-bolts.

Dishonest manufacturers in China caused major headaches for DMS when they started producing a similar but poorly made DiSEqC motor with the same model number SG-2100. Sold very cheaply, many unwitting consumers bought them and immediately upon attempting to install, realized they had a boat anchor disguised as a satellite positioner motor. DMS was then flooded with complaints from people thinking they had bought a genuine SG-2100 motor, and wanted warranty repair or replacement for a product that DMS never had a part in producing or importing. The

Italian made STAB H1-120 horizon-to-horizon Ku-band offset fed satellite dish. (Courtesy of the author)

eventual result was that DMS discontinued offering a model SG-2100, and there are still knockoff counterfeit units sitting on the market today, awaiting a purchaser looking for a bargain. This situation did not help the reputation of DMS (not their fault), and despite producing some heavier duty models with different part numbers, enough missteps were made in the market of selling DiSEqC motors that they no longer carry them at all.

The result of all of this is that anyone wanting a Ku-band motorized antenna needs to be vigilant and selective when specifying and purchasing equipment. There are a few better-built units out there, but they are overwhelmed in number by poorly made devices. The track record of small motors in general is now checkered, and the author personally avoids the low end of the market because they normally will not last through a full winter season even in the middle of the United States.

The old adage that you get what you pay for has seldom been truer, because enough bad apples marketing DiSEqC motors have tainted the reputation of this product in general. Other advice includes that you should seek recommendations from existing owners of these systems to avoid problems in general. Take the time to do some education on what channels are available with different sizes of antennas. Use high quality Ku-band LNBFs and take a look at the performance of those that claim PLL performance and/or design—another marketing area where there are sometimes unrealistic claims

Avoid the use of C/Ku LNBFs, which were never designed for antennas this small in diameter, and are not matched to the depth of Ku-band antennas. Even with the proper special C-band conical adapter with a C-band LNBF, very few channels will actually work on a 36-inch or smaller antenna. It is against the laws of physics. **TSM**

Scanning America

By Dan Veeneman **dan@signalharbor.com**

Marin County (CA); North Dakota and Radio Shack Bankruptcy (Again)

Springtime often brings changes, and this time is no exception. Upgrades, licenses, and a familiar bankruptcy are in store this month.

Marin County, California

Marin County, California is in the process of implementing a new APCO Project 25 (P25) Phase 2 trunked radio system.

Marin County is located on the Pacific Ocean coast, across the Golden Gate Bridge from San Francisco and has a population of about 252,000 people. It covers just over 800 square miles, about a third of which is water.

In December of 2013, the Marin Emergency Radio Authority (MERA) Governing Board reviewed a feasibility study for a new public safety radio system and determined that a 700 MHz P25 Phase 2 system would be the choice for what they termed the Next Generation system. Marin County voters approved funding for it via a parcel tax in November 2014.

In March of this year the Marin County Board of Supervisors approved a contract with Motorola for a new 700 MHz P25 Phase 2 system to support all members of the MERA, a countywide group of public agencies and first responders formed in 1998. The new system will provide communications for law enforcement, firefighting, public works, transit, and local government operations.

The new system will be organized into two "cells," one for the eastern part of the county and the other for the western part.

The eastern cell will have 13 channels operating from seven repeater sites. Because this will be a P25 Phase 2 system, each channel can carry two conversations. With one channel configured as a dedicated control channel, the remaining 12 channels will be able to carry a total of 24 simultaneous conversations. Repeater site locations are Big Rock, Dollar Hill, Mt. Barnabe, Mt. Tamaplais, OTA Broadcasting, San Pedro and Wolfback Ridge.

The western cell will have 10 channels operating from five repeater sites, located at Marshall, Muir Beach, Pt. Reyes, Stewart Pt. and Tomales.

All of the repeater sites will be connected via a microwave backhaul network.

The plan includes new dispatch consoles at nine locations, including the Communications Center, the Marin Backup Center, Novato Police Department, San Rafael Police Department, County Fire at Woodacre, Fairfax Police Department and the County Jail.

The new system will be installed in phases, upgrading equipment and testing new channels over the next two years. Final system cutover is planned for early 2019.

The Marin Emergency Radio Authority currently operates a Motorola Type II SmartZone system carrying a mix of analog and P25 digital voice traffic. It was purchased back in 1998 for about $21.4 million. It operates from more than a dozen repeater sites, including the following:

Site	Channels
Barnabe Mountain	7
Big Rock	11
Bodega Bay	5
Stewart Point (Bolinas)	5
Burdell Mountain	11
Dollar Hill	11
Forbes Hill	11
Mill Valley City Hall	11
Mount Tamalpais	7
Point Reyes Hill	7

San Pedro Ridge	11
Sonoma Mountain	6
Mt. Tiburon	11

Several of these sites will not be used in the new Phase 2 system, including Bodega Bay, Burdell, Forbes, Mill Valley, Sonora and Tiburon.

The current system operates on 34 channels in the UHF-T band, which is spectrum that was previously used for television broadcasting.

The system is organized as two simulcast zones (East and West) and three repeater "fill-in" sites. The eastern zone has six repeater sites and two additional receive-only sites for improved coverage, all of which operate on 11 channels. The western zone operates on seven channels from three repeater sites.

East Zone: 482.3500, 482.6250, 482.6500, 482.7875, 482.9375, 483.0250, 483.1250, 488.7000, 489.0750, 489.9125 and 490.9375 MHz

West Zone: 482.9750, 483.0500, 483.1500, 488.4250, 488.8500, 489.1000 and 483.5125 MHz

Sonoma Mountain: 482.3250, 483.5375, 488.4000, 488.4750, 488.7250 and 488.8750 MHz

Bay Hill (Bodega Bay): 488.9750, 489.3250, 489.7000, 490.1000 and 490.7250 MHz

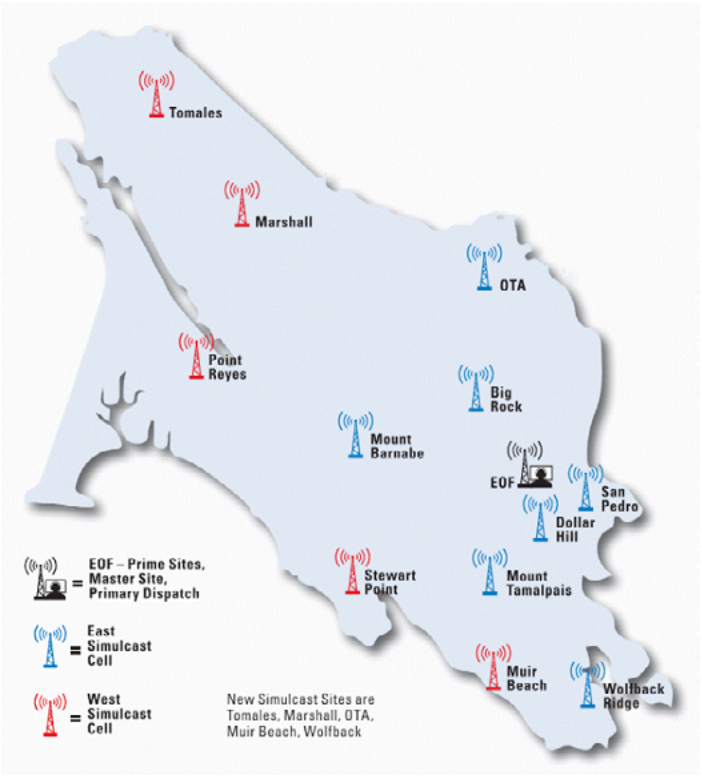
Stewart Point (Bolinas): 483.0250, 483.9500, 488.4750, 489.4500 and 490.8000 MHz

Some scanners may require a custom frequency table to properly track conversations on the system. Use the following settings for a Custom Frequency Table:

Base	Spacing	Offset
482.0000	12.5	380
488.0000	12.5	570
490.7250	12.5	739

There are a number of active talkgroups on the system.

Decimal	Hex	Description
9600	258	Marin County Open Space District (Tactical)
9680	25D	County Humane Society
9712	25F	County Public Works
9808	265	Civic Center Yard
9840	267	Nicasio Yard
9872	269	Marin County Parks & Recreation (Tactical)
10032	273	County Fair
10160	27B	Marin County Parks & Recreation (Tactical)
11600	2D5	Corte Madera Public Works
12016	2EF	Fairfax Public Works
12400	307	Larkspur Public Works



Marin County simulcast sites. (Courtesy: MERA)

12816	321	Mill Valley Public Works
13200	339	Novato Public Works 1
13232	33B	Novato Public Works 2
13616	353	Ross Public Works
14416	385	San Anselmo Public Works
14800	39D	San Rafael Public Works 1
14832	39F	San Rafael Public Works 2
14864	3A1	San Rafael Public Works 3
16400	401	Sausalito Public Works
16816	41B	Tiburon Public Works
18000	465	Marin County Parks & Recreation Rangers (Dispatch)
18032	467	Marin County Office of Emergency Services
18064	469	Urban Search and Rescue 2 (Tactical)
18096	46B	Urban Search and Rescue 3 (Tactical)
18128	46D	Marin County Transit District Whistlestop Wheels (Paratransit)
18368	47C	Special Event 2
18400	47E	Special Event 3
18432	480	Special Event 4
18464	482	Special Event 5
18496	484	Special Event 6
18528	486	Special Event 7
18560	488	Special Event 8
18592	48A	Special Event 9
18624	48C	Special Event 10
21616	547	Municipal Fire South G2 (Control)
21648	549	Municipal Fire South G3 (Control)
21680	54B	Municipal Fire South G4 (Tactical)
21712	54D	Municipal Fire South G5 (Command)
21744	54F	Municipal Fire South G6 (Tactical)

21776	551	Municipal Fire Central F2 (Control)
21808	553	Municipal Fire Central F3 (Control)
21840	555	Municipal Fire Central F4 (Tactical)
21872	557	Municipal Fire Central F5 (Command)
21904	559	Municipal Fire Central F6 (Tactical)
24016	5DD	Marin County Fire (Administration West)
24080	5E1	Marin County Fire H2 (Dispatch)
24112	5E3	Marin County Fire H3 (Dispatch)
24144	5E5	Marin County Fire (Tactical)
24176	5E7	Marin County Fire (Command)
24208	5E9	Marin County Fire (Tactical)
24240	5EB	San Rafael Fire (Tactical)
24048	5DF	San Rafael Fire (Tactical)
26416	673	San Rafael Fire (Control)
26448	675	San Rafael Fire (Control)
26480	677	San Rafael Fire (Tactical)
26512	679	San Rafael Fire (Command)
26544	67B	San Rafael Fire (Tactical)
26576	67D	San Rafael Fire (Administration)
28816	709	Novato Fire (Control)
28848	70B	Novato Fire (Control)
28880	70D	Novato Fire (Tactical)
28912	70F	Novato Fire (Command)
28944	711	Novato Fire (Tactical)
28976	713	Novato Fire (Administration)
32016	7D1	Municipal Fire Central F15 (Administration)
32816	803	Municipal Fire South G15 (Administration)
34416	867	Novato Fire (Tactical)
35216	899	Novato Fire (Tactical)
36016	8CB	Municipal Fire Central F9 (Tactical)
36816	8FD	Municipal Fire Central F8 (Tactical)
38416	961	Municipal Fire South G8 (Tactical)
39216	993	Municipal Fire South G9 (Tactical)
40016	9C5	Marin County Fire (Tactical)
40816	9F7	Urban Search and Rescue 4 (Tactical)
41616	A29	Marin County Fire (Information)
42416	A5B	Marin County Fire (Tactical)
43216	A8D	Urban Search and Rescue 5 (Tactical)
44816	AF1	County Emergency Medical Services (Dispatch)
44848	AF3	All Hospitals
44912	AF7	Marin General Hospital (Consultation)
45040	AFF	Marin General Hospital (Basic Life Support)
44880	AF5	Kaiser Hospital (Consultation)
45008	AFD	Kaiser Hospital (Basic Life Support)
44944	AF9	Novato Community Hospital (Consultation)
44976	AFB	County Emergency Medical Services (Tactical)
45072	B01	Novato Community Hospital (Basic Life Support)
45616	B23	Marin County Sheriff (Dispatch)
45648	B25	Sheriff (Secondary Dispatch)
45712	B29	Marin County (Court Security)
45744	B2B	Marin County Sheriff (Investigations)
45776	B2D	Marin County Sheriff (Investigations)
45808	B2F	Marin County Sheriff (Investigations)
45840	B31	Marin County (Jail)
45872	B33	Marin County (Jail)
45904	B35	Law Enforcement Mutual Aid Blue 2 (Tactical)
45936	B37	Sheriff (Tactical)
45968	B39	Law Enforcement Mutual Aid Blue 6 (Tactical)
46064	B3F	Southern Marin Police (Dispatch
46096	B41	Southern Marin Police (Secondary Dispatch)
46128	B43	Southern Marin Police (Tactical)
46272	B4C	Marin County Sheriff Search and Rescue 1
46304	B4E	Marin County Sheriff Search and Rescue 2
46336	B50	Marin County Sheriff Search and Rescue 3
46480	B59	Marin County Major Crimes Task Force
47248	B89	Novato Police (Dispatch)
47280	B8B	Novato Police (Secondary Dispatch)
47344	B8F	Novato Police (Tactical)
49648	C1F	Fairfax Police (Dispatch)
49680	C21	Fairfax Police (Secondary Dispatch)
49744	C25	Fairfax Police (Tactical)
52048	CB5	San Rafael Police (Dispatch)
52080	CB7	San Rafael Police (Secondary Dispatch)
52112	CB9	San Rafael Police (Tactical)
54448	D4B	Central Marin Police (Dispatch)
54480	D4D	Central Marin Police (Secondary Dispatch)
54512	D4F	Central Marin Police (Tactical)
61936	F1F	Marin County Open Space District Rangers (Dispatch)
61968	F21	Marin Municipal Water District Rangers (Dispatch)
62000	F23	Marin Municipal Water District Rangers (Tactical)
62704	F4F	All Points Law Enforcement Bulletins
62736	F51	Countywide Police (Calling)
62768	F53	Countywide Police (Tactical)
62800	F55	Law Enforcement Mutual Aid Blue (Command)
62832	F57	Law Enforcement Mutual Aid Blue 8 (Tactical)
62864	F59	Law Enforcement Mutual Aid Blue 9 (Tactical)
62896	F5B	Law Enforcement Mutual Aid Blue 7 (Tactical)
62928	F5D	County Fire (Dispatch)
62960	F5F	Marin County Emergency Operations Center
62992	F61	County Fire (Calling)
63056	F65	County Fire (Tactical)
63088	F67	Incident Command (Calling)
63120	F69	Incident Command 3 (Tactical)
63152	F6B	Incident Command 4 (Tactical)
63184	F6D	Incident Command 5 (Tactical)
63216	F6F	Incident Command 6 (Tactical)
63248	F71	Incident Command 7 (Tactical)
63280	F73	Incident Command 8 (Tactical)
63312	F75	Incident Command 9 (Tactical)
63344	F77	Incident Command 10 (Tactical)

63376 F79 Incident Command 11 (Tactical)
63408 F7B Incident Command 12 (Tactical)
63440 F7D Incident Command 13 (Tactical)
63472 F7F Incident Command 14 (Tactical)
63504 F81 Incident Command 15 (Tactical)
63536 F83 Countywide Police (911 Emergency)
63552 F84 County Fire (Emergency Button Activation)
63600 F87 Local Government (Calling)
63632 F89 Local Government (Tactical)
63664 F8B Municipal Fire Central F7 (Command)
63696 F8D Municipal Fire South G7 (Command)
63760 F91 Marin County Fire (Command West)
64704 FCC Golden Gate National Recreation Area 1
64736 FCE Golden Gate National Recreation Area 2
64768 FD0 Golden Gate National Recreation Area 3
(Point Reyes National Seashore)
63568 F85 Novato Fire (Command)
63728 F8F San Rafael Fire (Command)

North Dakota

In March, the Federal Communications Commission (FCC) granted a waiver request filed by the state of North Dakota to use frequency 155.4750 MHz within 15 miles of the border with Canada. The frequency will be used for interagency coordination during emergencies.

North Dakota is currently licensed to use 155.4750 MHz for transmissions from mobile or portable units throughout the entire state under call sign KO5210. It is also licensed to use that same frequency from a number of base stations throughout the state.

From the North Dakota State Radio Law Enforcement VHF Mobile/Portable Frequency/Scan Guidelines, regarding 155.4750 MHz:

"The common emergency system (Channel 3) will be available to every high band mobile radio unit on the state law enforcement system including the large city police departments. The mode of operation will be simplex. The system will be reserved for emergencies and special operations for vehicles normally assigned to other systems. Such operations will be conducted at the discretion of the dispatchers at State Radio or upon request from a department having a valid need.

"The State Radio Communications Department approved the official use of 155.475 for all school buses in North Dakota. This was done to provide communications capabilities between State Radio and school buses in emergencies. School buses can also use this frequency to communicate with other emergency services at the scene of an emergency such as an ambulance or police car."

However, under FCC rules, 155.4750 MHz is reserved for use in police emergency communications networks.

North Dakota sought a waiver in order to use this frequency for all types of emergencies, not just police emergencies.

Under the granted waiver, North Dakota can only use the frequency for mutual aid communications among public-safety personnel operating within 15 miles of the Canadian border. North Dakota must notify the state police in neighboring states (Minnesota, Montana and South Dakota) of its mutual aid plans to ensure that 155.4750 MHz remains available in those states for use in police emergency communications networks.

Under national interoperability guidelines, 155.4750 MHz is referred to as VLAW31, indicating it is a VHF frequency intended for law enforcement use. A similar law enforcement frequency is 155.4825, known as VLAW32.

Other naming standards exist for fire and emergency medical services, a topic which we will visit in a future column.

North Dakota State Radio is a network of 36 repeater sites spread across the state, controlled from a single dispatch center located underground in the state capitol of Bismark. The network has more than 4,000 users from nearly 300 federal, state, and local agencies.

Channel	Transmit	Receive
1	151.4600	154.9350
2	159.2250	154.6950
3	155.4750	155.4750

Radio Shack

Radio Shack logo (Courtesy: General Wireless Operations, Inc.)

For the second time in just over two years, Radio Shack has filed for bankruptcy. Papers were filed with bankruptcy court in Delaware in March.

After the first bankruptcy filing in February of 2015, General Wireless, part of hedge fund Standard General, acquired the RadioShack trademark and many of its stores for $160 million. Despite reducing operating expenses by 23 percent, the company has not been able to make progress against online and discount retailers. In addition, their partnership with Sprint, the cellular service provider, has not been as profitable as they had hoped.

The company announced it will close hundreds of stores and is evaluating what to do with the remaining ones.

A list of stores slated for closure can be found online at **http://www.businessinsider.in/heres-a-full-list-of-the-552-radioshack-stores-that-are-closing/articleshow/57697739.cms**

TSM

Federal Wavelengths

By Chris Parris **cparris@thefedfiles.com**

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the federal agency that regulates all aspects of civil aviation. In this capacity, the agency has a large area of responsibility in air traffic management and safety. And the FAA has the need for a variety of radio communications systems as well.

The history of the FAA has its roots in the Department of Commerce. Back in 1926, the Aeronautics Branch of the Department of Commerce was created to issue and enforce air traffic rules, license pilots, and certify aircraft, as well as establishing airways and maintaining navigation aids.

By 1940, the oversight of aviation was split over two agencies - the Civil Aeronautics Administration (CAA) and the Civil Aeronautics Board (CAB). The CAA was responsible for aircraft and pilot certification, safety enforcement and air traffic control. The CAB was an independent agency that handled safety regulations, accident investigations and airline regulations.

As commercial jet travel began in the 1950s, a series of accidents prompted the Federal Aviation Act of 1958. This took functions of the CAA and the air safety regulations from the CAB and gave them to a new agency, the Federal Aviation Authority. In 1967, the newly formed U.S. Department of Transportation (DOT) combined multiple federal agencies that were transportation related and put them within the DOT. The FAA Administrator now reported to the Secretary of Transportation, rather than directly to the President. The National Transportation Safety Board took over the role of investigation of all transportation related accidents and recommending solutions.

When most scanner listeners think of the FAA and civil aeronautics, they probably think about aircraft communications in the VHF 108 MHz to 138 MHz band. The shear number of frequencies and locations of FAA air traffic control channels would take up way more room than *The Spectrum Monitor* can spare, but don't worry. There are plenty of sources for aircraft and airport communications and navigation frequencies. One of my favorites is Airnav (**http://www.airnav.com/airports**) and there are others, including this searchable on-line airport facility directory from the FAA, **https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/dafd/search/advanced**. These directories can supply you with basic airport and en route air traffic control frequencies for your area. You will note that many airports and FAA facilities also operate on UHF air band frequencies as well. These are primarily used for military aircraft, although military aircraft and often be heard using VHF frequencies as well.

FAA seal (Courtesy: FAA)

Aircraft communications require many transmitter and receiver sites across the entire country to provide near constant communications with aircraft as they fly. The FAA shorthand for these remote sites is RCAG, or Remote Communications Air/Ground. These sites are not just at airports, but are often in very remote locations, some on mountaintops, along with the radar equipment used for air traffic surveillance. Maintenance and operation of these sites has required radio communications for the crews who travel to these sites. The FAA has many land-mobile frequencies in the VHF federal government band for such use. Many are used for equipment maintenance and backup communications in the FAA facilities. Some areas have reported that the FAA maintains a "phone-patch" capability on these channels, as some remote locations do not have commercial cellular phone service. Some of the frequencies have been heard being tested as emergency channels between the FAA control towers and air traffic control centers, so you never know what you might find on these:

162.0250
162.0500
162.1375
162.2000
162.2500
162.2750

162.3000	
162.3250	
162.3375	
162.3500	
162.5000	
162.6250	
162.7625	Nationwide assignment
163.0000	
164.0250	
164.0500	
164.7250	
164.8250	
165.3375	
165.4125	
165.4375	
165.5000	
165.5375	
165.6125	
165.6250	
165.6375	Nationwide assignment
165.6625	
165.6875	
165.7000	
165.7125	
165.7375	
165.7500	Nationwide assignment
165.7625	Nationwide assignment
166.0375	
166.0875	
166.1000	
166.1250	
166.1750	Nationwide assignment
166.2000	
166.2500	
166.3875	
167.1750	
167.8875	
167.9375	
169.0000	
169.2125	
169.2250	
169.2500	Nationwide assignment
169.2750	Nationwide assignment
169.3000	
169.3125	
169.3250	
169.3500	Nationwide assignment
169.3750	
169.5750	
169.6000	
170.1500	
170.2000	
170.4000	
170.5000	
170.7250	
171.0000	

An FAA Mobile Emergency Communications vehicle (Courtesy FAA)

171.2625	
171.4875	
171.7125	
171.9750	
172.0500	
172.1000	
172.1250	Nationwide assignment
172.1500	Nationwide assignment
172.1750	Nationwide assignment
172.1875	
172.2250	
172.3250	
172.7250	
172.8125	
172.8250	Nationwide assignment
172.8500	Nationwide assignment
172.8750	Nationwide assignment
172.9000	Nationwide assignment
172.9125	
172.9250	
172.9500	
172.9750	
173.0000	
173.0500	
173.0750	
173.1000	
173.1750	
173.4375	
173.5625	
173.9000	Nationwide assignment
173.9875	

Within the FAA VHF assignments, there are groups of channels that are assigned to the FAA "C2" communications system. C2 refers to Command and Control and represents an update from the older FAA National Radio Communications System, or NARACS. Following the terrorist attacks of September 11, 2001 the federal government started enforcing

guidelines that would provide better and more reliable communications channels for federal agencies and first responders of state and local public safety. Among the communications systems that were upgraded under these guidelines is the FAA land mobile radio network. Here are the FAA C2 channel assignments, and these are used in the APCO P25 digital mode:

162.1375	N293	Channel 09 repeater out
162.3000	N293	Channel 06 repeater in
162.3375	N293	Channel 11 repeater in
166.0375	N293	Channel 09 repeater in
166.1000	N293	Channel 06 repeater out
166.1750	N293	Channel 14 simplex
166.3875	N293	Channel 11 repeater out
167.8875	N293	Channel 12 repeater in
167.9375	N293	Channel 10 repeater out
169.2250	N293	Channel 07 repeater in
169.2500	N293	Channel 04 repeater in
169.2750	N293	Channel 05 repeater in
169.3125	N293	Channel 08 repeater in
169.3250	N293	Channel 01 repeater in
169.3500	N293	Channel 02 repeater in
169.3750	N293	Channel 03 repeater in
171.4875	N293	Channel 10 repeater in
171.7125	N293	Channel 12 repeater out
172.1750	N293	Channel 13 simplex
172.8250	N293	Channel 07 repeater out
172.8500	N293	Channel 04 repeater out
172.8750	N293	Channel 05 repeater out
172.9125	N293	Channel 08 repeater out
172.9250	N293	Channel 01 repeater out
172.9500	N293	Channel 02 repeater out
172.9750	N293	Channel 03 repeater out

Listeners in the Seattle-Tacoma area heard recent activity by the FAA radio technicians working on setting up some new P25 digital repeater sites. “Tech Support Base” was heard working with various units on 172.8250 MHz and 172.9500 MHz. Some encryption was heard being used by some of the units.

Sharp-eyed readers may have noticed a few familiar frequencies in the FAA list being used by another agency, often found at U.S. airports – The Transportation Security Administration (TSA). The TSA was formed in late 2001 after calls for better airport security after the terror attacks on September 11, 2001. At that time, the FAA was the agency primarily responsible for airport security, and was the overseeing agency for the TSA when they began. Three primary VHF channels, 169.300 MHz, 172.1500 MHz and 172.9000 MHz were the first radio frequencies assigned to use by the TSA and are still used at most U.S. airports. Since their inception, the TSA has been moved under the umbrella of the Department of Homeland Security (DHS), but it continues to use these, and other VHF frequencies for their operations.

The FAA also has a number of UHF frequencies allocated to them. They tend to use these for short-range operations at their fixed facilities, such as the Air Route Traffic Control Centers for maintenance and security at their buildings. These frequencies can be used as repeaters or simplex:

A newer FAA control tower design at Dulles Airport in the Washington DC area (courtesy Dulles Airport Authority)

406.2500
406.4500
406.5500
406.6000
406.7250
406.8000
406.8500
407.1750
407.2750
407.4250
407.4750
407.5000
407.5750
407.6250
407.8750
408.0000
408.0250
408.1500
408.1750
408.2500
408.4000
408.4250
408.4750
408.5250
408.6500
408.8125
408.8250
409.0250
409.1000
409.1250
409.1500
409.1750

409.2000
409.3000
409.4500
409.4750
409.4875
409.5500
409.5750
409.6000
409.8000
409.8250
409.8500
409.9750
410.0000
410.0250
410.1500
410.2000
410.2500
410.3000
410.4000
410.6000
410.6500
410.9000
411.1250
411.4500
411.5500
413.6000
414.7250
414.9750
415.4500
415.5500
415.6000
415.7250
415.8000
415.8500
416.1750
416.2750
416.4250
416.4750
416.5000
416.5750
416.6250
416.8750
417.0000
417.0250
417.1500
417.1750
417.2500
417.4000
417.4250
417.4750
417.5250
417.6500
417.8125
417.8250
418.0250
418.1000

Motorola DTR410 digital HT. (Courtesy: Motorola Solutions)

418.1250
418.1500
418.1750
418.2000
418.3000
418.4500
418.4750
418.4875
418.5500
418.5750
418.6000
418.8000
418.8250
418.8500
418.9750
419.0000
419.0250
419.1500
419.2000
419.2500
419.3000
419.4000
419.6000
419.6500
419.9000

Unfortunately, even with all these frequencies, you still may not be able to monitor the FAA facilities security. Some on-site observations have shown that some locations using contract security companies have Motorola DTR-410 radios, which are 900 MHz, license-free, frequency hopping, spread-spectrum, digital radios that can not be monitored.

In addition to these land mobile frequencies, the FAA maintains a number of HF or shortwave radio systems for

An FAA radio site linked with microwave dishes (courtesy the authors collection)

A joint military /FAA RCAG site (courtesy USAF)

very long-range communications. These are not part of the air traffic control system for oceanic communications, but for emergency FAA agency communications. All of these frequencies are in kilohertz (kHz) and likely transmit using Lower-Side Band (LSB) or Upper-Side Band (USB):

3331.0
4055.0
4475.0
4625.0
5356.0
5860.0
6840.0
6870.0
7475.0
7485.0
7574.0
7611.0
7850.0
8125.0
8912.0
9114.0
9914.0
9915.0
9982.5
10461.0
10515.0
11090.0
11288.0
11637.0
12199.5
13312.0
13457.0
13630.0
13905.0
14627.5
15698.0
15851.0
16135.0
16348.0
17964.0
19410.0
20852.0
23331.5
24550.0

Although I have not delved too much into the standard VHF or UHF aircraft frequencies so far, I will leave you with a few that you might want to keep in your scanners. Federal agencies often use airplanes or helicopters in their daily operations. In some cases, this may involve aerial surveillance,

transporting personnel or taking photographic observations from high altitudes. Many federal agencies have favorite air band frequencies they like to utilize. Here are some that you should keep an ear on, and remember that all these frequencies are in the AM mode:

120.3250 CBP Air and Marine Operations (AMO)
120.3500 FBI
120.3750 FBI
120.4500 CBP Air and Marine Operations (AMO)
120.6500 FBI
120.7750 DEA FLINT
120.8250 CBP Air and Marine Operations (AMO)
122.7500 Department of Energy
122.8000 A variety of government agencies have services on this frequency, also used as a UNICOM frequency.
122.8500 US Forest Service, Army Corps of Engineers, Environmental Research Labs severe storms studies (backup frequency) and NASA.
122.9000 National VHF search and rescue training frequency, also used by the Department of Agriculture, Bureau of Indian Affairs, Coast Guard, Environmental Research Labs severe storms studies, Environmental Protection Agency aircraft, US Forest Service, Department of Interior, National Park Service, NASA, NOAA.
122.9250 Environmental Research Labs severe storms studies, NOAA
122.9750 US Forest Service
123.0250 This is a nationwide helicopter "Multicom" frequency, so any federal agency using helicopters may show up here.
123.0500 US Forest Service, NASA, NOAA
123.0750 Also a nationwide helicopter Multicom frequency.
123.1250 This is a favorite of the NASA T-38 aircraft flying all over the country, so keep this one in your scanner and you are sure to catch some NASA air-to-air chatter.
135.8500 FAA flight inspection
135.9500 FAA flight inspection
135.9750 US Forest Service
136.2750 Reported DEA air operations
136.3750 CBP Air and Marine Operations (AMO), primary VHF
136.7250 Reported Air Force One and "Press Plane" coordination
137.9000 Reported CBP Air and Marine Operations

Happy monitoring and let me know if you hear anything on the frequencies I've provided for you here. See you in the May issue!

Federal Wavelengths Frequency List Legend

Unless otherwise noted, frequencies listed are FM and frequencies are shown in Megahertz (MHz). Frequencies listed will show additional information as follows:

PL CTCSS Tone Squelch
D DCS Digital Coded Squelch
RID APCO P25 Radio Identification Number
CSQ Carrier Squelch, no squelch tone
N APCO P25 digital Network Access Code (NAC)
DMR Digital Mobile Radio, marketed by Motorola as TRBO
NXDN Nexedge Digital, marketed by Kenwood
WACN Wide Area Communications Network, an APCO P25 trunked network Identifier

TSM

Utility Planet

By Hugh Stegman **mtutilityworld@gmail.com**

New Life Evolves on MARS

While the U.S. Military Auxiliary Radio System (MARS) might sound like another planet on the air at times, it's most definitely concerned with national security on this one. It is a quasi-amateur service that's sponsored by the U.S. Department of Defense to perform several activities in support of the military. A few years back, it had all the appearance of a purposeless operation in serious decline. However, it changed and refocused. It closed one whole branch (Navy/Marine Corps), and became a serious player in American NS/EP (National Security/ Emergency Preparedness).

On the air, we've heard MARS become a lot tighter, somewhat better drilled, and generally more like military communication. Its primary mission fits the current role of HF in national security strategy. This is to provide a contingency backup of last resort in dire national emergencies when everything else stops working. Newer technologies are more convenient and faster, but they are also vulnerable. Hurricane Katrina taught everyone a valuable lesson here, when the HF COTHEN system was the best performing comm mode for several days.

We've talked about the big quarterly exercises before. MARS still has these. They can get pretty intense, with a lot of traffic to be moved in a short time. Previous scenarios have included such regional catastrophes as hurricanes, floods, earthquakes, and nuclear terrorism. Many players use distinctive call signs with references to the Wild West or cowboy stories. The majority of these calls aren't heard anywhere else.

A few years back, the Army MARS headquarters moved to Fort Huachuca, AZ. It's still using the voice call sign of DESERT EAGLE. On ALE, it's usually R01. It works other stations, and broadcasts messages on a daily schedule. Some of these begin with the ALE global "All-call," which is @?@ in the [TO] word."

This links every radio that is listening on the net. Any following broadcast traffic is usually in a digital mode.

In normal operation, we're hearing shorter call signs, especially on ALE. Lately, there seems to be a tendency for some MARS stations to use three-letter aliases, resembling the ones we've seen on some U.S. government nets with similar responsibilities. Often, these MARS stations work other ones with three-figure numeric IDs. These are believed to be CFARS, the Canadian Forces Affiliate Radio System, a somewhat similar service. MARS and CFARS interoperate

MARS operator AAT3OT in an emergency comm van (Public domain)

on a Memorandum of Understanding (MOU) from a few years back. They also both turn up in NOBLE SKYWAVE, a Canadian Forces international joint activity in which HF stations in several countries contact one another. I can't find the date for 2017, but it's usually during the fall "DX season."

MARS frequencies, as I understand, are considered sensitive national security information. On-air, they are referred to using short designators that change often. Some frequencies have regularly scheduled nets, which pass traffic or train operators in various procedures. The best thing is to keep an ear out a few hundred kHz up and down from the bands used by civilian amateurs. There's also some activity around, though not in, the new 5 MHz allocation. The amateur radio tradition has always been to use LSB below 10 MHz, but MARS does not do this. They're USB.

Many of these nets will broadcast messages or pass traffic in various digital modes. Some of these modes are the same ones that we hear from hams, such as MT63 or Olivia. Increasingly, though we see a move to a military mode defined in U.S. standard MIL-STD-188-110A. Informally, we call it "110A." It sounds a lot like the NATO STANAG 4285, since both are serial PSK modes with similar characteristics. 110A, however, reveals its decoding parameters at the start of the transmission, where 4285 leaves these for us to guess. It can be clear or encrypted, and increasingly MARS is encrypting theirs.

Some recent ALE frequencies include 2476, 2838.5, 3355.5, 5205, 6833.5, 6907, 7882.5, 8184.5, 11105, 14935, 16148.5, and 24760. The long MARS voice call signs get

turned around for ALE. The prefix and suffix get switched. For example, AFA9DU becomes 9DUAFA. This procedure is said to be inspired by a technical quirk of ALE, in which calls are broken up into 3-character words. The first word sometimes gets through better, and the letters in the suffix are better for identifying the station. Of course, we're also starting to see quite a few of the new three-letter calls mentioned a bit earlier.

The ARRL Letter has a good item regarding the changing mission of MARS. The link is at the end of this column.

HAARP Returns to the Air

After a year of speculation and false alarms, the High-frequency Active Auroral Research Project (HAARP) is firing up the rows of generators and sending electrons through its many Continental transmitters to its vast antenna array. This is the first research campaign to use the "Ionospheric Research Instrument" (IRI) since it was defunded by the U.S. military. It is now operated by the Geophysical Institute of the University of Alaska, Fairbanks (UAF).

The campaign was a short one. It was also something of a shakedown, conducted by Chris Fallen, an assistant research professor at UAF. He's also a ham—call sign KL3WX. Unlike the tight-lipped military contractors of the past, Fallen posts to his own blog and twitter account about his activities at HAARP. He was also quoted in the same edition of the ARRL Letter mentioned above. He's having a good time, and he wants us to know it. In general, the project feels less ominous than its previous incarnation, even though it's the same equipment doing the same things. I'm sure it will still be blamed for everything from global warming and earthquakes to caribou walking backwards.

This new version of HAARP even has a publicly searchable FCC license in the experimental service. In fact, it has two of them. One is for the IRI itself. The other is for the Lowell Digisonde International DPS-4D sounder at the "observatory." The IRI, just possibly the world's most powerful HF transmitter, has a call sign of WI2XFX. It's licensed in the following frequency ranges, all in kHz: 2650-2850, 3155-3400, 4438-4650; 4750-4995, 5005-5450, 5730-5950, 6765-7000, 7300-8100, and 9040-9995. Emissions are all the way from dead carrier, through standard AM, to various exotic modes that sound very odd indeed on normal utility receivers. Authorized effective radiated power (ERP) ranges from "only" 457.088 megawatts at the low end to a blistering 3.63 gigawatts up high. That's more than enough to get Marty and the professor back to the future, even without a Flux Capacitor.

The other license, call sign WI2XDV, authorizes 300 watts peak pulse ERP from one to 40 MHz. If you've ever heard these sounders above 30 MHz, well, now you know why. You're not hallucinating. You also know why the line on your waterfall is always broken up into little short things.

Canadian Forces Affiliate Radio System logo (Courtesy CFARS)

It's not a continuous carrier. The technical name on the license is 82K0V7D emission.

The signals sent by HAARP on the first campaign were rather interesting. One experiment was to test the "Luxembourg Effect" we discussed a few columns back. It used tones and several short musical selections on two frequencies simultaneously. The music was in stereo, and the tones had different audio frequencies. The Luxembourg Effect worked, but listeners say it was hard to hear. I doubt it was as obvious as what we're routinely hearing from a French time station and several nearby entertainment broadcasters. However, the two frequencies were indeed slightly blended together on everything returned by propagated sky wave. It showed up nicely on waterfall displays.

The other experiment was to create an artificial aurora. This has been done before, notably by the HIPAS facility not far away in Alaska. I believe the idea is that, if aurora can be ordered up on demand, it gets a lot easier to study. This happened too, but it was only detectable on instruments.

HAARP will only conduct a few campaigns per year. It's expensive to run the facility, and multiple paying customers will use it together. The power will increase to the full licensed ERP at some point, but foil hats will not be necessary.

Alphabet Net Goes Silent

A dedicated utility chaser in Kansas just finished a three-day ALE scan of the frequencies mentioned last month for the "Alphabet Net." This is the one where most of the addresses are in sequence, like "ABC," "DEF," and so on. He got the same results that the rest of us have heard since last month. In other words, he got absolutely nothing. Since

the previous logging to this one was in 2015, maybe they just don't use HF all that often.

Silence happens. The trouble with putting stuff in this column is that, as often as not, the stations involved stop transmitting about a week after I send it off to the editor. Even so, I claim no mystical power over the actions of unidentified transmitters. Most likely, it's one of the more obscure corollaries of Murphy's Law. This well-tested law is, after all, the guiding principle of radio.

I've also been corresponding with a radio tech who runs an ALE system that uses NVIS propagation. NVIS stands for Near-Vertical Incidence Skywave. The idea is to radiate signals at very high angles approaching straight up, achieving uniform coverage of a relatively small region with no skip zones.

The topic was more about sounding, however. ALE stations sound at regular intervals to keep track of the best frequencies for a call. Now, some of the frequency lists that I've created from listener logs have gotten very, very long. As he was saying, it would not be practical to sound all of them. The radios would have little or no time for anything else. The transmitters would wear out fast, and the electricity drain would be staggering. In general, the system would be a useless and expensive waste.

All of this is true, of course. The best way to explain such long lists relates to the way militaries use HF radio in the field. Poland and some U.S. services are very good examples. They have little nets, which come and go with different operations and exercises. No single one of them uses every frequency in the list. However, we can't just remove the old ones, because they have a way of coming back months or years later. Keeping everything in the list creates a history that has often proven useful for identifying mysterious new activity. But still, at any given time, no one is sounding a hundred frequencies in sequence.

Of course, a system with a smaller frequency list might sound all of them. Even so, we are getting such proprietary ALE extensions as Codan's CALM, which reduce the number of soundings. CALM stands for Codan Automatic Link Management. It's proprietary to this Australian manufacturer. It doesn't do away with standard ALE, but it uses different computer code to maintain the list of "best" frequencies for calling. Codan manuals recommend that a radio using this system should sound only every five hours, instead of hourly or even more often. Listening seems to indicate some use of LQA exchanges between stations. LQA is part of the original ALE standard, and it stands for Link Quality Analysis. Think of it as an automated radio check.

More on WEGI

Another reader notes that the Russian transliteration I gave for the strategic group call sign "WEGI" is better transliterated into the Cyrillic "ВЕГИ" than my "WEГИ." It's a little thing, but details count in radio. After a bit of research, I have decided that he's right.

Before we all get dizzy, it's best to go straight to the CW version of this traffic. The voice messages heard on the "funny noise" frequencies are completely analogous to the ones that are sent elsewhere in Cyrillic Morse. In this code, the characters that "officially" give "WEGI" in Latin text do indeed correspond to the Russian "ВЕГИ." So there you go. Consider it corrected.

Online transliterations can return it either way. This uncertainty relates to a well known ambiguity in the Russian "V" sound. The technical details of this are best left to linguists. Being a call sign, WEGI has no literal translation that I can find. The general consensus, however, is that it's a code that somehow refers to "eyebrows." It's possibly an alert that the priority traffic that follows requires the raising of same. You know, like, "This message is important, so stop everything and look at it!"

Ary Boender has a nice description of Russian military broadcast messages and traffic grades at his terrific web site. The link appears at the end of this column. The format in both voice and CW often goes like this: [group call sign of those involved] [two figures] [three figures] [code word] [more figures] [variable stuff, if any]. As with most military code words, the one in these messages is probably mission-specific or changing frequently. In CW, the flash traffic begins with "XXX XXX." As best we know, the purpose of the messages is somewhat similar to that of the U.S. military EAMs and FOXTROT ("SKYKING") broadcasts that we've talked about many times.

Resources:

ARRL Letter items about MARS and HAARP:
http://www.arrl.org/arrlletter?issue=2017-02-23

HAARP experimental license:
https://apps.fcc.gov/els/GetAtt.html?id=176973&x=.

Official HAARP blog:
https://sites.google.com/alaska.edu/gakonahaarpoon/home

HAARP on Twitter:
https://twitter.com/ctfallen

More than you ever wanted to know about the Digisonde:
https://twitter.com/ctfallen

Ary Boender's guide to Russian military messages:
http://www.numbersoddities.nl/Monolyth.pdf

TSM

Shortwave Utility Logs

Recent Shortwave Utility Logs Compiled by Mike Chace-Ortiz

Frequency (kHz)	Callsign	Time (UTC)	User, Location	System Details
5300.00	???	0050	UK MIL DHFCS, Akrotiri	STANAG4285 HF modem, crypto tfc (on USB)
5303.00	???	2339	???, ???	MIL-188-110C Wideband HF modem, tfc using 6kHz waveform (on USB)
6801.50	NCS355-8***	0200	US SHARES, nr Aurora CO (DM79op)	PacTOR-III HF modem, tfc to "NCS419-8"
7560.00	LAMCUE***	0052	Ecuadorean Navy, Missile Ship “Cuenca”	1200bps/L MIL-188-110A HF modem, crypto tfc (on USB)
7597.00	NPG	2300	US Navy, Dixon CA	75bd/850 STANAG4481 FSK, KG84 crypto
7610.00	???	0100	???, ???	MIL-188-141C 3G HF modem, tfc (on USB)
8123.20	IDR	0130	Italian Navy, Rome	600bps/L STANAG4285 HF Modem, CARB “.//ss3i(0)/ss4i(0)" in ITA2 (on USB)
8158.00	???	2327	Russian Navy, ???	50bd/250 BEE, tfc
8202.20	???	0155	???, ???	300bd/300 FSK UNID Packet Radio System, tfc
8304.75	LOR	0100	Argentine Navy, Puerto Belgrano	75bd/170 Baudot, sea condx and WX for Argentine maritime zones
8478.50	RFLIE***, FUF	0010	French Navy, Fort de France	600bps/L STANAG4285 HF modem, ITA2 “oo faaa de rflie zui” marker (on USB)
8488.20	CKN	0020	Canadian Forces, Aldergrove	300bps/L STANAG4285 HF modem, crypto tfc (on USB)
8548.00	FUX	2324	French Forces, Reunion	600bps/L STANAG4285 HF modem, crypto tfc (on USB)
8566.80	FUB	0130	French Navy, Brest	50bd/850 FSK UNID System, sync, cont, ACF=21
8632.60	FUO	0130	French Navy, Toulon	1200bps/L STANAG4285 HF Modem, crypto tfc (on USB)
8676.00	NPM	1130	US Navy, Lualualei HI	50bd/850 FSK UNID System, sync, cont, ACF=0
8694.00	NPG	2300	US Navy, Dixon CA	50bd/850 FSK UNID System, sync, cont, ACF=0
9110.00	NMF	2240	US Coast Guard, Boston	120lpm/576/800 FAX, North American surface analysis chart from NWS
9159.00	???	2212	Australian MHFCS, Bohle River	50bd/340 STANAG4481 FSK, tfc & 600bd/600 STANAG4481 FSK, tfc (on ISB)
9169.00	1009***	0244	???, ???	125bd/1750 MIL-188-141A, ALE sounding (on USB)
9169.00	1011***	0244	???, ???	125bd/1750 MIL-188-141A, ALE sounding (on USB)
10390.00	2001***	2213	Moroccan DGSN, Morocco	125bd/1750 MIL-188-141A, ALE sounding (on USB)
10438.20	???	0100	UK MIL DHFCS, Crimond	1200bps/L STANAG4285 HF modem, crypto tfc (on USB)
11197.90	???	0130	NATO MIL, ???	Link-11 CLEW, 2 channels tfc (on DSB)
12168.00	???	2157	???, ???	MIL-188-141C 3G HF Modem, ALE & tfc (on USB)
12221.00	???	2100	Russian Intelligence, Cuba	50bd/500 FSK UNID System, ACF=128 tfc
12570.20	PBB	2109	Dutch Navy, Den Helder	75bd/850 Baudot, CARB “02a 04b 06a 08b 12a 16x 22x pbb"
12585.50	WLO	2108	ShipCom, Mobile AL	45.45bd/170 Baudot, sea conditions report
12829.20	CKN	2345	Canadian Forces, Aldergrove	300bps/L STANAG4285 HF modem, crypto tfc (on USB)
12892.20	CKN	2231	Canadian Forces, Aldergrove	300bps/L STANAG4285 HF modem, crypto tfc (on USB)
13031.20	FUF	2040	French Navy, Fort de France	600bps/L STANAG4285 HF modem, “de fuf zui testing” marker in ITA2 (on USB)
13057.60	EBA	2040	Spanish Navy, Madrid	600bps/L STANAG4285 HF modem, crypto (on USB)
13510.00	DET1MNMFRCMD1**	2030	US Marines, ???	125bd/1750 MIL-188-141A, ALE LQA with “DET1FWDMFRCMD1” (on USB)
13510.00	MLGMNMFRCMD1**	2030	US Marines, ???	125bd/1750 MIL-188-141A, ALE LQA with “DET1FWDMFRCMD1” (on USB)
13510.00	WUG6	0009	US Army CoE, Nashville TN	125bd/1750 MIL-188-141A, ALE sounding (on USB)
13562.00	???	2300	Russian Intelligence, Cuba	200bd/500 Baudot, repeats “11166 00127 76153 15002 00049”
14356.00	1RK***	2100	US FEMA DACN, ???	USB, OM/EE with US accent reads 30 char EAM
14415.70	IBA	2035	Italian Navy, Napoli	600bps/L STANAG4285 HF modem, crypto tfc (on USB)
14502.00	???	2010	Russian Intelligence, Cuba	200bd/500 Baudot, repeats “11166 00139 00000 14001 00059”
14718.60	???	2033	NATO MIL, ???	600bps/L STANAG4285 HF modem, crypto tfc (on USB)
14722.20	FUG	2320	French Navy, La Regine (Saissac)	1200bps/L STANAG4285 HF modem, crypto tfc (on USB)
14892.00	???	1955	???, ???	100bd/170 CCIR493-4 selcall, calling “8015” (on USB)
15037.00	???	2107	NATO MIL, ???	Link-11 CLEW, 2 channels tfc (on DSB)
16011.70	SSE	1126	Egyptian MFA, Cairo	100bd/170/E SITOR-A, Calling selcal "TVXS" (Manama), "KKVU" (Accra)
16023.00	???	2100	Russian Intelligence, Cuba	50bd/500 FSK UNID System, sync, cont, ACF=128 tfc
16106.20	???	1130	UK MIL DHFCS, Akrotiri	1200bps/L STANAG4285 HF modem, crypto tfc (on USB)
16180.00	???	1240	Russian MOI, Moscow	53.84bd/500 FSK UNID System, idle on reversals
16433.20	OVK	1540	Danish Navy, Aarhus	600bps/L STANAG4285 HF modem, short KG84 crypto messages (on USB)
16473.60	DHM85	1414	German Navy, Marlow	600bps/L STANAG4285 HF modem, crypto tfc (on USB)
16961.50	RFLIE***/FUF	2010	French Navy, Fort de France	600bps/L STANAG4285 HF modem, "de rflie znr" marker in ITA2 (on USB)
16984.00	PWZ33	2000	Brazilian Navy, Rio de Janeiro	200bd/200 PacTOR-I FEC, navigation warnings
16986.00	ZSC	1850	South African Navy, Cape Town	Saab MHF50 33 tone MFSK modem, tfc (on USB)
17237.60	EBA	2256	Spanish Navy, Madrid	600bps/L STANAG4285 HF modem, crypto tfc (on USB)
17416.00	???	2000	Russian Intelligence, Cuba	200bd/500 Baudot, repeats “11166 00139 00000 14001 00059”
17492.60	5897***	1616	US Department Veteran’s Affairs, ???	125bd/1750 MIL-188-141A, ALE sounding (on USB)
18035.00	ZSC	1338	South African Navy, Cape Town	Saab Grintek MHF50 MFSK modem, tfc (on USB)
18493.50	FUV	1315	French Forces, Djibouti	1200bps/L STANAG4285 HF modem, crypto tfc (on USB)
18534.20	MKD	1137	UK MIL DHFCS, Akrotiri	1200bps/L STANAG4285 HF modem, crypto tfc (on USB)
19881.00	???	1845	UK MIL, Europe	2400bd 24QAM HF modem, tfc (on USB)
20528.00	9Z4DH	1528	SailMail, Chaguaramas Trinidad	PacTOR-III HF modem, tfc to yacht “FIEU”
20536.00	RCV	1400	Russian Navy, Sevastopol	50bd/200 BEE, idle on reversals, tfc on sync=[0x1eb41eb2952]

Shortwave Utility Logs

Recent Shortwave Utility Logs Compiled by Hugh Stegman

Frequency	Callsign	User, Location	Time	System Details
339.00	BIA	NDB, Bournemouth, UK	2257	AM/MCW, repeating ID
468.00	FTZ	NDB, Fritzlar, Germany	2259	AM/MCW, repeating tone and ID
490.00	"S"	La Garde Radio, France (FRL)	2306	Sitor-B, Navtex weather in French
1743.00	Stornoway Coast Guard	UK Coast Guard, Scotland	2215	USB, male voice with weather information
2097.30	"A"	Unknown	0330	CW, unlicensed hobby beacon repeating ID every 9 seconds
2598.00	VOK	Canadian CG, St. Anthony	0120	USB, marine weather forecast
2749.00	Halifax Coast Guard Radio	Canadian Coast Guard, NS	0255	USB, male machine voice with N. Atlantic weather
3356.00	CAC	Possible U.S. MARS	0154	ALE, auto link check with WCM
3390.50	NF82SS	USCG Auxiliary	0202	USB, net traffic, then MFSK16 training message
3407.00	Tashkent Meteo	Russian Volmet, Uzbekistan	2028	USB, Russian female weather voice, also 8819
3413.00	Shannon Volmet	European Volmet, Ireland	2025	USB, female voice with aviation weather for Europe
3485.00	Gander Radio	North Atlantic Volmet, NL	0055	USB, ID and then SIGMET weather warning
4108.00	Unid	Possible Russian Military	2247	CW, coded Cyrillic message for weaker simplex station
4338.00	Unid	Possible Russian Military	2158	CW, coded Cyrillic message to unheard duplex station
4391.00	"99"	Russian Air Defense	2207	CW, usual time stamped tracking strings with null data
4438.50	9REAAR	U.S. Army MARS	0120	ALE, voice call AAR9RE, calling 8GZAAR
4721.00	Puerto Rico	USAF, Salinas	0122	USB, ALE and voice checks with Croughton (UK)
4724.00	Cornelia	U.S. Military	0118	USB, 30-character EAM "for Legion" on HFGCS
5140.00	WNBE 830	Missouri State EOC	1508	USB, checking into OK and MO SECURE net with KEFG 237
5155.00	TBB	Turkish Navy, Ankara	2048	STANAG 4285 (600L/5N1 ITA2), repeating channel availability marker
5402.00	WGY 908	FEMA Region 8, Denver, CO	1538	USB, calling WGY 928 (SD state EOC), no joy
5680.00	UK Rescue	UK SAR Centre, Fareham	1552	USB, comm check with Coastguard 163
5742.00	Gargoyle	Probably U.S. Navy, WA	1843	USB, clear and secure checks with unknown navy vessel
5896.50	NCS035	U.S. SHARES	0002	USB, controlling Region 6 Coordination Net
6518.50	AFA9TC	USAF MARS	1817	USB, net control checking in AFA9RE
6586.00	New York	Caribbean Air Control (CAR)	0035	USB, selcal GS-JP for JetBlue 1818 (A320 reg N523JB)
6607.00	4XZ	Israeli Navy, Haifa	2235	CW, ID and numbered messages in 5-letter groups
6652.00	HZ565	Satair A319 (VP-BUO)	1918	HFDL, passing HF ACARS to Guam (not heard)
6739.00	Ski Slope	U.S. Military	2242	USB, with echoey EAM broadcast
6765.00	NNB4DW	U.S. SHARES	1551	USB, checking in Northern SHARES Net
6845.00	Unid	U.S. SHARES	1402	USB and MT63-1KL, Storm Watch Net for Winter Storm Stella
6850.50	R01	U.S. Army MARS HQ, AZ	0108	ALE, global "Allcall" and unlink, similar on 13478
6910.00	AFA6EA	U.S. SHARES	1601	USB, checking in Region 6 Net
6996.00	0JOC	Utah National Guard	0004	ALE, Joint Operations Center working MAN (Manti, UT)
7348.00	WGY 908	FEMA Region 8, Denver, CO	1525	USB, working WGY 947, Iowa State EOC
7527.00	Z14	USCG Sector St. Petersburg, FL	2044	USB, securing radio guard with 704 (USCG HC-130H #1704)
7535.00	SESEF Norfolk	U.S. Navy, VA	1444	USB, checks with vessels Stellar Eagle and Wildcat
8424.00	SVO	Olympia Radio, Greece	2111	Sitor-B, news broadcast in Greek
8825.00	New York	Atlantic Air Control (NAT-E)	2236	USB, selcal DG-HP for United 1043 (B737 reg N75428)
8983.00	COMMSTA Kodiak	USCG, AK	2022	USB, position check with MH-65D Coast Guard 6593
9145.00	831	Russian Intelligence (S06s)	1200	USB, callup "831 250 6" and 5-figure-group message
10151.50	TOC	U.S. National Guard	1633	ALE and encrypted MIL-STD 188-110A with W6 and C6
10799.00	Destroyer 51	U.S. Military	1952	USB, training activity with Destroyer 53
11059.00	Andrews	USAF HFGCS, MD	1320	USB, patching Reach 144 (C-5M #86-0016) to Maniac Control, ME
11159.00	Navy RD 404	U.S. Navy aircraft	2022	USB, patch via Elmendorf (AK) to Base Ops
11175.00	Gun Barrel	U.S. Military	0130	USB, probable TACAMO/ABNCP, net entry with Ash Ridge
11282.00	San Francisco	Oceanic Air Control (CEP-2)	2126	USB, working USMC tanker Raider 25, a KC-130J
12444.00	JCND	F/V *Fukuseki Maru No. 3*	2205	CW, Japanese tuna boat working JFG, Shizuoka Prefectural Fishery
13276.00	FX3704	FedEx MD-11 (N617FE)	2200	HFDL, getting LAX ATIS from ground station 04, NY
13524.00	CO8JOC	U.S. National Guard, CO	1712	ALE, Joint Ops Center, calling HQ701N, headquarters
13993.00	High Card Romeo	Possible U.S. Army MARS	1500	USB, in net holding traffic for High Card Juliet
14396.50	NCS308	U.S. SHARES	1600	USB, checking in weekly SHARES Coordination Net
14441.60	4630	U.S. Dept. of Veterans Affairs	2210	ALE Global "Allcall" and text message, then voice testing
14575.00	333	Polish Intelligence (E11a)	0745	USB, callup "333/35" and 5-figure-group message
15016.00	Bike Race	U.S. Military	2150	USB, usual echoey voice of doom with EAM
16138.00	Unid	Russian Intelligence (XPA2)	1500	MFSK-16/20, multitone message in 5-figure groups
16276.00	283	Russian Intelligence (M12)	1400	CW, callup "283 1 6475 79," and 5-figure-group message
17480.00	Unid	Cuban Intelligence (HM01)	2200	AM, Spanish "53366 52518 07011 54822 75584 50051," then voice & RDFT
19529.50	CAM	U.S. Army MARS	1120	ALE, calling 7DGAAR
20518.50	CAB	U.S. Army MARS	0009	ALE, calling R0, headquarters in AZ

Digitally Speaking

By Cory GB Sickles WA3UVV **wa3uvv@gmail.com**

The Ground We Talk On

In the world of digital communications, "IP" is typically an abbreviation for Internet Protocol—a part of the TCP/IP stack that makes most networks possible. However, there is another use for IP as an abbreviation in digital communications, software design, and business in general: Intellectual Property. This IP drives what goes on inside of our DV radios, reflectors, talkgroups, and rooms.

The CAI (Common Air Interface) that details the parameters of how one device from one manufacturer can communicate seamlessly with another device from another company. By following the published CAI, a D-STAR radio from Icom is compatible with a D-STAR radio from Kenwood, such as the TH-D74A. With the NXDN CAI, differently designed mobile transceivers from Icom and Kenwood can communicate with NXDN portables from Alinco. Moreover, there is a CAI for each and every one of the popular DV methodologies that hams are allowed to use.

While CAI's are public domain, what specifically goes on inside a particular radio is not. The firmware that's executing on a TYT MD-380 is not the same as what is running inside of a Vertex VXD-720. At least, it's not supposed to be.

If an art teacher assigns homework to 10 of her students, asking them to paint a bowl of fruit, you would expect her to get 10 different paintings in return. If two or more of the paintings look exactly alike, you would expect this to raise some questions. If you found the exact same code, whether the entire program or particular sections, running inside of two different transceivers from two different manufacturers, then that raises questions, as well.

In the early days of microcomputers, software was often traded among owners of similar systems. Sometimes the software fell into the "public domain" category, meaning all were free to share it, as long as they shared it freely, not for someone else's profit. Sometimes, it was a commercial product, which was and is essentially "theft." The theft was not that of a physical item, but the theft of rightful income for the person or company who conceived of and developed the software. Eventually known as "piracy," it is frowned upon, yet still practiced to some extent.

In some cases, the software stolen was actually "firmware," directly executable code that resides on ROM (Read Only Memory), PROM (Programmable Read Only Memory), or EEPROM (Electrically Erasable Read Only Memory). Such computers were marketed as "clones" of whatever they copied.

Hytera MD652. Because it's the only DMR mobile I've found with a control head speaker mike for a semi-reasonable price, I was about to take "a trip to the hip" when Motorola Solutions' lawsuit was announced. Now I'm waiting so see how this all shakes out. (Courtesy: Hytera)

At one time, Apple Computer's Apple II series was incredibly popular. Certain Chinese manufacturers, wanting a piece of Apple's pie, created similar looking computers with names like "Orange" and "Pineapple." Copying Apple's circuitry was easy enough and while it wasn't "illegal," it was frowned upon by many. However, those computers were also purchased by many.

To maintain the utmost in Apple II compatibility, the ROMs were also copied. Apple was eventually successful in proving IP theft and those illegal clones coming into the US were stopped and destroyed by US Customs staff. After this, the Chinese companies involved went around the laws by revising their designs to reverse the PROM data lines going to the chips. As such, data lines D0~D7 (8-bit) were now D7~D0. Their ROMs were revised with all of the bit patterns reversed, as well. Thus a memory location with 11000110 would now be 01100011. Finally, the computers were imported without the ROMs installed. They were shipped separately; to be installed by the end user or dealer selling the clone.

When the new versions of the computers were examined, they were not in violation. When the ROMs were examined, they were not in violation. Only when the ROMs were installed in the computers and the contents of those memory addresses were read, was the violation evident.

New laws begat new lawsuits, which begat new enforcements. When the IBM PC and MAC 128K were intro-

duced, similar things happened, but the offenders were not as successful, following the laws set down from before. Software has always been a piracy problem, despite numerous attempts to squelch such activity. We can thank the computer industry for the development of strong IP protection laws, which took some time to develop amidst an environment where technology moved forward with a stopwatch and the legal system moved forward with a calendar.

Motorola Solutions has recently filed suit against Hytera, alleging theft of IP related to both manufacturers' line of DMR products. In reading through the legal filings, Motorola Solutions has asserted that Hytera (certain former Motorola Solutions employees, now current Hytera employees, in particular) is guilty of systematically stealing trade secrets, patents, and a significant amount of files. As I type this, Hytera has not filed an answer to this long list of claims, so I don't know both sides of the story.

With the timing of the published suit coming just before the IWCE (International Wireless Communications Expo) in late March, I'm sure the suit serves to change the conversation at both the Motorola and Hytera booths. Depending on the outcome, this could signal an end (or at least a significant suspension) to Hytera's DMR products. It brings into question what GigaParts (Hytera's exclusive dealer for the amateur market) will do and what service and support options will be left for those who have already purchased Hytera DMR radios.

The longer the suit drags out, the more FUD (Fear, Uncertainty, Doubt) will affect sales. All of this further serves to destabilize the DMR market and could have a trickle down effect that impacts other DMR-related companies. It was expected that Hytera and GigaParts would have indoor booth space at the upcoming Dayton Hamvention, but at the moment, neither is listed on the web site, as such. That may well mean nothing special, but it does raise questions, owing to the FUD that's now in play.

If Hytera has in their plans to announce any new products or sales promotions at Dayton, then those may be on hold until the legal issue(s) find resolution. Should Hytera be found guilty, they may have to cease production on everything that used Motorola Solutions' IP. Alternately, there may be some sort of licensing arrangement, should Motorola Solutions feel that would be more beneficial to them. Another possibility is that the case may never come to court, instead being settled in advance, with no admission of guilt.

If Motorola Solutions then wishes to pursue any other manufacturer who may also be using their IP, they will have an easier time of it, with a "win" against one company already. If such a situation is true, then there will be even more instability for those wishing to purchase a DMR radio.

If Hytera feels they did nothing wrong and the court's decision finds them innocent of any wrongdoing, then they have a case to pursue against Motorola Solutions, for damage to their business and brand. Further instability would probably arise – in a somewhat different direction - until such time as a court decision or settlement was reached.

FT-70D, Yaesu's newest dual-band portable offers a feature set of what most DV enthusiasts want, while paring down the lesser-used ones. Saving cost in manufacturing allows the sales price to be less, while still maintaining a high-value product. (Courtesy: Yaesu)

All of this could go on for some time. From an overall standpoint of DMR growth, I don't see much benefit in allowing all of this FUD to go on for an extended period of time. From a standpoint of one corporation attacking another corporation, I do. According to an old African proverb: "When elephants fight, it is the ground that suffers." I hope all interests in this are able to resolve their differences in short order.

While there was some perception of instability by many in the D-STAR arena in past months, it appears that Icom's interests in DV communications continue. The recent introduction of the ID-4100, as reported last month, and further progress with the G3 software has let us know that Icom is still in the game when it comes to D-STAR. Icom's ability to move data at higher speeds on the 1.2 GHz band seems to be gone for good. Production ended some time ago on the ID-1 transceiver. There is no replacement in the pipeline and, from what I learned recently, there are no (public) plans for one. The suggestion was to find a used one.

In early February, they hosted a "D-STAR Live!" event and streamed it on-line. The program goes on for several hours, so set some time aside, grab a snack, and get comfortable before you start to watch and take notes. If you are a D-STAR enthusiast or are thinking about becoming one, it's worth the time to watch it all. Links to the Ustream.tv recordings appear at the end of the column. I also understand that clips of the event will soon be posted on YouTube.com, as well.

Going back to the Dayton Hamvention for a moment, it is expected that Kenwood will be announcing (and possibly demonstrating) a tri-band D-STAR mobile with APRS as a follow up to their popular TH-D74A portable. From what I've been told, the radio is outselling Icom's portable and Kenwood is finding it challenging to keep them in stock at retailers. With all of the features it offers, that's not too much of a stretch of the imagination.

Having a DV portable with extensive APRS feature set included, plus the ability to use the 222 MHz band, makes it attractive to many—especially EMCOMM oriented groups. D-STAR's ability to move data in the way of forms and email through applications like D-RATS is their "killer application." Once Yaesu decides to enable the data port on their portables, we'll see how that affects D-STAR's "edge" for such applications.

Unlike some competing networks, Yaesu has had no serious controversies or fatal security issues, quite the opposite, in fact. The WIRES-X network continues to grow with additional rooms and nodes. As System Fusion remains the fastest growing DV methodology and the WIRES-X network is growing accordingly—stability and security is important. While there are several reasons, much of this stability is owed to the fact that it is designed and managed by only one organization.

Unfortunately, the same cannot be said of DMR and the four networks that make up its Internet connectivity. The heart of the system, DMR-MARC, is a tightly controlled and managed resource. To my knowledge, their portion of the overall connectivity has never been compromised, at least not in some "global" sense of the word.

Another component, Brandmeister (a network godsend has allowed non-Motorola DMR repeaters to be networked) is a huge boon for the growth we are now seeing in a technology that has been around since 2005. As much as the creative gray matter behind Brandmeister deserves some positive recognition, support, and respect, someone with nothing better to do launched a DDoS (Distributed Denial of Service) attack at it last week. This effectively took the network down for days. At the moment, it looks like they've stopped the attack(s) and recovered, but it brings up the question of just how much "openness" the communications networks we rely upon, should have.

Where is the midpoint in the metaphorical pendulum swing between totally open and totally closed environments? Detailed analysis of network traffic evokes images of chaos. The chaos needs to be managed. When the management is strict (closed), security is typically higher and so is stability. When the management is loose (open), security is at risk and the potential for instability is higher. Depending upon the exact nature of the DDoS attacks; this could illuminate some crucial differences between the DMR-MARC and Brandmeister networks.

It also brings us back to the discussion of relying upon the Infobahn for mission-critical applications like EMCOMM. For such emergency communications needs, it may

Alinco DJ-MD40T. Alinco's DMR portable is another offering that can be purchased through amateur radio retailers. Although only available in UHF, that will satisfy most DMR enthusiasts, as the ratio is about 8:1, UHF vs VHF. (Courtesy: Universal Radio)

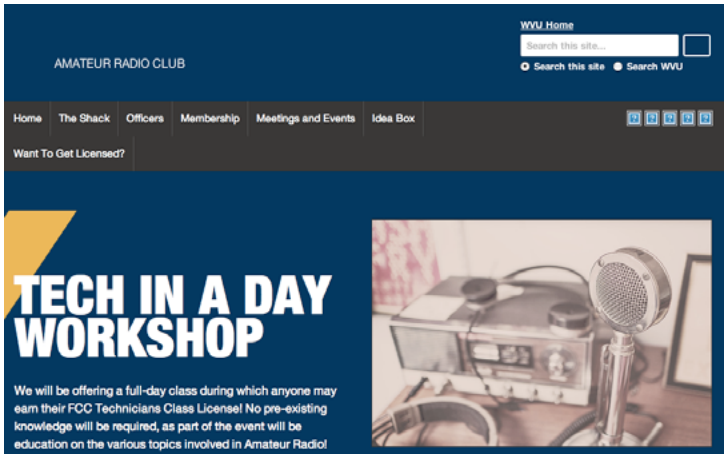
be prudent to invest some extra funds in microwave or other radio-to-radio bridging and networking.

Even more so, it's always a good idea to explore what sort of range and functionality you have with non-repeater involved communications; good ol' radio-to-radio simplex. Also known as "talkaround," simplex operation lets us know what sort of range we have when the repeater is unavailable, for whatever the reason. It also helps us understand the limitations of VHF and UHF, plus assists in revealing just how versatile we can be as hams.

Being prepared for various contingencies and knowing how to create ad hoc workarounds is one of our strong points. Even if your local repeater is available for a public or community service exercise, try going without, just to see how well everyone does.

Data migration, through applications like APRS, D-RATS, and others allows us to also show how we can bounce or "digipeat" data packets from one radio terminal to another, negating the need for a "normal" repeater. This too, is a technology and expertise that is impressive to many of the agencies we serve, in the EMCOMM world.

Radio Shack has been in the news lately, again for the wrong reason. The funding and cohabitation deal they had with Sprint has been terminated, resulting in even more stores closing. When the last round of closures had finished, there were still two left in my part of Pennsylvania that were at least semi-convenient to get to. The closest one closed, then the other. Thankfully, the one in nearby West Virginia is



The WVU Amateur Radio Club's web page has recently been updated, with a conversation-starting picture at present. The work done by students and advisors, plus supporting club, has already shown many positive results. (Courtesy: WVU ARC)

still open, perhaps owing to their proximity to West Virginia University.

WVU has an excellent engineering program and many of the students are active "makers." Part of the coursework in getting your EE involves studying for and earning a Technician class amateur radio license. Through the work of some very focused and enthusiastic students, advisors, and help from the Monongalia Wireless Association, the university's ham shack has been resurrected and improved. They have an upcoming ARISS contact with astronauts on the International Space Station scheduled, the result of more directed effort, and two of their repeaters are back on the air.

They hope to upgrade one to a Yaesu DR-2X (whenever that becomes available) plus update the equipment and range of capabilities. The focus on amateur radio also benefits other activities, both within the university and throughout the greater Morgantown community. Such members of our younger generation are a pleasure to know and they inspire many of us who, a few decades back, were the younger generation ourselves.

One way to feel younger or at least more excited about ham radio is to buy a new DV transceiver. On March 18, I presented a WPA ARRL section-wide seminar on the subject, with assistance from Joe Shupienis W3BC, and Josh Pritchard KC8TAI. Since Joe became WPA Section Manager, he has lit a fire under many and has greatly encouraged more activity and events, within the section. Even hams from neighboring sections have become involved.

Josh brought one of this homebrewed DMR repeaters and talked at some length about the methodology and how he put his together for $350, using a pair of Motorola CDM-1550 mobile transceivers, duplexer, and an MMDVM board set as the core foundation. As soon as Josh's repeater finds a permanent home, it will serve Monongalia and Preston counties in WV, plus Fayette and Greene, in Pennsylvania.

Following the seminar, I heard from a number of attendees that they had taken "a trip to the hip" and purchased a System Fusion transceiver. In addition, more than one stated that anticipation of the new radio and exploring an undiscovered aspect of ham radio had them excited, feeling like they did when they were first licensed. I guess there's still some magic in DV.

Following that, here's a new DV portable for you to consider; the Yaesu FT-70DR. I mentioned this one a few months ago, but it wasn't formally announced until March 21, that I could really talk about it. With a low introductory street price just below $200, it features dual-band operation, in a rugged looking case, plus it can make use of many existing Yaesu accessories. I already have one on order (deliveries expected to start in April) and will have a review of this new entry-level model in an upcoming issue of *TSM*.

For many, wanting to enjoy System Fusion with a dual-band mobile or set up a WIRES-X node, the FTM-100DR has been the perfect fit.

DV radio continues to be an exciting and growing aspect of amateur radio. While some companies are experiencing detours along the way, others have settled in comfortably with their product line and still others are building out their offerings in progressive directions. It's important to keep an eye on the technology, but also pay attention to the foundational business aspects effectively; the ground we talk on.

Links

Motorola Hytera Lawsuit

https://newsroom.motorolasolutions.com/news/motorola-solutions-files-patent-infringement-and-trade-secret-misappropriation-complaints-against-hytera-communications.htm

VHF and Above

By Joe Lynch N6CL **VHFandabove@gmail.com**

New Radios and Antennas for VHF and Above

ICOM Announces Release of IC-7610

Following on the heels of its most successful SDR radio, the IC-7300, ICOM (seep photo at right) announced last month of the release of its newest SDR radio, the IC-7610. The announced features include the following:

- Direct-Sampling SDR design
- High definition Real-Time TFT display
- Connection for external display
- Dual Real-Time Spectrum and Waterfall displays
- Dual Watch (with Spectrum/Waterfall displays)
- Touch interface (LCD touch-screen control)
- HF+50 MHz
- 100 Watts RF
- Built-In Antenna Tuner

Two features stand out for me: The dual watch separate receivers and the connection for an external display. The 7300's display is very small, which makes for difficulty touch QSYing for big finger guys, like me. Having a larger screen will go a long way in fixing that issue.

The Icom IC-7610 made its world debut at the Tokyo Ham Fair August 19, 2016. It provides professional performance in the 160 to 6 meter amateur bands. This direct sampling SDR receiver will have a digital preselector. It will also support dual watch with different mode and different band! It provides 100 (tentative) watts of power and features a built-in antenna tuner. It has a large color touch screen display and supports and external monitor. The rear panel has BNC jacks for receive antenna, transverters, reference input, etc. Icom has not yet announced availability or pricing on this radio, which will be available mid-2017. As of press time, this device has not been approved by the FCC and may not be offered for sale or lease or be sold or leased until approval of the F.C.C. has been obtained. The information shown is preliminary and may be subject to change without notice or obligation. (Text and photo courtesy of Universal Radio)

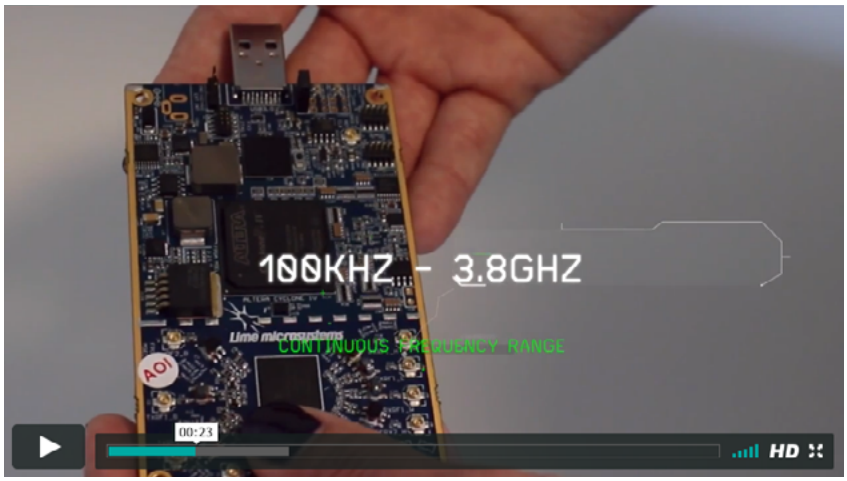
My LimeSDR has Arrived

Boasting enormous flexibility, the LimeSDR promises to be put to great use throughout the amateur radio maker community. Several blogs already are underway at http://www.limesdr.org. I received mine about a week before this column was due to the publisher (see photo on next page). I hope to have something going with mine by next month.

DX Engineering TW Antenna

A six meter version of a TW antenna that would fit on the DX Engineering TW Antenna Quadrastand. The photo at right shows my feeble attempt at designing a loop antenna.

Design considerations include: It must fit on the Quadrastand and it must easily break down and fit in one of DX Engineering's storage/travel bags. My design meets the two considerations. However, the spreaders are unstable. I ran out of time to have a completed project before sending this month's column. Two other ideas have crossed my mind: make a dipole and a delta loop, with the point of the triangle at the top. I invite your suggestions.



Left: The author's LimeSDR fresh out of the box LimeSDR, just waiting for some spare time and serious experimenting. Right: LimeSDR next-generation open-source software defined radio promotional video at https://www.crowdsupply.com/lime-micro/limesdr. (Courtesy: LimeSDR)

VHF and Above and Below?

With the FCC's Report and Order (R&O) on 630 Meters being published late last month *[See Kevin Carey's The Longwave Zone for links to the R&O – Editor]*, there is a growing interest in that spectrum. I am willing to give a venue to that experimentation in this column. It is not a surprise that VHF and Above weak signal operators gravitate where weak signal operations take place. Another gathering point is WSPR, the HF weak signal propagation using K1JT software. I would like to give more voice to these efforts.

Don Hilliard W0PW, SK

Bill McCaa K0RZ, reports the following:

It is sadness that I report the death of Don W0PW, ex W0EYE, on Saturday March 25, 2017. He had been very ill and suffering for the past several years from various diseases. May he rest in peace.

Over the decades, Don made numerous contributions to the hobby and specifically in the VHF, UHF and Microwave arena of amateur radio. He was a pioneer in developing the first amateur equipment for the 900 MHz band in 1983 in anticipation of the band becoming available for amateurs. Don was a founding member of the Central Stated VHF Society in 1967, as well as the Microwave Update in 1985.
He will be missed by his family and friends.

Current Contests

The Southeaster VHF Society's Spring Sprints will occur beginning this month. Below is the schedule:

Contest Date and Time:

144 MHz: Monday, 4/17/17 from 7 – 11 PM local
222 MHz: Tuesday, 4/25/17 from 7 – 11 PM local
432 MHz: Wednesday, 5/03/17 from 7 – 11 PM local
Microwave, 902 MHz and up: Saturday, 5/6/17 from 8 AM – 2 PM local
50 MHz: Saturday, 5/13/17 from 2300Z until 0300Z Sunday, 5/14/17.

For more information see this website: **https://sites.google.com/site/springvhfupsprints/home/2017-information**

The European Worldwide EME Contest 2017: Sponsored by DUBUS and REF. The EU WW EME contest is intended to encourage worldwide activity on moonbounce. Information for this contest is available at the following website: **http://www.marsport.org.uk/dubus/EMEContest2017.pdf**.

The June VHF QSO Party will be held during June 10-12, 2017. The ARRL Field Day will be held June 24-25, 2017. For more information on these contests, see the ARRL website: http:www.arrl.org.

Conference and Convention

Southeast VHF Society: Their 2017 annual conference will be hosted in Charlotte, North Carolina, April 28-29, 2017. For information on registering for the conference, please check the society's website at **http://www.svhfs.org**.

Meteor Showers

This month's showers and approximate peaks: The Lyrids meteor shower is active during April 16-25. It is predicted to peak around midnight on April 22. This is a north-south shower, producing at its peak around 10-15 meteors per hour, with the possibility of upwards of 90 per hour. Other April showers and approximate peaks: n-Puppids, April 24; April Piscids, April 20; δ-Piscids, April 24. For more information on the above meteor shower predictions please see the American Meteor Society website: **http://www.amsmeteors.org/meteor-showers/2017-meteor-shower-list**

TSM

Amateur Radio Insights

By Kirk Kleinschmidt NT0Z **nt0z@stealthamateur.com**

Morse Code: The Original Digital Mode is Still Hanging On

I have a confession to make. More than 90 percent of my QSOs over the past 40 years (yikes!) have been via Morse code, but I have to admit to myself that I no longer enjoy ragchewing via CW. There, I said it. And I guess I do feel just a bit better for confessing!

As a kid, Morse QSOs were verbose by today's standards. As a Novice I can remember methodically sending my mailing address (at 8-12 WPM) to facilitate QSL card exchanges, because call sign databases were still a long way off, and most "regular hams" didn't have the Callbook. I also remember dutifully copying the other guy's address, because back in the day we still mailed QSL cards back and forth to commemorate domestic contacts (even garden variety contacts).

Like tough guys who smoked unfiltered Camels, we didn't use envelopes, nor did we include SASEs. We simply sent naked QSL cards through the mail, and we considered any postal scars, scrapes and bends as badges of honor. And unless it was specifically stated, we all assumed that everyone else would send those QSL cards, too, with no undue delays. For the most part, they did, as my card collection attests! But I digress...

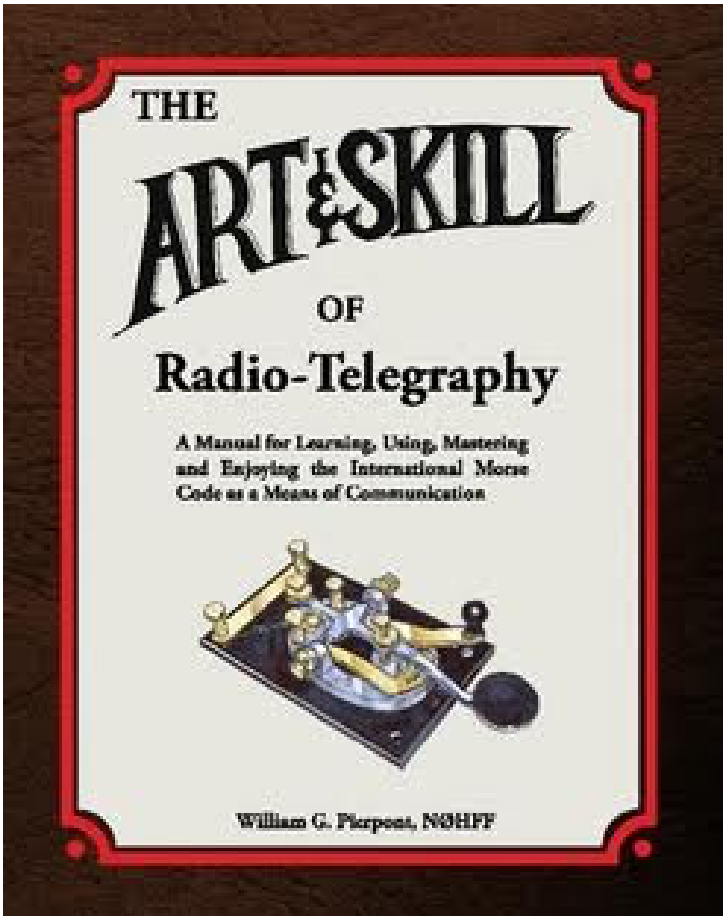
Nowadays, after four decades, I just don't want to do too much chatting via Morse (and I don't think I'm the only one). Don't get me wrong—I still LOVE Morse code and I would never want to be without it. I use it all the time—most of the time— and I'm faster and better at using it than ever before. But just not for ragchewing. What the heck?

Although ancient, Morse is still a secret weapon for contesting, weak-signal work, and enjoying home-brew radio, all of which are important to me. And even though I ragchew mostly via voice and keyboard modes, I still encourage everyone, new hams in particular, to learn and use Morse code.

Perhaps it's a bit unrealistic in the modern era, but I think it's still beneficial to learn the rules before you break them or, in this case, learn the code before you decide whether it's "your thing" or not. Morse is still alive and well, and I'd hate to see anyone miss out on using it after seeing how powerful it has been in my enjoyment of amateur radio.

Were the Pundits Wrong?

It's been a decade since the FCC pulled the plug on the Morse code requirement for amateur radio licensing in the US and its territories, and I think more than a few hams are surprised that we haven't experienced some kind of collapse.



The Art and Skill of Radio-Telegraphy, by William Pierpont N0HFF(SK), is available in its fully updated fifth edition only from www.lulu.com, and only in paperback. Earlier PDF and HTML versions are easily found via web search. At 241 pages (8.5 x 11 inches), Art and Skill is no lightweight, and at $11, it's a real bargain. (Publisher's photo.)

Newcomers may not have a sense of the history and the controversy that led to the decision, but let's just say that passions ran hot on both sides of the issue. Some hams thought that the Morse code requirement kept the riffraff out of the hobby, while others—riffraff and worthy aspirants alike—thought the code presented an "unrealistic and anachronistic barrier to admission." It probably did both.

Whatever the reasons, pro or con, demonstrating Morse

code proficiency hasn't been a licensing requirement for quite some time, but that doesn't mean that the "original digital" is going away any time soon (or at all?). After the first post-CW decade, all indicators suggest that Morse code is alive and well—and its use may even be growing!

The CW sub-bands are as crowded as they ever were (more crowded now that digital-mode ops are moving ever downward on bands such as 40 meters), the number of CW-mode logs submitted in a variety of contests is growing or holding steady, and so on.

Just because you don't have to learn the code, doesn't mean you shouldn't learn it! Using the code on the air is still a thrill, it still has tremendous advantages over voice modes, it's still the simplest and least expensive way to communicate via radio, etc.

For some, learning the code is a lot like taking piano lessons as a kid. At the time it may have been dreadful, but later in life you were darn glad you were forced to learn. (For me, the code came fairly easily. Touch-typing, however, is another matter... We all have our burdens!)

Having a hard time working mic-mode DX? Morse code destroys SSB when conditions are poor, you're running low power, you have a crappy antenna, you're operating in the field, you just have to work the DX station, etc. Case in point: I participated in this year's ARRL DX contests, CW and SSB. In both cases I used the same QRP radio and the same antennas (a low doublet and a fan vertical). Propagation was similar for both weekends, but via CW I made nearly 200 QSOs all over the world on 80 through 15 meters, while the SSB logs shows only about 30 QSOs, all in the Americas and the Caribbean. The signal-to-noise ratio boost to CW over SSB is about 20 dB, sometimes a bit more!

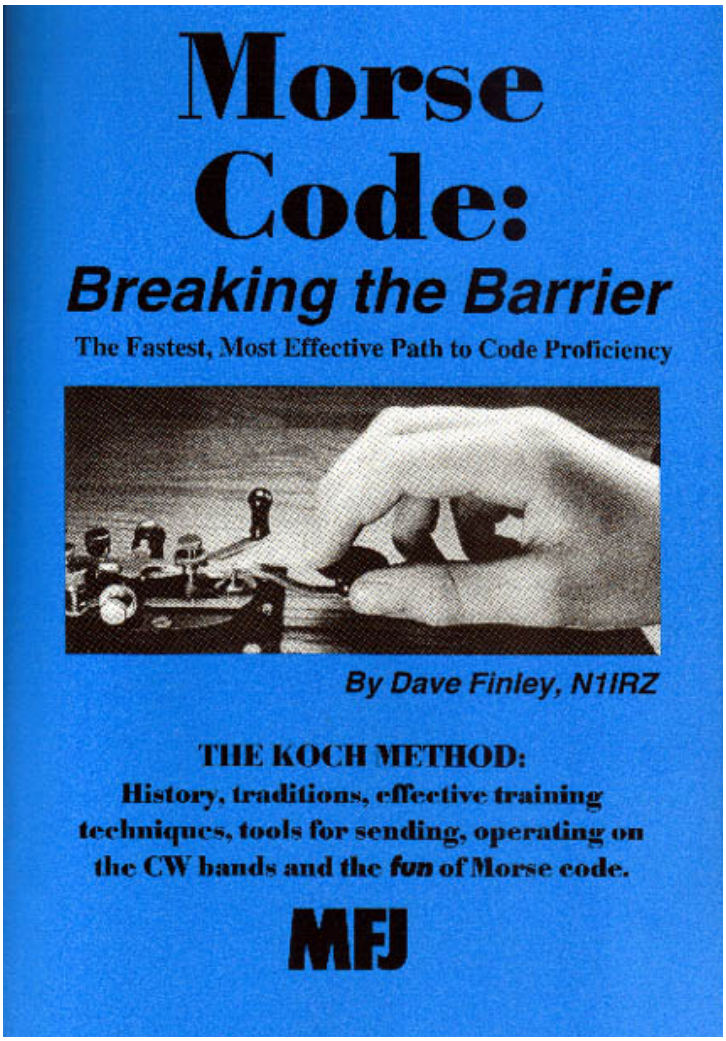
Morse code isn't for everyone, but most of the frustration seems to come from not really knowing how to use it effectively or not actually using it enough to become proficient. As with the piano, practice makes perfect, but practicing the correct techniques right from the start can reduce the time it takes you to perfect your Morse code skills and reduce the time it takes to actually enjoy the experience.

One Big Name or Another

There are plenty of methods for learning the code, but the consensus is that the Boy Scout Method (you learn the code "visually" as a series of printed dots and dashes before you learn the same sequences as audio tones) is probably the worst. I wish I would have known that before I learned the code...using the Boy Scout Handbook!

The Boy Scout method is a fine way to learn each individual element, but it's not a great way to actually use the code on air. First learning the printed sequence forces your brain to go through an extra translational step when you're hearing the code at speed, and those extra, unnecessary steps can really hurt your speed and proficiency over the long run. I'm speaking from experience!

Recognizing that no single method works best for



Morse Code: Breaking the Barrier, by CW enthusiast David Finley N1IRZ, is billed as the first book to detail the Koch method of learning the code and emphasize the training techniques that are the fastest and most effective for code proficiency. Finley, once frustrated by the code-learning process, discovered this simple method and used it to overcome the barrier and upgrade to extra class. The book is available at www.amazon.com (too expensive!), as item MFJ-3400 from www.mfjenterprises.com ($19.95), or from your favorite amateur radio bookseller. (Publisher's photo)

everyone, and that some ops who learned the code via the Boy Scout method do just fine in the long run, the best ways to learn it probably involve only audio tones—and no printed representations whatsoever!

Learning this way sort of comes down to choosing between two big names: Farnsworth or Koch. Each developed an excellent system for effectively learning Morse code and using it fluently after mastering the basics. Choose one system or both, but please put down the Boy Scout Manual until you already know the code!

Farnsworth and Koch teach the code at full speed, adjusting the spacing between full-speed letters and words or limiting the number of characters learned (at full speed) before adding others. Each system is probably way better than learning the code at slow speed or by visually learning the dot and dash patterns from a book or printed page—unless you want to stay at 5 WPM forever or physically print the

code on paper, perhaps as a cipher or an alphabet?

There are lots of Morse code learning resources available on the Internet, many of which use the Farnsworth or Koch methods. One of my favorites happens to be hosted by propagation guru and TSM contributor Tomas Hood NW7US, at **http://cw.hfradio.org**. The site's title is a bit sweeping in its scope—The NW7US International Morse Code Resource Center!—but by the time you've read the material there and followed a few links, you'll know all you need to know about Farnsworth or Koch!

What Would Milt Do?

Despite the fact that Milt Coleman, Sr., K4OSO, of Rockville, Virginia, had been a ham for only five years, right out of the gate he became a Morse code rock star. In only five years he went from newly licensed ham (in his 60s!) to membership in the ARRL's A-1 Operator Club and the UK-based First Class CW Operators' Club (FOC). Membership in each organization is "by invitation only" and is intended to honor exemplary on-air Morse code operating skills and overall operating excellence.

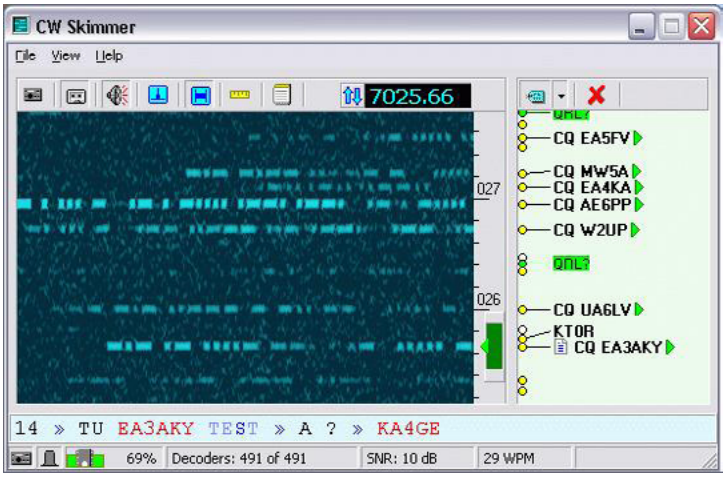
Here are Milt's "8 Good Reasons for Not Getting on the Air," included here with Milt's permission:

I can't copy very well. Copy skills get better with time and practice. Nerves are certainly a factor at first. The answer to nerves is exposure. Get on the air and practice your skills. After all, you're not copying vectors for exploratory brain surgery, just fun stuff. What if you do miss a few words? Eh?

I make mistakes when sending. Who cares? Everyone makes mistakes when sending! If you show me an op who sends flawless CW, I'll eat my hat. Even keyboarders make mistakes. It's what you do when you make a mistake that is the measure of an op. A good op corrects his mistakes. When you glide past mistakes it leaves the other guy guessing.

My CW is very slow. Accuracy transcends speed! Accuracy is absolute, while speed will increase/improve over time. What you don't want is to get faster at sending poorly. Fast and poor are an awful twosome. Practice sending well, at a speed that is comfortable for you. You will make mistakes. Simply correct them and move on.

I get lost in QSOs. As many have suggested, by writing down the parts of a typical exchange you will be better able to get through a QSO. It's funny to realize how few comments are directed to spelling. Spelling slows us down and trips us up in many QSO situations. When you practice sending CW off-air it's fine to use a sheet of text, but I find that sending as if you're in an actual QSO is much more helpful. Practice this by sending out of your head. You'll get used to sending off the cuff and your spelling will improve tremendously. If rag-chewing is your goal, keep your exchanges short. Don't try to say too much in one exchange. That way you'll have time to think about what you'll say next. The short exchanges will slow the other op as well, making his transmissions easier to copy. Keep it casual, and don't let it become hard work.



Need to identify 700 CW stations at once on your wideband SDR? Want a PSK-like waterfall program that tracks call signs with frequency in real time? CW Skimmer, now in version 1.91, by Alex Shovkoplyas VE3NEA, can do all that and a whole lot more. It's free to try, but a licensed version costs $75, so it's not exactly casual. The program does a great job at decoding Morse code signals for SWLs and raw recruits, but it's also used by DX-ers and contesters, where its use is still somewhat controversial! Check it out for yourself at the Afreet Software website, www.dxatlas.com/CwSkimmer. (VE3NEA graphic.)

My palms sweat. Keep a hand towel at your operating desk. My palms were sweaty on my first date, too, but it didn't stop me. Remember, no one can see you! Try pretending you're as calm as a cucumber. Think of yourself as a "take charge" op who can handle any situation. As an op thinkest, so shall he be on the air.

One activity that improved my confidence and ability to handle most situations was learning traffic handling on the Maryland Slow Net. Net speed was a maximum 10 WPM, and the instructors were patient and considerate. That training gave me the confidence I desperately needed. I'm now an Instructor and Net Control Station on that net and get to watch the new participants transform from tentative and unsure to ops who would be welcomed on any NTS traffic net throughout the country. Slow-speed CW nets are easy and painless, and new ops proceed at their own pace. Even if you don't become an active traffic handler, the training is invaluable for learning general operating practices.

Other ops will think poorly of me. No way! Everyone expects new and inexperienced CW ops to be somewhat tentative, make a few mistakes and miss some copy. They expect it because they performed the same way when they were new and inexperienced. Some well-meaning ops will suggest that "no one will notice your mistakes," but of course, they will notice them! They'd have to be idiots not to. The thing is, no one cares about your mistakes. This is a hobby, a means of having fun. It will be fun if you stop agonizing over it. The amount of fun you have when working CW is inversely proportional to the amount you worry about it.

I'll do it when I get better. That's fine if you like procrastinating. "He was gonna get on the air tomorrow" would

make an unfortunate epitaph. "He really enjoyed his ham radio hobby and his CW" would be much nicer. I waited until I was over 60 to finally get started in ham radio. I often think of how much fun I could have had over the years if I had just bitten the bullet and jumped in sooner. Now, I'm trying to make up for lost time. But, we all know that's impossible.

I have problems with this key or that key. It's simple: Use whatever key or keyer you're good with, and develop your skills on other keys at your own pace. Whatever you do, don't force yourself to use key that frustrates you. Learning new skills, while not always easy, should be fun. Measure your progress in small chunks. Don't set your goals too far ahead. You must be able to see progress. If speed improvement is your goal, measure it one word per minute at a time. Don't try to go from 5 WPM to 10 WPM. That's doubling your speed! It would be like me trying to go from 35 WPM to 70 WPM! It's never gonna happen. Go from 5 to 6, then to 7, and so on.

So, now that you know all of Milt's secrets, what are you waiting for?

Mor(s)e Tidbits

How to send is often more complex than where and when to send.

- Send at the same speed the CQing op is using. Assume that he's sending at a speed that's comfortable for him, and that he'll want your reply to be in the same ballpark
- Learn to adjust the length of your reply. If the CQing op sounds savvy (good fist, strong signal), a short reply will usually do the trick (his call sign once and your call sign once or twice). If conditions are poor or if the sending op sounds less sure of himself, send both call signs two or three times. Experience will help you to get the feel for this.
- Your Morse code should be crisp and accurate. Nobody wants to answer calls from sloppy senders. In fact, many sloppy calls are ignored! And these callers thought the bands were dead or that their signals were weak! Practice sending code off the air until yours sounds good. Have a friend who is a good CW op listen to your code. Work toward excellence! This makes all the difference when conditions are less than ideal.
- Make sure your signal is clean. Don't overdrive your rig or do anything foolish. And don't run out and buy a linear amplifier. Keep your rig tuned and adjusted properly and put up the best antenna system you can manage.
- Learn from your on-air experiences. Carefully see what works and what doesn't, and always stay in the realm of good behavior.
- Try to get comfortable sending with a solid paddle and a decent electronic keyer. I know that's anathema to some purists, but sending good code with a straight key (for any length of time) may indeed be a lost art. And forget about using bugs (semi-automatic keys). Sending with these relics should, for the most part, be a forgotten art! Historical and sentimental references aside, don't try to make your sending distinctive by having your own "swing." I'm sorry folks, but nonstandard code is bad code, no matter what the reason.
- Learn to copy code in your head without having to write it down. This makes Morse code more fun and less work. (Author—take your own advice!)

Band Segments and Additional Help

Unfortunately, you can't learn Morse code from this column alone, but you can pretty much find any and all necessary resources at the bottom of NW7US's Morse page, mentioned earlier. Several organizations exist to Elmer Morse beginners, and there are plenty of audio and software training resources available, many for free.

Having a local Elmer helps, too, of course. Just don't let them show you any printed Morse references. Use your ears and your brain exclusively until you've got it down. Then, if necessary, look at printed dots and dashes and remember how lucky you were not to have studied them first!

When I was learning to use Morse on the air, the USA Novice bands were loaded with signals, foreign and domestic. On 80 (3.7 to 3.75 MHz), it was almost exclusively domestic ops. Same thing for 40 (7.1 to 7.15 MHz). Fifteen and 10 meters (21.1 to 21.2, and 28.1 to 28.2), however, were loaded with stations from here, there, and everywhere during daylight and early evening hours. I came very close to making DXCC as a Novice because these segments were so well populated with slow-speed-friendly DX ops, many of whom were learning the code themselves.

Today, however, thanks to shifting usage patterns and a very uncooperative ionosphere, these band segments are all but dead. Even during rare band openings "upstairs," the old Novice sub-bands are all but flat lined. An occasional digital signal above ".100" can sometimes be heard.

There is, however, one fantastic band segment that is the salvation of all Morse learners everywhere (well, at least North America). By unofficial convention, 7.110 to 7.130 MHz is where Morse learners and Morse Elmers hang out. With present-day band conditions, it's probably a good thing. Forty meters will be a workhorse band for years to come, and it's open to somewhere round the clock. So, if you want to find other Morse learners or ops who are willing to happily engage in slow-speed Morse QSOs, that's the place to be. I know it's a bit crazy, but I encourage you to learn Morse code before you decide it's not for you. Of course, I haven't taken this advice myself on a great many things—ballroom dancing is among them, as is playing polka music on the accordion. But because we're hams talking about ham radio, to quote my parents, "Do as I say, not as I do!" Dit dit!

Culture Shock

I love my Rigol spectrum analyzer. I only wish I were better versed in actually using it for sexy tasks beyond the

basics. I had wanted a spectrum analyzer for the past 30 years, but until SDR technology leveled the playing field, they were just too expensive. SUV expensive, or college education expensive—not just "an extra latte a day at the coffee shop" expensive!

In 2014, Santa and an unexpected tax windfall put a Rigol DSA815-TG spectrum analyzer with tracking generator into my shack. I was living in a townhouse at the time, and I already had enough radio gear and couldn't put up another antenna even if I had wanted to.

The analyzer would force/allow me to spend more time building radios and learning about RF design and construction. That stuff I could do in my existing environment, and when I moved to a QTH that was more antenna-friendly, I could use it even more.

I noticed that my warranty was expiring at the end of 2016, so I contacted Rigol tech support about two minor issues that I hadn't bothered addressing. A few of the membrane keys on the front panel would "stick" sometimes, and the unit had a couple of non-standard "saved presets" that I couldn't seem to delete.

I inquired about the cost of repairs—in and out of warranty—as I'd probably wait a few months if minor repair costs weren't a big deal. I was right in the middle of a move (to that antenna-friendly QTH), and the issues were seemingly minor.

What I heard shocked me! Is it just me, or would it shock you, too?

If I sent the unit back while under warranty, there would essentially be no charge for anything. I'd have to pay for insured shipping from me to Oregon, but that was to be expected. So far, so good.

If I returned the unit after the warranty had expired, however, regardless of the severity of the issue, the company charged a flat fee that was equivalent to 45% of the cost of a new unit. Wow! In my case the fee was estimated at nearly $700!

There was no use in waiting, so I shipped the unit in straight away.

If rumors are correct, Rigol's North America unit is managed by former Tektronix executives, which is located nearby, also in Oregon. Maybe that's why servicing costs are handled that way?

My assumption—and it's only an assumption—is that Tektronix is used to dealing with institutions, schools, agencies and governments who are spending "someone else's money!" Heck, who cares what anything costs when you're not spending your own cash!

But, can you imagine if Icom had a similar policy? You say your $10,000 transceiver broke a switch or one of the rubber feet fell off? Service fee = $4,500! Or if the window crank on your nearly new Lexus broke? Take it to the dealer for repair because it'll only cost $18,000?

To add value, Rigol does calibrate and "performance verify" the units that come in for service. So, on your Lexus with the broken window crank, the Lexus dealership would also tune the car up and fix anything else that was out of spec, including the engine and transmission. Still, it seems like a radical way to do business when compared to the amateur radio norm.

Now that all of my "late model" test equipment is officially "out of warranty," should I be worried? See text. (NT0Z photo.)

I'm curious to see how far Rigol might go with this policy. Why buy a new unit for big bux when you could buy a non-working junker on eBay and then have Rigol make it like new for 45% of the cost of a new unit? Somehow, I doubt that would work for a variety of reasons...but I wish someone would try it and report results!

In my case, I'm glad I sent my unit back when I did. Some of the membrane keys were indeed bad—but so was the unit's main circuit board (motherboard)! I had to wait an additional three weeks for a new board to be shipped from China, but I wasn't in need of a spectrum analyzer in early February anyway.

I mention this only to raise awareness of the policy. Most hams won't ever own a Rigol spectrum analyzer, but many hams do own Rigol oscilloscopes. And I must admit, paying $150 for tip-to-tail repair and recertification of my $399 Rigol oscilloscope wouldn't bother me nearly as much (although I have no idea if the same repair percentages apply to other Rigol products).

Transitional technology is always a gamble. If my newly minted spectrum analyzer craps out in the next five years, today's good feelings will probably give way to something a bit more gnarly. Especially so because in five to 10 years, direct-sampling spectrum analyzers with even better performance will probably retail for $299. Radios, too, but that's a story for another day.

I have no idea whether independent shops can repair Rigol spectrum analyzers with any degree of economy. For my sake—or yours?—let's hope we never have to find out. Unless we're spending someone else's money, of course!

TSM

Radio 101

By Ken Reitz KS4ZR **ks4zr1@gmail.com**

Baseball on the Radio: 1921 and 2017

In North America, the game of baseball has been linked to radio since the beginning of the broadcast industry, when Pittsburgh, Pennsylvania, radio station KDKA made the first broadcast of a professional baseball game August 5, 1921. In those early days, broadcast equipment was very primitive and certainly not portable. There was no such thing as a sports announcer. There were sports writers who worked for newspapers or news organizations, such as Associated Press, who attended events, took notes on what happened and wrote reports for the next day's newspapers, but there were no sports announcers.

Credit for announcing that first baseball games goes to KDKA announcer, Harold Arlin. Hall of Fame broadcaster, Red Barber, wrote in his 1970 book, "The Broadcasters," about Arlin, and that August 5 baseball game: "He set up his equipment inside the screen behind home plate. And over this 'wireless telegraphy,' he announced the first baseball game." It was pretty much a one-off. Back in August of '21 there may not have been many listeners tuned in as radios were not a common household appliance at that time, and KDKA was transmitting with no more than 500 watts.

Just before the first baseball broadcast, Westinghouse engineers designed a radio for the non-technical radio fan, called the Aeriola, Jr., which, according to Westinghouse, was made available to the public in June 1921 that sold for $25 ($339 in 2017 money) and had a range of 12 to 15 miles.

The next broadcast of a baseball game would come later that year with the 1921 World Series, which took place in New York City at the Polo Grounds, between the New York Giants and the New York Yankees from October 5 through October 13. According to MLB.com, it was the first time in Series history that all games were played in the same park. The Giants won the series 5 games to 3 (yes, it was an eight-game series).

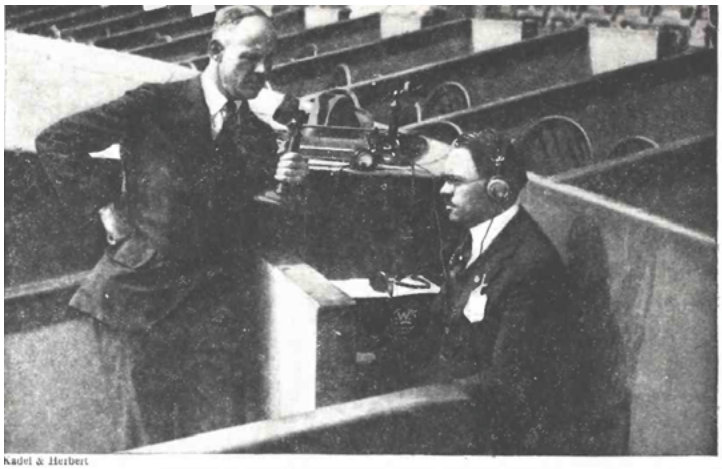
Just about everything on the radio was an experiment. According to the September 1923 issue of *Popular Radio* magazine, "The World Series came along, October 5, 1921, and a man went to the Polo Grounds and there put the news on a telegraph line. In the office of the *Sunday Call* it was taken down and then hustled on a telephone line. This came to one of the editors in the newly established broadcasting station of the Westinghouse Company and there the man spoke into the transmitter and sent it up into the air."

It's possible that the one-off August 5 game prompted a rush to acquire a receiving set for the 1921 Series, also broadcast on KDKA (as well as WBZ, Springfield, Massachusetts, and WJZ, Newark, New Jersey), but radio play-by-play for a full baseball season, as we might recognize it today, would not happen until the 1924 season with the Chicago Cubs.

Radio's first fulltime announcer was KDKA radio's Harold W. Arlin, shown here in a 1920s publicity photo. Arlin handled the first play-by-play of baseball and football, and introduced many noted persons in their radio debuts on this Pittsburgh station. Arlin was a graduate of the University of Kansas and was working in the Westinghouse offices at East Pittsburgh when he applied for the position of announcer. He stayed with radio only five years before going to Mansfield, Ohio, to work for Westinghouse Industrial Relations.

Regarding KDKA's famous ballgame, Red Barber, in his 1970 book, "The Broadcasters," wrote, "On August 5, 1966… forty-five years later…the Pittsburgh Pirates did a rare, rare thing in this materialistic world…they remembered. Harold Arlin was brought out of retirement, brought to home plate—and Bob Prince, who broadcasts the Pirates today, presented Arlin to the fans as the man who forty-five years before, right in the same ball park, announced the first game on the radio." (Courtesy: KDKA)

One of the reasons for the slow start of baseball on the radio was that in 1909 the telegraph company, Western Union, had purchased exclusive rights for all information coming out of all of the Major League parks. It sold the service, known as "Paragraph One," to newspapers and later



Kadel & Herbert

"4,000,000 Baseball Fans Heard His Voice—When Grantland Rice, the popular sport editor of the 'New York Tribune' broadcast from the New York Polo Grounds via WJZ his play-by-play report of the world-series baseball games, his audience was over half a continent.(Caption and image from the December 1922 issue of Popular Radio courtesy of AmericanRadioHistory.com) In his book, "The Broadcasters," Red Barber wrote that Grantland Rice's debut as a sportscaster was shortlived. "In the fourth inning of the third game, Rice decided he'd had enough of the microphone, and [Graham] MacNamee was handed the entire broadcast."

The photo also shows that there was no "broadcast booth" in those days—the lofty perch above home plate where modern, highly paid, play-by-play announcers are privileged to sit in air-conditioned comfort, away from the fans. In the early years, broadcasters sat in box seats along with their equipment and next to paying fans who may or may not have liked what the broadcasters were saying, and would let them know if they didn't.

to radio stations, which "recreated" the games as they were in progress—often complete with sound effects. There was no team radio network with a flagship station as we know it now—the only network was the telegraph line that went to each subscriber. The Morse operator was the only person reporting on the game who was actually at the stadium.

Club owners were suspicious of radio and not keen to allow live broadcasts, fearing that it would drive down ticket sales and, anyway, Western Union's contract with Major League Baseball wouldn't allow any other company to send information about a game out of a Major League ballpark.

According to James R. Walker, in his 2015 book, "Crack of the Bat: A History of Baseball on the Radio," "The service took its name from the initial paragraph of the FCC Tariff 216 covering the rates and conditions of sports play-by-play over the telegraph. The FCC rules provided rates for eight baseball services, including 'Paragraph Two,' half-inning reports, and 'Paragraph Three,' end-of-innings reports. Western Union paid baseball owners for the rights to send the information, and initially, the owners imposed no restrictions on who could receive it."

A Code within a Code

Morse operators perched in the press box at the stadiums were pounding out the play-by-play over telegraph wires using a code-within-a-code that told subscribers what was happening. Red Barber, in his book, wrote, "Western Union sent a skeleton outline: Lombardi up…S1C (for strike one called)…B1L (for ball one low)…Out…High fly to short right. Mungo coming in to pitch for Brooklyn…Frey up … B1W (for ball one wide)…DP (for double play)…Reese to Herman to Camilli."

"Reporting a World Series by Radio—The sporting editor, G. A. Falzer, is here seen using an ordinary telephone for reporting the baseball games at the Polo Grounds, New York, in 1921. But, his telephonic talk went to a transmitting station where it was broadcasted." (Caption and image from the September 1923 issue of Popular Radio, courtesy of AmericanRadioHistory.com)

Barber noted, "I never knew an announcer who knew a dot from a dash. I certainly didn't. All radio stations were welcome to buy this service from Western Union. WHO, in Des Moines, Iowa, carried the home games of the Chicago Cubs and White Sox, all re-created from Western Union, and its announcer at one time was 'Dutch' Reagan. He later became President Reagan."

Owners of the three New York City ball clubs, the New York Yankees, Giants and Dodgers, banned the broadcast of their games for five seasons, from 1934 to 1938, as did clubs in Philadelphia and Washington, DC. By 1939, Dodger's owner, Larry MacPhail, brought Red Barber from Cincinnati to do the announcing for the Brooklyn team and that was the end of the radio ban.

Barber refused to do the recreation bit. He wrote, "I deliberately stood at the mike, looking over the shoulder of the operator, reading what he typed. The sound of the dots and dashes, as well as his typing were completely audible. I wanted those working sounds to be constantly heard…I didn't want to try to fool anybody…neither did I want to be blamed for a garbled play sent to me, when I never saw the play." Barber, along with longtime Yankees announcer, Mel Allen, would later be honored as the first broadcast inductees into the National Baseball Hall of Fame.

With professional baseball, it's always been about the money. With the outright banning of broadcasts by many

Tunable AM loop antennas turn any AM radio into a better performer. At left, Terk Advantage ($40) and at right, Eton AN200 ($20) are both available from Universal Radio. (Courtesy: Universal Radio)

eastern teams and Western Union tying up information rights with all Major League teams, there was plenty of room for sketchy operating practices. Pirating radio broadcasts of games had the potential to bring a station some big money—especially if they didn't have to buy broadcast rights.

An article in the January 21, 1936 *Chicago Tribune* warned of a "War on Radio Pirates," which detailed steps the American League would be taking that year to prevent unauthorized play-by-play direct from the stadium: "Any one who looks as if he might be an announcer, and announcers are a distinct type, will be given the bounce if he hasn't his credentials and does anything suspected of bootlegging reports of a ball game. Gents with satchels that might contain miniature transmitting sets will be placed under surveillance the minute they enter a major league park. Newspaper reporters will be bound to forward play by play accounts to their newspapers only." There was a fear that bootleggers would bring in shortwave transmitters in bags with batteries strapped around the operator's waist and sneak the broadcasts out of the park.

The advent of television would bring even more money to broadcasters and team owners. While it might have been feared that radio killed baseball in the newspaper, it was clear that television could finish off baseball on the radio once and for all. But, that never happened. For many years, TV would not provide more than one broadcast of a baseball game each week—a select "Baseball Game of the Week."

And, as the decades wore on and TV became the dominant medium, radio's portability proved it could go where TV couldn't: the automobile, the workplace, the fishing boat, the beach, all thanks to the new generation of AM transistor radios that were literally pocket-sized, ran on long-lasting 9-volt batteries and had the advantage of being tucked away out of sight and listened to with a small earplug, as many a youngster growing up listening to baseball in the 1960s can attest.

Tuning in Baseball 2017-style

It's always been fun to think that a restored radio from 1930s can still be used to tune in some of the original Major League flagship radio stations from around the US today to hear professional baseball for free. And, for a relatively small fee, you can stream any MLB game on your handheld device, as long as you are within connecting distance of the Web. In addition, you can listen to every single Major League game played this season over satellite radio—also for a fee. So let's take a look at the Major League Baseball listening options.

DXing the AM band for Major League Baseball (MLB)

Each of the 30 MLB franchises broadcast all 162 of their games on the radio and each team fields its own team of radio station affiliates numbering from the low single digits (San Diego Padres) to over 100 stations (St. Louis Cardinals). Team affiliates are scattered all over both the AM and FM bands throughout the region of their influence. Games are in English (across North America), Spanish (many teams with large Spanish speaking populations such as Los Angeles, San Francisco, Chicago, New York) and Korean (one station in Los Angeles). To my knowledge, there are no French language stations broadcasting Toronto Blue Jays baseball, though there had been French language stations when the Montreal Expos were a Major League team (the Expos became the Washington, DC, Nationals in the 2005 season).

Spanish may be MLB's second language on the field and on the radio. There are so many Spanish-speaking fans across the US that many teams have a separate flagship station for their Spanish language broadcasts—some have several stations in their Spanish language radio network.

In earlier years it would have been unthinkable that the flagship station would be an FM station, primarily because

FM stations were few and far between until the 1960s and there were few receivers available before that, particularly in automobiles. Conventional wisdom was that baseball was such a moneymaker that coverage over the greatest area around the team's home was best done through a powerful AM clear channel station. But today, with satellite radio and streaming devices, that's no longer the case. Listeners don't have to struggle with poor reception caused by noise, fading and interference on the AM band. They have interference-free, fade-proof reception via FM, satellite radio and online streaming. As a consequence some flagship stations in the team's home town are FM, among these are Baltimore Orioles, Boston Red Sox, Minnesota Twins, Oakland A's, Texas Rangers, Philadelphia Phillies, Washington Nationals, Pittsburgh Pirates and San Diego Padres.

Despite all that have switched to FM for their flagship stations, many venerable old AM powerhouses remain as the flagship stations of these teams (see list at the end).

Tuning in the games on any AM radio can be a challenge, but my favorite accessory is a tunable AM loop antenna such as the Terk Advantage indoor AM antenna ($40 from Universal Radio **http://www.universal-radio.com/catalog/mwant/2774.html**). I use a Radio Shack tunable AM loop antenna, which I bought many years ago when there used to be a Radio Shack store nearby.

These antennas use a 10-inch diameter coil of copper wire encased in plastic that is tuned to match your radio's frequency by adjusting a tuning capacitor at the bottom of the loop. They typically come with a 6-foot connecting cable, which is particularly useful when using this antenna with a stereo amplifier/receiver. I use it connected to my Sangean HD-Radio tuner and have had good luck listening to AM HD-Radio stations from several hundred miles away. Forget about using small plastic loop antennas that come with radios, they are nearly worthless. Grundig has a similar antenna currently on sale for $20 plus shipping also from Universal Radio (**http://www.universal-radio.com/catalog/mwant/0912.html**).

To use the tunable loop, you can connect directly to the radio via the cable or place the loop near the radio's built-in ferrite core antenna. Tune to the station broadcasting the ball game you want to listen to, position the loop near the radio and adjust the loop's tuning capacitor. You will hear the station you're tuned to increase dramatically in signal strength. To null out interfering stations on the same frequency, rotate the loop left or right for greatest signal strength of the target station.

MLB Game Day Audio

This is the official connection to MLB, where you can "Listen live—every game—no blackouts." For $19.95, for the entire season, you have access to the home or away feed of every MLB game played this season—all 162 games (plus the playoffs and World Series). That's something you can't get any other way. With Sirius/XM you may get every game,

The Radio Shack AM loop antenna in action with a Tivoli Audio Kloss Model One AM/FM radio. (KSRZR photo)

but not necessarily a choice of either the home or away feed. That sometimes means that fans of small-market teams, such as the Baltimore Orioles, are stuck listening to (God help us!) the Yankee broadcasters doing the play-by-play when the O's are playing the Yankees. That's just one reason why, as an Orioles fan, I get MLB Game Day Audio. It's not just the problem with Sirius/XM. Even if I can receive a fairly strong nearby AM or FM affiliate station, as soon as the National Football League (NFL) starts its preseason games (August), those stations carrying Orioles baseball typically bounce them off the air in order to do play-by-play of NFL pre-season football. O's fans can't get any respect from their own team, even in their own market.

Normal online streaming of affiliate stations is suspended during the broadcast of an MLB game, so don't try to listen to an affiliate station's online stream—it will be blocked during the live game broadcast.
http://mlb.mlb.com/mlb/subscriptions/index.jsp?content=gameday_audio

Sirius/XM Satellite Radio

The only satellite radio service in the US requires a subscription to listen to anything other than an obnoxious "Preview" channel. So, if you're a baseball fan, you could be stuck with a $16/month fee. Compared with MLB Game Day Audio, that's a big tab. But, you can get a much lower price by taking advantage of teaser sign-up rates (six months for $30, which might cover the whole baseball season) and then cancelling the service when the teaser rate period is up. If you don't cancel, your subscription will automatically renew at the normal rate via the credit card you used to set up the subscription. When you do cancel (by phone), you'll be handed to a special sales rep who will let you sign up for about $80/per year or $6.66/month, a much better deal.

The advantage of having Sirius/XM is that during and

This Onyx Sirius/XM satellite radio receiver and home kit (left) could cost $150, or you could buy it slightly used (right) on shopgoodwill.com for under $10 (you'll pay shipping either way). (Courtesy: Sirius/XM and shopgoodwill.com)

after the baseball season you'll also have access to their commercial-free music channels, BBC World Service and many other channels—so it's not just about the cost of listening to baseball. Further, a full subscription lets you listen to their online channels, and for baseball listeners, that often means getting to hear the home team feed, even if they are away. To learn more go here: **http://www.siriusxm.com**

If you're concerned about having to buy expensive satellite radio equipment, don't worry, you can get new or almost new complete systems via **www.shopgoodwill.com** for very little. I found a complete unused Onyx receiver system for $7—you pay shipping from the store the set is located (call Sirius/XM's toll-free number to get the system authorized). At almost any time there are more than 20 satellite radio systems for sale on shopgoodwill.com ranging in price from $5 to $30.

A similar new system (Onyx receiver and car kit with warranty) sells new for $150 from **http://www.myradiostore.com/onyx-ez-xm-radio-receiver-with-car-kit-and-home-kit**. But, you can take advantage of a special offer from Sirius/XM (valid as of this writing) for the Onyx Plus with vehicle and home kit for $50 with free shipping. The catch is that you have to sign up for the $16/month subscription plan.

Still Thriving

Baseball on the radio in 2017 is as big as ever—despite the availability of live TV streaming on hand-held devices, endless sports channels on satellite and cable-TV and an exclusive deal with Sirius/XM satellite radio. And, even though "America's National Pastime" may come in a distant second in popularity behind football as the real American Pastime, there are hundreds of professional, minor league, college, high school, junior high school and Little League games being played across North America every day, all spring and summer.

Each year I like to try seeing how many MLB teams I can pick up on the AM band. Using the affiliates list, I can sometimes get lower-powered stations that are closer to my location than the flagship station to get them in the log. Others, such as powerhouse stations WFAN, WLS, WBBM, WTAM, and WOR are easy to hear almost any night during the season, though it gets a pretty rough during the peak of thunderstorm season in the summer.

Oddly, the original professional baseball broadcaster, KDKA, doesn't broadcast Pirates baseball on their AM station. In fact, the KDKA website is mute about its connection to baseball radio history, preferring, as many do, to hype its current talk-show lineup instead.

Things were different in 1970 when KDKA prepared a 32-page publicity booklet titled, "It Started Hear," in honor of its first 50 years of broadcasting (1920-70). It offers an excellent history, not just of the radio station itself, but also of the radio technology that spawned the "Golden Age of Radio," which happened from the 1930s and well into the 1950s in the US. I hope that the station will prepare something similar in three years as it celebrates its centenary.

Sources:

"The Broadcasters" by Red Barber 1970 The Dial Press, New York

"Crack of the Bat: A History of Baseball on the Radio" by James R. Walker 2015 University of Nebraska Press **http://www.nebraskapress.unl.edu/product/Crack-of-the-Bat,676325.aspx**

"It Started Hear" 1970 KDKA Pittsburgh, Pennsylvania

"Big Leagues Train Guns on Radio Pirates" January 21, 1936 *Chicago Tribune* archive

"4,000,000 Baseball Fans Heard His Voice" *Popular Radio* magazine December 1922.

"Reporting a World Series by Radio" *Popular Radio* magazine September 1923. (Courtesy: AmericanRadioHistory.com)

(Above) KDKA 1020 kHz, Pittsburgh, Pennsylvania, QSL card from 1965. Reception was done by using a typical AM tabletop radio in central Florida (850 miles from Pittsburgh) and serves to indicate how powerful this staiton was at the time and how uncrowded the band was, back in the day. KDKA claims the honor of broadcasting the first professional baseball game August 5, 1921. It's still broadcasting Pittsburgh Pirates baseball after 96 years, but only on their FM outlet—KDKA at 93.7 MHz. (KS4ZR collection)

(Above) WBZ-AM, Boston, as received a few years ago in central Virginia, using a Radio Shack tunable AM loop antenna on a Sangean HDT-1X receiver. At a distance of more than 480 miles the HD-Radio digital signal locked in, at least for a while, offering FM-quality audio while it lasted. Unfortunately, WBZ does not carry Red Sox baseball today. (KS4ZR photo)

2017 Major League Baseball Flagship Stations

Opening Day is Sunday, April 2, this year and you might think that each MLB team would want to make it easy to find their radio affiliates list, but it is not so. To find a complete list of each team's network stations go to **http://www.mlb.com** and click on your team of interest. On that team's official MLB website look under the tabs "schedule" or "fans."

Some teams affiliate lists are much harder to find. One, the Boston Red Sox, keep their list with their flagship station's website, not their team's website. If you still can't find it, you can also Google the team's name followed by "radio affiliates."

For each MLB team there are many other affiliated minor league teams, many of which have their own radio networks as well. Those minor league team affiliates can be found the same way.

American League East
Baltimore Orioles WJZ-FM 105.7
Boston Red Sox WEEI 93.7
New York Yankees WFAN 660
Tampa Bay Rays WDAE 620
Toronto Blue Jays CJCL 590

American League Central
Chicago White Sox WLS 890
Cleveland Indians WTAM 1100
Detroit Tigers WXYT 1270 97.1
Kansas City Royals KCSP 610
Minnesota Twins KQGO 96.3

American League West
Houston Astros KBME 790
Los Angeles Angels KLAA 830
Oakland Athletics KGMZ 95.7
Seattle Mariners KIRO 710
Texas Rangers KRLD 105.3

National League East
Atlanta Braves WCNN 680
Miami Marlins WINZ 940
New York Mets WOR 710
Philadelphia Phillies WIP 94.1
Washington Nationals WJFK 106.7

National League Central
Chicago Cubs WBBM 780
Cincinnati Reds WLW 700
Milwaukee Brewers WTMJ 620
Pittsburgh Pirates KDKA 93.7
St. Louis Cardinals KMOX 1120

National League West
Arizona Diamondbacks KTAR 620
Colorado Rockies KOA 850
Los Angeles Dodgers KLAC 570
San Diego Padres KBZT 94.9
San Francisco Giants KNBR 680

TSM

Radio Propagation

By Tomas Hood NW7US **nw7us@nw7us.us**

An Ice Age *and* Disappearing Sunspots?

Back around 2009, I had an opportunity to talk with Dr. Matthew Penn about the research of S. K. Solanki and his students from Zurich starting in 1990. That research commenced with the (then) new infrared capability at the McMath-Pierce Solar Telescope on Kitt Peak in Arizona. The original research was continued by the team of scientists led by Dr. Penn.

Each team made observations of sunspots including a mapping of solar magnetic fields, along with other spectral data. They believed that they discovered an unsettling possibility: the vigor of sunspots, in terms of magnetic strength and area, was decreasing with time, independent of the sunspot cycle.

Dr. Penn speculated that if the trend emerging from the data analyzed from 1990 through 2009 continued, it might indicate that by 2015 or so, sunspots might just disappear completely and the next cycle (Sunspot Cycle 25—we are now at the ending of Cycle 24) would be a 'dead' cycle. At the time that they announced this possibility, most of the solar scientists dismissed the conclusions, pointing out the very limited duration of their observations and other statistical issues in their data.

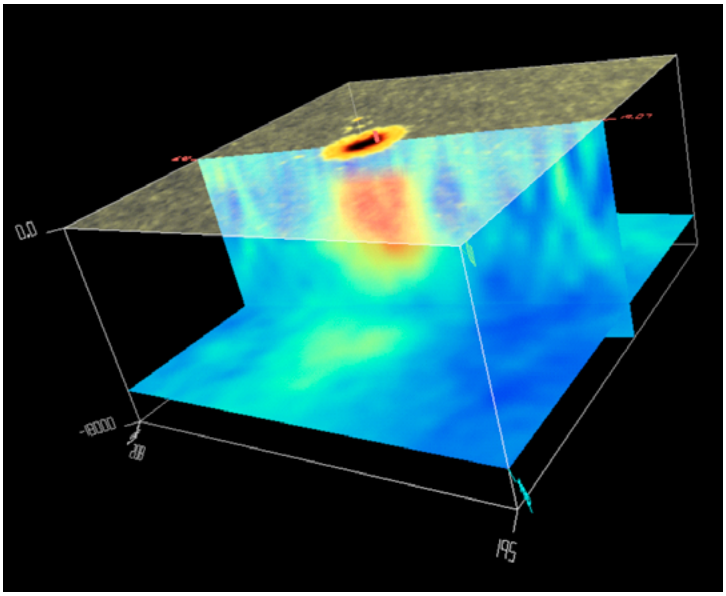
At an annual meeting of the solar physics division of the American Astronomical Society in June 2011, held at New Mexico State University in Las Cruces, results of solar research studies were announced that quickly caught the attention of the world's press, governments, and radio hobbyists from all corners of the Earth.

"The solar cycle may be going into a hiatus," Frank Hill, associate director of the National Solar Observatory's Solar Synoptic Network, said during the news briefing on June 14, 2011. He was not referring to the immediate cycle in which the annual meeting occurred. Rather, he was indicating the longer cycle made up of two cycles in a consecutive period.

The studies looked at a missing jet stream in the solar interior, fading sunspots on the Sun's visible surface (remember Dr. Penn that everyone discounted?), and changes in the corona and near the poles.

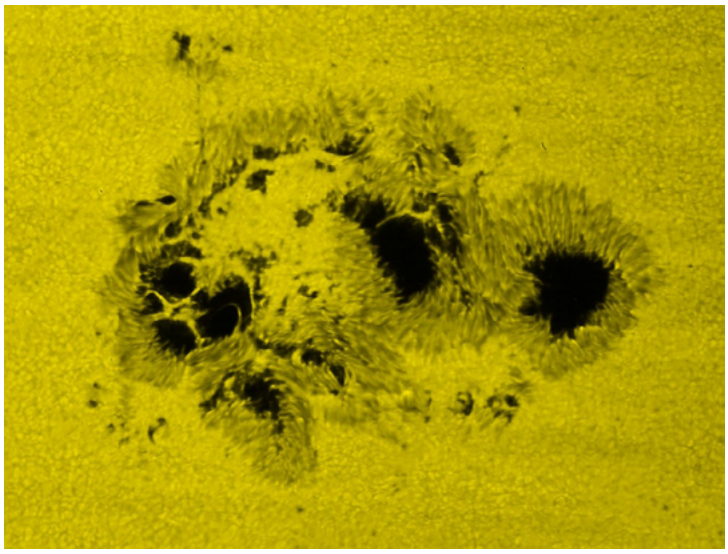
"This is highly unusual and unexpected," Hill said. "But the fact that three completely different views of the Sun point in the same direction is a powerful indicator that the sunspot cycle may be going into hibernation."

That statement created intense discussion and a flurry of news stories on every network, blog, and in many newspapers. Why? One of the implications is that some believe that the level of sunspot activity (more specifically, the correlating energy radiated by the Sun that ebbs and flows along with the sunspot cycle's rise and fall in activity) has an influence on Earth's climate. The less energetic the Sun, the lower will be Earth temperatures. They point to the Maunder Minimum, which was a 70-year period from 1645 to 1715 when the sun showed virtually no sunspots, a period during which we had unusually cold temperatures around the world.



The subsurface structure (sound speed) below a sunspot as derived from Doppler measurements by MDI (Michelson Doppler Imager). Using the technique of time-distance helioseismology, three planes are shown. The surface intensity shows the sunspot with the dark central umbra surrounded by the somewhat brighter, filamentary penumbra. The second plane cuts from the surface to 24000 km deep showing areas of faster sound speed as reddish colors and slower sound speed as bluish colors. The third plane (bottom) is a horizontal cut at a depth of 22000 km showing the horizontal variation of sound speed. Credit: NASA (National Aeronautics and Space Administration)/GSFC (Goddard Space Flight Center)/SOHO (Solar and Heliospheric Observatory)

Frank Hill is the lead author of one of the studies that used data from the Global Oscillation Network Group (which includes six observing stations around the world) to look at characteristics of the solar interior. The astronomers examined an east-west zonal wind flow inside the Sun, called torsional oscillation. The latitude of this jet stream matches the new sunspot formation in each cycle, and models suc-



Detailed image of a complex sunspot group shows dark, highly magnetized "umbras" and structured "penumbras." Credit: Southwest Research Institute/Dr. Matt Penn

cessfully predicted the late onset of the current Cycle 24 (but, note: this prediction was not accurate regarding the exact timing of the start and rise of Cycle 24, and the scientists have been constantly adjusting the model retroactively to better 'fit' it to the data, hoping that the models will predict the future cycles more accurately—we won't know until after the fact).

"We expected to see the start of the zonal flow for Cycle 25 by now, but we see no sign of it," Hill said. "The flow for Cycle 25 should have appeared in 2008 or 2009. This leads us to believe that the next cycle will be very much delayed, with a minimum longer than the one we just went through." Hill estimated, back in 2011, that the start of Cycle 25 could be delayed to 2021 or 2022 and will be very weak, if it even happens at all.

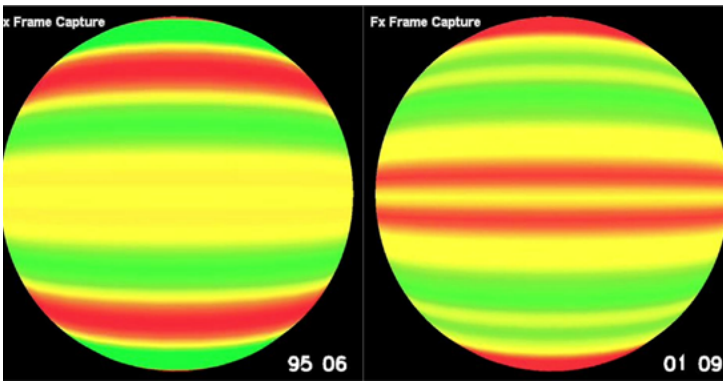
The Sun's Magnetic Field

Another study included in the announcement at that annual meeting is that of Dr. Penn. Now, instead of brushing aside the speculations he and his team previously made, they felt it could have merit, since the other two studies also indicate the same outcome.

With more than 13 years of sunspot data collected at the McMath-Pierce Telescope at Kitt Peak in Arizona, Matt Penn and William Livingston observed that the average magnetic field strength declined significantly during Cycle 23 and into Cycle 24. Consequently, sunspot temperatures have risen, they observed.

If the trend continues, the Sun's magnetic field strength will drop below a certain threshold and sunspots will largely disappear; the field no longer will be strong enough to overcome such convective forces on the solar surface.

In the third study presented, Richard Altrock, manager of the Air Force's coronal research program at NSO's facility in New Mexico, examined the Sun's corona and observed



Mobile "jet streams" in the Sun migrate from the poles toward the equator as the solar cycle progresses. At left (solar minimum) the red jet streams are located near the poles. At right (solar maximum) they have migrated close to the equator. The jet streams are associated with the locations where sunspots emerge during the solar cycle, and are thought to play an important role in generating the Sun's magnetic field. Credit: Southwest Research Institute

a slowdown of the magnetic activity's usual "rush to the poles." Altrock carefully examined 40 years of observations from NSO's 16-inch (40 centimeters) coronagraphic telescope. The data reveals that new solar cycle activity typically emerges at a latitude of about 70 degrees at the start of the solar cycle, then moves toward the equator. The new magnetic field simultaneously pushes remnants of the past cycle as far as 85 degrees toward the poles.

The current cycle, however, revealed different behavior. Altrock explains, "Cycle 24 started out late and slow and may not be strong enough to create a rush to the poles, indicating we'll see a very weak solar maximum in 2013, if at all." This prediction proved to be somewhat accurate. Cycle 24 is the weakest cycle in recent history.

"If the rush to the poles fails to complete, this creates a tremendous dilemma for the theorists," Altrock said. "No one knows what the Sun will do in that case." While there are some new predictions being contemplated that indicate a possible moderately strong Cycle 25, these early predictions may be the most plausible. Cycle 25 may be even weaker than Cycle 24.

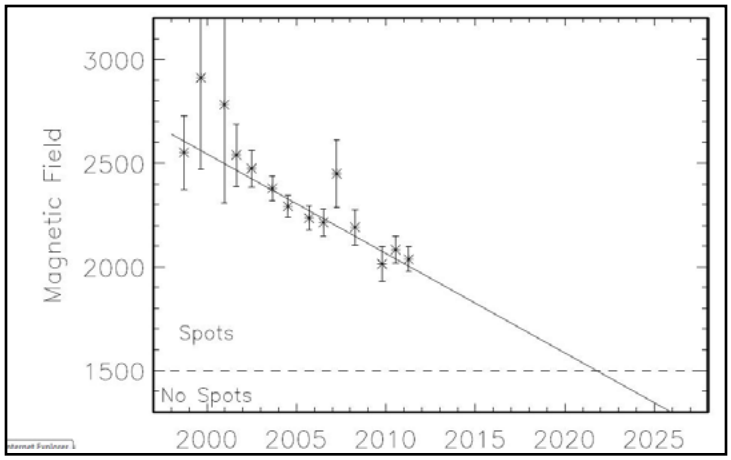
For the radio communicator, we've already had a taste of a spotless Sun for an extended period of time. This past sunspot cycle minimum, between Cycle 23 and Cycle 24, provided us with incredible insight on the nature of our ionosphere and how we can still communicate around the world even when there is so little solar activity.

If the models prove accurate and the trends continue, the implications could be far-reaching. Not just for radio communications, but in many other areas of our environment.

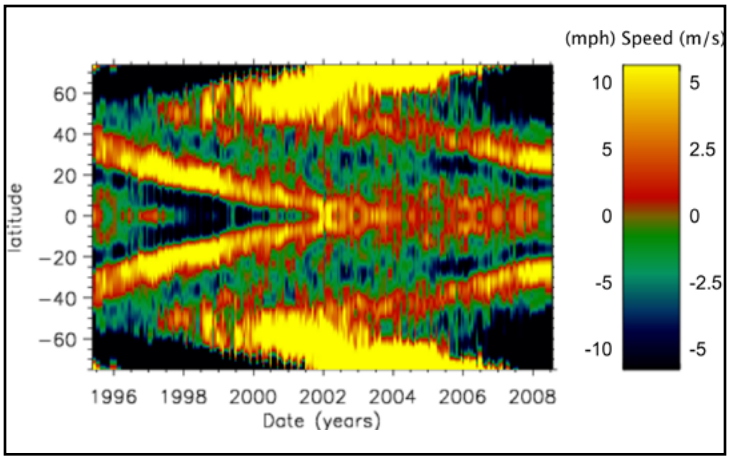
"If we are right, this could be the last solar maximum we'll see for a few decades," Hill said. "That would affect everything from space exploration to Earth's climate."

No Global Warming? An Ice Age Instead?

Back during the last solar cycle minimum, and in 2011



Average magnetic field strength in sunspot umbras has been steadily declining for over a decade. The trend includes sunspots from Cycles 22, 23, and (the current cycle) 24. Credit: SWRI/Dr. Penn



This diagram shows east-to-west motion speed versus latitude, as it evolves year to year at a depth of 4000 miles (7000 km) in the solar interior, as derived from helioseismology observations by GONG and SOHO/MDI. The diagonal yellow bands are the "torsional oscillation" jet streams inside the Sun. The streams are associated with the solar activity cycle. The flow for the previous cycle (#23) can be seen in yellow at the left side of the picture, while the flow for the next cycle (#24) is visible in yellow at the right side of the image. The streams for Cycle 24 have migrated slower than those for Cycle 23. The bottom of the yellow band is currently at the critical latitude of N/S 22 degrees (mid 2009). Source: GONG/SOHO/MDI

when scientists proclaimed the prognosis of a disappearing solar cycle, many news outlets like the Daily Mail (in the United Kingdom) ran headlines such as, "Earth facing a mini-Ice Age 'within ten years' due to a rare drop in sunspot activity." The "there's no global warming going on" crowd jumped for joy, hearing this announcement. Could it be true that the Sun is "cooling down" and we're going to see a global cooling, too, not global warming?

Let's remember some key points as we consider this proclamation by these scientists. Scientists studying the Sun have been trying to figure out the cycle of sunspots for over 400 years. More recently, over the last three cycles, we've increasingly had better tools and methods by which to study our nearest star. In all honesty, we've only had the highly accurate instruments that provide the deep view of the Sun's internal activity for just shy of two cycles. That's not a lot of data upon which to base whole models.

The Sun's cycles are very complex, but as technology has gotten better, some trends have been found. Now scientists are noticing that these indicators are all pointing to the Sun possibly settling down magnetically.

But do we have enough data, based on a long-enough period (don't we need the data of dozens if not hundreds of sunspot cycles?) to truly be able to forecast the future activity of the Sun? Is the Sun a machine that follows an exact sequence of events, and each cycle follows a set of rules? Or, is the Sun a dynamic and randomly active object that is not so predictable?

Back to the Global Warming question, and whether a spotless Sun will cause the temperatures to plummet. Climate scientists are all scrambling to assure us that the Sun has no effect on Earth's temperatures, at least from the standpoint of sunspot activity. They are claiming that humans have more influence on the rise and fall of global temperatures than the huge ball of plasma that can give us sunburns. They are going to great lengths to assure us that we still need expensive policies to be sure we're reducing our carbon footprint, in turn saving our planet from certain doom.

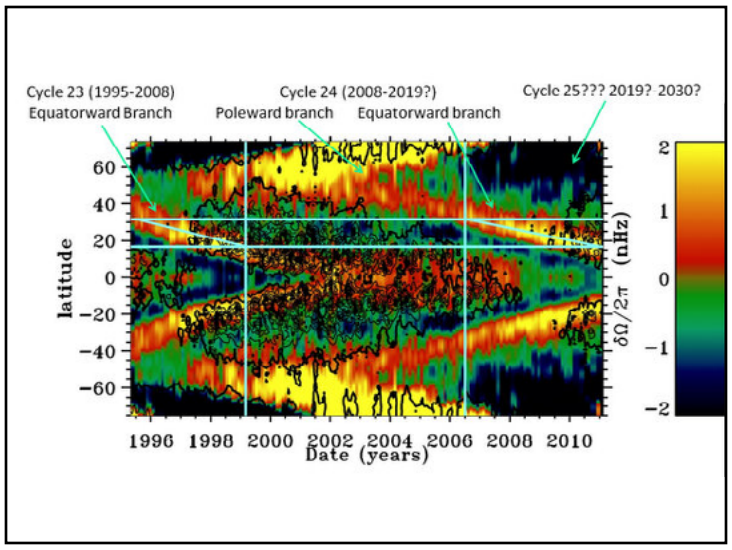
Global Warming experts tells us that if the Sun ends up spotless and lacks the energy we've come to enjoy since the days when the Thames River was frozen over, we're still in danger of our polar ice caps melting. Therefore, they postulate, we must be sure that our governments set their budgets accordingly and mandate policies by which industries and civilians operate.

Perhaps the same agenda drives climate scientists that drive solar scientists as they make their presentations to financiers: they need a cause worth funding. At the same time that the announcement was made in June regarding the disappearing sunspot cycles, the US president met with England's government to discuss the need to fund Space Weather and Solar Science initiatives. Timing is everything. Since then, former President Obama signed an executive order that funded space weather research and technology, to mitigate against the effect of space weather.

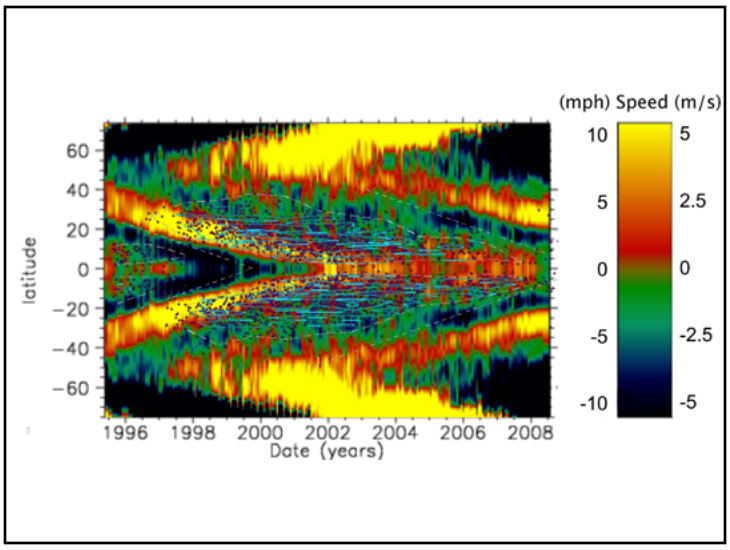
In any case, we radio communicators will be ready. If our weather turns rough and our lakes freeze over, or if the oceans rise and our cities flood, we know how to rise to the occasion and survive, helping our neighbors, providing communications and assistance. Your columnist, though, is not holding a lot of credence with either group of prognosticators; the Sun is not going to sleep, nor are we going into neither a Grand Cook Out nor an Ice Age. Perhaps the Sun will not be easily predictable. That's this columnist's prediction.

HF Propagation

As we move into spring in the northern hemisphere



Latitude-time plots of jet streams under the Sun's surface show the surprising shutdown of the solar cycle mechanism. New jet streams typically form at about 50 degrees latitude (as in 1999 on this plot) and are associated with the following solar cycle 11 years later. New jet streams associated with a future 2018-2020 solar maximum were expected to form by 2008 but are not present in this graph, indicating a delayed or missing Cycle 25. Credit: SWRI (Southwest Research Institute)



7000km deep overlay -- This diagram shows east-to-west motion like Fig. 6(a), but overlain on the surface pattern of sunspots and solar activity high above. The dashed diagonal lines show the slope (in degrees of latitude per year) of the Cycle 23 motion. The Cycle 24 motion has a shallower slope, requiring one extra year compared to Cycle 23 to reach the critical latitude of 22 degrees. In this plot, the Cycle 24 stream is just beginning to reach the critical latitude, and faint signs of sunspot activity can be seen in the northern hemisphere at right. This heralds the start of a new solar cycle. Source: GONG/SOHO/MDI

we experience better DX openings from around the world on HF. This is because the Sun is mostly overhead over the equator, creating equal day and night periods in both hemispheres. The Vernal Equinox at the end of March marks the day when the hours of daylight and darkness are about equal around the world. This creates an ionosphere of similar characteristics throughout more of the world than is possible during other times when it is summer in one hemisphere and winter in the other, and there are extreme differences in the ionosphere. This equalization of the ionospheric, which takes place during the equinoctial periods (autumn and spring) is responsible for optimum DX conditions, and starts late in February and lasts through late April. The improvement in propagation is most noticeable on long circuits between the northern and southern hemispheres. During this season conditions are optimum for long-path as well as short-path openings, and during gray line twilight periods associated with sunrise and sunset.

April is one of the hottest months for DX. The seasonal change plays out on HF with activity moving up from 41 meters, but down from the higher shortwave frequencies. Propagation on the higher HF frequencies (17 through 10 meters—though 10 meters has barely seen any life this cycle) begins to suffer late in April and into the summer months due to lower MUFs (Maximum Usable Frequencies) in the Northern Hemisphere. MUFs peak very late in the day during summer. Summertime MUFs are lower due to solar heating which cause the ionosphere to expand. An expanded ionosphere produces lower ion density, which results in lower MUFs. Short-path propagation between countries in the Northern Hemisphere will drop out entirely. Higher frequency propagation peaks in the fall. April and May are fall months in the southern hemisphere making long-path DX possible. Short-path propagation from South America, South Pacific, and other areas south of the equator will be strong and reliable when open. However, these do not happen every day on the higher frequencies.

From April to June, good propagation occurs on both daytime and nighttime paths. The strongest propagation occurs on paths that span areas of both day and night, following the MUF. During April, peaking in May and still in June, 15 meters may offer 24-hour DX to all parts of the world, with both short- and long-path openings occurring, sometimes at the same time! If you hear a lot of echo on a signal, you might be beamed in the wrong direction. Try the opposite azimuth. Thirty-one through 20 meters are more stable as nighttime bands, with propagation following gray line and nighttime paths.

Low-band propagation is still hot on 40 meters, with Europe in the evening, and Asia in the mornings. Occasional DX openings will occur on 80 and 75 meters around sunrise.

Propagation on VHF and Above

On VHF, many different types of propagation modes can appear once or twice during this month. Combination propagation modes may be possible on VHF, making for some exciting openings. An increase in Trans-equatorial (TE) propagation is typical, too. There are times when TE and F2-layer propagation modes will link, providing strong DX openings on VHF between North America and New Zealand, Australia, or other areas. The best time to catch a

TE opening across the geomagnetic equator is between 8 and 11 PM local daylight time. These TE openings will be north-south paths that cross the geomagnetic equator at an approximate right angle.

Widespread Auroral displays can occur during April, bringing with them unusual ionospheric short-skip openings on the VHF bands. Best times for these to occur are during periods of radio storminess on the SW bands. Look for days with high planetary K (Kp) and A (Ap) figures (typically, the Kp should be over 5). Will that occur often, this year? Because we are nearly at the end of the current solar cycle 24, we are not going to see major solar flares with resultant coronal mass ejections. But, coronal holes are numerous at the end of a cycle, so we might see a number of days this month during which there is geomagnetic storminess along with aurora.

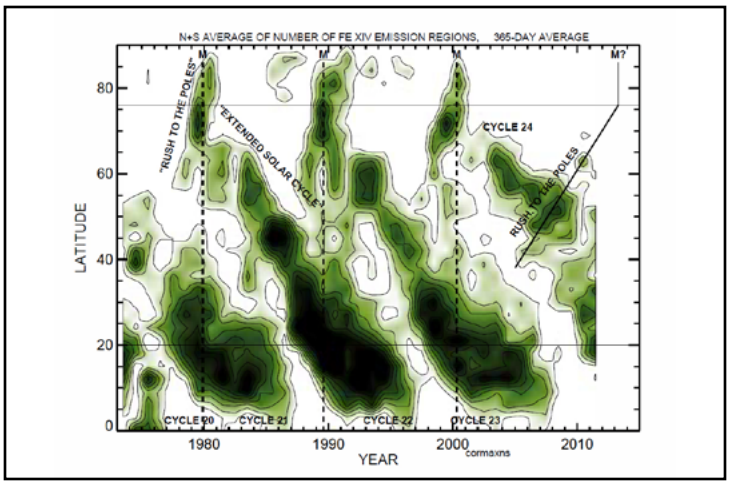
We expect a possible minor geomagnetic storm once or twice this month caused by increased solar wind speeds and density triggered by coronal holes (we've explored coronal holes in past issues). Geomagnetic storms that ignite auroras occur more often during the months around the equinoxes during early autumn and spring. This seasonal effect has been observed for more than 100 years.

Meteor showers provide opportunity for observing VHF/UHF Meteor Scatter propagation DX. Most meteor showers are at their best after midnight. After midnight, you're on the leading edge of the Earth and you're meeting the meteors head-on. Before midnight, you're on the trailing edge of the Earth and the meteors must catch up to you. As a result, not only are more meteors seen in the pre-dawn hours, but their impact speeds encountering the Earth's atmosphere are much higher and the meteors are generally faster and brighter. This causes greater ionization, which is what you use to refract a radio signal. Listen for FM broadcast "pings" (short bursts of reception from stations that you normally don't receive) during these events. If you are an amateur radio operator, look for 6 and 2-meter openings off the ionized meteor trails.

The Lyrids, a major meteor shower, should take place from mid to late April. The unpredictability of the shower in any given year always makes the Lyrids worth watching, since we cannot say when the next unusual return may occur. If this year's event is average or better (30 to 60 good-sized meteors entering the atmosphere every hour), meteor-scatter openings could occur on the VHF bands.

Solar Cycle 24 Today

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly mean sunspot number of 15.7 for February 2017, about the same as for January (15.5). The mean value for February results in a 12-month running smoothed sunspot number of 21.6 centered on August 2016. Following the curve of the 13-month running smoothed values, a smoothed sunspot level of 23 is expected for April 2017, plus or minus 14 points.



Plots of coronal brightness against solar latitude show a "rush to the poles" that reflects the formation of subsurface shear in the solar polar regions. The current "rush to the poles" is delayed and weak, reflecting the lack of new shear under the photosphere. Note the graph depicts both north and south hemispheres overlaid into one map of solar magnetic activity, and that the patterns correspond with the butterfly diagram above. Credit: SWRI

Canada's Dominion Radio Astrophysical Observatory at Penticton, British Columbia reports a 10.7-cm observed monthly mean solar flux of 76.9 for February, down slightly from 77.4 for January 2017. The twelve-month smoothed 10.7-cm flux centered on August 2016 is 85.5. A smoothed 10.7-cm solar flux of about 82 is predicted for April 2017.

The geomagnetic activity as measured by the Planetary-A index (Ap) for February 2017 is 10—the same level of activity as we've observed every month since November 2016. The twelve-month smoothed Ap index centered on August 2016 is 11.2 (same as for July). Geomagnetic activity this month should be about the same as for March 2017, with a possible slight increase in number of geomagnetically stormy days. Refer to the Last-Minute Forecast found at **http://SunSpotWatch.com** for the outlook on what days we might witness degraded propagation.

Feedback Requested

Do you have propagation-related questions, or a topic related to the Sun, the Ionosphere, or the Sun-Earth connection, that you'd like answered? Please send in your questions and comments, for possible inclusion in this column. If you are interested in a space weather and radio propagation forecast self-study course, visit **http://SunSpotWatch.com/swc** for details.

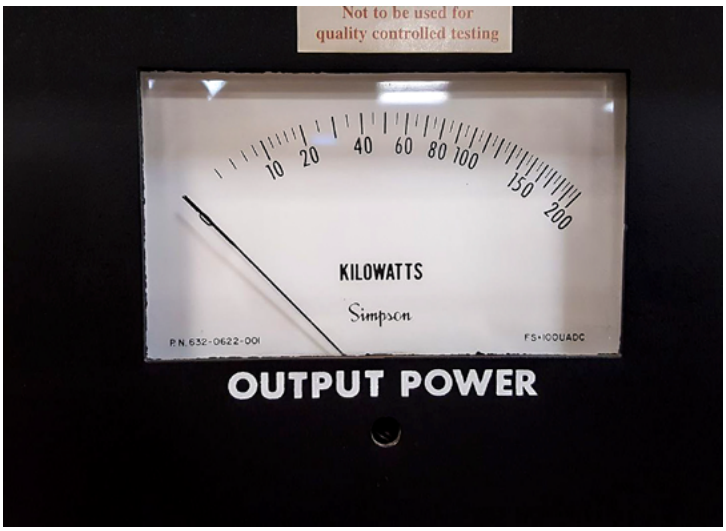
Your columnist has a website dedicated to space weather, at http://SunSpotWatch.com and also provides a Facebook page at **https://www.facebook.com/spacewx.hfradio** which features daily updates with solar images, space weather graphs, data, and educational tidbits, all day long, so please take a look. There are quite a few space weather and radio videos on this columnist's YouTube channel at **https://YouTube.com/NW7US**.

TSM

The World of Shortwave Listening

By Rob Wagner VK3BVW **robvk3bvw@gmail.com**

Radio Australia: A Possible Return?



Left: Preparing for the big switch off of the Shepparton transmitters. Right: This photo tells the story. No more watts coming out of the Shepparton transmitters. (Photo courtesy of Rex VK3OF)

If you have been following the saga surrounding the closure of Radio Australia on shortwave in *TSM* over the past three months, you will already be aware that this once strong international broadcaster has now gone. But is this really the end? Could we see Radio Australia (RA) rise from the ashes?

Back on January 31, I had been given the green light to attend the final broadcast from RA's Shepparton transmitters by the station manager, Steve Ashmore. My intention was to record the historic event through video and photographs. Unfortunately, I had to cancel the visit due to an ongoing illness. Making the round trip of 400 km (250 miles) in the one day was just not going to be possible. In addition, Steve reminded me that people with pacemakers were not allowed in the transmitter hall while the 100 kW transmitters were in operation. Whoops! That also counted me out! So there would be no chance to record the official shut down, at a site that had been in operation for over 70 years.

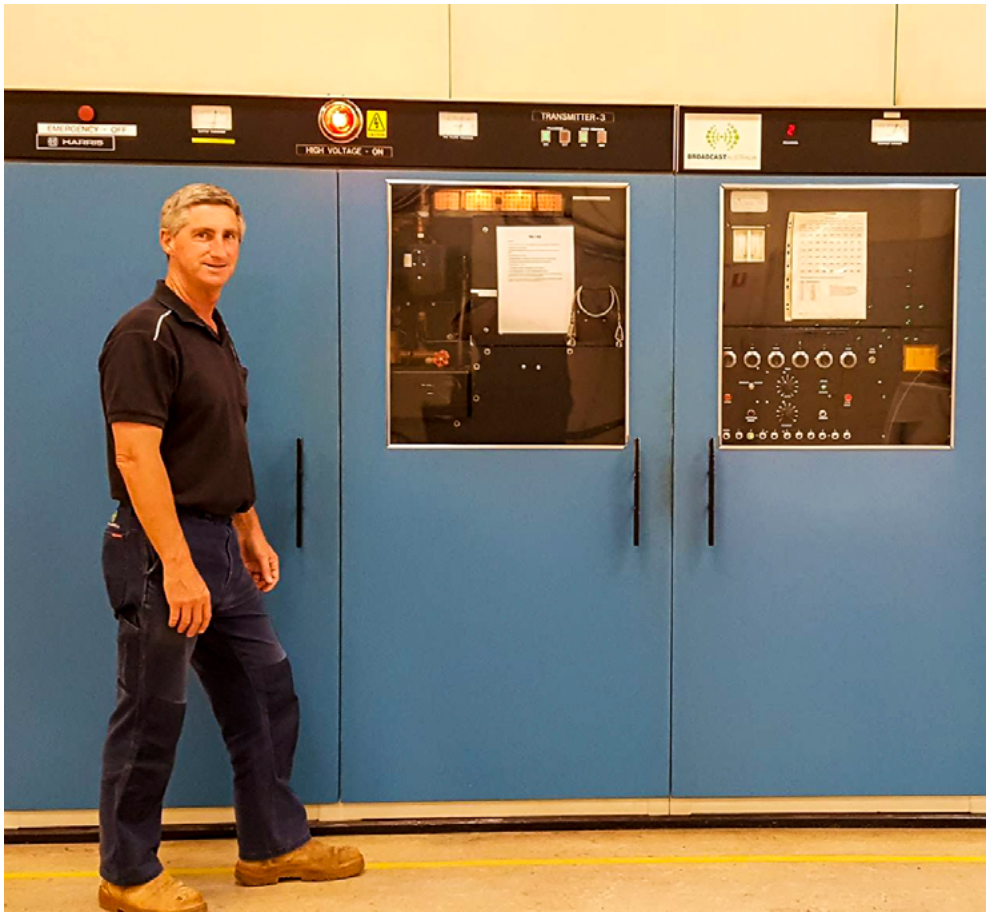
So, I did the next best thing I could do – I made sure I was near a radio for that final transmission. You can view my January 31 video of the last two minutes of the broadcast on 17840 kHz: **https://youtube/M8eJoTXf6Lw**

Pacific Islands Unhappy

In its heyday of the 1970s and 80s, RA broadcasts were beamed to Europe, North America, Asia and other parts of the globe. But as successive governments cut funding to the Australian Broadcasting Corporation (ABC), RA became one of the main services to suffer. European and North American broadcasts disappeared, and even the Asian services were whittled away to nothing. In the end, the once popular world voice of Radio Australia concentrated purely on Papua New Guinea and the Pacific Islands.

Now that the service has ended, leaders of many Pacific Islands are concerned about the effects this decision will have on their local communities. Thousands of island communities are poor. Radio is an important lifeline for them. The region is regularly subjected to natural disaster such as tsunamis, cyclones and earthquakes. As was found two years ago in the cyclone that devastated Vanuatu, one of the first parts of infrastructure to be rendered useless were island communications. It was weeks and months before some outer islands in the Vanuatu group were reconnected with the outside world. Radio became that important lifeline.

The Pacific region and parts of Asia are also known for



Transmitter No. 3 at Shepparton. (Photo courtesy of Rex VK3OF)

occasional civic disturbances. In recent decades, Fiji, Solomon Islands, East Timor, and Burma were just a few countries where national governments controlled, restricted and censored information. A freelance journalist in the Solomon Islands indicated that RA played an important part during the country's ethnic crisis, especially when the local journalists felt threatened and the independence of the media was jeopardized. At those times, radio came to the fore by allowing listeners to keep in touch with events as they happened via shortwave radio. It is truly the only medium without borders! As an independent voice, RA was highly valued among listeners. An excellent article on this topic can be found online at The Conversation news site: **https://theconversation.com/pacific-nations-lose-shortwave-radio-services-that-evade-dictators-and-warn-of-natural-disasters-70058**

Radio New Zealand International (RNZI) is now the only large shortwave broadcaster in the Pacific. RNZI reports that Papua New Guinea MP Mr. Ron Knight indicated the closure would affect 90 per cent of his people in the remote Manus Province who cannot receive FM radio. "For it (Radio Australia) to close down will deprive a lot of people of current affairs and news and the situation as day to day events unfold in and around the world and the Pacific region." You can read the full article at **http://www.radionz.co.nz/international/pacific-news/323492/dismay-in-melanesia-as-abc-ends-shortwave**

Leaders of the many Pacific island nations have expressed considerable disquiet over this decision, and they have made representations to the Australian Federal Government Minister for Foreign Affairs.

Northern Territory Complications

As well as its closure of RA, the ABC also ceased its domestic Northern Territory (NT) Shortwave Service on January 31. Operating from three locations: Alice

At the Shepparton site, there is plenty of memorabilia. This photo is of the 50 kW RCA transmitter, which was installed to increase broadcast capacity for the 1956 Olympic Games, held in Melbourne. (Photo courtesy of Rex VK3OF)

Springs, Tennant Creek and Katherine, this service in the 120 and 60 meter bands provided 24-hour radio contact to the very remotest parts of the Australian outback, to places where no FM or AM services were available. Cattle producers, truck drivers, travelers and tourism operators, remote homesteads, and even commercial fishermen operating off the far north coast of Australia have expressed concern about the dissolution of this long-time operation. For cattle drovers in outback camps who may be living in the bush away from home for several weeks at a time, the NT service was their only way of keeping in touch with the outside world.

ABC's Impractical 'Solutions'

The money saved by closing both the Pacific and Northern Territory shortwave services reportedly amounts to around US$3 million, although the ABC has been somewhat vague on the exact amount. The organization has indicated that some of the money saved would go into extending its DAB+ services in Darwin (NT) and Hobart (Tasmania) along with other digital radio improvements nationwide. As for the Pacific, ABC says that it will redirect some funds into FM distribution networks. Its solution is for listeners in remote outback regions to buy a VAST satellite system for their homes and fishing vessels, or stream ABC audio via the Internet.

It is clear that the ABC administration sitting in their air-conditioned Sydney offices have little understanding of the impractical nature of their suggestions. When your audience is spread over vast distances involving many hundreds of miles in both the remote Northern Territory and in far-flung Pacific Islands, offering FM and AM alternatives just won't cut it. Telling listeners to simply log onto the Internet is futile when Internet services are not available or data costs are prohibitive. In its defence, the ABC claims that Pacific Islanders all have mobile phones, so streaming content shouldn't be a problem. But try telling that to a poor family on a remote island in the Pacific or on a lonely cattle station where there is

Radio Australia logo (Courtesy: Radio Australia)

either no mobile telephone service or hideously expensive data costs. And, as one fisherman pointed out, with his boat always on the move over many hundreds of miles, he would need to constantly be readjusting his satellite dish in order to try and maintain reception.

Despite what some commentators and the ABC may say, mobile phone and Internet services in the Pacific Islands are still very much undeveloped. A case in point is Papua New Guinea where an extensive report by independent telecommunications researchers, BuddeComm, highlights the challenges of infrastructure and low-income base. While recognizing that there is enormous potential for telecommunications in that market, the report points out that, "This growth could be inhibited by the latent difficulties within the market, including the high cost of deploying infrastructure, the relatively low income base among potential subscribers, and the geographical dispersal of the population. As a result of these conditions PNG remains one of the least affordable mobile markets in the Pacific."

The report goes on to say, "Network deployment costs are high in PNG due to the relatively low subscriber base, the impervious terrain, and the high proportion of the population living in rural areas. As a result, fixed telecom infrastructure is almost inexistent outside urban centres, leaving most of the population unserviced." You can read the latest iteration (February 2017) of this report at **https://www.budde.com.au/Research/Papua-New-Guinea-Telecoms-Mobile-and-Broadband-Statistics-and-Analyses#**

The Fight Begins

Regular shortwave listeners will remember that several years ago Radio Exterior de España attempted to switch off its shortwave transmitters permanently. After an outcry from Spanish nationals, the service was reintroduced three months later on a much smaller scale for Spanish merchant sailors around the world. And, the Voice of Greece looked like it was finished when that country's government closed down the External Service back in June 2013. Later that year, the station began again in an "unofficial" capacity. It is now back with reduced daily services on 9420, 9935 and 11645 kHz.

So, there is a chance that both Radio Australia and the Northern Territory Shortwave Service will also return in some form. The ABC is an independent authority from the Australian Government, but its annual funding comes from government budgets. Theoretically, the ABC can do what it likes with the money it receives! But if strong enough representations are made to the Federal Government, then it is possible that legislation could be passed compelling the ABC to offer a shortwave service.

Nick Xenophon, Senator for South Australia. In a press release from January 29, 2017, Xenophon said, "Not only has ABC management failed to consult with individuals and remote communities affected by this decision, it has failed to consider its very own charter obligations to be a broadcaster for all Australians, not just those in capital cities." (Courtesy: https://nick.nxtmps.org.au)

Two Northern Territory parliamentarians have been very proactive in raising the issues on behalf of their constituents. Other Members of Parliament (MPs) have also taken an interest in the cause, including one rather colorful leader of a minor party known as the Nick Xenophon Team (NXT). We also know that the Foreign Affairs Minister, the Hon. Julie Bishop, has been in discussions with the Pacific leaders of Vanuatu, Solomon Islands and Fiji. She is anxious to continue developing strong ongoing relations with Australia's Pacific neighbors.

On February 13, a bill was introduced into Federal Parliament, to be known as the Australian Broadcasting Corporation Amendment (Restoring Shortwave Radio) Bill 2017. In summary, this bill seeks to amend the Australian Broadcasting Corporation Act 1983 to: require the Australian Broadcasting Corporation to maintain three domestic shortwave transmission services for the Northern Territory that were operating up until 31 January 2017; and maintain an international shortwave radio transmission service for Papua New Guinea and parts of the Pacific. The Senate Estimates Committee has called in the ABC Management in to what can be described as a rather fiery meeting! The committee is required to report back on May 10.

It's All In The Numbers

Some commentators have been referring to a figure of only 15 people complaining about the closure of the

shortwave services. This number has been touted by ABC management and appears to be rather inaccurate! There have been many more complaints, including some from people I know personally. Has the ABC registered and counted all complaints? Furthermore, at the Senate meeting on February 28, the ABC Managing Director again claimed that only 15 complaints had been received. Yet the Committee revealed that it had received 52 submissions from various organizations and individuals concerned about the closure. The Committee is currently calling for further submissions, which can be found at: **http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/Shortwaveradio**

The wheels of government have a tendency to turn slowly. It could be some months yet before Radio Australia is heard on shortwave again….if at all. Our fingers are crossed.

Big Listener Response

In the lead up to the big switch-off, and in the days immediately following RA's demise on shortwave, SWL and DXing social media was full of listener comments regretting the decision and offering their recollections about how RA had impacted their lives over many years. An especially strong outcry came from North American listeners who recounted regularly tuning in to RA's broadcasts to the U.S. It seemed that when RA did close the North American service to concentrate its limited funding on the Pacific and Asia, many U.S. listeners continued their listening habits. Probably the frequency most mentioned was the long-time 9580 kHz, an outlet that had been RA's "home" for decades. Responses from listeners ranged from dismay and sadness to downright anger!

One U.S. radio enthusiast, Bob K6TR wrote to me and recalled:

"In 1985, I would get up early on Saturday mornings to listen to Radio Australia. At 4 AM EST (US), RA would be broadcasting to the Pacific at 100 kW. Even in that configuration RA was armchair copy with an S-7 signal. As propagation improved the signal strength would increase, S-8 by 5 am followed by S-9 at 6 am. At 7 am the boys in Shepparton would throw the Big Switch and redirect its transmission to the Western US. The switch over was awesome. RA would thunder in to the New York City metropolitan area at a signal strength of 25 to 30 db over S-9. It was hard to believe a radio signal so strong could be originating 8000 miles away. The signal on 9580 kHz would be going strong up till 11 am local time when they would shift their transmissions to higher frequencies to take advantage of improved propagation. In the evening the same process repeated itself on 15240 kHz.

"Over the years ABC and RA felt the budget axe. Decisions were made to reduce the transmission power to the US to 250 kW and then eliminate it all together. This really affected the East Coast in the early Morning hours but we could still hear RA's Broadcasts to the Pacific. RA was always a beacon of light regarding news coverage of Australia, Oceania and Asia. We rarely get any news from that region of the world from US media so RA was a lifeline we could hardly do without. The Internet coming of age spelled the end for shortwave. The Big Beacon Signals have been dropping slowly but steadily - the BBC, Radio Deutsche Welle, Radio Netherlands, Radio South Africa and Voice of Russia. It seems we should leave the message 'to the last station shutting down, please turn off the lights when you sign off.' With Radio Australia passing into the ether it would appear that honor will likely fall to one of the Asian stations, most likely China Radio International. So to all the producers, on-air staff, technical staff and administrators that have filled our lives with news, sports and culture I say thank you from the bottom of our hearts. Radio Australia will be missed dearly." – Bob K6TR

Further Reading:

Michelle Guthrie says it is not her job to lobby for ABC funding: **https://www.theguardian.com/media/2017/feb/28/michelle-guthrie-says-it-is-not-her-job-to-lobby-for-abc-funding**

'Thousands' in Solomon Islands affected by ABC shortwave cut: **http://www.radionz.co.nz/international/pacific-news/323443/'thousands'-in-solomon-islands-affected-by-abc-shortwave-cut**

Xenophon not happy about Radio Australia: **http://video.sheppnews.com.au/2017/02/02/72104/xenophon-not-happy-about-radio-australia**

Workers upset by ABC's ditching of shortwave radio told to complain to Senate inquiry: **https://www.theguardian.com/media/2017/feb/02/workers-upset-by-abcs-ditching-of-shortwave-radio-told-to-complain-to-senate-inquiry**

ABC shortwave service a lifeline for Aussie expats in PNG: **http://www.abc.net.au/news/2017-01-31/abc-shortwave-service-a-lifeline-for-aussie-expats/8228440**

TSM

The Shortwave Listener

By Fred Waterer **programming_matters@yahoo.ca**

VOA at 75, WBCQ, RRI and RNZI

Radio has always served an important purpose, as a means of disseminating news, informing and entertaining listeners, and at times persuading them, with varying levels of success. The history of the twentieth century would be incomplete without a discussion of the impact of radio.

As many broadcasters leave the shortwave bands it makes those who remain all the more important to the listener. It never hurts to look back at where radio has been and where it is going in the future. Radio continues to play an important role. The way we get these signals is changing often in exciting ways.

The era prior to the 1950s is often referred to as The Golden Age of Radio. Radio truly was theater of the mind. Jack Benny, Fred Allen, Amos and Andy and hundreds more made the world laugh, often during troubled times. Millions listened with rapt attention to dreadful news reports of war and rumors of war. And nations around the world battled for the hearts and minds of listeners. In more modern times, this battle for hearts and minds consisted of ideas lobbed back and forth over the Iron Curtain, dividing East and West.

In February, the Voice of America celebrated 75 years on the air. From its first 15-minute radio broadcast in German in 1942, VOA has grown into a multimedia international broadcast service providing programming and content in 47 languages on multiple platforms, including radio, television, and mobile.

"On that first broadcast, announcer William Harlan Hale set the standard for all future VOA programs when he told his audience: 'We bring you Voices from America. Today, and daily from now on, we shall speak to you about America and the war. The news may be good for us. The news may be bad. But we shall tell you the truth.'"

Today, the Voice of America, like many broadcasters can be accessed in a variety of ways, by radio and the Internet. While we treasure the legacy of picking up distant radio waves out of the ether, it's also nice to hear programs on our computers and mobile devices. It's a wonderful media world.

When a radio station does leave the air, such as the case of Australia in January, many people are inconvenienced especially in remote regions such as the Northern Territory of Australia. But as we shall see, Radio New Zealand and others are stepping up—on shortwave, by satellite, on the Internet and on your mobile device. Radio is still theater of the mind and is still vital in our modern world.

The Internet can be a beautiful thing. Many radio

Legendary Voice of America music journalist, Willis Conover, interviews trumpeter Louis Armstrong. VOA celebrates 75 years this year (Photo courtesy of VOA)

stations and programs we have listened to in the past have migrated there; simulcast there or are archived there. The sky is the limit, when it comes to the wide variety of programming available. Local stations from around the world can be heard with a few clicks of a mouse or taps of a tablet. International services we listened to on radio can be found there. Many old friends can be heard again, via recordings of vintage radio broadcasts.

As an example, fans of Swiss Radio International in the 1970s and 1980s can go to switzerlandinsound.com/ a wonderful website maintained by Bob Zanotti who was with SRI for many years, one of the "Two Bobs" of the Swiss Shortwave Merry Go-round program of past years. It's a delight to peruse this website and hear some real treasures from the past. You can spend hours navigating this website listening to classic features and programs from Switzerland, and there are lots of photos from the station too. If you enjoyed SRI, you will love this website.

Marion's Attic was mentioned in this space last month. I particularly enjoyed William Tillman's take on the program, via Facebook: "Listening to Marion's Attic on WBCQ The Planet. A unique collection of Edison cylinders, 78s and other artifacts played on the original equipment. Marion's voice resembles a goat with strep throat, but the music is loads of fun." This is a wonderful program and well worth your time.

WBCQ is home to some of the most interesting "Free Speech Radio" on the shortwave bands (Photo courtesy of WBCQ)

WBCQ is a real treasure, featuring a cornucopia of programming and some of the most interesting hosts. Marion, Bill Tillford, Fred Flintstone, John P. Lightning and even Brother Stair bring interesting and entertaining perspectives to the table. We'll take an in-depth look at the programming from WBCQ in a future column.

Europe is rapidly becoming the focus of political change. As this is written, elections in the Netherlands are imminent and one of the leading candidates is running on an anti-immigrant platform and favors "Nexit", the Dutch withdrawal from the European Union. By the end of March the British government will trigger the process of leaving the EU. As this is happening, the government in Scotland is making noise about having another independence referendum. Other European nations seem to be looking at this option too. Elections are also due in France and Germany, with electorates in both countries being open to new non-traditional alternatives. It could be a time of great change and instability in Europe.

Meanwhile in Southern Europe, Turkey's President Erdogan will be holding a referendum, which if it passes, would give the president additional powers. All of these issues affect the many nations of Europe in ways many may not be able to foresee.

In the coming months and years, the BBC World Service could play an important role in discussing and explaining the many changes taking place. Barring that, it is worth checking out the various news programs on Britain's domestic networks. Scotland is clearly irritated at Brexit and wants another independence vote. BBC Scotland features a great deal of news and analysis at any time, but especially now. They can be heard online at bbc.co.uk/radioscotland. News programs are all available on demand any time at the

BBC World Service and BBC Radio Scotland are radio stations to follow in the coming months (Photo courtesy of BBC)

website. A good place to start is bbc.com/news/scotland/scotland_politics

Deutsche Welle does broadcast on shortwave to Africa in a number of languages including English. Try for Deutsche Welle English programming on 9820, 15290, 15315, 17690 and 17710 kHz at 1600-1700 UTC. Following Africa-Link on Mondays, one can hear Inside Europe, DW's long running current affairs program "from the heart of Europe." Inside Europe is a compendium of the latest developments in Europe and should feature coverage of the German elections and Brexit fallout. Inside Europe can be heard UTC Mondays at 1630 and UTC Sundays at 1600 UTC.

Another DW program, which might be timely, is World in Progress on Thursdays at 1630, which examines all aspects of globalization, including economic development, human rights, cultures and more.

The Voice of Turkey continues to be an important voice in a troubled region. Turkey has experienced much political turmoil since the attempted coup of last year and has a ringside seat for the civil war in Syria. Now more than ever they are an important station to listen to. Look for them at 6080 and 7240 kHz at 0400 UTC, 5960 kHz at 2300 UTC

And while we are in Southern Europe, the Voice of Greece keeps on broadcasting. My friend Sean Welsh even reported hearing some English spoken on the station one night at 0230 UTC Wednesday. The frequency of 9420 kHz can be heard every day beginning in the late afternoon with some of the greatest music one will ever hear.

Radio Romania International is one of the "last men standing" as it were, of the national broadcasters of Europe, on shortwave. Romania has indicated it will continue to broadcast on the shortwave bands well into 2017.

Since RRI was last featured in this column, there seems to have been a lot of changes to the RRI lineup. RRI has gone from being one of the more intriguing broadcasters of the Cold War to a very popular full service international broadcaster.

Let's take a look at the weekly line-up of programs from Radio Romania International.

At the beginning of every weekday broadcast one can hear Newsreel, which consists of a news bulletin, commentary and reports. Pretty standard fare.

Monday broadcasts include the following features: A contest promo, Sunday Studio/Panorama, Music Time and

Radio Romania International logo (Courtesy: RRI)

Listeners' Letterbox. Listeners' Letterbox may be one of the last programs on shortwave of this type. Mailbag programs were once ubiquitous and in fact I dedicated a whole column to just those programs back when I wrote for Monitoring Times. Drop them a letter or an email and perhaps they will read it on the air!

On Tuesdays one can hear such features as Pro Memoria: History of Romania, Think Greener/Political Flash, Sports Roundup, Your Music, Romanian Without Tears, The Cooking Show, New Names on the Cover/People and Places. Pro-Memoria is one of the more interesting programs of the week. It looks at issues and people of Romanian history without the filters of the former Communist era. It is fairly even handed talking about the good and the bad of Romania's past. Romanian Without Tears is a short feature on the Romanian language. Romanian is actually a Romance language, stuck in a sea of Slavic languages; a left over of wars and conquests of the past few millennia. It's a very interesting language. Another favorite is The Cooking Show.

This program brings you all sorts of Romanian treats and delicacies to tempt any palette. Think Greener is an interesting look at the environment and "green" issues.

On Wednesdays programming features include Business Club, a weekly program on business and the economy. The program seems to be there to remind listeners that Romania is open for business and is firmly in the capitalist/ European Union camp. In addition, one can hear Athlete of the Week, Truly Romanian, DX Mailbag and New Names on the Cover/People and Places. The latter looks at the fascinating people and places of this diverse country.

Thursdays, one can hear Society Today and a selection of the following: Visit Romania, RRI Sports Club, Student in Romania, Expat in Romania, Music Highlights, Pick of the Week, Living Romania, and Romanian Without Tears Fridays, Traveler's Guide takes center stage, a fascinating look around Romania. Other features include Guests on RRI, Football Flash (soccer for those of us in North America), Music Highlights, Pick of the Week/Living Romania, and a selection of the following: Partners in a Changing World,

The staff of the RRI English Service (Photo courtesy of Radio Romania International)

New Names on the Cover, People and Places.

On UTC Saturday one can hear such programs as The Future Starts Today/ The Green Planet ,On Point About Romania/Roots, Sports Weekend, Truly Romanian, Living Romania, Through the Looking Glass.

Sundays the programming is a bit more laid back, in a weekend mode. The program opens with Newsreel, which consists of a news bulletin and The Week in Review. World of Culture is the main feature. Followed by a selection of the following: Roots, RRI Encyclopedia, Visit Romania, All That Jazz, DX Mailbag, People and Places, Through the Looking Glass, New Names on the Cover,

Partners in a Changing World

Radio Romania International has a diverse and entertaining selection of programming to suit every interest. And as one of the last voices of Europe still broadcasting every day in English to the world they are to be cherished. Drop them a line and let them know you appreciate their efforts. I did.

You can listen to RRI at the following times and frequencies: At 0000 and 0300 UTC on 7375 and 9730 kHz and at 2030 UTC on 9610 and 11850 kHz respectively. The latter broadcast is only a 30-minute transmission.

With the demise of shortwave broadcasting from Australia, New Zealand and it's External Service Radio New Zealand International (RNZI) take on added importance as being one of the last sources of Pacific News on the shortwave bands. New Zealand has already indicated that it has no plans to leave shortwave any time soon, which is good news for isolated Pacific nations.

Radio New Zealand International carries an entertaining mix of programming designed for the Asia-Pacific region and relays of domestic programming from Radio New Zealand National. Both networks are top notch and provide some of the best radio on the planet. Check out Radio New Zealand National at rnz.co.nz which links to all RNZI networks.

TSM

Maritime Monitoring

By Ron Walsh VE3GO **marinecolumn@gmail.com**

A System for the System

(Photos courtesy of the author)

The St. Lawrence Seaway System had its longest season ever last year. This year the traffic has started moving on Lake Ontario earlier than usual. There is virtually no ice in the lake and what is near the shore is thin and easily broken up. Strong winds, exceeding 50 mph have broken up a lot of the ice recently. On March 9, the cement carrier Stephen B. Roman arrived in Picton to start the season for the cement trade. She is under new management this year and may also be replaced in the near future. This is another target for my radio and camera this season. No icebreaker assistance was needed in this area. The Stephen B. Roman made security calls on channels 16 and 13 as she approached the Picton area to advise the ferries at Adolphustown that she was entering their area. Normally the first traffic we hear is an icebreaker making a channel through the ice in our area. When crossing the Thousand Islands International Bridge, we saw very little ice in the river navigation channels.

The official opening date for the Seaway is 0800 March 20, 2017, for both the Montreal to Lake Ontario section and the Welland Canal between Lake Ontario and Lake Erie. There is network for communications throughout the system. We have discussed the various Canadian Coast Guard radio stations that handle emergency traffic, inquiries etc. The United States Coast Guard also has stations along their side of the lakes for the same purpose.

However I have never really given the network for traffic control along this section of the Great Lakes Water Highway. Anyone interested in the ships will find the monitoring of communications will give a great deal of useful information. Internet sites give some idea of ship traffic but the VHF radio communications give up-to-the-minute and accurate details of what is going on. There are stations for traffic control and also communications for the actual locks in the system. There are eight locks in the Welland Canal and seven locks between Lake Ontario and Montreal. All these stations use standard marine channels. In this column I will outline the communications sequence from mid Lake Erie to Montreal.

The following is the Seaway's requirement for radio equipment:

Seaway Radio Frequencies

All vessels transiting the Seaway must have a radio capable of transmitting on channels 11, 12, 13, 14, 15, 16, 17, 66A, 75, 76, 77. Ships switch over to the control of Seaway Long Point when they reach mid Lake Erie. The station uses channel 11 right up to the piers at Port Colborne, the Lake Erie entrance to the canal. Here the ships come under the traffic control of Seaway Welland and use channel 14.

Stephen B. Roman up-bound leaving Lock 7 of the Welland Canal.

This is for the traffic control in the canal itself. However at each lock there is a specific frequency for the control of each passage through a lock. These frequencies changed last year. The channels used at each lock are as follows:

Lock 8 at Port Colborne uses channel 77, lock 7 uses channel 66A, locks 4,5 and 6 use channel 15 for west up-bound traffic and channel17 for down-bound traffic, Lock 3 uses channel 77, lock 2 uses channel 76 and lock 1 is on channel 75.

Locks 4, 5, and 6 are like three steps and are called the Flight Locks. They are twin sets of locks and each set carries ships in one direction only thus the two radio frequencies there. The Seaway allows ships up to 740 feet in length and these must be winched the final few distance so that they will not potentially damage the lock gates. This is ten feet longer than the original maximum length for vessels. There are also Hands Free Mooring devices—pads, which are used in most locks and special instructions must be given for them. Once attached, the ship cannot use its engines. Radio procedures are outlined as follows:

SEAWAY NOTICE NO. 3 – 2017 Communications

Mariners are reminded that the following communica-

Tug Karen Andrie pushing a barge load of ashphalt into lock 7 of the Welland Canal.

tions procedures will be in effect at the structures:
AT LOCKS

Lock crews' initial communication with vessel will occur when vessel is at the In-bound Limit of Approach Positioning Instructions Vessel to verbally acknowledge at minimum the following 3 positioning instructions (whether given by Lock personnel or vessel self-spotting radio)
- Initial communication (for final mooring position)
- 25 m spotting instruction (15 m at U.S. Seaway locks)
- Final spotting instruction (In position)

At U.S. Seaway locks for down-bound maximum sized vessels required to winch to final mooring position the following additional communications must be acknowledged:
- The message "15 m to the 15m mark"
- The message "In position at the 15 m mark."
- When the vessel has winched into position, the message "In position"

Hands-Free Mooring (HFM) Instructions:

The following communication protocol will be followed during a lockage when HFM equipment is in use:

On initial communication, lock operator will advise vessel that HFM will be used at Final Mooring Position and stopped, lock operator will advise vessel that pads will be attached & vessel is not to use its engine(s): Verbal acknowledgement from vessel is required; Pads will only be attached to vessel once confirmation from vessel is received.
Lock operator will advise vessel once pads are attached & lockage to begin once lockage is complete, lock operator will advise vessel that pads will be detached:

Verbal acknowledgement from vessel is required. Pads will not be detached from vessel until confirmation from vessel is received.

Once pads are detached, lock operator will advise vessel to exit lock.

AT BRIDGES (remote from locks)

The following procedure applies at all freestanding Bridges, namely:
- Br. 7A/7B, SLU, VAL in the Montreal Lake Ontario Section
- Br. 4, 5, 11 and 21 in the Welland Canal Section

The bridge operator will make a VHF radio call on the normal working channel to the last vessel through the bridge draw, immediately prior to initiating the bridge lowering / closing sequence. e.g. "VESSEL NAME, BRIDGE 21 WILL START TO LOWER." Vessel may respond if there is a problem. Note: In the Welland Canal, the bridge lowering will not commence until the Bridge Operator has confirmed with the Master/Pilot that it is safe to do so.

The bridge communication was introduced after a bridge in the Welland Canal was lowered on the stern of the vessel Windoc, several years ago.

Once the vessel clears the Port Weller Piers and enters Lake Ontario, control is switched to Seaway Newcastle on channel 11. Ships give their ETA for the next control point

Tour vessel Jacques Cartier leaving the lock at Ste. Anne de Bellevue on the Ottawa River.

and an estimated eta for the entrance to the St. Lawrence River. At mid Lake Ontario, Seaway Sodus takes over using channel 12. At Sodus Point, the control switches to Seaway Clayton using channel 13. This used to be used by both stations but the frequency is also used for the New York State canal system and interference took place. At Crossover Island near Brockville, control switches to Seaway Iroquois on channel 11. There are 7 locks and they use channels 17 and 13 as follows:

Iroquois lock is on channel 17, Eisenhower lock is on channel 13, Snell Lock is on channel 17, Upper Beauharnois is on channel 13, lower Beauharnois is on channel 17, Cote Ste. Catherine lock is on channel 13 and St. Lambert lock, at Montreal, is on channel17.

At Bradford Point below the Iroquois, control switches to Seaway Eisenhower on channel 12. When the ships again cross into Canadian waters further east, the Seaway Beauharnois takes over control on channel 14 until the ships clear the Seaway at Montreal. Montreal Harbor control is on channel 10.

Here in Kingston, I can hear Seaway Sodus, Seaway Clayton Seaway Iroquois on my VHF vertical antenna. When we have good inversion conditions I have heard Seaway Welland, Long Point and Eisenhower here. Remember that the Welland canal lifts the ships the height of Niagara Falls so Seaway Welland, has quite a range during Inversion. There is always a great tradition to honor the first up-bound and down-bound ship through each section of the system. All ships are required to carry AIS while in the system. Believe me, you are told immediately if the AIS is not functioning. They watch your speed carefully and let you know of the slightest amount of excessive speed. You do not want a second warning, as that is a fine. The regulations for AIS are as follows:

While transiting the Seaway, the master of a ship shall immediately report to the nearest Seaway station any malfunction of the AIS transponder;

Mariners are advised that the AIS unit must be operational when transiting Seaway waters. The AIS unit must transmit a DGPS signal and gyro heading. It is that the following "Self-Checks" on the Minimum Keyboard Display (MKD) be performed prior to Seaway transit

• Check the heading field to ensure that it is accurate. If the heading is not indicated, the AIS unit is not transmitting a "gyro" heading as per IMO guidelines for installation. Verify that the correct vessel draft is being transmitted by the unit.

The AIS unit must be connected to and transmit position from an external DGPS. Verify on the "GPS source" screen that the source is "External GNSS"; this should change automatically to "External DGNSS" when picking up local radio beacons.

Navigation is limited to daylight hours at the start of the season until all lighted aids are reinstated. Time to charge the handhelds and get a new memory card for the camera.

I have been following Tom and Neale's BoatUS East Coast Alerts for several years I notice that the change of more signals to Radio Activated Fog Signals. The following notice

was recently seen:
More Maine Fog Signals to Become Radio Activated:

The U.S. Coast Guard is considering making the following changes to the listed Aids to Navigation (Aids are listed in alphabetical order only):
Great Duck Island (LLNR 2295)
Halfway Rock (LLNR 40/6675)
Libby Island Light (LLNR 1120)
Little River Light (LLNR 1075)
Matinicus Rock Light (LLNR 10/3195)
Mount Desert Rock (LLNR 5/2290)
Petit Manan Light (LLNR 1735)

CHANGE the fog signal to radio activated by the mariner. During times of reduced visibility, mariners are requested to turn their VHF-FM radio to channel 83A/157.175Mhz. By keying their microphone, 5 times consecutively, while on channel 83A, this will activate the fog signal for 60 minutes. Interested Mariners are strongly encouraged to comment on this proposal in writing, either personally or through their organization. All comments will be carefully considered and are requested prior to 31 March 2016 to complete the process. When responding to this proposal, please include size and type of vessel, recreational or commercial, and distance from aid that you start looking for it, and how you use the signal. Refer to Project No. 01-16-135. E-mail can be sent to: nnewaterways@uscg.mil. (First District LNM Week 03/2017)

The consolidation of Canadian Coast Guard Radio Stations has continued. Thunder Bay, ON and Churchill, Manitoba are now remotely run from Sarnia. I understand the four Lake Manitoba stations will be remoted to VBR Prescott Radio. Consolidation on the west coast continues as well.

It will be great to be back in South Carolina, along the Inter-coastal waterway. The Grand Strand Amateur Radio Club is always welcoming and provides good information.

A reminder that channels 16 and 70 DSC are monitored in the Seaway. Channel 65A and 82A are used by the Canadian Coast Guard while 22A is used by the United States Coast Guard. Channel 83A is heard when there is a problem on the system. Channels 6, 8 and 10 are the most common ship-to-ship frequencies used. Most Canadian marinas monitor channel 68 and channel 9 is a voluntary calling channel for pleasure craft in United States' waters.

When this April column is being read my wife and I will be travelling back to Kingston from Myrtle Beach, South Carolina. I hope to gather some marine information from this area as I have not been here for two years. I also remind monitors of previous columns where we mentioned the Canadian Coast Guard Radio stations in the Arctic regions. They are on HF and can be easily monitored. Check the 2017 Canadian government publication "Radio Aids to Marine Navigation" for full details.

I want to thank Frank J. Swatland KF4LMT, Mac McCormick and W4GRJ Jack Satterfield for their emails. Again, I will be pleased to hear from readers about what you monitor, frequencies etc.

Ice breaker CCGS Griffon that had an easy time this winter due to the lack of ice.

I am off now to listen to the radio as we have a Gale Warning for SW winds of 35 knots and Freezing Spray warnings for this area, this afternoon.

TSM

The Longwave Zone

By Kevin O'Hern Carey WB2QMY **wb2qmy@arrl.net**

Turning the Tables: Reverse Beacon Network

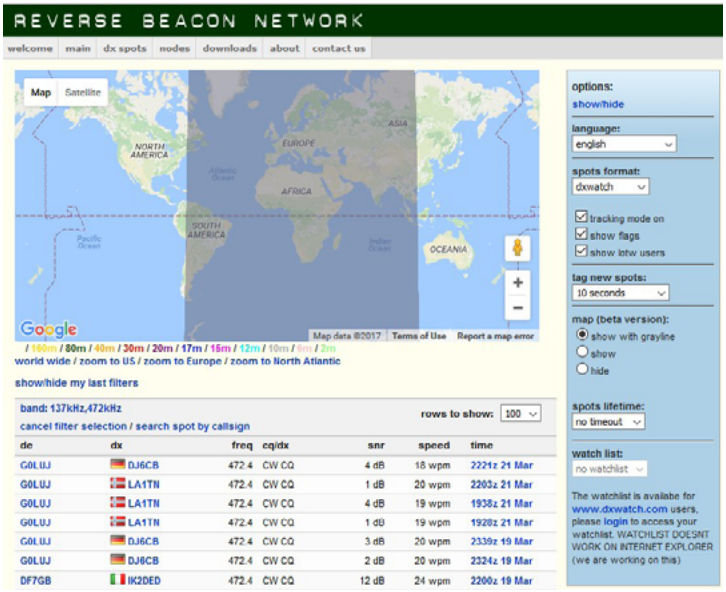
It's a safe bet that most of you reading this column are strongly attracted to DXing beacons. At the very least, you're likely to have a passing interest in these unmanned stations and which ones you are able to hear. Many of you are bona fide beacon addicts, searching to pull the next intercept out of the noise. Beacon DXing is the bread and butter of longwave monitoring, and it is what we do!

I am also aware that many of you are hams who are particularly interested in the lower amateur bands, including 160 meters. As of this writing, that is the lowest frequency/longest wavelength amateur band available to U.S. hams. After a recent early morning 160-meter QSO with Mark Murray W2OR in Florida, he informed me of an online resource known as the Reverse Beacon Network (RBN) located at **http://www.reversebeacon.net/srch.php**. It's a bit like DXing for beacons, only it involves stations around the world doing the monitoring, and you see the results.

This RBN is useful in many respects. If you are a ham, you can transmit a CQ or simple test message on CW or RTTY mode, and then log on to RBN to see which stations heard you. You may be surprised at just how far your signal is getting out. Even if you don't make a human-to-human contact, you can get automated feedback on how well your signal is propagating. RBN not only announces the reception of your signal and by which station, but it also rates signal strength. This can be extremely useful, especially if you are experimenting with different antennas or power levels. Even if you're not a ham, it's interesting to view other stations and then tune in on their actual (RF) signals with your receiver.

At first, I thought the RBN would be difficult to use, or require a lengthy registration process. Not so. I simply logged on to the web address shown above, entered my call sign, and got a listing of where I had been heard, how well, and the exact time of reception. It's really that simple. You can also check other stations you may be hunting for (typically DX stations) or for those in specific geographic areas. You'll get a good idea of propagation conditions on the bands. The site presents a map that shows the gray-line terminator and pinpoints where each station is located.

RBN allows you to select particular bands to search for signals, and this now includes the 136 kHz (2200 meter) and 472 kHz (600 meter) bands. Once the rules for these frequencies are formulated and approved by the FCC, there should be a huge amount of activity to look for here in the



The Reverse Beacon Network (RBN) offers a way to check your own transmitted signal or the status of others that are active on the bands. RBN includes coverage for the 2200-meter and 600-meter bands. Check it out at http://www.reversebeacon.net/srch.php. (Image Source: K. Carey)

States. For now, check out these bands to see the activity in other areas of the world.

Farewell to N2AFX

My family said good-bye to my father, Bill Carey N2AFX, in mid-February after a long illness. He was my inspiration for many things in life and was a man of varied interests, including radio communications. He introduced me to two-way radio around 1972 with an old tube-type CB that we would set up on the second floor of our house and connect to a ground plane antenna in the attic. This was well before the "good buddy" days of CB when the band became so crowded. There was a close-knit group of operators around the Rochester, New York area and we learned so much about radio from those early experiments.

My father was also adept at mathematics, a skill I have never excelled at, and he helped me learn what I needed to know to pass my Novice ham test in June of 1977. As fate would have it, I ended getting him to enter the ham radio hobby about a year later and join me in my pursuit of CW

communications. He was an active ham for many years, and supported me with many trips to hamfests, and in getting equipment on the air.

Although he was not specifically a longwave enthusiast, he encouraged me to explore off the beaten path in many areas of my life and to consider underdog causes. This mindset led me to explore longwave when others said it was nothing more than a "static band." His encouragement served me well, and I hope to live up to the many values he shared with me during my formative years.

Selected NDB Loggings

We have a large list of loggings this month. Our contributors this time include Arthur Peterson (CA), Melvyn Larson KC0P (MN), Richard Palmer (MO), Chris Waldrup (TN), and Russ Hill (MI). Each is identified by their initials and state in the right-most column.

Loggings are always welcome at the e-mail address in the masthead. Ask for our free loggings template, and it will be sent out to you. Some even find the template helpful as an e-logging tool, but we also hope you'll send your catches in to The Longwave Zone!

kHz	ID	Location	By
198	DIW	Dixon NC	C.W. (TN)
201	IP	Mobile, AZ	R.P. (MO)
206	SOW	Show Low, AZ	R.P. (MO)
208	YSK	Sanikiluaq, NU	R.P. (MO)
211	AN	Anniston AL	C.W. (TN)
215	AT	Watertown, SD	R.P. (MO)
216	CLB	Carolina Beach, NC	C.W. (TN)
219	YMG	Manitouwadge, ON	M.L.(MN)
220	HUR	Roxboro, NC	R.P. (MO)
221	BJT	Athens GA	C.W. (TN)
224	BH	Birmingham, AL	C.W. (TN)
230	BU	Columbus, OH	R.P. (MO)
230	AT	Appleton, WI	R.P. (MO)
233	QN	Nakina, ON	M.L.(MN)
233	AG	Augusta, GA	R.P. (MO)
233	HEM	Sparta, TN	C.W. (TN)
236	VJ	Abingdon, VA	R.P. (MO)
237	EZF	Fredericksburg, VA	R.P. (MO)
239	GIW	Greenwood, SC	R.P. (MO)
242	MMI	Athens, TN	C.W. (TN)
245	YZE	Gore Bay, ON	M.L.(MN)
248	FRT	Spartanburg, SC	C.W. (TN)
253	OC	Nacogdoches, TX	R.P. (MO)
254	ZYC	Calgary, AB	R.P. (MO)
254	LLW	Elizabeth City, NC	R.P. (MO)
257	DT	Denton, TX	R.P. (MO)
260	GHJ	Gastonia, NC	R.P. (MO)
263	LB	Lake Jackson, TX	R.P. (MO)
263	BF	Scottsbluff, NE	R.P. (MO)
263	BGF	Winchester, TN	C.W. (TN)
266	HBV	Hebbronville, TX	R.P. (MO)

My dad, N2AFX, sharing another long-held interest with me—off-road motorcycling. This photo was taken at a motorcycle trials meet, circa 1975. Although he never rode in competition, my dad was a huge supporter of my interest in the sport. He also volunteered as a section observer (scorer), and is shown here returning to the pits with me on the back, age 13. (Image Source: K. Carey)

272	GLS	Baltra Island, GAL	R.P. (MO)
272	YQA	Muskoka, ON	R.H. (MI)
278	NM	Matagami, QC	R.H. (MI)
280	MQW	McRae, GA	C.W. (TN)
308	EVZ	Cartersville, GA	R.P. (MO)
309	EEX	Swainsboro, GA	C.W. (TN)
317	VC	La Ronge, SK	A.P. (CA)
323	UWP	Argentia, NL	R.P. (MO)
323	GR	Fort Hood, TX	R.P. (MO)
325	YJQ	Bella Bella, BC	R.P. (MO)
326	FO	Topeka, KS	R.P. (MO)
326	BKT	Blackstone, VA	R.P. (MO)
326	PKZ	Pensacola, FL	C.W. (TN)
328	BZJ	Bellgrove, PA	R.P. (MO)
328	5J	Coronation, AB	R.P. (MO)
329	CH	Charleston, SC	R.H. (MI)
329	X2	Athabasca, AB	R.P. (MO)
329	HMA	Hondo, TX	R.P. (MO)
329	YHN	Hornepayne, ON	R.H. (MI)
332	STI	Mountain Home, ID	R.P. (MO)
332	YFM	La Grande-4, QC	R.P. (MO)
334	ULH	Tullahoma, TN	C.W. (TN)

338	ZU	Whitecourt, AB	R.P. (MO)
340	YY	Mont Joli, QC	R.H. (MI)
341	YYU	Kapuskasing, ON	M.L.(MN)
341	SB	South Bend, IN	R.P. (MO)
341	CQN	Chattanooga, TN	C.W. (TN)
341	YYU	Kapuskasing	R.H. (MI)
342	PFT	Pinecreek, MN	M.L.(MN)
344	BKU	Baker, MT	M.L.(MN)
344	YC	Calgary, AB	M.L.(MN)
344	JA	Jacksonville, FL	R.H. (MI)
344	BKU	Baker, MT	R.P. (MO)
346	YXL	Sioux Lookout, ON	M.L.(MN)
346	YXL	Sioux Lookout, ON	R.H. (MI)
346	VU	Albemarle, NC	R.P. (MO)
347	SBX	Shelby, MT	R.P. (MO)
349	GW	Greenwood, MS	C.W. (TN)
352	BVG	Enterprise, AL	R.P. (MO)
353	PG	Portage, MB	M.L.(MN)
353	QG	Saint Clair Beach, ON	M.L.(MN)
353	LLD	Lanai, HI	A.P. (CA)
355	YWP	Webequie, ON	M.L.(MN)
356	ODX	Ord, NE	M.L.(MN)
359	SDY	Sidney, MT	M.L.(MN)
359	HHH	Devine, TX	R.P. (MO)
359	FXY	Forest City, IA	R.P. (MO)
359	LYZ	Bainbridge, GA	C.W. (TN)
362	HPC	Hope, AR	R.P. (MO)
362	SB	Sudbury, Ontario	C.W. (TN)
363	RNB	Millville, NJ	M.L.(MN)
365	TV	Traverse City, MI	M.L.(MN)
365	AA	Fargo, ND	R.H. (MI)
366	YMW	Maniwaki, Quebec	C.W. (TN)
370	YBV	Berens River, MB	R.H. (MI)
371	GW	Kuujjuarapik, QC	R.H. (MI)
372	UQN	Vidalia, GA	C.W. (TN)
373	AEA	South Hill, VA	C.W. (TN)
376	BHC	Baxley, GA	C.W. (TN)
379	RUE	Russellville, AR	R.P. (MO)
379	BRA	Asheville, NC	C.W. (TN)
382	YPL	Pickle Lake, ON	M.L.(MN)
382	YPL	Pickle Lake, ON	A.P. (CA)
385	ZDH	Toronto, ON	R.P. (MO)
385	EMR	Emory, GA	C.W. (TN)
388	GLY	Clinton, MO	M.L.(MN)
390	OWC	Douglas, GA	C.W. (TN)
391	EFW	Jefferson, IA	R.P. (MO)
391	DDP	San Juan, PR	C.W. (TN)
392	ML	Charlevoix, QC	M.L.(MN)
395	ULS	Ulysses, KS	M.L.(MN)
397	CIR	Cairo, IL	C.W. (TN)
400	TRX	Trenton, MO	M.L.(MN)
400	XW	Mason, KY	M.L.(MN)
400	XW	Flemingsburg, KY	R.H. (MI)
400	CI	Sault Ste. Marie, MI	R.H. (MI)
400	ENS	Ensenada, BCN	A.P. (CA)
401	YPO	Peawanuck, ON	R.H. (MI)

Southern Avionics manufactures NDB transmitters that can be configured to transmit from 10 to 1,000 watts. The SE Series NDB transmitter (pictured above) uses state of the art technology including powerful Renesas© Microcontrollers and Analog Devices© Direct Digital Synthesizers to provide accurate beacon signals in power ranging from 10 Watts to full rated carrier power. SE Series transmitters feature: 125-Watt carrier power; Programmable for any frequency from 190-650 kHz; Optionally Programmable from 650 to 1250 kHz and 1500 to 1800 kHz.. (Photo and caption courtesy of Southern Avionics)

404	CKI	Kingstree, SC	C.W. (TN)
408	JDM	Colby, KS	M.L.(MN)
409	YTA	Pembroke, ON	R.H. (MI)
410	BA	Columbus, IN	M.L.(MN)
410	SO	Marquette, MI	R.H. (MI)
410	GDV	Glendive, MT	A.P. (CA)
414	AZE	Hazlehurst, GA	C.W. (TN)
415	CBC	Cayman Brac, Cayman	C.W. (TN)
417	HHG	Huntington, IN	M.L.(MN)
417	HQT	Erwin, NC	R.P. (MO)
423	PCW	Port Clinton, OH	R.P. (MO)
515	OS	Columbus, OH	M.L.(MN)
515	SAK	Kalispell, MT	R.P. (MO)
515	PN	Ponca City, OK	M.L.(MN)
521	INE	Missoula, MT	A.P. (CA)
521	INE	Missoula, MT	R.P. (MO)

Notes:

- All loggings received at 300 miles (483 km) or greater distances are welcome.
- For ITU codes, refer to: **https://en.wikipedia.org/wiki/List_of_ITU_letter_codes**.
- All logging times are in UTC format, as broadcast by WWV or CHU Canada.
- Please double-check the spellings in your location data.

Another excellent list of loggings this month, and special thanks to our newest contributors (or those we haven't heard from in a while)!

Contributors

A.P. (CA): Arthur W. Peterson, Richmond, California. Receiver: Sony ICF-2002, Antenna: Radio Plus+ Quantum loop.

C.W. (TN): Chris Waldrup KD4PBJ, Tracy City, TN, Receiver: HP 312B Selective Level Meter, Antenna: Burhans Active Whip mounted about 15 feet above ground on my shed.

Comments: It has been several years since I last fired up my LF receiving gear and I am happy to get back into it this winter. We are out in the sticks, on top of a 2,000-foot mountain in rural Tennessee, with thousands of acres of forest around so very quiet conditions. On 25 January 2017, I also received the Algerian broadcast station on 252 kHz. I hope to submit more loggings over the next few months.

M.L. (MN): Melvyn Larson KC0P, Rochester, MN. Receiver: Icom R-70A in C.W.-narrow mode. Antenna: Wellbrook ALA 100 LN amplifier on 15-foot circumference, single turn hexagon loop in basement. The six spider supports are 30 inches long in a vertical plane, now rotatable.
Comments: Being able to rotate loop in azimuth allowed me to null out a strong local, IY on 417 kHz and copy HHG at 419 miles, Nice. The mystery signal of 9 dahs, 3 dahs, and 4 dahs in 8 seconds is still there on 392 kHz. CW only; nothing heard on AM. I get the best null at a heading of 250 degrees from my location in Grid Square EN34sb.

R.H. (MI): Russ Hill, Oak Park, MI. Receiver: Kenwood R5000, Antenna: Palomar Loop.

R.P. (MO): Richard D. Palmer W7KAM, Foristell, Missouri. Receiver: Icom R-75, Antenna(s): Clifton Z1501 active, base up 25 foot, 10 foot whip. Audio Processors: Timewave DSP-599zx and a Ratzlaff 9Hz in series.

Comments: Logged 462 beacons this month, 218 less than last month. Conditions remained good for February but listening time was limited due to a trip to Colombia from 02/10 through 02/20. 45 new loggings for the year brings the year's total to 725. One all-time new one this month with BKT, 326 kHz, making the log.

And, finally, after years in the making, the FCC has released a Report and Order (R&O) setting forth the rules for amateur radio operation on the 135.7-137.8 kHz (2200-meter) and 472-479 kHz (630-meter) bands. Authorization won't become effective until 30 days after publishing in the Federal Register. A summary of the R&O can be found here: **http://www.arrl.org/news/new-bands-fcc-issues-amateur-radio-service-rules-for-630-meters-and-2-200-meters**.

I'll have more on this new development next month.

LF Link Of The Month

Check out this NDB Search tool, which allows you to search by frequency, frequency range, or ID. The search results are plotted on a map of the U.S. This site is also useful for showing the relative density of NDBs in the U.S. Be advised that some recently decommissioned sites are still shown on the map: **http://www.fivegulf.com/ndb**

Adventures in Radio Restoration

By Rich Post KB8TAD **kb8tad@gmail.com**

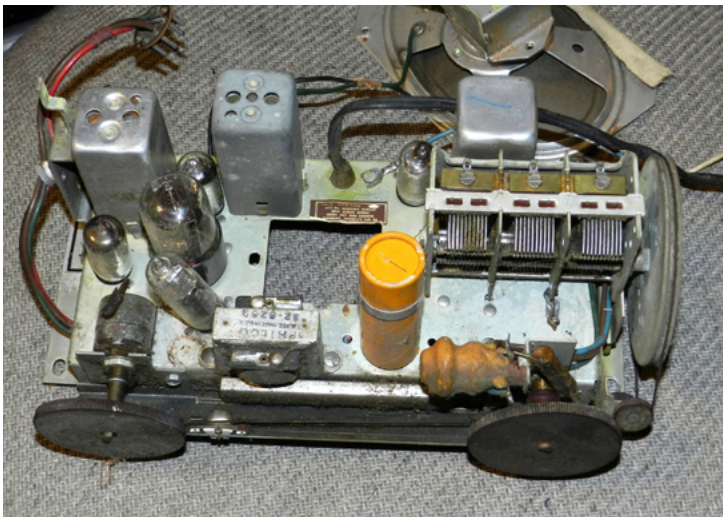
Philco 46-350: The "Tambour Door" Portable

The Philco model 46-350 was Philco's only portable radio for the 1946 model year. One ad in the December 17, 1945 *Life* magazine touted, "By actual test, the most powerful, greatest performing portable radio ever built... Plays on any house current or battery... Light weight, it's truly portable." Another ad stated, "Far outperforms any portable radio ever built... Tested and proved in the most difficult locations... Light in weight, perfectly balanced, truly portable!... New, distinctive cabinet."

It also was the first portable radio with a tambour cover over the knobs and dial. What's a tambour cover? Think roll-top desk, a flexible cover made of fabric with thin wood slats in curved slots for a movable top cover. The cabinet construction was all wood with a vinyl-like fabrikoid cover on the sides that appeared to be leather. The radio was an instant success, not surprising given both the ad hype and the shortage of new radios during the war years. Philco sold a reported 220,500 of these at $45.95 each ($622 in today's money). That makes finding one today relatively easy.

The radio is definitely compact, using six tubes, five of which are miniature and the sixth, for audio output, is octal. This radio preceded the change in portable radios to selenium rectifiers. The rectifier is a 117Z3 miniature tube with a 117-volt filament. It supplies not only the B+ for the set but also the series filaments with 50 mA at 8.5 volts. The series tubes are two 1T4 for RF and IF amp, 1U5 for detector and audio preamp, 1R5 as pentagrid converter, and 3Q5 for audio output. All of those are the 1.4 volt 50 mA miniature tubes designed specifically for portable radio applications.

The 3Q5 has a center-tapped filament so it can be run at 1.4 volts at 100 mA or in this set, at 2.8 volts and 50 ma. The filament circuit, like most tube portables, is a brute-force design that simply drops the nominal 90 volts or so of B+ down to the needed 8.5 volts using power resistors, dropping the remaining 81 volts at 50 mA as 4 watts of heat. The 117 volt heater of the 117Z3 itself takes 40 mA for another 4.7 watts of heat. When this radio is operated on AC, there is no need to worry about a bit of humidity with over 9 watts of heating inside! The total power draw for the set on AC is listed as 25 watts. The IF for the set is 265 kHz, which is relatively low but allows for greater selectivity than the more typical 455 kHz.



Philco 46-350 chassis top as purchased (KB8TAD photo)

I bought this radio some time ago as a basket case. No knobs were visible, the chassis was loose and small parts would rattle around inside the cabinet when the radio was moved. I had figured it for a "parts radio." The cabinet had white paint spatter spots and a long streak of black paint along the vinyl on one side. The belt handle was missing as was the hardware needed to bolt it to the cabinet. Upon opening the radio, however, I found all the pieces and parts inside except for the belt and the bolts for the speaker. In the meantime, I had purchased what I assumed was another model 46-350 in very good cosmetic condition, thinking I could use the basket case for spare parts. However, that second radio turned out to be a Philco model 48-360, a similar model made for the 1948 model year.

With two different models on hand, I decided to try to clean up the basket case and perhaps restore both of the sets. The schematics are readily available on the 'Net. For model 46-350, I downloaded a copy from *Beitman's* 1948 volume of "Most Often Needed Schematics" [(1)], *Rider's* volume 15 schematic and pictorials [(2)], and the 10-page service bulletin from Philco itself [(3)]. The Philco service bulletin is the most useful source but its schematic is relatively poor quality and hard to read. The schematic in *Beitman's* is much better.

Philco 46-350 ad in 12-17-45 Life Magazine (KB8TAD collection)

Philco 46-350 with tambour door open. (KB8TAD photo)

However, the schematic for the 1948 model 48-360 in the Philco service bulletin for that model [4] is an excellent copy. While it has a number of differences, it is a very useful reference when viewed alongside the other schematics. I printed out the two half pages of that schematic, taping them together for a ready reference. The *Rider* information is useful as well.

Safer Floating Ground

The chassis uses the safer floating ground principle. When fed by AC, one side of the line cord is directly connected to the circuit B-, but the chassis is connected to B- through a 120K-ohm resistor in parallel with a 0.1 uF capacitor. That arrangement allows RF currents to pass, but presents a much greater impedance to 60 Hz AC. It is possible to get a shock from the chassis depending upon the orientation of the power plug, but at a low current level that is not likely to be lethal. The floating ground arrangement is much safer than a direct B- chassis connection as employed by some other three-way portables. Always check for that possibility. Also, for a chassis-mounted electrolytic in a radio with floating ground, always check to see if the cardboard sleeve is in place on the electrolytic. I have seen chassis-mounted aluminum electrolytics that were replacements but the repairman did not use a version with a cardboard sleeve insulator like the original may have had. The aluminum shell of that capacitor is normally directly connected to B- and one side of the power cord, thus the reason for the cardboard sleeve.

The chassis revealed some repairs, likely done in the late 1950s or 60s based on the looks of the replacement parts. A coupling capacitor to the grid of the output tube had been replaced—a good sign since that is a critical cap. All the other foil capacitors were still the original wax caps. One replacement electrolytic had been sandwiched under the already tight chassis. A second much newer electrolytic was hanging loose on the topside with wires going to the chassis below. The multi-section electrolytic was still in place and connected. I assumed, erroneously, that it was an original. I learned the truth after rebuilding it. It was simply an excellent job of replacement by a repairman probably in the 1950s since the replacement cap had itself been partly replaced by the one hanging loose on the top of the chassis. The clamp for that earlier replacement cap had been neatly attached to the variable cap frame looking as if it belonged there.

Open Candohm

I noticed one round and three square power resistors tacked onto the original chassis-mounted three-section Candohm resistor. Candohm is a brand name for power resistors that are typically multi-section, are riveted to the chassis and covered by a metal sleeve. The chassis helps dissipate the heat of a Candohm resistor. When Candohms burn out, replacement power resistors are often soldered to their exposed terminals. In this case, the original Candohm had a 60-ohm section and two 875-ohm sections in series supplying the filament voltage. Total resistance added to 1810 ohms. The replacements only added up to 1550 ohms, which would have resulted in increased filament voltage. I pulled each tube to check filament continuity with my VOM and thankfully found them all intact.

While my small stock of power resistors did not yield any at 875 ohms, I did locate a 60-ohm, an 800, and a 1050. Total resistance would be about 100 ohms higher than the 1810 target. A quick calculation showed that at a 50 mA filament load plus some cathode return current, the combination would likely drop an additional 5 to 6 volts over the originals, which should help to compensate for today's higher line voltage. I decided to install those resistors after capacitor replacement.

Cap with wax stalactite and cap with one turn 'gimmick' choke. (KB8TAD photo)

Philco 46-350 chassis with original wax capacitors. (KB8TAD photo)

Tight Spacing

Capacitor replacement is tedious and difficult in this chassis because of the tight quarters that required caps to be layered. Replacements also have to allow for the magnet structure and the frame of the special speaker that fits over top of the circuitry. There is very little clearance between the capacitors and the speaker frame. Care has to be taken to avoid short circuits. This set also had about twice as many capacitors as the typical AC-DC set, such as last month's Zenith, a total of 15 dry caps and four electrolytic sections. One cap had what appeared to be a custom one-turn of hookup wire attached on one end. The schematic shows that turn as a choke and labels it and the 0.01 cap on which it is wound as "IF bypass" in the parts list. I re-created that wire "gimmick" choke on the replacement cap, selected to be the same physical size as the original cap.

The tight spacing did not allow room for separate electrolytics under the chassis, leaving me little choice but to re-stuff the three-section electrolytic that I later determined to be a period replacement. I tried using a heat gun to loosen the insides but that only softened a bit of the lower wax seal. Drilling was required. The interior was a lot tougher than I had anticipated; appearing to be something like very hard resin that came out as dust. I finally drilled out most of the interior. The remainder was worked loose from the sleeve, leaving just the empty shell for the space I needed for new caps. I mounted three electrolytics inside the sleeve, using just a bit of hot-melt glue to hold them in place. A fourth electrolytic for filtering the filament line was mounted under the chassis.

X-Rated Cap

One cap in particular deserves mention. The radio has a 0.04 uF cap connected from one side of the power line to the other for the purpose of power line noise suppression. That cap is connected before the On-Off switch and is thus subjected to the AC line whenever the radio is plugged in. Similar connections can be found in other three-way portables. That cap was obviously subjected to stress as evidenced by the wax that had dripped off and even formed a small wax stalactite on the cap itself. At least it had not yet shorted. I have seen caps in that position literally blown in two. The replacement was an X-rated cap, designed specifically for service across the power line and to fail open circuit rather than short circuit.

Polarized Line Cord

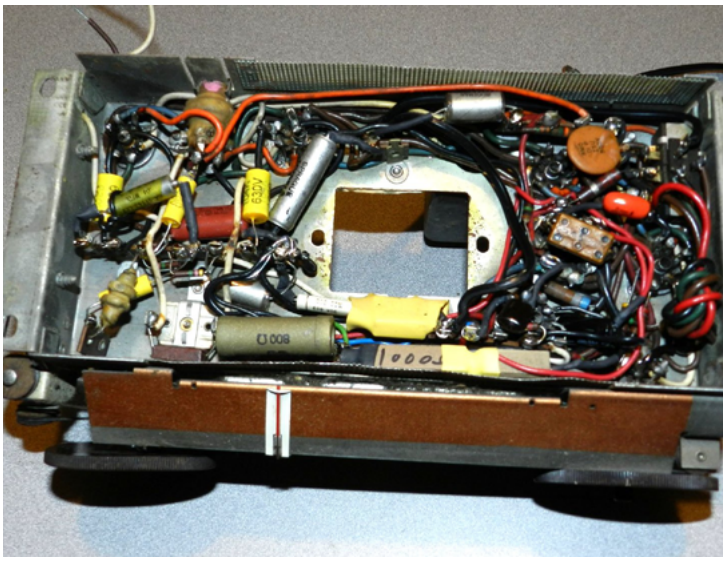
I replaced the line cord with one that was polarized, connecting the neutral side to the permanent chassis B-side. The line side of the power cord is connected to the battery changeover switch. Even though Philco used a floating B- in this set, permanently connecting the B- to neutral is an easy improvement for safety, requiring no special re-wiring.

First Power-Up

After the extensive work done on this little chassis, it was time to see if my effort was worthwhile. I connected my voltmeter to the first electrolytic off the rectifier and powered the radio with the isolated Variac. Turning up the Variac to about 2/3 maximum, the 117Z3 rectifier warmed up and the voltmeter slowly ran up to over 80 volts with no undue wattage draw. At that point, I turned the Variac off. Before applying full line voltage, it was time to check the very important voltage on the filaments. Moving the voltmeter to pin 2 of the 3Q5, the point of maximum voltage on this set's series filament string, I powered the set again, this time looking for the 8.5 volts as called for in the schematic. I wanted to make sure the voltage was at that level but no higher. At 122 volts in, it read exactly that! Pleased with the results of the voltage checks, I righted the chassis, connected my shop speaker and tried to see if the radio would make noise.

Even though the separate loop antenna in the cabinet

Philco 46-350 with tambour door closed. (KB8TAD photo)



Chassis with all caps replaced. (KB8TAD photo)

was not yet connected, I expected some RF noise to come through as I touched my signal injector to the loop connecting wires. I had cut those wires since they were soldered to terminals in the cabinet, planning to splice them later with push-on terminals making it easier to remove the chassis in the future. There was no response from the radio. Was the oscillator working? My hand-held frequency counter showed a good signal when its little antenna was held near the 1R5 oscillator tube. Holding my finger near the 1U5 audio preamp tube brought a bit of hum. OK, the audio is working as well as the oscillator. What else? Were the tubes worn out? At least two of them were the original Philco tubes. I checked each tube with my Heathkit emissions tester, spritzing just a bit of DeoxIT on each tube socket while the tube was out. All the tubes tested well, a pleasing result.

Volume Control Surprise

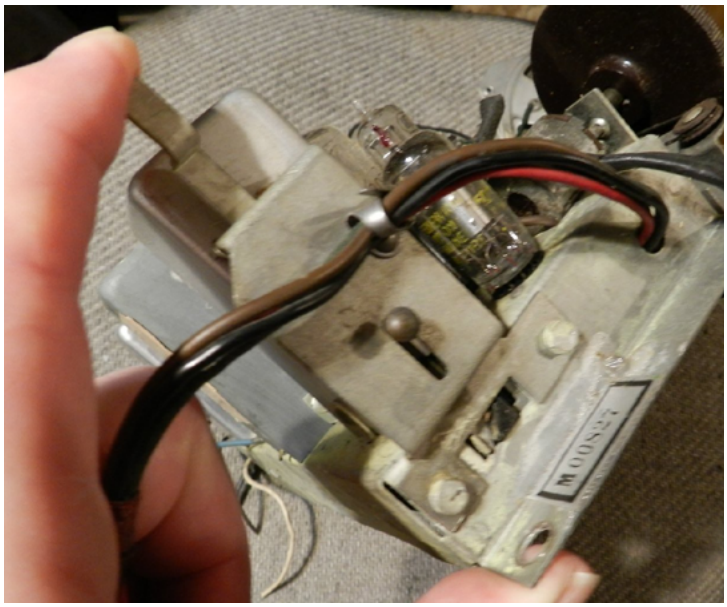
Was the lack of response because the loop antenna was not yet connected? The loop antenna for this set is unusual in that the radio was apparently designed for some type of plug-in external antenna. The ungrounded side of the loop connection can be interrupted via a closed-circuit jack to which an external connection can be made. Like most closed circuit jacks not used for a long time, just a bit of corrosion can interrupt the connection. I tested it and sure enough, my VOM showed no continuity. A quick spritz of DeoxIT and some mechanical cleaning solved that. I connected the loop antenna to the chassis with clip leads and powered the set again. Still nothing. I had turned the volume control fully clockwise all this time assuming the audio would be at maximum. Surprise! The volume control worked in reverse! As I moved to turn the radio off, lo and behold, the volume picked up and the radio was playing rather well. Live and learn! Because of the way the thumb-wheel knobs would be turned once the radio was mounted back in its cabinet, the side-facing knob and the counter-clockwise volume control would seem correct to the user.

The next day, I worked on the radio again. Power draw at 117 volts was 20 watts and 22 watts at 120 volts. Sensitivity was good. I easily tuned in my favorite daytime weak-signal oldies station. However, tweaking the alignment especially of the input to the first IF transformer really brought up the sensitivity! Philco did indeed have some justification for its advertisement hype. Once this thing was back in its case, I wondered how it would compare with the AM reception of my GE Superradio! It appeared it might give that radio a run for the money.

It was time to do a final cleaning of the chassis and then the case. I found that the black paint streak on the one side of the leatherette vinyl succumbed rather easily to being scratched off by my thumbnail. A thorough cleaning came next. The tuning scale is made of glass. One of the two flexible metal clamps had come loose allowing the glass to hang loose on one side. I removed the scale to clean it. As always, I did NOT clean the painted side, just dusted it a bit with a paintbrush. Don't ask me how I learned that lesson! However the front side had what looked like a coating of hardened dark glue in several parts on the scale. I assume that a former owner had tried to fix the loose glass scale from the front side of the radio using something like Duco cement. I scrubbed the glass carefully with a plastic scouring pad but most of the glue stayed on the glass. I finally resorted to using a razor blade to scrape off the hardened glue. The scale was carefully replaced by tightening the metal clamps. However, I did add just a bit of Goop adhesive at the center lower edge in order to strengthen and support the glass at its center. I did not want to chance a bump at the center cracking the piece of glass which was barely an inch wide and only supported on the ends.

The Handle

I cut a handle from an old belt that had already contributed to a couple of handles for test equipment. A scrap of the previous belt provided the dimensions for the pair of slots



Philco 46-350 battery changeover switch mechanism. (KB8TAD photo)

needed for each end. Since I did not have a leather punch, I drilled a pair of holes for the ends of each slot and used my very sharp flush cutters to connect the holes to the size of the proper slot. The result was a reliably strong handle.

The speaker barely cleared the circuitry as it was fitted into the chassis. I checked both ends of the metal speaker basket for proximity to components. The design of the speaker and its basket openings allowed for some leeway. Some of the circuitry just below the speaker was only facing the cone itself. However, one B- terminal point on the largest terminal strip came very close to the metal basket. I inspected it carefully but that terminal and its connections just cleared the metal basket.

Performance

After installing the chassis back into the cabinet, it was time to admire the sensitivity and selectivity of the radio. Its TRF front end and lower IF really make it shine on the broadcast band. It is a fun radio to use. Could it keep up with my GE Superradio? Frankly no, although in 1946 it was as good as Philco could come up with in a well-designed portable, roughly the same performance as the rival Zenith 6G001Y "Long Distance" Universal, the broadcast only brother of the Transoceanic. However, the more compact Philco lacks the Zenith's movable antenna for which Zenith held a patent. I'm left to wonder about that closed-circuit antenna jack on the Philco. Did Philco originally have a similar scheme in mind, an optional second antenna? I could find no reference to the purpose for that jack but can think of no other reason for it but to provide a similar scheme as that of the later Transoceanic rivals from Hallicrafters and RCA which did not move their loop antennas, thus avoiding some of the patent issues, but offered a separate movable ferrite rod antenna as an answer for shielded environments.


PHILCO SERVICE

PHILCO RADIO MODEL 46-350

CIRCUIT DESCRIPTION

The Model 46-350 is an entirely new and outstanding battery-operated or ac-dc portable radio. Its design provides a combination of high sensitivity, high selectivity, and power output unprecedented in this type of set.

The six-tube superheterodyne circuit may be briefly analyzed as follows: rf signals are picked up on one of three types of antenna—the built-in loop, the external loop, or a conventional external aerial. A high signal-to-noise ratio is achieved by the tuned rf amplifier stage, employing the super-control 1T4. The amplified rf signals are fed through a tuned transformer to the 1R5 pentagrid converter, where they are mixed with an oscillator frequency tuned 265 kc higher than the signal frequency. Since the plate circuit of the 1R5 is tuned to 265 kc, this intermediate frequency is passed through the first if transformer to the grid of the 1T4 if amplifier. The sensitivity of this stage is considerably increased by positive feedback to the screen of the if amplifier from the tertiary winding in the second if transformer.

The modulated 265-kc signal from the plate of the 1T4 if amplifier is passed through the second if transformer and rectified by the diode section of the 1U5 second detector and first audio.

MODEL 46-350

Philco Service Bulletin masthead, model 46-350 (KB8TAD collection)

Rectifiers

The 117Z3 tube rectifier seems more desirable than the later use of selenium rectifiers in three-way portables. Selenium rectifiers seem to fail by slow aging and increasing internal resistance. However, if that tube had been defective, I would have been tempted to replace it with a simple diode such as a 1N4007 and an added resistor. When operating this set with batteries, the 1.4-volt tubes are active almost instantly whereas the rectifier takes about 20 seconds to warm up. A diode would allow almost instant sound from this radio.

Next month we check out its younger sibling. Could Philco improve on its 1946 portable?

Questions and comments? kb8tad@gmail.com

(1) *Beitman's* "Most Often Needed Schematics" 1948 page 134

All of the *Beitman* volumes can be found at this site. Click on the desired year:
http://www.rsp-italy.it/Electronics/Radio%20Schematics/Collections/Beitman/index.htm

(2) *Rider's Perpetual Troubleshooter's Manual* Volume 15 Philco page 5

NostalgiaAir has the *Rider* schematic and information
http://www.nostalgiaair.org/Resources/596/M0013596.htm

(3) Philco 10 page service bulletin for model 46-350 in djvu format
http://audiophool.com/Philco.html page down to 46-350

(4) A better quality schematic can be found for the nearly identical model 48-360. Page down to 48-360 for that service bulletin.

TSM

Antenna Connections

By Dan Farber AC0LW **ac0lw@att.net**

HF: Antenna "Comfort Zone"

Welcome back, my friends. Last month, we talked about some of the "transitions" between radio and antenna, and how they are used. This month, I'd like to focus on a bit of serendipity—the fact that early radio research and development brought us HF first, a frequency range that has all the action we could want; DX, sunspot cycles, numerous forms of propagation. Had radio first been developed at 300 kHz, or at 1400 MHz, we could very well have missed that entire boat. Shortwave broadcasting wouldn't exist—hear the SWLs groan at that dark notion! All the great DX on the HF ham bands wouldn't exist either. More importantly, as regards this column—HF coming first meant the development of all our basic antennas, built off of ¼ wave and ½ wave constraints, the vertical, the dipole, and so forth. We will examine some of the aspects of this, using example frequencies of 500 kHz and 468 MHz, as well as real-world 20 meters antennas. I realize that 500 kHz, and 468 MHz, are not within actual bands; they were chosen to simplify visualization.

Center of my old 102-foot dipole, 35 feet up. At 500 kHz, it would need to be nearly 1000 feet long and 1000 feet up above ground; at 468 MHz, it would be a foot long. (AC0LW photo)

The Lowly Dipole

The dipole is a perfect example of this serendipity. Recall that an orthodox dipole is ½-wave long at the operating frequency, and sees the horizon best when at least a ½-wave above ground. OK, let's look at the ramifications of this paradigm. At 20 meters—about as close to the "middle" of HF as we can get—our dipole is around 32 feet long and 32 feet up in the air. First, these dimensions are attainable for many of us. Trees 30 or so feet tall are not at all uncommon. What may be often overlooked is that, at HF, when we raise a dipole a ½-wave above ground, we also raise it above a great deal of ground clutter that would, block, absorb, or deflect a lot of the signal that might reach, or leave, our dipole. This includes trees, houses and any other large objects. This 20 meter dipole, 32 feet long and 32 feet up, will work the world when band conditions are right, because it satisfies the length and height requirements for proper dipole operation—and raising it that high also puts it in the clear, above interfering objects.

Now let's consider a couple of other scenarios. Let's say that you want a dipole for 500 kHz. You'll need a lot of acreage and some really tall trees, because this dipole is 936 feet long, and would need to be raised 936 feet above ground to see the horizon. The physical constraints are obviously impossible to defeat, let alone how upset the FAA will be when their planes run into a dipole nearly a thousand feet above ground.

OK, let's try going the other direction. How about a dipole at 468 MHz? Well, it'll be a foot long, and at a foot above ground it will be a ½-wave up. What's wrong with this scenario? Can you say "ground clutter?" Now we are in a realm where the "1/2-wave above ground" constraint is meaningless; it may satisfy the dipole principle, but no one will be able to see or hear it! OK, let's raise it much higher, say 35 feet above ground. Now it's in the clear, but it's still just a dipole; and the reality is that, at 468 MHz, path losses and so forth make the dipole a very poor weapon of choice. Maybe if the dipole is made the driven element of a 20-element Yagi, it might have a chance in the real world.

Now think once again of the lowly, simple dipole at HF, a ½-wave long and a ½-wave above ground, working the world on the HF ham bands, bringing the whole world into the SWL's radio room. We begin to see how fortuitous our assignment to HF in the beginning really was.

Your Basic Vertical

Now let's consider another "standard" antenna at HF—the ground-mounted vertical. The standard drill says that we now have a vertical radiating element a ¼-wave long, with a field of radial wires underneath to form a ground image.

How does this scenario stack up against the real world?

If we look at 20 meters again, we now see a vertical radiating element 16 feet or so tall. This is still taller than many of the background objects the vertical might be near, like the house, or neighbors' houses, or the trees in the area. Equally important, at a ¼ wave in length, it sees the horizon well; over a good ground image formed by radials, and with even ordinary propagation luck on 20 meters, this humble antenna has enabled many an operator to work the world.

Now, let's consider the vertical at 500 kHz. Whoa! Now we need a vertical element 468 feet long! An impossible engineering feat, even if our neighbors would accede to the idea, which doesn't seem likely. And the FAA will be quite unhappy about this huge traffic hazard in the air. Also, the sea of radials needed underneath this monstrosity, to form a ground image, would be immense, requiring tons of wire and weeks of work.

OK, what about the other scenario, at 468 MHz? Well, now we have a radiating element six inches long! Mounted at ground level, it is literally buried in ground clutter: trees, houses, the neighbors' poodle, are all taller than our micro vertical. The radial field underneath will be small and easy to build; but that's no consolation, since the stub of an antenna is buried in ground clutter, and won't be working much of anyone.

As we did with the dipole scenario, raising it higher above ground, we can "raise" the vertical above ground by building, instead of a ground-mounted vertical, a ground plane vertical, which has rigid radial elements permanently attached at its base. Now the vertical can be placed high in the air, say at rooftop or chimney level. At 468 MHz, this puts it many ¼ wavelengths above ground, and above almost all of the ground clutter. However, as with the dipole scenario at this frequency, the antenna is still physically tiny, presenting a very small target for receiving and generating no gain when transmitting. Path losses at this UHF frequency will ensure that the tiny ¼ wave vertical isn't going to work many operators, unless you live near a local repeater. Here at UHF, one is far more likely to find a many-element Yagi, or at least a lengthened vertical (5/8 wave or 3/4 wave) to generate some gain and overcome path losses. We certainly won't find many ground-mounted verticals here at UHF! Antennas for UHF must be raised above all the ground clutter and into the clear to have a chance of working well.

What Now?

So it becomes clear that what we think of as basic antennas are actually standard antennas at HF, where they were first developed. One can now look at the "lowly" dipole and take pride in the fine job it does at HF. Many of us have Worked All States, or worked a hundred countries (DXCC), or logged a hundred entities as a SWL, without using anything more complex than a simple dipole or ground-mounted vertical. The happy coincidence of lengths and heights that can be fitted into the average yard is the key, along with

MFJ's popular 43 foot vertical, 5/8 wave at 20 meters. At 500 kHz it would need to be 1053 feet tall to reach 5/8 wave; at 468 MHz it would be 15 inches tall. (Courtesy: MFJ Enterprises)

Mother Nature's willingness to provide us with various propagation scenarios at HF that are absent at lower and higher frequencies. Even the casual HF operator gets clear evidence of the limitations. For example, the Yagi beam antenna was developed to get some gain, as well as some side and back signal rejection on receive. But have you ever seen an 80-meter Yagi? And you probably won't, because it's just too big. With elements around 65 feet long, this monster would be a real feat of engineering, not to mention the scary scenario involved in raising it and its tower. (We used to joke in the 1970s that you could work moonbounce on 80 meters this way—when you rotate the antenna, the ends of the elements will scrape against the Moon, because they're so long.)

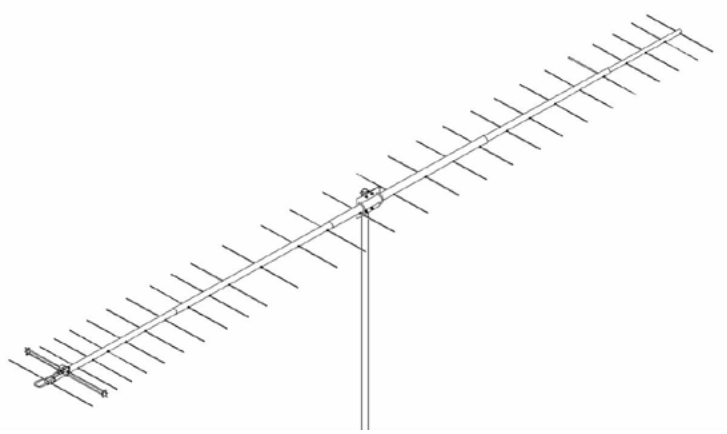
Technically, 6 meters isn't HF, but many HF rigs include it now, and many of us think of 6 meters as a sort of super-duper 10 meters—when the band is open. But the frequency is high enough that path losses begin to be a real problem (as they routinely are for VHF and UHF operators). It's also a high enough frequency that multi-element Yagis and other high-gain antennas, commonly used above 144 MHz, are small enough to build and erect easily. But, when 6 meters is open, many of us have worked a whole lot of grid squares using nothing fancier than a simple dipole or vertical. My old 102-foot dipole, up 35 feet and fed with ladder line, was an absolute monster on 6 meters; around eleven half-waves long at 6 meters, it had considerable gain. If only I could have rotated it…

So we see that HF is truly the comfort zone for what we think of as basic antennas; they are of lengths and heights that can be accomplished at many of our locations; they get above ground clutter with a minimum of fuss; they enable dependable HF operation. As we have seen, at frequencies much below or above HF, we have to resort to different designs, because we can't make dipoles or verticals long enough at lower frequencies, and at higher frequencies the basic antennas are not sufficiently efficient (nor gain-worthy) for effective operation.

Work-Arounds

At low frequencies, like the 500 kHz scenario we have been using, a popular choice for receiving is some form of loop antenna. This one makes a certain amount of instinctive sense. You can't put a 1000-foot dipole 1000 feet overhead; but you can wind the 1000 feet of wire into a large coil on a form. A big advantage of this loop—apart from not having to mount it 1000 feet in the air—is that the loop tends to be sensitive to received signals when the loop is broadside to the source signal, while turning the loop edge-on to the source can produce a deep null. This is invaluable to the low-frequency listener, since this lower spectrum abounds in noise sources of every variety. Generally, the larger (in circumference) the loop, the more its performance improves; but even a loop wound on a very small form can be quite effective. My homemade receiving loop, pictured here, is only about 18 inches wide, but it pulls in more signals at MF and below than the 102 foot dipole ever did. If you're old enough to remember pocket radios and AM table radios, you'll realize they both utilized very small (physically) loops to haul in the local stations, rendering the pocket radio totally portable and the table AM radio quite capable. (When I was little, my older sisters and I would tune around on their big old AM radio at night and listen rapturously to stations far away. I guess that's where I got the DX bug.)

To transmit at such low frequencies, it will be hard to improve on the simplicity of a ground-mounted vertical. Of course we can't make it full size; but through the twin workarounds of a loading coil and a huge field of ground radials, we can get it to load up. There are few other choices, since the laws of physics make any full-sized antenna at low frequencies truly gigantic—unobtainable from either an engineering or real-estate standpoint. (Ever notice that the vertical antennas of AM stations are the tallest items in your town?)



DX Engineering's beautiful 28-element Yagi for 432 MHz, weighing 8 lbs provides 19 dB of gain. A similar antenna for 80 meters would be the size of a football field. (Courtesy: DX Engineering)

When we go in the other direction—toward UHF—we face a different set of problems. Now antennas of huge gain are easy to build since they are so small physically. "Full size" is not a problem anymore; recall that the dipole for 468 MHz is a foot long, and the ¼-wave vertical is six inches long. The problem now is that path losses at VHF and UHF demand a lot of antenna gain to overcome them. But, again, at these frequencies, a high-gain antenna can be built and raised that would be impossible at HF—picture a 20-element Yagi for 20 meters, for example. Too huge! But at, say, 432 MHz, we can build a 20-element Yagi, with typically around 18 dB or so of gain, and have it be small and light enough to easily raise on a tower. Indeed, we can stack several such Yagis at the proper spacing and get enough gain to work moonbounce—something we can't do at 20 meters!

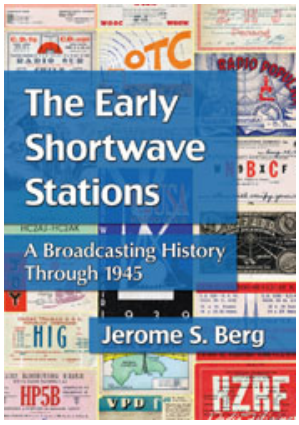
There You Have It

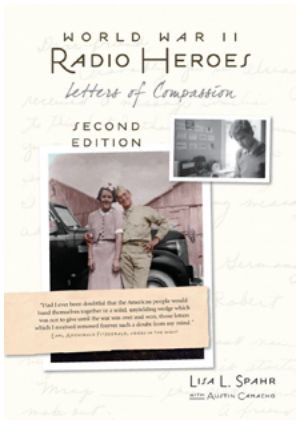
The "basic" antennas we learn as an introduction to HF are actually "standard" antennas, that must be severely modified or re-worked to be employed above or below HF. We're all really lucky that in the beginning we got relegated to the "useless" frequencies above 200 meters, enabling shortwave broadcasting and world-spanning propagation on the ham bands, which we wouldn't have had if we hadn't been handed these useless frequencies. Thanks, early legislators! That's all for this month. Join me here in May and we'll further explore the Big Antenna Jungle. Stay safe, and happy operating!

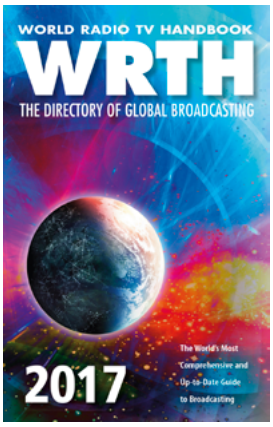
TSM

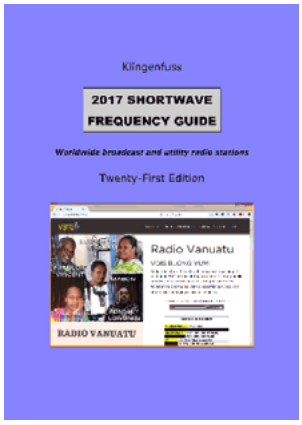
T S M Bookshelf

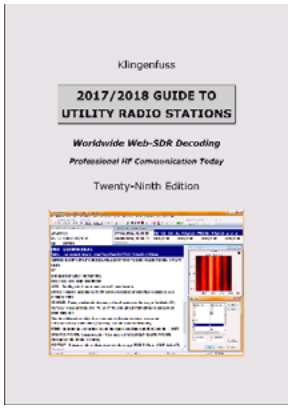
Books of Interest to *TSM* Readers to Enhance your Radio Listening

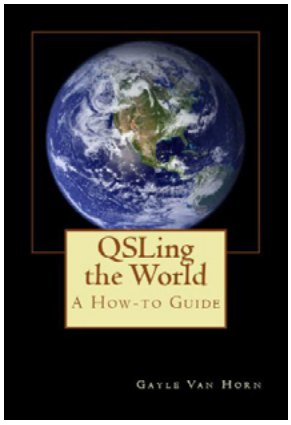


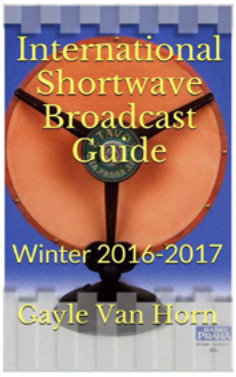


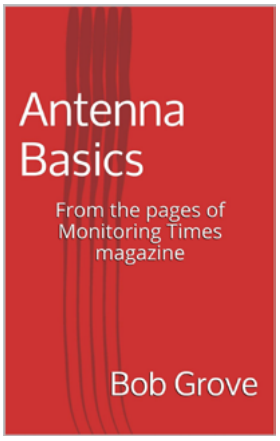


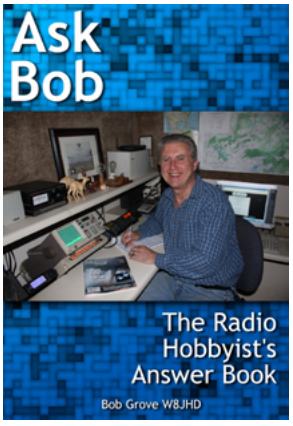


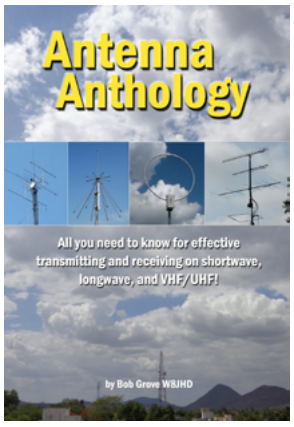


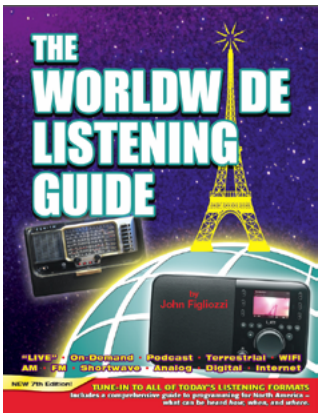


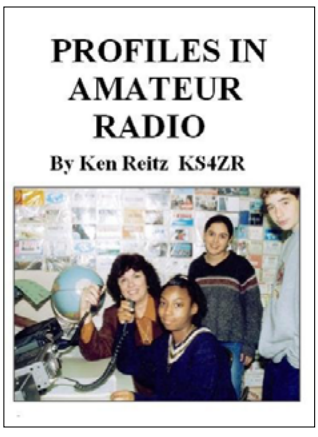


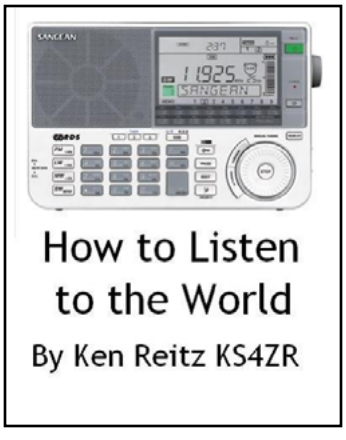


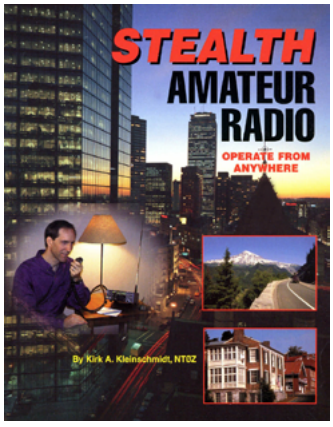






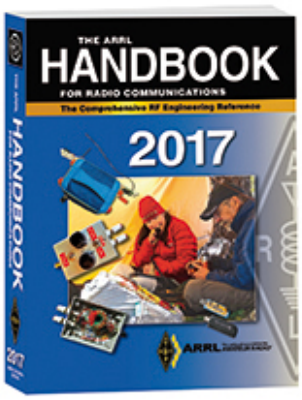


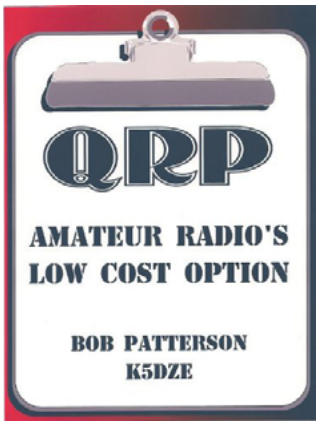


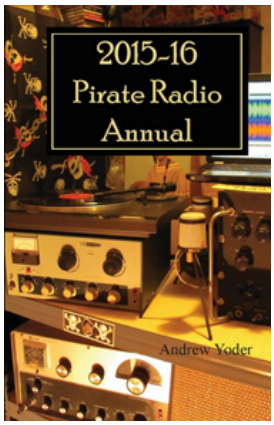


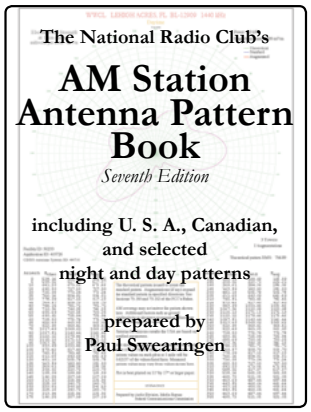
T S M Bookshelf

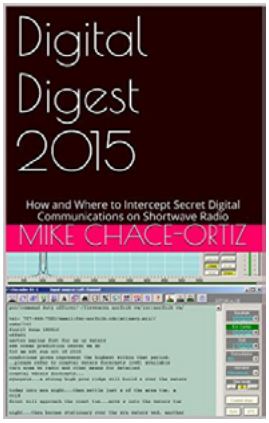
Books of Interest to *TSM* Readers to Enhance your Radio Listening

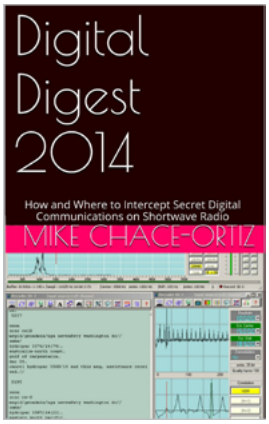


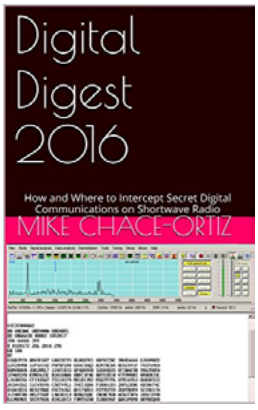


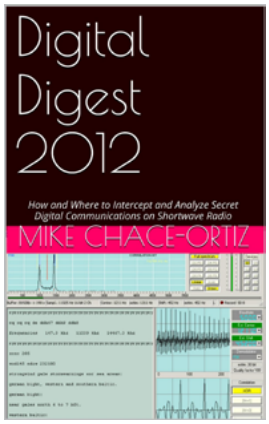


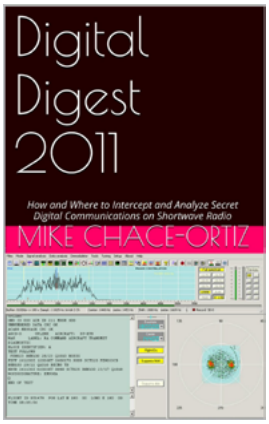


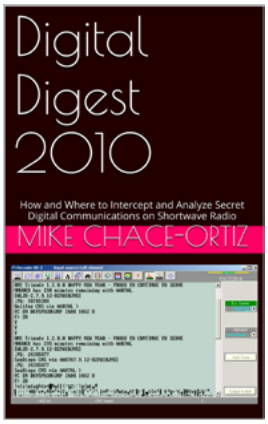


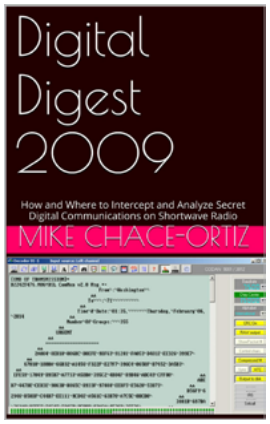


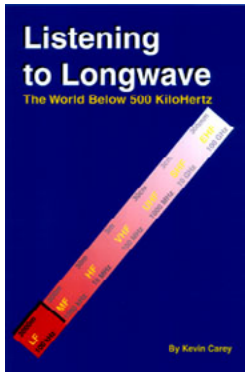












About Us

The Spectrum Monitor Writers' Group

The Spectrum Monitor is edited and published by Ken Reitz KS4ZR, former managing editor, features editor, columnist and feature writer for *Monitoring Times*. Former feature writer and columnist for *Satellite Times*, *Satellite Entertainment Guide*, *Satellite Orbit*, *Dish Entertainment Guide, Direct Guide;* contributing editor on personal electronics for *Consumers Digest*. Author of the Kindle e-books "How to Listen to the World" and "Profiles in Amateur Radio." E-mail: editor@thespectrummonitor.com

The Spectrum Monitor Writers' Group consists of former columnists, editors and writers for *Monitoring Times* and *Popular Communications* magazines. Below, in alphabetical order, are the columnists, their amateur radio call signs, the name of their column in *The Spectrum Monitor,* a brief bio and their websites and contact information.

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Past president and currently treasurer of the Radio Amateur Satellite Corporation (AMSAT). Freelance writer and photographer on amateur space telecommunications since 1993. Columnist and feature writer for *Monitoring Times*, *The Canadian Amateur* and the *AMSAT Journal*. kb1sf@hotmail.com **www.kb1sf.com**

Kevin O'Hern Carey WB2QMY, "The Longwave Zone"

Reporting on radio's lower extremes, where wavelengths can be measured in miles, and extending to the start of the AM broadcast band. Since 1991, editor of "Below 500 kHz" column for *Monitoring Times*. Author of "Listening to Longwave" (http://www.universal-radio.com/catalog/books/0024u.html). This link also includes information for ordering his CD, "VLF RADIO!," a narrated tour of the longwave band from 0 to 530 kHz, with actual recordings of longwave stations. E-mail: wb2qmy@arrl.net

Mike Chace-Ortiz AB1TZ/G6DHU "Digital HF: Intercept and Analyze"

Author of the *Monitoring Times* "Digital Digest" column since 1997, which follows the habits o f embassies, aid organizations, intelligence and military HF users, the digital data systems they use, and how to decode, breakdown and identify their traffic. **www.chace-ortiz.org/umc**

Dan Farber AC0LW, "Antenna Connections"

Monitoring Times antenna columnist 2009-2013. Building ham and SWL antennas for over 40 years. E-mail: ac0lw@att.net.

Richard Fisher KI6SN

A veteran journalist with a 35-year career in daily newspapers, and an amateur radio operator living in Riverside, California, Richard has been an editor and writer for *Popular Communications, WorldRadio Online*, and *CQ Amateur Radio* magazines. Among his previous responsibilities have been the monthly "Emergency Communications," "Trail-Friendly Radio" and "Easy Does It" columns for *CQ*, and has written for several QRP publications, including *QRP Quarterly* and *QRPp* magazine. An avid homebrewer, he is a co-founder of The Adventure Radio Society. Write to him at ki6sn@aol.com.

Tomas Hood NW7US, "Radio Propagation"

An Extra Class operator since 1990, Tomas enjoys CW and digital modes on all HF bands. He is a contributing editor to *CQ Amateur Radio*, the former *Popular Communications* and *CQ VHF* magazines, an ARRL publication on QRP communications, and *Monitoring Times*. He runs the Space Weather and RadioPropagation Center at **http://SunSpotWatch.com**. Web site: **http://nw7us.us** Twitter: **https://twitter.com/NW7US**.

Kirk Kleinschmidt NT0Z, "Amateur Radio Insight"

Amateur radio operator since 1977 at age 15. Author of "Stealth Amateur Radio." Former editor, "ARRL Handbook," former *QST* magazine assistant managing editor, columnist and feature writer for several radio-related magazines, technical editor for "Ham Radio for Dummies," wrote "On the Ham Bands" column and numerous feature articles for *Monitoring Times* since 2009. Web site: **www.stealthamateur.com**. E-mail: nt0z@stealthamateur.com

Joe Lynch N6CL, "VHF and Above"

Currently Director of Religious Education for the Army at West Point, New York. He holds a Doctor of Ministry, Master of Divinity, an MBA and is an adjunct instructor for four colleges and universities and a retired United Methodist minister. He served as the editor of *CQ VHF* magazine for 12 years and the VHF editor for *CQ* magazine for 22 years.

Stan Nelson KB5VL, "Amateur Radio Astronomy"

Amateur radio operator since 1960. Retired after 40-plus years involved in mobile communications/electronics/computers/automation. Active in radio astronomy for over twenty years, specializing in meteor monitoring. He wrote the "Amateur Radio Astronomy" column for *Monitoring Times* since 2010. A member of the Society of Amateur Radio Astronomers (SARA). **www.RoswellMeteor.com**. E-mail: Stan.Nelson@RoswellMeteor.com

Chris Parris, "Federal Wavelengths"

Broadcast television engineer, avid scanner and shortwave listener, freelance writer on federal radio communications since 2004, wrote the "Fed Files" column for *Monitoring Times*. h**ttp://thefedfiles.com http://mt-fedfiles.blogspot.com** Twitter: @TheFedFiles E-mail: cparris@thefedfiles.com

Rich Post KB8TAD, "Adventures in Radio Restorations"

As a teenager Rich Post repaired radios and TV sets. He passed the exam for a First Class FCC license when he was told he needed one to repair his CB. He later received his amateur radio license as KB8TAD. Rich now holds a University Emeritus title having retired from Ohio University as Assistant Dean and Director of the Instructional Media and Technology Services. One of his hobbies is collecting and restoring "boat anchors." He maintains the web site Boat Anchor Pix at **www.ohio.edu/people/postr/bapix**.

Tony Roper, "Military Air and Naval Reception"

A Civil Air Traffic Controller in the UK as well as previously being in ATC in the Royal Air Force, totaling 25 years experience. He has worked as a part-time aviation photographer/writer and has been published worldwide. He also provides photos and research for IHS Jane's, principally Jane's Fighting Ships. His photography website is **www.rogdabbit.co.u**k and his blog is **http://planesandstuff.wordpress.com**

Cory GB Sickles WA3UVV, "Digitally Speaking"

First licensed as a Novice over 40 years ago, he enjoys exploring various facets of amateur radio, from the latest state of the art technologies, to the elegant simplicity found with a one-tube transmitter and straight key. He has an extensive background with computers and likes to restore 8, 12 and 16-bit classics from the 1970s. He owns a television production company and creates series programming, as well as marketing and training videos. wa3uvv@gmail.com.

Hugh Stegman NV6H, "Utility Planet"

Longtime DXer and writer on non-broadcast shortwave utility radio. Former "Utility World" columnist for *Monitoring Times* magazine for more than ten years. Web site: **www.ominous-valve.com/uteworld.html** Blog: **http://mt-utility.blogspot.com** /email: mtutilityworld@gmail.com Twitter: @UtilityPlanet

Dan Veeneman, "Scanning America"

Software developer and satellite communications engineer writing about scanners and public service radio reception for *Monitoring Times* for 17 years. Web site: **www.signalharbor.com** E-mail: dan@signalharbor.com

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