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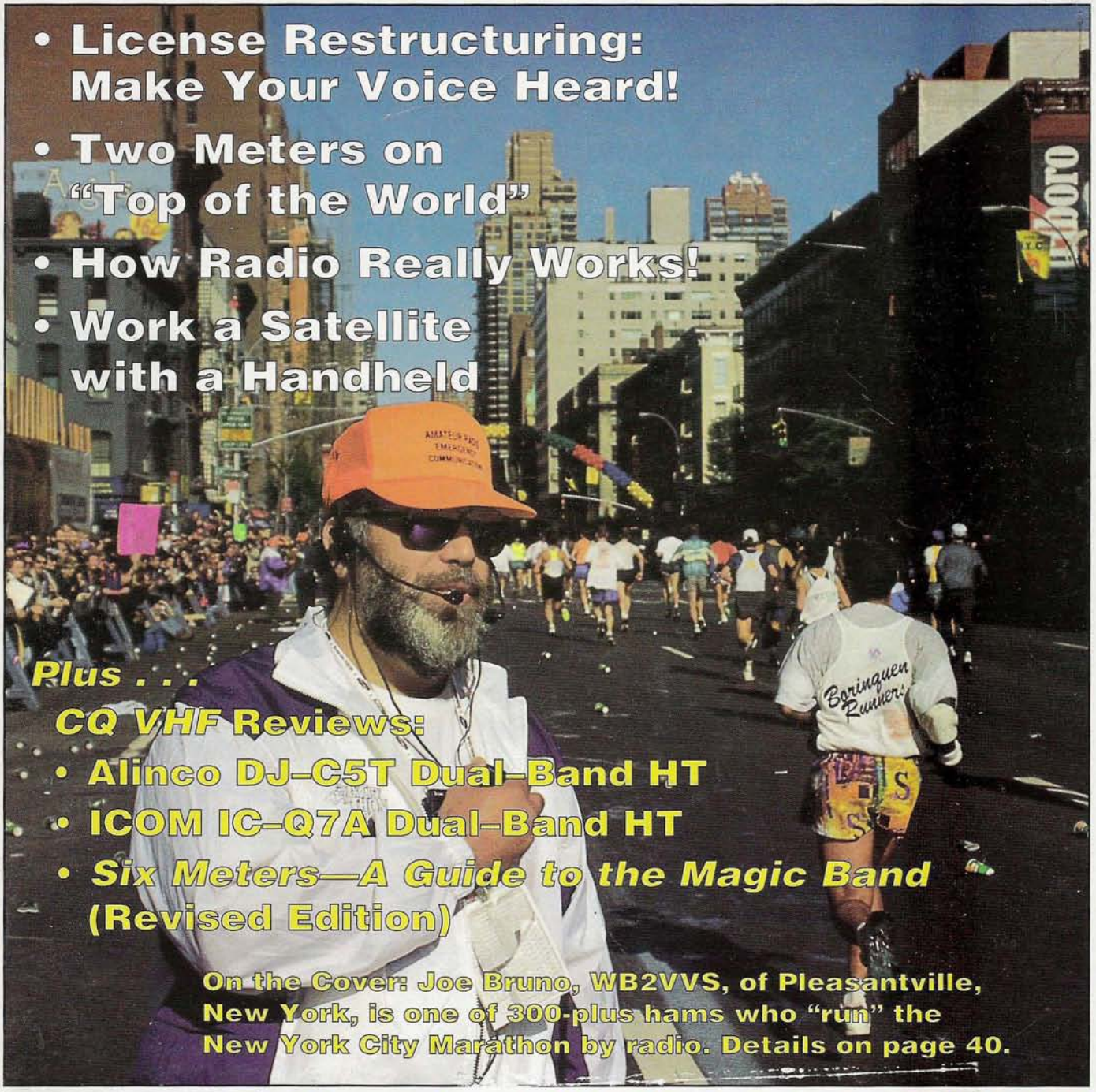
CQ VHF Ham Radio Above 50 MHz

November 1998



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On the Cover: Joe Bruno, WB2VVS, of Pleasantville, New York, is one of 300-plus hams who "run" the New York City Marathon by radio. Details on page 40.

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B-1016-G Great for ICOM IC-706!

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***Power Curve* -- typical B-310-G output power**

Watts Out	25	50	75	95	100	100+	100+
Watts In	¼	½	1	2	4	6	8

- *100 Watts out with all handhelds up to 8 watts*
- *All modes: FM, SSB, CW*
- *Great for ICOM IC-706*
- *15 dB low noise GaAsFET preamp*
- *Reverse polarity protection/SWR Protection*
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***Power Curve* -- typical B-34-G output power**

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Watts In	1	2	3	4	5	6	7	8

- *35 Watts Output on 2 Meters*
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- *18 dB GaAsFET preamp*
- *Reverse polarity protection*
- *Includes mobile bracket*
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MIRAGE RUGGED!

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***Power Curve* -- typical BD-35 output power**

Watts Out (2Meters)	30	40	45	45+	45+	45+	45+
Watts Out (440 MHz)	16	26	32	35+	35+	35+	35+
Watts In	1	2	3	4	5	6	7

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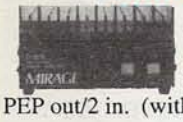

Industry standard ATV amps -- **D-1010-ATVN, $414**, 82 watts PEP out / 10 in. **D-100-ATVN, $414**, 82 watts PEP out/2 in. (without sync compression).

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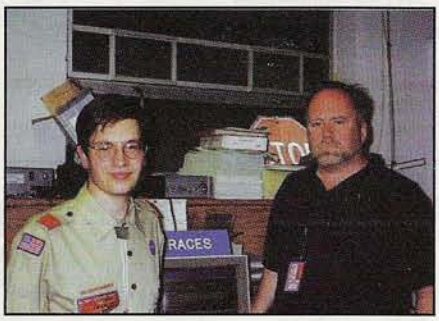

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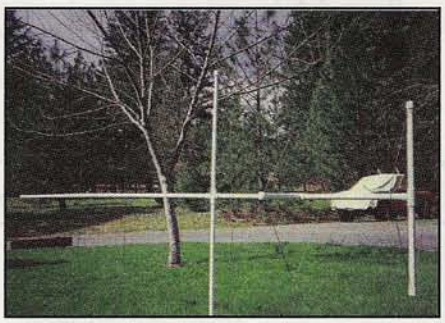

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Next Month: "Are NiMH Batteries Really Better?" by Ken Collier, KO6UX

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The FCC and License Restructuring—Now It's Our Turn

The FCC has proposed half a plan for amateur license restructuring. Now it's up to us to fill in the blanks and tell the FCC what we really think will work.

Both the American Radio Relay League (ARRL) and the Federal Communications Commission (FCC) put out proposals last summer to restructure amateur radio licensing. The goal, presumably, is to create a licensing structure that will carry amateur radio into the 21st century as a strong, healthy, and important service and hobby.

The ARRL took a good first step (see last month's "Line of Sight"). The FCC fell flat on its face. Amid a world of good intentions, the FCC's proposal was cosmetic at best and damaging at worst, the apparent victim of bureaucratic bungling and—if we read the tea leaves correctly—infighting within the Commission staff.

The Notice of Proposed Rule Making (NPRM) issued by the FCC was actually two proposals: one in the discussion section and another, totally different, in the Appendix that contained the actual proposed rules. The differences were so great that the Chief of the Wireless Telecommunications Bureau felt forced a month later to issue a 13-page "Errata" in order "to conform the proposed rules to the proposals discussed in the text of the *Notice*." In English, that means to make the left hand and the right hand agree. Unfortunately, the "corrections" corrected only some of the major problems with the NPRM (if you're not familiar with what the FCC proposed, see "The FCC Proposal: An Overview" for a thumbnail sketch).

An Incomplete Proposal

The biggest problem is that the NPRM should have been a Notice of Inquiry (NOI). An NOI says, in effect, "we're considering changing the following rules. We want you to tell us if you think this is necessary and, if so, what changes we should make." And this is, in fact, what several sections of the NPRM do. But as a Notice of Proposed Rule Making, it necessarily includes proposed rules which, if unchallenged, will be adopted as they are written (or rewritten, as is the case with the Errata). And the proposed rules leave huge gaps, especially in those areas for which the Commission seeks input from the amateur community.

The most glaring of these gaps is in the area of code speed. In the discussion section, the Commission suggests that it would strongly consider reducing code speed requirements for the various license classes that require a code exam, and it asks hams what they think the speed requirements ought to be. But since it has no answer yet, the proposed rules simply eliminate the Element 1(A) five-wpm code exam and make no change to the speed requirement for Element 1(B), the current 13-wpm exam for General and Extra. If this is enacted as is, then access to even the most basic HF privileges would require passing a 13-wpm code test. Access to HF hasn't been so restricted since 1951, when the Novice license was established. It is clear from the discussion section of the NPRM that it is not the Commission's intent to *increase* basic code speed requirements, but that is the effect of the rule as proposed.

Likewise, there's a gap in what to do about the handicap waivers for the higher code speed exams. After discussing allegations of abuses of the current system, and suggesting that the ARRL's proposal (that applicants with disabilities be required to take and fail a code exam before being issued a waiver) is too burdensome, it again asks for input from the ham community. But in Version 1 of the proposed rules, it simply eliminated the waiver provision altogether...and in Version 2 (the Errata), it eliminated the elimination, leaving the rules exactly as they are.

"Amid a world of good intentions, the FCC's proposal was cosmetic at best and damaging at worst, the apparent victim of bureaucratic bungling and—if we read the tea leaves correctly—infighting within the Commission staff."

It looks to us like there was quite a bit of wrangling inside the Commission over the code speed requirements, with one camp promoting a single five-wpm requirement (in which case there'd be no need for handicap waivers), and the other taking a more cautious approach of "let's ask what they want before we decide." The latter camp obviously won, but produced an NPRM that appears to do exactly the opposite of what it is intended to do in this case.

Why Eliminate the Tech Plus?

The Commission appears to have a very short memory regarding the Tech Plus license. It was created as a distinct license class soon after the code requirement was

By Rich Moseson, W2VU, Editor (cqvhf@aol.com)

The FCC Proposal: An Overview

In case you missed our page-long description of the original proposal in last month's "VHF News," here's a thumbnail sketch of what the FCC proposed in WT Docket 98-143:

- Issue no new Novice licenses; allow indefinite renewals of current Novice licenses. The NPRM is unclear on what would happen with the current HF Novice subbands. The discussion section proposes restoring full power privileges to higher-class hams using what are now the Novice frequencies, but we can't find a matching provision in the Appendix; likewise, the discussion suggests giving current Novices CW privileges anywhere in the 80-, 40-, 15-, and 10-meter bands. The original appendix appeared to give Novices CW privileges on all segments of all HF bands, including Extra subbands (to which General and Advanced class licensees do not have access); the revised Appendix makes no changes to frequency privileges.
- Issue no new Technician Plus licenses and treat renewals of Tech Plus licenses as renewals of Technician licenses. It is unclear from the proposal what will happen to Tech Plus HF privileges or whether code credit would be permanent.
- Eliminate the license exam elements associated with the Novice class license: Element 1A (five-wpm code) and Element 2 (basic theory), which apparently would be folded into a larger Element 3A (Technician theory) exam. Without changing the speed requirement for Element 3B, this would mean that new upgrades could require a 13-wpm code test for any HF access at all.
- Provide permanent exam element credit to holders of certain expired Technician class licenses (pre-1987, Element 3B; pre-1991, Element 1A); but does not extend this privilege to holders of other expired licenses.
- Re-examine the matter of 13- and 20-wpm code test waivers for people with disabilities that limit their code copying ability—but once again, there are no specific proposals made and amateur input is requested.
- Issue no new RACES (Radio Amateur Civil Emergency Service) station licenses.
- A variety of non-licensing issues, such as including in the rules the band-by-band power limits above which RF exposure evaluations must be conducted; and allowing Advanced class Volunteer Examiners (VEs) to administer General class code tests.
- Comment deadline is December 1, 1998, with reply comments due by January 15, 1999.

For more on filing comments with the FCC, see Gordon West's article, "License Restructuring: Make Your Opinion Count," elsewhere in this issue. A full copy of the FCC's NPRM maybe downloaded from the FCC's Web site <http://www.fcc.gov> or from the ARRL Web site <http://www.arrl.org>, or by following the links from the VHF News page on the *CQ VHF* Web site <http://members.aol.com/cqvhf/>.

dropped for the basic Tech license, in order to distinguish those Techs with HF operating privileges from those without. Eliminating the distinction, while continuing to have some Techs with HF privileges and some without, returns to the problem that the Tech Plus license was created to solve: Techs who have passed a code test would have HF privileges based solely on a Certificate of Successful Completion of Examination (CSCE) from a VEC, not on any sort of specific grant from the FCC. There is no legal authority for the FCC to delegate the granting of frequency privileges. In addition, CSCEs normally are valid only for one year, but these would be permanent; and if your CSCE was lost or destroyed, there'd be no proof in the FCC database that you had qualified for HF privileges.

In addition, the FCC uses as its justification for eliminating the Tech Plus license a statement that "Both Technician and Technician Plus Class licensees predominantly use FM voice and digital packet technologies on the amateur VHF and UHF bands....We therefore propose that the Technician Plus Class be phased out." Now wait just one minute—what basis in fact does the FCC have for this statement? Has it surveyed Tech Plus hams to learn their operating habits? Has it taken into account that we've just been through the bottom of a sunspot cycle, that 10 meters is just starting to come back to life after a few years of very little reliable long-distance propagation? That 15 meters hasn't been in much better shape from a DX perspective? That the 40-meter Novice band is virtually unusable at night due to interference from broadcasters in Europe? If most Tech Plus hams only use FM and packet on VHF and UHF, then why did they bother learning the code and taking their code tests? This claim—and thus the Commission's entire basis for eliminating the Tech Plus license—has no basis in fact!

How does this differ from the ARRL's proposal to eliminate the Tech Plus license? Considerably. The ARRL says reduce the General class code requirement to five wpm and grandfather all current Novices and Tech Pluses into General class. This is very different from what the FCC is proposing—I think—if, that is, the FCC really knows what it is proposing.

And What about Novices?

The FCC is correct in its assertion that the Novice license has outlived its usefulness, and this time it has numbers to back up its claim: 961 Novice license applications in 1997 versus 21,416 Technician applications in the same time period. But once again, what to do with current Novices is left up in the air. They can renew forever—and be in permanent limbo, maybe having expanded HF CW privileges, maybe not—maybe having more CW privileges than General and Advanced Class hams! The ARRL has the right idea here: bite the bullet, put up with cries of righteous indignation from Generals who will feel slighted, and just grandfather them all into a five-wpm General class.

Reviving Expired Licenses

Here's one of the weirder items to come out of the FCC proposal: If you have an expired Technician license issued before 1987, you'll have lifetime credit for Elements 1(A) and 3(B), but not for Elements 2 and 3(A)! Likewise, an expired Tech license issued before 1991 will give you permanent credit for Element 1(A). No such credit is proposed for holders of expired licenses of any other class.

What I think the FCC was trying to do here is to say that, *if you're currently licensed, and* you have proof of having been licensed before either 1987 or 1991, respectively, then the old licenses should

CQ VHF Ham Radio Above 50 MHz

EDITORIAL STAFF

Richard S. Moseson, W2VU, Editor
Edith Lennon, N2ZRW, Managing Editor
Bernadette Schimmel, Editorial Assistant

CONTRIBUTING STAFF

Gordon West, WB6NOA, Sr. Contributing Editor

Kent Britain, WA5VJB, Microwaves and Antennas
Ken Ernandes, N2WWD, Amateur Satellites
Dave Ingram, K4TWJ, How It Works/Project Corner
Bob Josuweit, WA3PZO, Public Service
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BUSINESS STAFF

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Arnie Sposato, N2IQO, Advertising Manager
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Ann Marie DeMeo, Accounting Department

CIRCULATION STAFF

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Barbara McGowan, Associate Art Director
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Emily Leary, Assistant Production Manager
Pat Le Blanc, Phototypographer
Hal Keith, Illustrator
Larry Mulvehill, WB2ZPI, Staff Photographer
Joe Veras, N4QB, Special Projects Photographer

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CQ Communications, Inc.
25 Newbridge Road
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Offices: 25 Newbridge Road, Hicksville, New York 11801. Telephone: (516) 681-2922. FAX (516) 681-2926. E-mail: CQVHF@aol.com; 72127.745@compuserve.com; cqcomm@delphi.com; WWW:<http://members.aol.com/cqvhf/>. CQ VHF (ISSN 1085-0708) is published monthly by CQ Communications Inc. Periodical postage paid at Hicksville, NY 11801 and additional offices. Subscription prices (all in U.S. dollars): Domestic—one year $24.95, two years $45.95; Canada/Mexico—one year $34.95, two years $65.95; Foreign Air Post—one year $44.95, two years $85.95.
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count as element credit on upgrading. But that's not the way it's written.

Actually, though, I think they have a good idea here: Let holders of expired licenses reactivate those licenses on request, without the need for retesting, and with a new callsign, of course (but with vanity calls, it wouldn't take long to get back an expired call if it was still available). Just file a 610 form, attach a copy of your expired license and wait for the new one to arrive in the mail. Why not? They've already passed their tests. It's a great idea. It ought to be applied to all former licensees.

Not Listening to Other Ideas

The NPRM solicits input from amateurs on all of the matters we've discussed above, but, curiously, it also ignores or rejects other proposals already made. Primary among these is the ARRL's restructuring proposal, which was hand-delivered to the FCC a full week before the Commission adopted its own, highly-flawed, document. Even if it was too late in the process to have the details of the ARRL proposal considered at this stage of the proceeding, the Commission should at least have acknowledged its receipt and made a statement along the lines that it would be considered as an alternative to its own proposal.

In addition, the FCC flatly rejected several pending petitions dealing with frequency privileges (such as making additional HF frequencies available to Tech Plus licensees), new technical standards for repeaters, and a proposal from Henry Ruh, KB9FO (a former *CQ VHF* columnist), "that the current examination system for an amateur radio license be changed from one that is based on memorization of questions and answers to one that is based on experiential operation of an actual amateur station."

These various petitions are dismissed on the basis of the following paragraph:

> All of the petitions discussed in the foregoing paragraphs concern licensing requirements, operator frequency privileges or seek a restructuring of the amateur license classes. The current operator frequency privileges, structure of the license classes and the requirements for obtaining an amateur license were developed in accordance with the expressed desires of the amateur community to provide motivation for amateur operators to advance their communication and technical skills. We do not believe that sufficient evidence has been presented to justify altering the current requirements which are in accordance with the basis and purpose of the Amateur Radio Service in the United States. Therefore, we will dismiss these repetitive petitions.

Read that again—it says that there's no good reason to justify restructuring license classes, frequency privileges, or licensing requirements—*in an NPRM proposing to restructure license classes, frequency privileges, and licensing requirements!* If the Commission doesn't believe "that sufficient evidence has been presented to justify altering the current requirements," then why in the world is it proposing to do just that? The proposals relating to license classes, frequency privileges, and licensing requirements should be considered as part of this proceeding, not dismissed out of hand. And the one about technical standards for repeaters certainly shouldn't be lumped in with the others; it ought to be considered separately, on its merits.

Your Turn

OK. It's time to politely and gently remind the folks in Washington that *they* work for *us*, and to file enough comments—with enough good, solid ideas for helping ham radio—that they'll be forced to pay attention and to take our collective views into consideration before making a final decision. Elsewhere in this issue, Senior Contributing Editor Gordon West, WB6NOA, walks you through the procedure for writing and filing comments with the FCC (see "License Restructuring: Make Your Opinion Count"). It really isn't difficult. Follow his advice and make your voice heard. We're working on *our* comments right now.

One thing is certain: the FCC's current proposal is not in the best interests of amateur radio. It must be changed, and it must be us—the amateurs licensed by the FCC—who tell the Commission what *will* be best for our future. ■

Help Wanted

If you're involved with a project or activity that you think would be of interest to your fellow *CQ VHF* readers, we'd like to hear from you. Article submissions are welcome, as are "Op-Ed" opinion pieces if you have a point of view you'd like to share about a VHF-related topic. You can contact us by mail at 25 Newbridge Rd., Hicksville, NY 11801 (send an SASE for writers' guidelines), by e-mail to <CQVHF@aol.com>, or via our World Wide Web page, <http://members.aol.com/cqvhf/>. We look forward to hearing from you.

VHF News

AAA: Land Mobile Group "Backing Away" from 70-Centimeter Request

The Land Mobile Communications Council (LMCC) "[will] not continue to actively seek access to the amateur radio spectrum," according to an official of the American Automobile Association (AAA), but it will not specifically ask the FCC to withdraw that portion of its request. Last spring, the LMCC filed a petition with the FCC (RM-9267), requesting the reallocation of several pieces of spectrum—including 420 to 430 and 440 to 450 MHz—to the Private Mobile Radio Service (PMRS).

In a letter to ARRL San Diego Section Emergency Coordinator David Doan, KC6YSO, AAA's Gary Ruark said the automobile club, which is a member of the LMCC, had asked the council to file supplemental comments with the FCC, "withdrawing the language regarding the amateur radio frequencies." Ruark said the LMCC denied that request, fearing that such a request could "undermine the rest of the petition." However, he added that "I was told that the LMCC would not continue to actively seek access to the amateur radio spectrum, and would forfeit that language during FCC negotiations in exchange for more important spectrum allocations."

Ruark also suggested that the LMCC never seriously expected to get the 70-centimeter ham band, adding that "Within the LMCC there are members that support the strategy that one should ask for everything and then bargain away part of it in order to get what is really needed. That is what the LMCC was doing when it included the amateur radio spectrum in the plan."

The full text of the AAA letter is posted on the ARRL's Web site at <http://www.arrl.org>.

Canadian Hams Help after Swissair Crash

The September 2 crash of Swissair Flight 111 into the ocean off Nova Scotia sent area hams into action, as they set up communications between downtown Halifax and the disaster coordination site at Peggy's Cove. According to the *ARRL Letter*, the hams kept Red Cross teams in the field in touch with each other and with their headquarters in Halifax. In addition to using two VHF repeaters, the ham volunteers also set up non-amateur HF links to military and naval stations and on VHF marine emergency channel 16. *CQ VHF* public service columnist Bob Josuweit, WA3PZO, is working on a comprehensive report for his December column.

Japan's New Prime Minister a Ham

The Japanese Amateur Radio League (JARL) says that country's new Prime Minister, Keizo Obuchi, is also JI1KIT. Obuchi, who was elected in a special parliamentary session at the end of July, is said to be a very good friend of JARL President Shozo Hara, JA1AN.

New Satellites Get OSCAR Numbers

The two newest amateur satellites, launched last July from Russia by hams from Thailand and Israel, are now official members of the OSCAR family. OSCAR stands for Orbiting Satellite Carrying Amateur Radio, and all ham satellites except for Russia's RS series have been given OSCAR numbers after successfully achieving orbit and turning on at least one amateur transmitter.

According to the AMSAT News Service, Thailand's TMSAT-1 is now TMSAT-OSCAR 31, or TM-31; and the Israeli TECHSAT 1-A is now GURWIN-OSCAR 32, or GO-32. The announcement did not explain the significance of the name Gurwin.

At press time, both satellites were still being loaded with flight software and were not yet available for general use. However, several images downloaded from TO-31 by its controllers have been posted on the Internet. Five "multispectral" images of portions of the Earth's surface are available in JPG format at <http://www.ee.surrey.ac.uk/EE/CSER/UOSAT/amateur/tmsat/index.html>. A note of caution: Each image is over 500

Compiled by the CQ VHF Staff

kilobytes in size, so don't expect a real quick download.

Space Station Planning Continues

Hams from seven countries involved with planning the Amateur Radio aboard the International Space Station (ARISS) project met last July and formed two permanent working groups: one in charge of designing and building the ham equipment that will be flown aboard the space station, and the other in charge of setting ground rules for operation, arranging financing and taking care of other administrative matters.

According to the *ARRL Letter*, Lou McFadin, W5DID, who's been a major player in the AMSAT Phase 3D project, is chairing the ARISS Hardware Group; and AMSAT Vice President for Human Satellite Programs Frank Bauer, KA3HDO, is heading up the ARISS Administrative Group. While no final equipment decisions have been made, Bauer says the final station will likely include all-mode capability on all bands from 10 meters to 13 centimeters. The initial ham gear—a 2-meter handheld and packet TNC—is expected to be carried into orbit before the end of this year on STS-88.

New Web Site for "Station Program"

Speaking of satellites, the "Station Program" satellite tracking and station control program (see "Orbital Elements," July '98 *CQ VHF*) may now be downloaded from the AMSAT-NA Web site at <http://www.amsat.org/amsat/ftpsoft.html/#win-tsp>. The *SpaceNews* newsletter reports that the move was made necessary by a change in Web sites for AMSAT-Bermuda, where author Paul Willmott, VP9MU, had originally posted the files.

New Vanity Callsign Address

If you're filing a paper (non-electronic) application for a vanity callsign, there's a new address to which you should mail it. According to *Newsline*, Form 610-V and FCC Fee Remittance Form 159 should now be sent to FCC Wireless Bureau Applications, P.O. Box 358130, Pittsburgh, PA 15251-5130. Just to confuse matters, hams who file their 610-V forms electronically should still submit their fee payments (and Form 159) to FCC Amateur Vanity, P.O. Box 358994, Pittsburgh, PA 15251-5994. And remember, as of September 14, the vanity callsign application fee is $13.

FCC Says OK to Paper Comments

The FCC's Notice of Proposed Rule Making (NPRM) on license restructuring (see this month's "Line of Sight" and WB6NOA's article, "License Restructuring: Make Your Opinion Count") originally stated that comments filed on paper had to be accompanied by a digital copy on a floppy disk. However, the *ARRL Letter* says an FCC official has assured the League that this is not a strict requirement and that paper comments without diskettes *will* be accepted. *However*, he also said those comments should include the following footnote: "My comments are being filed on paper only, without a diskette, since it is not feasible for me to include a diskette." Comment deadline on the restructuring proposal is December 1.

Question Pool Updates on Hold

The FCC's license restructuring proposal has prompted the Volunteer Examiner Coordinators' Question Pool Committee (QPC) to put the brakes on any further updates of the question pools for amateur written exams. A new set of questions for the Advanced class exam (Element 4A) was due out next July 1, but the "ARRL Audio News" and other sources report that the process will be put on hold until the restructuring questions are settled. This will keep the committee from doing double work in the event that restructuring changes some of the rules, etc., on which those questions are based.

Digital Voice on LO-19

Would you like to try a voice QSO on a digital satellite? Well, ON1DLL in Belgium says he's been able to successfully digipeat digitized voice messages through the LUSAT-OSCAR-19 satellite, using the WinGT voice packet program. The *SpaceNews* newsletter says anyone interested in scheduling a digital voice QSO with ON1DLL may contact him via e-mail at <on1dll@amsat.org>, via packet at <ON1DLL@ON5VL.#LG.BEL>, or on the air via the AO-16, KO-23 or KO-25 satellites.

"Satellite Times" QRT

The September issue of *Satellite Times* magazine was its last, according to the *ARRL Letter*. Publisher Bob Grove of Grove Enterprises blamed rising paper and printing costs for the magazine's demise after four years of publication. Subscribers will receive Grove's *Monitoring Times* magazine for the remainder of their subscription terms.

Leo Labutin, UA3CR, SK

Russian amateur satellite pioneer Leo Labutin, UA3CR, became a Silent Key in September, according to an Internet posting by Peter Guelzow, DB2OS. According to Peter, Leo was involved in various RS satellite projects, helped bring ham radio aboard the Mir space station, and was also a participant in the ongoing international Phase 3D satellite project. Among his many other accomplishments, Peter wrote, "He was on the South Pole after the launch of RS5..RS8 for testing store-and-forward techniques from such remote locations."

Russia, Mexico Plan Spectrum Sales

Following the U.S.'s lead, the governments of Russia and Mexico are planning spectrum auctions to raise revenue. The AMSAT News Service reports that Russia has decided to charge spectrum usage fees to mobile communications companies and will hold auctions to see who gets licenses for cellular telephone systems. According to the report, 80% of the money raised will be earmarked for the Ministry of Defense and the Russian Space Agency.

Mexico, meanwhile, is said to be planning to auction the rights to use 148 to 174 MHz and 450 to 470 MHz, and may later do the same with the *440- to 450-MHz amateur band* and parts of UHF TV channels 16 to 18 (485 to 495 MHz). On a related note, hams in Guatemala are fighting for the restoration of amateur privileges on 70 centimeters, which were lost when the government decided to auction those frequencies for commercial land-mobile use. So far, no success.

Letters

Your Spot to Speak Out

CQ VHF *welcomes comments and suggestions from readers. We'll print a representative sampling each month, and we reserve the right to edit letters for length or style. All letters must be signed and show a return mailing address or valid e-mail address. Writers' names will be withheld from publication upon request. Address letters to: Letters,* CQ VHF, *25 Newbridge Rd., Hicksville, NY 11801; or via e-mail to <CQVHF @aol.com>; <cqcomm@delphi.com> or <72127.745@compuserve.com>. Please specify that it is a letter for* CQ VHF *magazine.*

License Restructuring

Dear *CQ VHF*:

I think the ARRL proposal is a great start. I have two areas that I feel should be changed:

A. One is the name of the new classes. I do not like A, B, C, etc. I feel that the license classes should have names similar to those we use today. I like Extra, Advanced, and General, and the code-free license should become the Novice (A = Extra, B = Advanced, C = General, D = Novice, eliminate Technician totally).

B. The second change I would like to see is to move the current General class licensees into Advanced class. They passed a 13-wpm code test and the written was not that different from the Advanced. The current Novice and Tech Plus are being upgraded to General with no further written test. Most current Advanced and most General class hams will take a written exam to upgrade to Extra anyway. The only class being (in effect) demoted would be the General (I am an Advanced) and I see no point in that. If we are going to give so much, why not give to every class?

Ric Sohl, KK5RIC
Nogal, New Mexico
and Odessa, Texas

Dear *CQ VHF*:

I believe that we will eventually lose 440/220 and maybe some of the 2-meter frequencies if you do not get more hams and get more activity and usage out of 440. I am recommending establishing an "Operators License." This license would cover rules of the road and proper operating procedures with the focus on emergency communications. We need more operators on 440. This license would encourage more 440/220 activity. You do not need to be a graduate engineer to be an excellent operator. It would certainly be an excellent stepping stone for people who are into SWL, CB, CAP, etc., and young people in high school who have an interest in radio communications. It is time to do something about getting more hams before we lose our bands. I am most interested in comments on this proposal.

Charlie Chapman, W1WTG
Virginia Beach, Virginia
e-mail: w1wtg@juno.com

Ham Bands and National Defense

Dear *CQ VHF*:

I am a long-time ham (43 years) and Air Force retiree, so I am always concerned with matters relating to national defense and any assaults or attempted incursions on our ham bands.

I noticed the enclosed news clipping in the Air Force Times weekly, which indicates that the Defense Department is becoming concerned with the attempts of commercial and other interests to "take over" military frequencies, many of which are shared with the amateur fraternity.

Unfortunately, many members of Congress have little or no knowledge of the long-term consequences of these so-called "auctions," and only see the immediate dollars that can be raked into the Treasury.

I'm glad that Senator Strom Thurmond (R-SC) has his staff investigating.

Lawrence H. Sanderson, KDØYZ
Manchester, Iowa

Larry—You are quite correct that most members of Congress don't really understand frequency auctions except as a source of "free money" to the government. And before anybody puts up a repeater, please contact your frequency coordinator for proper coordination procedures in your area. The FCC was mandated by Congress to auction these frequencies, so only Congress can shut down the auctions. You can help (and so can the rest of you) by writing to your Congressional representatives, explaining the importance of these frequencies to our national security, and of the value of their shared use by amateur radio. One of the points I've always made in this regard is that, in the event of a national emergency when these frequencies will be needed by the military, it'll be a lot easier to temporarily move hams off of them than to move established businesses. In the meantime, we are excellent "caretakers" of these frequencies.

Let's Get Active!

Dear *CQ VHF*:

I am writing this to find out why there are not many users of 6-meter repeaters?

The 6-meter repeater frequencies are dead, and the existing repeaters rarely have activity on them. I suppose that the first thing someone would say to that question is that there are no repeaters around in their immediate area to use—well, I say, put one on the air! Get a group together and some equipment for 6 meters and have fun. There are at least two brands of HTs available for 6 meters now, and many radios today come with 6 meters already in them.

SSB is nice to operate, but let's not forget about the FM portion of the band. Let's keep our frequencies active!

Steve Turner, N2KEJ
Quinton, New Jersey

Steve—There's a fair amount of 6-meter simplex activity in my part of New Jersey (New York City metro area), virtually all on 52.525 MHz. There's also an excellent repeater system that covers virtually the whole state: the W2GEZ system in Holmdel (52.470 in/53.470 out) and Paramus (52.470 in/53.490 out) with a 136.5-Hz CTCSS tone on both. It's quite active at "drive times." I'd suggest you check it out if you haven't already.

Dear *CQ VHF*:

I'm concerned about losing our frequencies, and that what little we have is to be lost, as you can read about every day. It seems about the only time hams use the 222, 432, and higher bands is on contest days.

(Continued on page 70)

Product Update

Kenwood Offers Portable Emergency Radio Kit

Kenwood Communications has introduced a self-contained portable Emergency Radio Communications Kit for use in disasters and other emergencies. Designed for instant setup and use, the kit includes radios and essential accessories for disaster management communications. The specially designed collection of two-way radio equipment is housed in a rugged case with wheels, sized for easy handling and air freight.

"The disaster recovery market demanded a dedicated emergency radio system package that was easy to transport and use," said Paul Middleton, National Sales Manager for the Kenwood Amateur Radio Group. "Two-way radio always makes a difference in life and property damage in situations when telephones and other communications system are out. Kenwood responded to this by selecting high performance radios for their versatility and ruggedness and gathering them into a single, economical package."

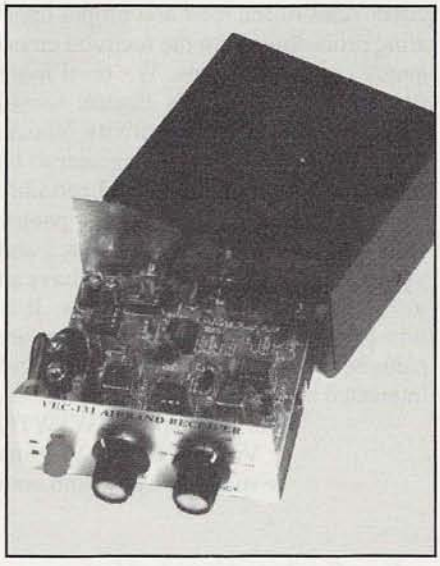
The Emergency Radio Communications Kit includes a Kenwood TM-V7A dual-band base station, capable of voice and APRS (Automatic Position Reporting System) when used with a GPS receiver, and TH-G71A dual-band portable transceivers. Kenwood FreeTalk™ portables are included for short range communications. A compact and lightweight switching power supply, magnetic mount antenna, and gang charger are also packed in the kit. In addition, an accessory package with spare NiCd battery, AA Alkaline battery case, speaker mic and earphone and cigarette lighter power adapter are incorporated into a waist pack.

For more information, contact Paul Middleton, Kenwood Communications Corp., National Sales Manager; Phone: (310) 639-4300; Fax: (310) 537-8235.

Circle 100 on reader service card

New Line of Kits from Vectronics

Vectronics is introducing a line of electronic hobby kits with over 30 offerings, from shortwave converters to aircraft receivers and ham radio kits to an old-



fashioned crystal radio kit. Vectronics kits are created by engineers who are hobbyists at heart. Each kit features a professional-quality epoxy glass pc board with solder mask and screen printed components legend and the highest quality components. The kits also feature an extensive owner's manual, which has been written specifically for each kit.

This detailed, easy-to-follow manual features illustrations, specific instructions, and a schematic diagram. In addition to its step-by-step instructions and helpful tips, the manual also guides you into the next step of the process: the fun of using your equipment.

Vectronics offers an optional custom cabinet for most kits, which includes a sturdy metal box, knobs, hardware, decals, and protective rubber feet.

To order, or for your nearest dealer, call (800) 363-2922; Fax: (601) 323-6551; Web: <http://www.vectronics.com>.

Circle 101 on reader service card

Array Solutions StackMaster

Array Solutions has announced the StackMaster, a four-antenna stack controller for monoband Yagi stacks. The StackMaster maintains a 50-ohm match to all combinations of any one, two, three, or all four antennas in your stack, allowing easy selection of any combination of the antennas from the controller inside your station.

The electronic controller utilizes easy-to-push buttons with LEDs on each button to indicate which antennas are selected. Basically, you just touch the button to select the antenna(s) desired or touch the button again to take it out. All unselected antennas are grounded.

The StackMaster uses high-power relays which conservatively can handle more than 5 kW CW as well as giving tremendous isolation. Reliability is further enhanced by incorporating the PTT (push to talk) line as an input to the electronic controller. This feature locks out being able to change any antenna selections while transmitting and assures that no switching can occur by accident. The StackMaster system also incorporates lightning protection for all control lines.

Matching of the antennas is accomplished through four professionally built and measured 1/4-wave coaxial stubs which attach to the StackMaster. The user can order the StackMaster with or without stubs, allowing the option to build your own matching lines and save costs.

Details will be published soon on the Array Solutions Web site. For more information, contact Array Solutions; E-mail: <wxøb@arraysolutions.com>; Web: <http://www.arraysolutions.com>.

Circle 102 on reader service card

Cushcraft Introduces "TechExpress," Internet-Based Tech Support

"TechExpress" is Cushcraft Corporation's new, Internet-based customer support resource to provide customers worldwide with a timely response to technical questions and related antenna needs. TechExpress can be directly accessed from Cushcraft's newly redesigned Web site at <www.cushcraft.com>. This Web site provides customers with a 24-hours-a-day, seven-days-a-week communication medium to place parts orders, ask technical questions, review frequently asked questions, initiate warranty information, and locate part numbers and descriptions.

TechExpress inquiries via e-mail are given top priority and are answered within one business day. In addition to TechExpress, customers can also access customer service assistance through a

new, automated voice mail system which provides options to leave messages for warranty issues, new and existing parts orders, technical questions and the option to request catalogues. Customers can contact Cushcraft at (603) 627-7877 or fax inquiries to Customer Service at (603) 627-1764. Voice mail and fax inquiries will be processed within three business days.

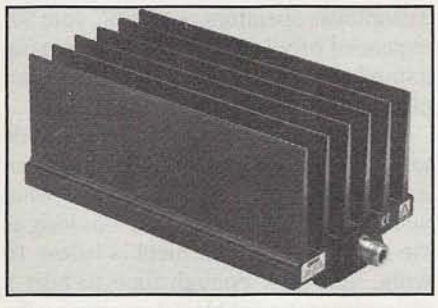
For more information, contact Loraine K. Hobausz, Cushcraft Corporation, (603) 627-7877.

Circle 103 on reader service card

Bird 500-Watt Dry Loads and Attenuators

Bird Component Products has introduced a new series of RF loads and attenuators that features an extremely compact and lightweight design, low VSWR, and economical price. The 500 WT Series includes models to either terminate or attenuate up to 500 watts of RF energy. With a frequency range of DC to 2.5 GHz, the new units can be used in a variety of commercial and amateur applications.

According to David Distler, Product Line Manger, the 500 WT Series "represents a significant breakthrough in the size-performance equation. The new load, for example, will handle 500 watts, but it weighs 60% less and occupies only one-quarter as much volume as compared to other dry and oil dielectric loads of comparable wattage. VSWR is also very low."



The 500 WT Series are dry, convection-cooled devices that weigh approximately 7.9 pounds. The loads measure approximately 4.3 x 5.4 x 10.38 inches (HWL) and attenuators are approximately 4.3 x 5.4 x 11.2 inches (HWL). The finish is black anodized aluminum. Available tri-alloy plated connectors are IEC 7/16, N or TNC.

All 500-WT Series loads and attenuators are 50-ohm devices rated for 500 watts (unidirectional) at 25°C ambient temperature derated linearly to 50 watts at 125°C. Maximum VSWR is 1.10:1 at DC to 1 GHz and 1.25:1 at 1 GHz to 2.5 GHz. Standard attenuation values available on the 500-WT Series attenuators are 3, 6, 10, 20, and 30 dB. Custom values are available on quantity purchases.

The new 500-WT Series loads and attenuators are currently in production and orders are now being shipped. For more information, contact David Distler, Product Line Manager, Bird Components Products, 50 West Jefferson St., Franklin, IN 46131; Phone: (317) 346-6600; Fax: (317) 346-6601.

Circle 104 on reader service card

New Svetlana Web Site

Svetlana Electron Devices invites you to browse its new Web site, The Svetlana Tube Zone, at <www.svetlana.com>. There you'll find information on the tube industry with access to vast amounts of specific technical information, including data sheets on Svetlana products (downloadable in Adobe Acrobat format), online help and technical support, and the Tube Search section, which offers general characteristics on virtually every popular tube type ever made. Find out which types are still in production and which types can be substituted for others.

For more information, contact Svetlana Electron Devices, Inc., 8200 South Memorial Parkway, Huntsville, AL 35802; Phone: (256) 882-1344; Fax: (256) 880-8077; E-mail: <info@svetlana.com>.

Circle 105 on reader service card

Contact East Fall Catalog

Contact East introduces its largest catalog ever, featuring 292 pages of tools and test instruments for engineers, technicians, hobbyists, and general purpose users. Featured are quality products from brand name manufacturers for testing, repairing, and assembling electrical and electronic equipment. New product highlights include Tektronix' TX-DMM Series of True RMS DMMs with built-in RS-232 interface; Weller's electronically controlled Silver Series soldering stations; and Erem "2200 Series" ergonomic cutters and pliers. Also featured is a full selection of DMMs and oscilloscopes, power supplies, solder/desoldering equipment, heat guns, precision and hard-to-find hand tools, cordless power

tools, measuring instruments, ESD protection products, adhesives, and custom made tool kits.

Choose from brand names including Fluke, Tektronix, Hewlett Packard, Weller, Metcal, OK, Pace, Milwaukee, Makita, Xcelta, Loctite, Leatherman, and 3M. All products are fully guaranteed; same day shipping is provided.

To receive a free catalog, write to Contact East, Inc., 335 Willow St., North Andover, MA 01845; Phone: (978) 682-2000; Fax: (978) 688-7829; E-mail <www.contacteast.com>.

AOR Establishes U.S. Office

Receiver manufacturer AOR has established AOR USA Inc., a sales and support center serving North America.

"This move will allow AOR to have a much higher presence in the marketplace and an enhanced dealer network," said Takashi "Taka" Nakayama, KW6I, who was named Vice President for AOR's North American operations. "AOR is about to introduce some exciting new products. Combined with our existing line of receivers, we felt the time was right to establish a higher profile in marketing our products to both retail customers and institutional users."

AOR is headquartered in Tokyo, Japan, with field offices in England, Germany, and now the U.S. Additional information on AOR products can be found at the company's Web site at <www.aorusa.com>, or by phone at (310) 787-8615. ■

License Restructuring: Make Your Opinion Count!

Do you think the FCC's plan for license restructuring is the right idea? Is the ARRL's plan better? Should we leave things as they are? Or do you have an even better idea of your own? The FCC wants to hear your views (really). Here's a guide to writing formal comments...

By Gordon West, WB6NOA*

Where were *you* a year ago when the American Radio Relay League (ARRL) was considering a petition to the Federal Communications Commission (FCC) to simplify the amateur radio license structure and to increase HF privileges for everyone with a Novice or Technician Plus license? That's right. A year ago, the ARRL was contemplating asking the FCC to scrap the Novice license and add 75-meter and 15-meter *voice* privileges for existing Novices and Tech Plus licensees. And for anyone with a regular (No-Code) Tech license, this would have meant voice privileges on not only the 75-meter nighttime band, but the 15-meter DX band as well, plus voice privileges already in the rules for 10 meters, simply by passing a five word-per-minute (wpm) code test.

But where were *you* when the League solicited comments from members and non-members? From what I hear, the response was so ho-hum that it took several memos to division directors to try to solicit more comments on the matter. And only a few additional comments trickled in. So it was no surprise last January 20, that the ARRL board voted *not* to draft a petition for increased privileges for Technician-Plus and Novice operators. It wasn't that there was an overwhelming *rejection* of the idea, but rather almost no enthusiasm *for* increased Tech Plus privileges.

Gordon West, WB6NOA, is Senior Contributing Editor of CQ VHF.

The ARRL thinks that the Novice and Tech Plus licenses should be rolled into the General class, with a 5-wpm code requirement, along with a 12-wpm code test for Advanced and Extra. You can register your opinions with the League, but the most important comments you can make right now are to the FCC.

Your Comments Count

I can't believe that Technician class licensees (making up half of the ham community) wouldn't rally to gain additional high-frequency privileges, where working the world would be commonplace during the day on 10 and 15 meters, and working all over the U.S. would be commonplace at night on 75 meters.

Many Techs claim they had no idea that their comments could actually make a difference in the consideration of increased high-frequency voice privileges for the Tech Plus community.

Don't fall asleep at the wheel on the most recent ARRL and FCC proposals. For the Technician class operator who already has code credit, a "YES" vote on increased privileges could let you on segments of ALL worldwide bands using voice. If the ARRL proposal is adopted by the FCC, Tech Plus hams would be grandfathered into General class licensees. Under the FCC's own plan, you'd need to take a single additional multiple-choice theory test that will cover the new rules and frequency privileges for your new worldwide band privileges.

And for those of you No-Code Technician operators, a "YES" vote for expanded privileges means only passing a simple five-wpm code test, and that simple one additional written exam.

Or maybe it will be a seven-wpm code test (*the FCC has left the speed issue open as wide as a barn door; tell them what you think!—ed.*). No big deal—as long as the code speed requirement is below 10 wpm, you have enough time to hear a character sent, scribble it down during the

"Don't fall asleep at the wheel on the most recent ARRL and FCC proposals. For the Technician class operator who already has code credit, a 'YES' vote on increased privileges could let you on segments of ALL worldwide bands using voice."

The FCC's license restructuring proposal would eliminate the Novice and Tech Plus licenses and leaves open the question of code speed requirements for General class and above. What are your thoughts? Comment deadline on WT Docket 98-143 is December 1, 1998.

silent period, and then pick up the next character being sent. The reason many folks hit a brick wall at speeds faster than 10 wpm is because there is no silent period during which they can write down the just-received character, and the next character short circuits their brain. At five and seven wpm, nothing will disturb you in figuring out what letter was sent and getting it written down.

Whom Do You Call?

Your comments directed to the American Radio Relay League should be sent to your local Division Director if you are a member, and directly to League headquarters if you are not a member. ARRL members can find the address of their directors on Page 10 of each issue of *QST* magazine. Members and non-members alike may e-mail the League on this issue at <restrux@arrl.org> (if you know your Division Director's callsign, you might want to send a copy to your director at <(callsign)@arrl.org>.

But the ARRL is not the decision maker on this one. It is the Federal Communications Commission that will fine-tune its own proposal, which was released in a Notice of Proposed Rule Making (NPRM) known as WT Docket 98-143. You need to be familiar with the FCC's specific proposals so you can add constructive recommendations within your comments. (*For specifics on the FCC proposal, see last month's "VHF News" and this month's "Line of Sight" editorial. You can link to the proposal itself from the* CQ VHF *Web page at <http://members.aol.com/cqvhf/>*). It's now *our* time to nit-pick what the FCC is planning for us, so constructive comments will do a lot more to fine-tune the proposed rules

Comments Sample

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	WT Docket No. 98-143
1998 Biennial Regulatory Review —	)	RM-9148
Amendment of Part 97 of the Commission's	)	RM-9150
Amateur Service Rules.	)	RM-9196
	)	
	)	

COMMENTS OF

(Place your name, organization/company name, if appropriate, and address here. You can also include the date you are submitting it in the comments.)

Start your comments here: *I (or your organization, association, or company name) file these comments on (date) in the FCC's Notice of Proposed Rule Making WT Docket 98-143.*

It is often best to start with a summary of your comments, then follow with the details, explanations and other pertinent information.

Tell the Commission who you are and your credentials (why you are qualified to comment on the document). Your comments should state your specific interest and clearly present your position and facts. The comments may be more than one page. Be sure your name and rule making or docket number you are referring to appear on *each* page.

Comments may be any length, but if they exceed 10 pages, a *table of contents and a summary* at the beginning is required. Formal comments must be typed (double spaced) on 8.5 by 11-inch paper with 1-inch margins. You should include your conclusions at the end of your comments. Be sure to sign the document.

Submitted by:
(Signature)
Typed Name
Address
Date

The basic format for FCC comments, customized specifically for the restructuring NPRM from general FCC instructions. Be sure the top of the first page of your comments looks like this example.

"Since the FCC generated this NPRM on its own, in a process that began long before the ARRL came out with its proposal, you can be sure this NPRM is not going to go away or get bogged down in the 50-foot-high stack (really!) of proposals in the radio regulations circuit."

than simply saying, "Yes, the whole idea is great," or "No, the proposed rules stink as a whole."

Since the FCC generated this NPRM on its own, in a process that began long before the ARRL came out with its proposal, you can be sure this NPRM is not going to go away or get bogged down in the 50-foot-high stack (really!) of proposals in the radio regulations circuit. And, since the FCC has these proposed rules on the *fast track*, things will happen in a hurry and your comments must be submitted before the cutoff of December 1, 1998, to be considered.

Get Involved!

"The Federal Communications Commission seeks comments from the public on proceedings and Proposed Rulemakings before the Commission—everybody can get involved in the comment period, and this allows you to tell the FCC your feelings about the subject topic," comments Fred Maia, W5YI, well-known VEC (Volunteer Examiner Coordinator) and chairman of the Question Pool Committee (QPC) which has the major job of rewriting ham test questions to meet the requirements of whatever restructuring plan is finally adopted.

It's important that you file comments, but it's also important to plan out what you're going to say and how you're going to say it. In the case of FCC comments, appearances *do* count. *The appearance of your paperwork is vitally important to the perception of our hobby by the Commission.* In other words, don't write your comments on a brown paper bag and hastily mail them off to the FCC. Rather, structure your opening page of comments to look like our "Comments Sample."

At the top of the page, in the center, you must type the words "Before the Federal Communications Commission, Washington, D.C. 20554." On the right-hand side of the page, list the Notice of Proposed Rulemaking number. In this case, it is **WT Docket No. 98-143**. On the left-hand side, type "**In the Matter of 1998 Biennial Regulatory Review—Amendment of Part 97 of the Commission's Amateur Service Rules.**" Then skip a few lines down the page, type "**COMMENTS OF**" in the center of its own line, and follow that with a line identifying yourself, your address, the date of your comments if you want to, and once again identify the NPRM on which you are commenting.

The Meat of the Matter

In the body of the 8-1/2 x 11-inch white paper with 1-inch margins, first state your own qualifications (for most of us, you'd say you hold an amateur license of such-and-such a class and list your callsign), and then *briefly* compare the FCC's NPRM with what *you* think about each

Electronic Filing Procedures

You may file comments on the FCC's restructuring proposal either by the traditional paper comment format or electronically, using the Commission's Electronic Filing System (ECFS). In addition, the FCC recommends that you include a diskette (two, actually), even if you are filing traditional paper comments. The following are the FCC's specific instructions for filing electronic comments and for filing diskettes with paper comments (see main text for instructions on filing the paper comments themselves):

Comments filed through the ECFS can be sent as an electronic file via the Internet to<**http://www.fcc.gov/e-file/ecfs.html**>. Generally, only one copy of an electronic submission must be filed. If multiple docket or rulemaking numbers appear in the caption of this proceeding, however, commenters must transmit one electronic copy of the comments to each docket or rulemaking number referenced in the caption. In completing the transmittal screen, commenters should include their full name, Postal Service mailing address, and the applicable docket or rulemaking number.

Parties may also submit an electronic comment by Internet e-mail. To get filing instructions for e-mail comments, commenters should send an e-mail to <**ecfs@fcc.gov**>, and should include the following words in the body of the message, "**get form <your e-mail address>**." A sample form and directions will be sent in reply.

Send a Diskette with Paper Comments

Parties who choose to file by paper should also submit their comments on diskette. These diskettes should be submitted to: MJ DePont, Public Safety and Private Wireless Division, Wireless Telecommunications Bureau, Room 8332, 2025 M Street, N. W., Washington, D. C. 20554. Such a submission should be on a 3.5-inch diskette formatted in an IBM-compatible format using WordPerfect 5.1 for Windows or compatible software. The diskette should be accompanied by a cover letter and should be submitted in "read only" mode. The diskette should be clearly labeled with the commenter's name, proceeding (including the lead docket number in this case, WT Docket No. 98-143), type of pleading (comment or reply comment), date of submission, and the name of the electronic file on the diskette. The label should also include the following phrase "Disk Copy—Not an Original." Each diskette should contain only one party's pleadings, preferably in a single electronic file. In addition, commenters must send diskette copies to the Commission's copy contractor, International Transcription Services, Inc., 1231 20th Street, N. W., Washington, D. C. 20037.

Alternative formats (computer diskette, large print, audio cassette, and Braille) are available to persons with disabilities by contacting Martha Contee at (202) 418-0260, TTY (202) 418-2555, or at <**mcontee@fcc.gov**>. This *Notice* can also be downloaded at: <**http://www.fcc.gov/dtf/**>.

Remember: the filing deadline for comments on WT-Docket 98-143 is December 1, 1998. This means that your comments must be received *by December 1, so be sure to mail them with enough lead-time to arrive on time in Washington.—ed.*

of the individual categories. If you agree on specific items, list those items and indicate "complete agreement." You may wish to even tell them *why* you agree.

If you *disagree* on a certain issue, clearly describe the FCC's stated proposal as you understand it, and then describe *why* this proposal may not, in your opinion, be in the best interest of ham radio. *But don't stop here with your disagreement*—go one step further and offer a counter-proposal that you think will be better.

As an example, if the FCC proposes printing your new license on onion skin parchment (don't worry, that's *not* really part of the proposal), you might indicate disagreement with their idea *because* most automatic copiers will digest and jam onion skin originals, and it might be more cost effective to use recycled pulp paper that the Bureau of Documents has left over and can't figure out what to do with it. In other words, don't just bash one of their proposals, but give them some alternates. The FCC made this quite clear at a recent Volunteer Examiner conference in Gettysburg, Pennsylvania. Don't "Just Say No," we were told; offer another *alternative* to their proposal.

Sending It In

Once you've finalized your attractive paper, send it to the FCC at Office of the Secretary, 1919 "M" Street, N.W., Room 222, Washington, D.C. 20554. Enclose an original plus four copies: nine copies if you want your formal comments to go all the way to every FCC commissioner. You might as well as do this because, after all, you spent a lot of time in making your paperwork look good.

No typewriter? No computer or printer? You just want to go ahead and file your comments on a brown lunch bag? OK...*but* these will be treated as *informal* comments, and you should make at least four copies of the brown bag and send it on to the FCC at the above address. If you just send in a single page of comments, they indeed might be read, but won't carry the weight as more formally presented comments.

Do Your Own Thing

Individual comments are better than a letter to the FCC with a whole bunch of ham signatures. Try to avoid similar-looking correspondence where it looks like the exact same letter was duplicated, and every ham in your club simply signed his/her own name. You'd probably do better with a brown paper bag than trying to petition for a comment.

But if you do nothing, you *might* think that the NPRM will simply go through as issued by the FCC. WRONG—there may be enough comments from fellow hams who would rather see a 50-wpm code requirement than a five-wpm. This is why it's important to *endorse* the FCC's thinking if it's something you like—your "YES" comment carries as much weight as a "NO" from a seasoned ham with an Extra ticket and 50 years of operating time. And even though you may think that huge ham radio organizations will be the ultimate ones to sway the Commission, that isn't necessarily true. Individual comments from local clubs and hams may carry the exact same weight as comments from the American Radio Relay League and other organizations.

So don't be a no-show when the comments are read. They are available for everyone to review (not just the FCC commissioners) if you want to take a trip to Washington. I know I'll be there, and I will specifically be looking for comments from *CQ VHF* readers. ■

VHF Propagation

Solar Activity Heats up 6 Meters

A solar flare in late August touched off a major geomagnetic storm here on Earth, and, while these storms have the potential of disrupting HF and satellite communications, they also provide enhanced communication possibilities via aurora, or Au. Au contacts, normally possible only in northern latitudes, were reported well into the southern U.S. as a result of this storm. Contributing Editor Ken Neubeck, WB2AMU, provides us with the following details:

With the presence of high geomagnetic activity, strong aurora openings were present in the northeast on 6 meters on August 26 and 27. Dave Ripton, K2SIX, in FN20, worked new grids FN24 and FN34 on the 26th as well as FN02, FN53, FN82, and other nearby grids from 3:30 p.m. local time into the early evening. Dave reports that K2SMN and K2TXB worked some stations via aurora on 2 meters at the same time. Two days later, Dave reported that he'd added two more new grids—FN12 and EN 93—to his Au log, along with another 15 or so stations in grids he'd already worked (northern EN and FN grids).

From my station in FN30, I heard stations from FN02 later that evening at 9:30 p.m., but really hit it big on the next day at 5:00 p.m. local time, working a string of stations on CW from FN21, FN31, FN42, FM19, and FM29. Signals were severely distorted, so CW seemed the best way to go.

Increasing solar activity will result in higher geomagnetic activity that, in turn, will result in more instances of aurora openings on 6 meters and other VHF bands. This strong August, 1998, aurora propagation may be just the opening salvo of many future Au events, as well as F_2 openings that will be coming in the next few years.

Paging New Zealand

Another sign of improving DX conditions on 6 meters was relayed by Mike Foubister, ZL3TIC/ZL3SIX, in New Zealand. On September 2, he reported 35- and 43-MHz pager transmissions from the U.S. coming in at levels of 5/9 and 5/5, as "the strongest I have heard them in years!" Plus, Mike says ZL2KT (also in New Zealand) and N6XQ (in California) heard each other on 6 meters (but didn't complete a contact) on September 1, concluding that "this is looking very promising!"

Two Meters on "Top of the World"

For most VHF contesters, going mountaintopping means loading up the back of a 4-wheel drive vehicle and heading for the hills. For AC6XK, it means loading up a backpack and hiking up the hills.

By Lorraine Y. Aubert, AC6XK*
(lya@juno.com)

Mountaintop contesting is one of my favorite activities. But my idea of mountaintopping is a little different than most. I prefer to load up my backpack with overnight gear and lightweight QRP (low-power) radio equipment, hike a few miles, climb a mountain and set up shop! Recently, I had the opportunity to play in the "Top of the World" contest, a four-hour "sprint" sponsored by the Adventure Radio Society (ARS) and piggybacked on the ARRL June VHF QSO Party.

I wanted to do well, so I decided to climb Mt. San Jacinto Peak, which is the summit of the San Jacinto mountains, and, at 10,804 feet, the second highest peak in Southern California. At this altitude, I have HT access to all of Southern California, parts of central California, Arizona, and Nevada. And I feel like I'm "on top of the world" (see Photo A).

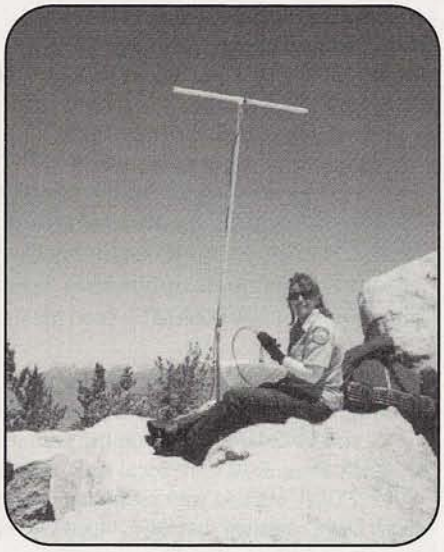


Photo A. The author operating "on top of the world," from San Jacinto Peak in California, at an elevation of 10,804 feet. (Photos by the author)

Taking It to the Hills

I've been an avid hiker/backpacker for the last 13 years. In 1995, I became a ham radio operator and quickly became enthused with QRP operation. What a great way to combine two hobbies, I thought...to have the peaceful solitude of the mountains and also be able to communicate with people and have some company when the mountains become *too* quiet! And, even better, ham radio is the perfect emergency tool if something goes wrong in the backcountry. I once became disoriented in a surprise spring blizzard. Visibility was less than 50 feet. I put through a call to a local repeater and an operator was able to contact a ranger who then came up on the frequency and was able to talk me to safety.

When hiking or backpacking, I always carry my 2-meter HT and backup AA alkaline battery case. I have a telescoping 5/8-wave antenna, which works well in places from which my rubber duck doesn't quite make it. For HF operation, I use a Wilderness Radio Norcal 40A transceiver. It's a small, lightweight (11-ounce) radio whose sensitive receiver is better than my base station at home. And, a dipole makes a wonderful backcountry antenna—just stay away from those antenna-eating trees!

"Here I am—bivouacked on the east face of San Jacinto with only 300 feet to the ridgetop. My first bivouac ever! Not the most comfortable of spots, it is a small patch of uneven, rocky dirt on the hillside surrounded by hard, icy snow."

Aim High!

For this expedition, I hit the trail with my backpack on Friday afternoon. My goal was to reach San Jacinto's ridgetop to camp for the night. From there, I'd have an easy walk to the summit. (*If—like us—you don't know your summit from your ridgetop, see the "Hiking Glossary" elsewhere in this article.—ed.*) As always, goals don't always go as planned and I ended up with an uncomfortable but safe bivouac for the night (see Photo B). The following is my journal entry...

Here I am—bivouacked on the east face of San Jacinto with only 300 feet to the ridgetop. My first bivouac ever! Not the most comfortable of spots, it is a small patch of uneven, rocky dirt on the hillside surrounded by hard,

Lorraine Y. Aubert, AC6XK, is the Outdoor Editor for the Adventure Radio Society's online magazine, The Sojourner. *She works as a seasonal ranger for Mt. San Jacinto State Park and enjoys educating the public about the benefits of amateur radio.*

Photo B. Snow and ice like this just below the ridge on the east face of Mt. San Jacinto forced the author to make her first-ever bivouac while hiking—spending the night in a safe but uncomfortable spot just 300 feet from the ridgeline. This two-dimensional photo doesn't do justice to the 35-degree slope between the camera and the ridge.

Glossary of Hiking Terms

Some of the terminology used in this article may not be familiar to those readers who aren't involved with hiking and mountain-climbing. Here's a brief glossary of the "hikespeak" used in this article:

Bivouac—An uncomfortable overnight stay in an open area with minimal or no equipment.

Bivy sack—A lightweight, compact shelter for one person.

Crampons—Pointy steel footwear that attaches to the bottom of a boot. They usually have 12 sharp points and are worn when climbing ice and/or hardpacked or glaciated snow.

Liner gloves—Lightweight gloves, made of a material such as polypropylene, which are made to be worn under a heavier glove.

Ridge—The long, narrow top or crest of a mountain.

Summit—The highest point of a ridge or mountain.

"What a great way to combine two hobbies, I thought...to have the peaceful solitude of the mountains and also be able to communicate with people and have some company when the mountains become too quiet!"

icy snow. I really wanted to make it to the ridgetop, but the hard snow prevented me from going any further because of my lack of crampons! Climbing a 35-degree slope on hard, icy snow at dusk is not the thing to be doing! I can't believe I still get myself into these situations!! I need to trust myself more. I was on the "trail," but it looked so far to go traversing in the snow. It looked quicker and easier to go straight up the slope. Wrong! My gut told me to stay heading for Miller peak. That's what I mean by trusting myself! It is hard to write in the cold. All I have are liner gloves and they aren't enough. Its really getting dark now so I am going to tuck myself in. Glad this is a southeast slope. The sun will be up glaring at me early! 6/12/98 20:30 hours.

It's embarrassing to admit that, even after much experience in the backcountry, I still make mistakes. I should have had crampons and I should have had heavier gloves with me. On the other hand, it's hard to justify carrying the crampons when they are needed on only a short part of the route to the summit. If I had been smart, I would have camped below the east face in a small plateau area called the Rock Quarry (see map). I had passed a nice melted area where I could have gotten a wonderful night's sleep. But, no, I had to be adventurous! I was able to clear some rocks out of my small patch of dirt, but it was still very uncomfortable. I suppose it could have been worse, though, and at least I was safe.

To comfort myself, I turned to a repeater frequency on Palomar Mountain in San Diego County. They had a hiker's net on Friday nights (see "The Palomar Hikers' Net") and I know several of the hams who check in regularly. I enjoyed listening to them plan their upcoming weekend hikes and tried desperately to check in, but my location on the face of the mountain blocked me from accessing the repeater. Still, it was nice to hear the familiar voices.

Up with the Sun!

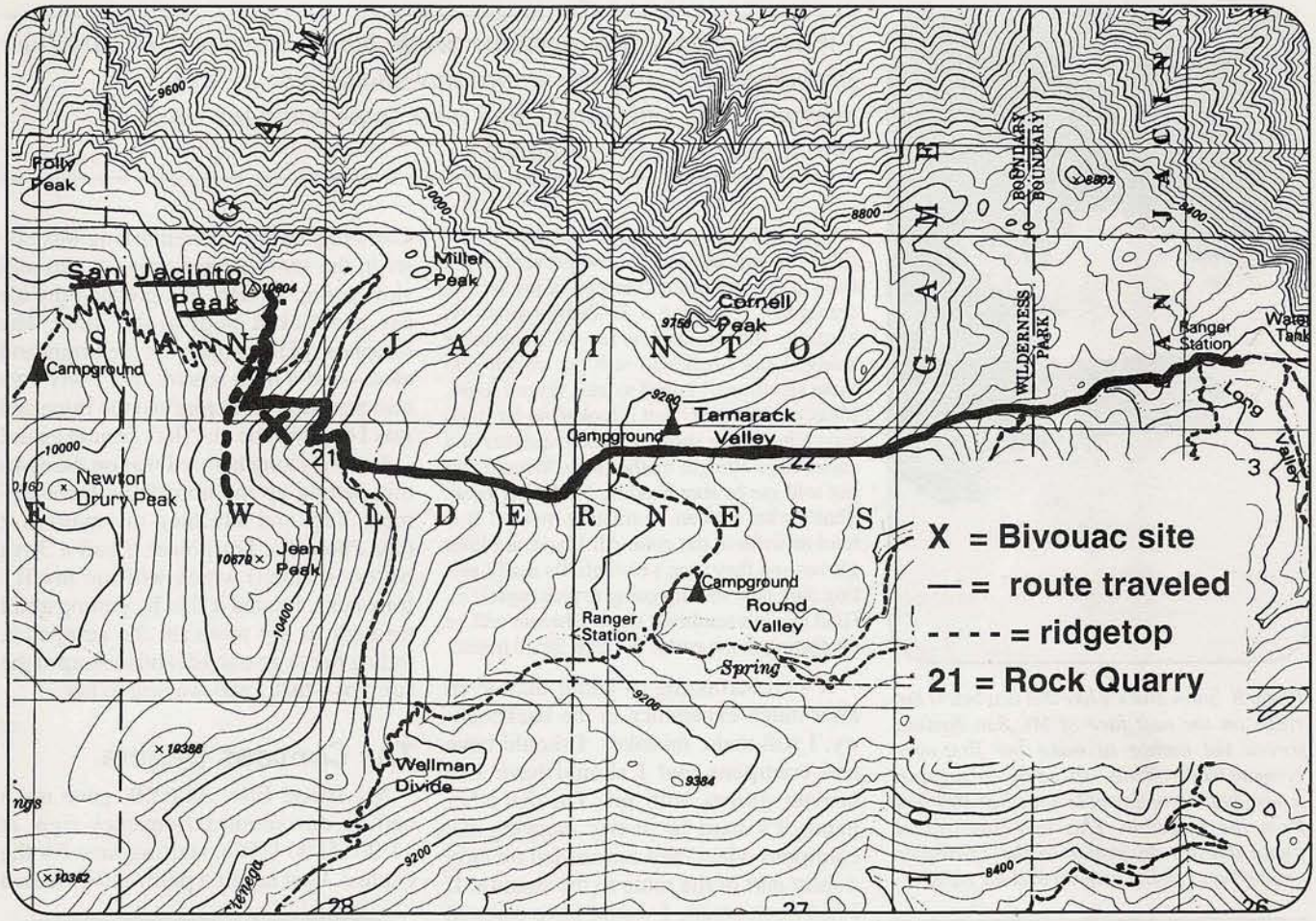
The sun awakened me early by creating so much radiation in my bivy sack that I felt like I was baking! I was eager to get to the top so I got up (being careful not to send myself rolling down the mountain) and prepared to start climbing again. Climbing the face in the morning was easier in the sun-softened snow. It was still slow going, though, as I plunged my ice axe and kicked steps in the snow. The steepness of the slope kept me bright and alert—and a little scared, too. Forty-five minutes later, I had reached the ridge and was I happy to be on "flat" ground again!

It wasn't long before I was on the summit, setting up my homebrew three-element Yagi and attaching my radio to it (see Photo C). For power, I had a 3-Ah battery (heavy!) which will run my HT for weeks. I tested it first by putting a call through to my mom on the autopatch, telling her to go outside and look up at the summit—that I was waving to her!

The Contest Begins

My friend Eric, AC6YB, gave me a call on our simplex frequency right at 11:00 (1800 UTC), starting time for the contest. I got my first point and switched

Photo C. AC6XK's portable setup atop San Jacinto Peak: a handheld, a long-life battery, and a home-built three-element Yagi antenna mounted on top of a PVC pipe, which was in turn attached to the author's walking stick.



Segment of a topographic map showing AC6XK's route up Mt. San Jacinto (solid line), along with the ridge line (dashed line), the "rock quarry" area discussed in the text (marked as 21 on the map), and the location ("X") of her unplanned overnight bivouac.

over to 146.55 MHz, the main 2-meter simplex frequency during contests (ARRL VHF contest rules prohibit using 146.52 for contest contacts). The frequency was swarming! I had a great time homing in on weak stations with my beam, and what a delight it was to exchange information with them. Throughout the day, I had hoped to hear Richard, NU6SN (ARS membership chairman), out there in FM land. I would have liked to QSO with another ARS member, but didn't get that opportunity.

There were a few lulls during the day, which gave me the opportunity to chat with some competitors. For example, Wesley Printz, W3SE, was a single operator near Mt. Wilson outside Los Angeles. He had 18 different antennas that he had installed himself (Wes was operating from Roundtop Mountain, 6,315 feet high, in the Angeles National Forest. He operated on five bands, using CW, SSB, and FM. His 18 antennas were commercial antennas which he installed for his portable operation. It took him 23 hours to complete his station set-up. Everything was powered from a generator.). That man was dedicated!

Wrapping Up

I needed to be back at the ranger station at 17:00 hours, so I had to wrap up the contesting after three and a half hours. But I had a hard time putting the radio down. Then, all of a sudden, my radio died. I looked down and the ground wire on my connector had come loose. Now I *had* to quit! I did have a backup HT battery, but I knew it was time to pack up and head down. All in all, I made 79 contacts (all in California)—my record so far. And while I didn't make any contacts in Arizona or Nevada this time around, I still had a blast!

Meeting Multiple Challenges

I thoroughly enjoy QRP mountaintopping on 2-meter FM simplex. Not only is it a challenge to climb a mountain, but it

"Top of the World" Contest

Encouraging "human-powered" adventure in the outdoors with amateur radio, the Adventure Radio Society sponsors numerous events and has been a tremendous success since its birth in May, 1996. The "Top of the World" contest is a new event from ARS, created to emphasize that QRP (low-power) operators were not limited only to HF. The contest runs concurrently with the ARRL June VHF QSO Party (generally the second full weekend in June), but is a short-duration "sprint" event covering only the first four hours of the ARRL event.

For more information on the Adventure Radio Society, see this month's "Club Spotlight" column, which accompanies this article.

The Palomar Hikers' Net

This net, sponsored by the Palomar Amateur Radio Club (PARC), helps hikers in the mountains of southern California keep in touch with folks back in civilization, and it gives those planning hikes an opportunity to talk with other hams who might be able to offer advice and suggestions. The net meets every Thursday night at 7:00 p.m. on 146.73 MHz (a new night and time), negative offset, CTCSS (PL) 107.2. The net control varies. Two regulars on the net are Stan Rohrer, W9FQN (W9FQN@amsat.org), and Bob Gonsett, W6VR (W6VR@amsat.org), who are very informative.

Also, Stan puts out an e-mail newsletter for the hiker's net called the "San Diego Hiker." To subscribe to the newsletter send "subscribe San Diego-hiker" in the body of a message to <wcListServe@fanciful.org>. To post a message to the newsletter, send it to <San-Diego-Hiker@fanciful.org>. The electronic newsletter is not affiliated with PARC.

Resources

For more information on the Adventure Radio Society and the ARS "Top of the World" contest, see this month's Club Spotlight.

For more information on portable QRP HF radios (many of which are also suitable as IF radios for VHF/UHF transverters), contact Wilderness Radio, P.O. Box 734, Los Altos, CA 94023-0734. Phone: (650) 494-3806; e-mail (owner Bob Dyer, KD6VIO): <qrpbob@datatamers.com>; Web: <http://www.fix.net/~jparker/wild.html>.

is a challenge to pack and carry lightweight radio gear. And, of course, there's the challenge of the contest! I always get questions from other hikers asking what I'm doing. I happily reply that I am an amateur radio operator working a contest. I especially enjoy the strange looks I get when people see my beam antenna attached to the outside of my backpack! I am proud to be a QRPer and I'm excited to be on VHF as well!

I would like to encourage QRP operators to work VHF (and vice versa). Most hams have an HT which works great for simplex operation. I'd also like to encourage more hams to experiment with human-powered transportation. Whether you hike, bike, boat, ski, walk, run, or skate; I guarantee that you will have fun and feel great! Most VHF contesters drive to their mountaintops. As a member of ARS and an avid backpacker, I'm excited to be able to achieve my destination by my own power—namely, my legs! ■

Club Spotlight

Ham Radio Clubs in Action

The Adventure Radio Society

We've been telling you forever that ham radio should be an adventure. Well, here's a group that really takes that idea seriously!

The Adventure Radio Society (ARS) combines amateur radio with a love for the outdoors. We encourage the design of radio equipment and antennas for portability and the outdoor environment, and we sponsor outdoor events in which operators hike, bike, ski, and boat to their operating sites.

ARS promotes an operating ethic based upon simplicity, respect for the environment, and adherence to sound amateur practice. We offer cooperation and good will to other amateur radio organizations. We energetically use the Internet to improve the speed and quality of communications, strengthen our community, and reduce our expenses. Membership is free.

ARS was molded from the vision of veteran QRPer Russ Carpenter, AA7QU. The organization was developed with the help of Wayne Burdick, N6KR, and Richard Fisher, NU6SN. Since the birth of ARS on May 1, 1996, the organization has grown and changed, including the May, 1998, introduction of a monthly Web magazine called *The Sojourner*.

For more information on the Adventure Radio Society, contact Russ Carpenter, AA7QU, ARS President, Contest Manager, and Webmaster, via e-mail at <russ@natworld.com>; Richard Fisher, NU6SN (Membership Chairman and Executive Editor of *The Sojourner*), at <NU6SN@aol.com>; or visit the ARS Web site at <http://www.natworld.com/ars>.

Let Us Know...

Does your club do something innovative or unusual? Do you have a secret formula for building membership and keeping members interested and active? Maybe some fun activities that you'd like to share? If so, we'd like to hear about it. Send your story of 500 words or less, plus a photo if you have one to "*CQ VHF* Club Spotlight," 25 Newbridge Road, Hicksville, NY 11801. Or e-mail (text only) to <CQVHF@aol.com>. Submissions are not returnable and become the property of *CQ VHF*. If your club's story is printed, we'll give your club a free one-year gift subcription or extension to *CQ VHF*.

Two Hot New Dual-Band Micro HTs: Alinco's DJ-C5T and ICOM's IC-Q7A

These new radios are tiny in size, but not in what they can do. Here's a quick look at two of the biggest new micro-handhelds on the market today.

By Gordon West, WB6NOA*

You're packing for a business trip, and you want to be able to chat with fellow hams at your destination. Wouldn't it be great to have a dual-band handheld you can pop into a briefcase, a purse, or even your pocket? Well, you can, and the number of choices in the micro-handheld market continues to grow.

Alinco started things out last year with its single-band micro-HTs, the DJ-C1T and DJ-C4T (see review, September, 1997, *CQ VHF*). Then Yaesu raised the stakes later in the year with its tiny VX-1 dual-bander (see review, January, 1998, *CQ VHF*). Now, Alinco's back with a micro dual-bander of its own—the DJ-C5TT—and ICOM has joined the game with its tiny IC-Q7A. Since these two rigs each have a somewhat different focus, what follows is *not* a comparison, but rather a brief look at each, starting (alphabetically) with the Alinco.

Alinco DJ-C5T Credit-Card Dual-Bander

Looking for a compact, credit-card-sized dual-band transceiver? Want something *real* small? Alinco now doubles the excitement caused by its credit-card-sized DJ-C1T and DJ-C4T single-band handheld transceivers (for 2 meters and 70 centimeters, respectively) with its new dual-band DJ-C5T. This tiny radio not only includes both bands, but also a little built-in speaker, two features that were on everyone's "wish list" when they operated one of the single-band units that required an earphone.

In addition to covering both the 2-meter and the 440-MHz bands, the DJ-C5T offers extended receive coverage on VHF from 118 to 174 MHz, and from 420 to 470 MHz (with the MARS/CAP modification; "out of the box" UHF receive coverage is 420 to 450 MHz only). Plus, it *will* transmit across the entire 70-centimeter band, from 420 to 450 MHz, a plus for satellite operators who want to try a super-QRP (low power) uplink to, say, the repeater on the Mir space station. On 2-meters, it operates from 144 MHz to 148 MHz, with capabilities for Coast Guard Auxiliary and MARS operation just outside the ham band (you'll need to send Alinco a copy of your permit).

The Alinco DJ-C5T is a credit-card sized dual-band handheld, complete with a built-in speaker and a rechargeable lithium-ion battery. It transmits "out of the box" on 144 to 148 MHz and 420 to 450 MHz, the entire 70-centimeter band. (All photos by the author)

Big Features in a Small Box

The Alinco C5T offers 50 memory channels, plus two calling channels. Its power output is 300 milliwatts, making the radio ideal for local simplex use or line-of-sight repeater operation. You can also use the 440 side to link up with a higher-powered mobile rig nearby that offers cross-band repeat. The battery is the new generation lithium ion, and Alinco supplies a quick charger that brings it back to a full head of steam in two hours. There is also an optional cigarette lighter assembly for using this equipment in your car.

CTCSS encode and decode are included as standard features, and I was able to bring up a local repeater with just a few simple keystrokes. The display is easy to see in the bright sunlight, although there's

Gordon West, WB6NOA, is Senior Contributing Editor of CQ VHF.

This top view gives you an idea of just how thin the DJ-C5T is—less than a half inch thick! Features on the top include the screw-in antenna, power on-off switch, transmit indicator LED, and socket for an external mic/earphone.

If we still haven't convinced you that this radio is really tiny, consider this: When you unpack the unit, the accessories (e.g., battery charger) take up more space in the box than the radio itself!

no lamp for nighttime operation, so you'll have to bring your flashlight to see the keypad in the dark. Speaking of the keypad, it has only eight buttons (see photos), so you can't directly input phone patch numbers. The best bet is to let someone else do the tone dialing.

The supplied antenna is a little thin rubber duck, with a unique stud on the end. This means the equipment is intended for its own little rubber antenna, and not for an external antenna hookup. The little antenna jack is for a screw-threaded antenna, not the standard SMA or BNC connector.

On the Air

When you transmit, a small LED illuminates, letting you know you are on the air. And, while you might not think that 300 milliwatts will get you very far, you

Table 1. Alinco DJ-C5T Specifications

	VHF	UHF
Receive Coverage (MHz)	118.000–173.995 (118–135.995 AM aircraft)	420.000–449.995 (420–470 with MARS/CAP mod)
Transmit Coverage (MHz)	144.000–147.995	420.000–449.995
Modulation	F3E (FM)	
Modulation System	Reactance	
Transmit Output Power	300 mW	
Spurious Ratio	Max –60 dB	
Receiver	Double Conversion Superheterodyne	
Sensitivity	Max –16 dBµ	Max –15 dBµ (430–439.995)
Intermediate Frequencies	1st IF: 21.7 MHz / 2nd IF: 450 kHz	
AF Output	Max 60 mW @ 8 ohms	
Microphone Impedance	Approx 2,000 ohms	
Current Drain/Transmit	Approx 240 mA	Approx 300 mA
Current Drain/Receive	Approx. 80 mA (squelched)	
Ground	Negative	
Rated Voltage	3.8 VDC (internal lithium ion battery)	
Operating Temperature Range	-10° C (14° F) – 50° C (122° F)	
Dimensions (HWD) excl. projections	94 mm (3.7") x 56 mm (2.2") x 10.5 mm (.417")	

might find yourself pleasantly surprised. As Alinco's Doug Wynn, KB6YZD, points out, "QRP really does work on VHF....You'll be surprised how well you do on low power." Obviously, the higher you are, and the clearer your path to the repeater or other station, the better your results will be.

On the receive side, audio output is reasonable when you're inside. Outside, you will need to hold this little handheld to your ear to make out what's coming over the built-in speaker (60 milliwatts of audio power; see Table 1 for additional specifications). But even so, I was surprised by how well the tiny speaker did in a noisy environment. It can also take an external earphone and microphone, too, for concealed operation.

The Big Squeeze

So if you need a micro-thin little handheld with plenty of features, the little Alinco DJ-C5T might be just what you're looking for. Its small size makes this equipment ideal for a woman's purse, or perfect for a shirt or jacket pocket. Best of all, Alinco took the two things "missing" from its single-band units—the speaker and the second band—and packed everything into an almost-same-sized system that is probably (for the moment) the world's smallest dual-band handheld. List price is $249, with "street prices" generally lower.

Resources

For more information on the Alinco DJ-C5T, visit your Alinco dealer or contact Alinco Electronics, Inc., 438 Amapola Ave., Lot #130, Torrance, CA 90501; Phone: (310) 618-8616; Fax: (310) 618-8758; Internet: <http://www.alinco.com>.

ICOM IC-Q7A Micro Dual-Band Transceiver

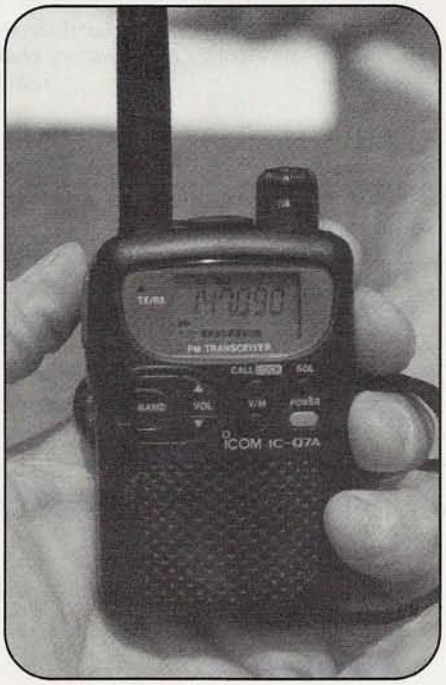
ICOM America is now on the micro transceiver bandwagon, following in the footsteps of Yaesu with its popular VX-1. The new 1/3-watt ICOM dual-bander, the IC-Q7A, runs on two AA alkaline cells, and I played it for nearly four days before I finally pulled down the batteries to the point the radio automatically cycled off. A version with a rechargeable nickel cadmium (NiCd) battery and wall charger came out in late summer and is available for a few bucks more.

In the Memory Mix

The IC-Q7A will store 200 memory channels with any mix of 2 meters, 70 centimeters, or extended-frequency receive. The micro ICOM offers full amateur transmit and receive on the 2-meter band, 144 MHz to 148 MHz; and on the FM portion of the 70-centimeter band, 440 MHz to 450 MHz. Straight out of the box, it won't transmit below 440 MHz, but we understand a simple modification on the inside (contact ICOM) can undo this lockout and provide access to FM satellites in the 435- to 438-MHz area.

The ICOM IC-Q7A can also be a great pocket scanner, covering virtually everything between 30 and 1300 MHz in seven "bands." Of course, cellular phone frequencies are locked out. But good news: there is full receive capability from 30 MHz to 50 MHz that the new ICOM IC-T8 lacks. This means you can scan some of the state police channels that operate in the 40-MHz region. See Tables 2 and 3 for details.

As a scanner, it zips through the frequencies at about 20 per second. This is not lightning fast, but it certainly is a big improvement over traditional ham sets that may only scan one or two channels per second. You can scan pre-memorized frequencies, skip certain frequencies, scan selected portions of the band, scan from 30 MHz up, and do all of the other neat scanning things you can do with a modern scanner. Again, it's not quite as fast as a "real" scanner, but it's pretty good. You can also scan for a CTCSS tone.



The ICOM IC-Q7A is tiny enough to fit in the palm of your hand, but offers full transceive capabilities on 144 to 148 and 440 to 450 MHz, plus broadband receive from 30 to 1300 MHz (minus cellphone frequencies).

The antenna connector is the SMA style that's common on cellphones but relatively new to ham rigs. The Q7A comes with a large rubber duck antenna that causes the unit to easily tip over when sitting on a table. I replaced the supplied antenna with a Comet SMA 503, a tri-band, five-inch super-flexible whip. It works great on this handheld.

Audible Audio

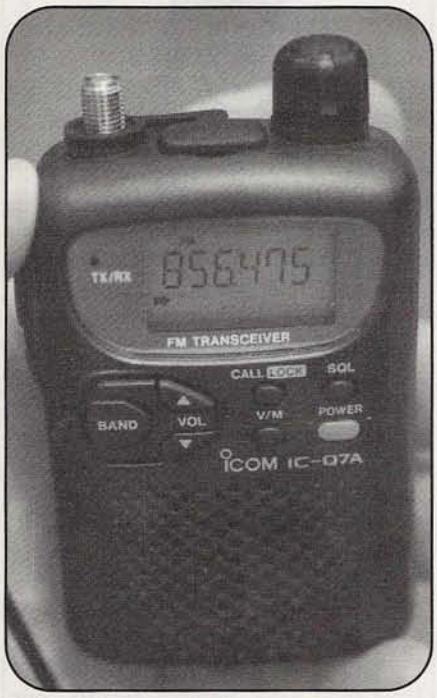
The audio output is impressive—loud enough (100 mW) that you can wear the radio on your belt and hear it, too. The audio is rather sharp without too much bass response, and this, again, is good for a scanner-type amateur transceiver.

In the CTCSS (Continuous Tone Coded Squelch System) department, the ICOM Q7 has both encode and decode. Accessing these may cause some confusion. Despite what you might think, "RT"

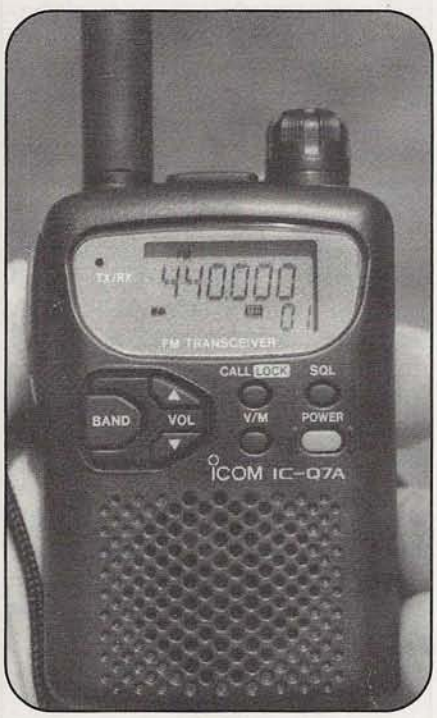
Table 2. IC-Q7A "Out of the Box" Band Settings

51 MHz FM	430 MHz FM
118 MHz AM	850 MHz FM
145 MHz FM	1295 MHz FM
370 MHz FM	

Table 2. The ICOM IC-Q7A has seven default band settings "out-of-the-box." See Table 3 for specific frequency ranges and receive sensitivity levels.



The antenna connector on the IC-Q7A is the SMA style, and the supplied "duck" is so big in comparison to the radio that it often falls over when you try to stand it up! The 856-MHz frequency on the readout is typical of the many public service frequencies you can monitor on this versatile HT.



Out of the box, the IC-Q7A won't transmit below 440 MHz, but it can be modified to cover more of the 70-centimeter ham band. Like other micro handhelds, it does not offer a DTMF tone pad for making autopatch calls.

Table 3. Frequency Ranges/Receive Levels

Freq. Range (MHz)	Mode	Sensitivity
30–1300	Narrow-Band FM (NBFM)	typical 0.32 µV
General, with the following exceptions:		
76–108	Wide-Band FM (WBFM)	1.0 µV
118–136	AM	0.5 µV
118–175	NBFM	0.16 µV
175–222	WBFM	1.0 µV
222–247	AM	0.8 µV
247–330	AM	1.4 µV
470–770	WBFM	5.6 µV

Table 3. Receive frequency coverage and sensitivity levels of the ICOM IC-Q7A micro dual-band handheld.

does not stand for receive tone, but rather transmit *repeater tone*. For tone decode on receive, you would select "CT." I have suggested to ICOM that everyone in the industry try to standardize how they refer to tone encode and tone decode. Many times we find even seasoned handheld programmers punching in the CTCSS receive tone thinking they were actually on tone encode, and then becoming stymied when the handheld goes silent, and pushing the transmit button doesn't bring up the tone-controlled repeater. I suggested "C-TX" for CTCSS transmit, and "C-RX" for CTCSS decode. We all know that TX is for transmit and RX is for receive, right?

So if you're into scanning as well as hamming, the new ICOM IC-Q7A looks like a terrific radio to consider. List price is $229 with the AA alkaline battery pack, and $239 with the rechargeable NiCd pack and wall charger. As always, "street prices" are generally a bit lower. ■

Resources

For more information on the ICOM IC-Q7A, visit your ICOM dealer or contact ICOM America, Inc., 2380 116th Ave., NE, Bellevue, WA 98004; Phone: (425) 450-6088; Web: <http://www.icomamerica.com>.

CQ VHF Ham Radio Above 50 MHz

Reader Survey—November, 1998

We'd like to know more about you...about who you are and where you live, about the kind(s) of work you do, and about your ham radio interests and activities. Why? To help us serve you better.

Each month, we'll ask a few different questions and ask you to indicate your answers by circling certain numbers on the Reader Service Card and returning it to us (we've already paid the postage).

And, as a bit of an incentive, we'll pick one respondent every month and give that person a complimentary one-year subscription (or subscription extension) to CQ VHF. *This month, we'd like to get a sense for your overall operating habits.*

1. Please indicate which statement best describes your operating activity. Please mark only one answer. I operate...

	Circle Reader Service #
VHF/UHF (or above) only	1
Mostly VHF/UHF, but some HF	2
About half and half, VHF/UHF and HF	3
Mostly HF, but some VHF/UHF	4
HF only	5
Not currently active on the ham bands	6

2. The FCC says most Tech and Tech Plus hams "predominantly use FM voice and digital packet technologies on the amateur VHF and UHF bands." Do you...

Agree	7
Disagree	8

3. Does the FCC statement above apply to YOUR operation if you hold a Tech or Tech Plus license; or, if you hold a higher class license, *did* it apply to YOUR operation when you were a Tech or Tech Plus? (Please mark only one answer)

Yes (current Tech)	9
No (current Tech)	10
Yes (current Tech Plus)	11
No (current Tech Plus)	12
Yes (former Tech/Tech Plus)	13
No (former Tech/Tech Plus)	14

4. Please indicate which choice best describes your most recent ham radio equipment purchase (if multiple purchases made, mark ALL that apply):

VHF/UHF FM handheld	15
VHF/UHF FM mobile	16
VHF/UHF multimode (No HF)	17
HF + VHF or HF + VHF/UHF multimode	18
HF multimode (No VHF or UHF)	19
Do not own any ham radio equipment	20

Thank you for your responses. We'll have more questions for you next month.

What You've Told Us...

Maybe we should print up "I'm a Ham and I Vote" bumper stickers...our August survey asking about your political activity showed that, among those who responded, 91% are registered voters, and 78% have voted in every or nearly every election in the past five years. Among the registered voters, 98% regularly vote in general elections, 87% are regular primary voters, and 65% vote regularly in their school elections. One in 10 of you has even run for public office, and nearly half of you have won at least once, although none of you is currently in office.

More than three-quarters of you (78%) have contacted your U.S. Congressman or Senator to register an opinion or request assistance or action; and one in three (37%) has filed formal comments with the FCC on ham-related matters. On the specific question of whether you'd filed comments on the Land Mobile Communications Council's grab for the 70-centimeter ham band (RM-9267), 19% of you had already done so, 53% planned to before the deadline, and another 28% weren't aware of the situation. These results are remarkably consistent with your responses the first time we asked similar questions, back in October, 1996. We clearly don't have to remind you, but be sure to vote this month!

As always, thank you for your responses to our survey. This month's winner of a free one-year subscription to *CQ VHF* is Ed Anderson, of Newstrawn, Kansas.

The Magic of Radio Wave Propagation—Part 1

There is no sleight of hand in this magic, just science! A science of the sun, the Earth, and the Earth's atmosphere...a science that is basic to radio, and the better you understand it, the better your chances of using it to improve your ability to communicate.

By Lew Ozimek, N2OZ*
(lozimekn2oz@erols.com)

Radio communication. We all know how it works, right? You merely talk into a microphone or press a CW key connected to a transmitter and your voice or Morse code is reproduced in a speaker or earphones at a distant receiver. But what happened between the two stations? There is no wire interconnection and the distance of separation is too great for sound waves to have traveled directly between the two. But somehow, a form of audio or Morse code is transferred from one location to another. How does it happen?

Starting in the 1800s

What actually occurs may be a mystery to many of us, but it was explained as far back as the late 1800s, when Heinrich Hertz created electromagnetic waves and demonstrated that radio waves could be transmitted and received over relatively short distances. A few years later, Guglielmo Marconi, recognizing the potential for long-range contacts, produced the first practical wireless telegraph system. Capabilities increased quite rapidly and, in 1901, the first Transatlantic message was sent from England to Newfoundland. A significant advance had occurred in the "art" of radio communication, but no one was yet able to explain the "science," other than the fact that radio waves moved from one location to another, which was not much of an explanation.

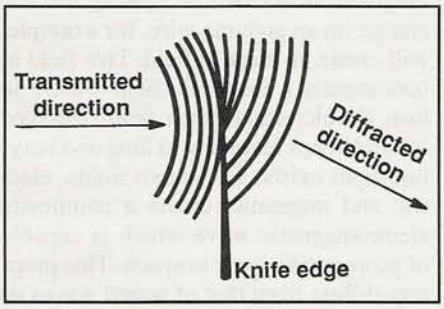


Figure 1. Long-distance radio communication depends on the deflection of signals that would otherwise be radiated into space. One of the many forms and types of deflection that affects radio signals, knife-edge diffraction, is shown here and explained in the text.

The first major advance in solving the riddle of "why and how" became possible after Arthur Kennelly in the U.S. and Oliver Heaviside in Great Britain simultaneously theorized, in 1902, that the Earth's upper atmosphere was made up of electrically conducting "regions." They did not, however, connect this atmosphere to radio wave propagation.

The existence of the Kennelly/Heaviside "region" was proven 25 years later when Sir Edward Appelton of Great Britain measured the reflected angles of radio waves transmitted toward space. The results demonstrated not only that such a region existed, about 100 miles above the Earth's surface, but also that it was capable of reflecting radio signals.

That same year, American physicists Gregory Briet and Merle Tuve developed techniques to accurately measure the height of the reflective layers in the ionosphere by transmitting short bursts of radio energy straight up. The tests showed that reflections were frequency-dependent and that, as the frequency of radio waves increased, a point was ultimately reached where reflections stopped. Extensive tests using their technique proved that this "highest reflected frequency at vertical incidence" (now known as the *critical frequency*) changed from day to day, from month to month, and from one location to another.

In 1927, during a total eclipse of the sun, a sharp decrease in *critical frequency* was observed. This eclipse and its effect on the *critical frequency* guided observers to the conclusion that solar ultraviolet radiation was primarily responsible for the generation of ionized layers in the atmosphere and that the extent of ionization and the height of the layers determined the *critical frequency* by creating different "reflective charac-

*Lew Ozimek, N2OZ, holds an Extra class license and has been a ham since 1961. An engineering graduate of the U.S. Naval Academy, Lew worked in the aerospace electronics industry for 40 years, rising to a vice presidency in his company before retiring in 1991.

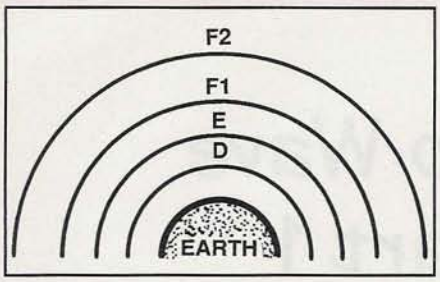


Figure 2. The ionosphere, which is responsible for most long-distance propagation, contains four layers that affect radio signals: D, E, F_1 *and* F_2. *The role of each layer is explained in the text.*

teristics." It was also determined that the intensity of ultraviolet radiation was directly tied to storms, called *sunspots,* occurring on the surface of the sun. Considering the early stages in the development of such ideas, that conclusion was amazingly accurate.

The Importance of Sunspots

The existence of sunspots was not a new concept, but understanding the effect they had was new. Sunspots were first observed by the Chinese many years before Christ, but nothing was known about them except that they existed. The first record of sunspot activity was made in 1611, one year after Galileo invented the telescope. Sporadic records of sunspot cycles, or solar storms as they were correctly characterized, were made in subsequent years. Formal sunspot measurements and records were started in 1749 and have been maintained continuously until this day. This 250-year record proved that solar activity increased and decreased cyclically over a period of about 11 years. During any 11-year period, the number of sunspots counted would go from a maximum to a minimum and then back to a maximum.

Today, we are in the early stages of sunspot cycle 23, which began earlier this year, when measurements disclosed that sunspot activity had started to increase—a long stretch from cycle one, which started about 1755. Since radio communication improves proportionally with the sun's activity, we are on the threshold of major radio propagation improvement which will probably reach a peak by the year 2004. That being the case, it surely behooves us to determine what the increased sunspot activity may mean to our ability to communicate and how we can take advantage of any upcoming opportunities.

What Are Radio Waves?

Those early scientists certainly recognized the existence of radio waves and demonstrated how they could be used. But what *are* radio waves? We know a lot more about them today than we did at the beginning of this century. We now know that there is a large "family" of electromagnetic waves, including gamma rays, cosmic rays, X-rays, light rays (including ultra-violet, visible, and infrared) and radio waves. Each has its own range of frequencies (or wavelengths) with radio waves being the lowest in frequency (longest wavelength). Radio encompasses that portion of the electromagnetic spectrum containing frequencies of 10 kHz through 300 GHz (wavelengths of 30,000 kilometers to 1 millimeter).

All electromagnetic waves are generated by the interaction of electric and magnetic fields. An oscillating electric charge on an antenna wire, for example, will create an electric field. This field in turn creates a magnetic field which, in turn, develops an electric field. The type of field keeps reversing as long as a varying input exists. These two fields, electric and magnetic, create a composite electromagnetic wave which is capable of propagating itself in space. This property differs from that of sound waves or ocean waves, which need a medium such as air or water to permit propagation. Thus, radio waves are capable of traveling through a vacuum (such as space) as well as through a solid (such as wire). They travel in a vacuum at a constant speed of 186,400 miles/sec (300,000 km/sec)—the speed of light—and their speed decreases slightly when traveling through a solid such as a wire. (These are very dry facts, to be sure, which may not be helpful to an amateur only interested in improving communication. What's important though, is the way that radio waves move and what happens to them on the way.)

Obstacles and Opportunities

Radio waves weaken as they move away from a signal source in air, or even in the near vacuum of cosmic space, because of *free-space attenuation,* an action through which radio energy is dispersed over a larger and larger area with increasing distance. It's much like the beam of a flashlight, which covers a broader area, but more weakly, the farther away it hits. Free-space attenuation is the major factor governing signal strength.

Radio waves moving through any medium other than a vacuum also lose energy due to *absorption.* Wave movement is not very efficient and as a result, heat is developed, which stays in the propagating medium and is *absorbed.* The amount of energy lost depends upon the frequency of the wave and the characteristics of the medium.

"These two fields, electric and magnetic, create a composite electromagnetic wave which is capable of propagating itself in space. This property differs from that of sound waves or ocean waves, which need a medium such as air or water to permit propagation."

Radio waves normally travel in straight lines until they are *deflected.* Anytime a deflection takes place, energy is lost and the wave changes direction. It is this change of direction, however, that makes long-distance communication possible. Waves traveling from one medium to another, such as through different layers of the atmosphere, are bent or *refracted,* a form of deflection. This effect can be observed when a pencil is dipped into a glass of water and, when viewed from the side, looks bent. The apparent bending is a result of wave *refraction.*

Radio waves traveling over solid objects with sharp edges are bent towards the edge or *diffracted,* another form of deflection, known as *knife-edge diffraction* (see Figure 1). In addition, when radio waves meet randomly arranged objects, such as masses of electrons, ionized particles, water drops, or snow flakes, their direction of travel is changed, or *deflected,* by a phenomenon known as *scattering.*

At frequencies above 30 MHz, radio waves are *reflected* (another form of deflection) when they strike large stationary objects, such as buildings, bridges or mountains. After the waves strike an object, they are deflected and move away from the object at an angle.

On the lower frequency bands, especially 80 and 160 meters, a special form

of *diffraction* creates *ground waves*, which allows the signal to travel over distances beyond 120 miles. This occurs because the curvature of the Earth acts like a rounded knife edge at these long wavelengths, *diffracting* the wave down towards the Earth's surface and allowing the signal to follow its curvature.

What has all of this told us so far? Radio waves are only one of a number of different types of electromagnetic phenomena. They need no medium for propagation (a major difference from sound and ocean waves), and they are just as happy traveling through a vacuum as through a wire or other form of metal. In space, they lose strength as they move away from the generating source because of *free-space attenuation*. Waves traveling through a medium other than a vacuum lose energy by the absorption of the heat generated by the process used to move within the medium, another form of strength loss. They like to travel in straight lines, but are relatively easily deflected by *refraction, diffraction, reflection,* or *scattering*. Each such deflection also results in a loss of energy. Despite the dispersion of the radio signal and all of the obstacles which rob it of energy and reduce its power, somehow the radio wave persists and, more likely than not, achieves its objective of reaching a distant station.

We also know that one form of propagation is the *ground wave*, in which propagation improves as frequency decreases, and where the distances covered go from a few miles to more than 100 miles. AM broadcast stations use this mode to reach listeners, but it is of limited value to amateurs, except perhaps at 1.8 MHz.

Look! Up in the Sky!

The other major form of propagation is the *sky wave*. This phenomenon occurs because of the tendency of radio waves to travel in straight lines and the fact that they can be easily deflected. If a radio wave travels in a straight line away from an antenna on Earth, what can it encounter which will deflect it? The only straight line path it can follow is into the area surrounding the Earth, that is, into the gaseous mass called the *atmosphere*. The atmosphere extends out several hundred miles from the Earth's surface and is divided into several layers.

The portion of the atmosphere that starts at the surface and goes up to an altitude of seven to 10 miles is the *tropos-*

Looking Ahead in CQ VHF Ham Radio Above 50 MHz

Here are some of the articles that we're working on for upcoming issues of *CQ VHF:*

- Part 2 of "The Magic of Radio Wave Propagation," by Lew Ozimek, N2OZ
- "Make Your HT Talk Forever," by Ken Collier, KO6UX
- "Are NiMH Batteries Really Better?" also by KO6UX
- "The 550T+ Laser Team," by Eric Stroud, KB2TCQ

Plus...

- "Two-Meter Mountaintopping with Mirrors," by Edward Butler, KF6DXX
- "ARES on the Internet," by Ray Rischpater, KF6GPE
- "A Box Beam Fox Finder," by Eugene Shapiro, WØDLQ

If you'd like to write for *CQ VHF*, you may download our writers' guidelines from the *CQ VHF* World Wide Web site at <http://members.aol.com/cqvhf/> or FTP to <ftp://members.aol.com/cqvhf/General> and look for the file, "writguid.txt." Or, you may send a written request along with an SASE (self-addressed stamped envelope) to *CQ VHF* Writers' Guidelines, 25 Newbridge Rd., Hicksville, NY 11801.

phere. Temperatures in this layer decrease rapidly with altitude and convection is very active. This is where clouds form and virtually all of our weather originates. The troposphere is an important player in long-range VHF radio communication (we'll discuss that in Part 2 of this article).

The next portion of the atmosphere, located seven to 30 miles from Earth, is called the *stratosphere.* In the *stratosphere,* the ambient temperatures do not change very much with altitude and clouds of water are very rare. The stratosphere does not play a significant role in radio communication.

The *ionosphere* is the next layer out, beginning about 25 miles up and extending 300 miles or more. Of all the gaseous layers, the ionosphere exerts the maximum influence on radio waves because it contains electrically charged, or *ionized*, particles which are capable of deflecting radio waves. The extent of deflection depends upon the intensity of ionization which, in turn, is determined by solar activity.

Within the *ionosphere* are a number of layers, each of which varies in height and extent of ionization based on the time of day, the season, and the intensity of solar activity. The four layers involved in radio communication are depicted in Figure 2.

The closest region to the Earth, the D-*Layer*, sits at 35 to 60 miles of altitude. Its existence is highly dependent upon ionization and, as a result, it disappears at night when the sun no longer shines on it. It is ineffective in bending HF signals back to Earth and its major action is the absorption of radio waves.

The next region, the E-*Layer,* is located 60 to 90 miles from Earth and is characterized by short-lived ionization. It will *refract* radio waves during sunlight hours (that is, when it is ionized), creating a "skip" range of about 1,400 miles on one hop, and multiple hops are possible.

The last two layers of the four are the F_1 and F_2 layers. Layer F_1 is located 80 to 130 miles up and does not significantly affect the range of communications. It is similar to the *D* layer in its ability to absorb radio energy. Layer F_2 is about 150 to 300 miles up and is the most important element in long-range shortwave communication because of its ability to *deflect* radio waves. It creates a maximum "skip" of 2,500 miles in one jump. At night, the F_2 and F_1 layers combine into a single, larger layer which retains the characteristics of the F_2 layer.

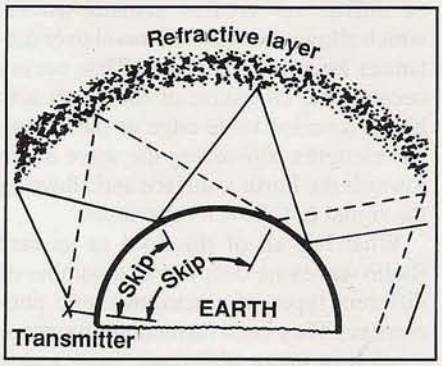


Figure 3. Skywave propagation is the most common means of making long-distance contacts on the HF and low VHF bands. Signals head toward space until hitting a refractive layer that bends them back toward the Earth. The lower the angle of transmission, the greater the distance covered in any one hop, and multiple hops are possible.

So there we have the obstacles to a radio wave's attempt to travel in a straight line, the four gaseous layers which make up our atmosphere. It is hard to consider layers of gas as being destructive or as obstacles, but that is exactly their role. On the other hand, it's only because of these obstacles that our radio signals don't all get lost in space. When conditions are right, one or more of these layers, or combinations thereof, will *reflect* or *refract* radio waves back to Earth.

The point at which reflected waves arrive on the Earth's surface is determined by such factors as the layer(s) involved, the extent of ionization which exists, and the angle at which the transmitted signal strikes the layer. The greater the angle of *reflection*, the greater the distance the waves will travel before returning to Earth. The distance between the point of transmission and the point of return is referred to as the *skip distance* or *skip zone.*

Multiple skips can cover different distances simultaneously as illustrated in Figure 3. Don't be fooled by the illustration into thinking that the areas between "touchdown" points are completely devoid of radio signals. This is far from accurate because an effect called *scatter* diverts signals *into* the skip zone, as well as into other areas. However, any such scattered signals will, as a rule, be weak and somewhat distorted. More later on this and related concepts.

Don't Slam the Door!

Most references to long distance contacts will connect the *sky wave* and *HF*

together. It perhaps is a little glib to say that *sky wave* applies only to HF (that is, to the 3- to 30-MHz bands), implying that no use for it exists on VHF and UHF. In my mind, no door exists in the ionosphere which slams shut when 10 meters is reached, preventing any higher frequencies (or smaller wavelengths) from being *reflected* or *refracted*. In lieu of a rude rejection, such as a slamming door, the only reasonable assumption is that no sharp cut-off exists and that a gradual degradation of performance occurs as frequencies increase. Think of the action as interrelated overlapping effects, or as a gradually changing gradient. Many factors contribute to the final result, including the elevation angle of radiation and the location (surrounding terrain) of the transmitter. Figure 3 also shows how skip range can increase as the transmission angles decrease, thereby increasing reflection angles.

The concept of *maximum usable frequency* or *MUF* may help in understanding the way that changes occur. The highest frequency at which a *vertically incident* signal will be *refracted* (or diverted) by the ionosphere is known as the *critical frequency*. As the angle of transmission is moved away from the vertical, the frequency which will exhibit *refraction* from the *ionosphere* back to Earth increases above the critical frequency. In its simplest concept, *MUF* is the highest frequency permitting communication between two stations *for a specific path*. The maximum one-hop distance for the *E* layer is approximately 1,400 miles, and for the F_2 layer, about 2,500 miles. Published predictions of *MUF* normally are based on median values of transmission paths. *The New Shortwave Propagation Handbook* (see "Resources") will provide you with more data on this topic.

"Of all the gaseous layers, the ionosphere exerts the maximum influence on radio waves because it contains electrically charged, or* ionized, *particles which are capable of deflecting radio waves."

Wandering Waves

With these errant radio waves filling our atmosphere, a varying pattern of *refraction, diffraction, reflection*, and *scattering* is constantly taking place in different combinations. These actions are tied rather specifically to the atmospheric layer(s) involved, as well as the frequency employed. To understand the true propagation characteristics of the *ionosphere*, however, and the differences which occur between HF and VHF/UHF signals, we must look at each layer independently and identify the special communication modes which can occur. These aspects will be covered in Part 2 of this article. ■

Resources

For more detailed information on propagation basics, we recommend *The New Shortwave Propagation Handbook*. by G. Jacobs, W3ASK; T.J. Cohen, N4XX; and T. Rose, K6GKU, published by CQ Communications, Inc., 25 Newbridge Rd., Hicksville, NY 11801; Phone: (516) 681-2922; Fax: (516) 681-2926.

From VHF History to a Hydrogen Line Receiver

The technical presentations given at VHF conferences range from the practical to the eclectic. Here's an overview of what you missed if you couldn't be at this summer's conferences, held in Kansas City and Connecticut.

By Rich Moseson, W2VU*

If you want to stay on top of what's happening at the leading edge of amateur VHF/UHF technology, you should read *CQ VHF*, of course. But if you want to go deeper—seeing and hearing and asking questions directly of the people who are *doing* all of these leading edge things, then you should try to work one of the VHF/UHF conferences into your schedule and budget. There are conferences for weak-signal enthusiasts, satellite enthusiasts, packet enthusiasts, and microwave enthusiasts. Whatever your interest, there's probably something out there for you.

I went to two weak-signal conferences last summer: the Central States VHF Society conference July 24 and 25 in Kansas City, Missouri, and at the Eastern VHF/UHF Conference August 21 and 22 in Enfield, Connecticut. Whether you wanted to know more about pushing out heavy-duty power on 6 meters, learn the basics of high-speed CW meteor scatter, or figure out how to interface a transverter to the current generation of HF transceivers, there was something there for virtually every weak-signal VHF interest.

Photo A. Central States VHF Society President Denise Hagedorn, AJØE, welcomes attendees to the society's 32nd annual conference, held in July in Kansas City, Missouri. (W2VU photos).

"Take Me Out to the Ballgame..."

For early arrivals in Kansas City, the Central States conference started out on Thursday night with a decidedly non-technical trip to Kauffman Stadium to watch the Kansas City Royals lose to the Texas Rangers (actually, the pitchers' velocity factors and the angle of refraction of the ball off the hitters' bats were very important...so maybe it wasn't so non-technical after all!).

The rain moved in while we slept Thursday night, delaying the start of the antenna range measurements on Friday morning. Nonetheless, WA5VJB and WBØTEM managed to test the gain of 71 antennas for all bands from 50 MHz to 24 GHz, brought in by more than two dozen different hams. The top homebrew antenna for each band is listed in Table 1. There's a kind of monotonous sameness in the callsign column, as the team of Gary Gerber, KBØHH, and John Hall, KAØKUY, racked up wins on every band except 6 meters and 10 GHz. And if you look closely at the results for the microwave bands, you'll see that Gary and John proved conclusively that a soup can exhibits greater gain than either a bean can or a coffee can! (My vote would've been for the bean can!)

There was also an ongoing noise-figure measurement in the back of the main conference room. W5LUA, N5QGH, WA8WZG, WD5AGO, KAØRYT, and NØDAG all pitched in to make the measurements on a variety of amplifiers, using a Hewlett-Packard HP346A noise source (which, according to HP, is accurate to ± 0.2 dB), taking readings for both noise figure and gain. Table 2 shows the top homebrew performers for each band.

A Mixed Bag

The technical and operating presentations were too numerous for me to list every one of them, so I'll just hit the highlights. The conference began with welcomes by Conference Chairman (and CSVHFS President) Denise Hagedorn, AJØE (Photo A), and Program Chairman

Rich Moseson, W2VU, is Editor of CQ VHF *magazine.*

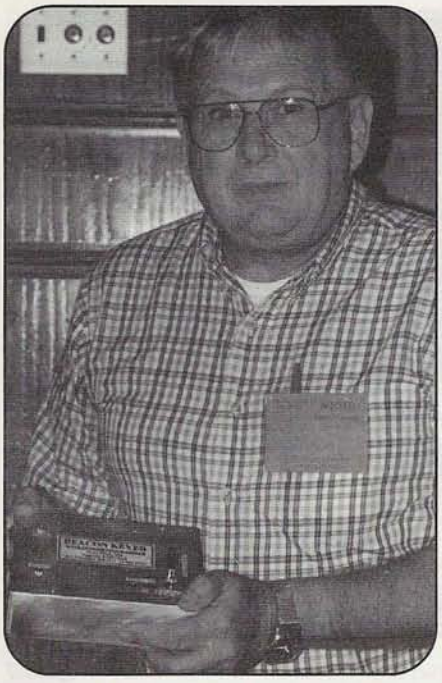


Photo B. Bob Carpenter, W3OTC, holds the "simple beacon keyer" he designed, and which he described at the Central States conference.

Tom Bishop, KØTLM, then a talk on designing triode amplifiers for 6 meters by Dick Hanson, K5AND—who also showed us his control board that monitors voltage and current levels to protect amps from being overdriven or otherwise abused (details in the conference *Proceedings)*, and how he uses an MFJ-259 SWR Analyzer to tune amplifier circuits.

Bob Carpenter, W3OTC, gave a pair of presentations: one on a simple beacon keyer he's designed (Photo B), and the other on using a computer database of TV and FM broadcast stations (TVFMSTNS) to help spot band openings.

Bill Tynan, W3XO, led us back through the history of VHF ham radio; then Bill Flake, KD4HLG, took us out with him on the Appalachian Trail, where he set up portable contest stations (since we were all in Kansas City, it had to be a *virtual* hike on the AT). Finally on Friday, Jeff Embry, WI2T, showed off some impressive, but very expensive (about $7/foot!), low-loss cable from Ma-Com (Photo C).

Friday evening featured the VHF+ flea market (Photo D) and, at midnight, the annual meeting of SNOTTS, Silly Nitwits on Two Twenty Sideband. I couldn't stay awake for this one, but if past experience is a guide, then "silly" would be an understatement for the get-together.

The Main Event

The big guns came out on Saturday, when the greatest number of people would be able to attend (overall attendance was about 180). The morning began with Wayne Overbeck, N6NB, updating the audience on the FCC's RF safety rules, which were announced just after the 1996 Central States conference, at which Wayne explained why they'd be forthcoming.

He told the group this year that "there is growing evidence of the need for such rules, especially in connection with radio frequencies," and that while there's still no conclusive evidence of health danger from RF exposure, "if there are hazards, they are greatest in the VHF range, the lower UHF range and the upper HF range." However, he also showed that all but the biggest of the big-gun stations are most likely already in compliance with the rules, especially when using the averaging methods set out by the FCC in its guide to compliance.

After a couple of more down-to-earth presentations, Paul Shuch, N6TX, Executive Director of the Search for Extra Terrestrial Intelligence (SETI) League, played his guitar and talked about a design for building a cheap, reproducible receiver for 1420 MHz, the so-called "hydrogen line" at which experts in SETI think it's most likely we'll be able to tune in signals from other civilizations (assuming that there are any,

A New CSVHFS Award

The Central States VHF Society will be sponsoring a new award—*Reverse VUCC*—to recognize "rovers" who place rare grid squares on the air for other stations to work during contests. VUCC is the VHF-UHF Century Club, the ARRL's main VHF/UHF operating award. Details on the CSVHFS *Reverse VUCC* award will be posted on the Central States Web site at <http://www.csvhfs.org>.

Table 1. 1998 Central States Antenna Gain Champs

Band	Callsign	Antenna	Measured Gain
50 MHz	NØKE	3-el. Yagi	8.9 dBd
144 MHz	KBØHH/KAØKUY	11-el. 20-foot Yagi	12.7 dBd
222 MHz	KBØHH/KAØKUY	17-el. 25-foot Yagi	15.7 dBd
432 MHz	KBØHH/KAØKUY	40-el. 31-foot Yagi	18.0 dBd
902 MHz	KBØHH/KAØKUY	6-foot dish with 2-el. quad feed	18.9 dBi
1296 MHz	KBØHH/KAØKUY	6-foot dish with coffee can feed	26.3 dBi
2304 MHz	KBØHH/KAØKUY	6-foot dish with bean can feed	36.9 dBi
3456 MHz	KBØHH/KAØKUY	6-foot dish with soup can feed	37.6 dBi
5760 MHz	KBØHH/KAØKUY	1.1-meter dish with penny feed	17.9 dBi
10 GHz	WD4MUO	55 x 24-inch elliptical dish	34.9 dBi
24 GHz	KBØHH/KAØKUY/ WA5VJB	18.5-inch dish with horn feed	26.8 dBi

Table 1. Highest-gain homebrew antennas for each band measured on the antenna range at the 1998 Central States VHF Society conference in Kansas City, Missouri. The range was run by WA5VJB and WBØTEM. Gain measurements are listed either in dBd (decibels over a dipole) or dBi (decibels over isotropic). A dipole has a little less than 3 dB of gain over an isotropic antenna, which is a theoretical antenna that radiates equally in all directions.

Photo C. Jeff Embry, WI2T, holds up a sample length of highly flexible, very low-loss—and very expensive—new feedline from MaCom. He described the product in detail during the conference.

Photo D. If it talks or hears on VHF, UHF, or microwave, chances are you could have found it at the CSVHFS Friday night fleamarket, a haven for the ham in search of an esoteric and hard-to-find widget.

and that they're not all listening for someone else to call CQ). The receiver he demonstrated works with a computer sound card to produce a 22-kHz bandwidth, which could then be increased even further.

After lunch, Tom Clark, W3IWI, made a fascinating presentation on high-accuracy time and frequency standards, including the "orbiting atomic clocks" we know as GPS (Global Positioning Satellites) (Photo E), and the "Totally Accurate Clock" that he designed and which is now being sold by TAPR (Tucson Amateur Packet Radio) as well as commercial outlets. Tom also revealed—for what it's worth—that recent time studies have shown that the length of a day is slightly longer than normal during the El Niño weather phenomenon, and slightly shorter than usual during the reciprocal La Niña pattern, into which we've recently moved. (See? There really *is* less time in a day!)

North by Northeast

Speaking of moving, the VHF conference action then moved to the northeast about a month later, with the annual East-

Table 2. 1998 Central States Noise Figure Champs

Band (MHz)	Callsign	Design	Active Device	Noise Figure (dB)	Gain (dB)
50	WA5VJB	Cavity		1.3	22.5
144	KAØRYT	Homebrew	FSC11LG	0.18	25.5
222	WA5VJB		MGF1801	0.57	21.5
432	KAØRYT*	Tapped HB cavity	FHX05LG	0.22	22.47
902	WD5AGO	Series-L	2X36077	0.45	32.3
1296	WD5AGO	AGO-2-23-HB	NE325-ATF10135	0.3	33.8
2304	NØTOU	DEMI/HB	ATF36077	0.38	18.1
3456	W9FZ	WB5LUA	2X10136	0.95	25.2
5760	W7CNK	CNK	36077	0.61	13.8
10368	W7CNK	W7CNK	10135	1.34	9.87
24192	W5LUA			2.95	20.65

*KAØRYT tested several 432-MHz amps designed around the same FHXØ5LG device. His design "F" was the winner for the band.

Table 2. Noise figure leaders for each band from 50 MHz to 24 GHz, for homebrew design amplifiers, as measured at the 1998 Central States VHF Society conference. Data courtesy Al Ward, W5LUA.

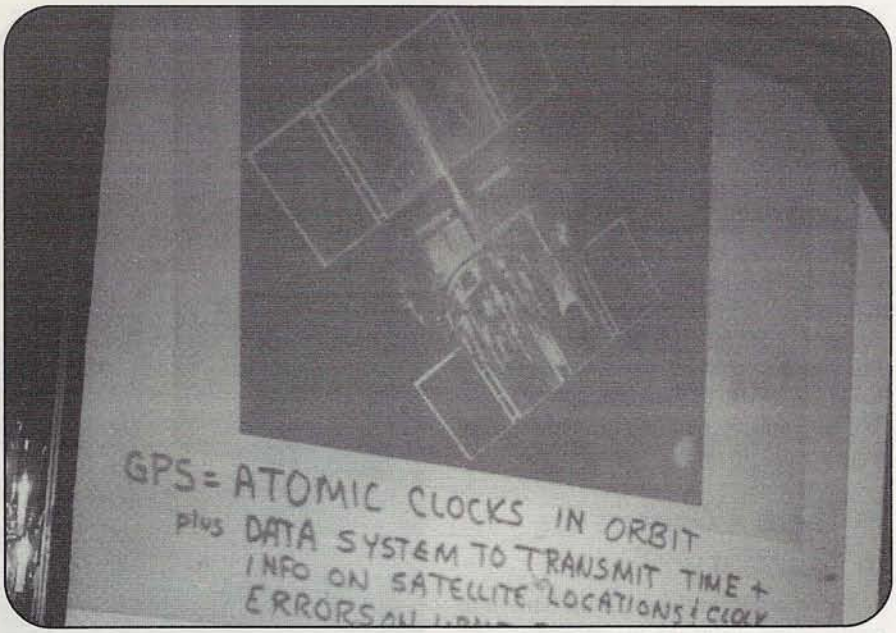


Photo E. An orbiting atomic clock, better known as a Global Positioning System (GPS) satellite, which uses extremely accurate timekeeping to help your $300 GPS receiver on the ground know exactly where it is! Tom Clark, W3IWI, explained the process in detail.

ern VHF/UHF Conference in Enfield, Connecticut, sponsored by NEWS, the North East Weak-Signal Society. This was a smaller gathering, but it was easier to get in close and ask questions. Among the more interesting presentations was one by Dave Olean, K1WHS, of Directive Antenna Systems, on so-called "blowtorch antennas"—monster loop Yagis—for the microwave bands (Photo F); working EME (Earth-Moon-Earth) on 903 MHz by Dale Clement, AF1T, who gave us the quote of the conference: "I enjoy doing these sorts of things for next to nothing and making them work"; and a really amazing talk by Paul Wade, W1GHZ (ex-N1BWT), on eliminating feedline loss at 10 GHz by mounting the antenna *on the ground, facing up,* and then literally reflecting the

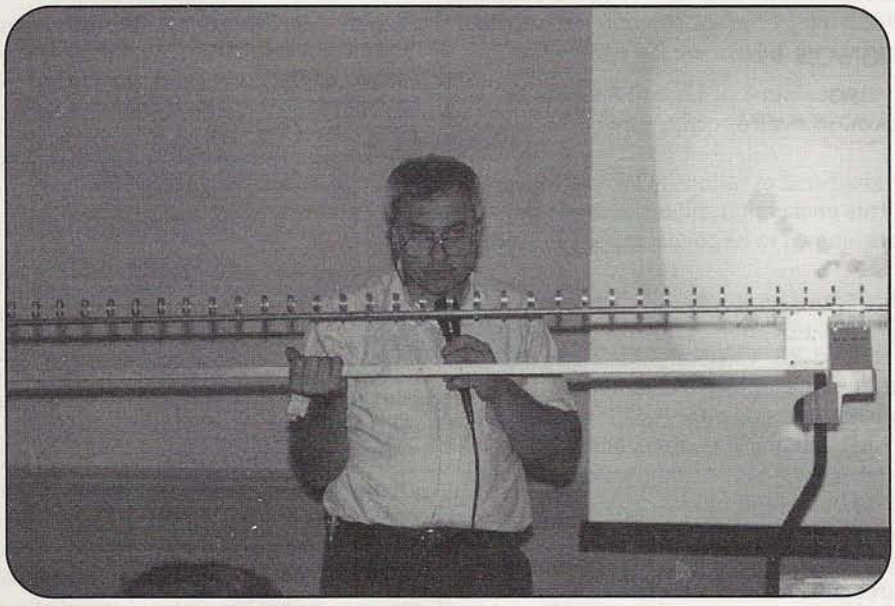


Photo F. Dave Olean, K1WHS, holds up one of his "blowtorch" antennas—mega-wavelength loop Yagis for the microwave ham bands.

signal off of a movable reflector on his tower! See what you missed if you didn't get there!

Finally, the group took up the discussion on the 6-meter DX window and domestic calling frequency (see "The 6-Meter DX Window: Why, Where, and How Big?" in the October, 1998, issue of *CQ VHF*). Curiously, about a third of the participants at the Eastern conference wanted to do away with the DX window altogether, while the others were about evenly split in their feelings over whether it should be expanded or left alone. Of course, the "big guns" in the northeast are probably going to work any openings into Europe with or without a DX window, so the issue may have been of less importance here than elsewhere. On the question of moving the domestic SSB calling frequency from 50.125 MHz to 50.200 MHz (regardless of what happens with the DX window), there were no strong feelings in either direction, and roughly two-thirds of the 35 folks in the room at the time of this discussion said they'd be willing to go along with a calling frequency QSY.

What part of this conference did I enjoy the most? Without question, it was the informal presentation at the Sunday morning flea market by Stan Hilinski, KA1ZE, on his new contest "rover" truck (Photo G). He built all the ham parts himself and designed it for one-person setup and tear-down in five minutes or less. We're planning a more complete tour of Stan's truck in an upcoming issue.

Is There a Conference in Your Future?

There is another significant benefit to conferences, as far as I'm concerned. And that's the opportunity to meet, talk with, and learn from some of the sharpest minds in amateur radio today. To me, this alone is worth the expense of getting there and being there.

Just about the only VHF/UHF interest group that doesn't have its own annual conference is repeater users. So if your VHF+ interests go anywhere beyond chatting with your friends on the local repeater, watch the announcements for a conference near you on a topic of interest. It'll be worth the effort! ■

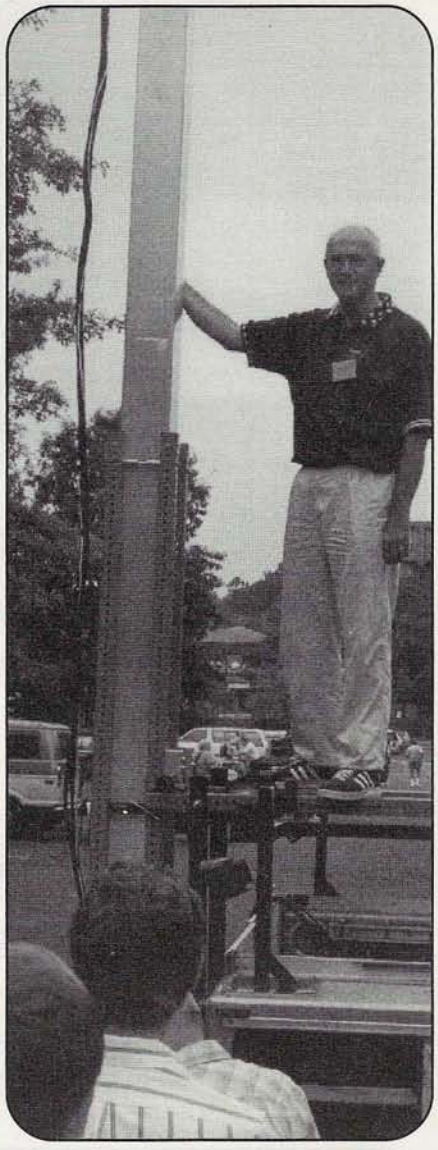


Photo G. Stan Hilinski, KA1ZE, holds court at the Eastern VHF/UHF Conference flea-market, demonstrating and explaining his new contest "rover" truck, designed for one-person operation and quick setup and tear-down. Watch for more on Stan's truck in an upcoming issue of CQ VHF.

Oops ...

Cover-Up!

We neglected to properly identify the loop antennas on NW7O's truck on our September, 1998, cover. They are made by KB6KQ Antennas of Carson City, Nevada. For more information, see the KB6KQ ad in this issue, or contact Norm Pedersen, KB6KQ, via e-mail at <KB6KQNORM@aol.com>. We apologize for the oversight.

Resistance Is Futile! (But Add These In!)

Three resistors were inadvertently omitted from the Internet Interface article ("Put Your Repeater on the Internet with a PIC Microprocessor Interface") by John Hansen, W2FS, that appeared in our October, 1998, issue (*a hazard of going on vacation while your article is in the final editing stages!—ed.*). Here are the corrections:

1. A 10K resistor should be connected between pin 8 of U1 and the base of Q1. The schematic in the article shows this connection made directly, rather than through a resistor.

2. An additional 10K resistor should be connected as follows: One end to the +5-volt supply, the other end to pin 7 of U1. This connection should be made in addition to the collector of Q2, which is currently shown to be connected to pin 7 of U1 in the schematic.

3. Resistor R3 is mentioned in the article. It must be at least 1K, but may be 10K or higher. It controls the volume of the CW identification. It should be connected between pin 9 of U1 and the junction of R1 and R2. Currently this connection is made directly, rather than through a resistor. *It is especially important that this resistor not be omitted as overheating and component damage are possible without it.*

The circuit boards that are provided by FAR Circuits are correct and have provisions for all of these parts. Thus, builders using the FAR boards should not have to make any alterations in the boards in order to build their units.

If you have any additional questions concerning the corrections or any other aspect of the project, contact the author, John Hansen via e-mail at: <hansen@fredonia.edu>

A final note: Rather than the separate source code files (vox.c and vox.h) promised in the article on the *CQ VHF* FTP site, we have posted a single ZIP file (vox.zip) containing both code files and an errata file containing the information above. We regret the errors.

Hamfest Calendar

The following hamfests are scheduled for November, 1998:

Nov. 1, Hamfest Iowa '98, 4H Building, Iowa State Fairgrounds, **Des Moines, IA**. Talk-in: 146.22/82. For information, contact Hamfest Iowa '98, Randal Lees, NØLMS, 1575 Northwest 78th Street, Clive, Iowa 50325-1255; Phone: (515) 279-4241, or e-mail: <rclees@raccoon.com>. (exams)

Nov. 1, Hamfest '98, Stark County Fairgrounds, **Canton, OH**. Talk-in: 147.18+ repeater. For information, contact MARC, P.O. Box 73, Massillon, OH 44648, include SASE; or e-mail: <MARC.HAMCLUB@JUNO.COM>; or call Terry Russ (330) 837-3091 before 10 p.m.

Nov. 7, Enid Hamfest, Oxford & 4th streets at the Garfield County Fairgrounds (Hoover Building), **Enid, OK**. Talk-in: 147.15+, 444.400+. For information, contact Tom Worth, N5LWT at (580) 233-8473, <N5LWT@HOTMAIL.COM>; or Fred Selfridge, N5QJX (580) 242-3551, <FREDNNEL@IONET.NET>. (exams)

Nov. 7, Annual Interstate Repeater Society Fall Fleamarket, Londonderry Lions Club, **Londonderry, NH**. For information, contact Paul, K1LLX, at: (603) 432-1538; or e-mail: <K1LLX@JUNO.COM>.

Nov. 7, 14th Annual "6.91 Friendly Fest," Waukesha County Expo Center Arena Forum, **Waukesha, WI**. Talk-in: 146.91- (The Friendly Repeater) and on 146.52. For information, call Mike KB9PHA, (414) 258-4435; or see their Web site: <http://www.execpc.com/~mrc/friendlyfest.htm>. (exams)

Nov. 7, Amateur Hazard Swapfest, Hazard High School, **Hazard, KY**. Talk-in: 146.07/.67. For information, contact John Farler, K4AVX, 109 Hall St., Hazard, KY 41701; call (606) 436-5354; or e-mail: <jfarler@mis.net>. (exams)

Nov. 7, Hamfest, Computer Show and Electronic Expo, East Chamber of Commerce Building, **Sorrento, FL**. Talk-in: 147.255+, 442.90. For information, contact Chuck Crittendon, KA4EXM, P.O. Box #615, Altoona, FL 32705; Phone: (352) 669-2075. (exams)

Nov. 7–8, Odessa Hamfest, Ector County Coliseum Fairgrounds, Bldg. D, **Odessa, TX**. Talk-in: 145.470, 444.425, 28.350. For information, contact Robert Jorda, N5RKN, Hamfest Chairman, 1521 E. 13th St., Odessa, TX 79761-2958, (915) 335-7980; Web page: <http://nonprofit.apex2000.net/hamfest>; E-mail: <n5rkn@apex2000.net>. (exams)

Nov. 8, Hamfest, The Starlite Club, **Kaukauna, WI**. Talk-in: 146.52 simplex. For information, contact Chad Pennings, N9PRC, Hamfest Chairman, at (920) 993-0485. (exams)

Nov. 14, 1998 Alabama ARRL Convention and 21st Annual Montgomery Hamfest and Computer Show, Garrett Coliseum, **Montgomery, AL**. Talk-in: 146.24/84, call W4AP. Ragchew 146.32/92 (with phone patch, *up/#down), 147.78/18, 449.50/444.50. For information, contact Hamfest Committee, c/o 2141 Edinburgh Dr., Montgomery, AL 36116-1313; Phone: (334) 272-7890 after 5:00 p.m. CST; Fax: (334) 365-0558; E-mail: <wb4ozn@worldnet.att.net>; Web: <http://jschool.troyst.edu/~w4ap>. (exams)

Nov. 14-15, Fort Wayne Hamfest & Computer Expo, Allen County War Memorial Coliseum Exposition Center, **Fort Wayne, IN**. Talk-in 146.88(-). For information, send SASE to: ACARTS/Fort Wayne Hamfest, P.O. Box 10342, Fort Wayne, IN 46851; Phone: (219) 484-1314; Web: <http://www.pipeline.com/~dagagnon/>. (exams)

Nov. 15, Hamfest, American Legion Complex, **Benson, NC**. Talk-in: 147.270+ .600, 100.0 Hz PL. For information, contact Bill, AK4H, at (914) 894-3352 between 7 to 10 p.m.; or e-mail: <blambert@interpath.com.>

Nov. 16, 8th Annual Catered Fried Chicken Picnic, in Shelter #13 at Lake Seminole Park, **St. Petersburg, FL**. Talk-in: 145.29-600, the QCWA repeater. For information, contact Don Bice, W4PCO, at (813) 347-2707 or Callbook address.

Nov. 20–21, Annual Hamfest/Swapfest, Latimer Community Center, **North of Ocean Springs, MS**. Talk-in: 145.110 (-600). For information, contact Phil Husberger, W9NZ, 1207 Lancelot Ln., Ocean Springs, MS 39564, or call (228) 872-1499.

Nov. 21, Amateur Radio & Electronics Auction, Newton Masonic Hall, **Newtonville, MA**. Talk-in: 146.64 (-) Waltham Repeater. For information, contact Eliot Mayer, at (617) 484-1089; E-mail: <wlmj@amsat.org>; Web: <http://ourworld.compuserve.com/homepages/emayer/auction.htm>.

Nov. 28, Evansville Winter Hamfest, Vanderburgh County Fairgrounds Exposition Center, **Evansville, IN**. Talk-in: EARS Wide Area Repeater Network, 145.150- Evansville/146.925- & 443.925+ Vincennes (alternate: EARS repeater 145.110-). Use 107.2 CTCSS on all frequencies listed. For information, contact Neil WB9VPG (812) 479-5741, or write: EARS, 1506 S. Parker Dr., Evansville, IN 47714; E-mail: <EARSHAM@aol.com>; Web: <http://members.aol.com/earsham/>. ■

Operating Notes

For November and early December, 1998:

November

1	Good EME Conditions
1–2	IARU Region I (Europe/Africa) Marconi Memorial CW Contest, 2 meters
7–8	ARRL *non-competitive* Microwave EME wknd (see ARRL International EME Competition rules, 10/98 *CQ VHF*, pg. 69)
17	Leonids meteor shower peak (possible meteor storm)
29	Good EME Conditions

December

5–6	ARRL International EME Competition, 2nd weekend. (see rules, 10/98 *CQ VHF* p.69)
14	Geminids meteor shower peak.

EME data courtesy W5LUU. More contest info is available on the CQ VHF *Web page at:* <http://members.aol.com/cqvhf/navhfcon.htm>.

Installing That New Radio in Your New Car

So you've got a brand new rig to install in your brand new car. All's well...until you try to figure out WHERE and HOW to install it! AD5X shares the secret of his success.

By Phil Salas, AD5X*
(psalas@aud.alcatel.com)

What is the greatest challenge faced by a new-car buying ham today? It's how to install a mobile radio in that new car!

It seems like just yesterday that it wasn't too uncommon to find a Collins KWM-2 or a Heathkit SB-100 mounted under the dash of the family car. Today, it'd be virtually impossible to fit those tube-type rigs of the '60s into anything except a tractor trailer (maybe). Even today's larger cars have little-to-no under dash space. I know, I know—many of today's rigs, VHF/UHF and even HF, have removable front panels so that you can mount the transceiver in some out-of-the way place. However, you still have to find a place for the front panel, microphone, and a speaker. And with the curving, sloping instrument panels, dashboards, and consoles of current cars, this can be a formidable task.

Photo A. The author's wife, Debbie, N5UPT, is happy with both her new dual-band radio...and her new Ford Mustang! (Photos by the author)

"[My XYL, Debbie, N5UPT] wanted a VHF/UHF rig in the car, and her rules were simple: No holes and no wires!"

I recently went through this frustration when my XYL, Debbie, N5UPT, obtained a new Ford Mustang (the XYL *always* gets the new car!—see Photo A). She wanted a VHF/UHF rig in the car, and her rules were simple: No holes and no wires! Unfortunately, there was no visible place to mount a radio, and I couldn't find a place to mount a remote display where wires wouldn't be obvious. Frankly, I couldn't even find a place to mount a remote display! What I needed was a remotely mountable radio *without* a remote display.

The solution presented itself in the inside front cover of the October '97 issue of *CQ VHF*. There I saw an advertisement for the Standard C5718DA. This is a dual-band (144/440 MHz) FM rig that provides access to all functions, and even the dual-band display, in the speaker/microphone (see Photo B). The C5718DA doesn't even come with a front panel display! Within a few days, I had the solution to my problem...sort of.

Mounting the Radio

OK, so now I had the radio. How did I go about mounting it in the Mustang? I originally thought about mounting the radio under the console, but I couldn't figure out how to remove the console! There were no screws visible. I called the Ford dealer and he told me that internal clips hold everything in place. He recommended that I bring the car into the shop if I wanted to remove anything, so as not to damage the console! So I took the easy

Phil Salas, AD5X, is Senior Director of Radio Product Development at Alcatel Network Systems in Richardson, Texas. He is a frequent contributor to both CQ *and* CQ VHF *magazines.*

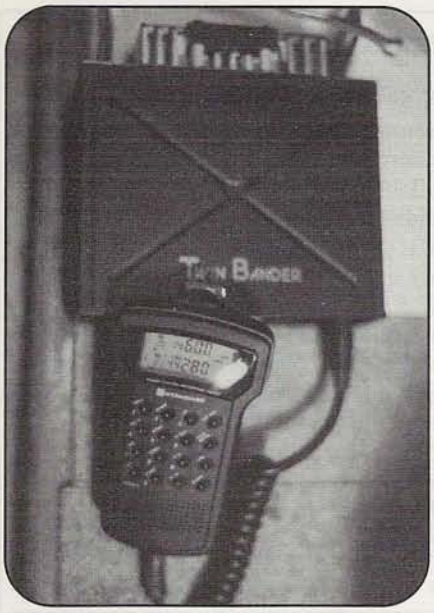


Photo B. The Standard C5718DA has all controls, and even the dual-band frequency readout, right in the speaker/mic. This enables you to install the main transceiver unit in an out-of-the-way place and still have full control over all functions.

way out and mounted the C5718DA under the passenger seat.

To do this, I cut two 8-inch long by 1-inch wide aluminum strips and attached them to the mobile mounting bracket as shown in Photo C. I drilled 1/2-inch diameter holes in the far end of the strips so that they could be attached to the bolts that hold the front passenger seat in place. This also ensured an excellent ground connection for the radio (very important, but often neglected). I was able to fish the microphone and power cables under the center console and then under the dashboard. Once I got the radio's power cable under the dashboard, I terminated it with a RadioShack 274-151 20-amp, 2-pin male connector.

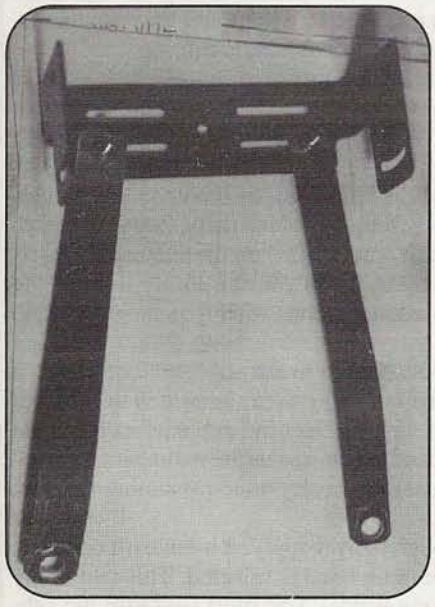


Photo C. Under-seat mounting bracket for the C5718DA. The author attached two aluminum straps to the mobile mounting bracket on one end and to the bolts holding the front passenger seat to the floor on the other end. This not only anchors the radio under the seat, but also assures a solid ground connection for the rig.

"I called the Ford dealer and he told me that internal clips hold everything in place. He recommended that I bring the car into the shop if I wanted to remove anything, so as not to damage the console!"

Next, I made up a cable that ran through an existing firewall grommet from the battery into the passenger compartment under the dashboard. Please note that it is *extremely important* to fuse *both* the positive and negative power leads as close to the battery as possible. I used 12-gauge red and black automotive hook-up wire (RadioShack 278-565 red, 278-566 black) and a pair of 12-gauge in-line "blade" fuse holders (RadioShack 270-1213) and 20-amp blade fuses (RadioShack 270-1083). I terminated the fused end of the cable (battery end) with 1/4-inch solder lugs available from my local hardware store. These solder lugs were just the right size to fit over the bolts on the battery lugs (*check the connectors on your battery before buying these connectors—ed.*). Don't connect these to the battery yet! First, pass the other end of the cable through the firewall and terminate this end with a mating connector to match whatever you put on the radio's power cable. My match was the RadioShack 274-154 20-amp 2-pin female connector. Now you can *carefully* connect the solder lugs to the battery terminals.

Once everything is mounted, all you see is the microphone lying on the console (See Photo D). Incidentally, the speaker in the C5718DA speaker/mic/display is *loud*! It easily overcomes road noise, even when the windows are open (or the top is down). The C5718DA also has a radio-mounted speaker, which can

On the Cover

Marathon Ham — Joe Bruno, WB2VVS, of Pleasantville, New York, is one of some 300 hams who fan out across New York City on the first Sunday of November each year, providing communications for the annual New York City Marathon.

It's a marathon event for the hams, as well as the 25,000-plus runners, as they comprise—for one day each year—the largest non-emergency ham radio network ever put on the air. The hams cover the 26.2-mile course along with the runners, operating a variety of nets dedicated to logistics—making sure necessary supplies, facilities, and volunteers are in place before the runners arrive—medical traffic, runner dropout information, and specialized communications around the starting area and the finish line.

The race course winds through all five boroughs of New York City, from the start at the toll plaza of the Verrazano Narrows Bridge in Staten Island to the finish line in Manhattan's Central Park. WB2VVS is pictured at Mile 16, the Manhattan end of the 59th Street Bridge, where runners enter Manhattan for the first time to the cheers of tens of thousands of New Yorkers and other race fans from around the world who line the streets.

Nearly every city has some event each year for which hams can provide useful—often lifesaving—communication. To get involved, contact your local radio club, ARES/RACES group, or your ARRL Emergency Coordinator or Section Manager. (Cover photo by Larry Mulvehill, WB2ZPI)

Mini-Review: The Standard C5718DA

The C5718DA is a tiny (5-1/2 X 1-1/2 X 5-1/4 inch) and light (2 pounds) dual-band radio that is designed specifically for remote mounting. The basic radio comes with the full-featured CMP843A remote-control speaker microphone and is 9600-baud packet ready. It has 20 memories available per band, but the optional CMU-182 memory unit (approximately $50) provides 100 memories per band. A full-featured front panel is available for about $220 if you don't want to rely on the mic for all functions and displays. This front panel can also be remotely mounted with an optional extension cable (the 6.5-foot CAW-573 or 13-foot CAW-574). The prices of the CAW-573 and CAW-574 extension cables were very close, so I decided on the longer of the two so as to give me more mounting options. One of these cables will pretty much be a necessity for a remote mounted radio. There is even a split cable available for connecting two microphones to the C5718DA (CAW-570). The only other option I went for was the CAW-572 13-foot microphone extension cable.

"The C5718DA has all the usual features, including scanning, CTCSS encode/decode, paging, DTMF, and cross-band repeater capabilities, that we've all come to expect in mobile radios today."

The C5718DA has all the usual features, including scanning, CTCSS encode/decode, paging, DTMF, and cross-band repeater capabilities, that we've all come to expect in mobile radios today. There are three transmit powers available: 50, 10, and 3 watts on 2 meters, and 40, 10, and 3 watts on 440 MHz. The transmit current drains are 11, 6, and 4.5 amps at the three power levels, respectively. The receive current drain is 0.9 amps.

The Perfect Radio...Almost

The C5718DA is the perfect radio for this application. However, there are a few operational features of the unit that I wish were handled differently.

My first complaint is that the PTT (push-to-talk) key is on the right as you look at the speaker/mic/display. Therefore, you push the PTT button with your thumb. This is just the opposite of most PTT microphones and handie-talkies.

I appreciate the fact that the C5718DA has the ability to simultaneously receive the main band and the subband. The subband can be the other frequency band, or another frequency within the same band. Whichever band you select as the main band is the band on which you can transmit. It's nice to monitor two frequencies when you're looking for activity, or when you're talking to someone on one frequency and are anticipating a call on another frequency. Normally, however, when you are in a QSO on the main band, you don't want a QSO on the subband to interfere with your conversation. And the C5718DA gives you the ability to mute the subband by 6, 12, or 18 dB (determined in a setup menu) when you have the main band selected.

However, there is one problem: when you change to the subband, (i.e. make it the main band), the audio is *still* muted. The only way to un-mute it is to re-select the other band, un-mute the subband, and then reselect the subband as the main band. It would be far better for whichever band is selected as the main band to automatically un-mute, and for the subband to automatically mute (assuming the subband mute function is turned on).

If the 18 dB of subband muting isn't enough (surprisingly, it often isn't enough), you can also turn off the subband when the main band is selected. This takes only two keystrokes. But now, you cannot change bands! You must first turn the subband back on, then change bands. It would be much better for you to be able to change bands easily, and have the new subband automatically turn off when this option is selected.

As I noted above, though, it's absolutely perfect for this no-holes, no-wires, no-radio(!) installation, despite its few minor flaws. And if my XYL is happy, I'm happy! List price for the C5718DA is $849.00.

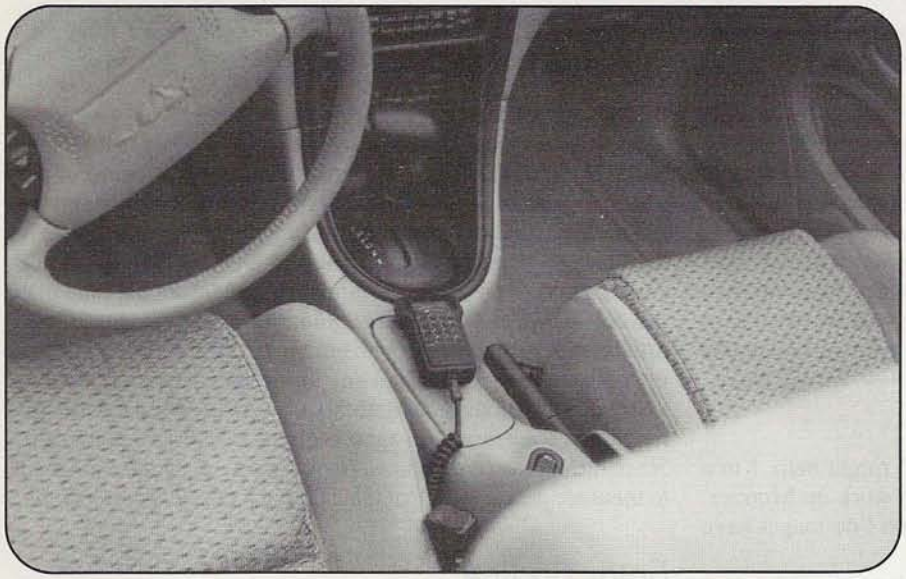


Photo D. All that's visible of the C5718DA in Debbie's car is the speaker/mic/display and a bit of coiled cord—the perfect solution to mounting a radio, with no holes and no wires, in a car with no on- or under-dash mounting space.

be programmed to be on or off, or you can connect an external speaker if you prefer that approach.

How About an Antenna?

OK. All we needed now was an antenna. Remember the rules? No holes and no wires! The answer to this part of the problem came in the form of the Diamond K600M variable angle trunk mount. This is a sleek and very low profile SO-239 trunk lip mount that permits vertical antenna adjustment over a nine-degree range (*if that's not enough, the K400 has wider range—ed.*). The K600M has a black base with a chrome UHF connector and really looks good on the XYL's dark green Mustang. The mount comes with a 16.5-foot length of low-loss coax cable (has about the same diameter as RG-8X). The PL-259 at the rig-end of the coax is attached to the coax with a small-diameter special RF connector of some sort. This enabled me to unscrew the PL-259 connector and then easily fish the cable through the trim of the car. For the antenna itself, I chose the Comet B-20, a 30-inch-long black dual-band antenna that also is very unobtrusive.

Finally, depending on your car's color, you may wish to paint the mount and antenna to provide a better color match. I've had very good success with the enamel "appliance" spray paints available at Home Depot and other home supply stores. There are colors available to match just about any car!

No Problem!

Many new cars today significantly restrict your ability to physically mount ham rigs in them. And, properly wiring up the radio and antenna system can be even more challenging. The Standard C5718DA, with its full remote control speaker/mic/display, and the Diamond K600M antenna mount may give you the ability to overcome a seemingly impossible mobile installation problem. It certainly did in my case! ■

Resources

For more information on the products mentioned in this article, contact:

Comet Antennas, NCG Company, 1275 N. Grove St., Anaheim, CA 92805; Phone: (800) 962-2611 or (714) 630-4541; Fax: (714) 630-7024.

Diamond Antennas/RF Parts, 435 S. Pacific St., San Marcos, CA 92069; Phone: (760) 744-0900; e-mail: <rfp@rfparts.com>; Web: <http://www.rfparts.com>.

Standard Amateur Radio Products, Inc., P.O. Box 48480, Niles, IL 60714; Phone: (773) 763-0081; Fax: (773) 763-3377; Web: <http://www.stdradio.com>.

Back in July's "Q&A" column, reader Jim Seipel, KBØPTC, of Colwich, Kansas, asked for advice on converting an old Motorola Motrac transceiver to the 6-meter ham band. We were only able to provide a few general pointers at the time, but, once again, our readers have come through in the ham spirit of sharing our knowledge and experience. Since we're sure Jim isn't the only ham with access to an old Motrac and an interest in putting it on 6 meters, we're going to share with all of you this very detailed response sent to Jim by Dick Warren, W7TIO:

Hi Jim:

Saw your note in *CQ VHF* and thought I might help. I'm a retired professional technician, and used to work on Motracs, but so long ago I've forgotten some of it, and I no longer have a tech manual on them.

If the radio originally worked, it shouldn't need much to put it back to work. To get into your radio, you need a 2135 key. ALL Motorola radios used that key to prevent tampering and to preserve the integrity of the technician's readings.

A Few things...

To retune the radio to a ham channel, you need to be able to "peak" and meter the radio's transmit and receive sections. Motorola used *negative hot, positive ground current metering* of its circuits, whereas G.E. used voltage. The metering was based on a 50-microamp center-zero meter, so if you find a 50-microamp meter, it needs to have a meter reversal switch (DPDT) to reverse the readings as needed. It also needs a current limiting resistor in series, but I forget how much.

The metering socket is a phenol socket at one side of each of the transmit and receive decks that resembles a 9-pin miniature tube socket with extra pins. There are numbers on the socket pin jacks, and, as I remember, on the receive side, pins 1 and 2, are metering points for the RF amplifier and pin 3 is the IF metering point. If not, 2 and 3 would be for the IF, and, either way, 4 and 5 are the discriminator. Do *NOT* mess with these 4 and 5 points or try to adjust the discriminator coil. You should *NOT* have to disturb the IF tuning, either.

Channel Elements

Motorola also used "channel elements," little assemblies that the crystals were mounted in that had temperature-balanced-coefficient components that the crystals worked with. That way, the crystals didn't drift in frequency with temperature changes. You need to have crystals that work with these assemblies, and *if* you choose to open these and replace the crystals, be sure that the crystal manufacturer had the element number to match the crystal to. I have done this successfully. If you have no element, you need to find one first.

Motorola made these sets in two frequency ranges: 30 to 40 MHz and 40 to 50 MHz. The 30- to 40-MHz models had capacitors across the coils in the RF amplifier and mixer sections to bring down their tuning ranges, but the 40- to 50-MHz units normally did not. If yours is a lower frequency model and has these extra caps, remove them. The model number will tell you what range it was made for.

As you tune up the receiver, put in an on-frequency signal that is *in the noise*, since you are dealing with a couple of limiting stages that you don't want to saturate. As you go into the transmitter, you will probably find a tube in the output stage, at the back. It might be "flat." You will also find HIGH VOLTAGE on two of the metering pins, which is where the final plate current is read, NOT against ground. You might also find a "tune up/normal" switch in the transmitter section. Put this in "tune up" so as to protect the final on reduced power until it is tuned.

All of these commercial mobiles are made for use with vertical mobile antennas fed against ground, so this set is made for 50-ohm antenna connections. Also, commercial radios are made to measure power *output* at the antenna jack, NOT power *input*.

Color Coding

If you have the original cables, they are color-coded and will save you a lot of guesswork. Here's what's what:

DC Power input—Large red wire is transmitter power; *small red* is switched (ignition key) power to the T/R relays and "on air" light. *Green* is receiver power and will light pilot light. *Short black* wire is ground to car.

There will also be a plug in assembly in both the transmitter and receiver called "Private Line"™. This is a sub audible tone system (*known generically as CTCSS, or Continuous Tone Coded Squelch System—ed.*) that keys the other end's receiver, runs the repeater if the radio is set for it, and may open your receiver's audio. For receiving, this should be turned off. The mic hank-up bracket may have had contacts in it and a switch for listening before transmitting.

Random Notes

Motracs also had a plug-in DC power-in polarity reversal "pack" assembly feature that allowed positive ground. You want to check that before you power up!

Multi channeling: Motorola advised that these sets not stretch out to more than 500 kHz without degrading, but I've run them out 1.5 MHz without problems. I'll stop here, and you can tell me what you have and ask questions.

73 and CUL,

Dick Warren, W7TIO

If anyone has additional information to share, please feel free to pass it along.

Q: After reading Gordon West's article on the ICOM IC-T8A in the July issue, I decided to go out and purchase it as my first HT. In Mr. West's article, he mentioned that on 6 meters with an outside antenna, he worked a station almost 900 miles away. I was curious what type and size antenna he was using. I would like to try to catch some *E*-skip and am curious as to what size antenna Mr. West used. I thank you in advance for any information that you may have.

Sincerely,

Greg Schrager, KF4ZXD
Boca Raton, Florida

A: I'm not sure what kind of antenna Gordon was using with the T8, but when 6 meters is open, you can work 900 miles with a wet noodle! (well, almost). Peak times for sporadic-E on six are June and July (although this August was very active) with a smaller peak around the beginning of winter. It generally drops off to nearly nothing around the equinoxes (but this fall may be good if some F_2 propagation pops up).

On FM, just keep tuned to 52.525 MHz, the national simplex frequency, and listen for faraway signals to start popping in. I regularly worked into 4-land this summer on six from my home in New Jersey with a 50-watt Azden PCS-7500 and an omnidirectional AEA Halo-6 antenna on my roof at about 25 feet above the ground. Be sure to find out your grid square from local hams who are active on VHF, since folks from faraway are going to want to exchange that info with you.

The following question was sent to CQ VHF *"Antennas, Etc." columnist Kent Britain, WA5VJB:*

Q: Concerning the "J"-driven cheap Yagis: As per your article (August '98 issue), I sent away and received the Central States Proceedings which covered your "cheap Yagis," but unfortunately there were no dimensions for poor guys like me who are still on 146.52 MHz. Just out of curiosity, could I use the DL6WU antenna dimensions and use your driven element with an overall length the same as his folded or split dipole lengths?

Also, can I just connect the braid and center conductor of the coax to the true centerline of the element, or should I offset them as in your wooden designs? I'm building a portable take-down model and I can connect the coax anywhere I want, hence my curiosity.

Thanks and 73,

London Lewis, WH6FV
Honolulu, Hawaii

WA5VJB replies:

The DL6WU is an excellent Yagi, but it has a 75-ohm feed versus my 150-ohm feed, so there will be some mismatch if you just substitute the driven elements. As for dimensions, my October column had the figures for both 2 meters and 222 MHz, and I'm working up models for other bands.

On your question of where to put the feedpoint, to make another reader happy, I actually calculated the voltage offset of 1/4-inch on 432 MHz and it was .4% (*that's point-four percent, or .004—ed.*). I think you'll be OK. If you can measure SWR, just prune for lowest SWR (on prototype units, I slip a piece of brass tubing over the end of the driven element and slide it back and forth for best match) and you're perfect.

Q: The *ARRL Repeater Directory* gives the DX Window on 6 meters as 50.100 to 50.125 MHz, but none of the other bands have any listed that I can see. Do they have them, and, if so, what are they?

George Clark, KO4QR
Grandy, North Carolina

A: None of the other VHF/UHF bands have designated DX windows because they do not normally support international DX propagation. For the purposes of the 6-meter window (which several groups now support expanding to 50.150, by the way, with the domestic calling frequency moving to 50.200), DX is defined as stations outside the continental U.S. and lower-tier Canadian provinces. It is highly unlikely that you will be able to make contacts outside these areas on 2 meters or above without the use of satellites (for which there are designated subbands). While efforts are being made to bridge the Atlantic on 2 meters, it hasn't yet been done.

Do YOU have a question about any aspect of "Ham Radio Above 50 MHz"? We'll do our best to give you a clear, concise answer—or if it's not a question that has just one easy answer, then we'll invite readers to offer their solutions. Send your questions to: Q & A, *CQ VHF* magazine, 25 Newbridge Rd., Hicksville, NY 11801; via e-mail to <CQVHF@aol.com> or <72127.745@compuserve.com>; or via our Web page at <http://members.aol.com/cqvhf/>. Be sure to specify that it's a question for "Q & A."

Book Review: "Six Meters—A Guide to the Magic Band" (Revised Edition)

For a good start on a great band, get this revised and updated guidebook by Ken Neubeck, WB2AMU.

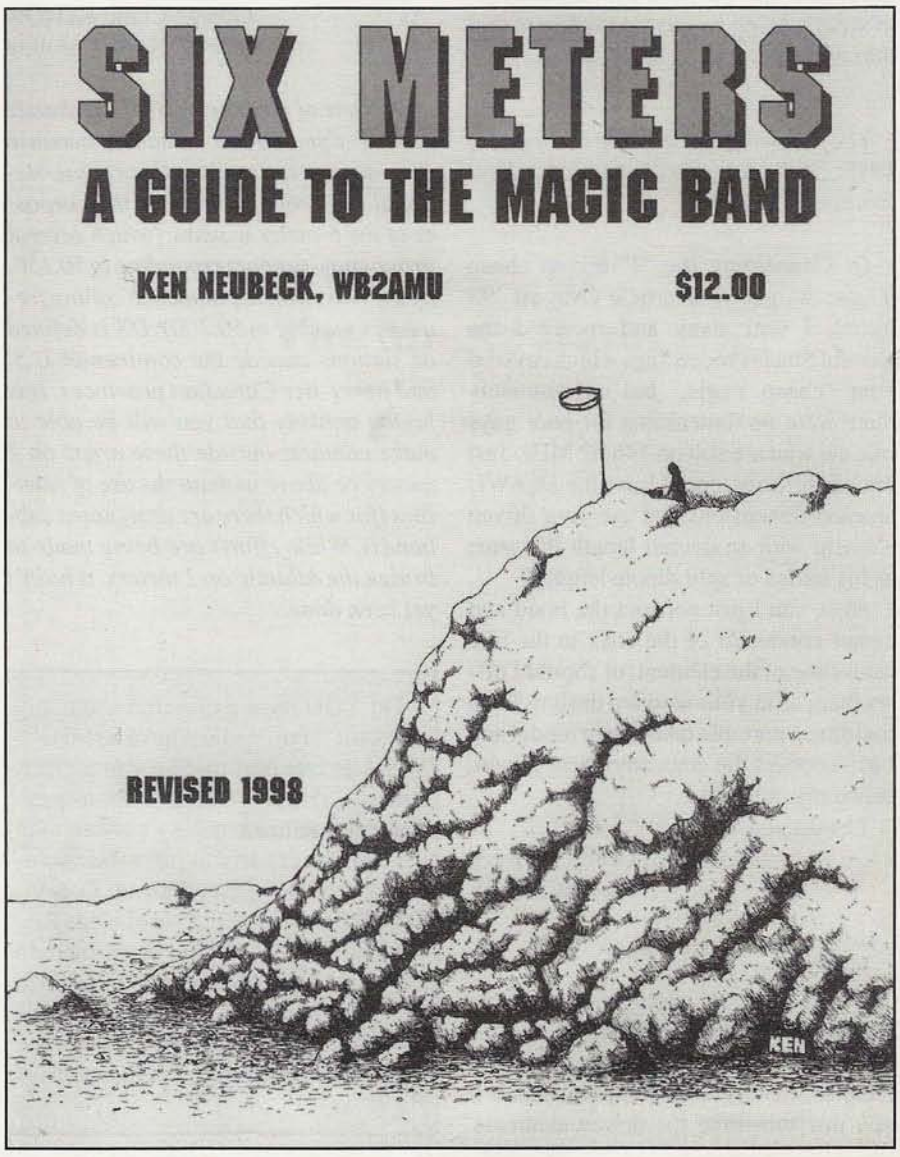
By Rich Moseson, W2VU
(cqvhf@aol.com)

The first time I met Ken Neubeck, WB2AMU, was at the 1995 Eastern VHF/UHF Conference. He was orbiting Styrofoam balls around each other to show how the relationship between the sun and the Earth affects sporadic-*E* on 6 meters, and I was looking for writers for a brand new magazine (the one you're reading). Impressed both by Ken's knowledge and the clarity of his explanations, I bought a copy of his book, the original edition of *Six Meters—A Guide to the Magic Band*, and talked to Ken about writing for *CQ VHF*. He's been a regular contributor since the very first issue.

An Excellent Beginner's Guide

This book is ideal for the newcomer to 6 meters or the occasional operator; it was just right for me, even though I'd had some limited contact with the band (some AM work while in college and occasional visits during contests or while at other people's shacks). The revised edition is even better.

Don't look for deep technical discussions or lots of construction projects. Although Ken is fully capable of both, that's not what this book is about. What the book *is* about is the magic of "the magic band," how far you can expect to work, the different kinds of propagation that carry your signals to great distances, the basics of what equipment and anten-



Rich Moseson, W2VU, is Editor of CQ VHF *magazine.*

nas you'll need, operating hints, etc. There's a whole chapter on preventing and curing TVI (TV interference) problems (important for a band that's been dubbed "the TVI band"); another whole chapter on sporadic-*E* and aurora, and a brand new chapter on 6 meters around the world. This new chapter was made necessary by the band's explosive growth in Europe over the past five years, and the likelihood of U.S.-European openings as the sunspot cycle climbs toward its next peak.

Also updated is the final chapter, titled "The Future of Six Meters" in the original edition (and quite uncertain about the band's outlook), and changed in the revision to the much more optimistic "The Band That Refused to Die." This reflects the sea-change that has occurred on six in the past few years, evolving from an underused ham radio backwater to the hottest band in the hobby today; from a band for which equipment was difficult to find to one that's included on practically every other HF or VHF rig that comes onto the market today. Its rediscovered popularity may be propelling six back toward its pinnacle in the late '50s and early '60s when, it seems, nearly every ham who started out in that time frame will tell you they "got started on six." Unfortunately, the first chapter of Ken's book still refers to 6 meters as "the most underpopulated of all the bands." If it ever really was, it certainly isn't any more.

A Couple of Nits...

Of course, nothing is perfect and this book is no exception. Fortunately, most of the inconsistencies are minor. The biggest goof was the omission of half the frequencies used for radio control (R/C) on 6 meters. Of course, if you get into ham R/C, you'll quickly find the others (they're also listed in "Beginner's Corner" in the July, 1998, issue of *CQ VHF*.

A mistake carried over from the first edition is misidentifying Tim Marek, the former NC7K, as NC7R—especially now that he's K7XC. Plus, Ken is listed as the "VHF+" columnist for *CQ* magazine (he's not; Joe Lynch, N6CL, is); and—my biggest gripe—the list in the Appendix of magazines that regularly cover 6 meters doesn't include *CQ VHF*! Ken certainly knows that it does, since he provides the bulk of that coverage (along with NC7R, umm NC7K, umm K7XC). Ken says he included *CQ VHF* in his original submission, but that it apparently got lost somewhere in the editing/publishing process.

In addition, much of the material in the book will look familiar to regular *CQ VHF* readers; the benefit to the book is that all the information is in one place and you don't have to go searching through stacks of magazines to find what you're looking for.

All in All

All in all, though, *Six Meters—A Guide to the Magic Band* is a worthwhile investment for any active 6-meter operator and particularly for the newcomer to the band. If you operate six, or want to, you should own this book. ■

Resources

Six Meters—A Guide to the Magic Band (Revised Edition), by Ken Neubeck, WB2AMU, is published by Worldradio Books, P.O. Box 189490., Sacramento, CA 95818-9490; Phone: (916) 457-3655; Web: <http://www.wr6wr.com>. Price is $12 + $2 shipping to U.S. addresses.

Fun on a Budget: QRP'n via Satellite

Do you like pinball machines, computer games, and new amateur radio adventures? This month's column describes a unique pursuit comparable to all those challenges rolled into one. It's terrific fun in a dozen different ways. Take a look at our introduction and join the action!

OK gang...we've been talking theory and technical aspects of circuits for several months straight. Now it's time to break for some real radio *fun*—and introduce a few new ideas and areas of special interest along the way! What kinds of ideas and areas, you ask?

Basically, we're talking about joining OSCAR satellite activities "QRP style," tracking orbits and Doppler shifts the easy way, fine-tuning your operating techniques, and homebrewing mini antennas. Exciting? You bet! It could even give your hobby a new lease on life by opening a variety of previously unrealized or overlooked doors of captivating pursuit. Amateur radio is filled with unique activities. That's what keeps it new and infinitely rewarding year after year. Don't limit your enjoyment. Continue expanding your horizons—always!

Introducing OSCAR

As you may know, several amateur radio satellites (OSCARs, for Orbiting Satellites Carrying Amateur Radio) are presently operational and orbiting the Earth every day. One satellite in particular, AO-27 (see Figure), is in a fairly near-earth orbit and carries a 145.850-MHz input/436.795-MHz output FM repeater. Yes, and you can operate through this high-flying repeater using only a dual-band handheld transceiver and a small gain-type whip antenna. The satellite treks across the sky above or near your QTH a couple of times a day, and its high-in-the-sky position yields a range or ground "footprint" of up to 2,000 miles. Depending on where you are in the U.S., you may even work into Canada, Alaska, Mexico, Central America, or the Caribbean via AO-27. This is QRP'n with a unique new twist, and it's a treat! Start planning your operating strategy today and give it a good old college try! You'll love it! Need a nudge? Read on!

Photo A. CQ VHF *columnist Dave Ingram, K4TWJ, ready to catch an AO-27 pass. Outdoor location ensures a clear sky view in the satellite's direction of travel. With a bit of luck, three or four quick QSOs can be conducted during a 12-minute pass. Details in text. (Photos courtesy K4TWJ)*

Amateur Satellites: A Crash Course (No Pun Intended!)

Thanks to "Orbital Elements" columnist Ken Ernandes, N2WWD, and Editor Rich Moseson, W2VU, prime information on our OSCAR satellite program is featured regularly here in *CQ VHF*. Presenting more than a sampling of satellite information in our limited space is obviously impossible, so I encourage you to read a stack of back issues to expand your knowledge of satellites. If you do become hooked on satellites, incidentally, consider visiting the archives of your city's main library and reading OSCAR articles in *CQ* and *QST* back to the program's beginning in 1961. It's fascinating!

Two basic facts you'll learn right off the bat are the types and orbits of various satellites (called "Phases") and their bands of operation (called "modes"). Low/near-earth orbiting satellites carrying transmit-only beacons like the early OSCAR 1 and 2 were Phase I "birds." Low-orbiting satellites carrying wide-band SSB/CW transponders for relaying signals back to earth are Phase II units (as are the many amateur satellites relaying digital signals). Satellites in high ellipti-

By Dave Ingram, K4TWJ

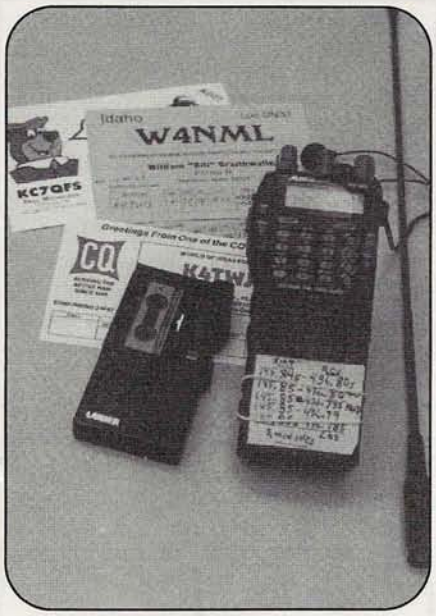


Photo B. Equipment comprising K4TWJ's QRP satellite station includes an Alinco DJ-580 2-meter/70-centimeter FM talkie, a Premier RD-78 dual-band whip, earphones/earbuds, and tape recorder for no-fumble logging. Note frequency relationship chart rubber-banded to rig. QSLs are from a couple of previous AO-27 QSOs.

cal orbits and carrying wideband transponders can relay signals over one-third of the world's area (DX galore!), and are called Phase III satellites. (What's a transponder? Basically, it's a dual-band repeater with a very wide bandwidth capable of retransmitting several signals at one time—and it works on SSB or CW as well as FM.) Transponders are usually 50 or 100 kHz wide, with SSB/CW inputs on one band and related outputs on another band (see Table 1).

That is enough background information; now let's focus on this column's "star satellite"!

Meet AO-27

AO-27 is a low orbiting/Phase II-type spacecraft with a unique difference. Rather than carrying a wideband SSB/CW transponder, it has an FM repeater. You access it crossband repeater-style by transmitting on 145.850 MHz (± Doppler shift) and receiving on 436.795 MHz (± Doppler shift). Doppler shift is an apparent (but very real) change in frequency—like the changing pitch of a train whistle—that occurs because the satellite is moving quickly in relation to your station. A frequency relation chart with approximate Doppler corrections for each 2.5-minute period in an AO-27 pass is given in Table 2. Rubber-band a copy of the chart to your rig for quick and easy reference (see Photo B). If your rig can store frequencies for both bands in single memory slots, you're in luck with easy "memory tuning." Otherwise, you must select bands and step-tune your VFOs by hand in 5-kHz increments (practice on a couple of passes and it's easy!).

AO-27 typically makes one or two good orbits in range of your QTH every day. These passes are usually between 10:00 a.m. and 1:00 p.m. local time, when the satellite is in sunlight, traveling from north to south, and its repeater is switched "on" for operation. Two other passes occur 12 hours later, when the satellite is in darkness, traveling south to north, and its repeater is switched "off."

Suggested/authorized operating times are determined and specified in bulletins from AMSAT, the Radio AMateur SATellite Corp. These bulletins are posted on the Internet and also transmitted on 14.282 MHz at 1900 UTC Sundays. As of this writing, AO-27 is available for weekend operation with weekday use unofficially acceptable, but that's subject to change if it's abused. Check AMSAT bulletins for latest details. (*The AO-27 amateur transponder shares space and power on its satellite with EYESAT, a commercial transponder, which has priority for usage during business days/hours.—ed.*)

After you have experienced the thrill of high flying QSOs by satellite, incidentally, I heartily encourage joining AMSAT to further your knowledge and enjoyment of space communications. In

Satellite QRP'n: A Peek Preview

Surely the most logical and effective way to visualize VHF/UHF QRP'n via satellite is with a quick description of the adventure. A real life example follows:

The time is 11:00 a.m. on a crisp fall morning. According to my calculations, AO-27 is due to trek from north to south over the eastern U.S. coast during the next 12 minutes. Equipped with my 2-watt dual-band FM handheld transceiver, earbud 'phones, a snap-on quarter-wave whip antenna, and a pocket recorder for logging, I head outdoors for an unobstructed signal path to the satellite (Photo A). The satellite appears as expected, with a continuous string of QSOs activating its previously mouse-quiet 70-centimeter downlink frequency.

I call a station while listening on the earphones to ensure my own 2-meter signal is being relayed and can be heard on the satellite's output/downlink frequency. Nothing. Folks continue QSOing like I am not even there. Bucking the odds is fun, but life at the top can be lonely. I call another station while slowly moving my talkie and antenna in a sweeping arc motion. Hopefully, I can match the satellite's roll and changing signal polarity. Whoa Dave—right there! Now I hear my own signal and voice being relayed! The station I called vanished, but another station (in Idaho, no less!) is answering me. We exchange quick greetings, then three strong stations "capture" the satellite repeater and work each other in rapid succession.

The satellite has now risen high in the sky and relayed signals are stronger but "scratchy." Oops, it is Doppler shift correction time. Quick checking my watch and the frequency chart on my rig, I change uplink and downlink frequencies by 5 kHz. Folks are now knocking off 10-second QSOs like crazy. I call a station in Virginia. A stronger station clobbers my QRP signal. I listen very closely and precisely time my next call. "QRP Alabama" gets through the mixture of voices. The Virginia station returns with "The QRP in Alabama—you are 4 by 5, repeat your call letters." Another strong station jumps in and works the chap in Virginia. Signals are again becoming scratchy. Quick Dave—Doppler correct your frequencies again! Keep that talkie and antenna tilted to match the satellite's polarity! I quick-reply to the Virginia station. He confirms my call letters.

Now a station in Texas is calling me. I snap out a fast reply. U.S. signals are dwindling. A couple of Spanish voices are heard. My downlink signal is weak... weak...gone. AO-27 is gone...until an hour and 42 minutes later when a Midwest pass again fires up excitement. Wow—what a blast!

AO-27 Quick Start

Ready to try your skill at QRP'n with AO-27? Let's quickly review some major points to ensure your success right from the start:

First, you should know when AO-27 is in range of your QTH and its general path of north-to-south travel (whether it treks overhead, east or west of your QTH). You probably don't have a tracking aid at this early time, so some mid-U.S. passes for a few days in November are shown in Table 3. Actually, these are near mid-U.S. passes; if you live near the east coast, try listening for a closer pass an hour and 42 minutes earlier; if you live near the west coast, check for a closer pass an hour and 42 minutes later (also remember to convert UTC to your local time). Use N2WWD's info in April '98 *CQ VHF* to estimate pass times and dates not shown, then perfect your own tracking method or technique.

Use earphones/earbuds and full duplex operation to listen for an open frequency and monitor your satellite-relayed 70-centimeter signal while transmitting on 2 meters. Reduce/open your rig's 70-centimeter squelch so you can copy weak signals. Follow the satellite's movement and signal polarity with your rig's whip. Remember—maximum radiation is *broadside* to the whip. This is vital to QRP success because you must use all available assets to your advantage.

Finally, watch that Doppler shift! Use our included frequency chart as an operating guide. Change frequencies approximately every two minutes. Move through QSOs quickly, be accurate, patient, persistent, and enjoy outgunning the big guys!

addition to receiving a timely newsletter and reduced prices on software, etc., your annual dues ($30/year in the U.S.) will help fund and support both present and future satellites. The address is the "Resources" box.

Tracking Satellite Orbits

Using AO-27 (or any other OSCAR satellite) requires knowing precisely when it's within range of your QTH and its direction of travel in the sky. The most common and popular means of accomplishing this "tracking" is using a computer program initialized with Keplerian data from AMSAT bulletins. A handy "getting started" program for IBM compatibles is available from Carl Gregory, K8CG, at <http://www.sat-net.com/winorbit>. It's a bare bones program, but the price is right (it's freeware!). Other and more elaborate programs are available from AMSAT's Software Exchange (see "Resources").

Another quite clever tracking method that streamlines the approach to visualizing mechanics of orbits and using intelligent logic in lieu of a computer program was described by "Orbital Elements" columnist Ken Ernandes, N2WWD, in the April '98 issue of *CQ VHF*. Check it out! Ken really takes the mystery out of orbits!

As he explains it, AO-27 travels a never-changing path and makes one revolution around the Earth every 102 minutes. Since the Earth rotates ever so slowly beneath AO-27, each orbit seems shifted 22.5 degrees longitude west of the previous orbit. Typically, this shifting places one orbit over the eastern U.S., the next orbit over the U.S. heartland, and the following orbit over the Pacific Ocean out from Washington, Oregon, and California. AO-27's 22.5-degree westerly progression every hour and 42 minutes and the Earth's movement of 360 degrees in 24 hours are not even multiples, so one day's "eastern U.S. pass" eventually becomes the "heartland orbit." That orbit, in turn, becomes a "western U.S. orbit" while the "over Pacific Ocean orbit" moves over Hawaii and an "over Atlantic orbit" moves into range of the eastern U.S. AO-27's path of travel around the world, however, never changes position. Get the idea?

Equipment Requirements

Here is where the game really gets exciting! Many OSCAR enthusiasts consider high power multimode transceivers and circularly polarized beam antennas steerable in both azimuth (north-south) and elevation (up-down) basic equipment for satellite communications (see Photo C). Some setups even sport computer-positioned antennas for automatic satellite tracking. Nice indeed! Comparatively, a QRPer operating AO-27 uses only a 2- or 3-watt talkie and an extended length whip to achieve the same long-distance communications. Impossible? Not at all. And it's fun! It also proves, as I always

Table 1

TRANSPONDER	MODE
2 m in/10 m out	V/A (also known as Mode A)
70 cm in/2 m out	Mode U/V (also known as Mode B)
2 m in/70 cm out	Mode V/U (also known as Mode J)
1.2 GHz in/70 cm out	Mode U/S (also known as Mode S)

AMSAT, the major ham satellite organization, is in the process of changing the mode designators to reflect both the input, or uplink, band and the output, or downlink, band. The single-letter designations in parentheses are the old style, still used by many hams.

Table 1. In satellite-speak, "mode" refers to a combination of uplink/downlink bands, not FM or SSB. Here are several common satellite modes.

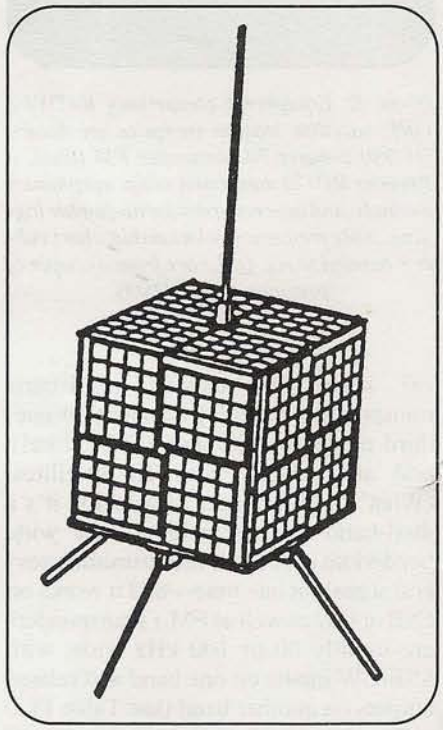


Figure. Line art sketch of AO-27. The little satellite is covered with photocells and is small enough to sit on an auto's rear seat. Sketch courtesy AMSAT.

Photo C. Circularly polarized beam antennas for 2 meters and 70 centimeters are a sure sign of a nearby OSCAR satellite enthusiast. The combo shown here belongs to Bill Braithwaite, W4NML, in Idaho and has a nice clear sky view for top performance.

say, that "the operator rather than the rig makes the difference!"

The secret ingredients for success, so to speak, are a good dual-band talkie, a high-performance whip antenna and even higher performance operating skills *Your talkie should be capable of transmitting and receiving simultaneously, include extended 70-centimeter reception down to 436.780 MHz and tune VFO frequencies in 5-KHz steps.* It also needs a sturdy antenna socket (BNC, preferably) and *earphones wired for receiving only 70 centimeters in both ears.* A 12-volt/5-watt battery pack is optional, if you lack QRP confidence.

With respect to antennas, *forget trying to use your talkie's standard "ducky"; it's too lossy.* Opt for a full length quarter-wave 2-meter/half-wave 70-centimeter whip like Premier's 16-inch-tall RD78 or MFJ's 17-inch-tall 1717. Another good antenna to try is Premier's high-gain AL-800 pull-up whip for 2 meters and 70 centimeters. It's 34 inches tall when extended and pumps out a stout signal!

Finally, operating expertise is a QRPer's greatest asset. Practice accuracy in copying signals the first time around and in timing your return call. Be patient, yet persistent, and you'll soon get the knack of it.

More "how-to" guidance and details are coming next month. Meanwhile, let's QSO on AO-27! Listen for me. I'll be the weak one running QRP! 73,

—Dave, K4TWJ

Table 2

TRANSMIT/UPLINK Frequency (MHz)	RECEIVE/DOWNLINK Frequency (MHz)	NOTES
145.845	436.805	AOS
145.850	436.800	
145.850	436.795	Middle of pass
145.850	436.790	
145.855	436.785	LOS

Table 2. Uplink/downlink frequency relations and Doppler shift corrections for each approximately 2.5 minutes of an AO-27 pass. A good high-in-the-sky pass is typically 12 minutes long from northern horizon AOS (Acquisition Of Signal) to southern horizon LOS (Loss Of Signal).

Table 3

AO-27	MIDDLE OF PASS	
DATE (Nov., 1998)	TIME IN UTC (6 mins. after AOS and 6 mins. before LOS)	GEOGRAPHIC AREA (Satellite over listed state)
1	1658	Colorado
2	1630	Missouri
5	1648	Missouri
6	1623	Illinois
7	1735	Utah
8	1709	Colorado
9	1642	Kansas
10	1613	Illinois
13	1632	Illinois
15	1722	Utah
16	1651	Kansas
17	1624	Illinois
19	1713	Colorado
22	1730	Colorado
24	1636	Kansas
26	1722	Colorado
29	1740	Utah
30	1714	Colorado

Table 3. Predicted times of some AO-27 passes over the mid U.S. during November. Use this info and try your hand at QRP'n via satellite! If you live in the east, plan on a pass about an hour and 40 minutes earlier; out west, look for passes about an hour and 40 minutes later.

Resources

Additional information on amateur satellites, as well as several satellite tracking programs, are available from AMSAT, P.O. Box 27, Washington, DC 20044; Phone: (301) 589-6062; Fax: (301) 608-3410; Internet: <http://www.amsat.org>.

Information on the antennas described in the column is available from your ham dealer or directly from the manufacturers:

MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762; Phone: (601) 323-5869 (8:00–4:30 Central time, M–F); Orders/Dealer Locations: (800) 647-1800; Fax: (601) 323-6551; Internet: <http://www.mfjenterprises.com>.

Premier Communications, 20277 Valley Blvd., #J, Walnut, CA 91789; Phone: (909) 869-5711; Fax: (909) 869-5710; Web: <http://www.adi-radio.com>.

Downloading Weather Satellite Pictures

You don't need a lot of fancy equipment to download weather images from Automatic Picture Taking (APT) weather satellites. I do it with a RadioShack scanner radio and a PC-compatible computer with a Soundblaster™ compatible sound card. Here's how...

Receiving weather satellite pictures is an activity enjoyed by many hams as well as a sizable group of non-ham hobbyists. Some may ask "why bother?" since weather information is readily available and even satellite pictures can be found on television and the Internet. But there's something special about seeing pictures of the ground and cloud cover filling your computer screen as the satellite flies overhead. If you're watching as the picture is coming down from the satellite, you have the latest available weather information. Besides that, it's rewarding and just plain fun to do it yourself.

I was interested in copying weather satellite pictures for some time before I actually went ahead and did it. I kept putting it off because of equipment costs—my money was going toward upgrading my satellite station (and there were also those improvements I was making to my HF station). Then in the August, 1997, *QST*, I came across an excellent article by Eugene Ruperto, W3KH (see Reference 1 in "Resources"). An important point I realized from W3KH's article was that I already had the equipment I needed to download weather images—I didn't need to spend *any* money.

W3KH's *QST* article was very enlightening, so if you have a copy of the magazine, it would be worthwhile to read it. For those of you who don't have ready access to the article, I'll summarize its most important parts here, and I'll relate my experience to help you get this setup to work for you.

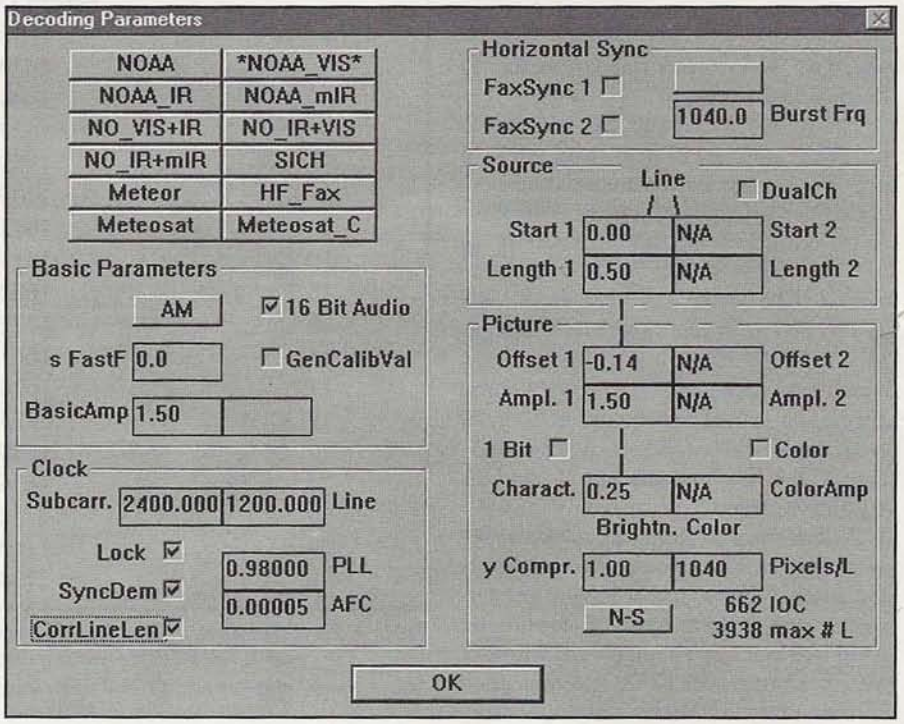


Figure 1. WX-SAT image decoding Parameters. This example is set up for capturing visible wavelength pictures from an NOAA satellite.

What Equipment Do You Need?

The basic equipment you need to be able to download weather images from APT satellites is an FM radio capable of receiving in the 137-MHz band and a 40-MHz 80486 (or better) PC-compatible computer with a Soundblaster™ compatible sound card. You connect the radio's audio output (at the external speaker output or headphone connector) to the sound card input ("Line In" is preferred, but you can also get the microphone input to work).

By Ken Ernandes, N2WWD (n2wwd@amsat.org)

Table 1. APT Satellite Information

Satellite ID	Catalog Number	Int. Designator	Frequency (MHz)
NOAA 12	21263	91-032A	137.500 FM
NOAA 14	23455	94-089A	137.620 FM
NOAA 15	25338	98-030A	137.500 FM
METEOR 3-5	21655	91-056A	137.850 FM
OKEAN-4	23317	94-066A	137.400 FM
SICH-1	23657	95-046A	137.400 FM

Table 1. The names, identifier information, and downlink frequencies of the six Automatic Picture Taking (APT) weather satellites you can tune in and monitor using just a 137-MHz receiver and a computer with a sound card.

This system works like a fax machine, except that it uses a radio link rather than a telephone link to receive the data. The digital imagery is modulated as a 2400-Hz audio subcarrier on the 137-MHz RF signal. The digital information is Amplitude Modulated (AM) on the audio signal—not to be confused with the Frequency Modulation (FM) of the 137-MHz RF signal. The input of your computer's sound card has an analog-to-digital (A/D) converter that gives numeric values as it reads the amplitude levels of the audio signal. The final piece in this system is the WX-SAT software that captures the digital information from the sound card and converts it back to a picture.

WX-SAT Software

WX-SAT is a Microsoft Windows® program written by Christian Block. Version 2.4e of this program may be downloaded from W3KH's Web page (see "Resources") and freely used for amateur or educational purposes. I'll go over the setup process with you.

Before using the program, you should set your sound card to the optimum configuration for decoding weather imagery. Block recommends 11.025-kHz, 8-bit Mono and telephone voice quality. If you're using Windows 95®, you can select "Settings," then "Control Panel" from the "Start" button. Next select "Multimedia" and set the preferred quality to "Telephone Quality." Choose the "Customize" button next to the Preferred Quality pull-down list and verify that the sound is set to 11.025-kHz, 8-bit Mono (otherwise set it to that from the pull-down list).

Satellite Setup

When using the WX-SAT program, the first thing you need to do is set up the parameters for the satellite you're using. While the infrared (IR) pictures can be interesting, I usually capture the visible (VIS) wavelength imagery from the National Oceanic and Atmospheric Administration (NOAA) satellites. You can choose the imagery "Parameters" from either the "File" or "Recording" menu. Figure 1 shows the typical parameter settings I use for NOAA VIS imagery capture.

The "wxsat.wri" file gives a complete explanation of these parameters. I'll briefly describe a few important ones.

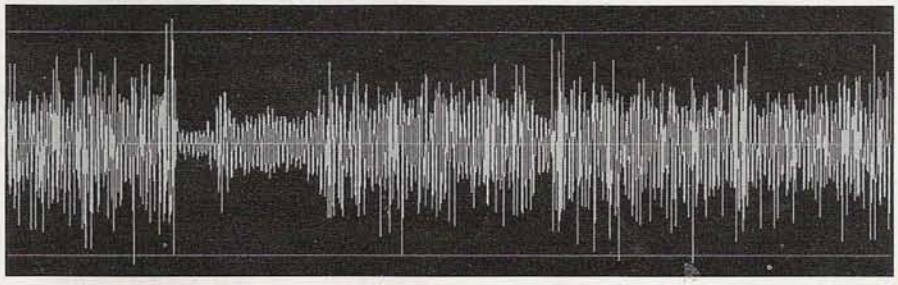


Figure 2. The WX-SAT Test tool. Use this to set the audio peaks so the largest ones go past the gray lines (as shown), but do not clip beyond the borders.

First, notice that I selected "NOAA VIS" as my satellite in the upper left corner. Next, let me draw your attention to two things in the Basic Parameters: the "AM" and the "Basic Amp." The AM refers to the modulation on the audio sub-carrier signal. The Basic Amp gives you a software volume control so you can get the full range of black to white in your picture; the higher amplitudes are the lighter shades in your picture and the lower amplitudes are the darker shades. If your picture is too dark or lacks contrast, you should increase the Basic Amp value.

The Clock Settings, checked as shown, are what I have found is needed to make sure the picture lines up correctly. One other important thing to set properly is the N-S/S-N in the lower right corner. N-S is used for North-to-South satellite passes; S-N is used for South-to-North passes. You need to consult your satellite tracking software (see "Satellite Track-ing") to know whether you have a N-S pass or vice-versa.

The WX-SAT software has an important tool called "Test," available from the "Recording" menu. The test tool has an audio amplitude versus time display (see Figure 2) to help you get the best receiv-

er volume setting. Your volume is set correctly if the highest amplitude peaks go above the gray line (as shown), but are not clipped at the upper and lower limits. You need to make this adjustment when you have an active signal coming from one of the satellites.

Antennas

The antenna is often the most important factor in radio system performance. Signals from the weather satellites are *no exception*. The satellites do have a *reasonably* strong signal: 5 watts Right Hand Circularly Polarized (RHCP) with an Effective Isotropic Radiated Power (EIRP) of decibel milliwatts (dBm). I can get fairly good imagery with a discone antenna, but I get better quality imagery with my 2-meter OSCAR beam. The difference is that imagery copied using the discone tends to have multiple "dropouts" per pass, while the pictures copied using the beam have few if any dropouts. It's also easier to properly adjust the radio volume with the stronger signal coming from the beam.

The main disadvantage of the beam is that you need a two-axis (AZ-EL) rotor to get it to follow (track) the satellite across the sky. If you already have this setup for your satellite station, you're all set. However, the remainder of this section is intended for the operator without fancy satellite equipment.

As I indicated, an antenna like a discone will do a fair to reasonable job, but reports are that a 137-MHz resonant antenna makes up for much of the shortfall. The "fixed" antenna of choice appears to be the *quadrifilar helix* (see Reference 2 in "Resources"). This is not a trivial antenna to build, but, from what I've heard of its performance, it's worth the effort.

If a quadrifilar helix is too complicated for your construction skills or patience, you might want to try a *turnstile* antenna. The turnstile is two perpendicularly oriented dipoles fed 90 degrees out-of-phase to establish circular polarity. References 3 and 4 have information for building practical antennas for weather satellite reception.

If your antenna performance is marginal, you might get a better signal by using an antenna-mounted pre-amp. It's important to mount any pre-amp near the antenna to have a stronger Signal to Noise (S/N) ratio *before* sending it down the coax. (In-shack pre-amps can't recover the signal lost in the feedline.)

Table 2. NOAA Satellite Direct Overflight Times for CQ VHF HQ, Long Island, New York

Satellite ID	N-S Overflight	S-N Overflight
NOAA 12	6:30 a.m.	5:30 p.m.
NOAA 14	3:15 a.m.	2:15 p.m.
NOAA 15	9:00 a.m.	7:00 p.m.

Note: the overflight times occur one hour later during Daylight Savings Time (DST).

Table 2. Daily times of direct overflights of CQ VHF *headquarters by the three NOAA (National Oceanic and Atmospheric Administration) weather satellites. These satellites are in a* sun-synchronous *orbit, meaning that they appear in roughly the same place in the sky at roughly the same time every day.*

Available APT Satellites

There are currently six Low Earth Orbit (LEO) APT satellites from which you can download weather imagery in North America. Table 1 lists their catalog and frequency information. I update this table on my personal Web page (see "Resources") as needed. The NOAA satellites have both VIS and IR imagery that you can download; Meteor 3-5 has VIS only. The OKEAN-4 and SICH-1 satellites have both VIS and IR, but their data is only occasionally available in North America.

Satellite Tracking

I've addressed the satellite tracking topic twice before in this column (see April and July, 1998 *CQ VHF* issues). If you own a computer, satellite tracking software seems to be the most convenient and straightforward way of figuring out when any particular satellite is above your horizon and available for communications. As with the amateur radio satellites, I post current Keplerian elements for the APT weather satellites on my Web page.

NOAA Satellite Pass Times

If you're not comfortable using satellite tracking software, you can still estimate NOAA satellite pass times. The NOAA satellites are in what's known as *sun-synchronous* orbits. The interesting property about sun-synchronous orbits is that they over-fly you at the same local times each day. These satellites use this special orbit type to get consistent sun illumination angles (for taking pictures) on every orbit throughout the year.

Just by monitoring the frequencies, you can learn what time of day to expect each satellite to make North-to-South passes and what time to expect South-to-North passes. (For equatorial and middle latitudes, the North-to-South passes are separated by about half a day from the South-to-North passes.) Passes at very high elevations (direct over-flights) tend to occur at about the same time each day—within 15 to 30 minutes of the *average* direct over-flight time. Alternatively, you may get two consecutive passes, one to your East and then one to your West, usually within an hour of the average direct over-flight time.

As you begin collecting imagery, you'll be able to tell whether the satellite passed to the East, to the West, or directly overhead by observing if your location is on the left side, right side, or down the middle of the picture. As an example, Table 2 lists direct NOAA satellite overflight times for *CQ VHF* headquarters on Long Island, New York. Your pass times may be somewhat different depending on which end of your time zone you're in and how much different your latitude is from that of Long Island (approximately 41 degrees North).

Putting It All Together

I had to play with this system a little before I found a way to get good pictures

every time. If you follow the method I'm about to outline, you should get satisfying results with little effort. Figure 3 is an example of imagery captured from the NOAA 15 satellite using this method.

The first thing you need to do is get the best possible receive signal quality from the satellite. (The receive system is, by the way, the most important optimization point for *all* amateur satellite communications.) You generally optimize the receive by the best combination of an antenna and possibly an antenna-mounted pre-amp, along with a good quality receiver. You'll know you're receiving the satellite when you hear the characteristic "chirping" signal.

Once you can get a good receive signal, you need to set up the Parameters for the satellite (see Figure 1 for an example). When you acquire the satellite's downlink signal, use the WX-SAT software's Test screen to correctly set up the receiver's audio level as shown in Figure 2. Once the receiver's audio level is correct, abort the test mode and select the "Picture and Wave File" option from the Recording menu. Unless your computer is fast, the picture will not automatically begin scrolling across the screen; use the "Manual Sync" option from the Recording menu to see the picture.

I use the "Picture and Wave File" option because I find the picture displayed in real time is not often the best possible quality. When the pass is complete, I replay the wave file into the WX-SAT software using the "Wave Input File" selection, followed by the "Start Processing" option under the "File" menu. I repeat this process as often as necessary, adjusting the "Basic Amp" value in the "Parameters" until I'm happy with the picture quality. With experience, you shouldn't have to make more than one or two adjustments.

Summary

Receiving weather satellite imagery is fairly easy and do-able with very basic equipment. You can use a scanner or amateur rig to get 137-MHz FM reception. You feed the receiver's audio into your PC's sound card and demodulate the picture using WX-SAT software. You can improve your signal quality by building a 137-MHz antenna or adding a pre-amp at the antenna. If you follow the steps I've outlined for using the WX-SAT software, you'll soon be getting your own weather pictures directly from the satellites. ■

Figure 3. An NOAA 15 image downloaded on July 25, 1998. Clear geographic features include the Great Lakes, Cape Cod, Long Island, and Florida.

Resources

For more information on weather satellite reception and station setup, we recommend the following:

1. *An Easy Way to Copy the Weather Satellites*, Eugene Ruperto, W3KH, *QST*, August 1997, pp. 36–39.
2. *The W3KH Quadrifilar Helix Antenna*, Eugene Ruperto, W3KH, *QST*, August 1996, pp. 30–34.
3. *Weather Satellite Handbook*, 5th Edition, Ralph Taggart, WB8DQT, ARRL, 1994.
4. *The Radio Amateur's Satellite Handbook*, Martin Davidoff, K2UBC, ARRL, 1998.

All of the above are available from the ARRL, 225 Main St., Newington, CT 06111; Phone (orders only): (888) 277-5289 or (860) 594-0355; Fax: (860) 594-0303; Internet: <http://www.arrl.org>.

Web Pages:

WX-SAT software:
<http://ourworld.compuserve.com/homepages/HFFAX/toc6.htm>
Keplerian elements and satellite information:
<http://www.mindspring.com/~n2wwd> (my Web page)
NOAA satellite Web page:
<http://psbsgi1.nesdis.noaa.gov:8080/EBB/ml/nic00.html>
Dallas Remote Imaging Group (DRIG):
<http://www.drig.com>

Youth in Public Service

This month we highlight some young hams, in their own words, as they tell us about youth...serving in the public interest.

It might have been a beach day, but...

A Florida teenager won a week at U.S. Space Camp for helping alert people about spreading wildfires in his state, but he decided to donate it to the Make-A-Wish Foundation, which grants wishes to children with life-threatening illnesses, rather than keep it for himself. Richard Paczkowski, KF4BIA, 16, of Edgewater, Florida, won the week at the Huntsville camp from our sister publication, *CQ* magazine, for outstanding service as an amateur radio operator during the Florida wildfires earlier this summer.

"I just try to do what I can for people when I can."—Richard Paczkowski, KF4BIA, 1998 Young Ham of the Year

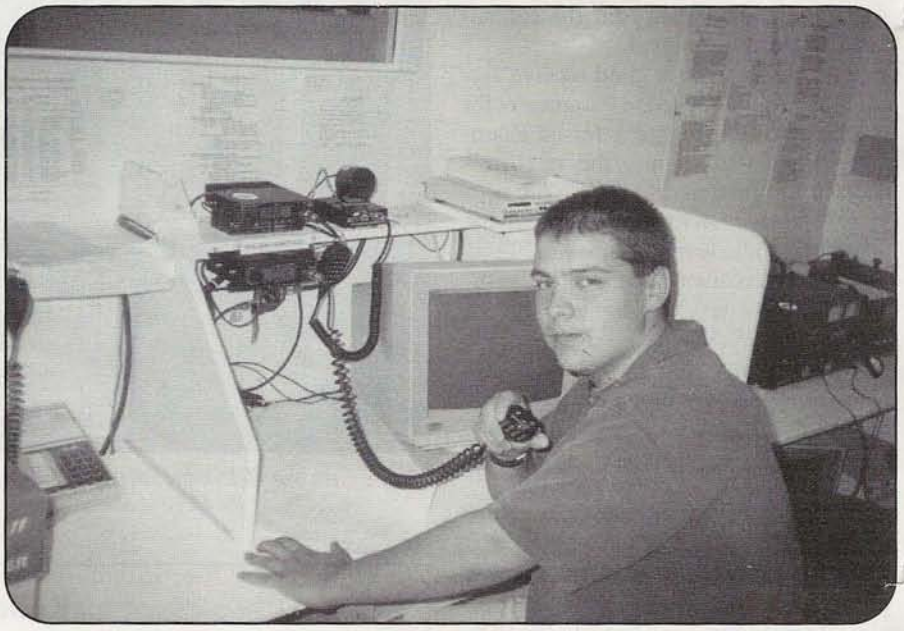


Photo A. Richard Paczkowski, KF4BIA, the 1998 Newsline Young Ham of the Year, at the ham station in the Volusia County, Florida Emergency Operating Center (EOC). As acting Emergency Coordinator, Richard organized ham radio response to Florida wildfires. (Photo courtesy KF4BIA/WA6ITF)

Young Ham of the Year

Paczkowski, who was named the 1998 Newsline Young Ham of the Year, worked for about five days in the emergency operations center at Daytona Beach, Florida, helping coordinate setting up shelters. He was selected as this year's recipient based on his four-year Amateur Radio career that has been dedicated almost exclusively to public service (see Photo A). The week at Spacecamp was in addition to a variety of radio equipment donated by Yaesu USA, the other corporate sponsor of the award.

The Young Ham of the Year Award—sponsored primarily by Amateur Radio Newsline, a recorded news service whose reports are aired on repeaters across the country—is in its second decade. Spacecamp officials were so impressed by Richard's decision to donate his week to the Make-A-Wish Foundation that they awarded him with an additional week—for himself—at their expense. But the real story here is Richard's work in the Florida wildfires.

The fires knocked out phone lines in Volusia County, making radio communications vital. Paczkowski's father, KE4ZTP, is the county's Emergency Coordinator (EC), but when the wildfires appeared under control, he had left town to visit an ill relative. Later, the fires began threatening again, and the American Red Cross asked the younger Paczkowski, an Assistant Emergency Coordinator, to step in.

He arranged for hams to staff communications posts in Red Cross shelters and coordinated volunteer deployments with the EC of adjacent Orange County, which was also afflicted with wildfires. In addition to coordinating staffing, Richard put in several shifts on the air at the county EOC (Emergency Operating Center), often working from 8 p.m. to 1 a.m., then returning to work from 8 a.m. to 10 a.m. "I just try to do what I can for people when I can," Paczkowski said.

Youth at Dayton...

"My father's father was a ham, but my father didn't get his ham license until he was 40 years old," John Pituch, W2MBY, of Livingston, New Jersey, told the gathering as he began his talk at this year's

By Bob Josuweit, WA3PZO (bjosuweit@aol.com)

The Young Ham of the Year Award

Do you know a ham age 18 or younger who has distinguished himself or herself through amateur radio? Each year, qualified nominees are sought for the Newsline Young Ham of the Year Award, administered by the Amateur Radio Newsline with corporate sponsorship by *CQ* magazine and Yaesu USA.

Nominees must have made a significant contribution to amateur radio, or used amateur radio to make a significant contribution to their community or the nation (getting a license at age five doesn't qualify you for consideration). Nominations for each year's award are accepted between January 1 and June 30, and must include supporting documentation. The award is presented each summer at the Huntsville Hamfest and includes a plaque, a free week at Spacecamp, a variety of publications (courtesy of *CQ*), and an assortment of radio equipment (courtesy of Yaesu).

For official nominating forms,contact award administrator Bill Pasternak, WA6ITF, 28197 Robin Ave., Saugus, CA 91350; or send an e-mail request to <newsline@ix.netcom.com>.

Youth Forum at the Dayton Hamvention in Ohio.

I got my license a little while ago when I was 11, so I guess my father did something right. A few things my father did with his radios didn't seem very exciting. But one day he told me about a running race he was going to help out with. I went with him and it was cool. Everyone was cheering the runners, who were brightly dressed. My father said something to a nearby motorcycle cop and he suddenly took off. My dad said that he had heard on his HT that a runner was down, and that the EMT vehicle was not in sight. The policeman correctly assumed that the EMT driver was lost in the park. My father and amateur radio had saved the day. This really impressed me. Here my father was an ordinary person, who could help people with his hobby, and he was having fun doing it.

John, W2MBY, now 12 (see Photo B), got his Tech Plus license after being hooked at Field Day. Public service is just one of the ways John stays interested in ham radio. "The first time that I was assigned to my very own checkpoint during a public service event, I felt so important." Pituch continued. "At my next event, I had to use a J-pole in a tree and a gel cell for more power to contact net control. I must have looked pretty important, as five policemen who saw me asked for a demo. It makes you feel pretty important when you give a policeman instructions on what to do," Pituch added. "Talk about a boost in self-esteem. This is what makes public service worth the effort."

Pituch offered this advice to adults who want to sell ham radio as a hobby to kids:

First, make sure you have a young ham present as part of your presentation. Stress how important amateur radio is to the government during disasters. Then show how young hams can help their community during public service events, and have fun doing it. Then show them how they can communicate on a worldwide basis using HF. If they ask how hard it is to get a license, just point to the kid and say that he's a ham. That way the kids will say to themselves; "Hey, I can do that."

Carolina Ready...

We recently met another young ham, Scott Wolf, KF4UXI, of Southern Shores, North Carolina, via the Internet. He told *CQ VHF* of his interest in public service and answered our questions:

The Attendance Manager at Manteo High School on the Outer Banks started an amateur radio club. When I entered ninth grade, I became aware of the club and, having an interest in electronics, I decided to join. Within about two months, I got my Tech Plus license. Through the school and club, I became a member of the Outer Banks Repeater Association (OBRA), which volunteers for many community activities.

This year, I helped with communications at one of the regional bike race rest stops. During the race we had problems locating the repair van. So I took my portable transceiver and rode around with the bike repair van. I was able to listen to the calls for help and direct the repair van to the correct places. Our club also helped with communications during this year's storms. Later this year I am volunteering at the Visually Impaired Persons (VIP) fishing tournament sponsored by the local Lions Club. I look forward to volunteering for any additional public service needs in the future.

CQ VHF: *What do you find interesting in public service activities?*

It is exciting to be able to help your community in your spare time and during emergencies. It gives me a sense of accomplishment. I love to volunteer and meet new people. It is a great way to make friends and learn from those more experienced. I am currently a Life Scout and have completed all of the required merit badges for Eagle Scout. I have found many opportunities during my scouting advancement to work with different community projects such Food for the Needy at Thanksgiving, Annual Clean the Beach day, any many more service hours working on other scouts' Eagle projects. I expect to complete my final Eagle project during June of this year. I find I get to have fun and help people at the same time. You can't beat that.

Photo B. John Pituch, W2MBY, proves that ham radio public service communication doesn't have to be strenuous. Here, he's operating a race checkpoint from the comfort of a lawn chair. (Photo by Steven Pituch, W2MY)

CQ VHF: *What would you say to encourage to other young hams to become involved in public service/emergency communications?*

The goal of amateur radio is to learn more about radio communications and to help people. With our communication ability, we are sometimes the last line of hope during emergencies. I have found that all of my volunteer work to date has been a very rewarding experience. I would encourage all hams, young and old, to volunteer as much as they are able.

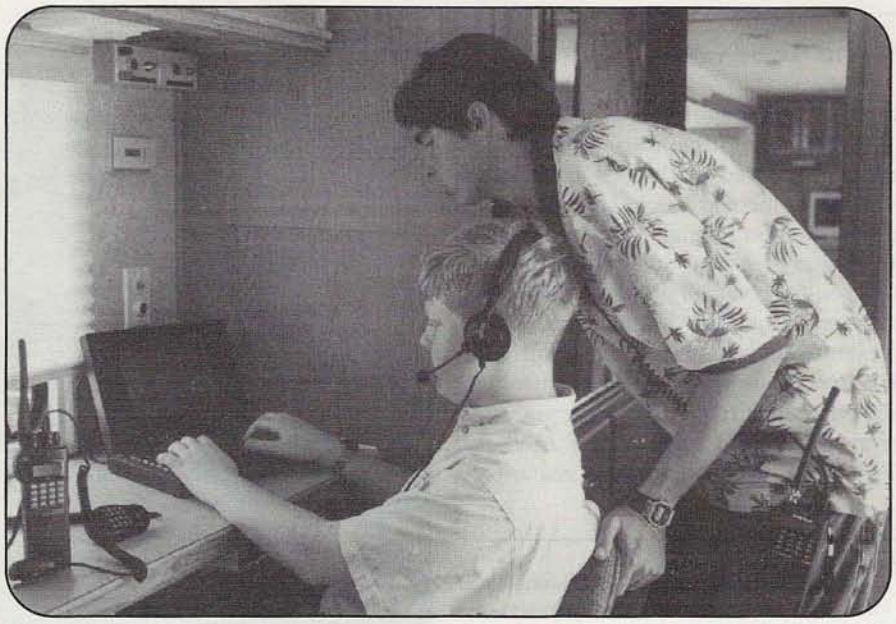


Photo C. Scott Wolf, KF4UXI (sitting), and Alan Hall, KF4RQO, operate the packet station inside the Dare County, North Carolina, Mobile Command Van. (Photo courtesy KF4UXI)

It is a great learning experience. I have worked with many people from all walks of life and have really enjoyed the uniqueness of this new hobby.

Scott's classmate, Alan Hall, KF4RQO, also helps with various public service events. Alan spent his summer at Boot Camp with the Coast Guard. He's going into their Reserve Program and is now attending his senior year in high school this fall. He'll do his reserve drills in the area and then, next summer, he's planning to go to the Coast Guard Electronics School. Both Scott and Alan are pictured in Photo C.

Eagle Scout Gets Ready with Ham Radio

Jonathan Miner, WJ2RM (Photo D), of New City, New York, used his interest in amateur radio to earn his Eagle Scout badge. According to the Boy Scouts of America, fewer than 3% of all scouts earn the rank of Eagle Scout (see "An Eagle Scout Project"). When we asked John how he got interested in public service communications, Miner replied, "I like giving something back to the community. Especially since I can do it in a way I enjoy." Here's his story:

Before beginning any [Eagle Scout] project, there was a need to determine if there was a need for it. I evaluated the emergency communications needs in the area and determined there was a need for a digital linkup between two hospitals and the Rockland County Fire Training Center to provide an additional means of information processing and assisting in an emergency situation. The link would enhance communications that now exist between a disaster site and the individual hospitals, and could be used during emergencies to transfer data between these centers, in conjunction with other modes of communication.

"It is exciting to be able to help your community in your spare time and during emergencies. It gives me a sense of accomplishment."—Scott Wolf, KF4UXI

The digital link would enable patient information to be sent to the various hospitals and to the Fire Training Center, where the Emergency Management Office (EMO) is located. This will better inform the personnel at the disaster site as to the ability of the local hospitals to care for specific injuries...and to better inform the hospitals, so they will be able to prepare for incoming patients. It will also serve as a backup system, should other major modes of communication (telephone, cellphone, radio) fail or become overloaded, as is common in most major emergencies. A digital format was chosen since it ensures that the information is received and recorded properly, under any condition, and because digital modes require minimal operator training and skill.

Miner's project was to create a digital communications network, using amateur radio frequencies, through which the hospitals could transmit information about their capacity to accept casualties in the event of a major disaster. It also enhances the transmission of information about the injuries of patients being dispatched from the disaster site. To Miner's credit, this was the first amateur radio equipment installed at hospitals in Rockland County. The project was com-

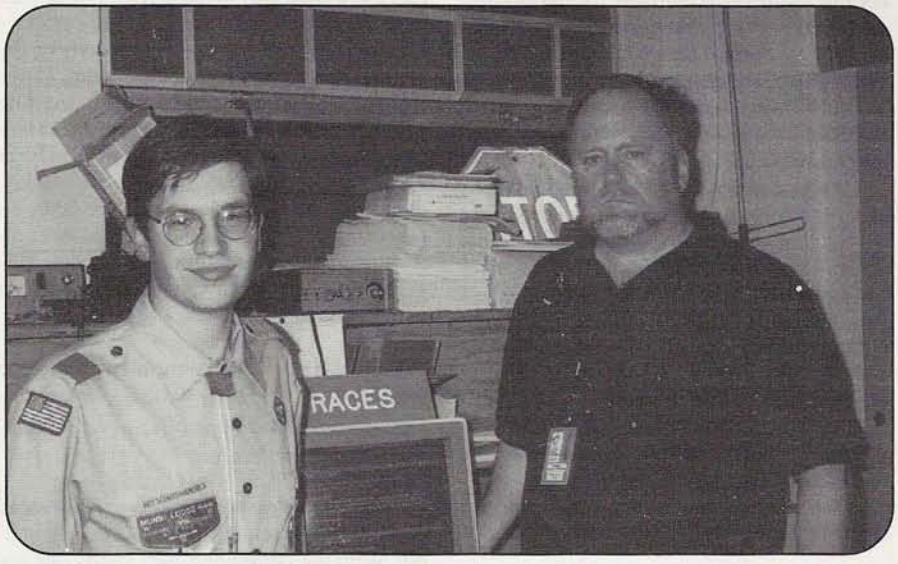


Photo D. John Miner, WJ2RM, and Rockland County, New York, RACES Director Steve Koeper, KF2JA, at the county Emergency Management Office (EMO). As his Eagle Scout service project, John set up a digital ham radio link between the EMO and two hospitals. (Photo courtesy WJ2RM)

An Eagle Scout Project

In order to become an Eagle Scout, one must plan, organize, and carry out a community service project. Part of that process is writing up a plan that identifies the need, explains how the project will meet the need, and how the Scout will demonstrate leadership skills by organizing and supervising the project. John Miner, WJ2RM, shares some of his proposal that helped him become an Eagle Scout:

I. Rockland County currently does not have a system available for use in an emergency which is capable of sending mass amounts of data between the hospitals and a RACES (Radio Amateur Civil Emergency Service) central point. I contacted Steve Koeper, director of RACES for Rockland. He was able to provide the names and phone numbers of the people I needed to contact at the local hospitals and the Fire Training Center. The two hospitals' representatives gave me a commitment to participate in the project.

II. It was necessary to make a list of the equipment needed with the approximate costs. I submitted it to each hospital for approval. They all agreed to purchase the equipment involved (except for the computer), and to provide space for the equipment in the hospital. I contacted the Crystal Radio Club for the donation of the computers. They will supply three (3) IBM AT computers for the project, if needed. I can obtain any additional minor donations of wiring and connectors needed from individual members of the Crystal Radio Club.

III. It is now necessary to contact the hospitals again, to be sure the needed equipment has been ordered and is ready for installation. I will inspect each hospital's equipment to be sure it is correct and complete. At this time each hospital should install its antenna. To ensure the safety of scouts and other participants in the project, the hospitals will put up their own antennas.

IV. Equipment installation areas will be cleared and cleaned. The computers, TNCs, and Radios (Exhibit G) will be installed, so testing on the system can be accomplished. Adult supervision of Scouts will be maintained at all times.

V. Testing of the various components will be necessary as each portion is installed. Any bugs that may appear during testing will be corrected. A similar installation process will be followed at each hospital. Only minor computer programming, frequency, and protocol changes are needed at the Fire Training Center to make their system compatible with the hospitals' radio network.

VI. Following the installations at each hospital, a clean-up of the area will be done. I will make sure that everything is in working order and ready for use.

VII. A series of testing the hook-ups will be necessary to ensure that all the hospitals and the Fire Training Center can communicate digitally, as planned.

VIII. It will be necessary to thank everyone involved with making this project a success. Thank you letters will be prepared and given out.

IX There is a possibility that Helen Hayes Hospital in Haverstraw will also join the network. I am currently in negotiations with them.

I believe that my leadership will be demonstrated in the following ways:

1. As head of this project, I will make sure the work is accomplished, as planned.
2. I will be contacting and working with hospital officials, convincing them to support and maintain the project.
3. I will be directing scouts in supportive tasks, such as cleaning the areas involved and assisting the setup of equipment. The scouts would help to do such things as measuring and cutting wires. They will solder connectors and work with the radio transmission line. This will provide them with a great opportunity to learn about computers, radio transmissions, and emergency communications.
4. I will be organizing scouts and other team members for the tasks of testing the equipment after setup.
5. I will be working with RACES Coordinator to make sure that the system will meet all established standards and protocols necessary for its use in emergencies.

"I like giving something back to the community. Especially since I can do it in a way I enjoy."— John Miner, WJ2RM

pleted in October, 1997, after Miner faced, and solved, several problems along the way.

The biggest problem was trying to work out times that I could gain access to the hospitals. Since I wanted to work on the weekends, they had to grant me security clearance. Because of this, I had to plan the time needed a week ahead.

I had no problems while assembling the components (radio cables and wire connections) and setting up the system at Helen Hayes Hospital. When I added Good Samaritan Hospital on-line, there were some difficulties. When we brought in the equipment, I realized that the electrical outlet they provided was in the wrong spot. Fortunately the head custodian was on duty and was able to provide us with an extension cord. We got everything hooked up, but the computer would not work. I decided to check it out. Inside, I found that one of the cards had come loose from its socket. When the card was replaced, everything worked.

I had one more problem during the first test with Radio Amateur Civil Emergency Service (RACES) officials. At Good Samaritan Hospital, the cable that connected the Terminal Node Controller [TNC] to the radio had been knocked loose. Because of that, it could not send back any data to the Emergency Management Office. I had to fix the cable and add reinforcement to it so it would not come loose again. At the final test of the system, everything worked and both hospitals were able to communicate with the EMO. The project was a very gratifying experience for me. It made a significant contribution to our community. I have learned a lot about planning and carrying out a complex project. I discovered that even the best plans do not work exactly as laid out. I also learned that one always has to be prepared to adapt, and to compromise when unplanned events happen.

Tell Us YOUR Story

This month we saluted young hams serving in the public interest. Do you have a story to tell about a public service or emergency communication event? Let us know about it. Send your information via e-mail to <Bjosuweit@aol.com> or <CQVHF@aol.com>, or by regular mail to "In the Public Interest," c/o *CQ VHF* magazine, 25 Newbridge Rd., Hicksville, NY 11801. ■

Hams & Hurricane Bonnie

An inside look at what you didn't see on the news...in this diary-style report from a ham who was there.

By Frank Ebbinghouser, N2EMR
Azalea Coast ARC, Wilmington, NC

Monday, 8/24/98:

Tensions were high as Hurricane Bonnie slowly crossed the Atlantic. The New Hanover County, North Carolina, Office of Emergency Management was on standby as hurricane warnings were issued for the southeastern U.S. ARES (Amateur Radio Emergency Service) nets were testing communications and links were made between the various counties all up and down the coast.

Tuesday, 8/25/98:

All eyes were on the weather as Hurricane Bonnie wobbled its way toward North Carolina. Anxiety levels were very high among the residents and summer visitors, with Hurricanes Bertha and Fran still very fresh in our collective memory. The area still has not fully recovered from the devastation caused by hurricanes in 1996. We all hoped Bonnie would go elsewhere, but a few hours later, our hopes appeared to be in vain.

At 8 a.m., ARES was activated and the job of setting up the shelters began. The shelter boxes were delivered and local ARES members began connecting and testing the radios and computers in order to assure communications. Stations were located at New Hanover County EOC (Emergency Operating Center), American Red Cross, National Weather Service Wilmington (Skywarn), along with three shelter locations. The setup was made more difficult by the exodus of several hundred thousand visitors leaving the area, clogging roads and placing an additional strain on resources.

Wednesday, 8/26/98:

Residents began to panic as the track of Bonnie targeted Wilmington. You could not find generators, plywood, batteries, bottled water, or ice. The stores were cleaned out of storm supplies. Skywarn was activated and reports started pouring into the National Weather Service as the leading edge of the storm began to cover the area. Winds started gusting to 40 mph and small amounts of damage began to occur. The shelters were filling up and the hams were passing traffic via packet to the EOC and Red Cross as to needed supplies and conditions in the shelters. During the height of the storm, Pender County lost its ARES repeater and the K4GMP (Skywarn) repeater was pressed into service for their use.

"Residents began to panic as the track of Bonnie targeted Wilmington. You could not find generators, plywood, batteries, bottled water, or ice. The stores were cleaned out of storm supplies."

Thursday 8/27/98:

Conditions in the shelters were barely tolerable for the 2,500 evacuees due to sewage plants being overwhelmed, and sewage backups occurred. In addition, intermittent power outages occurred when two generators failed and hundreds of evacuees were left sweltering in the dark in 90-degree heat. Fortunately, the EOC was able to bring some small gen-

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"The National Weather Service Wilmington office lost power and phone service, the backup generator failed, and countless messages had to be passed via ham radio."

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Contest Results

Results of the First North American HSMS Contest

If KM5PO's article in the September issue persuaded you to try high-speed CW meteor scatter (HSMS), you should be set up and operational in time for next year's HSMS contest. Here are the results of this year's event, held in May.

By Jay Kesterson, KØGU
(kOgu@verinet.com)

Here are the results of the First NA HSMS contest, held May 2 and 3, 1998, during the Eta Aquarids meteor shower. The Eta Aquarids added some improved propagation, in the mornings, over random meteor counts. Almost all contacts were made in the morning hours, and all QSOs made on 144 MHz, via meteor scatter, of course.

It did prove difficult for the Limited class stations to make many QSOs. Lack of active stations and the requirement that all QSOs be random added to the difficulty. In the future, some possible rules changes and more HSMS stations should help this situation. Also KM5PO's portable operation demonstrated that we need a rover class. Much was learned from the first attempt at a contest.

Thanks to N7STU for checking the logs (I checked his). Certificates should be mailed in late September. Thanks to the Western States Weak Signal Society for sponsoring the contest. ■

Unlimited Class (> 5 kW ERP)

Call	Grid	# of QSOs	# of Grids	Total Points
KØGU	DN70	11	11	242
W8WN	EM77	8	8	128
NØKQY	DM98	6	6	72
KM5PO/p	EM24	4	4	32
K5IUA	EL29	3	3	18
KM5PO/p	EM21	3	3	18
KM5PO/p	EM22	2	2	8
W6MT	CM87	1	1	2
KM5PO	EM23	1	1	2

Limited Class (5 kW ERP or less)

Call	Grid	# of QSOs	# of Grids	Total Points
VE5UF	DO61	2	2	8
KB5WMY	EM32	2	2	8
KBØVUK	EN34	1	1	2
VE3CWJ	EN96	1	1	2
KOØU	FN42	1	1	2
N7STU	DM07	1	1	2

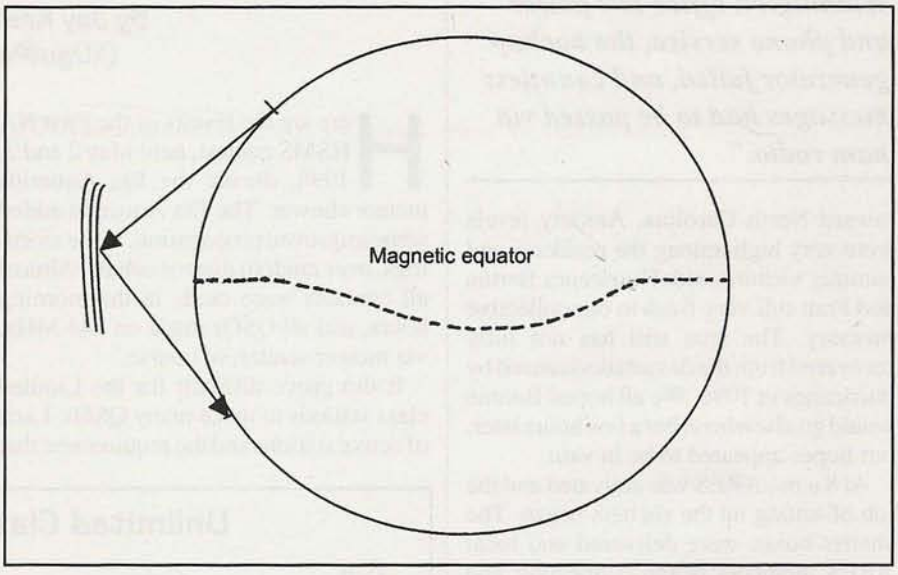
Transequatorial Propagation on 6 Meters

As the sunspot cycle picks up steam, your chances of making DX contacts via "TEP" improve...especially if you live in the deep south.

While hams in higher latitudes can enjoy occasional propagation activity, such as aurora, on the Magic Band, it's not often available to hams in the lower latitudes of our world. The reverse is true for *Transequatorial Propagation,* or *TEP* for short. Around the spring and fall equinoxes, many 6-meter operators in the southern U.S. enjoy contacts with places like Argentina and Brazil via this exciting mode!

This mode is generally present during the equinoxes throughout the sunspot cycle, but it seems to become stronger and more common as sunspot activity increases (as it's doing now). Signals are generally weak with some fluctuation, yet occasionally, openings can be quite strong.

"Around the spring and fall equinoxes, many 6-meter operators in the southern U.S. enjoy contacts with places like Argentina and Brazil via this exciting mode!"



Transequatorial Propagation (TEP) allows contacts between stations that are equidistant from the magnetic equator, which tends to wander in relation to the geographic equator. Occasional sporadic-E links may make contacts possible over even greater distances.

What Is TEP?

TEP is a form of *F*-layer propagation which is present when heavy ionization occurs over the area of the magnetic equator (*which doesn't always match up with the geographic equator—ed.)* and stations in certain locations on either side of the equator can make contact with each other. The key is that both stations must be roughly *equidistant* from the magnetic equator.

There are some very common paths that have actually become somewhat predictable on the Magic Band, such as the Mediterranean area into Southern Africa, and the southern U.S., Mexico, and the Caribbean area into the South American area on the other side of the equator. It's a common mode of propagation on 10 meters.

Some TEP Examples

Tom Glaze, KC4SUS, of Miami, Florida (EL95), regularly works into Argentina via TEP during the spring and fall equinoxes. One of Tom's best days of TEP-related activity occurred on April 6, 1994. For an hour, starting at 3:00 p.m. local time, Tom was able to work several Argentine stations—LU1DMA, LW5EJU, LU9AWA, LU8DIN, LU1EDH, and LW2DDS—in both the GF and FF grid fields. During a recent opening in October of 1997, he was also able to work into Brazil via TEP.

TEP is not confined to Florida. Another 6-meter friend of mine, Bob Mutchler, WB4OQX, in EM83 in Georgia, was able to work Argentina and Uruguay during the first few days of October, 1997.

Sporadic-E Links

Over in Europe, TEP occurs often from the southern countries into Africa. And occasionally, even stations at the higher latitudes can tap into TEP activity via a sporadic-*E* link. For example, Ray, PAØALN, is located at around 50 degrees north latitude (*farther north than most of*

By Ken Neubeck, WB2AMU (kneubeck@suffolk.lib.ny.us)

"Over in Europe, TEP occurs often from the southern countries into Africa. And occasionally, even stations at the higher latitudes can tap into TEP activity via a sporadic-E link."

the continental U.S.—ed.) and has, over the years, caught a couple of *Es*/TEP openings. In the spring of 1993, he worked into 7Q7 (Malawi) and ZS6 (South Africa) during the late afternoon. More recently, he was able to work TR8CA in Gabon at 1614 Z on October 15, 1997. A few days later, he heard V51KC in Namibia coming in at 5 by 7, but he was not able to work him.

What about the Northern U.S.?

It was believed for many years that it's rare for stations in the northern U.S. to be able to tap into this mode, as another propagation link such as sporadic-*E* would be required to connect to the southern states area. As sporadic-*E* is very rare during the months of March, April, September, and October—when TEP is more common—you can see why very few examples have been recorded, particularly during the quieter years of the sunspot cycle.

Yet, this thinking is now beginning to change as the result of apparent *Es*/TEP activity that occurred on November 26, 1997. On this date, not only did southern U.S. stations work into Brazil, but a sporadic-*E* opening occurred to the northeast that allowed a number of *New England* stations to work into Brazil as well! *QST* magazine VHF editor, Emil Pocock, W3EP, worked PY5CC on 50.110 and then called CQ and worked two more stations. The signals had the weak, watery quality associated with TEP. It now appears that not only does TEP activity increase with increased sunspot counts, but also that the season may extend further into November, when sporadic-*E* is more common.

Be a Researcher!

All of this knowledge has become possible because of the diligence of active Magic Band operators! But there's clearly much more to be learned about this phenomenon. Why not join the "TEP Research Team"? All you have to do is get active on six, listen for those weak, watery signals (if they come from the north, think Aurora; if they come from the south, think TEP), and be sure to report your DX contacts on the Internet e-mail "reflectors" and to the VHF weak-signal columnists: Tim Marek, K7XC, here at *CQ VHF* (k7xc@vhf.reno.nv.us), Joe Lynch, N6CL, at *CQ* (jlynch@post.cie.smu.edu), and Emil Pocock, W3EP, at *QST* (w3ep@arrl.org). And when you make your first contact into South America on six, you'll "believe in magic" on the Magic Band. ■

Do *you* have a 6-meter adventure to share? If so, we'd love to hear about it. Just contact us by mail or e-mail.

Reader FEEDBACK!

Reviewing Gordon's Review

Dear *CQ VHF* (and Gordon West, WB6NOA):

First I would like to commend you on your magazine. I'm glad the VHF/UHF arena is finally being given its due, and I appreciate the efforts of all involved.

However, I believe the review of the Kenwood TS-790A Multimode transceiver may be somewhat confusing to some readers. The article seems to imply that the unit is a recent addition to the Kenwood line (referring to three-year-old technology), but I have had one for the last five years, and the unit has been on the market for at least 10 years; I have a Summer 1988 catalog from AES that lists the unit.

Indeed, this unit has been a venerable Field Day workhorse, having served as the VHF/UHF station for our club's Field Day operations for the last five years. (It even provided our club with our only 1296-MHz SSB contact on Field Day, with WB6NOA himself!) It also works great for packet radio!

This unit has met or exceeded all my expectations, but there seems to be a discrepancy as to the frequency coverage on the lowest frequency band. My radio tunes from 140.000 MHz to 168.000 MHz, not down to 137 MHz as stated in the article. Perhaps WB6NOA was using a MARS/CAP modified version, or Kenwood expanded the receive coverage in more recently produced radios.

All in all, the unit *is* a great radio, and, yes, it is at a premium price, but I feel well worth the investment, and I intend to be using mine for many years to come.

Yours truly,

Larry J. Rolewic, WA9SVD
Long Beach, California

Larry—We're sorry if there was any confusion, and we should have been clearer about the rig's vintage. Gordon did say in the review that he'd had his unit for over a year (granted, that's not 10), and that what prompted the review was "the appearance of this equipment at flea markets, selling for $1,000...." That's less than half of what a new TS-790 goes for today. In addition, we are occasionally reviewing older rigs (such as the Yaesu FT-x90 series) that are still on the market and with which relative newcomers to the VHF SSB market may not be familiar. But again, we should have been clearer. Glad you're enjoying your 790!

—W2VU

Harmonious Antennas

Thoughts on keeping harmony with your neighbors and family...and still getting a "signal squirter" on the air. We also give you plans for three basic antennas.

Moving is like starting over, at least where antennas are concerned. The old ones come down, and new ones have to go up at the new house. If you own a stand-alone house, you have a lot of freedom. Unless you're dealing with deed restrictions in a planned community, you can probably get some sort of antenna outside, maybe even two or three for different operating needs. Life is relatively simple in that case.

But what about those of us who rent or live in condos? If the landlord or condo police are particularly vigilant, it can be nearly impossible to get an antenna put up outside, even a VHF or UHF model. What do you do then?

"Early Geek"

Maybe you live alone and you really couldn't care less what your home looks like. In that case, you can pretty much do whatever you want inside. Put a 5/8-wave mag-mount for 2 meters on top of the fridge. Just let the black cable drape down over the side of the off-white appliance and run over to the counter where you have installed your rig and power supply. Nice. Early geek. You can always accessorize with empty pizza boxes.

But there are some of us who share our lives with others—often people who don't appreciate our passion for ham radio. How are we going to get a decent antenna up while preserving family harmony? A little thought and ingenuity goes a long way in this situation.

Let's spell out some assumptions here. Since this is a beginner's column, we'll assume that our primary need is for a vertical antenna to access some of the local repeaters on 144, 222, or 440 MHz. Also, we'll assume that you're too far from one or more of those repeaters to get in reliably with your "rubber duck" antenna. Where to start?

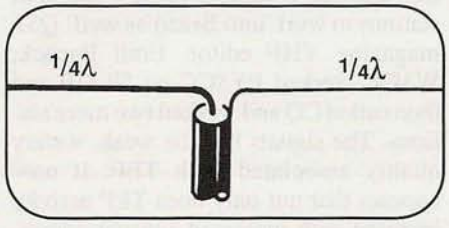


Figure 1. A half-wave dipole is the simplest of antennas, with a quarter-wavelength (λ) element attached to each side of a piece of coax. Mount it to any convenient non-metallic surface at least six or eight inches away from any metal objects. See the Table for sample element lengths.

First, you need to survey the situation to see what's available for you to take advantage of. Sometimes it just makes sense to put the ham equipment in a particular location for whatever reason. Once you have the location, you then make the antenna installation to match. There are always trade-offs where antennas are concerned. Height, short runs of coax, and bigger coax are good things, from the perspective of an efficient antenna. But you can't always have everything.

A Personal Example

In my case, I live in a two-story town house with three bedrooms upstairs. We use one of the bedrooms for a home office, and it's already ugly in Wendy's eyes (computers, printers, file cabinets, copier, etc.). This is a no-brainer: the ham station goes in one corner of the home office, next to the computer. But which corner?

Facing the computer desk, the left corner is close to a pair of windows. This is a possibility. I could make a vertical dipole (Figure 1, instructions below) out of magnet wire, tape it to the window, and get pretty good coverage. In my case, there are a couple of drawbacks. The windows are the sash variety, and the individual panes are not that tall. From tip-to-tip, a 144-MHz dipole figures to be about 38 inches long. So, with 32-inch window panes, the dipole would overlap the pane by several inches unless it was tilted almost at a 45-degree angle. And the window frames are made of aluminum, which means you can't get the dipole legs close to the edges. Furthermore, the windows are designed to slide up and down, creating a potential flexing problem for the feedline. Finally, we have mini-blinds on the windows, but no curtains. That means anytime the blinds are open, you'll be able to see the antenna and feedline. With curtains or drapes, you can hide the dipole and feedline behind them, but that's not a possibility here without purchasing additional window treatments.

"How are we going to get a decent antenna up while preserving family harmony? A little thought and ingenuity goes a long way in this situation."

So, what about the other corner? It butts up against a walk-in closet. Now we're getting somewhere. The worst case scenario would be to simply hide an antenna in the closet. Room permitting, it could be a commercial type. Or I could make a vertical dipole out of magnet wire, speaker wire, or whatever I have available and

By Peter O'Dell, WB2D (success@qth.com)

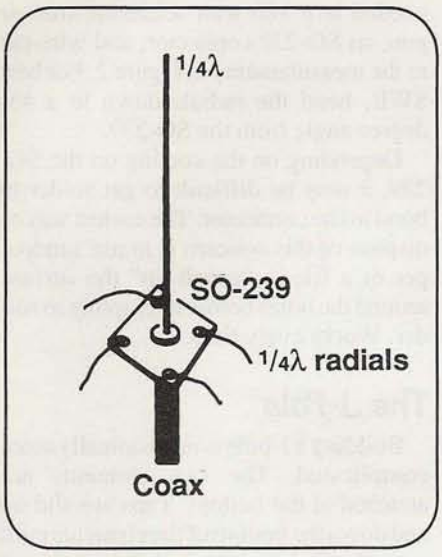


Figure 2. The quarter-wave groundplane antenna using an inverted SO-239 for attaching the elements. Terminate the cable with a garden-variety PL-259 and screw it into the SO-239. The vertical radiator is soldered to the pin that normally accommodates the coax center conductor. Again, see the Table for sample element lengths, and bend the radials down at a 45-degree angle.

tape it to the inside of the closet wall. Getting the feedline into the closet is easy. The interior construction is plasterboard over a 2 x 4 framework, so all that's necessary is to drill a hole through the two pieces of plasterboard and fish the line through with a coat hanger.

But there's an even better option in my case, since we have access to the attic. The only thing in the attic is part of the air conditioner, some duct work, and a lot of insulation. I constructed a quarter-wave vertical groundplane with radials made of some brass stock that I had purchased at a hobby store. I used an inverted SO-239 connector to make the antenna (Figure 2, instructions below) and sat the antenna on top of a convenient run of air-conditioner ducting.

Before taking the antenna to the attic, I had gone into the closet and drilled a $^3/_8$-inch hole in the ceiling between the joists. Since the attic is full of blown-in insulation, it would be almost impossible to find this hole without some sort of marker. So, I simply wedged a long screw driver into the hole. Once in the attic, it was easy to spot the screw driver sticking up through the insulation. I moved the insulation away from the screw driver, pushed it back down out of the hole, and inserted the coax into the hole. It was a simple matter of feeding the line down through the hole. I used some wire staples to hold the cable to the wall and routed it through the wall into the office. The only tense moment came when I thought that I might not have allowed enough cable to reach from the antenna to the radio. I had intended to have a good five feet extra, but the overage came to only about 18 inches, which is cutting it a bit too close for my tastes. But it was an adequate amount, and there was no need to add an extra jumper line.

Then, it was a simple matter of adding a connector to the coax, checking the SWR, and making that first contact. The SWR was under 1.4:1, which I can live with (so can my transceiver). Now, I'm able to check into repeaters 30 to 40 miles away anytime I want to.

I used ordinary *black* RG-58 for this run, because no one is likely to see it. It's only about 20 inches from where the feedline exits the closet wall to the desk where the radio is located, and there's a small file cabinet in this space. Had it been necessary to run the coax half-way around the room, I probably would have gone with a white jacket variety. But it is much more expensive and hard to find, unless you stumble across some at a fleamarket.

Hiding in Plain Sight

What if I didn't have the closet or attic available? What then? Sometimes the easiest way to hide something is to put it in plain sight. Make it very obvious. Chances are, your spouse is not going to think of a Ringo Ranger as a work or art to be displayed in the living room. But there are other antenna designs that lend themselves to those who have an artistic streak. Several years ago I came up against a situation where it was impossible to get an antenna out of sight. Finally, I hit upon the idea of doing something rather "artsy" with a J-pole.

I obtained an eight-foot section of $^5/_8$-inch brass tubing and cut the elements for the J-pole out of the brass. Then, I polished it until it had an almost chrome shine to it. I went to a craft shop and purchased a large can of fiberglass casting resin and tinting to give it an aquamarine color. An odd-shaped, half-gallon jug became the mold for the base. I embedded a small string of Christmas tree lights through the bottom of the mold, prepared the J-pole, mixed the fiberglass, and poured it into the mold. After the fiberglass set, I cut the jug away and added white-coax feedline. The result was a J-

Table. Element Lengths

Band	1/4-wave	3/4-wave
146 MHz	19.25 in.	60.5 in.
223 MHz	12.6 in.	39.6 in.
445 MHz	6.3 in.	20 in.

Table. Element lengths in inches for popular VHF/UHF bands. To calculate lengths for other specific frequencies, use the formula 2808/Freq (MHz) for quarter-wave measurements in inches, and 8838/Freq (MHz) for 3/4-wave measurements in inches.

pole antenna that sat on the small desk in the living room and functioned as a night light of sorts. My only mistake was in neglecting to provide a way to change the bulbs. Once it was no longer a light, the antenna lost some of its panache.

The antennas mentioned in this column are all easy to build with the simplest of tools—at least, up through 70 centimeters. Diagrams and construction details are given for 146, 223, and 445 MHz (near the center of FM activity in each band). See the Table for sample element lengths. More detailed information on constructing the quarter-wave groundplane and the J-pole can be found in chapter 20 of *The ARRL Handbook*.

The Half-Wave Dipole

The half-wave dipole is the simplest, most fool-proof, resonant antenna going. You can't mess this up, no matter how little experience you have. Suppose you have a window that's suitable for such an installation (meaning, basically, it's tall enough and there are curtains or drapes behind which you can hide the antenna), here's what I'd suggest:

The smaller the wire, the less chance of anyone noticing it, so I recommend magnet wire (No. 22 or so) for the elements and RG-174/U for the feedline. Of course, you want to keep the feedline as short as possible when using the 174—certainly no more than six to 10 feet. Simply cut two 19.5-inch lengths of the wire and solder one to the center conductor of the feedline and the other to the braid (see Figure 1). Using clear tape, tape the antenna to the inside of the window with the elements running straight up and down, and the feedline coming off at a 90-degree angle toward the wall. Staple the feedline to the window molding and run it to the rig. What could be simpler than that?

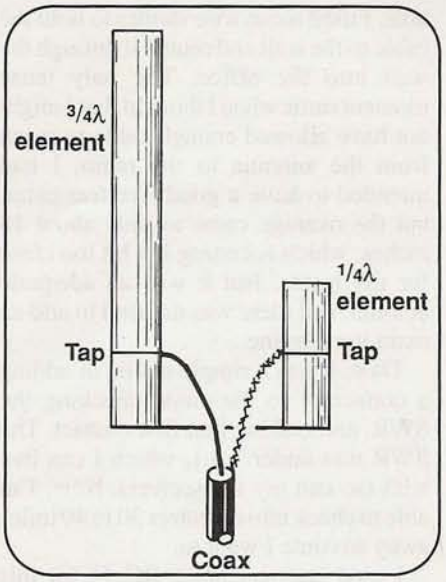


Figure 3. The simple J-pole antenna. The construction material can be any good conductor. See text for details on element spacing and feed systems.

This antenna will provide a slight mismatch, say on the order of 1.4:1 or so. If you absolutely have to have your SWR flat, then you can install the two elements in a slight vee (the vertical equivalent of the traditional HF inverted vee). Varying the angle of the vee will change the SWR. You can experiment with what angle brings it down to a minimum.

The Ground Plane

Building a quarter-wave ground plane is almost as simple. Recent editions of the *ARRL Handbook* have shown a version of this antenna that has the SO-239 mounted on a small piece of aluminum. The radials are then bolted to the aluminum sheet. That seems like a lot of busy work to me. Why not solder the radials directly into the screw holes of the SO-239? All that's needed is a 100-watt soldering iron or gun, an SO-239 connector, and wire cut to the measurements in Figure 2. For best SWR, bend the radials down to a 45-degree angle from the SO-239.

Depending on the coating on the SO-239, it may be difficult to get solder to bond to the connector. The easiest way to dispose of this concern is to use sandpaper or a file to "rough up" the surface around the holes before attempting to solder. Works every time.

The J-Pole

Building a J-pole is mechanically more complicated. The two elements are attached at the bottom. Taps are slid up and down the bottom of the elements until a good match is achieved. In my case, I used brass for the elements, largely because of the visual effect I wanted. The version in the current *Handbook* calls for copper pipe, but almost any good conductor will work.

According to Joe Carr's *Practical Antenna Handbook*, if you use 50-ohm coax and 1/2-inch (outside) diameter tubing, a spacing of 1-1/2 inches between the elements will be about right. Antenna elements of a different diameter will require some experimenting. For best results, feed the 3/4-wave section through either a gamma match with a 25-pF variable capacitor in the line or a 4:1 balun. Then adjust the location of the taps for best SWR. See Figure 3 for details.

Keeping It Harmonious

Whether you're a new ham or an old-timer who's moved to new digs, it's easy to install at least a basic antenna that the rest of the family, landlords, and even condo police can live with (how can they object if they can't see it?). A little imagination is all that's needed. ■

Resources

For additional information on VHF and UHF antennas, we recommend the following resources:

The ARRL Handbook and *The ARRL Antenna Book,* both published by ARRL, 225 Main St., Newington, CT 06111; Phone (orders only): (888) 277-5289 or (860) 594-0355; Fax: (860) 594-0303; Internet: <http://www.arrl.org>.

Practical Antenna Handbook, 2nd edition, by Joseph J. Carr (K4IPV); published by Tab Books, Division of McGraw-Hill, Inc., Blue Ridge Summit, PA 17294-0850; Phone: (717) 794-2191; Fax: (717) 794-2103.

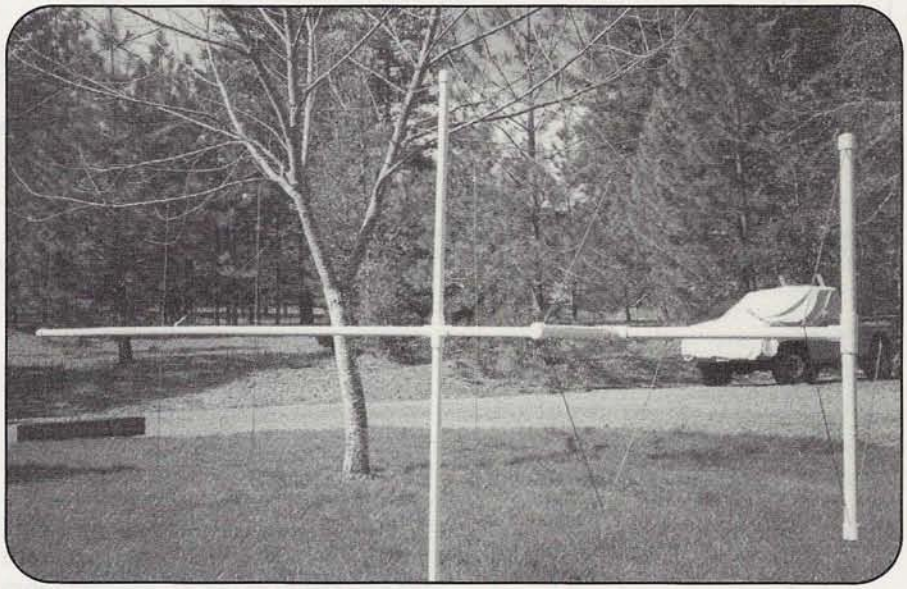
And, of course, the "Antennas, etc.," column by Kent Britain, WA5VJB, every other month here in *CQ VHF*.

Build a 2-Meter Quagi

If your rubber duck—or even an omnidirectional "ranger" type antenna—won't reach the repeaters you want to hit, try this cheap and easy Quagi antenna to put some muscle into your signal.

Sitting in this month in the "Project Corner" is Blake Kilburn, KI6US. Blake has been a ham since 1944 and has held various calls from places ranging from Alaska to the South Pacific, the last being FOØKU, during a seven-year period in which he lived, worked, and operated from the islands of Tubuai, Tahiti, and Bora Bora. Blake currently lives in Rogue River, Oregon, where he works for an electronics manufacturer. No matter where he's lived, Blake has always enjoyed building ham gear and experimenting with antennas. This is his first article for CQ VHF.

—W2VU



KI6US's assembled Quagi antenna. It'll work better, of course, if you can install it a little bit higher off the ground (but, then again, it's easier to take a picture while standing on the ground than while hanging from a tower!).

After many years away from VHF operation, I recently purchased a 2-meter HT. Since I live in a mountainous area where easy access to repeaters is limited, I decided to build a 2-meter beam in order to reach repeaters which I otherwise could not raise. After reviewing my antenna reference books, I settled on a *Quagi* design—a combination of a *Quad* and a *Yagi*—which permitted ease of feed with 52-ohm coax (quads may be directly fed) and broadband characteristics. The final result far exceeded my fondest hopes.

The beam is an excellent performer, and the total cost to construct it was less than $15. The ease of construction was an added bonus. The entire antenna is made from 3/4-inch schedule-40 PVC pipe, a few PVC fittings, a piece of hardwood dowel, copper-coated brazing rod, and a piece of 1/8-inch brass tubing obtained at a local hobby shop (see "Parts List"). No special tools are required, so gather up the materials, start building, and be pleasantly surprised.

Preparation of Material

The boom and other pieces of the 3/4-inch PVC are cut to the lengths shown in the Table and Figure 1. The four pieces of PVC pipe which hold the quad elements and the 36-inch boom support mast are notched as shown in Figure 2. The 12 pieces of brazing rod (one each for the four directors and four each for the driven element and the reflector) should be cut to the sizes shown and tagged to prevent confusion during assembly. Next, cut seven 1-1/2-inch-long pieces from the piece of brass tubing, taking care not to crush or distort the open ends of the tubing. These will become the corners for your quad elements.

Next, take each of the four director rods (which you've tagged for easy identification, right?) and solder a small washer, nut, or wrap of hookup wire 1/2 inch off of the center. This will keep the rods from falling through the holes when installed in the boom. When you assemble the antenna, make sure this washer, etc., is on the *top* half of the element so everything is even when you push it through the boom.

Assembly

Take one of the reflector element rods and slide one of the previously cut 1-1/2-inch lengths of brass tubing over one end.

By Blake Kilburn, KI6US

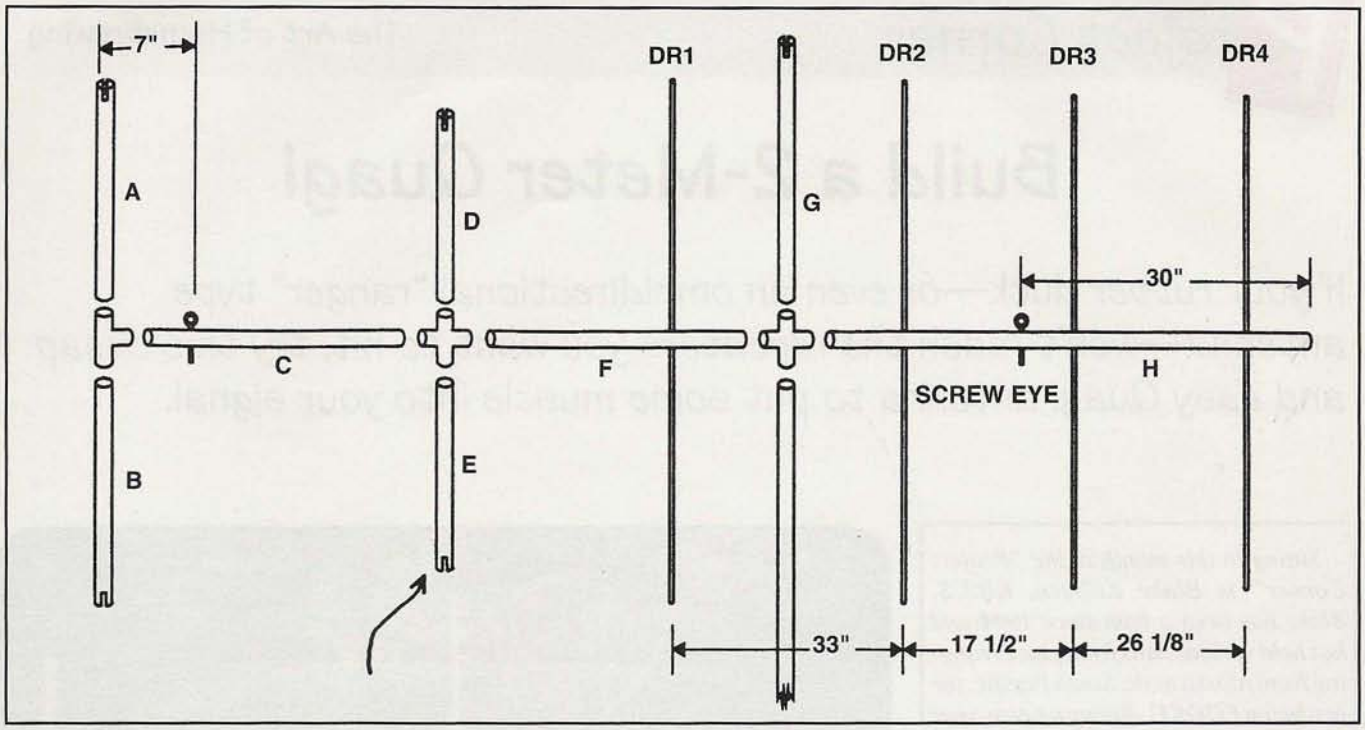


Figure 1. Exploded view of the KI6US Quagi and separation distances for various elements. See the Table for lengths of each of the marked segments. Note that parts D and E, the driven element supports, are shown vertically only for clarity in this illustration. They should be mounted horizontally prior to final gluing.

"No special tools are required, so gather up the materials, start building, and be pleasantly surprised."

Take another reflector element rod and insert it in the same piece of brass tubing. Get an equal amount of tubing over both rod ends, leaving a space of approximately 1/8-inch between the two rods inside the brass tubing. Now, carefully bend the tubing so that the rods are 90 degrees apart from each other. Use a small torch or suitable soldering iron to securely solder the rods to the tubing. A smooth, sturdy corner will result. Complete the reflector loop using the same procedure at each of the other corners.

The driven element is made in the same way, except that an SO-239 coax connector is soldered into one of the corners instead of brass tubing (and now you know why you cut only seven pieces of tubing to make eight corners). Solder one piece of brazing rod to the center conductor of the SO-239 (you may have to put a 90-degree bend at the end of one rod) and another rod to the ground side of the connector (make a small loop through one of the mounting holes, and make a good physical connection before soldering it to make a good electrical connection), making sure you don't have any short-circuits between the two sides.

It's time now to assemble the boom. Using PVC cement, assemble and glue the various pieces of PVC and the fittings together as shown in Figures 1 and 3. *But do not install or glue any of the 3/4-inch PVC caps* until you make certain that the notches cut in the five pieces of support pipe are oriented at right angles to the boom. Seat all pieces of pipe fully into the various fittings. While gluing, use a flat surface to ensure proper alignment of all the support pipes.

After the glue dries, insert the 36-inch piece of hardwood dowel into the front section of the boom. Allow it to slide down and butt against the first PVC cross fitting (the one that holds the boom support mast). Secure the boom in a vise and drill the four director mounting holes at the locations shown in Figure 1. Use care to make the holes perpendicular to the boom so the directors will be aligned with the support pipes. Some of the holes will be drilled through the dowel. This is OK, as it allows the directors to hold the dowel

Parts List

1	18-foot length of 3/4-inch schedule-40 PVC tubing
2	3/4-inch PVC cross fittings
1	3/4-inch PVC fittings
5	3/4-inch PVC caps
1	small can of PVC cement
1	36-inch piece of 3/4-inch hardwood dowel
12	36-inch pieces of 1/8-inch copper coated brazing rod
1	12-inch length of 1/8-inch brass tubing (hobby shop stock)
2	eyebolts
1	SO-239 coax connector

Silicon Seal and some 50-pound test monofilament fishing line

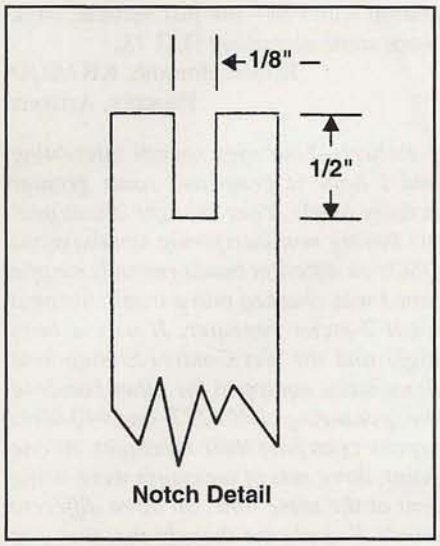


Figure 2. Detail of notch to be cut into one end of parts A, B, D, E, and G in Figure 1. These notches will hold the quad elements and the support cable in place.

securely in place. Drill the screw-eye mounting holes at the locations shown in Figure 1 and in alignment with the support pipes.

Final Assembly

Install the directors in their appropriate holes in the boom (just slide them through until the washers or other stops you installed bump against the PVC pipe). Install the driven element by slipping the corner with the SO-239 connector into one notch on the support mast and fitting the opposite corner into the other end of the mast.

Install the reflector onto its support mast in the same manner. The mast may be mounted either vertically (as shown in the Figures) or horizontally. Next, lock the elements into place by slipping three of the 3/4-inch PVC caps onto the ends of the support masts. Use silicon to seal the coax connector to the pipe end.

Now, install the two screw-eyes into the holes previously drilled for them. Take a piece of 50-pound test monofilament fishing line and securely tie one end to the front screw-eye. Lop the line up over the boom support mast, using the notch to hold it in place, and string it through the rear screw-eye (see Figure 3). Pull the line so that there's no droop in the boom, and secure it to the rear screw-eye. Install the remaining PVC on the front end of the boom.

Table

A	14 1/2"	E	13 1/4"	DR 1	35 5/16"	Quad Reflector	Quad Driven Element
B	14 1/2"	F	19 3/4"	DR 2	35 1/8"		
C	19 3/4"	G	26"	DR 3	34 15/16"	21 3/8" on each side	20 1/4"≈ on each side
D	13 1/4"	H	72"	DR 4	34 3/4"		

Table. Lengths for PVC support elements (A-H), Yagi director elements (DR 1-DR 4), and Quad reflector/driven element. Refer to Figure 1 for parts identification.

Summary

The dimensions shown are for operation above 146 MHz. To operate below 146 MHz, all of the director elements should be lengthened by 5/8 of an inch and the quad loops should be lengthened by a 1/4 inch on each side. The configuration can also easily be changed for horizontal polarization for SSB or CW operation. Simply put the antenna together so that the director elements are horizontal instead of vertical (you might need some

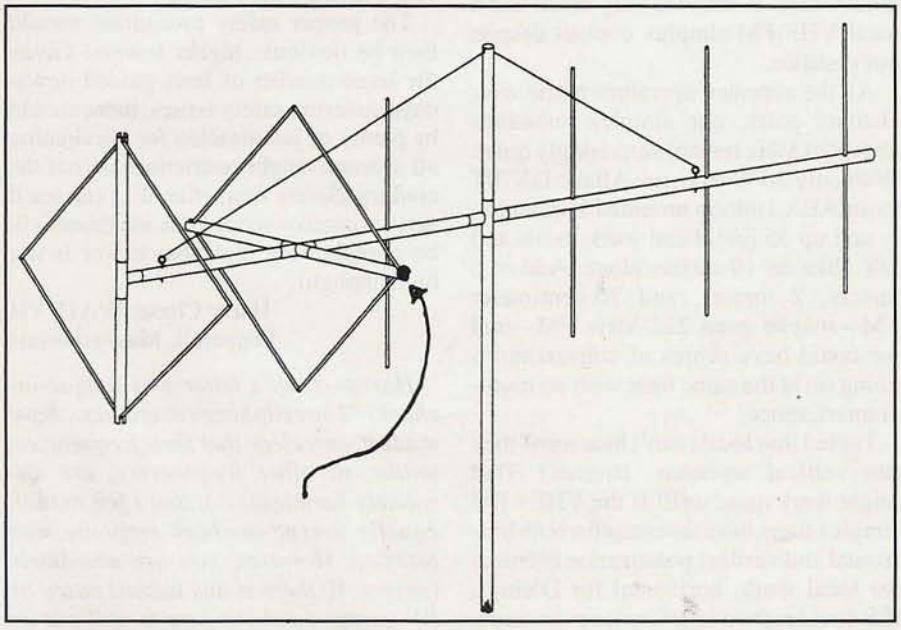


Figure 3. View of the completed Quagi antenna. Note that, in a quad antenna, the coax is fed from the side for vertical polarization, and at the bottom (or top) for horizontal polarization.

Putting the Squeeze on SWR

I first built this antenna during the incredibly wet El Niño winter of 1998. The excessive rain undermined my mast and I took down the antenna until the weather improved and I could reset its support. Being an antenna junkie, I used the time to come up with a method of easily adjusting the driven element for minimum SWR on any chosen frequency in the 2-meter band.

I did this by cutting one of the legs of the driven element nearly in half (it doesn't matter which one), then inserting each cut end into one end of an 8-inch length of the 1/8-inch brass tubing. The fit is snug enough to allow fine adjustment of the SWR by sliding the legs closer together or farther apart inside the tubing. By doing this, I was able to achieve a nearly 1:1 SWR over the entire 2-meter band (although not all at one time). Solder the driven element legs and brass tubing into position when you've found the minimum SWR for your desired operating frequency.

"I can now access repeaters I couldn't reach before and rejection off the rear is surprisingly good. The SWR is acceptable and the tuning appears to be quite broad."

added support to keep them from slipping out, now that you don't have gravity working for you), and mount the driven element so that the SO-239 connector is on the *bottom*. In any case, the coax should come away from the driven element at a 90-degree angle, if possible, then routed down the mast to the radio.

I'm unable to make any valid measurements on gain or the front to back ratio, but in practice, these factors have been very good. I can now access repeaters I couldn't reach before and rejection off the rear is surprisingly good. The SWR is acceptable and the tuning appears to be quite broad. All in all, for the few dollars invested and the short time to construct, I found this to be an excellent antenna. ■

Letters *(from page 9)*

Perhaps you could put it out in your magazine to set up a certain day to at least utilize a band (such as 6 meters on Monday, 2 meters on Tuesday, 222 MHz on Wednesday, and so on). You could ask for a survey to see what days would be best for each band (in the opinion of the readers), then post it at a later date.

Most hams listen but don't call, waiting for someone else to call CQ. I, myself, have a favorite band (6 meters) but I do go through the other bands calling CQ, spending time, trying to wake 'em up. Other hams can do as I do, and go back to their favorite later on if there aren't any openings, but to just say or think there isn't anyone on those bands might be a mistake on their part. This is my two cents worth! Maybe this could get something rolling, though. I think it's worth trying!

George Clark, KO4QR
Grandy, North Carolina (FM26)

George—Thanks for your note and for your excellent idea. However, it's already been done, by the ARRL, I believe. There are "activity nights" each week for each VHF/UHF band from 50 to 1296 MHz. We list them occasionally here in CQ VHF, *and they're also listed in the* ARRL Operating Manual *(and the really handy "Ham Desktop Reference" that comes inside the current edition). Since you apparently aren't familiar with the VHF/UHF activity nights, here's the rundown:*

Day	*Local Time*	*Band*
Sun.	*6 p.m.*	*6 meters (50 MHz)*
Mon	*7 p.m.*	*2 meters (144 MHz)*
Tues	*8 p.m.*	*1.35 meters (222 MHz)*
Weds	*9 p.m.*	*70 centimeters (432 MHz)*
Thurs	*10 p.m.*	*13 centimeters (1296 MHz)*
Fri	*9 p.m.*	*23 centimeters (902 MHz)*

Local schedules may vary, so ask around if you don't hear any activity in your area on these activity nights. (And if there's just no activity, get some started!)

Dear *CQ VHF*:

Thank you for printing that great article some months back by Arnie, CO2KK, suggesting we treat 10 meters as a "VHF" band ("10 Meters: Is it HF or VHF?" Nov., 1997). I worked my first 10-meter simplex FM DX recently, and noted that there's plenty of room from 29,100 to 29,300 kHz for simplex line-of-sight and scatter communications using FM.

As many ops tried to outshout one another on 29,600 kHz (the simplex calling frequency), I had a neat 45-minute QSO with VE3KO, with no interference and little fading, after we went down to 29,200 kHz. It sounded very much like a local VHF-FM simplex contact despite our distance.

As the repeater operators battle over channel pairs, our simplex subbands above 29 MHz remain surprisingly quiet. With only 50 W from my Alinco DX70T to an AEA Isoloop mounted horizontally and up 35 feet, I can work locals and DX alike on 10 meters alone. Add in 6 meters, 2 meters, and 70-centimeter FM—maybe even 222-MHz FM—and we could have scores of conversations going on at the same time with no mutual interference.

I noted that locals can't hear me if they run vertical antennas. Hmmm? That might work quite well! If the VHF+ FM simplex users have antennas for both horizontal and vertical polarization (vertical for local work, horizontal for DXing), that could reduce interference even more.

Say "no" to repeaters. Practice safe simplex. Treat 10 meters as a VHF band. Use both horizontal and vertical polarization with FM—not just vertical. And, work some surprising DX! 73,

Robert Homuth, KB7AQD
Phoenix, Arizona

Robert—Your idea sounds interesting and I hope it generates some greater activity levels. Your thought about people having non-interfering simultaneous QSOs on different bands reminds me of a time I was checked into a traffic net on a local 2-meter repeater. It was a busy night and the Net Control Station sent those hams equipped for other bands to the sponsoring club's 222- and 440-MHz repeaters to pass their messages. At one point, three sets of messages were being sent at the same time, on three different bands. I've always thought that that was one of the most efficient uses of time and spectrum that I've ever seen.

Can't You Get That Thing Any Higher?

Dear *CQ VHF*:

I have just read Tony Melton's letter about RF exposure, and the editorial reply, in the August issue, and I think the most important point was overlooked: April research papers aside, it *really is* true that, in general, RF exposure hazards decrease as the antenna is raised higher above people, buildings, and other obstructions that can produce localized reflections toward an occupied area. (Go through that required field strength analysis for your station with antennas on the roof, and then with them at 100 feet, and you will see what I mean!)

The proper safety precaution should then be obvious...higher towers! Given the large number of laws passed nowadays covering safety issues, there should be plenty of justification for eliminating all antenna height restrictions across the country! Safety first, after all! I can see it now; someday soon, your neighbor will be complaining that your tower is not high enough!

Harry Chase, WA1VVH
Pepperell, Massachusetts

Harry—Tony's letter was tongue-in-cheek ("The cellphone companies...have made it very clear that their frequencies, unlike all other frequencies, are absolutely harmless..."), and I felt that an equally tongue-in-cheek response was justified. However, you are absolutely correct: IF *there is any hazard posed by RF energy (and the jury is still out on that), then the higher your antenna is, the less hazard (if any) there is to people on the ground.* ■

Homebrew Doppler Radar

No, you're not going to watch incoming weather fronts with this simple radar, but it can still be a lot of fun to build and operate.

The guts from a radar detector, a radar door opener, or even a Gunnplexer can easily be made into a nice little Doppler radar. In Photo A, you see two of my simple radars (plus a muffin fan). The small unit has been used for many small demonstrations and will pick up your hand or a metal object at a few feet. The larger unit is the veteran of dozens of presentations. It will pick up a baseball at 30 feet or a walking person out to 50 feet. But these are all fun to experiment with.

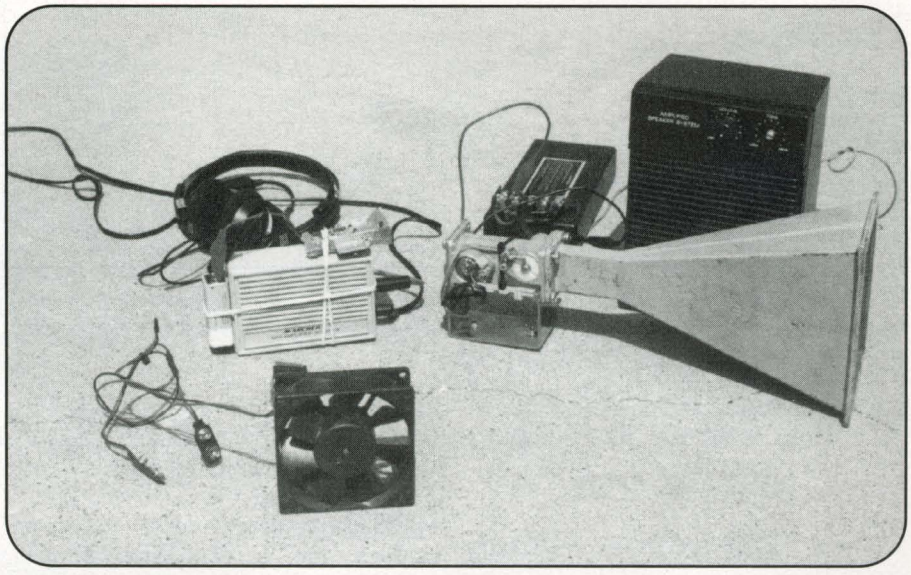


Photo A. Two of the Doppler radar units I've built for demonstrations, along with a muffin fan which I also use in radar demos. Read why in the text. (All photos by the author)

A Little Theory

A basic Doppler radar only detects a moving target (weather radars are more complex Pulse-Doppler radars so they can detect both range and motion). We can actually think of these radars as SWR meters. But instead of measuring the reflections in a piece of coax, we're going to measure the reflections in a piece of free space. As the target moves, the reflected waves go in and out of phase. Every time the target moves 1 wavelength (about 3 centimeters) one sine wave is generated in the detector diode.

To do this, we just put an audio amp on the detector diode (Figure 1) and listen to the SWR of the antenna change as objects move around the antenna. The audio tone of the target as it moves is about 12 Hz/mph. A person walking towards your radar generates about a 30-Hz tone. But their arms and legs are moving at different speeds, so a far more interesting mismash of sounds comes back. Cars at highway speeds generate about an 800-Hz tone. But most signals are pretty low in frequency, so it's a good idea to use a speaker with good bass response.

Building a Simple Doppler Radar

In Figure 2, we have the system diagram for a simple Doppler radar, and a schematic in Figure 3. The audio amp is not critical: I have used stereo amps (phono inputs work well), RadioShack telephone listener amps like the 43-2318, or you can use your favorite LM386-based audio amp circuit. Again, most any old audio amp will work.

In fact, none of the parts used are particularly critical. The capacitor on the mixer diode can be most anything between 1 and 50 µF. Since there are only .7 volts on the mixer diode, the voltage rating of the coupling caps isn't important, either. The 1K resistor can actually be anything between 500 ohms and 10K ohms. If you're trying to get the last inch out of your radar, you can play with the value a bit, but 1K works fine.

On the transmitter side, the 33-ohm resistor is typical for radar detector guts. If you have one of the units from a security system, this may need to be decreased to 10 or 20 ohms. The .1-µF capacitor keeps the Gunn Oscillator from breaking into low frequency oscillation., and values between .02 µF and .2 µF can be used. One value that *is* important: The voltage rating needs to be more than 12 volts and the leads must be kept very short; this is a bypass cap and bypass caps like short leads. Many surplus Gunn oscillators already have a bypass cap on the Gunn

"We can actually think of these radars as SWR meters. But instead of measuring the reflections in a piece of coax, we're going to measure the reflections in a piece of free space."

By Kent Britain, WA5VJB (wa5vjb@cq.net)

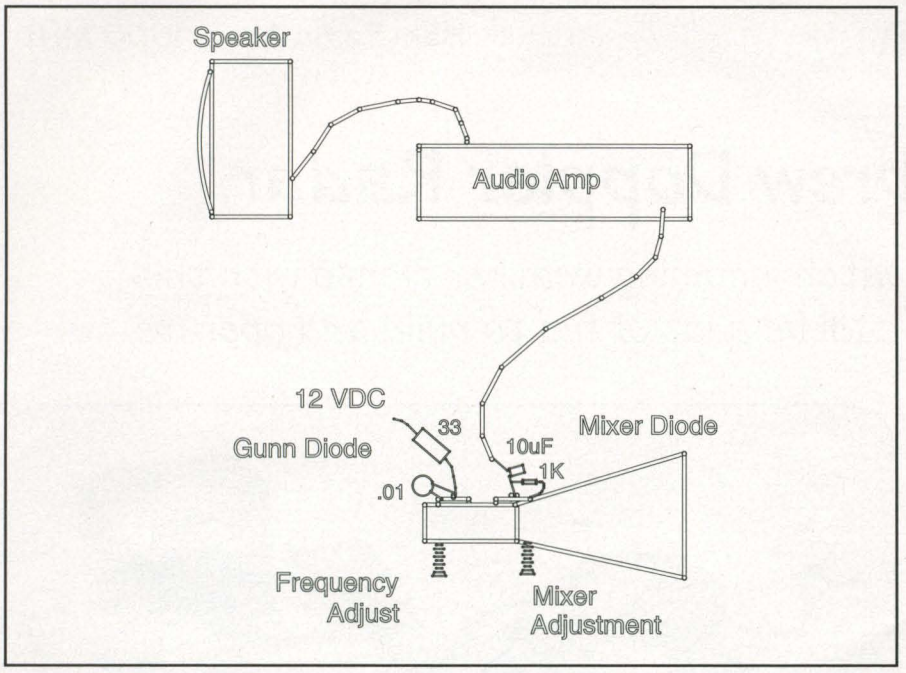


Figure 1. Basic setup of a Doppler radar built around a Gunn oscillator. Garage door openers and the guts of police radar detectors (retuned to the 10-GHz ham band) may also be used.

diode. Hey, that's the one the manufacturer thinks works best. I'd just leave it alone if I were you.

Using Your Doppler Radar

If you are using a door opener or some other security device radar, then the radar is already tuned to and licensed for 10.525 GHz, which is handy because it doesn't take much to retune it into the 10-GHz ham band (10.0 to 10.5 GHz). If you're modifying a police radar detector, then legally you should have someone retune in into the ham band. Oh yeah, while you're at it, add a CW key and send your call letters every 10 minutes. This will also keep the FCC happy.

"A person walking towards your radar generates about a 30-Hz tone. But their arms and legs are moving at different speeds, so a far more interesting mismash of sounds comes back. Cars at highway speeds generate about an 800-Hz tone."

The frequency of the Gunn diode is controlled by a tuning screw in the back cavity of the radar (see Figure 1 again). In front of the mixer diode is another tuning screw. This screw controls how much of the reference wave is reflected back into the mixer diode. A good target for tuning the mixer adjustment is to point your radar at the moving blades of a fan and adjust for the loudest signal.

A Little More Theory

Figure 4 illustrates the Inverse Cube Law. As an RF signal travels twice as far from the transmitter, it spreads out twice as much. But it doesn't just spread out in one direction. It spreads out twice as much up and down, *and* it spreads out twice as much left and right. So as the signal travels twice as far, it's $^1/_4$ as strong. Want to

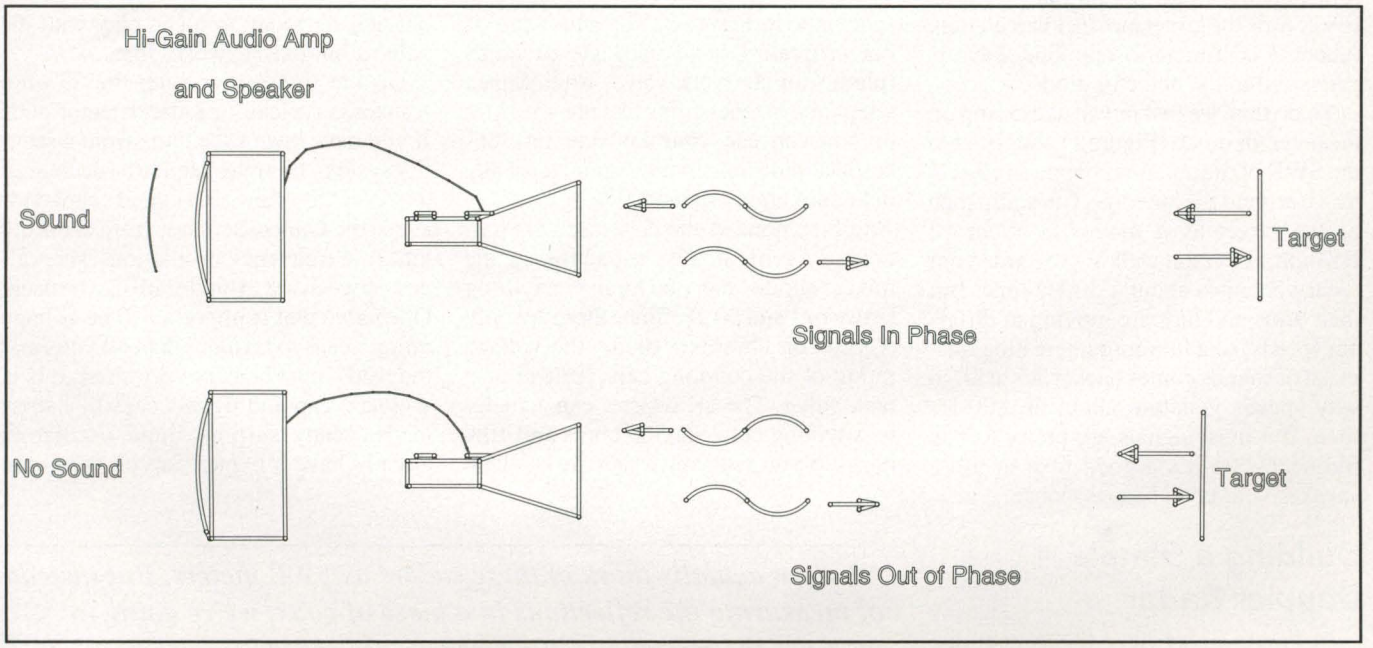


Figure 2. System diagram of how a Doppler radar responds to motion. When signals in both directions are in phase with each other, you'll hear a sound through the speaker; when they're not, you don't. The pitch of the sound varies with distance, direction, and speed.

Photo B. WB5VYE's VHF/UHF/microwave rover van. The loop Yagis in front are for the microwave bands.

"You can also do your own 'stealth' experiments. See how far away you can detect a piece of flat metal. Now see how far away you can detect a piece of fiberglass, a piece of plastic, or a piece of wood."

talk twice as far? You need four times the power (this is for line-of-sight paths). When a radar reaches out twice as far, the signal hitting the target is 1/4 as strong. As the reflection travels back, the *reflection* is now 1/4 as strong. This gives you 1/4 of 1/4 the original signal. That's 1/16 as much signal. So if you want to double the range of a radar, you need 16 times more power! Want you radar to reach out four times as far? Upgrade power by a factor of 256!

Bigger antennas really help—you can count the extra gain of the antenna on both transmit and receive—but it's going to take some serious upgrades to this system to reach out miles.

Let's use car headlights as an example. On a clear moonless night, you can see a car stopped on the side of the road in the glare of your headlights at what, 300 feet? Maybe 400 feet? Yet if a car is coming the other way with its headlights on, you can see its headlights coming from miles and miles away. So if that headlight is used for communications, its range is miles and miles, but if that same headlight is used as a radar, the range is only a few hundred feet. Same way with these low power Doppler radars. We can talk several miles with a pair of these units, but as a radar, range is quite short.

Have Fun with the Truckers!

So what can we do with these? I'll skip over my daughter's award at a science fair with one of the Doppler radars, but they're really fun to play with. The little ones will pick up a baseball at 10 feet, the bigger ones out to 30 feet. Wiggle your fingers near the horn, it sounds pretty neat. One Dallas ham enjoyed listening to road noises as he drove down Highway 635. He said the underpasses sounded particularly interesting. I think he also enjoyed sending CQ to the truckers' "Fuzz Busters."

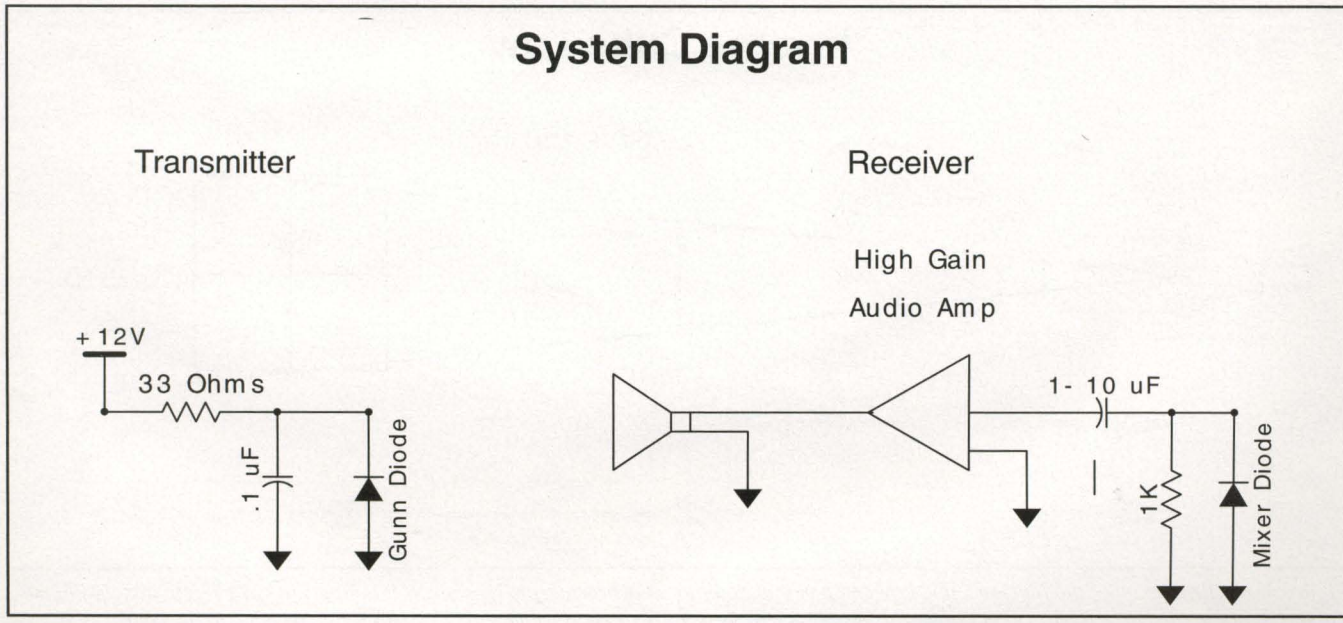


Figure 3. A schematic diagram of a Doppler radar system. None of the component values are critical (see text), so it is really a pretty easy "junkbox" project.

Photo C. N5QGH and his 47-GHz station. QGH was active on 10, 24, and 47 GHz, plus laser, during this year's ARRL 10 GHz Contest.

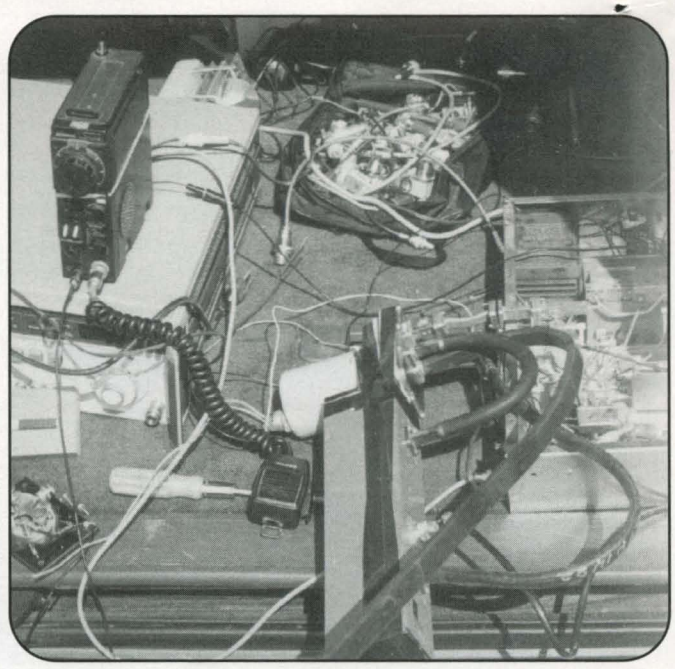


Photo D. The author's 24- and 47-GHz stations. Aren't they neat, compared to what you saw in Photo C?

Back in Photo A, you see a small muffin fan I use in my radar demos. Ever wonder why stealth aircraft have the blades of their jet engines buried deep inside the airframe? Try pointing your personal radar at a fan and see what I mean. And yes, I use a plastic bladed muffin fan.

You can also conduct your own "stealth" experiments. See how far away you can detect a piece of flat metal. Now see how far away you can detect a piece of fiberglass, a piece of plastic, or a piece The results may surprise you!

Next time I'll explain why you're detecting what you're detecting. And we'll cover some simple laser communications systems. Have fun experimenting.

Photo Gallery

No particular stories here—just some interesting pictures of various hams' microwave setups. In Photo B, you'll see WB5VYE's VHF/UHF/microwave Rover setup for contesting. Photo C shows N5QGH and the 47-GHz station he used during the recent ARRL 10 GHz Contest (which is actually for 10 GHz and up). The station was active on 10, 24, and 47 GHz, and on laser. Finally, we have in Photo D my own exquisitely neat 24- and 47-GHz stations. But they work, and that's what counts! ■

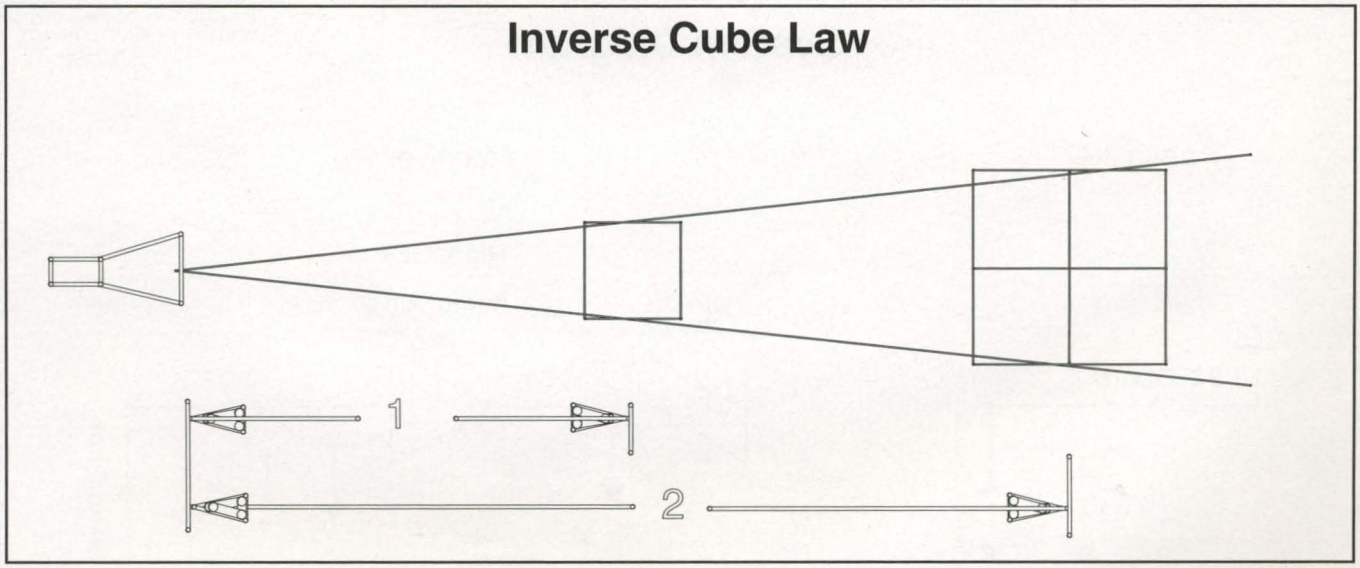


Figure 4. An illustration of the Inverse Cube Law. As a signal doubles its distance from its source, it doubles in both height and width, making the signal at the twice-as-far point only 1/4 as strong as the first point of measurement. If it's then reflected back to the source, it arrives with only 1/16 the strength with which it left.

How Do We Sound to Them?

If ham radio's license structure and exam requirements are going to be revamped, says KC7MKX, whatever finally is done needs to put more emphasis on operating proficiency.

By Larry Page, KC7MKX*

This article came about as I was reviewing comments that my brother, Doug, KM5HW, and I have made to each other in an ongoing series of discussions concerning the amateur radio hobby in general, our participation in it, and its future. My ideas are also formed to some degree as a result of active participation in my other hobby, model railroading, which has generally failed to attract the young newcomers who are so necessary to keep a hobby alive and "kicking." Things also seem to have come to a head as the result of the ARRL's recent proposal for licensing simplification (which both of us support, and which I realize is a really good deal for me) as well as the FCC's own Notice of Proposed Rule Making.

"...I am convinced that the reason we have problems with operator proficiency is that most licensees beyond Technician class are spending 90% or more of their study time learning the code. In today's busy world, that doesn't leave much time to learn operating practices."

Code vs. Operating Practices

While I think the ARRL proposal is a good compromise, I was disappointed that the opportunity was not taken for a more meaningful reduction in the code requirement below 13 wpm. Why? Because I am convinced that the reason we have problems with operator proficiency is that most licensees beyond Technician class are spending 90% or more of their study time learning the code. In today's busy world, that doesn't leave much time to learn operating practices.

By way of personal history and background, I became an amateur about three years ago and currently hold a Tech Plus license. For those who care, I had a perfect score on the written tests for elements 2, 3A, and 3B, and came close to passing element 4A without having studied for it. I missed two answers on the element 1A test (yes, one was a blown callsign) and have not yet had the time to study and bring my code speed up to 13 wpm. I was encouraged to enter the hobby by a colleague at work who was leading my company's activity in the commercial land mobile service at the time, and who had (and has) a Technician class license. As a result, much of my procedural training is built around the operating practices used by a skilled commercial/public safety operator (who took *no* tests for his operating privileges, by the way), followed up by training in ARES and public service activities.

Gettin' "Ornery"

My comments are intended to provoke some thought and are fairly direct. While it's OK for you to think I might be a little "ornery," nothing here is intended to be mean-spirited or ugly. What this all means, of course, is that when I got my license, I immediately stepped right into the middle of the code versus no code, good operator versus "lid," and "who's going to attack our spectrum next" controversies. If I had known that things were going to be this much fun and this interesting, I'd have gotten involved much sooner.

As a result of reading editorials and articles in *CQ VHF* over the past three (almost) years and participating in discussions with KM5HW and others, I have come to the (not very startling) conclusion that the root cause of disagreements in the amateur radio hobby is simply the result of our natural human diversity. Any time we get together with 600,000 of our closest friends, we are bound to disagree over something. On top of that, there is a very natural human tendency to want to be better than someone else. This means that when we disagree about something, the natural next step is to develop an "I'm right, you're stupid" attitude.

One other factor that cannot be avoided is the geographical one. Things that are problems in Dallas may or may not be an issue in Seattle. And neither of those locations likely has to deal with the kinds of problems associated with having 17 million people crowded into Los Angeles and Orange Counties in Southern California.

Public Servants

"So what?" you ask. So...if amateur radio is to survive, we are going to have to all come to the realization that there are

*Larry Page, KC7MKX, is an industrial engineer specializing in work methods, computer system design, and total quality. He holds a Tech Plus license and lives in Redmond, Washington.

"...much of my procedural training is built around the operating practices used by a skilled commercial/public safety operator (who took no tests for his operating privileges, by the way), followed up by training in ARES and public service activities."

multiple facets of this hobby we call amateur radio and there are multiple reasons that people get involved. It is important that we remember that some people, for instance, participate in amateur radio primarily to support volunteer emergency response activities. That's why they became involved and, for at least some period of time, that is probably all (or most) of what they will do in the hobby. Certainly we would have to agree that use of the bands to support medical and other critical needs in the event of an emergency is one of the defining purposes for the existence of amateur radio.

Unlike my brother and me, these people probably will not have had several semesters of electrical engineering or physics classes so that the written tests come as second nature. Their primary skills, on the contrary, may be in the medical/first aid arena, or they may be primarily interested in the organization/management side of these emergency responses. They are just definitely not electrical engineers. With a few exceptions, I find these folks to be outstanding operators who use great economy of words and time to execute crisp radio communications with minimal airtime. Why? It has nothing to do with passing either a difficult or simple written test or with knowing or not knowing Morse code. It's because they have been trained either in the art of emergency medical communications in the emergency room or they are "old hat" users of either the public safety or commercial two-way services. Testing has nothing to do with it. Training and good habits have everything to do with it.

Consider also those people who are involved actively in search and rescue activities. This use of the bands is another defining purpose for the existence of amateur radio. Ham radio is used because the licenses are not tied to specific geographic locations; operations can be established at any location. Most people in this group are primarily interested in doing outdoor activities and many of them have told me that they found the current elements 2 and 3A tests intellectually difficult. Again, most of these folks are outstanding operators who have learned the importance of listening over talking and who are masters of clear, concise communication with minimal air time used. Their focus is not on technical expertise, but on using radio as a tool in their life-saving activities. The proposed new rules and privileges could be literally a lifesaving change for these groups.

Consider now how beneficial it would be for these same folks to have meaningful access to the HF bands. For the first time, volunteers in mountainous terrain will be able to use NVIS (Near Vertical Incidence Skywave) to be able to talk over hills and mountains that previously blocked the line-of-sight VHF/UHF communications. What an opportunity and tool to make available to those who would not likely soon pass elements 3B and 1B (*current upgrade requirements from Tech Plus to General—ed.*).

Exam Makeup

Some have proposed that the written testing be made more difficult, that questions be removed from the public domain, or that all testing for a given license class be completed on the same day. I do think that controls need to be put in place that limit abuses of the Volunteer Examination system. We have all heard of people taking tests over and over until they got it right. That should not happen. But I see no problem with an applicant being given a second chance at a written exam when code testing via loudspeaker is being done in adjacent space simultaneously (yes, it happened to me while taking the element 4A exam).

Incremental testing has been a fact of life at the FCC for at least 26 years. (It was that long ago that I passed the examination for my commercial radiotelephone license.) There is clearly no need and no precedent to change that procedure.

KM5HW correctly points out that there is a requirement in the rules that as amateurs we demonstrate technical competence. He is right. In fact, he would be right whether the requirement were in the rules or not. The reason is that operators in the Amateur Service enjoy privileges unmatched in any other radio service... privileges to operate on any of our frequencies, at any location (with some minor restrictions), at any time, and at any power level up to the legal limit. It is only reasonable that some requirement for technical knowledge be expected in return for all that flexibility, if only for our own protection.

Defining "Technical Competence"

But even the definition of technical competence is rapidly changing as it applies to amateur radio. For example, my best radios are three Motorola "Spectra" models of various designs and band capabilities. The construction of these radios most closely resembles a block of granite. They were manufactured in Motorola's "factory of the future" in Fort Worth, Texas (now in Ft. Lauderdale, Florida, I believe). They always work and they never receive any cross modulation (intermod, if you didn't learn your terms correctly). But they are constructed using surface mount components exclusively and they have no moving parts. There is not a single mechanical adjustment to be made in these radios and not a single component that can be readily replaced in the field. Everything is controlled by three microprocessors, and all adjustment and alignment is done through a special software package. So technical competence in this case centers around proper and effective use of the service software when adjustments are needed, not sequential alignment by adjusting inductors, coils, and resistors.

It All Boils Down to Operating Proficiency

Finally, it seems that most meaningful discussions around licensing really boil down to operating proficiency. (I say most because there seems to be one group that feels "If I had to do it, you have to do it." This kind of resistance to change will guarantee only one thing: the death of the hobby.) Testing is not the answer, because there is no way to guarantee any particular level of operating proficiency via testing. And Morse code is not the answer either. If operating proficiency is the issue, let's address operating proficiency.

Industry experience shows that the only way to form specific behavior pat-

terns is to train people to exhibit those behavior patterns. And to complicate things, there's only one chance to effectively do that...at the beginning. The solution, then, is some requirement to operate with or communicate with "good" operators for some period of time, or else require certification from a "good" operator that proper practice is understood before a license is issued. The difficulty, of course, comes in certifying the "good" operators. This would represent a whole new round of testing activities and would certainly offend many, if not all, of those "old-timers" who already consider themselves God's gift to operation.

In summary, I believe that what needs to be done is really pretty much what we are doing...take the tests as we are ready and operate within our privileges, trying to set the absolute best example possible for operation. Also, take every opportunity to explain gently to others how and why good operational practices improve the environment and all our reputations.

Take out your scanner and listen to commercial aircraft and ground personnel for awhile. What kind of image do these people portray? How do you feel while listening to them? How about emulating them in appropriate ways next time you get on the radio? Remember, a significant segment of the general public, the news media, and others know where to find us and our communications on their scanners and receivers. When an event happens, they are listening to us. How do we sound to them? ■

• • •

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If you have an opinion on this issue or another matter of importance to the VHF ham community, we'd like to hear from you. Well-reasoned, well-written commentaries will be considered for our "Op-Ed" page. If we publish your "Op-Ed" article, we'll give you a complimentary one-year subscription (or extension of your current subscription) to CQ VHF. *Submissions not accepted for the "Op-Ed" page may also be considered for Letters to the Editor.* CQ VHF *reserves the right to edit all submissions for length and style.*

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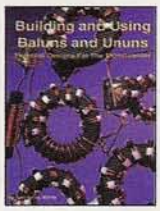
by Jerry Sevick, W2FMI



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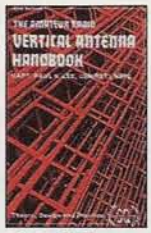

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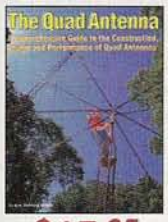

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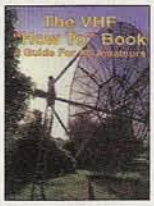

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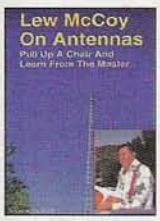

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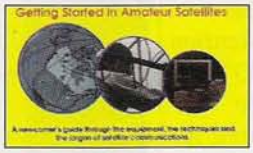

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Basics

Weak-Signal Modes

Weak signal is a general term used to describe Morse code (CW) and single-sideband (SSB) activities on VHF, UHF, and above that rely on *natural phenomena* to extend signal ranges beyond "line of sight." These natural phenomena include Sporadic-E and tropospheric propagation, aurora, meteor scatter, and Earth-Moon-Earth (EME, or "moonbounce") communication. The use of satellites and amateur television (ATV) is not generally considered "weak-signal" work, since no natural phenomena are at work. Even so, a good 70-centimeter/2-meter satellite station generally makes an excellent weak-signal station.

The term, "weak signal," by the way, refers to a station's ability to *receive* and make sense of a very weak signal. Serious weak-signal operators use serious power and serious antennas, but even a strong signal will sound weak by the time it reaches your receiver after, let's say, a round-trip to the moon.

Station Requirements

Basic needs for operating any of the weak-signal modes include a *multimode* transceiver capable of operating on SSB and CW, a directional antenna, and some education on the characteristics of the various weak-signal modes. When you want to go beyond the basics, you'll probably want a bigger, higher antenna; more power; a bigger, higher antenna; a receiver preamplifier; and—you guessed it—a bigger, higher antenna. You'll also want to learn Morse code, which hams typically abbreviate as *CW*.

Why CW?

You don't *need* to learn the code to do weak-signal work. So why would you *want* to? The answer is quite simple. Even though there's plenty of weak-signal work done on SSB, when signals are barely audible—and that's the usual state of affairs for such modes as EME and meteor scatter—code will get through when a voice signal won't.

Why? Because your brain only has to interpret simple sequences of dots and dashes from a CW signal, rather than the complex (and often distorted) voice patterns of SSB signals. Because of this, virtually all EME and meteor contacts are made on CW, as well as many other contacts on other weak-signal modes.

Why SSB?

Single sideband is used instead of FM for voice contacts on weak-signal modes for a variety of reasons. First, it uses less bandwidth. You can pack nearly twice as many SSB signals as FM signals into the same chunk of frequency space. Plus, narrower-bandwidth signals travel farther, meaning you'll get greater range on SSB than on FM (the same applies for CW versus SSB). And finally, SSB doesn't have the *capture effect* that's found on FM. This is the phenomenon by which the stronger of two FM signals

Carl Ebhardt, W4HJZ, operates weak signal as well as satellites from his well-equipped shack in Raleigh, North Carolina.

"captures" a frequency, totally wiping out the weaker station. On SSB, it's possible to pull out what a weaker station is saying, even in the presence of a very strong signal on an adjacent frequency.

Why Weak Signal?

What is the appeal of weak-signal modes, where signals are normally marginal and you often have to struggle just to exchange signal reports? Why not just use FM?

First of all, FM is easy, and most weak-signal operators aren't looking for "easy." They're looking for challenges.

Second, weak-signal work satisfies the primal DX urge of most hams. SSB and CW signals travel farther than FM signals every day, providing regular contacts on 2 meters, for example, of 200 to 400 miles. *Band openings*, or periods of enhanced propagation, can easily double that range. And when you add in such exotic modes as aurora, meteor scatter, and EME, distances covered can be in the thousands of miles. Try that with your FM rig!

Third, there's a greater technical challenge in assembling and operating an effective weak-signal station than in plugging in and turning on an FM rig for repeater use.

Finally, there are greater opportunities for competitive challenges through awards programs and the variety of VHF/UHF contests held each year. Virtually all of these require "direct" contacts, that is, without the help of repeaters.

Educational Opportunities

Unlike repeaters, which can be operated by the average 8-year-old with no special training, working weak-signal modes requires that you further your education—whether it's learning about the flow of solar particles to understand aurora, studying astronomy to predict your best paths during a meteor shower, or delving into the mysteries of Sporadic-E propagation. You will be infinitely more successful at these modes if you understand how they work.

You can start your education right here in *CQ VHF*, which will regularly present articles on various weak-signal modes, along with a monthly weak-signal column by Tim Marek, NC7K. But if you can't wait until next month to learn more, we recommend the following references:

The VHF "How-To" Book, by *CQ* magazine VHF editor Joe Lynch, N6CL (CQ Communications)

Getting Started in VHF video, produced by *CQ VHF* editor Rich Moseson, NW2L (CQ Communications)

Your VHF Companion, edited by Steve Ford, WB8IMY (ARRL)

The ARRL Operating Manual (ARRL)

The ARRL Handbook for Radio Amateurs (ARRL)

A word of warning: If you're bitten by the VHF weak-signal bug, the effects can be life-long. And there is *no cure!*

Contact Information

ARRL—225 Main St., Newington, CT 06111. Phone: 860-594-0200 (ARRL publications)

CQ Communications, Inc.—25 Newbridge Road, Hicksville, NY 11801. Phone: 516-681-2922 (CQ publications)

Basics

Calling Frequencies

It's common practice on VHF/UHF weak-signal modes (SSB and CW) to look for contacts on a nationwide *calling frequency* on each band, then to move off frequency to complete your contact. There are even specialized calling frequencies on some bands for EME (Earth-Moon-Earth) contacts.

Plus, each band has a designated *national simplex frequency* for non-repeater FM contacts, generally based on the ARRL's national bandplan for each band. These frequencies are set aside by "gentleman's agreements" and, while there's no rule establishing them, it's considered poor amateur practice to tie up the calling frequencies with long-winded QSOs—and *that* is against the rules. So please respect the calling frequencies by moving off once you've established contact.

Keep this in mind, too: just because there's a calling frequency doesn't mean it's the *only* place where you can call CQ. Spread out, especially when the band is getting crowded.

Here's a list, by band, of designated calling frequencies and national simplex FM frequencies:

Band	Frequency	Notes
6 meters	50.110 MHz	DX Calling Freqency
(50–54 MHz)	50.125 MHz	SSB (Domestic) Calling Freqency
	50.200 MHz	Proposed New (Domestic) SSB Calling Frequency
	50.400 MHz	AM (Domestic) Calling Freqency
	52.525 MHz	FM National Simplex Frequency
	(28.885 MHz)	(10-meter frequency used to report 6-meter band openings)
2 meters	144.010 MHz	EME (random; see below for scheduling frequency)
(144–148 MHz)	144.100 MHz	CW
	144.110 MHz	CW Alternate
	144.200 MHz	SSB
	146.520 MHz	FM National Simplex Frequency
	(3.818 MHz)	(Meteor scatter scheduling, unofficial)
	(14.345 MHz)	(EME scheduling—nets every weekend)
1.25 meters	222.100 MHz	CW/SSB
(222–225 MHz)	223.500 MHz	FM National Simplex Frequency
70 centimeters	432.010 MHz	EME (random; see below for scheduling frequency)
(420–450 MHz)	432.100 MHz	CW/SSB
	446.000 MHz	FM National Simplex Frequency
	(14.345 MHz)	(EME scheduling—nets every weekend)
33 centimeters	902.100 MHz	CW/SSB (some areas)—check locally
(902–928 MHz)	903.100 MHz	CW/SSB (other areas)—check locally
	906.500 MHz	FM National Simplex Frequency
23 centimeters	1294.500 MHz	FM National Simplex Frequency
(1,240–1,300 MHz)	1296.100 MHz	CW/SSB
13 centimeters	2304.100 MHz	CW/SSB
(2,300–2,310 MHz/ 2,390–2,450 MHz)	2305.200 MHz	FM National Simplex Frequency
9 centimeters	3456.100 MHz	CW/SSB
(3,300–3,350 MHz)		
5 centimeters	5760.100 MHz	CW/SSB
(5,650–5,925 MHz)		
3 centimeters	10,368.100 MHz	CW/SSB
(10,000–10,500 MHz)		

CQ VHF Hamlink

CQ VHF "Hamlink" offers *free listings* of clubs, licensing classes, and exam sessions! *Plus,* for $1/month or $10/year, we also offer listings of **ham-related** *personal* Web sites (*commercial* **ham-related** Web listings are $5/month or $50/year).

Web site listings must be accompanied by payment in full in check or money order in U.S. dollars and mailed to *CQ VHF "Weblink,"* Attn: Bernadette Schimmel, 25 Newbridge Road, Hicksville, NY 11801. Credit card orders are accepted by mail, phone (516) 681-2922, or fax (516) 681-2926. Club, class, and exam listings may be submitted to *CQ VHF* "Clublink," or by e-mail to <CQVHF@aol.com>. Be sure to say what it is in the subject line (e.g., Club Listing).

Club Listings

CA, Santa Barbara Amateur Radio Club, Inc.: Meets 3rd Friday of September–May at 7:30 p.m., County Schools Auditorium, 4400 Cathedral Oaks Rd., Santa Barbara. For more information about SBARC, see the club Web site: <http://www.sbarc.org>; or call (805) 569-5700.

CO, Bicycle Mobile Hams of America: National non-profit club of bicyclists who use VHF radios for emergencies, lost riders, route information, chatting, etc. 450 members in 46 states, 6 countries. Annual Forum at HamVention. Net: 14.253, 1st & 3rd Sundays, 2000 UTC. E-mail: <hartleyal@aol.com>. For info, sample newsletter, send SASE to BMHA, Box 4009-CV, Boulder, CO 80306-4009.

FL, Highlands County Amateur Radio Club: Meetings held 3rd Monday of each month, 7 p.m. Agri-Civic Center Conference Room 3, South US 27, Sebring, FL. Visitors are welcome. Repeaters at 147.045 +.6, 442.350 +5.0, with packet on 144.970. Web page: <http://www.strato.net/~hamradio>; E-mail: <hamradio@strato.net>.

FL, Major Armstrong FM Association: Meetings held 2nd Saturday of each month, 12 noon, Pizza Hut of Lantana, 6170 South Congress Ave., Lantana, FL. Visitors welcome. Info e-mail: <WA4AW@juno.com>.

GA, College Park REACT 4921: Training in packet, computers, radio building, space radio, FCC. Net. ev. Mon, 8:30 p.m., MatPARC Club 145.41-repeater. Contact: Thorton Williams, 2001 Godby Road, Ste. 0-6, College Park, GA 30349.

IL, Olney, Olney Amateur Radio Club-Richland County: Meetings 2nd Thursday of each month, 7:30 p.m., Hardees banquet room, 912 E. Main Street., Olney, IL; Repeater: 146.760-. Contact Vice President Ben Rose, KB9OTJ, at <harley@wworld.com>.

IL, Skokie, Free Live Online Hamfest: Buy, sell, trade. Instant listing of all your items for sale or wanted! No charge for this classified listing of radios, antennas, computers. Open chat room to discuss the details of your purchase or sale! Sponsored by the Tri-County Radio Group, Inc.; Web site: <http://quality-enterprises.com/tcrg/onlinefest/>.

MA, Falmouth Amateur Radio Assoc. (FARA): Meetings held last Thursday of the month at 7:30 p.m. at Falmouth Town Hall, Main Street, Falmouth, MA. ARRL exams at all levels given at 9 a.m. second Saturday of every month at the Town Hall. Primary rptr. 146.655. Contact President Lyman Mix, WA1KPE, at Box 815, W. Falmouth, MA 02574 or visit Web page: <http://www.falara.org/index.html>.

MB, Canada, Winnipeg Amateur Radio Emergency Service Inc. (WARES): Callsigns VE4YWG (Public Service Communications), VE4EOC (City Emergency Operations Centre). Meetings 3rd Tuesday of month, 1930h Sir Wm Stephenson Library, 765 Keewatin St. Membership open to all licensed amateurs at least 18 years of age living in or near Winnipeg and interested in emergency amateur communications. E-mail Jeff Dovyak, VE4MBQ, Emergency Coordinator at: <ve4mbq@ve4umr.ampr.org>; Web site: <http://www.geocities.com/CapeCanaveral/Hanger/1632/wares.html>.

NC, Stanly County Amateur Radio Club: Meetings held every 4th Thursday of the month at Stanly Community College. Two-meter nets held at 9 p.m., local, Wednesday (146.985) and Friday (147.390). Six-meter ragchew each Tuesday at 8:30 p.m. (50.135). For more info, visit our Web site at <www.qsl.net/scarc>.

NY, Binghamton Amateur Radio Association, Inc. (BARA): Meetings 3rd Wednesday of each month 7:30 p.m., Unitarian Universalist Church, 183 Riverside Drive, Binghamton. Visitors welcome. Club Station with HF/VHF operating positions, Club Repeater W2OW 147.390 MHz output/147.990 MHz input, PL 100 Hz, Autopatch. See our Web site at: <http://binghamton.edu/bara> or write BARA, P.O. Box 853, Binghamton, NY 13902.

NY, Tonawanda, Radio Association of Western New York (RAWNY): Meets 2nd Tuesday if each month from September to May, 8 p.m., at Church of the Nativity, corner of Thorncliff and Colvin Blvd., Tonawanda, NY. Web site: <http://hamgate1.sunyerie.edu/~rawny>.

OH, Cincinnati, Weather Amateur Radio Network (WARN, W8NWS): This is the Cincinnati, Ohio, chapter of Skywarn. In addition to club details and weather-spotter training information, the Web site features a searchable southwest Ohio repeater database, and a search engine covering all known ham club sites in the Greater Cincinnati area. Membership forms and mailing list to receive club news and announcements are also available online at <http://www.warn.org>.

OH, Adena Area, Triple States Radio Amateur Club: Features an all-mode 6-meter net on 50.150 on Wednesday nights at 9 p.m. EDT (50150 FM), SSB/AM/CW. Will have a reunion of Six Meter Operators at the Wheeling Hamfest, Wheeling Park, WV Sept. 12. For info newsletter, send adr to TSRAC 2011 St. Hwy 250, Adena, OH 43901; E-mail: <k8an@aol.com>.

OH, Cleveland Area, Cuyahoga Amateur Radio Society: Meets on the third Wednesday of every month except December at 8 p.m. at the Busch Funeral Home community room, 7501 Ridge Rd., Parma, Ohio. June, July, and August, "Picnic Meetings" are held at the Cuyahoga County Metropolitan Park. Repeaters are on 146.82(-), 443.825 & 444.75 (+), 53.83 & 53.01 (+), plus digipeater at 145.07, and club simplex frequency of 146.475 MHz. For more info, contact club president, Tom Wayne, WB8N, at (440) 232-4193 or at <wb8n@en.com>.

OH, Firelands Amateur Repeater Association (FARA): Assn. of amateur radio operators and their families in North Central Ohio, dedicated to operation and maintenance of a repeater system south of Berlin Heights. Meets monthly on 4th Tuesday at Erie County Services Cntr., 2900 Columbus Ave., wSandusky at 7 p.m. in basement cafeteria. For info, write FARA, P.O. Box 442, Huron, OH 44839; E-mail: Tim Stookey, N8AHK, President: <n8ahk@amsat.org>; Web: <http://www.fara.berlin-heights.oh.us/index.htm>.

OK, Tulsa Amateur Radio Club: P.O. Box 7283, Tulsa, OK 74159-4283. Repeaters 145.11, 147.045, 442.00, 443.00, 443.45, 443.75, 444.625. Autopatches on 145.11, 443.00. Net every Thursday on 145.11 @ 8 p.m. (linked to 442.00, 443.75, 444.625). Meetings 3rd Tuesday of month at 7 p.m., West Regional Library, 2224 West 51st Street, Tulsa, OK. Breakfast Meeting, 1st Saturday of month at 8 a.m., Ollie's Restaurant, 4070 Southwest Blvd., Tulsa. For more information, call (918) 446-6451, Vince Moore, N5RFW, Public Service Liaison Officer.

PA, Foothills Amateur Radio Club (FARC), Greensburg: Meetings 2nd Tuesday of month at Red Cross Building, Plymouth Ave., South Greensburg, at 7:00 p.m. EST. Two-meter repeater on 147.18 (+600, PL 131.8). Contact N3SRJ, 907 Arlington Ave., Jeannette, PA 15644, e-mail: <n3srj@bellatlantic.net>; Web <http://www.geocities.com/Heartland/Acres/7896>.

PA, Lambda Amateur Radio Club (LARC), Philadelphia: Since 1975, the only open and visible public service-oriented ham club for gay and lesbian hams. Monthly newsletter, HF skeds, internet listserv and IRC, hamfest meetings, chapters, DXpeditions. E-mail: <LARC@net-quest.com>.

PA, New Castle: Amateur Radio League of Lawrence County (ARLLC) and Lawrence County ARES (LCARES). Meetings every 2nd Tuesday of each month, 7:30 p.m., American Red Cross Bldg., 222 North Mercer St., New Castle, PA. Weekly informational net @ 9:30 p.m. every Thursday on 147.195(+) MHz and 146.625 (-) MHz linked repeaters. SKYWARN severe weather nets as situation requires. Contact Club Secy, ARLLC/LCARES, P.O. Box 7931, New Castle, PA. 16107-7931 or visit our Web site: <http://pages.prodigy.com/arllc>.

PA, Skyview Radio Society, New Kensington: Business meeting 1st Tuesday, social meeting 3rd Tuesday of month at SRS clubhouse, 2335 Turkey Ridge Road, Upper Burrell Twp. at 8:00 EST; 2-meter repeater 146.64 MHz (-600, PL 131.8). UHF repeater 444.3 (+5 MHz). Net Thursday at 9:00 on 146.64. Contact N3WAV, 116 Arizona Dr., Lower Burrell, PA 15068. E-mail: <n3wav@aol.com>.

TX, The Clear Lake Amateur Radio Club of Houston TX: Meetings are the 3rd Wednesday of every month at 7 p.m. at the Webster Volunteer Fire Dept. 17100 Texas Ave. in Webster, TX. Meetings are open to anyone interested in amateur radio. Our Web site has the info <www.clarc.org>.

TX, No Code International: An international non-profit club of hams who are dedicated to the elimination of morse code testing as a requirement for amateur HF licenses. SASE for information to: No Code International, P.O. Box 565206, Dallas, TX 75356 or visit our Web site at: <http://www.nocode.org>.

UT, Rocky Mountain Radio Association (RMRA): Offers Utah, Wasatch Front, unique UHF to 6, UHF to 2, and UHF to HF remote gateways. Net Thursday at 9 p.m. on 447.900 PL 114.8 UHF/6-meter gateway open 24 hours on 448.700 PL 114.8. Visit the RMRA Web site: <www.inconnect.com/~rmra>; or e-mail: <rmra @inconnect.com> for more information.

WV, Charleston, Kanawha Amateur Radio Club (KARC): Meetings held first Friday of each month at 7 p.m. at the South Charleston City Hall Annex, 4th Avenue and D street in South Charleston. Weekly Sunday net at 8:30 p.m. on 145.35 W8GK Club repeater. Mail to: KARC, P.O. Box 1694, Charleston, WV 25326. For information, contact Jim Damron, N8TMW, Publicty Director, at: <103347.610@compuserve.com>.

WV, Plateau Amateur Radio Association, Inc. (PARA), Oak Hill, WV: Meetings held the first Tuesday of every month, 7:30 p.m. in the basement of the New River Pawn Shop, 328 Main Street, Oak Hill, WV. Mailing address is PARA, P.O. Box 96, Fayetteville, WV 25840. Repeaters are 146.790-; 147.075- and 443.300+. For more information, contact Juddie Burgess, KC8CON, Secretary, at <kc8con@usa.net>.

Exam Sessions

CA, Cypress: ARRL amateur radio license test sessions start at 9 a.m., every 2nd Saturday of odd months. We test all levels, Novice through Extra, reservations not required. The address is 10824 Hope St., Cypress, CA (nearest cross streets are Katella and Valley View). For information, contact Harrision Spain, AC6TI, via e-mail: <spain@ugsolutions.com>; Phone: (714) 952-6114; Web: <http://www.serve.com/n6ehm/testing.html>.

CA, Los Angeles: United Radio Amateur Club, K6AA, Los Angeles Maritime Museum (6th Street, on Main Channel of the Harbor). Contact Elvin, N6DYZ (310) 325-2965. VEC: W5YI. Cost: $6.35 (or current amount allowed); Dates: 2nd Saturday every month except December; Time: 1:30 p.m.; Pre-registration: Recommended, but not required.

FL, Highlands County: Examinations held 4th Monday of each month, 7 p.m. Agri-Civic Center Conference Room 1, South US 27, Sebring, FL. Walk-ins are welcome. Web page: <http://www.strato.net/~hamradio>; E-mail: <hamradio @strato.net>.

FL, West Palm Beach: Exams held 1st Saturday of each month, 9 a.m. VA Medical Center, 7305 North Military Trail, West Palm Beach. Walk-ins welcome. For info, contact Steve, W2QX, at (561) 585-8504; or e-mail: <WA4AW@juno.com>.

IL, Chicago: Ham testing session 1st Thursday every month, from 7–10 p.m. We test all levels from Novice thru Extra. Reservations are NOT required. For info, contact Dennis L. Sladek, N9OZ, 4344 W. 51 St., Chicago, IL 60632; Phone: (773) 838-8088; E-mail: <n9oz@juno.com>.

NC, Wilmington: Azalea Coast Amateur Radio Club will hold a VE testing session on Oct. 10, 1998 10 a.m. at Morton Hall. University of North Carolina Wilmington Campus. Contact Jack, WD4OIN, at (910) 791-1556.

OH, Cincinnati: OH-KY-IN Amateur Radio Society are forming ham radio classes for all levels of amateur radio licenses, Novice through Extra, including the No-Code license in the Cincinnati, OH, area. Classes will be held every Thursday evening for 10 weeks at the Salem Presbyterian Church located at the corner of Mozart and Higbee in Wester Hills (behind the White Castle Restaurant at Harrison and Boudinot). At the conclusion of the 10-week course, participants will be given an FCC license exam on Saturday, November 21st at the same location. All morse code classes are free! The course is open to persons of any age, and no prior experience is necessary. For more information, contact Carol Hugentober, K8DHK, at (513) 5323 or Bruce Vanselow, N8FWA, at (513) 251-1555.

OH, Cleveland Area: Cuyahoga Amateur Radio Club holds exam sessions on the second Sunday of each odd-numbered month (except May), at the Olde Independence Town Hall, 6652 Brecksville Rd. (Rte 21), Independence, OH. Sessions start at 9 a.m. Fee is $6.95 and a valid ID and copy of your FCC license is required (if you are already licensed). For more info, contact Gary Dewey, NI8Z, at (216) 642-1399 or at <gdewey@en.com>.

OH, Colerain: The Triple States Radio Amateur Club holds exams the last Monday of every month at 6 p.m. at Citizens Bank. Courtesy call you are coming required. Phone: (740) 546-3930; Fax: (740) 546-3685; E-mail: <k8an@aol.com>.

SC, Columbia: ARRL/VEC testing session for all license classes will be held third Saturday of each even month (August, October, and December), at 9 a.m., at Heathwood Hall Episcopal School, 3000 South Beltline Blvd., Columbia, SC. For more information, visit the Web site at: <www.qsl.net/ku4qn>, e-mail: <KU4QN@juno.com>, or call (803) 779-5234. Exam fee is $6.35. Elements 2 (Novice written exam), and 1A (5-wpm code) are free of charge.

TX, Houston: The Clear Lake Amateur Radio Club (CLARC) serves the SE (NASA) area of Houston, TX. We give VE exams the 2nd Saturday of each month, check in at 9 a.m. at the Clear Lake Presbyterian Church 1511 El Dorado in Clear Lake. Our Web site has all the info: <www.clarc.org>.

Personal Web Site Listings

Jim Bridge, KQ6BS, URL: <http://www.qsl.net/kq6bs>. Specialty: weak signal.

"The Radio Picture Archive," URL: <http://www.e-etc.com/rpa>(corrected). Speciality collection of pictures of radios.

Commercial Web Site Listings

Communications Specialists, Inc.: Manufacturers of Tone Signaling Equipment including CTCSS encoders and decoders, Morse Station IDers, Repeater Tone Panels and much more. Please see our ad in this issue. <http://www.com-spec.com>.

KMA Antennas: VHF, UHF & HF log periodics, Yagis and unique 6-meter antennas. Please mention *CQ VHF* when you visit <www.qsl.net/w4kma>.

MS-Windows Software: RAC Callbook CD-ROM, Ultimeter Weather Stations and more, info <n2ckh@cybercomm.net>; Web: <www.QTH.com/n2ckh.bytewise.org>

Teletec: Manufactures 6, 2, 1 1/4 meter and 70 cm Linear Amplifiers as well as Receive Pre-Amplifiers. <http://www.Teletec-usa.com>.

Woodhouse Communication: Antennas and publications for weather satellite imaging: <www.view2earth.com>.

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HF/50/144/430 MHz All Mode Transceiver

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- **MIL-STD 810E (rain & shock)**
- **CTCSS tone scan**
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- **Key illumination**
- **High-performance antenna**
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KENWOOD COMMUNICATIONS CORPORATION
AMATEUR RADIO PRODUCTS GROUP
P.O. Box 22745, 2201 E. Dominguez St., Long Beach, CA 90801-5745, U.S.A.
Customer Support/Brochures (310) 639-5300
KENWOOD ELECTRONICS CANADA INC.
6070 Kestrel Road, Mississauga, Ontario, Canada L5T 1S8

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