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COMMUNICATIONS & TECHNOLOGY

JANUARY 2004

CQ

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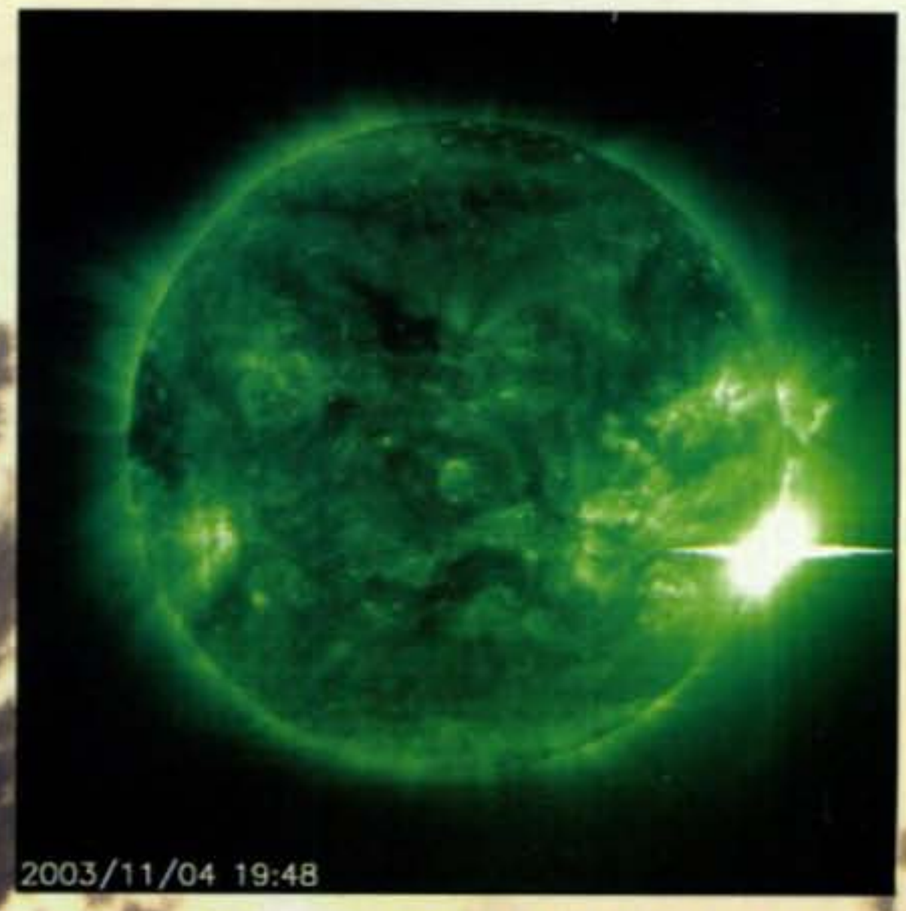

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On the Cover: Southern California firefighters wait to battle an approaching wildfire. Hams provided communications help with this major firestorm. Details on page 49.

THE RADIO AMATEUR'S JOURNAL

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TH-11DX
$1079.95
11-Elements, 6.2 dBd gain.
10, 12, 15, 17, 20 Meters

TH-11DX, $1079.95. 11-element, 6.2 dBd Gain, 10,12,15,17,20M

The choice of top DXers.

With 11-elements, 6.2 dBd gain and 5-bands, the super rugged TH-11DX is *the "Big Daddy" of all HF beams!*

Handles 2000 Watts continuous, 4000 Watts PEP.

Every part is selected for durability and ruggedness for years of trouble-free service.

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Uniquely combining monoband and trapped parasitic elements give you an excellent 27 dB F/B.

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The broadband *five element* TH5-MK2 gives you an outstanding 6.1 dBd average gain.

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You get an impressive 5.9 dBd average gain and a whopping 25 dB average front-to-back ratio. Handles a full 1500 Watts PEP. 95 MPH wind survival.

Fits on average size lot with room to spare -- turning radius is just 15.3 feet. Four piece boom is ideal for DXpeditions. Rotates with CD-45II or HAM-IV rotator.

Features *Hy-Gain BetaMatch*™ for DC ground, full power *Hy-Q*™ traps, rugged boom-to-mast bracket and mounts on standard 2"O.D. mast. Stainless steel hardware. BN-86 balun recommended.

TH-2MK3, $339.95. 2-element, 3.4 dBd Gain, 10,15,20 Meters

The 2-element TH-2MK3 is Hy-Gain's *most economical* full power (1.5kW PEP) full size tri-bander.

For just $339.95 you can *double* your effective radiated power and hear *15-20 dB* (=F/B) better!

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EXP-14, $549.95. 4-element, 5.9 dBd Gain, 10,15,20 Meters

Revolutionary 4-element compact tri-bander *lets you add 40 or 30 Meters!* Has 14 foot boom and tight 17.25 feet turning radius. Fits on roof tri-pod, mast or medium duty tower.

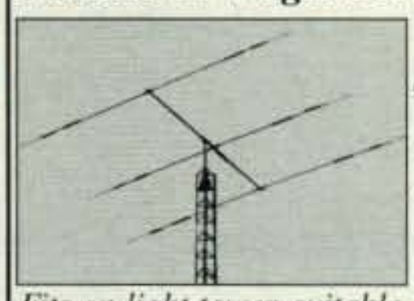
Hy-Gain's *patented* broadbanding *Para Sleeve* gives you less than 2:1 VSWR. 1.5kW PEP.

BetaMATCH™ provides DC ground to eliminate static. Includes BN-86 balun. Easily assembled.

***Truly** competitive against giant tri-banders at half the cost!*

QK-710, $169.95. 30/40 Meter option kit for EXP-14.

Compact 3-element 10, 15, 20 Meter Tri-Bander
For limited space . . . Installs anywhere . . . 14.75 ft turning radius . . . weighs 21 lbs . . . Rotate with CD-45II, HAM-IV



Fits on light tower, suitable guyed TV pole, roof tri-pod

TH-3JRS, $329.95. Hy-Gain's *most popular* 3-element 10, 15, 20 Meter tri-bander fits on most lots! Same top performance as the full power TH3MK4 in a compact 600 watt PEP design.

Excellent 5.8 dBd gain and 25 dB F/B let *you* compete with the "big guns".

Tooled manufacturing gives you *Hy-Gain* durability with 80 MPH wind survival.

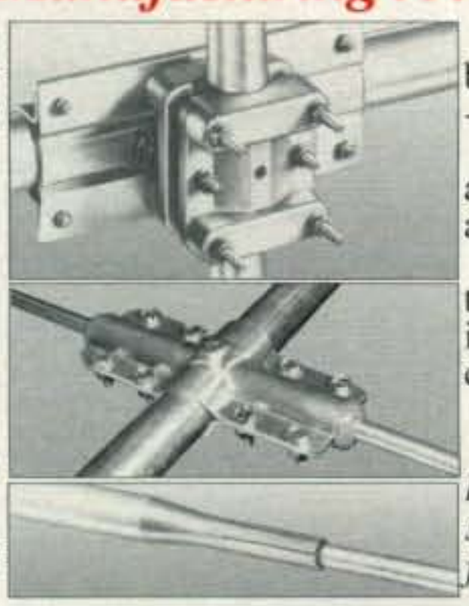
Model No.	No. of elements	avg Gain dBd	avg F/B dB	MaxPwr watts PEP	Bands Covered	Wind sq.ft. area	Wind (mph) Survival	Boom (feet)	Longest Elem. (ft)	Turning radius(ft)	Weight (lbs.)	Mast dia O.D.(in.)	Recom. Rotator	Retail Price
TH-11DX	11	6.2	22	4000	10,12,15,17,20	12.5	100	24	37	22	88	1.9-2.5	T2X	$1079.95
TH-7DX	**7**	**6.57**	**21**	**1500**	**10, 15, 20**	**9.4**	**100**	**24**	**31**	**20**	**75**	**1.5-2.5**	**HAM-IV**	**$819.95**
TH-5MK2	5	6.1	20	1500	10, 15, 20	7.4	100	19	31.5	18.42	57	1.5-2.5	HAM-IV	$699.95
TH-3MK4	**3**	**5.8**	**25**	**1500**	**10, 15, 20**	**4.6**	**95**	**14**	**27.42**	**15.33**	**35**	**1.9-2.5**	**CD-45II**	**$439.95**
TH-3JRS	3	5.8	25	600	10, 15, 20	3.35	80	12	27.25	14.75	21	1.25-2.0	CD-45II	$329.95
TH-2MK3	**2**	**3.4**	**15-20**	**1500**	**10, 15, 20**	**3.25**	**80**	**6**	**27.3**	**14.25**	**20**	**1.9-2.5**	**CD-45II**	**$339.95**
EXP-14	4	5.9	25	1500	10,15,20 (opt. 30/40)	7.5	100	14	31.5	17.25	45	1.9-2.5	HAM IV	$549.95

Tooled Manufacturing . . . Highest Quality Materials

1. Hy-Gain's famous super strong *tooled* die cast *Boom-to-Mast Clamp*

2. *Tooled* *Boom-to-Element Clamp*

3. Thick-wall *swaged* aluminum tubing



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Die-cast aluminum boom-to-mast bracket and element-to-boom compression clamps are made with specially *tooled* machinery.

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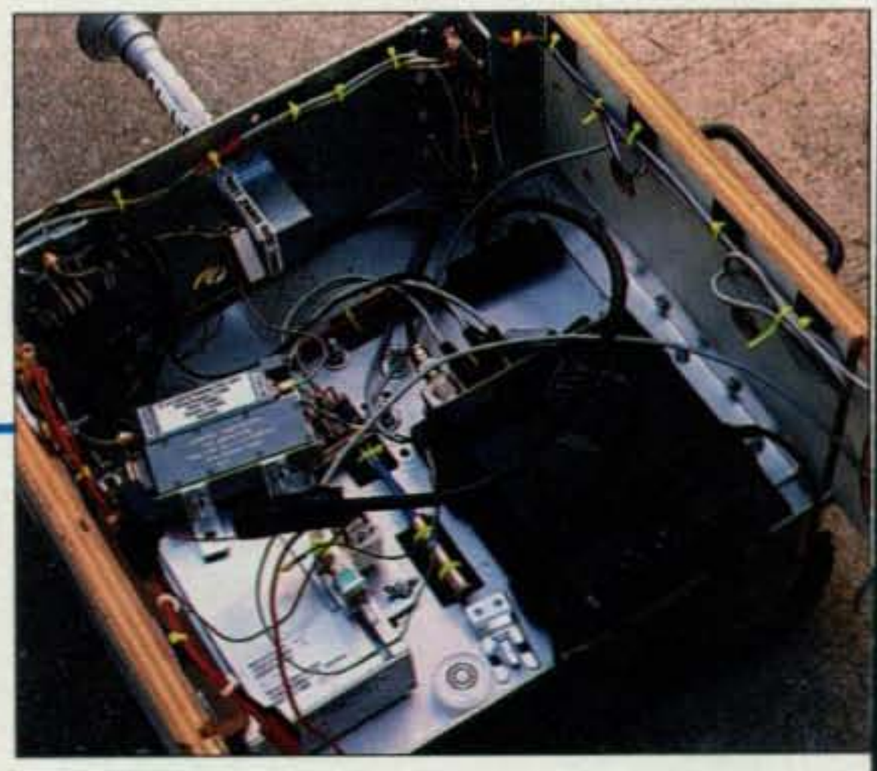

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BPL Forum Draws Broadcasters, Others

A group of 25 communications professionals gathered at the National Association of Broadcasters headquarters in early November for an ARRL-sponsored symposium on the interference potential of Broadband over Power Lines, or BPL. According to the *ARRL Letter*, attendees included people representing a wide variety of HF/low VHF band users. The program included a technical review of BPL, along with excerpts from the ARRL's videos made in BPL test areas and discussion of ways to combat the systems' interference potential. ARRL officials said they were pleased to get significant support from outside of amateur radio.

Meanwhile, a spokesman for FCC Commissioner Kathleen Abernathy has clarified her statement at the United Powerline Council's annual conference that she felt BPL was a step along the pathway to "broadband Nirvana." The *ARRL Letter* reports that her senior legal advisor told the ARRL and others that "ensuring that BPL and all new technologies avoid causing harmful interference to licensed RF users is a bedrock position for Commissioner Abernathy."

Just outside of Washington, the suburb of Manassas, Virginia, has approved plans for a citywide rollout of BPL early this year. According to the *ARRL Letter,* ARRL CEO Dave Sumner, K1ZZ, sent a letter to the city's mayor, alerting him to the system's interference potential, FCC rules concerning interference to licensed services, and a promise that the League "will ensure that there is full compliance with the FCC regulations..."

Hams Help in California Fires

Hams from throughout southern California pitched in to provide emergency communications during the spate of wildfires that struck the state in late October. Their task was made more difficult by the fact that several repeaters were destroyed by flames or lost commercial power for so long that their battery backups ran down. We have detailed coverage in this issue, beginning on page 30.

OSCAR-14 Satellite Permanently QRT

After nearly 14 years in orbit, during which time it distinguished itself as the first "pacsat," or amateur radio digital satellite, as an FM "easy-sat," and as a humanitarian aid satellite, UoSat OSCAR-14 (UO-14) has been declared officially dead, according to the ARRL and AMSAT. Luanched in 1990, UO-14 initially operated as a 9600-baud digital satellite—the first amateur data satellite. About a year and a half after launch, the satellite was removed from amateur service to provide digital messaging into Africa for Volunteers in Technical Assistance (VITA), then returned to the ham bands as an FM voice repeater, its most popular role. In early 2001, UO-14 was a major tool for hams in India to provide communications there after a devastating earthquake. UO-14's repeater stopped working last August, but efforts continued until November to bring it back online. Controllers attributed the problems to battery failure.

FCC Goes After IRLP/Echolink QRM

Three hams have received FCC letters regarding alleged interference to internet-linked repeaters. Two Oklahoma hams were accused of deliberate interference and harassment of users on an IRLP repeater in Oklahoma City, and a ham in Florida has been cited for allegedly causing interference not only on a local repeater but also on another one in New York State which was linked to his local machine via Echolink.

Hamvention 2004 Will Be at Hara

The Dayton Hamvention® is staying in Dayton, at least for one more year. General Chairman Gary Des Combes, N8EMO, announced in late October that the Dayton Amateur Radio Association had signed a one-year contract to hold the 2004 show at its longtime home, Hara Arena, in the Dayton suburb of Trotwood. According to the *ARRL Letter,* Des Combes also announced "sweeping changes" in Hamvention management, aimed at turning around a three-year slide in attendance. One of the major changes will be a return to relying on volunteers, rather than paid staff, to plan and produce the show. This year's Hamvention will be held on May 14–16.

AMSAT OSCAR-Echo Set for March Launch

The AMSAT News Service reports that an agreement has been reached to launch the amateur satellite organization's newest satellite, AMSAT OSCAR-Echo, from Kazakhstan at the end of March. It will be launched aboard a converted Russian intercontinental ballistic missile (ICBM) from the Baikonur Cosmodrome, and is planned to operate on FM voice as well as various digital modes (including PSK-31) as well as SSB on a 10-meter uplink. For more information, see <http://www.amsat.org/amsat/sats/echo/article-03-11.html>.

The Echo satellite project got a boost in early November from AMSAT-UK. The British amateur satellite organization decided to donate £10,000 (approximately $16,000 US) to AMSAT-NA for the project immediately, and to donate another £10,000 in the future to AMSAT-DL, for a new satellite the German group is building for launch in the 2005–06 timeframe.

Phase 2 Ham Gear to ISS

Look for an expanded presence on the ham bands from the International Space Station over the coming months, as it is no longer limited to using a 2-meter handheld for ham radio contacts. According to "Newsline," a Russian supply rocket that arrived in early November included a specially programmed Kenwood TM-D700E dual-band transceiver. Once it's hooked up by Expedition 8 crew Mike Foale, KB5UAC, and Alex Kaleri, U8MIR, the ISS crew will be able to operate with up to 25 watts on either 2 meters or 70 centimeters, using voice, packet, or APRS. The rig can also be set up as a crossband repeater and has an emergency mode as well. Sometime this month another supply flight is scheduled to deliver a Yaesu FT-100D, which will put the station on HF, along with slow-scan TV gear and new headsets.

Special on-the-air activity from the space station was planned for the last weekend in November (for those not operating the CQ WW CW contest!) in commemoration of the 20th anniversary of ham radio operations from manned spacecraft and in memory of former NBC News Science Correspondent Roy Neal, K6DUE, who persuaded NASA to allow astronauts to bring ham gear into space and who died last August. According to the ARRL, anyone contacting the ISS via voice (NA1SS) or packet (RS0ISS) between November 29 and December 31 was eligible for a special anniversary certificate.

Additional and updated news is available on the Ham Radio News page of the CQ website at <http://www.cq-amateur-radio.com>. For breaking news stories, plus info on additional items of interest, sign up for CQ's free online newsletter service. Just click on "CQ Newsletter" on the home page of our website.

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Its bell construction gives you total weather protection for super reliable operation. Its super heavy duty steel gear drive gives you years of superior and trouble-free performance. Many Hy-Gain rotators still provide excellent service after over 25 years of outstanding performance.

The last thing you want to fall apart is your rotator that's mounted on the top of your tower. You won't make any compromises when you buy and install high quality Hy-Gain rotators.

And we're the only manufacturer to offer a full line of rotators that are completely MADE IN THE USA.

HAM-IV, $559.95. *The heavy duty Ham-IV is the most popular rotator in the world!* It is designed for medium size antenna arrays up to 15 square feet wind load area when mounted in-tower, or 7.5 square feet when mast mounted with an optional lower mast bracket. New alloy ring gear gives extra strength up to 100,000 PSI for maximum reliability. New low temperature grease permits normal operation down to -30 degrees Fahrenheit. New wire-wound potentiometer gives reliable and precision directional indication, new ferrite beads reduce RF susceptibility, new Cinch plug connector plus 8-pin plug at control box (no screwdriver needed). Dual 98 ball bearing race for load bearing strength. Strong electric locking steel wedge brake prevents wind induced antenna movement. Easy-to-use Control Box has illuminated directional meter with North or South center of rotation scale, separate snap-action brake and rotation switches. Uses low voltage control for safe operation. Accepts masts up to 2 1/16 inches diameter. Rotator size is 13 1/2Hx8D inches.

T-2X, $649.95. *Extra heavy duty Tailtwister antenna rotator!* For large antennas up to 20 square feet wind load when mounted in-tower, or 10 square feet when mast mounted with optional support bracket. Triple 138 ball bearing race, strong electric locking steel wedge brake. Control Box has an illuminated directional indicator with North or South center of rotation scale, separate snap-action brake and rotation control switches. Accepts masts up to 2 1/16 inches diameter. Rotator size is 14 1/16Hx9 3/16D in.

CD-45II, $389.95. *Medium duty antenna rotator.* Handles antenna arrays up to 8.5 square feet windload area when mounted in-tower, or 5 square feet when mast mounted with supplied lower support. Dual 48 ball bearing race, disc brake system. Control Box has an illuminated directional indicator with North or South center of rotation scale, separate snap-action brake and rotation control switches with disc brake release. Accepts mast sizes up to 2 1/8 diameter. Includes light duty lower mast support, Rotator size is 17 3/8Hx8 D inches.

AR-40, $289.95. *Lightweight antenna rotator.* Handles smaller ham antennas and large TV/FM antennas up to 3.0 square feet windload area when mounted in-tower, or 1.5 square feet when mast mounted using the supplied lower support bracket. Dual 12 ball bearing race, disc brake system. Silent, automatic control box -- just dial and touch for desired direction. Accepts mast sizes up to 2 1/8 diameter. Includes light duty mast support. Rotator size is 17 3/8Hx8D inches.

Call your dealer for your best price!

Rotator Specifications	T2X	HAM-IV	CD-45II	AR-40
Wind Load capacity (inside tower)	20 sq. ft.	15 sq. ft.	8.5 sq. ft.	3.0 sq. ft.
Wind Load (with mast adapter)	10 sq. ft.	7.5 sq. ft.	5.0 sq. ft.	1.5 sq. ft.
Turning Power (in pounds)	1000	800	600	350
Brake Power (in pounds)	9000	5000	800	450
Brake Construction	Electric wedge	Electric wedge	Disc brake	Disc brake
Bearing Assembly/How many	Tripl race/138	Dual Race/96	Dual race/48	Dual race/12
Mounting Hardware	Clamp plate	Clamp plate	Clamp plate	Clamp plate
Control Cable Conductors	8	8	8	5
Shipping Weight (pounds)	28	24	22	14
Effective Moment (in tower)	3400 ft/lbs.	2800 ft/lbs.	1200 ft/lbs.	300 ft/lbs.

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$649.95
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CD-45II
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A CQ EDITORIAL BY RICH MOSESON, W2VU

Ham Radio at a Crossroads

Since the beginning of a new year is traditionally a time for taking stock of where you've been and where you're heading, I thought it would be appropriate this month to step back a little and take a look at "the state of the hobby."

Ham radio is at a crossroads, one in which established and comfortable ways of doing things are threatened while new technology waits in the wings. We've been at this crossroads before, and each time the new technology has not only saved our hobby but ushered in a new era of activity and growth.

In the early days of radio, the broad bandwidth of spark signals proved to be such a source of interference as the use of radio grew that, after World War I, the Navy tried to take over all control of radio in the United States and to shut down amateur radio in the process (It failed but hams were shunted to the "useless" frequencies above 200 meters). And in 1927, spark was outlawed for use by hams. Fortunately, the invention of the vacuum tube in the same time period led to the development of oscillators, which allowed the use of narrow-band continuous wave (rather than broadband damped wave), or CW, transmissions. Widespread adoption of this new technology literally saved amateur radio (over the eternal protests of the "Spark Forever" crowd).

After World War II, television took America by storm and with it came an avalanche of TV interference complaints against hams. Again, our future was threatened, and again, new technology proved to be our salvation. The new art of mobile operating became very popular and single-sideband—around but resisted since the mid '30s—gained acceptance when it became clear that it caused far less TVI than AM phone. This crisis of the early 1950s set ham radio on its basic path for the next half century, as SSB became the standard for HF voice communications and mobiling today is as popular as it's ever been.

More recently, cell phones and the internet have threatened our traditional role as emergency communicators. In the past two years, though, it has become clear to many emergency managers that communications systems which rely on having connections to the telephone network or the electric power grid are not fail-safe. We've seen situation after situation in which cell phones haven't worked, connections to the internet can't be made, and the power grid fails; and in each and every one of those situations, radio amateurs and amateur radio have come to the fore and performed wonderfully. Plus, where we can access the internet, we've combined that technology with amateur radio to do such things as enabling hams at the National Hurricane Center to directly communicate with VHF nets in Texas or North Carolina. Today, our role as emergency communicators is stronger and more secure than ever (see this issue's articles on the California wildfires).

The biggest threat currently is BPL, or Broadband over Power Lines, and the threat is both real and severe. Experiments conducted by the ARRL in BPL test areas suggest that widespread deployment of this system of using power lines to distribute internet signals would virtually wipe out HF and low VHF communications beneath unremitting S9 noise levels. Entering stage left, however, is digital voice, with which hams are already experimenting on HF, VHF, and UHF. A year and a half ago, we reviewed Alinco's VHF/UHF handheld with digital voice; one of our reviewers is working right now with AOR's ARD-9800 "fast modem," which lets you use any standard analog transceiver (HF or VHF/UHF) to transmit and receive digital voice and image signals within the bandwidth of an SSB voice signal. In addition, Wireless Local Area Networks (WLANs) for amateur use have been featured here in *CQ* and in *CQ VHF*, and an article in the current TAPR *Packet Status Register* talks about the voice and video potential of high-speed multimedia (HSMM) in amateur radio. All of this is here now, waiting to be adopted for broader use, just as software-defined radios are here and beginning to make their way into amateur transceiver design, most notably with the Ten-Tec Orion, all of whose operating parameters are defined in software, making it possible to download updates and upgrades from the internet (see ON4UN's review in this issue).

Will digital voice technology be able to "beat" BPL? We don't know, and perhaps further enhancements will be needed to keep the HF ham bands viable. What we do know is that virtually every threat to ham radio in the past has been met with the creativity and ingenuity for which we are famous. As a result, these threats have not only failed to destroy the hobby; they've pushed it forward. (This is *not* to suggest that we shouldn't fight BPL, which is a bad idea from a whole lot of perspectives; rather, it is an observation that life has given us lemons many times before, and we've repeatedly been able to make lemonade.)

Digital technology today is what CW was in the 1920s and what SSB was in the 1950s. It will fundamentally change the way we "do" ham radio—just as CW and SSB did in their time—and very likely will not only permit us to survive today's technical challenges but will push us forward and enable amateur radio to continue to thrive in the 21st century. It is part of the ongoing evolution of amateur radio, an evolution that is essential for the continued vitality of the hobby.

Pushing 60

If you look at the Table of Contents page in this issue, you'll see that it is Issue number 1 of Volume 60—as *CQ* begins its 60th year of serving the amateur radio community. It provides us with another opportunity to take stock—to look at where we are and where we're going. But rather than trying to analyze ourselves, I'm going to turn this task over to you. How are we doing as we push 60? Are we still fulfilling our mission statement from Volume 1, Issue 1, in January 1945:

> This, then, is the *raison d'etre for CQ*—a magazine for the radio amateur, with a particular invitation to the newcomer. It should not, however, be inferred that we shall confine ourselves to the ABC's of ham radio. We visualize *CQ* as a magazine that will stick with the ham long after the parts of his first rig are dust-laden in the junk box, and as a monthly refresher course for the old timer. While placing some emphasis on the elementary, we are still under obligation to carry through with articles on modern techniques and apparatus. Similarly, we shall follow up tradition (with which every ham must be familiar) with all the vital news of amateur radio today and tomorrow.

Are we still doing the job? Is this 60-year-old mission statement still valid? Where do we need to improve? Let me know what you think.

All the best for a happy, healthy, peaceful, and prosperous new year.

73, W2VU

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announcements

St. Michaels Island (Azores) Radio Club – Ana, CU2YK, a mathematics teacher in St. Michaels, has formed a ham radio club in the school at which she teaches. She is working with 18 students, some of whom are studying to get their licenses, and they are interested in DXing, forming a net, and other amateur radio activities. The club, the CREC, is looking for used equipment and ideas to help promote the hobby to the students. Ana's e-mail address is <xinhas@sapo.pt>.

The following hamfests, etc., are scheduled for January:

Jan. 3, **West Allis RAC Midwinter Swapfest**, Waukesha County Expo Center Forum, Waukesha, Wi. Contact Phil, W9NAW, 414-425-3649, or go to <www.warac.org>. (Exams at Waukesha Lanes, reservation suggested, and by Dec. 27)

Jan. 3, **Lakeway ARC Hamfest**, National Guard Armory, Morristown, TN. Contact Mike, KF4JOZ, <kf4joz@lakewayarc.org>, or write to LARC, P.O. Box 895, Talbott, TN 37877-0895. (Talk-in 147.030; exams)

Jan. 17, **Northwest Missouri Winter Hamfest**, Ramada Inn, St. Joseph, MO. Contact Neal, WBØHNO, or Carlene, KAØIKS, 816-279-3406, e-mail: <nem3238@ccp.com>. (Talk-in 146.85, 444.925; exams)

Jan. 18. **Ham Radio University 2004/ARRL NYC/LI Section Convention**, East Woods School, Oyster Bay, LI, NY. For more info go to <www.limarc.org>, and see Dec. *CQ* announcements.

Jan. 18, **Hazel Park ARC Hamfest**, Hazel Park High School, Hazel Park, MI. Contact Jeff, N8WR, 248-642-3608, e-mail: <N8WR@arrl.net>. (Talk-in 146.64 [–]100 Hz)

Jan. 25, **Wheaton Community RA MIdwinter Hamfest**, Pheasant Run MegaCenter, St. Charles, IL. Contact WCRA, 630-604-0157, e-mail: <info@wheatonhamfest.org>, <http://www.wheatonhamfest.org>. (Talk-in 145.390; exams)

Jan. 25, **Tusco ARC Hamfest**, New Towne Mall, New Philadelphia, OH. Contact Gary, K8WFN, 740-922-4454, e-mail: <k8wfn@tusco.net>. (Talk-in 146.730–; exams by appointment)

Jan. 31, **Lockport ARA Hamfest**, South Lockport Firehall, Lockport, NY. Contact Duane, W2DLR, 716-791-4096, e-mail: <W2DLR@arrl.net>, web: <http://lara.hamgate.net>. (Talk-in 146.820 [107.2 PL])

our readers say

A Trip Down Memory Lane

Editor, *CQ:*

In the December issue I read with interest "There Once was an Ocean Hopper," by Scott Freeberg, WA9WFA, regarding the disappearance of product names.

Yaesu radios, about 20 to 30 years ago, did, occasionally, have product names attached to them. The FT-2FB 2-meter transceiver was dubbed the "Sigmasizer," while the renowned FT-227R series was known worldwide as the "Memorizer." The FT-301 HF series was known as "The Gold Line," and a very popular HF transceiver from the early 1980s was the FT-707 "Wayfarer."

Mr. Freeberg's article was quite a trip down memory lane.

Chip Margelli, K7JA
Manager, Engineering/R&D
Yaesu Amateur Products Division
Vertex Standard USA, Inc.

Rohn Towers

Editor, *CQ:*

I was so sorry to hear about the demise of Rohn Tower Company. I have a Rohn #25 I purchased (drop ship) from Burstein Applebee Company in Kansas City. My tower is 40 feet high and it's in very good condition 35 years later.

Richard Mollentine, WAØKKC
Overland Park, KS

Richard: At this time, Rohn is still in business, but is reorganizing under protection of the bankruptcy laws (Ch. 11) in an effort to regain solvency and remain in business. Many such efforts succeed.—W2VU

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- Backlit remote control mic

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- Multiple DSP controlled AGC loops
- Advanced CW functions
- 101 alphanumeric memories

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- Auto repeater
- Easy operation!
- Mil spec 810, C/D/E*†

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- Dynamic memory scan
- Backlit keypad & display
- CTCSS/DTCS encode/decode w/tone scan
- Weather Alert

IC-2720H Dual Band Mobile
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- VV/UU/VU
- Wide band RX inc. air & weather bands
- Dynamic Memory Scan (DMS)
- CTCSS/DTCS encode/decode w/tone scan
- Independent controls for each band
- DTMF Encode
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- PC Programmable
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IC-2100H 25N 2M Mobile Transceiver
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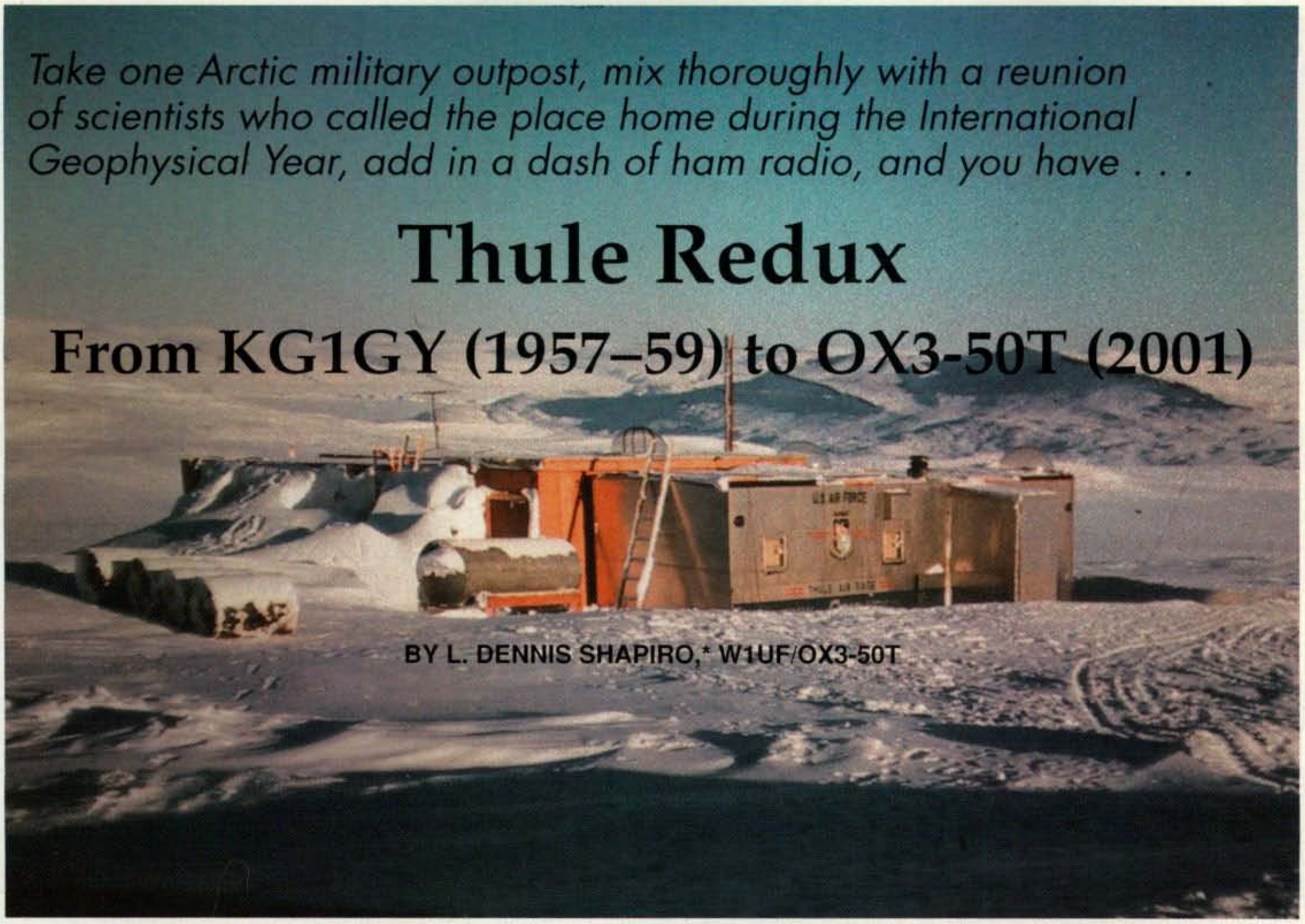
Thule Redux

From KG1GY (1957–59) to OX3-50T (2001)



BY L. DENNIS SHAPIRO,* W1UF/OX3-50T

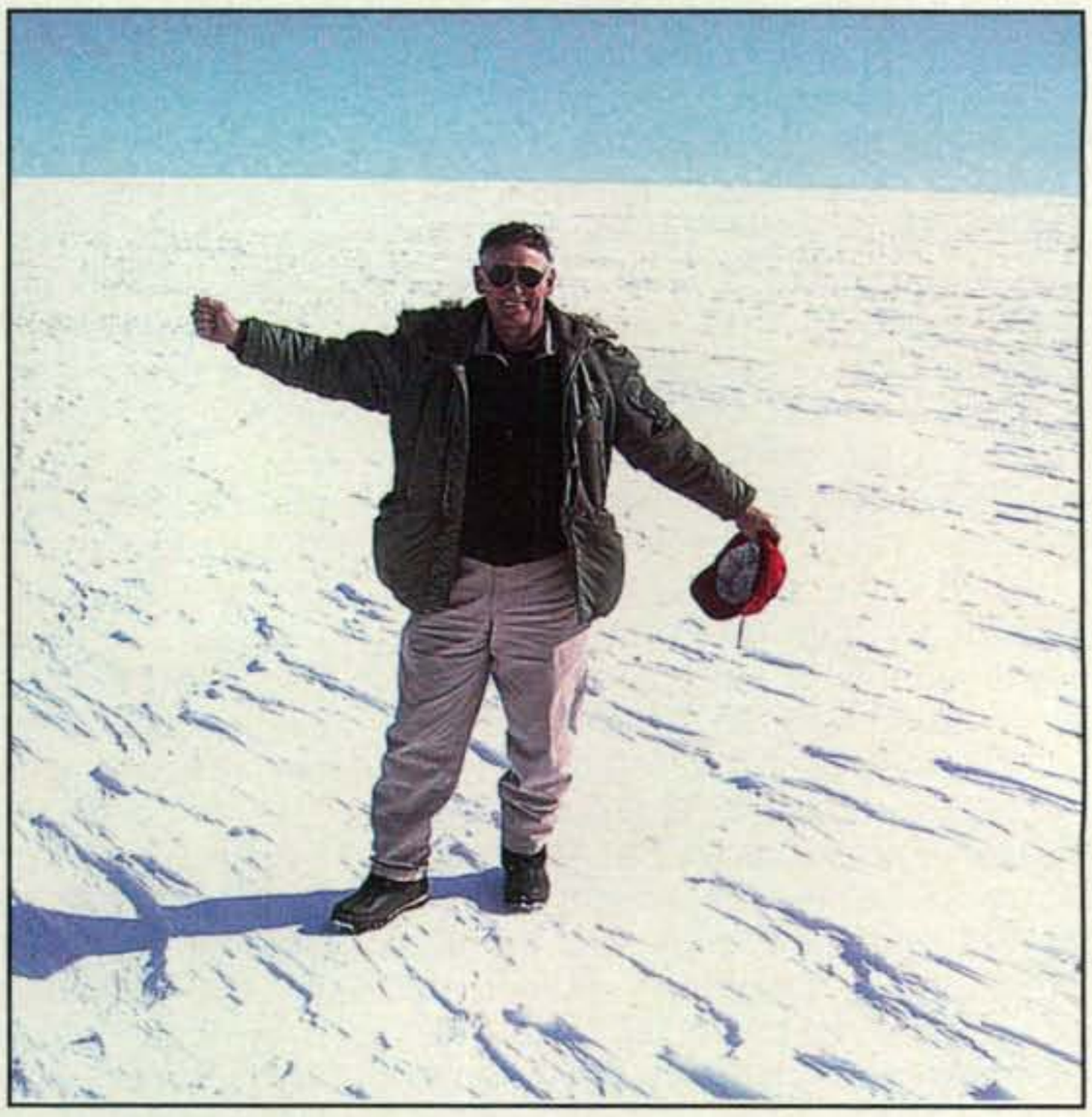
The Thule IGY (International Geophysical Year) research station and home of KG1GY, on North Mountain, 1957–58. (All photos courtesy of the author)

Di-di-di-dah-di-dah. No it's not CW. It was my Eudora e-mail program announcing that another message had arrived. I wondered what spam this time.

Hmmm. This was different. 6 March 2001, USAF, Thule Air Base, Greenland, Lt. Eric Gardner. The message said that the air base was to celebrate its 50th anniversary in June and that there might be an opportunity for some "Thule-ites who were up here in the '50s" to join in the celebration. "Would you be interested?"

As a shave-tail lieutenant with a couple of degrees in electrical engineering, I began active duty just in time for the International Geophysical Year. I was assigned to be part of a three-man team tasked to organize and prepare a research station that would be operated at Thule from 1957 to 1959 to collect data on the ionosphere. Thule happens to be situated at the Earth's geomagnetic North Pole, and the characteristics of its ionosphere were an important part of this worldwide effort. In addition, this team would have the (dubious) honor of operating the station at Thule for the first year.

It was a very interesting year—one which continued to ring in my memory. Every so often I would take out my slides and relive some of the unusual experiences of being "top of the world" at 76 degrees north latitude—just 800 nautical miles from the "real" North Pole. Four months of light, four months of darkness, and four months of in-between.



"On Top of the World," author W1UF on the Greenland Ice Cap in 2001.

*e-mail: <LDShapiro@comcast.net>

One day while surfing the Web (the bands must have been dead), I did a search on "Thule." There was a page called "Thule Forum" organized by Steffen Winther, a Dane. One could sign in, giving the year(s) and the unit in which you served so that people who served together might know of one another—and I did. As I later learned, Lt. Gardner used this list to get e-mail addresses of people who had served in the '50s.

One of the "lifetime" wishes that I had stowed in the back of my mind was to revisit Thule. This e-mail was a wish come true. It must have taken me less than a microsecond to grab for the mouse, click on "reply," and send a message saying "Count me in. How do I sign up?" So began an exchange of e-mails over the next couple of months. Finally I started receiving messages with seven addresses in the header, and I had the notion that I had "made the cut."

The KG1GY operating position with Dennis, then W2URX (now W1UF), at the key, 1957.

1957

Thule weather can be beautiful and otherwise. Temperatures can drop to –40 degrees (Fahrenheit and Celsius match up at that point) and lower, and winds can blow at 50–100 mph for days at a time. It's dark in the winter, and we used to say that Greenland is a grand place—there is a pretty woman behind every tree (Greenland has no trees!). Except for three nurses at the hospital, Thule was populated by 8000 men! Ham radio was a saving grace. I had been a ham since 1947 with the call W2URX. When I was assigned to Thule, I applied to the Headquarters of the Eighth Air Force (Strategic Air Command) at Westover (MA) Air Force Base and asked for a MARS (Military Amateur Radio Station, now Military Affiliate Radio Service) call. I was issued AF2URX. I was also issued a special Greenland call for the Geophysical Year, KG1GY. At that time, U.S. military personnel at Thule were authorized KG1 calls, while Danish/Greenland nationals had OX prefixes.

I was able to locate and secure (scrounge) from Air Force inventory a Hammarlund SP-600 Super Pro receiver and a 60 watt CW transmitter for 20 and 15 meters. I installed them in our research enclosure—a special triple-insulated house trailer that became the Thule IGY Station. I brought up a reel of wire and some coax, had the base erect three telephone poles, and designed a Vee beam 140 feet on each side, pointed stateside. In February 1958, I finally received a long-awaited SSB exciter (it was an Eldico) from the Air Force, and the Army Signal Corps detachment at Thule came up with a 750 watt 4-400 amp amplifier.

My first KG1GY QSO was on October 24, 1957 with W1EFQ, and the final contact was on June 12, 1958 with PY4AS. It was grand being "DX." Zone 40 was still pretty rare, and there was no lack of QSO activity as long as the bands were open. Fortunately, the science at the IGY station was related to magnetic storms, so the workload was light under normal conditions, allowing for ham operation. When the ionosphere was disturbed, propagation on 20–10 meters often was nil.

Propagation was different from the lower latitudes. Some days I could hear no stations except Antarctica and had several QSOs with MIT friend Charley Greene at KC4USN at the South Pole. Some days I could not penetrate the auroral zone and could only hear other arctic stations, including KL7FLA operating on Ice Floe Alpha in the Arctic Ocean northeast of Alaska. Once I contacted them while they were in the process of relocating their gear because the floe was splitting in two. Another QSO came when it was 'breaking up' and evacuation was in progress!

When conditions were good I enjoyed working the world, including some famous hams: Art Collins, WØCXX; Katashi Nose, KH6IJ; "Uncle" Dave, W2APF; Vic Clark, W4KFC; and Gus Browning, W4BPD. There were also some hams I would get to know later: Dana Atchley, W1HKK/W1CF, who was a neighbor in Lincoln, Massachusetts, and Art Tessler, K9JKF, whose niece I would meet and marry in 1965—my wife, Susan.

I worked the MIT Club Station, W1MX, several times, including one QSO with Dave Goldman, W1YSW, with whom I still chat over the Middlesex ARC repeater. The QSOs I remember most were with my late father, W2CSZ/WA4SYX. These weekly schedules made life easier at Thule, and Dad helped many at the IGY and nearby stations with phone patches.

In those days communications was not what it is today. Picture this vital SAC base—our first line of defense for the Cold War. What was *its primary* communications link? When I arrived at Thule, I was invited to see the secret "Comm Center." I expected to see major heavy iron *a la* the broadcast industry, but it looked like a top-end ham station. The main console was Collins equipment—Collins *ham* equipment: R-5100 general-coverage receivers, 75A ham-band receivers, KWS-1 transmitters, and fixed Sterba curtain high-gain directional antennas. SAC communications were SSB nets on HF between different bases. This was the outgrowth of the demonstrated superiority of SSB to "get through" which earned the support for the system from Generals Curtis LeMay, head of SAC, and Butch Griswold, head of SAC communications. You can imagine what happened when there was a solar flare and HF died. SAC was out of touch. But that's the way things used to be (and there were procedures to deal with it), like how the military functioned before Marconi.

One alternate was an "operational" tropo system that linked Thule to Sondrestrom Air Base (also in Greenland), with further relays to Goose Bay, Newfoundland and on to Westover. It looked great (beautiful "heavy iron" consoles) and worked very occasionally. An LF teletype circuit operating near 100 kHz was probably the most reliable messaging system.

You can imagine this environment for a ham with a station at Thule. People wanted to talk to folks at home. They needed phone patches. Rank had no meaning, and this 2nd Lt. ham found he had clout. Around the holidays, the SAC station was set up for phone patching and people from the base could sign up. All the hams did patch duty. We had a list of addresses and telephone numbers. In those days, long-distance charges were related to mileage, and we tried to get patches as close to the target as we could. The procedure was for the patching ham to make a collect call, and if the people were home, we would get the base person on the phone or to the station. Patching was big, and MARS stations were critical to morale.

2001

With these memories in mind, I e-mailed Lt. Gardner and asked to be put in touch with the MARS station, since I wanted to get on the air while in Thule. He replied, "What is MARS?" I explained. He said he'd look in the phone directory and ask around. Nobody knew what it was, and there was no MARS on the base. "Okay," I said, "please put me in touch with a radio ham who has a station." He said he didn't know of any radio hams and there were no ham stations at Thule now.

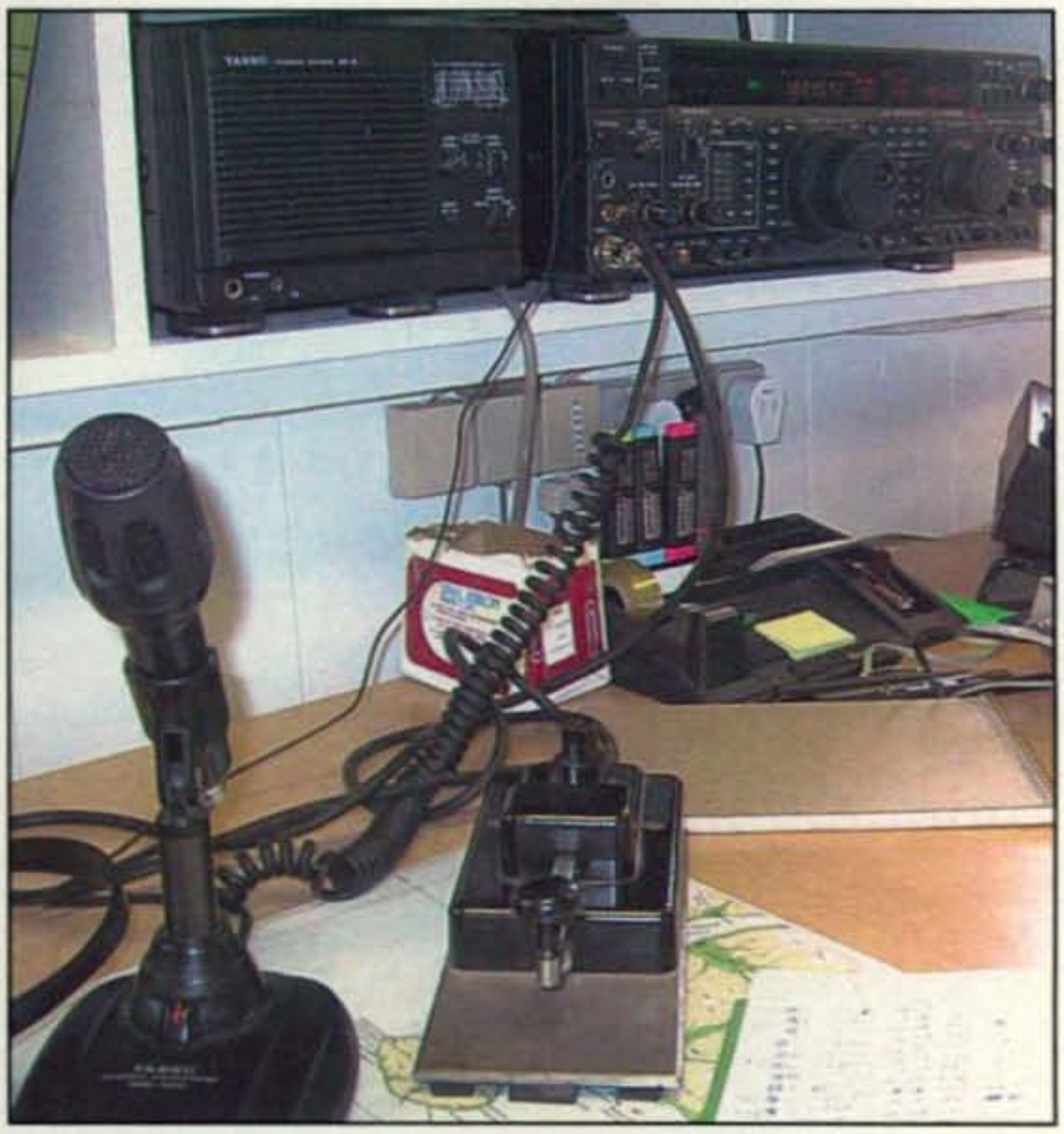
On June 3, 2001 seven men arrived at the Quality Inn near the entrance to McGuire Air Force Base in New Jersey. None of us knew each other, but it was only a matter of moments before we bonded, both by the nature of our Thule experience in our youth and the adventure that was ahead. The next morning we were at the McGuire terminal at 0615, and after some squaring away of the paperwork (and for those who were not retired military and therefore not eligible for space-available transportation, as I was, paying round-trip fare in cash or money order), we were bucket-seated in a C-141. Six hours later we landed at Thule.

We received a red-carpet welcome from Base Commander Col. Michael Rampino and his staff, and from Commander Holmer Sogaard, the Danish Liaison Officer. We were assigned a van and a driver, given a schedule of our week's activities, billeted at the new VIP hotel, and given carte-blanche to relive our memories to our hearts' content. The time of the year showed Thule at its best—24 hours/day of sunshine and light and temperature just above freezing with very light breezes. I could write several pages about our week, but this is a ham magazine and you are probably wondering whether W1UF will ever get to the point. Don't QSY yet.

It was quickly evident why ham radio has lost its importance at Thule. Pick up a phone and dial stateside for free. Plug your computer into the high-speed connection and the Web is yours. If you don't have a computer on your desk or in your room, there are cubicles at the base library all set up with just about any software you might need. Thule is now cable-connected with satellite backup.

A Radio

While "Thule-tripping," we visited Base Headquarters and the office of the Danish Commander. An item on a shelf by the desk caught my eye—an FT-1000MP. The adjutant said that it was for communications with outlying native villages in northern Greenland. I asked if I could use it for some ham



The OX3-50T operating position at the Thule Danish Liaison Office, 2001. The rig was an FT-1000MP used for contacting outlying villages. The key was a relic dug out of a closet, and it turned out to be a blessing as well.

A Source of Inspiration

One of the IGY "graduates" who joined Dennis for the reunion had operated the Thule ham station while in Greenland. The reunion had an unintended effect, as related by Dennis in this e-mail to W2VU:

Hi Rich,

I received an e-mail from Dan Lufkin, one of the Blue Nosers, with some delightful and related information. By the way, Dan is a retired USAF Col., an MIT grad, and has a Ph.D. in meteorology. He was the scientific guru and credentialed historian of the Blue Nose group, having been at Thule during the original site surveys.

73, Dennis, W1UF

Dan's e-mail:

Hi there, Dennis,

Just wanted you to know that I was inspired by your QSL and just resumed ham activity after 50 years off the air. OX3BC is back on the air as KB3JRL. My son Dave, who works for RadioShack, got the ham bug a while ago and asked me to go along with him a few weeks ago to a VEC exam in Hagerstown (25 miles west of us). I thought, "What the hell?" and took and passed the Tech and code tests just walking in off the street. Dave passed, too, with 35/35. He's KB3JRJ and I'm JRL (someone had already taken JRK as a vanity call—some vanity!). I took the General exam as well but missed the cut-off by two questions, so I had to get the W5YI book and study up on the new band plans, etc. I took the General exam yesterday and passed it, but missed the Extra by two questions. I know the theory pretty well, but there's lots of stuff about satellite rules, etc., where theory is of no help. So now I have the Gordon West Extra book and will work on that for a while. . .

. . . Anyway, thanks for the QSL card, very nice.

73 ES CUL, Dan

The "Knights of the Blue Nose," as dubbed by the Thule base commander. Front row (left to right): Frank Watt and Norm Russell. Back row: Jimmy Dalla, Dan Lufkin (now KB3JRL), Dennis Shapiro (W1UF), and Ed Brink. Not shown: Charles McElroy.

A handmade KG1GY QSL card confirmed contacts from Thule back in 1957–58.

radio activity, and the answer was yes. I needed to have a government license, he said, but that could be arranged. He took copies of my ham ticket and my passport for fax transmission to the capital at Suuk. I requested a special callsign commemorating 50 years of Thule. The next day he presented me with an official document with the call OX3-50T (including the dash), said that I could use the radio whenever it was free, and gave me a key to the office.

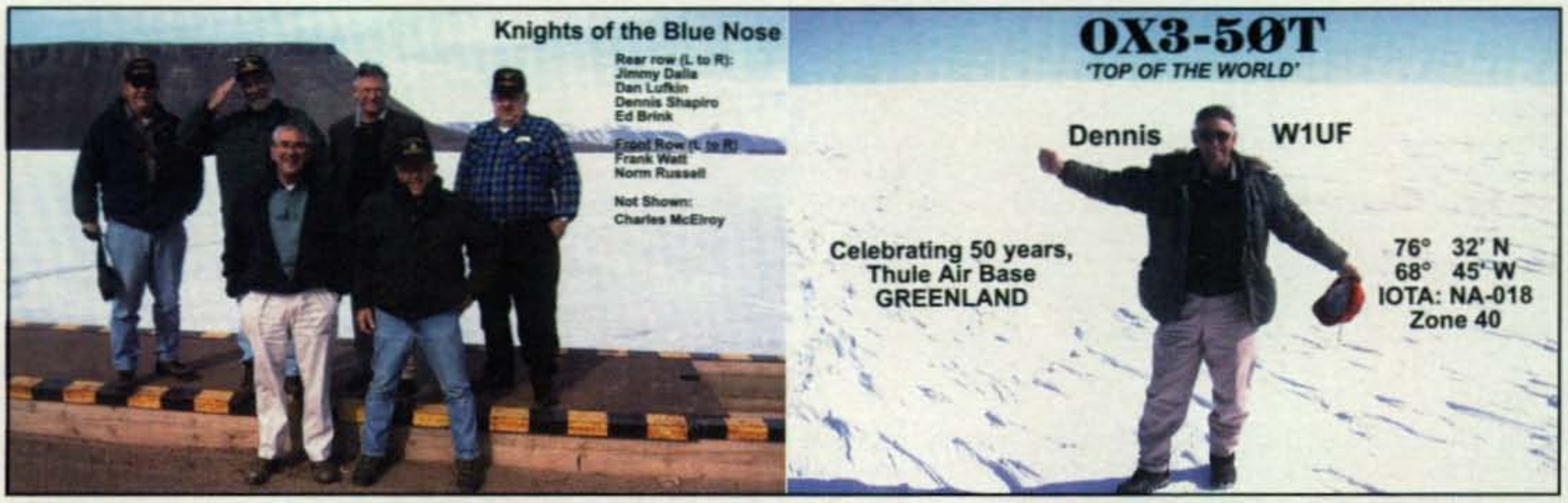
I asked about antennas and was shown a wire about 20 feet up, strung from one building to the next with a coax feed to the radio. It was a dipole used for their schedules and looked to be about 50 feet long, center fed. I asked if there was a code key. He said no, and then—maybe. Deep within a closet he found a straight key that looked as if it could have been used on the *Titanic*. Massive brass. As it turned out, the key was a blessing.

Here is a question for you brass pounders: What is the CW character for the "dash" in OX3-50T? I realized that I had never sent a dash and had never needed to know . . . until then. Commander Sorgaard said that he would find out. Using e-mail, he sent an inquiry to Suuk, and they returned with the symbol: -….- . OK, that was done, but not so easy. Imagine a QSO with station OX3-50T. Who out there could recognize a dash? Much of the time on CW was spent explaining the dash, and many of the QSL cards I received had the call wrong! The "spots" for OX3-50T (see fig. 1) are testimonials.

QRV

June 8, 2001. I was up early and went over to Base Headquarters. The door key worked. I cranked up the MP, plunked down on 14195 (which was clear), and activated the tuner. It did its job. "CQ, CQ . . ." Back to me came W9WJ, and Al gave me a 57 from Illinois. I got mentally prepared for a pileup and there was none. "CQ, CQ"—no answer. I tried again—nil. Hmmm, I thought, that Sterba curtain would help. Twenty meters was not there for me, so I tried 17. EA8ZZ and a couple of stateside QSOs, and then nothing. The Danes came into the office and I pulled the switch. Propagation from the arctic is difficult. QSOs would not come easily.

June 9 was a Saturday, and the office was free to use as I eked out QSOs on 15, 17, and 20 meters. Seventeen was most productive, and JA1MCU was the first JA into the log. The conditions from Thule were poor, my antenna was worse, and I found myself bouncing around between bands and modes trying to get a string going. It didn't happen. The Qs were 5–10 minutes apart.



The OX3-50T QSL card from 2001 is a professionally printed, full-color, foldout card.

I operated in between scheduled activities over the next few days, working mostly stateside and Europe, some JA, Siberia, and China. The last QSO was on June 10 with K8ZBY on 17 meters SSB. All told I made 130 QSOs in 25 countries, 52 Qs on CW and 78 on SSB. The blessing? The old straight key had a rebirth and earned its place in the station. When signals on SSB were not there for me, CW QSOs were often possible.

Thule Redux

What happens when one finally gets to have a "lifetime" wish come true? There is that grand feeling of having actually done it. However, there is also that empty feeling of no longer having that wish to look forward to.

Our group re-visited our youth—searching out buildings, barracks, and other places, and enjoying each others' images and stories. The Thule community seemed to hang on our every word of how it was. We were feasted, honored, and featured in the dedication of a museum for which we had brought artifacts and writings, and I returned my original Thule Air Force parka for display. Commander Sogaard invested us in the mighty brotherhood of *Our Arctic and Sub-arctic Royal Greenland Kingdom*, and Col. Rampino dubbed us *Knights of the Blue Nose*.

Revisiting Thule was like being in the movie *Back to the Future*. The seven of us had been whisked away at the end of our one-year tours and plunked back again 45 years later. We had left a bustling cold war SAC base of 8000 people, including bomber squadrons, refuelers, fighters, anti-aircraft battalions, support teams, and an IGY station. We returned to see a place that looked remarkably similar. Most of the buildings were the same, and some of us identified our old barracks. Mt. Dundas, the icon of Thule, was as majestic as ever, except this time we got a helicopter ride to the top.

The mystical part is that the base was like a ghost town. The total population is now 800 men and women, of which only 100 are military. SAC is gone. The missions are now BMEWS (a high-power missile-detection radar) and satellite tracking . . . and the base is being run by our children and grandchildren! For a few brief days, though, we were able to return to those bygone days, and ham radio helped share the adventure with the rest of the world. ■

EA8ZZ	18145.0	OX3/50T	via w1uf	1216	08 Jun 2001
W8AXI-@	18145.0	OX3-50T	SPEC EVENT Will be on this wke	1221	08 Jun 2001
WX3B	21304.6	OX350T	OX3-50T is the REAL Call!	1413	09 Jun 2001
ON4JW	18145.0	TOP	of the world ox3.50t good sig	1737	09 Jun 2001
W6ADA-@	14193.0	OX3-T0T	Tule AFB Special Event	0353	10 Jun 2001
WJ5K-@	14193.0	OX3-50T	Thule Air Force Base Special E	0357	10 Jun 2001
JA1NLX	18080.0	OX3BT50T	OX	1232	10 Jun 2001
F5NOD	18082.0	OX3	=50t 50Years of THULE AIR BASE	1253	10 Jun 2001
7K4EDI	18075.2	OX3BT50T		1344	10 Jun 2001
HA6KNF	18145.0	OX3/50T	only 25 min and QRT!!	1358	10 Jun 2001
JF2KOZ	18145.0	OX3/50T		1403	10 Jun 2001
JA2TK	18145.0	OX3/50T	50 years of thule air base	1416	10 Jun 2001
W8KL	18155.0	OX350T	VIA W1UF	2219	10 Jun 2001
K2LS	18155.0	OX3/50T	HIS CALL IS OX3-50 T !!!	2233	10 Jun 2001

Fig. 1– How do you send a "dash" on CW? Here are all the spots posted to the DX Summit website testifying that few knew the answer.

The secrets of the ionosphere are constantly being probed by researchers in the Arctic north. On a recent trip to Alaska, Contributing Editor Gordon West, WB6NOA, had the opportunity to visit one such research station, home to HAARP—The High-Frequency Active Aurora Research Program.

Up Close at HAARP

BY GORDON WEST,* WB6NOA

Every September I travel to Alaska in support of the Anchorage and Fairbanks ham conventions. Recently, I had the opportunity to travel with the FCC's Bill Cross, W3TN. Bill and I enjoyed the great Alaska auroras and the tours of some megawatt ionospheric research stations that constantly radiate the heavens to better explore how our ionosphere is formed. An amusing sight was aluminum ducting that looked like heater vents, but was formerly used as 430-MHz over-the-horizon radar waveguide!

One ionospheric research station I toured in Alaska was the High Frequency Active Aurora Research Program, affectionately called "HAARP." The facility itself looked more like a college research room than "a super-secret military weapons project" mentioned by some popular AM radio hosts. HAARP is located off a well-traveled road in a sparse area between Anchorage and Fairbanks, but there are neither armed guards at the gate nor razor wire surrounding the facility. One of the facility's public-relations agents seemed eager to give me a complete tour of the entire facility without any hint of government "off limits" areas.

I was assured many times that I could take photographs of anything and everything, and that there are no government secrets behind this ionospheric facility. I was told that indeed they can operate the system much like over-the-horizon radar, and that they were presently exploring ground-penetrating techniques hundreds of miles away to try to better locate abandoned mine shafts. They indicated they can also determine ice floes and floe pack thickness, and can even tell hundreds of miles away when the normally barren trees begin to sprout spring leaves. However, as for tracking humans walking down Denali Road in Anchorage, no way, and absolutely no interest by those scientists to whom I talked on site. Thus, without any further ado, here are the "secrets" of this not-so-secret research program that should be of interest to any ham who wants to learn more about the ionosphere and radio-wave propagation.

"Running 3.6 Megawatts Here..."

"Our transmitters will be capable of producing up to 3.6 million watts to an antenna consisting of 180 crossed-dipole arrays arranged in a rectangular planar array," commented our tour guide, pointing out that we were currently looking at only 48 crossed-dipoles mounted on 72-foot towers arranged in eight columns of six rows each. The effective radiated power (ERP) with their start-up antenna system is about 20 megawatts; new antennas recently have come on line, and they put out over 150 megawatts ERP. Each transmitter cabinet contains two identical transmitters, each of which is capable of producing a maximum output power of 10,000 watts. Transmit frequency range is 2.8 to 7 MHz, and sometimes higher.

"During active ionospheric research, we transmit in an upward direction and observe at a remote monitoring site how

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e-mail: <wb6noa@cq-amateur-radio.com>

Despite the theories of some popular talk radio hosts that HAARP is an ultra-secret military project, I found just a sign and a gate at the front entrance . . . no razor wire, no armed guards. Inside, I was given loads of information and permission to photograph whatever I wanted. (Photos by the author)

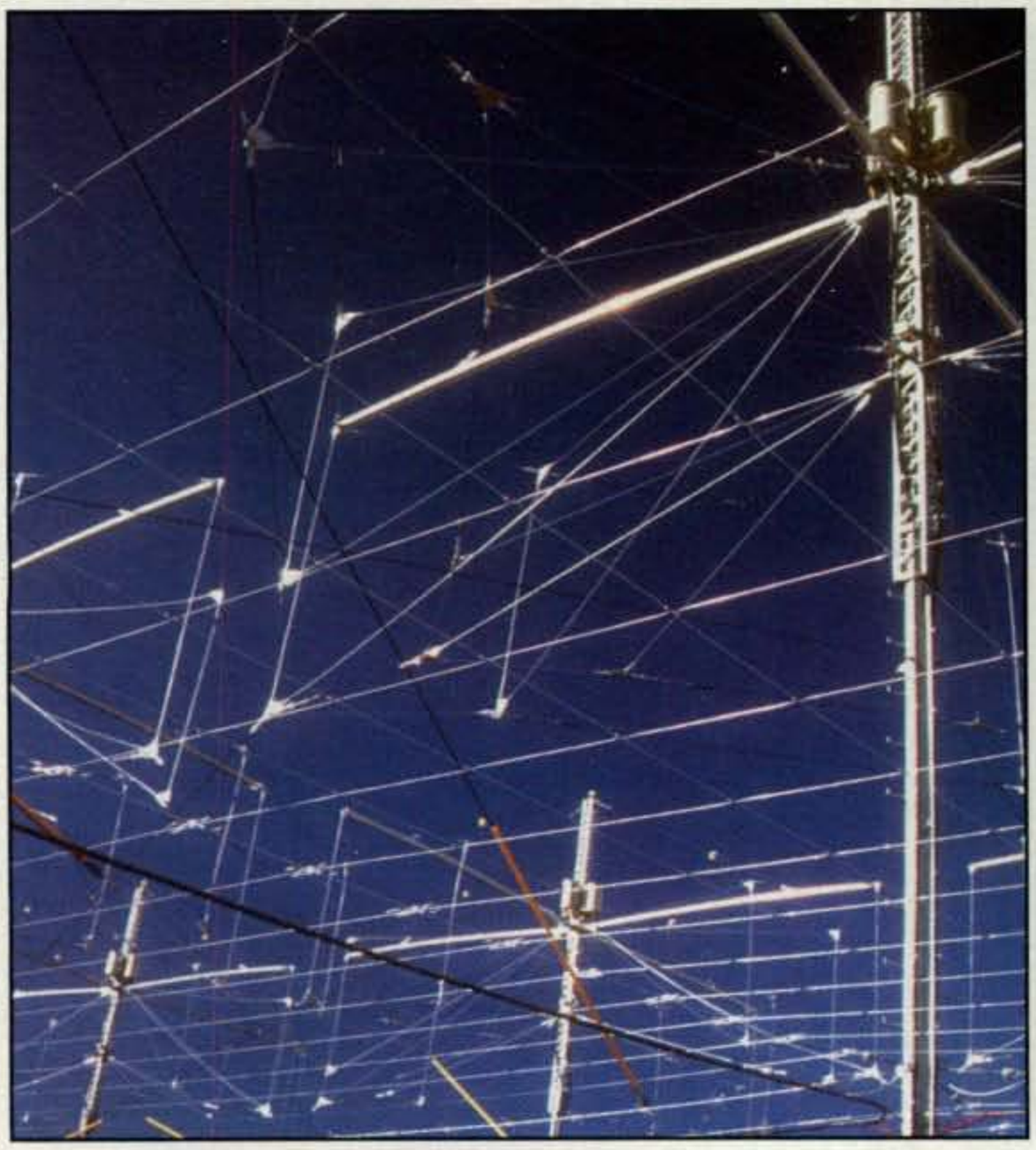
our signals are absorbed between 100 to 350 kilometers by a few hundred meters thick ionosphere," explained our tour guide. The researchers will then study the return echoes and develop more information about the dynamics of plasmas and new insight into the process of solar-terrestrial interactions. And no, the megawatts of power do not create an artificial aurora, nor do they bounce back down to the lower 48 and cause us to become senile.

"The intensity of the signal is less than 3 microwatts per centimeter squared," commented our HAARP tour director, "tens of thousands of times less than the sun's natural electromagnetic radiation that reaches the Earth, and hundreds of times less than even the normal random variations in intensity of the sun's natural ultraviolet energy which creates the ionosphere."

HAARP has conducted several demonstrations during which amateur radio operators were encouraged to listen in at 3.3 MHz. There were also ham radio listening tests at 6.99 and 3.39 MHz which resulted in many reception reports. HAARP was interested in seeing the skywave reception reports because most of their testing is on the ionosphere directly over the facility with the main pattern lobe pointed almost straight up. You can see a detailed analysis of their results at <http://www.haarp.alaska.edu/haarp>.

Planar Array

While the individual buildings with their twin transmitters and major-size, irrigation-pipe-looking, coaxial "waveguide" were indeed interesting, the antennas, known as a *planar array,* were fascinating, with their artificial ground just above our heads as we walked under for a close-up view. No, the power was not turned on!



The antenna at HAARP consists of up to 180 crossed-dipole arrays mounted in a square planar pattern and pointed straight up at the sky.

Each HAARP transmitter uses fire-hose-size feedline to send its 10-kilowatt HF signals out to the antennas. Effective radiated power is in the megawatts!

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*Jan. 2003

FT-857 DESIGN HIGHLIGHTS

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Utilizing the renowned receiver performance of the FT-897 and MARK-V FT-1000MP, the FT-857 features wide dynamic range, optional Digital Signal Processing, and outstanding audio.

The wide array of convenience features includes a 32-color display; Spectrum Scope; built-in keyer with memory and beacon mode; U.S. Weather Band reception; 200 memories with Alpha-Numeric labels; AM Aircraft reception; detachable front panel (optional YSK-857 required); and much, much more.

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Actual Size

March 2003 VP6DIA Ducie Island Expedition Utilizing Mark-V Field, FT-857, FT-847

The 2nd Ducie Island DX-pedition (VP6DIA) was active March 5 - 13, 2003 from this rare DXCC Entity near Pitcairn Island. Operators VP6MW, VP6DB, VP6AZ, JA1SLS, DK9KX, JR2KDN, DJ9ON, N6TQS, and FO3BM generated over 25,000 QSOs on SSB, CW, and RTTY using YAESU Mark-V Field and FT-857 rigs, and provided the first-ever AO-40 Satellite contacts using the FT-847. The excellent ergonomics, high performance, and compact size of the FT-857s yielded no-compromise pile-up performance on all HF bands.

QSL via JR2KDN. VP6DIA Home Page: http://www.qsl.net/wd4ngb/ducie.htm

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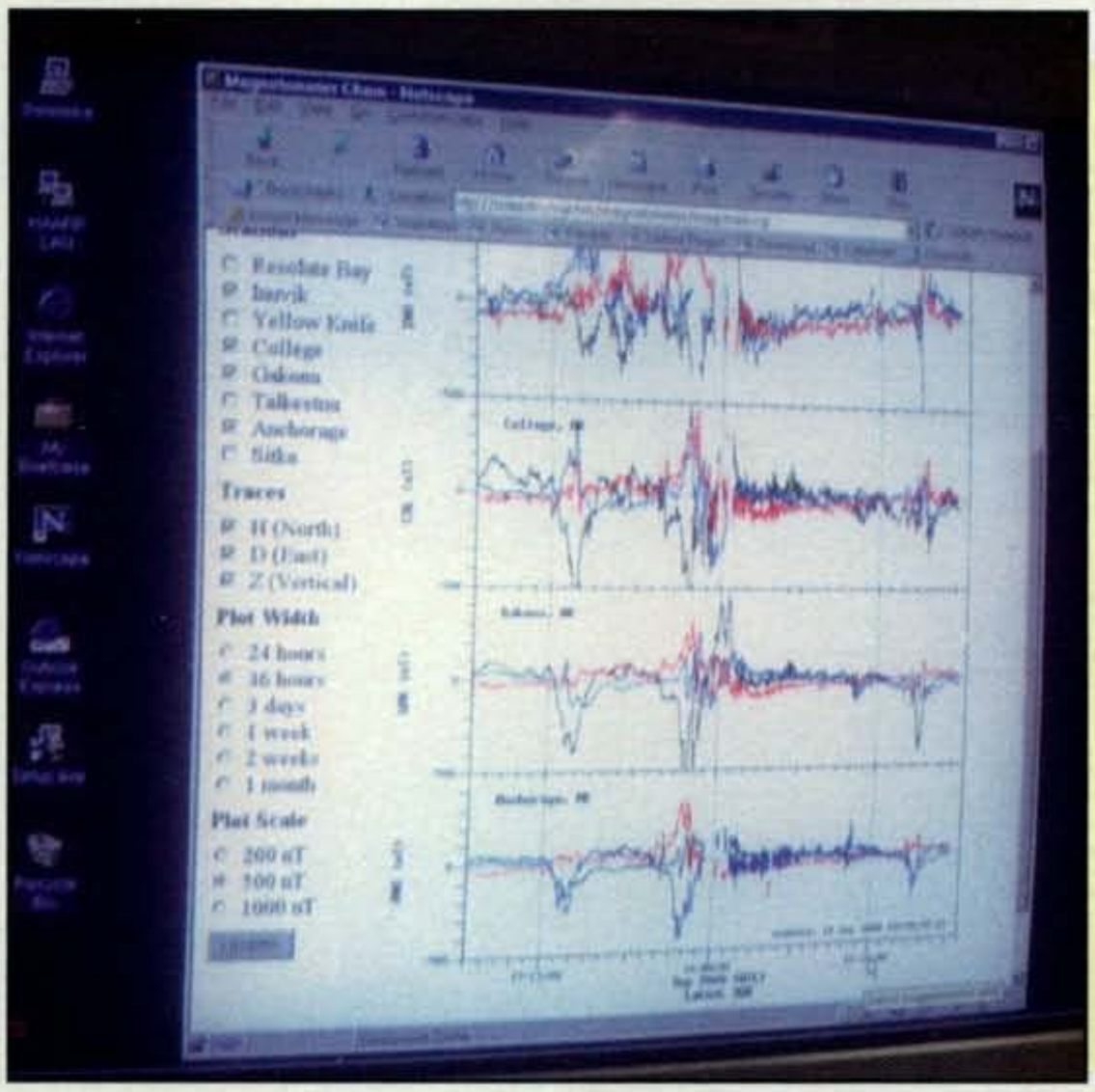

Data received from reflections of the transmitted signals are recorded and analyzed at a remote receiving station. Scientists hope to unlock secrets of the ionosphere.

The antenna elements consist of two upper and two lower crossed-dipoles mounted to a mast above a wire-mesh ground screen. The upper or lower crossed dipoles are remotely selected depending on the desired operating frequency range. The dipole elements are of a wire-cage design. Using this approach, the impedance bandwidth of the dipoles is elevated dramatically. The horizontal aluminum tubes seen in the photos are actually only the tops of the low-band dipole elements which operate from 2.8 to 7 MHz. I am told they occasionally may stray above 7 MHz, up to 10 MHz, and use the higher elevated dipoles. Phasing the dipoles allows researchers to optimize or restrict the transmission pattern to lie within a narrow overhead region to study the ionosphere. By adding more antenna elements in a properly phased manner, a specific main-lobe pattern may be formed with minor side lobes. The side lobes are generally undesirable characteristics of any antenna system, and researchers at HAARP continue to work on phasing techniques from their remote blockhouse to minimize this undesired radiation.

Any ham visiting the site immediately conjures up the thought of working 75 and 40 meters during a contest when hooked into the business end of their planar antenna array. Think of the possibilities of this phased array steering ham signals along a specific path to work some exotic DX as we come off the peak of the present sunspot cycle!

For 6-meter buffs who often wonder about sporadic-*E* and when the next cloud will float by, there's a very good chance that HAARP may help find that answer, and they seem willing to tell everyone via their website when they're conducting ionospheric experiments. Log on and see what they are doing up in Alaska. ■

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AL-80B . . . *Desktop Kilowatt* 3-500G Amp

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Results of the 2003 CQ WW WPX SSB Contest

BY STEVE MERCHANT,* K6AW

The 2003 running of the CQ WPX SSB Contest enjoyed decent conditions in many parts of the world and record participation. There were 13 new world and continental records set! Once again the group of islands off the west coast of Senegal was the place to be if you were serious about winning Single Operator, All Band.

The world top WPX SSB Multi-Multi team at HC8N in the Galapagos Islands. Shown left to right are LU8ADX, XE1KK, NM5M, KI7WX, HC8GR, N5KO/HC8N, K5KA, and OH0XX. Notice Nokia executive OH0XX talking on his cell phone even while in the middle of the Pacific Ocean! (Photo courtesy of NM5M)

DX

From Cape Verde, D4B and D44TD took the top two SOAB spots. Al, 4L5A, set another world record as D4B, surpassing Alberto, IV3TAN's D44TD second-place score by over four million points. Third place went to Didier, FY5FY, followed by P40Y, operated by Andy, AE6Y. Aruba was a very busy place, as John, KK9A, operated P40A for a fifth-place finish, followed by Jacky, P43P, operating P41P for the number six position. In seventh place was TO3M (Daniel, T93M op), and in eighth place was veteran entrant Hrane, YT1AD, at 3V8BB. Thomas, SU9NC, was number nine, and Bruce, ZF2NT, rounded out the top ten.

The 10 meter category was hotly contested by South American stations, with PX2W (Oliveira, PY2YU), Pedro, CX5BW, and ZX2B (Wanderly, PY2MNL) taking the first three spots, respectively. Fourth place went to Claudio, ST2CF (low power), and Walter, PP5WG, rounded out the top five. On 15 meters it was PX5E (Sergio, PP5JR) by a huge margin. VP2E operated by Gordon, N5AU, was second, and NH7S (Mike, K9NW) took third place. Operating from Guam was Joel, KG6DX, in fourth place, and WPX Contest Director Emeritus Steve, N8BJQ, took fifth from low-power entry PJ2T. Twenty meters was dominated by Mike, KH6ND, who set a new Oceania record. Second place went to Fernando at PR5B, with Shota, 4L6AM, third. Robert, 9A5E, was fourth and IU9S (Giuseppe, IT9BLB) was fifth. On 40 meters Tine, S50A, won, edging out Philippe, LX7I, who was second and Andre, PY0FF, in third place. Fourth was DJ4PT and Andi, UU0JM, took fifth place. Eighty meters saw Eugen, 9A7V, with a big first-place lead over second-place IQ2CJ (Luca, IK2NCJ). WH7Z (Brian, K9QQ) was right behind in third while setting a new Oceania record, and Andrzej, SP8BRQ, was fourth and Joe, AA1BU, took fifth place. Top band was dominated by Egon, OZ3SK, followed by four low-power entries from Leonid, UX5NQ, second, Robert, G4VGO, third, LY2OU fourth, and Alexandr, LY3UM, in fifth place.

World low-power SOAB honors went to John, KK9A, operating P40A. Second place went to Thomas, SU9NC, and third was Dave, W5AO, at VP5V. Fourth was A45WD (Alex, YO9HP op), H22H (Spyros, 5B4MF) fifth, XT2TI sixth, Derek, 9G5MD, seventh, LV5V (Jorge, LU5VV) eighth, Mart, 3B8MM, ninth, and Marcelo, LV7H, tenth.

ST2CF (IV3OWC op) won the low power 10 meter category by a very wide margin, followed by Angelo, PY5DL, in second place and J5UDX (Simone, IV3NVN) third. Cesar, LU3HIP, was fourth and Silvio, LW9EOC, fifth. On 15 meters low power Steve, N8BJQ, took first place as PJ2T, followed by Rafael, PY2NDX, in second, and L44DX (Esteban, LW1DTZ) third. Pedro, PP5UA, was fourth and fifth place went to Shu, BD5RI, who made a fine effort from that part of the world. The first-place 20 meter low-power winner won handily: Wisnu, YB0AZ, edged out his second-place rival, Antonio, YV5OIE, by 1.3 million points. Third place went to KP4AH (Alfredo, WP3C) and fourth was Valery, UA9AMF, while Pyotr, RX0AE, was in fifth place. The 40 meter low-power winner was LY5A (Jonas, LY2PAJ), with Giovanni, I2IFT, second and Ladislav, OK1DCF, third. Anatoly, RW3GB, took fourth place and Alessandro, IV3SDE, fifth. Eighty meters was won by II3M, with Vinko, S53F, in second and 4N1A third. Bogdan, SP6LUV, took fourth place and Vlado, OM7AB, fifth. The challenging 160 meter low-power category was won by UX5NQ, with G4VGO in second. LY2OU was third, LY3UM fourth, and SO6A (Jan, SP6IHE op) fifth.

The Tribander-Single Element category continues to grow. The top three finishers in this category are also shown in the World Top 10 box. John, KK9A, at P40A was first, Thomas, SU9NC, was second, and Bruce, ZF2NT, was third. P40A and SU9NC were also low power. 9S1X (Patrick, F6BLQ op) took fourth place and LT0H (Juan, LU3HY) was fifth. Pal, HA8JV, took sixth place, EA8AH (Pekka, OH1RY op) was seventh, CT7P (Jose, CT1DIZ) was number eight, Pertti, OH2PM, was ninth as XX9TRR, and Derek, 9G5MD, number ten. Ten meter winner in the TS category was ZX2B (PY2MNL), with J5UDX (IV3NVN) second and Jan, 4X1VF, third. The 15 meter winner was Kelly, KE9KD, followed by Jose, YY5JMM, second and Bob, K8IA, in third place. Twenty meters was won by Andrei, RA6LBS, with Dmitry, UA3AGW, in second and CQ3E (Jose, CT3FQ) third. On 40 meters there were two winners: Jari, OH3BU, first and Juergen, OE5CWL/5, second. On 80 meters Dave, NT6K, won, with Di, G3UEG, in second place.

The Rookie category scores were up over the previous year. The 2003 winner was

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PT5A operated by Kelmer, PP5KE, with almost 2.6 million points, followed by low-power entrant RZ9SWP (Alexander, RX9SN op) and Jim, AD6WL, in third place. Trent, K5TWJ, took fourth and Bob, VE3AGC, was in fifth place. Vladimir, UN9LW, was the Band Restricted category winner.

Single Op Assisted was dominated by ZW5B (Oms, PY5EG op), followed by Pavel, OD5/OK1MU, Yuri, UA9AM, Igor, UT7QF, and Bernd, DL6FBL. The 10 meter Assisted winner was Jon, NJ7I, with Mike, N5MT, second and JM2RUV in third place. On 15 meters Denny, KX7M, won nicely, followed by Laszlo, HA3NU, Tapani, OH5BM, OK5H (Kaz, JK3GAD op), and Toomas, ES5RY. On 20 meters Horvat, 9A3TR, turned in a nice score to win, followed by Ivo, S51CK. The 40 meter top spot in Single Op Assisted went to Simon at S53M with Walter, DJ6QT, in second. Kohei, JA1IZZ, won 80 meters and Manny, W2MF, was 160 meter winner, followed by Dimitry, UT4UXW.

Africa took the top QRP spot this year: Rudi, ZS6DX, was number one, followed closely by György, HG5Z, in second place. TM9K (Gérard, F5BEG op) was third, with Janez at S53D fourth and Tomasz, SP6T, fifth. Alejandro, LU6HPF, was the top 10 meter op, Sergei, RU9BB, the winner on 15 meters, Javier, EA4DQD, won 20 meters, RUØAIG was the 40 meter champion, and OL4W (Milan, OK1IF op) was the winner on 80 meters.

TROPHY WINNERS

SINGLE OPERATOR, ALL BAND

WORLD: Stanley Cohen, W8QDQ Trophy. Won by: **D4B operated by Alexander Teimurazov, 4L5A.**
World Low Power: Caribbean Contesting Consortium Trophy. Won by: **John Bayne, P40A (KK9A).**
USA: Atilano de Oms, PY5EG Trophy. Won by: **Bob Shohet, KQ2M.**
USA Zone 4: Society of Midwest Contesters Trophy. Won by: **George Fremin III, K5TR.**
USA Zone 4 Low Power: Society of Midwest Contesters Trophy. Won by: **Thomas C. Johnson, WD5K.**
AFRICA: Peter Sprengel, PY5CC Trophy. Won by: D44TD operated by **Alberto Annesi, IV3TAN.**
EUROPE: Jim Hoffman, N5FA Trophy. Won by: **Jiri Sanda, OK1RI.**
SOUTH AMERICA: Ron Moorefield, W8ILC Trophy. Won by: **Didier Bironneau, FY5FY.**
OCEANIA: Philip Fraizer, K6ZM Memorial. Won by: **David Burger,VK8AA.**
JAPAN: The DX Family Foundation Trophy. Won by: **Masaki Okano, JH4UYB.**
USA QRP/p: Doug Zwiebel, KR2Q Trophy. Won by: **Daniel J. Shepherd Sr., N8IE.**

SINGLE OPERATOR, SINGLE BAND

WORLD: John N. Reichert, N4RV Trophy. Won by: **PX5E operated by Sergio Lima De Almeida, PP5JR (21 MHz).**
WORLD 28 MHz: Alan Dorhoffer, K2EEK Memorial Trophy. Won by: **PX2W operated by Hamilton Oliveira Martins, PY2YU.**
WORLD 7 MHz: William D. Johnson, KVØQ Trophy. Won by: **Tine Brajnik, S50A.**
USA 3.7 MHz: Lance Johnson Engineering Trophy. Won by: **Joe Gagliardi, AA1BU**.
USA - 14 MHz Low Power: Boomer Contest Club Trophy. Won by: **Ken Ruddock, K6HNZ.**
USA 21 MHz: Bernie Welch, W8IMZ Memorial. Won by: **Station NQ4I operated by John Laney, K4BAI.**

MULTI OPERATOR, SINGLE TRANSMITTER

USA: Steve Bolia, N8BJQ Trophy: Won by: **NF4A operated by N4PN, NF4A, N4OX, KB4ET, W1MD.**
USA Zone 4: Society of Midwest Contesters Trophy. Won by: **NO5W operated by NO5W, KG5U, N5RP, K5GA, K5NZ.**
ASIA: W2MIG Memorial Trophy sponsored by Ed Campbell, NT4TT. Won by: **RK9CZO operated by UA9FQY, RX9CAZ, RV9CTD, RV9CGD.**

MULTI-OPERATOR, TWO TRANSMITTER

WORLD: Doris Wong, AG1RL Trophy. Won by: **STØRY operated by DK7YY, DL3DXX, DL5NAM, DL7FER and DL9NDS.**

MULTI-OPERATOR, MULTI-TRANSMITTER

WORLD: Gail Schieber, K2RED Trophy. Won by: **HC8N operated by K5KA, OHØXX, KI7WX, NM5M, XE1KK, LU8ADX, N5KO.**

CONTEST EXPEDITION

WORLD: Kansas City DX Club Trophy. Won by: **ST2CF operated by IV3OWC.**

USA

Bob, KQ2M, once again grabbed the top SOAB USA spot. He was followed by George, K5TR, in second and Pat, N9RV, as KW9N in third place. Don, K4ZA, was fourth, Dennis, NB1B, fifth, Mitch, N7GYD, sixth, and NR3X (Nate, N4YDU op) in seventh. Long-time competitor Pat, W5WMU, was eighth and George, K5KG, took ninth place as AB1HZ. The number ten spot went to John, NY6DX.

Chuck, W5PR, was once again the 10 meter champ as NN5P, followed closely by Dave, K5GN, as NU5A. Elliot, W7EB, was third, Bob, N4BP, was fourth, and NA4W (Courtney, K4WI op) was fifth. On 15 meters John, K4BAI, operating as NQ4I won handily. Second place went to Tom, K7ZZ, followed by John, N3HBX, and KE9KD. Joe, W5ASP, was fifth, operating as NQ5K. Twenty meters was won by AD7J (Chuck, W7FP op), with Rick, KX9DX, in second place. Ken, K6HNZ, was third, Joe, WG1Z, fourth, and NN5Z (Bruce, K5PX) fifth. On 40 meters Brad, K7ZSD, was the winner, with KC8VC (Tom, W8JWN op) in second and John, W9SE, third. John, K7WP, was fourth and Bob, N2KX, fifth. The 80 meter winner was AA1BU, with Steve, W3BGN, in second. NT6K was in third, with Lynn, W5FO, fourth and WI4R (Rick, NQ4I) fifth. On 160 meters NE5D (Jim, K5RX op) was the winner, with Leo, AA4MM, in second, Jonathon, WO9S, third, Bruce, K6OY, fourth, and W4KZ in fifth place.

John, NY6DX, captured the US SOAB low-power title, followed by Tom, N6NF, in second, with Tom, WD5K, third, Bill, ACØW, fourth, and in fifth place Jeff, WK6I. Don, W7UPF, was the 10 meter winner, with Bruce, WA7BNM, second and Jonathon, KI9DX, third. Fifteen meters was won by K8IA, with Dick, W7ZR, second, and Barry, NI9C, third. K6HNZ appeared again as the top 20 meter low-power entry, followed by WG1Z and NN5Z (K5PX). Forty meters was won by Bob, N2KX, with Paul, KU6T, second. Bob, W1AAD, was the winner of the 80 meter award, and K4WI won 160 meters.

Tom, WD5K, won the US T/S category, followed by Kevin, K7ZS, in second, Jonathon, W1CU, third, KW5DX (Lee, K1NT op) fourth, and Dick, W6TK, fifth. WD5K and Paul, KE1LI, were the top two low-power winners in theT/S category, followed by Jim, KO4MM, WR1TE, and Ben, W3LL. Jim, AD6WL, won the Rookie top spot, with K5TWJ in second place and Rick, W2RDS, in third.

Single Op Assisted top honors went to KS9K, operated by Terry, N4TZ, with second place going to Kevin, WN9O. Chas, K3WW, took third this time out, followed by Barry, N2BJ, and Harry, WF2B. NJ7I had the top 10 meter score, as did KX7M on 15 meters and W2MF on 160.

The USA QRP winners were Dan, N8IE, in first place, with Jerry, N4JF, second, followed by Laing, KB3TS, W7RAB (Eugene, KH7YD), and Matt, WB6BWZ. Single-band winners were Bill, WWØWB, on 10 meters, Dan, AE9F, on 15, Dave, WA8WV, on 20 meters, and W6QU (Bill, W8QZA) on 40.

Multi-Ops

The Multi-Single category was won this year by C5P, operated by YL2KL, YL3CW, YL1ZF, and LY2TA. EA8ZS, operated by RW3QC, RX3DCX, and RA3AUU, came in second. CQ9K was third and PQ2Q was fourth. TO4T scored fifth, with IR4T in sixth place, TM5C seventh, HG1S eighth, ZY7C ninth, and OM7M finishing up in the tenth spot.

Again this year the NF4A crew won the top USA Multi-Single award with ops N4PN, NF4A, N4OX, KB4ET, and W1MD. Second place went to NO5W, ops NO5W, KG5U, N5RP, K5GA, and K5NZ. Third place was claimed by NØNI, staffed by NØNI, KØKD, WØFLS, WOØV, and KØWHV. Fourth went to WT4Q, and in fifth place was KØDU.

In the new Multi-Op Two-Transmitter category many new records for world or continental categories were set. STØRY was the winner, operated by DK7YY, DL3DXX, DL5NAM, DL7FER, and DL9NDS, setting the world record of 30.3 million points for this new category. P3A, operated by the P3A Contest Team, was second, and V47KP with W2OX and K3NM ops was third. TI5N was fourth and HG6N took fifth place.

The US M2 winner was KM3T, operated by KM3T, WC1M, KP4WW, KC1XX, and

K1GQ, setting the USA world record for M2 from KC1XX. Second place honors went to KI5DR, ops KI5DR, K5NA, K5DU, W5MF, NA4M, and WM5R.

Operators K5KA, OHØXX, KI7WX, NM5M, XE1KK, LU8ADX, and N5KO at HC8N left everyone else in the dust in this category, setting a new world Multi-Multi record of almost 61 million points. Second place went to L71F and operators LU1AEE, LU1FAM, LU1FGE, LU1FJ, LU1FKR, LU1FMO, LU1FT, LU2DKT, LU2FV, LU2NI, LU3FZW, LU4DX, LU5DX, LU5HM, LU6ETB, and LU7DW. The third spot went to YW4M, ops YV2IF, YV4GLD, YV4BOU, YV4FZM, YV4GLD, YV4YC, YV5/DL2GG, YV5AMH, YV5ANF, YV5CVE, YV5IQJ, YV5LMW, YY5AFJ, and YV5NCZ. OT3A was third, operated by a very long list of operators which will appear on the CQ website, <www.cq-amateur-radio.com> (along with the full list of the operators at multi stations and expanded random comments).

In the US, NR6O took first place Multi-Multi, operated by N6RO, K3EST, K6AW,

The contest expedition home of PJ2T (N8BJQ) and PJ2C (N8NR).

WORLD TOP SCORES

SINGLE OPERATOR ALL BAND

D4B (4L5A)	25,937,444
D44TD (IV3TAN)	21,039,355
FY5FY	16,135,200
P4ØY (AE6Y)	15,142,440
*P4ØA (KK9A)	14,010,480
P41P (P43P)	13,390,603
TO3M (T93M)	13,235,250
3V8BB (YT1AD)	12,570,572
*SU9NC	11,402,253
ZF2NT	10,136,175
*VP5V (W5AO)	9,427,791
VC1R (K6IF)	8,599,776
*A45WD (YO9HP)	8,073,000
OK1RI	7,905,744
UA9AYA (UA9BA)	7,563,884
SO2R (SP2FAX)	7,549,802
9S1X (F6BLQ)	7,214,928
KQ2M	7,089,792
LO7H (LU7HN)	6,691,734
YT6A	6,681,425

28 MHz

PX2W (PY2YU)	6,977,484
CX5BW	6,675,724
ZX2B (PY2MNL)	6,144,213
*ST2CF	5,779,768
PP5WG	5,587,280
LU1HF	5,429,214
*PY5DL	4,024,980
*J5UDX (IV3NVN)	3,561,032
CB4Y (CE4FXY)	3,193,823
LU3HIP	2,931,560

21 MHz

PX5E (PP5JR)	12,428,386
VP2E (N5AU)	9,616,596
NH7S (K9NW)	7,536,826
KG6DX	5,920,876
*PJ2T (N8BJQ)	4,856,093
9V1YC	4,781,420
JI3OPA	3,756,425
*PY2NDX	3,465,450
9A8A	3,449,940
CX7BY	3,363,000

14 MHz

KH6ND	6,493,727
PR5B	5,453,825
4L6AM	4,323,942
9A5E	4,089,132
IU9S (IT9BLB)	3,544,380
VA7RR	3,340,974
*YBØAZ	2,889,354
ERØND (UT7ND)	2,762,875
YP3A	2,422,602
IKØYVV	2,280,097

7 MHz

S5ØA	3,816,165
LX7I	3,115,494
PYØFF	3,059,100
DJ4PT	2,488,246
UUØJM	1,992,381
ES5MC	1,727,088
SP6IXF	1,624,671
UP5G	1,421,718
LX1KC	1,105,280
*LY5A (LY2PAJ)	1,070,788

3.7 MHz

9A7V	1,874,670
IQ2CJ (IK2NCJ)	1,260,504
WH7Z (K9QQ)	1,208,900
SP8BRQ	971,388
AA1BU	960,245
LN8W (LA5KO)	886,608
ES5TV	870,255
YO2KJI (YO2DFA)	826,472
II3M	825,300
F5RZJ	812,441

1.8 MHz

OZ3SK	313,404
*UX5NQ	217,968
*G4VGO	168,720
*LY2OU	160,552
*LY3UM	149,100
*SO6A (SP6IHE)	111,926
NE5D (K5RX)	104,076
*T94DO	102,780
*VE3MGY	82,404
*ON4ACA	50,085

LOW POWER ALL BAND

P4ØA (KK9A)	14,010,480
SU9NC	11,402,253
VP5V (W5AO)	9,427,791
A45WD (YO9HP)	8,073,000
H22H (5B4MF)	6,213,598
XT2TI	5,059,698
9G5MD	4,924,140
LV5V (LU5VV)	4,547,160
3B8MM	4,406,028
LV7H	4,249,687
AY9H	3,482,948
LU7FJ	3,050,036
9M2TO (JA0DMV)	2,908,062
NY6DX	2,464,378
YMØT (TA2RC)	2,451,570

28 MHz

ST2CF	5,779,768
PY5DL	4,024,980
J5UDX (IV3NVN)	3,561,032
LU3HIP	2,931,560
LW9EOC	2,917,393
PS5S (PP5MQ)	2,364,253
PJ2C (N8NR)	1,636,760
YC4VD	1,609,458
NP3P (NP3E)	1,351,960
4X1VF	1,298,448

21 MHz

PJ2T (N8BJQ)	4,856,093
PY2NDX	3,465,450
L44DX (LW1DTZ)	2,475,576
PP5UA	1,516,700
BD5RI	1,418,998
S59W	1,388,044
FM5FJ	1,371,075
RA9JR	1,086,804
3Z6V	910,344
YY5YMA	889,602

14 MHz

YBØAZ	2,889,354
YV5OIE	1,569,712
KP4AH (WP3C)	1,453,956
UA9AMF	1,341,811
RXØAE	796,975
RK9AX	683,196
YV4BK	652,740
RA6CT	646,736
S58M	579,420
K6HNZ	561,321

7 MHz

LY5A (LY2PAJ)	1,070,788
I2IFT	492,660
OK1DCF	374,528
RW3GB	227,584
IV3SDE	140,901

3.7 MHz

II3M	825,300
S53F	707,445
4N1A	542,059
SP6LUV	362,368
OM7AB	230,736

1.8 MHz

UX5NQ	217,968
G4VGO	168,720
LY2OU	160,552
LY3UM	149,100
SO6A (SP6IHE)	111,926

TRIBANDER/SINGLE ELEMENT

*P4ØA (KK9A)	A	14,010,480
*SU9NC	A	11,402,253
ZF2NT	A	10,136,175
9S1X (F6BLQ)	A	7,214,928
LTØH (LU3HY)	A	6,613,056
HA8JV	A	5,685,856
EA8AH (OH1RY)	A	5,643,486
CT7P (CT1DIZ)	A	5,207,073
XX9TRR (OH2PM)	A	5,179,300
*9G5MD	A	4,924,140
PY7ZY (PY7ZY)	A	4,842,665
3B8MM	A	4,406,028
IO4T (IK4VET)	A	3,745,854
JA7NVF	A	3,115,042
RA3AJ	A	2,379,520
*VE3DZ	A	2,197,526
ZX2B (PY2MNL)	28	6,144,213
*J5UDX (IV3NVN)	28	3,561,032
*4X1VF	28	1,298,448
KE9KD	21	1,212,066
*YY5JMM	21	840,177
*K8IA	21	695,310
RA6LBS	14	1,022,554
UA3AGW	14	961,056
CQ3E (CT3FQ)	14	489,090
OH3BU	7	157,500
OE5CWL/5	7	125,216
NT6K	3.7	269,575
G3UEG	3.7	35,765

ROOKIE

PT5A (PP5KE)	A	2,596,649
*RZ9SWP (RX9SN)	A	1,715,218
AD6WL	A	1,359,336
K5TWJ	A	1,300,044
*VE3AGC	A	941,287
*YT1LT	A	882,980
*W2RDS	A	835,278
*YY5JRU	A	590,562
*HR1CP	A	449,210
*OK2CLW	A	433,840
*PY5DL	28	4,024,980
*PY2LTY (PT2IC)	28	626,865
*VE1ASJ	28	111,936
YZ1KA	21	1,469,125
*YY5YMA	21	889,602
*UR3HC	21	882,180
4L6AM	14	4,323,942
*YT1RA	3.7	46,364

BAND RESTRICTED

*UN9LW	A	1,527,448
*S57IIO	A	663,264
*YY5JRU	A	590,562
EX2T	A	491,036
*JA5EO	A	428,085
*KF4ZEO	28	13,752
*YY5JMM	21	840,177
*EC3CJN	21	82,209
*RX9CEL	14	249,162

QRP/p

ZS6DX	A	1,440,318
HG5Z	A	1,212,640
TM9K (F5BEG)	A	756,510
S53D	A	718,530
SP6T	A	547,272
LU1VK	A	543,040
N8IE	A	456,120
N4JF	A	326,655
KB3TS	A	243,243
SM3C (SM5CCT)	A	228,810
LU6HPF	28	470,272
LW7DQW	28	297,548
CX2PI	28	146,520
LU8CM	28	125,257
JR3RWB	28	97,125
VE5UF	28	74,910
RU9BB	21	788,190
RZ6HX	21	385,917
T94OM	21	193,764
9A7ZZ	21	138,125
SP5AKG	21	107,520
EA4DQD	14	135,200
WA8WV	14	110,664
YU1LM	14	92,868
ES8SW	14	78,440
AG4PJ	14	49,454
RUØAIG	7	96,614
W6QU (W8QZA)	7	15,088
UW6N (UR5NX)	7	14,896
OL4W (OK1IF)	3.7	33,292
RW3VZ	3.7	31,740
SP3J	3.7	24,108

MULTI-OPERATOR SINGLE TRANSMITTER

C5P	24,012,075
EA8ZS	23,255,830
CQ9K	16,670,430
PQ2Q	11,658,240
TO4T	10,862,952
IR4T	10,078,080
TM5C	9,913,392
HG1S	9,414,900
ZY7C	9,024,366
OM7M	9,001,440
VE7SV	8,732,028
ZL6QH	8,200,238
EN7Z	8,190,976
LU1NDC	7,792,120
AN8OK	7,410,080

MULTI-OPERATOR TWO TRANSMITTER

STØRY	30,346,161
P3A	27,063,259
V47KP	15,958,488
TI5N	14,729,650
HG6N	12,127,464
RU1A	11,814,660
MD4K	10,381,280
KM3T	9,950,919
KI5DR	9,459,637
9M2RPN	7,698,094
LX4B	7,218,240
WX5S	6,767,560
AA5NT	6,156,410
LY4CW	6,118,082
EMØU	5,673,602

MULTI-OPERATOR MULTI-TRANSMITTER

HC8N	60,703,452
L71F	29,254,018
YW4M	26,112,248
OT3A	16,418,964
LZ9W	14,107,545
NR6O	13,362,844
NW4V	10,332,990
YZ7W	10,032,057
LY7A	9,418,752
EA4URE	9,196,200
ED7VG	8,133,906
NE1C	5,772,540
AE9B	5,660,460
DFØCQ	5,417,430
OL7R	4,352,400

** Denotes low power*

USA TOP SCORES

SINGLE OPERATOR ALL BAND

KQ2M	7,089,792
K5TR	6,353,784
KW9N (N9RV)	5,088,432
K4ZA	4,975,719
NB1B	4,355,175
N7GYD	3,986,362
NR3X	3,750,875
W5WMU	3,168,066
AB1HZ (K5KG)	2,946,372
*NY6DX	2,464,378
*N6NF	2,010,580
K3PN	2,010,096
WA7LT	1,966,266
K3ZO	1,910,853
*WD5K	1,897,101
N8II	1,759,313
NE4AA	1,676,189
N7TT	1,610,180
K7ZS	1,603,368
W1CU	1,602,124

28 MHz

NN5P (W5PR)	1,543,986
NU5A (K5GN)	1,386,371
W7EB	665,133
N4BP	565,995
NA4W (K4WI)	545,528

21 MHz

NQ4I (K4BAI)	2,291,256
K7ZZ	1,435,280
N3HBX	1,398,852
KE9KD	1,212,066
NQ5K (W5ASP)	788,732

14 MHZ

AD7J	789,786
KX9DX	599,808
*K6HNZ	561,321
*WG1Z	259,985
*NN5Z (K5PX)	158,589

7 MHz

K7ZSD	499,337
KC8VC (W8JWN)	160,400
W9SE	154,874
K7WP	119,616
*N2KX	118,272

3.7 MHz

AA1BU	960,245
W3BGN	460,836
NT6K	269,575
W5FO	130,625
WI4R	63,700

1.8 MHz

NE5D (K5RX)	104,076
AA4MM	47,196
WO9S	25,425
K6OY	4,929
W4KZ	3,124

LOW POWER ALL BAND

NY6DX	2,464,378
N6NF	2,010,580
WD5K	1,897,101
ACØW	1,436,856
WK6I	1,094,952
KE1LI	1,005,928
N4NX	972,252
WS1A	970,752
W2RDS	835,278
N4IG	751,608

28 MHz

W7UPF	319,746
WA7BNM	199,320
KI9DX	49,343
NS2P	29,505
KØFA	26,986

21 MHz

K8IA	695,310
W7ZR	410,916
NI9C	232,935
WG7Y	102,342
W1GOU	85,260

14 MHz

K6HNZ	561,321
WG1Z	259,985
NN5Z (K5PX)	158,589
AG4PM	97,693
KZ5OH	73,872

7 MHz

N2KX	118,272
KU6T	10,168

3.7 MHz

W1AAD	2,916

1.8 MHz

K4WI	1,363

TRIBANDER/SINGLE ELEMENT

*WD5K	A	1,897,101
K7ZS	A	1,603,368
W1CU	A	1,602,124
KW5DX (K1NT)	A	1,532,068
W6TK	A	1,422,984
W6AFA	A	1,214,906
NA9D	A	1,199,863
N3UM	A	1,140,990
WB8TLI	A	1,101,126
K3MD	A	1,048,173
*KE1LI	A	1,005,928
*KO4MM	A	707,736
K7VI	A	693,240
*WR1TE (W1JQ)	A	684,600
*W3LL	A	635,064

ROOKIE

AD6WL	A	1,359,336
K5TWJ	A	1,003,044
*W2RDS	A	835,278
*AK6DV	A	212,715
*KD5LNO	A	186,944
*KG6HAF	21	37,808

QRP/p

N8IE	A	456,120
N4JF	A	326,655
KB3TS	A	243,243
W7RAB (KH7YD)	A	212,241
WB6BWZ	A	101,556
WWØWB	28	46,018
N4ZAK	28	24,480
K5ALE	28	18,905
AE9F	21	72,436
W2IQL	21	39,038
WA8WV	14	110,664
AG4PJ	14	49,454
K9PO	14	14,406
W6QU (W8QZA)	7	15,088
WB7OCV	7	1,638

MULTI-OPERATOR SINGLE TRANSMITTER

NF4A	7,309,170
NO5W	7,217,808
NØNI	5,963,220
WT4Q	4,999,428
KØDU	4,953,300
WØGU	4,931,880
N3AD	4,603,804
K9ES	4,306,911
WS4NC	4,091,838
KD9ST	3,436,890
WR3Z	3,373,056
WE1H	2,959,341
WØNO	2,536,398
KDØS	2,487,012
NZ1U	2,464,894

MULTI-OPERATOR TWO TRANSMITTER

KM3T	9,950,919
KI5DR	9,459,637
WX5S	6,767,560
AA5NT	6,156,410
WM4RM	4,858,233
NK7U	4,605,340
AG1RL	4,269,801
NG3U	3,439,077
ND6E	2,081,450
KO8HIO	1,509,470

MULTI-OPERATOR MULTI-TRANSMITTER

NR6O	13,362,844
NW4V	10,332,990
NE1C	5,772,540
AE9B	5,660,460
WX3B	3,338,015

** Denotes low power*

N6BV, WA6O, K6CTA, K2RED, WX5S, and K2RD. Second place went to NW4V, operated by the W4MYA crew, followed by NE1C in third, AE9B fourth, and WX3B fifth.

The Rest of the Story

Log submissions were up over 10% in 2003, partly because there was no Easter holiday schedule conflict. Most logs were sent in Cabrillo format, which is the default requirement. We continue to refine our log preparation instructions on the website <http://www.cqwpx.com> so contestants will not have difficulties submitting their logs. Please do not rely on your logging program to get the Cabrillo header filled out correctly, especially if you are entering one of the categories that requires a Category Overlay line in the header. If you make any changes to your Cabrillo file, please use a simple text editor, not a word processor. See the 2004 WPX Contest rules in this issue or on the website for more information.

We are checking serial numbers. If we receive a log without sent or received serial numbers it will reclassified as a Check Log. If you encounter problems with serial numbers in your log, please take up the matter with your logging program author. With close to 5000 logs to process each year it's impossible for us to fix everyone's log.

Special thanks go to the many operators who travel to remote locations all over the world so the rest of us can have interesting and exciting prefixes to work. Also, we thank the many operators who arrange for special prefixes solely for use in this contest.

Thanks to WT4I for his log-checking software, and to EA3DU and OH5DX for help handling logs from their respective countries. Many thanks also to members of the CQ WW Contest Committee for helping with various log-handling issues in local languages. Thanks as well to Trey, N5KO, and his robots; they are a huge help in the log-checking process.

The biggest thank you goes to Steve

ORION

Ultra High-End HF Transceiver

$3300

$3599 WITH AUTOTUNER

ORION represents the culmination of 35 years of Ten-Tec radio manufacturing expertise.

Our goal was to combine the very best receiver performance of any amateur transceiver to date with cutting edge high-tech features to provide active hams with THE top of the line HF transceiver available today.

Take a look at some of what is included in this revolutionary new radio:

- Dual 32-bit floating point ADI SHARC DSPs. Two 32-bit processors deliver significantly more processing "horsepower" than a single 32-bit radio can provide.
- Unmatched close-in HF receiver performance on the main receiver. Very high receiver intercept points and superior dynamic range are made possible by an industry-best low phase noise synthesizer, selectable crystal roofing filters and dual 32-bit DSP processing power.
- Two receivers, with an amateur-bands-only main receiver and general coverage subreceiver. Each receiver has fully programmable AGC characteristics and 590 IF-DSP filters standard. Receivers can be used separately or in tandem for diversity reception on any frequency with no compromise in RX performance. Use both receivers on a single antenna, or both on separate antennas.
- ORION is equipped with dual antenna outputs, two linear amplifier keying outputs, two band-data connections. This allows two sets of amplifiers and antennas to be connected to the radio simultaneously to take full advantage of both receivers' capabilities.
- Continuous real-time spectrum display with 5 selectable widths.
- Adaptive DSP noise reduction filtering available in 9 stages. Dual noise blankers, both DSP and 'analog' are provided.
- Optional heavy-duty internal automatic antenna tuner matches up to 10:1 SWR (8 to 600 ohms load impedance).
- Panoramic Stereo™ receive. PS receive allows signals heard through headphones to 'move' across the spectrum spatially as they are tuned across. Makes copying a single signal in the presence of multiple signals on the same frequency (like a contest or DX pileup) much easier than with 'mono' output.
- SSB audio receive and transmit controls. 18 transmit bandwidths to a maximum of 3.9 kHz are provided along with equalization on both transmit and receive. Bass and treble response can each have their own EQ setting.
- Flash-ROM update capability allows an ORION owner to instantly upgrade their radio to the latest version by downloading a file from the Internet – free of charge.

MADE IN THE USA

HOW IS ORION DIFFERENT?

For the complete technical description of the ORION and/or to download the operator manual in .pdf format, visit our website at www.tentec.com.

ORION uses both crystal roofing filters and IF-DSP bandwidth filtering as part of the main receiver. The usual pitfall for top-notch performance in a modern HF receiver is the use of a 15- to 20-kHz wide roofing filter at the 1st I-F stage. This wide filter will allow unwanted signals outside of your receiver's passband to compromise receiver performance. By using crystal filters as selectable roofing filters at the 1st I-F, undesirable signals are kept out of the receiver chain and do not compromise close-in receiver performance.

Any signal that appears inside the roofing filter – even if you do not hear it in your receiver passband – will have a negative impact on receiver performance. Loud signals inside a roofing filter lead to a loss of dynamic range and receiver sensitivity. Consult any ARRL product review from the past two years and look at the difference in receiver performance numbers for 20-kHz spacing and 5-kHz spacing two-tone dynamic range and third-order intercept. The 5-kHz spacing numbers are always significantly worse than the 20-kHz numbers for our competitors transceivers – this is because of the presence of the loud test signals under their wide roofing filters. Imagine how much worse it is if you have several loud signals within 15 kHz rather than just two used for testing! The optimum receiver set up is to use high-rejection, very narrow crystal filtering up front, and brick-wall DSP filtering at the end of the chain at the 3rd I-F. No receiver system can top this! There are six crystal roofing filter positions in ORION. Three roofing filters at 6 kHz, 2.4 kHz, and 1 kHz are standard; three at 1.8 kHz, 500 Hz, and 250 Hz are optional. ORION's roofing filters are not to be confused with traditional crystal bandwidth filters – for bandwidth filtering, ORION has 590 built in DSP filters from a minimum of 100 Hz to a maximum of 6 kHz. What is the result? Receiver performance specifications that are significantly better than any other transceiver on the market to date.

OPTIONAL EQUIPMENT

Heil/Ten-Tec Studio One Microphone
$129.95
(cable and stand sold separately)

307B Speaker
$98.00

706 Desk Microphone
$99.95

963 Switching Power Supply
$169.00

302R Remote Encoder Keypad
$139.00

310 Fan Kit
$39.95

Not shown: #217-218-219 Optional Roofing Filters – $109.00

TEN-TEC

1185 Dolly Parton Parkway
Sevierville, TN 37862

Sales Dept.: 800-833-7373
Sales Dept.: sales@tentec.com
Office: (865) 453-7172
FAX: (865) 428-4483

Repair Dept.: (865) 428-0364 (8 – 5 EST)
Repair Dept.: service@tentec.com
Monday – Friday 8:00 – 5:30 EST
We accept VISA, Mastercard, Discover, and American Express

Just some of the antennas at US Multi-Multi top-scoring NR6O. The vineyards of Ken, N6RO, are perfect for placement of those tall towers and big antennas. (Photo by K2RED)

Bolia, N8BJQ. He has been tireless and always ready to step in to help in the WPX Contest Director transition.

The 2004 WPX SSB Contest will be held on March 27 and 28. Please plan to participate. Rules can be found both on the CQ website <www.cq-amateur-radio.com> and the WPX Contest website <http://www.cqwpx.com>. We request that logs be submitted by e-mail in Cabrillo format. Send SSB logs to <ssb@cqwpx.com>.

QRM

I love this contest. . . . **NW6H.** Worked strictly S&P using TS-520 and end-fed wire strung in the trees. Worked almost everybody I heard. Tnx to everybody worked. . . . **AA3WI.** Neighbor called about RFI, so I had to shut down for a while first night. Found a loose ground wire and I was back on the air! Great contest!. . . . **AB5XZ.** Not easy to break the EU-wall on 40m, but my best result from 3B8 ever. . . . **3B8MM.** My first contest from Conakry Guinea. Would have liked to have spent more time with it. Thanks for a great contest. QSLs go to KA5BQM. . . . **3XY8B.** Only antenna up is a 140 foot center-fed dipole up 45 feet in a tree. Big thrill was CQ9K called me. . . . **NT6K.** It is so nice to be a wanted mult for a change. Even with 100 watts and a dipole was able to sustain runs and hold freqs on 10 and 15. . . . **ND2T.** Multi-Two is great fun and less work than multi-multi. Thanks *CQ*!. . . . **KM3T.** It was a great contest from my point of view. The propagation to Europe was excellent and balanced the poor condx to USA (21 MHz only was in a decent shape) and to Japan. I had to use 50 watts during daytime because of some local interference. . . . **A45WD**. Propagation was low but spirits were high. Francisco, CT2IAF, our chef de cuisine, kept us happy during off times. A radio contest and a gourmet festival go well together if you are in Alentejo, Portugal. . . . **CS6RPA.** Sure missed 10 meters not being open much. . . . **WB8TLI**. This was my last chance at the USA low power Rookie title. Keeping my fingers crossed that it is enough! Had a great time and now setting my sights on WPX CW! . . . **W2RDS.** Horrible to work with this long callsign. Got very interesting comments about that from many stations. Thanks for a nice contest ! . . . **EI/DH5ST/P.** Had fun, and it was good to back on Guam after 8 years and contesting again. . . . **KG6DX**. Conditions not good first day, plus 50 KW BC station was splattering and had birdies. . . . **WA7LT**. A great time again at NR6O in the WPX, and a USA Multi-Multi winning score. What more could one ask for?! My thanks to Ken, N6RO, and all the ops with whom I shared the experience. . . . **K2RED.** Great contest. It was my first try at the WPX contest. QRP works even on SSB! I can't wait

CQ WW WPX SSB CONTEST ALL-TIME RECORDS

The contest is held each year on the last full weekend of March. The All-Time Records will be updated and published annually. Data following the calls: year of operation, total score, and number of prefix multipliers.

WORLD RECORD HOLDERS

Single Operator

1.8	VA1A('99)	535,225	271
3.5	EA8/OH1MA('97)	4,317,284	562
7.0	ZX9A('97)	10,787,128	814
14	EA8AH('97)	11,142,198	981
21	ZW5B('95)	14,095,142	1054
28	D44AC('02)	15,707,401	1123
AB	D4B('03)	25,937,444	1258
QRP/p	HC8A('94)	7,520,562	714

Multi-Operator Single Transmitter

	D44TD('02)	33,443,856	1332

Multi-Operator Two Transmitter

	STØRY('03)	30,346,161	1119

Multi-Operator Multi-Transmitter

	HC8N ('03)	60,703,452	1476

U.S.A. RECORD HOLDERS

Single Operator

1.8	K1ZM('95)	327,712	308
3.5	WE3C('95)	1,519,300	475
7.0	KC7EM('95)	1,950,228	495
14	KK9A('00)	6,621,446	962
21	KX8R('00)	7,556,250	930
28	NY4A('00)	6,006,573	877
AB	KQ2M('00)	11,875,240	1066
QRPp	KR2Q('00)	2,688,158	649

Multi-Operator Single Transmitter

	KM3T('99)	14,091,468	1077

Multi-Operator Two Transmitter

	KM3T('03)	9,950,919	1041

Multi-Operator Multi-Transmitter

	KM3T('00)	29,338,460	1355

CLUB RECORD

Contest Club Finland ('00) 250,320,141

QRPp RECORD

HC8A('94) 7,520,562

WPX (Prefix) RECORD

OTØA('00) 1528

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	EA8/OH1MA('99)	404,976	208
3.5	EA8/OH1MA('97)	4,317,284	562
7.0	EA8AH('96)	7,101,380	715
14	EA8AH('97)	11,142,198	981
21	EA8AH('01)	12,387,139	1063
28	D44AC('02)	15,707,401	1123
AB	D4B('03)	25,937,444	1258

ASIA

1.8	UL7ACI('91)	331,008	128
3.5	UA9CSS('94)	1,074,780	315
7.0	H24LP('87)	5,348,975	503
14	H2A('91)	6,297,464	758
21	7L1GVE('92)	6,848,136	838
28	H22H('00)	9,092,146	931
AB	JY9NX('01)	15,463,485	1017

EUROPE

1.8	LY6K('95)	481,164	303
3.5	YT6A('96)	1,976,436	558
7.0	9A9A('99)	4,624,188	724
14	DJ7AA('00)	7,955,224	1052
21	CQ1BOP('00)	6,989,997	1029
28	GM7V('00)	8,305,756	982
AB	OK1RI('01)	10,844,592	1034

NORTH AMERICA

1.8	VA1A('99)	535,225	271
3.5	VE1BY('00)	2,226,300	492
7.0	TE1C('95)	7,281,630	745
14	KP2A('95)	7,088,976	912
21	WP3R('98)	10,167,632	986
28	KP2A('00)	11,385,710	1046
AB	TI1C('99)	17,078,930	1117

OCEANIA

1.8	AH6PR('99)	18,963	49
3.5	WH7Z('03)	1,208,900	308
7.0	WH7Z('99)	4,582,773	507
14	KH6ND('03)	6,493,727	887
21	AH7DX('00)	7,645,990	890
28	TXØDX('00)	12,049,422	847
AB	KH6ND('01)	15,498,798	1029

SOUTH AMERICA

1.8	YV5JEA('84)	40,320	63
3.5	P4ØA('96)	1,715,076	426
7.0	ZX9A('97)	10,787,128	814
14	PYØFM('95)	9,660,432	939
21	ZW5B('95)	14,095,142	1054
28	ZX5J('99)	14,405,820	1095
AB	HC8A('01)	25,180,199	1199

MULTI-OPERATOR SINGLE TRANSMITTER

AF	D44TD('02)	33,443,856	1332
AS	A61AJ('02)	23,610,785	1243
EU	9A7A('02)	19,034,950	1306
NA	VP2EC('92)	24,409,580	1115
OC	T33RD('99)	17,778,372	998
SA	HC8A('93)	32,502,677	1107

MULTI-OPERATOR TWO TRANSMITTER

AF	STØRY('03)	30,346,161	1110
AS	P3A('03)	27,063,259	1129
EU	HG6N('03)	12,127,464	1167
NA	V47KP('03)	15,958,488	1092
OC	No Entry		
SA	CV1T('03)	2,233,579	629

MULTI-OPERATOR MULTI-TRANSMITTER

AF	CN8WW('99)	55,151,562	1334
AS	P3A('00)	53,554,592	1456
EU	9AY2K('00)	42,477,343	1493
NA	WL7E('00)	42,013,215	1395
OC	KH7R('02)	32,806,032	1304
SA	HC8N('03)	60,703,452	1476

CONTINENTAL LEADERS

AFRICA

1.8	No Entry	
3.5	No Entry	
7	No Entry	
14	CQ3E	489,090
21	5R8FU	433,840
28	ST2CF	5,779,768
AB	D4B	25,937,444

ASIA

1.8	No Entry	
3.5	RA9MX	23,312
7	UP5G	1,421,718
14	4L6AM	4,323,942
21	9V1YC	4,781,420
28	4X1VF	1,298,448
AB	A45WD	8,073,000

EUROPE

1.8	OZ3SK	313,404
3.5	9A7V	1,874,670
7	S50A	3,816,165
14	9A5E	4,089,132
21	9A8A	3,449,940
28	LZ9X	552,948
AB	OK1RI	7,905,744

NORTH AMERICA

1.8	NE5D	104,076
3.5	AA1BU	960,245
7	K7ZSD	499,337
14	VA7RR	3,340,974
21	VP2E	9,616,596
28	ZF2AH	2,551,145
AB	TO3M	13,235,250

OCEANIA

1.8	No Entry	
3.5	WH7Z	1,208,900
7	*VK8AA	4,089
14	KH6ND	6,493,727
21	NH7S	7,536,826
28	VK4WPX	2,148,966
AB	VK8AA	4,841,184

SOUTH AMERICA

1.8	No Entry	
3.5	PP5ZD	24,420
7	PY0FF	3,059,100
14	PR5B	5,453,825
21	PX5E	12,428,386
28	PX2W	6,977,484
AB	FY5FY	16,135,200

MULTI-OPERATOR SINGLE TRANSMITTER

AF	C5P	24,012,075
AS	RK9CZO	5,894,656
EU	IR4T	10,078,080
NA	TO4T	10,862,952
OC	ZL6QH	8,200,238
SA	PQ2Q	11,658,240

MULTI-OPERATOR TWO TRANSMITTER

AF	ST0RY	30,346,161
AS	P3A	27,063259
EU	HG6N	12,127,464
NA	V47KP	15,958,488
OC	No Entry	
SA	CV1T	2,233,579

MULTI-OPERATOR MULTI-TRANSMITTER

AF	No Entry	
AS	R9/N5XZ	984,906
EU	OT3A	16,418,964
NA	NR6O	13,362,844
OC	No Entry	
SA	HC8N	60,703,452

**Denotes Low Power*

for the CW leg. . . . **ZS6DX.** For the very first time I operated so3r (three radios) all connected to single computer all automatic. I enjoyed a lot. Thanks for calling, OMs. . . . **ZW5B.** Ten meters, where hast thou gone? When wilt thou return? . . . **NZ6Q**. It was amazing! My first contest as licensed ham. Great fun and DX action! . . . **IZ0FKE**. Celebrating the 10th anniversary of the contest station LX4B. . . . **LX4B.** Great contest as all 40+ previous years!. . . . **N7IH**. All contacts made with indoor dipoles inside my attic. . . . **N2MH**. Contest weekend enjoyed by Cray Valley Radio Society members, despite very poor conditions. . . . **M8C**. Very bad aurora, variable cndx all over Finland. . . . **OH5BM.** Conditions quite bad on 10m, especially the first day. Very surprising to set new record. . . . **D4B**. Good to see 10m open for so long from VK. . . . **VK1MJ**. Boy, were the conditions poor! Sure wish we had made some strategy changes better than we did. Made some notes on it. The low bands were good though, really enjoyed 75! Thanks to all who called us. . . . **NZ1U.** The bands weren't as friendly as in recent years, but had a good time. . . . **W6TKV.** Very poor conditions. We even couldn't work NA. On Saturday morning listening better Pacific than Europe. Where were the big guns? We give thanks to Mr. Murphy for giving us many problems. . . . **AN2WP.** Had fun beside poor conditions in northern Germany. . . . **DF3KV.** Long time ham, first time contester. . . . **N4WQH.** Always thought SSB QRP on 160 would be virtually impossible with a simple 110 ft. inverted Vee. WPX proved me wrong. Thanks for a great contest! . . . **KR1ST.** The last three hours were the worst rate in years. Anyway, always nice to say "hi" in the test and happy to know you are there and I am here! QRV is everything. Let's enjoy and CU in the next one. . . . **JA8RWU.** I'm 16 years old. Early I worked with RZ9SWP team in multi-op class, but in this test I decided work single op. . . . **RZ9SWP.** I really enjoy this contest. It's just not possible to run out of multipliers. But where was western Europe? . . . **NI9C.** I enjoyed the contest. However, line noise drove me crazy. . . . **W5FO.** 80m opening to EU was a blast on the second day. . . . **KM4M.** A great contest where we relaxed between our turns with sauna and snow-bathing!. . . . **LA1TUR.**

(Continued on page 106)

Hams responding to last fall's California wildfires often had to improvise, since many repeaters normally used were either destroyed or without power for so long that their battery backups wore down. WB6NOA looks at one effective solution.

Southern California Firestorms: Cross-Banding Techniques Worked!

BY GORDON WEST,* WB6NOA

(Photo © Ron Eggers, KA6RWK)

As southern California burned last October, WB6NOA was assigned to help provide communications at this huge evacuation center set up inside an airplane hangar. The hams set up their stations in the upstairs area toward the rear in the photo.

When seven firestorms hit southern California last fall, amateur radio emergency groups were well prepared for their communications assignments, but in many cases improvisation was the order of the day.

"Seven simultaneous fires consuming more than a million acres put demands on our emergency communications networks like we had never seen before," commented William Alber, WA6CAX, who worked with this author in the rollout of a southern California county-wide ARES (Amateur Radio Emergency Service) program.

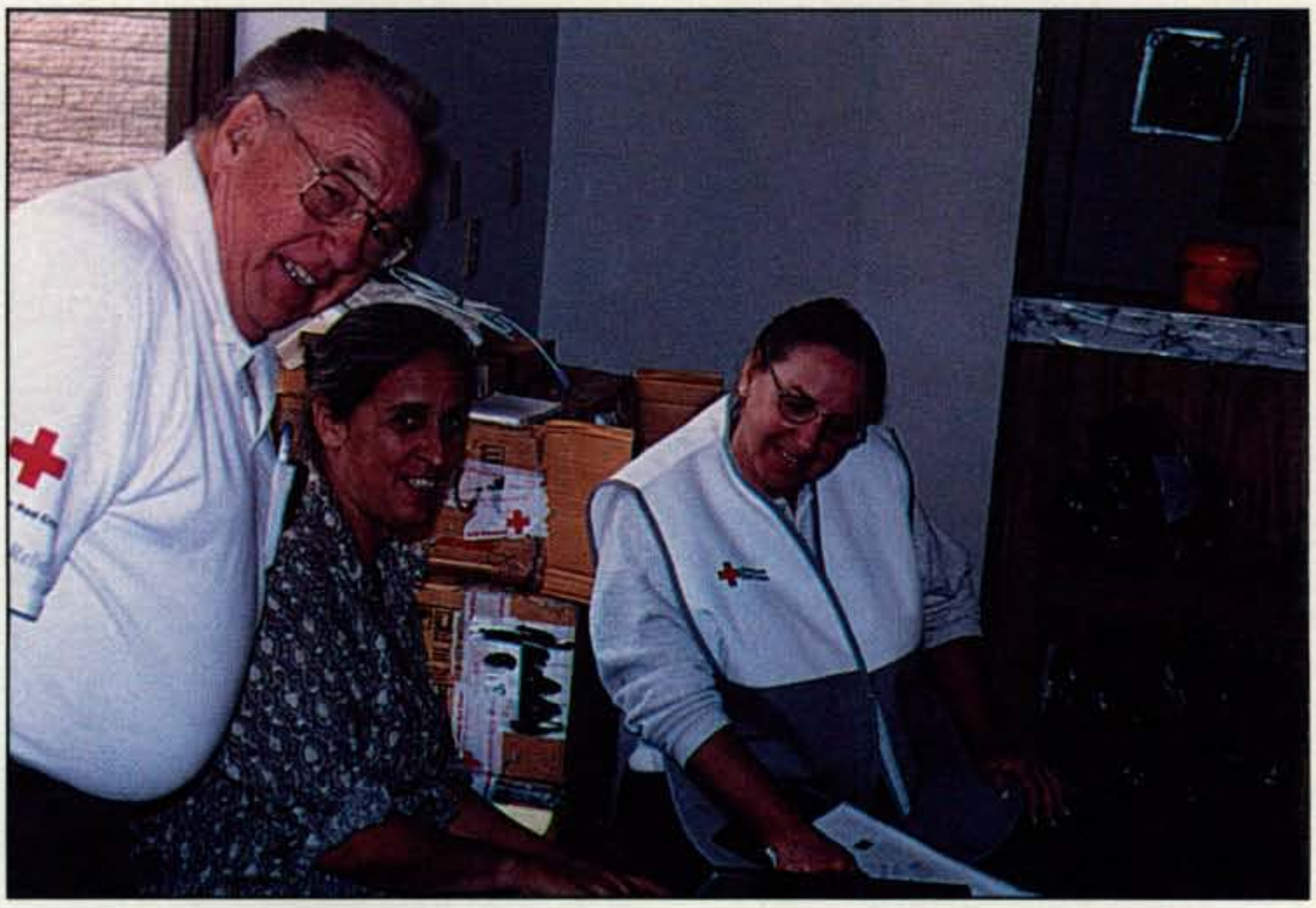
"When the southern California hams began to deploy, several relatively new standards were in place to facilitate a smooth set up of any emergency evacuation center," Alber added, referring to amateur radio operators coming together on specific technical and jurisdictional matters.

Exactly how separate emergency communications can work close together on a widespread emergency was well documented in the ARRL certification and continuing education program "Amateur Radio Emergency Communications Course, Level 1." At several EOC (Emergency Operating Center) ham radio command posts, copies of the ARRL course book plus the ARRL *Emergency Coordinator's Manual* were open to several reference pages. Many ham responders were carrying the ARES field resources manual, which has many pages dedicated to quick-reference items on handling emergency comms, plus multiple pages for incident reports and logging. Many of the ham radio supervisors indicated that they had training up to Level 3 from the relatively new, yet well-respected, ARRL Emergency Communications course.

During the firestorms shelters were quickly established to take hundreds of clients, and the request went out for local hams to come in and assist with shelter communications. To facilitate the orderly flow of communications and relief of ham operators working these shelters, local hams usually set up a 12-volt DC, 20-amp power supply along with a good dual-band antenna on the outside of the building. The dual-band antenna, with the coax cable terminating to a PL-259, is a no-brainer for commonality, but the enterprising local ham also included a BNC adapter, an N adapter, and even an SMA adapter to complement almost any type of radio system hooking into the dual-band antenna. This is outlined in one of the ARRL emergency courses.

For the power supply, the red and black Anderson Power Pole™ connector, along with a 12-unit distribution strip from West Mountain Radio (called the Rigrunner), made setting up their own equipment a snap. "This also lets us identify who the 'professional' emergency responder is," added Alber, pointing out that the majority of hams well trained in emergency comms may always come in with their own equipment with the common Anderson Power Pole connector attached to the 12-volt DC leads.

"We can always tell which of the incoming hams has emergency communications training by how they plug into what is already here at the evacuation center," echoed Orange County, California American Red Cross Radio Communications Coordinator Mel



Hams working inside shelters often had to rely on cross-band links to get their signals out to other shelters and Red Cross headquarters. See text for details. (WB6NOA photo)

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VHF/UHF repeater links between evacuation shelters were supplemented by a 40-meter net on HF. Here Suzy West, N6GLF, operates 40 meters from outside the hangar-turned-shelter. (WB6NOA photo)

Goldberg, N6MEL. Although Orange County, where I live, did not have any fire within its own jurisdiction, many of us were deployed to other Red Cross agencies that had more evacuation centers than Red Cross radio personnel to handle th situation.

The types of facilities used as evacuation centers were school gyms, community recreation centers, National Guard armories, and in one of our southern California fire areas, an entire aircraft hanger. The points of communications were usually from each shelter to a Red Cross headquarters, or to local mountaintop repeaters, or to selected simplex frequencies for voice communications. For the digital modes, outside antennas were necessary for a good packet connection on VHF or UHF, or a good PACTOR connection on HF.

As the evacuation centers began to open during the southern California fire storms and ham operators arrived on scene, one thing immediately became clear: Hams inside the evacuation centers did not have clear paths to the local repeaters, and many times the signals from their handhelds would continuously break up as they went from hot to cold spots within the facility. Certainly an outside antenna hooked into an HT would have solved this problem, but in this type of situation for the first few hours of setup there is so much incoming and outgoing radio traffic that there may be little time to erect a formal antenna system.

As the shelter to which I was assigned began to set up just a few miles downwind of the fire storm along the main route between Los Angeles and Las Vegas, I knew I was too far away for an inside access to the Red Cross communications center and the repeater station that was designated as having good coverage for our particular fire scene. Closer repeaters had either burned up or had lost their power in the fire storm, and after a few hours of continuous on-air time, their back-up battery systems finally gave out.

Coverage from the mobile unit in the evacuation facility parking lot was slam-dunk to the repeater about 30 miles away, but HT comms inside the building were continuously plagued with hot spots and not spots. No time for an outside antenna and coax run, so on went the cross-band repeater in the mobile.

Cross-Band Repeating

Cross-band repeating from VHF to UHF and UHF to VHF is a common undocumented function in many dual-band and tri-band fixed-mount mobile radios. You can also cross band with a dual-band HT, but this is not recommended because of heat build up and "cross talk" within the tiny HT's TX/RX circuits. Do the actual cross banding with a big heat-sink mobile rig, set to low power, and you will be set.

Manufacturers often don't document the cross-band feature on a radio because FCC rules on control point and ID come under question when, for example, you are using your vehicle outside in the shelter parking lot as a repeater-type station while you are inside on your HT. However, if you set it up correctly and use it only during times of setting up an emergency command post, you will make good use of this undocumented feature to help you get a good, rock-solid signal out of a shelter to a distant repeater. Remember, the rules specify that in an emergency you may do whatever you need to do to get messages out and in.

If your repeater system is on 2 meters, you will cross band on a vacant UHF frequency with your HT inside the shelter. Avoid popular UHF frequencies such as 445.000 and 446.000 MHz, as any signal your mobile picks up on these

Hams helped fire officials with more than communications, such as filing house-by-house damage reports after the fires had passed through an area. The smaller maps at the lower left were transmitted via slow-scan TV. (WB6NOA photo)

frequencies will be cross banded out to the distant repeater system. This happened at a couple of southern California shelters, and they quickly learned that going to CTCSS encode from the shelter HT to CTCSS encode/ decode on the mobile unit would help mitigate the problem. I found it much easier to go to a frequency on the 440-MHz band that I knew was absolutely unused in my area and I didn't even need to go with a subaudible tone.

In my communications van I have a radio specifically designated for cross-band repeating. I purposely put a small UHF antenna on the system to prevent outside signals from accidentally getting into the UHF receive side, or anyone else very far away hearing the cross-band output that is relaying the 2-meter repeater. My dual-band handheld that I would use inside the shelter could then be worn on my belt, and I would turn up only the UHF side to hear my mobile cross-band remote. (Make sure you have all squelch settings relatively tight; you don't want noise to trigger the cross band into continuous transmit.)

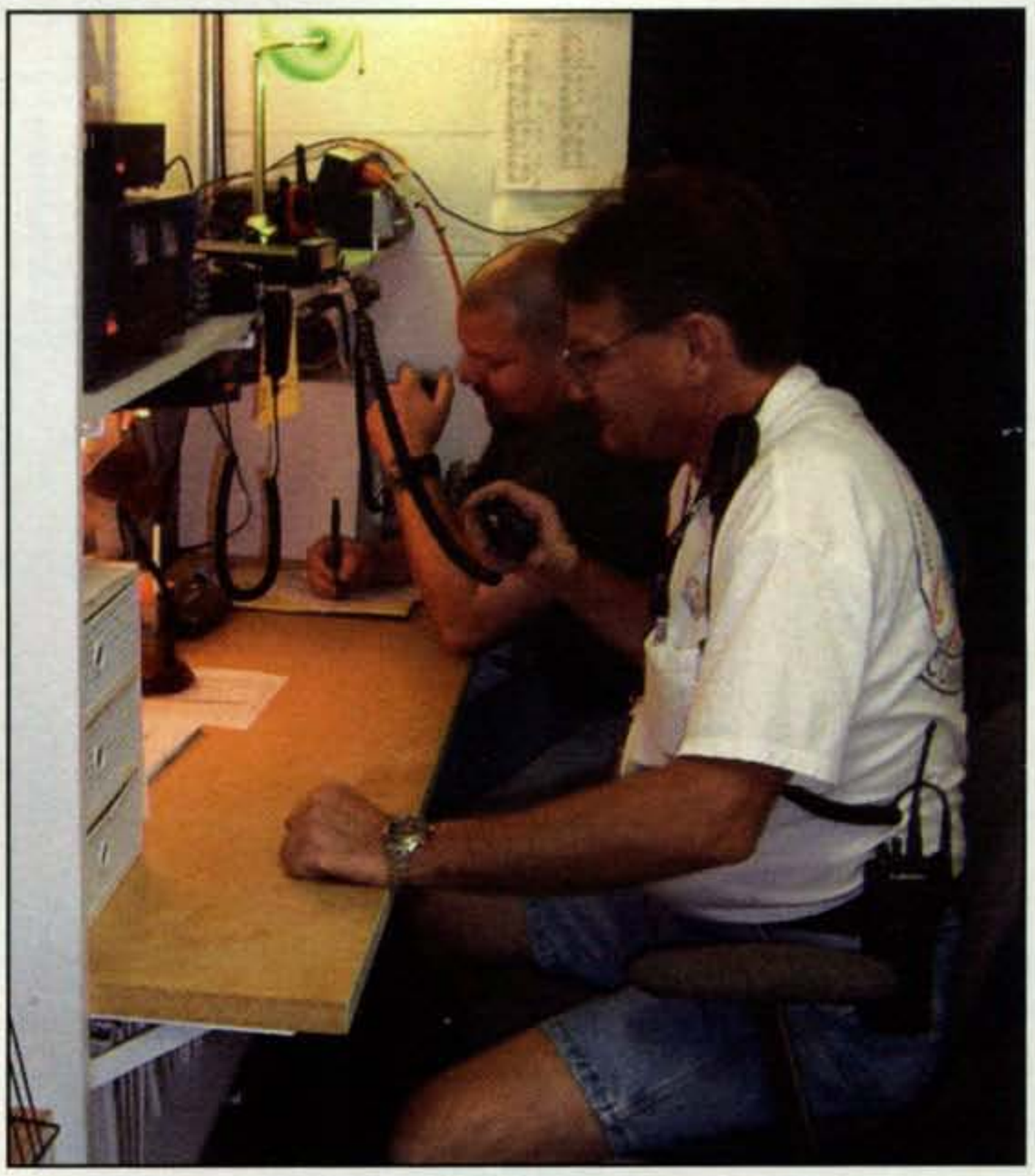
Solving Another Problem

However, we had a problem that several other shelters throughout the southland also encountered with their cross-band remote systems. The repeater they had chosen had an abnormally long squelch tail, and operators inside the facilities were starting to talk after they heard the repeater go beep, thinking that the cross-band remote would now repeat out their conversation. Unfortunately, the mobile radio cross-band system will stay on 2-meter receive and 70-cm transmit until the repeater actually drops its carrier. This makes a fast-paced communication with the other communications agency next to impossible. There was a cure, though!

Out in the mobile I had pre-memorized the local repeater INPUT as well as output frequencies, along with their required CTCSS tones. I went out to the comm van, switched from normal 2-meter repeater operation over to the designated repeater input frequency, running SIMPLEX with tone, and then re-energized my mobile cross-band remote circuit.

On the radio I was wearing on my hip, I now turned up the 2-meter repeater OUTPUT, which I could hear relatively consistently within the building. I was then transmitting on 70 cm to the mobile that would cross band my signal onto the repeater input. I would hear myself coming through the other side of my HT,

Ed Greany, KB6DOL, operates a GMRS radio as Crest 25 from Red Cross headquarters in San Bernardino County, California, during the "Old Fire" in late October. (Photo courtesy KB6DOL)



San Bernardino Red Cross Chapter communications room in use during the "Old Fire" last October. In this photo Jeff Roberts, KG6PTO (in the rear in the photo), operated CREST 68 on 2 meters while Jerry Schnock (GMRS callsign WPOXH766), CREST 47, was on GMRS to the shelter located at Norton International Airport. (Photo courtesy KB6DOL)

so an earphone on the 2-meter side kept me from going into feedback. As soon as I unkeyed, the repeater went beep and the other party talked; as soon as the repeater went beep again after they finished, I immediately could take over the cross-band transmit because my mobile cross-band "repeater" was only responding to signals on UHF. If another operator came in close by and was heard on my 2-meter input to the same repeater, no big deal. My system would drop as soon as his/her input carrier dropped.

This whole arrangement prevented the cross-band system from staying "hung up" during a lengthy repeater ID or an abnormally long squelch tail. Remember, the cross band stays up for as long as it detects repeater carrier on the output. Going to the input solves this problem.

I regularly IDed, and all power levels were at an absolute minimum along with my UHF antennas at a minimum to keep this whole cross-band system localized to the evacuation center grounds. The system worked so well that we never did put up an outside antenna on the side of the gymnasium. We simply instructed all incoming hams to monitor the repeater on the 2-meter side of their handhelds, and to talk to the repeater on a UHF frequency we gave them as soon as they signed in at the shelter site. Even for brand-new hams with dual-band handhelds, transmitting on UHF while simultaneously receiving on VHF with the volume turned relatively low was a pretty easy configuration to their little dual-band handhelds. Many did not know exactly what was going on out at the communications van, other than knowing they no longer were relegated to sitting right at a specific radio operating desk within the evacuation center.

Putting Out Internal "Fires"

Not being confined to a specific spot at the shelter also allows you to get more involved in some of the "fires" that need to be put out with the shelter director. Now that most shelter coordinators have two or three cellular phones strapped to their sides and a Bluetooth wireless earphone and boom mic blinking away, your need as *just* a radio communicator is diminished. *However,* as a radio and electronics specialist, you will become a hero when you untangle the overload of five coffee makers all plugged into one extension cord and a tripped breaker, or a hero when you get the FAX machine back up, and a *hero* when you figure out the gymnasium lighting circuit to shut down most of the overhead lamps above the sleeping clients, yet leaving one or two lamps still on for the on-duty nurse and mental-health workers.

Many of our clients left their now destroyed homes in such a rush that their cell-phone chargers were left behind. Again, as an amateur radio operator, you become the center of attention when it is discovered you know how to jumper-lead a dead cell-phone battery back to life with a quick charge, and then maybe rig up your own any-voltage desk charger to get some voltage back into the client's handheld radio. At one shelter a ham came up on high-frequency Winlink Airmail and was handling incoming and outgoing e-mail traffic for the clients.

Solar Flare

At the height of the fires the sun began to burn up itself with a major solar flare, causing many communications satellites to go into their automatic protection modes, thus limiting the number of calls that could get through. One shelter worker, operating a portable satellite phone, could only complete about one call every couple of hours. This might have been due to overloading from the many fire department communication units with satellite access, plus the possible satellites' turn-off due to increased solar activity.

Yet ham radio operations didn't miss a beat. Southern California was well-prepared for the widespread communications emergency during the worst wild fires in history. ■

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R-5-06 Hear them all with Icom's winning performance. (left) The R5's combination of small size, powerful specs and outstanding features puts the user in the action, whether listening in on car-to-pit radio calls or catching a favorite radio program at home. The unit's wideband reception (.15-1309.99MHz, cell blocked) means virtually anything from AM to UHF TV audio is fair listening game (AM/FM modes). The R5 also features 1250 alphanumeric memories, DMS, multiple power sources and PC programmability. 3.38"h x 2.28"w x 1.06"d, 6.5 oz.... © **$189.99**

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R-75 Wide frequency coverage, innovative features. The all mode R-75 communications receiver covers a wide frequency range from 0.03 to 60MHz, allowing the user to listen in to a world of information. With innovative features such as twin passband tuning, synchronous AM detection, DSP capabilities, remote PC control and more – shortwave listening is easier tham ever. Use the R-75 conveniently in a ham shack, den or vehicle. 9.5"w x 3.69"h x 9.03"d, 6 lbs, 10 oz..... NOW! FREE DSP © **$499.99**

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IC-2100H-25N Durable 2M rig with superior RX IMD, performance. The 2100H25N offers 50W on transmit, extending its range. It also features CTCSS tone enc/decode, tone scan and 100 alphanumeric memories. It can be remote controlled using the new backlit mic. 5.5"w x 1.56"h x 7.09"d, 2 lbs, 10 oz..... © **$149.99**

IC-706MKIIG Base station features, mobile size. The 160-10M + 6M, 2M, 70cm Mark II G is constructed for stable, quality output with low IMD and spurious emissions. It features tone squelch, DSP, auto repeater, and 107 alphanumeric memories. 6.56"w x 2.28"h x 7.88"d, 5 lbs, 6 oz ..... NOW! FREE RMK706 sep kit © **$779.99**

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BY BOB JOSUWEIT,* WA3PZO

Red Flag Warning: Hams Respond to California Fires

The hot days of summer mean vacation, perhaps a trip to the lake, the beach, or the mountains. Why talk about this in January? Because in many areas of the country, summer also brings with it the possibility of "Red Flag Days," or "fire weather." This weather, while most common in the summer, easily can extend into autumn, as was the case this past October in California.

On exceptionally hot days a state forestry department, in conjunction with the National Weather Service, may declare a "Fire Weather Watch" or "Red Flag Warning." Fire weather includes high winds, high temperatures, and very low humidity. The drying winds increase the chances of a fire igniting and spreading rapidly. Wind gusts result in erratic fire behavior. Local fire agencies prepare for summer fire weather by increasing patrols and inspecting fire-prone areas. Local news media are alerted to remind communities about the increased fire danger, and special signs may be posted to indicate high fire-hazard conditions. Amateur radio operators are put on alert.

While training varies among states, there are some common elements. Amateur radio operators receive training from the National Weather Service or a state agency, such as the Department of Forestry, that is similar to the severe-weather training that many SKYWARN volunteers receive. When these trained amateur radio operators are sent on patrol, there is at least one additional person in the vehicle and the mobile radio has an output of at least 25 watts. More important, a check of radio communications is made while the vehicle is still in a safe area.

*c/o CQ magazine
e-mail: <wa3pzo@cq-amateur-radio.com>

Heavy smoke made driving dangerous in southern California last October as amateur radio operators kept an eye out for new fires. In Santa Barbara County, where there were no fires, trained hams were put on fire patrol, while county firefighters were dispatched to help in nearby counties. This photo is from San Bernardino County. (Photo © Ron Eggers, KA6RWK)

California Hams Respond

In the October wildfires in southern California amateur radio operators were alerted for communication duty. Calls came from local, county, and state emergency management and fire agencies. In addition, the Red Cross and Salvation Army activated ham volunteers. Amateurs responded to these various requests for much-needed communications assistance. For example, amateurs helped the Red Cross with shelter communications and damage assessment and served as a link between shelters and the Red Cross Chapter Headquarters in San Bernardino. Hams with the Salvation Army Team Emergency Radio Network (SATERN) supported communication for firefighters and police and kept Salvation Army relief teams in contact with one another.

SATERN

Paul Cook, N6RPF, San Diego area SATERN Coordinator, said SATERN members supplied communications for a number of canteens in the San Diego area. He said the situation was busy and intense. At times they were overwhelmed with work. Cook said that getting to areas that needed assistance was difficult because many highways were closed and people were discouraged from using the ones which were open. In the San Bernardino area Tony Stephens, KE6JZF, reported amateurs assisting the Salvation Army with communications for the Waterman fire. He said SATERN set up communications on 7.233 MHz to provide communications from support vehicles in the field back to command. They also used 144.30 MHz simplex. In addition, at least six shelters and many emergency management centers and hospitals were staffed by hams. The 30-mile fire was formed when two smaller fires merged, covering the region with thick smoke and ash.

ARRL San Diego Section Manager Kent Tiburski, K6FQ, estimated that about a hundred ham ARES and RACES volunteers participated in his section, where one of the largest fires was burning. The fire caused at least nine deaths. At one point, he said, the San Diego area had up to

Forest fires destroyed everything in their paths, including hundreds of homes and some mountaintop amateur radio repeaters. Other repeaters and cell-phone towers that were not destroyed lost electrical power for so long that their battery backups ran down. (Photo © Ron Eggers, KA6RWK)

four nets going simultaneously—one on 40 meters and three on 2 meters.

Amateurs Keep A Watchful Eye

Many amateurs were directly affected by smoke and fires. There were at least 11 separate fires that burned more than 500,000 acres. "This is a terrible situation," Gov. Gray Davis said. "These are the worst fires that we've faced in California in ten years." Larry Weaver, N6TW, a net control station for the SATERN 20-meter net, reported a fire just three miles from his home in West Hills. Weaver evacuated the area, but was ready to get back on the air when he reached his temporary residence. Tiburski said he lives within 10 miles of the Otay fire. "It's almost like it's snowing over here with all the soot and debris coming down out of the sky," he said. Santa Ana winds reached velocities of 50 mph, and at least one fire jumped a major highway.

In San Bernardino County, ARRL Orange Section Manager Carl Gardenias, WU6D, said ARES volunteers supported emergency communication in the county. ARRL Los Angeles SM Phineas Icenbice, W6BF, reported that ARES members from his section assisted volunteers in the Orange and San Diego Sections. Los Angeles SEC Dennis Smith, KA6GSE, said ARES volunteers from the section also helped at Red Cross shelters in Los Angeles.

Smoke from wildfires burning out of control in Ventura County choked the Santa Barbara area Sunday as high temperatures, windy conditions, and steep terrain plagued containment efforts. While there were no fires in Santa Barbara County, many firefighters were sent to other fire scenes to help out. In order to help keep a watchful eye in the county, the fire department asked the Amateur Radio Emergency Service group to patrol roads in areas of severe fire danger.

County emergency management officials were quick to point out that although smoke was thick and a deterrent for moving around, it was not an emergency to them. The Santa Barbara County Fire Department was on a similar level of alert over the past 4th of July holiday. This type of fire-fighting resource mobilization is not particularly rare during the fire season and other periods of hot, dry weather.

In San Diego County, Lowell Grimaud of the county's Fire Safe Council cited the decision to select Palomar Observatory as a staging area and shelter and planned for the use of local ham radio operators as an information source. "Thanks to the Palomar Amateur Radio Club, we had around-the-clock information during the fires," Grimaud said.

Special Unit

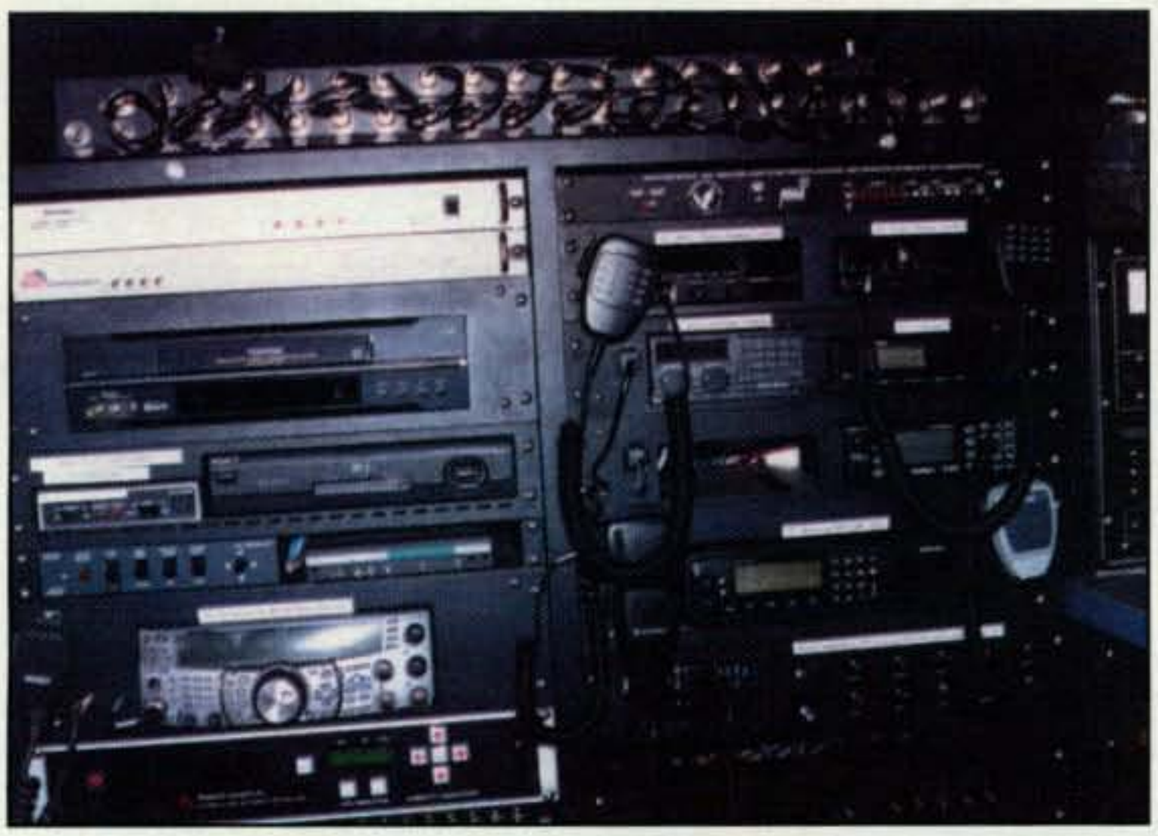
About 20 or so properly trained Amateur Radio Emergency Service members were on the front lines with the firefighters and provided backup communications for the California Department of Forestry and the US Forest Service. "These ARES members have gone through wildland fire training," San Diego SM Tiburski explained. "They go with the firefighters into the field, where they relay information back to the CDF command center." The ARES volunteers were equipped with full fire-protective equipment and tents.

Special Links/Skills

Besides VHF/UHF FM communications among the various shelters and command posts, amateur radio operators were able to provide key services with-

The California wildfires were so big that they could be seen from the International Space Station. This was one of several fire photos taken by the Expedition 7 crew. (NASA photo)

California hams helped provide communications for a variety of emergency response agencies, including the American Red Cross. Here a local ham talks with Red Cross National Communications Officer Frank Glorioso, N2YSA (in the light blue shirt) outside a Red Cross emergency communications van. (WB6NOA photo)



Interior view of the Red Cross communications response vehicle. Gear includes HF, VHF, and UHF transceivers usable as needed both on and off the ham bands. (WB6NOA photo)

in the fire zones. While many people across the country watched live television coverage of the fires from TV news crews in the air and on the ground, many fire command posts did not have access to a television. Here hams were able to use slow-scan television from nearby hilltops to let the fire commanders see their fire line. In addition, they were able to provide e-mail-type service via PACTOR and other digital modes. The hams were versatile in providing the needed communication links even though there was a major solar flare and several repeaters were knocked off the air because of a lack of power (the lengthy shutdown of commercial power ran down many battery backups) or because they literally went up in smoke.

Trained Communicators

Sometimes being a trained communicator means more than knowing how to push the microphone button. *CQ* Contributing Editor Gordon West, WB6NOA, told amateur radio *Newsline* that amateurs became known as the e-mail and cell-phone guys. They knew how to get e-mail out of the shelter, charge a cell phone when the charger was missing, fix the circuit breaker when several coffee urns were plugged in, and adjust the lights so more of the evacuees could get some sleep. It was clear the trained communicator, that "ham guy," was a valuable resource.

For more on amateur radio's role in the California fires last fall, see WB6NOA's companion article elsewhere in this issue.

An Educational Public Service

In November I participated in the NBC10 Technology & Lifestyles Expo in suburban Philadelphia. In speaking to representatives of some of the educational groups at the show, which was attended by over 20,000 people, we came up with a way of introducing kids to basic electronics and ham radio. Maybe the idea isn't that new, but the local enthusiasm generated was incredible.

The instructors' goal was to allow the kids to build some type of electronic device each week and be able to take home the completed kit. This could be a buzzer, a blinking button, a small broadcast radio. We discussed a simple code oscillator and other projects. The instructors thought that ham radio would be a second step in terms of the students' age and ability. The group is investigating funding for the projects. Is a group or organization running a similar project in your neighborhood? If so, drop us a note.

With Thanks . . .

Each month we report on another part of amateur radio serving in the public interest. This month we want to acknowledge input from the ARRL and *Amateur Radio Newsline.*

Do you have a story to tell? Drop us a note as to how your group is providing a service in the public interest.

73, Bob, WA3PZO

Goals for 2004

We all make New Year's Resolutions. Maybe some are broken a few days into the new year. Maybe others are forgotten about by the end of January. As we move forward into the new year, has your ARES group, RACES group, or club made some resolutions or set some goals for 2004? Last January I presented a list of ideas. Did you follow the list? Make your own? Or put the magazine on the table? Here's a list that may be beneficial.

1. Take at least the ARRL Emergency Communications Level 1 class.
2. Take other ARRL classes or a selection of FEMA, Red Cross, or Skywarn classes during the year.
3. Make sure your group is identified to the general public by using vests, hats, badges, etc.
4. Make sure your emergency plans, rosters, and other documentation are up to date
5. Put together your go-kit, if you haven't already.
6. Have you experimented with a NVIS antenna for HF? Do you know how to assemble one?
7. Be sure you know how to operate the equipment at your club station or EOC.
8. Become familiar (if you're not) with a variety of amateur radio modes including ATV, SSTV, PSK31, IRLP, Echolink, etc.
9. Make sure your group has an effective public-relations/news-media relations program to publicize your group's activities.
10. If you participated in a drill last year, be sure you have taken steps to make improvements should you be called at a moment's notice.

MFJ Sound Card-to-Rig Interface

Use sound card and rig for all digital modes!

Plug and Play -- includes software, all cables, AC power supply . . . RFI-proof . . . Isolation transformers -- no hum, noise, distortion . . . Operate PSK-31, packet, APRS, AMTOR, RTTY, SSTV, CW, Meteor Scatter, others . . . Use as Voice Keyer, CW Contest Memory Keyer . . . Monitor On/Off Switch . . .

MFJ1275/M/T
$99.95

Plug this new MFJ-1275/M/T sound card interface between your transceiver and computer and enjoy operating all digital modes.

Everything you need is included -- software, audio cables, RS-232 serial cable and AC power supply.

Provides fully automatic operation with audio and push-to-talk control. It matches sound card audio, eliminates ground loops and provides microphone override.

Models available for all transceivers with 8-pin round, 8-pin modular (RJ-45) or 4-pin round microphone plugs.

Operate PSK-31, packet, APRS, AMTOR, RTTY, SSTV, CW, high speed CW Meteor Scatter and many others. Also use as Contest Voice Keyer and CW Contest Memory Keyer.

Digital Modes or Normal Operation

Select the ON digital mode -- all connections are made between your rig and computer for instant digital operation.

Select BYPASS normal mode -- your transceiver and computer connections are restored for their normal operation.

Audio Isolation Transformers

Audio isolation transformers and relay eliminate ground loops, audio hum, noise and distortion.

RFI-Proof

Extensive RF suppression and line isolation eliminates RF feedback problems.

Automatic Microphone Override

Transmit mic audio at any time by pressing PTT to override digital modes -- great for SSTV and Contest Voice Keyer.

More Impressive Features

Serial port -- lets computer control radio to override/interrupt digital transmissions.

VOX Control -- lets you use VOX control when not using computer serial port control.

Level Controls -- for transmitter drive and for receiver-to-sound card drive level. No need to adjust microphone gain or sound card level when you change modes.

Stereo or Mono Audio Input -- A front panel switch selects left, right, or both sound card audio output channels to accommodate various programs.

Off-the-air recording -- for replaying or for use with spectrum analyzer programs.

Monitor on/off switch lets you have a normal QSO and receive SSTV pictures at the same time in the *"monitor on"* position. This is great for modes like SSTV and Voice Keyer operation that may require listening to receive audio during operation.

Rugged Construction -- All aluminum cabinet and surface-mount construction gives you years of trouble-free service.

Use any Transceiver

Internal jumpers program microphone wiring for any brand or model radio -- no soldering required. Order **MFJ-1275** for 8-pin *round* mic plug. Order **MFJ-1275M** for 8-pin *modular* mic (RJ45) plug.

NEW! Order MFJ-1275T, for *4-pin round* mic plug, for Ten-Tec and others.

Plug and Play!

Everything you need is included --audio and RS-232 cables, AC power supply and a CD with a collection of the most popular amateur radio software to operate PSK-31, RTTY, SSTV, PACKET, AMTOR, CW, HSCW Meteor Scatter, Contest Voice Keying and other modes. Use 12 VDC or 110 VAC.

No Matter What™ Warranty

Protected by MFJ's famous *No Matter What*™ one year limited warranty. MFJ will repair or replace (at our option) your MFJ-1275/M/T *no matter what* for one full year.

Try it for 30 Days

Order from MFJ and try it -- no obligation. If not delighted, return it within 30 days for refund less shipping.

New! Super Sound Card Interface

MFJ-1279/M/T
$129.95

This *super* sound card interface has all of the features of the MFJ-1275 ***plus . . .***

- **Auxiliary Input Jack:** Lets you switch your sound card from MFJ-1279 so you can use your sound card for something else. No more plugging/unplugging!
- **Direct CW/FSK Keying Jack:** Allows direct CW or FSK keying operation.
- **Headphone Jack:** Use your stereo headphones so you won't disturb your XYL (also turns off external speaker).
- **Footswitch:** Use footswitch or other for PTT (push-to-talk) when not using VOX.

Plug and Play! Includes software CD, RS-232 and audio cables, AC power supply.

Order MFJ-1279 for 8-pin round mic, MFJ-1279M for 8-pin modular (RJ-45) mic, MFJ-1279T for 4-pin round mic.

Add "X" suffix for 220VAC.

New! Basic Digital Interface

Plug and Play! Has sound card, radio, speaker, RS-232 jacks. Includes: software CD and RS-232, audio, mic cables. No external power needed. Has no mic jack or mic switch. **Order** MFJ-1273B for 8 pin round mic, MFJ-1273BM for 8-pin modular (RJ-45) mic, MFJ-1273BT for 4-pin round mic.

MFJ-1273B
$59.95

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What You've Told Us...

Our September survey asked about your reactions to the decisions made at the 2003 World Radiocommunication Conference (WRC-03), held last summer in Geneva. We discussed some of your responses in November's "Zero Bias" editorial. Here's a wrap-up of all the results:

Our first question asked whether you agreed with the decision to leave the question of code tests up to each country, and 78% of you said yes, with 22% disagreeing. We had an even split on what the FCC should do, between making some changes and leaving things as they are; with 25% saying the FCC should eliminate all code tests, 21% saying eliminate only the General test, and 4% suggesting replacing the current test with a code recognition test. The remaining 50% said make no changes.

Regarding HF privileges for current Technicians, one-third said leave things as they are; 25% favor merging the current Novice and Technician licenses and combining the privileges of both; 15% agree with expanding Tech and Novice privileges to include HF subbands offering voice, CW, and data at limited power levels; 8% say give Techs all current Novice privileges; and 5% each call for Techs to be given only Novice 10-meter voice privileges or only Novice HF code privileges.

Forty-six percent of you feel the FCC should lift current restrictions on international third-party messages, while 30% favor no change and 20% registered no opinion. Two-thirds of you say the FCC should *not* ask Congress to change the reciprocal licensing rules for foreign hams operating in the US, while 18% say it should, but as a low priority, 5% say yes as a high priority, and 11% have no opinion.

Finally, on the question of whether the compromise reached on 40 meters represented a worthwhile investment of ARRL and IARU staff time and member dues, 78% said yes, 9% said no, and 13% had no opinion.

This month's free subscription winner is Robert Gregory, KD7H, of Kirkland, WA.

Reader Survey
January 2004

We'd like to know more about you—about who you are, where you live, what kind(s) of work you do, and of course, what kinds of amateur radio activities you enjoy. Why? To help us serve you better.

Each time we run one of these surveys, we'll ask a few different questions and ask you to indicate your answers by circling numbers on the Survey Card and returning it to us. As a bit of an incentive, we'll pick one respondent each month and give that person a complimentary one-year subscription (or subscription extension) to *CQ*.

This month we'd like to get your views on QSLing.

Please indicate...	**Circle Response Card #**
1 ... which statement most closely reflects your QSLing habits:	
I QSL 100%—all contacts	29
I respond 100% to all QSL cards I receive	31
I send QSLs only to DX stations	31
I send QSLs only to stations whose cards I need, or who have QSLed me	32
I respond to QSL requests only if they are accompanied by an SASE or IRCs	33
I respond to QSL requests only if they are accompanied by "green stamps" (US dollars)	34
I do not QSL at all	35
2 ... your primary reason for exchanging/collecting QSL cards:	
Credit toward operating awards	36
To have a record for myself of the people I've contacted	37
To impress visitors to my ham shack	38
Other	39
None (I do not exchange/collect QSL cards)	40
3. ... what you think the main reason is (pick only one) that fewer hams seem to exchange QSL cards:	
Cost of postage	41
Cost of printing	42
Too little time	43
Too little interest	44
Talking only to people they already know	45
Operate only on repeaters, where nobody QSLs	46
Other	47
4 ... whether you participate in the following electronic QSL/award credit programs:	
ARRL Logbook of the World	48
eQSL.cc	49
Single-station online QSLing	50
Other electronic QSL/logbook exchange	51
None	52
5. ... whether you feel electronic/online QSLing is a reasonable alternative to the high cost of traditional QSLing:	
Yes	53
No	54
Unsure	55
Don't care	56
6. ... whether you use the ARRL Incoming QSL Bureau (or equivalent outside the US):	
Yes	57
No	58
7. ... whether you use the ARRL Outgoing QSL Bureau (or equivalent outside the US):	
Yes	59
No	60

Thank you for your responses. We'll be back with more questions next month.

Extreme Performance Action Value

Take to the air and take to the road. Be ready for action when the bands are red-hot. With Alinco mobile transceivers, you get superb audio quality and low noise. Whether you're a county-hunter, contester, DX chaser or just looking for a pleasant QSO with a new contact, Alinco delivers extreme performance in value-packed mobile radios.

For Demanding Amateurs Like You!

High flying HF

DX-70TH

HF + 6M Mobile/Base Transceiver

Put a proven performer to work for you! 100 watts output and a "no nonsense" design that's easy to use at home or on the go. "All mode" performance on HF bands and 6m. Removable, remote mount control head, big display, wide choice of operator parameters and full QSK CW operation. Getting on HF has never been so easy, and if you haven't tried 6 meters, you're missing a lot of fun. Why wait? With a DX-70 you're ready for action!

Daring dual bands

DR620T VHF/UHF

Mobile/Base FM Transceiver with Wide Band Receive

Dare to be different with this "new breed" mobile. VHF and UHF operations are a snap but there's a lot more. Listen to wide band broadcast FM signals, AM Airband, monitor weather and other public safety frequencies and keep track of it all with the large alphanumeric display that lets you change display colors! You can add the optional internal TNC for packet or APRS® operations or be among the first to enjoy digital voice communications with the optional digital module. Removable remote-mount head also allows you to invert the transceiver for the best speaker placement, illuminated mic, internal duplexer, CTCSS encode+decode, DCS and more!

DR-605TQ VHF+UHF

Dual Band Mobile FM Transceiver

Who said dual-banders had to be expensive? Dual band, dual watch and crossband repeat at a price that's amazingly low. CTCSS encode+decode, 50 memories per band, internal duplexer, large controls. Massive heatsink for quiet, fan-free operation. Reviewers loved this radio; you will too!

Sizzling single bands

DR-135T MkII

VHF FM Mobile/Base Transceiver

This rugged 2 meter mobile is ready for the "real world" of heavy use in demanding conditions. Whether you're chasing storms or chatting through the commute, you'll appreciate the large alphanumeric display, the big illuminated mic and the well designed functions that are easy to use. 100 memories, AM Airband receive, high stability TCXO, ignition key on/off feature, theft alarm, direct frequency input & optional internal TNC or optional internal digital voice module and more!

DR-235T 222 MHz

FM Mobile/Base Transceiver

If you're not yet on 222 MHz, you're not using all your privileges. From voice contacts to remote control of repeaters and more, now you can get on 222 MHz at a reasonable price. Enjoy 100 memories, alphanumeric channel labels, ignition key on/off operation, large illuminated mic, autodial memories, CTCSS encode+decode, DCS, wide/narrow FM operation, optional internal TNC and a host of features.

DR-435T MkII UHF

FM Mobile/Base Transceiver

There are many reasons you might want a monoband 440 MHz transceiver and the DR-435 is ready for whatever job you have in mind. From working repeaters, UHF satellites, remote command and control, data or simplex voice, and more; you'll find the 100 memories, large alphanumeric display, mic with illuminated keys all well designed to suit your purposes. Packed with features like CTCSS encode+decode, DCS, tone bursts, theft alarm, alphanumeric display, autodial memories, high stability TCXO and more.

www.ALINCO.com

Imagine a radio that never gets outdated. . . . That's exactly what Ten-Tec's engineers imagined when they designed the new Orion transceiver. Noted DXer ON4UN has our review.

CQ Reviews:

Ten-Tec Orion HF Transceiver

BY JOHN DEVOLDERE,* ON4UN

I first saw a prototype of Ten-Tec's Orion transceiver at HamCom in Dallas back in June of 2002. I liked its looks, and when I saw the specs, I liked the radio even better. I picked up my new Orion a year later, in mid-June 2003.[1] Now, after a few months of operating it and putting it through its paces, my first impression has not changed: clean layout, knobs and controls positioned just where they should be, and good-size tuning knobs with a good feel. In one phrase, "It all fits my hands and fingers." Plus, it does not have the look of mass consumer electronic gadgets. It's sober and very functional, which is what I like.

Perhaps the Orion's greatest innovation is the concept of a top-notch radio with firmware updates available via the internet. Taking advantage of today's technology makes it possible for Ten-Tec to provide continuous improvements at no charge. It also made it possible for Ten-Tec to release a product in early 2003 that maybe was not 100% complete, but at the same time avoided making us eager contesters and DXers wait another six months for the radio. It also is undoubtedly the best way for Ten-Tec to get live feedback from the field.

I decided to get one of the earlier Orions and become part of this improvement process, adding my two cents worth. I was happy to be an informal Beta tester for firmware updates, and I spent many hours trying to make things go wrong. At the end the software became so thorough that I felt miserable trying to make things go wrong! I've heard of a few people who do not like the concept of firmware updates; they obviously do not yet understand the power of this advanced concept. My reaction: Let the upgrades come. I know each one is a further improvement to the product.

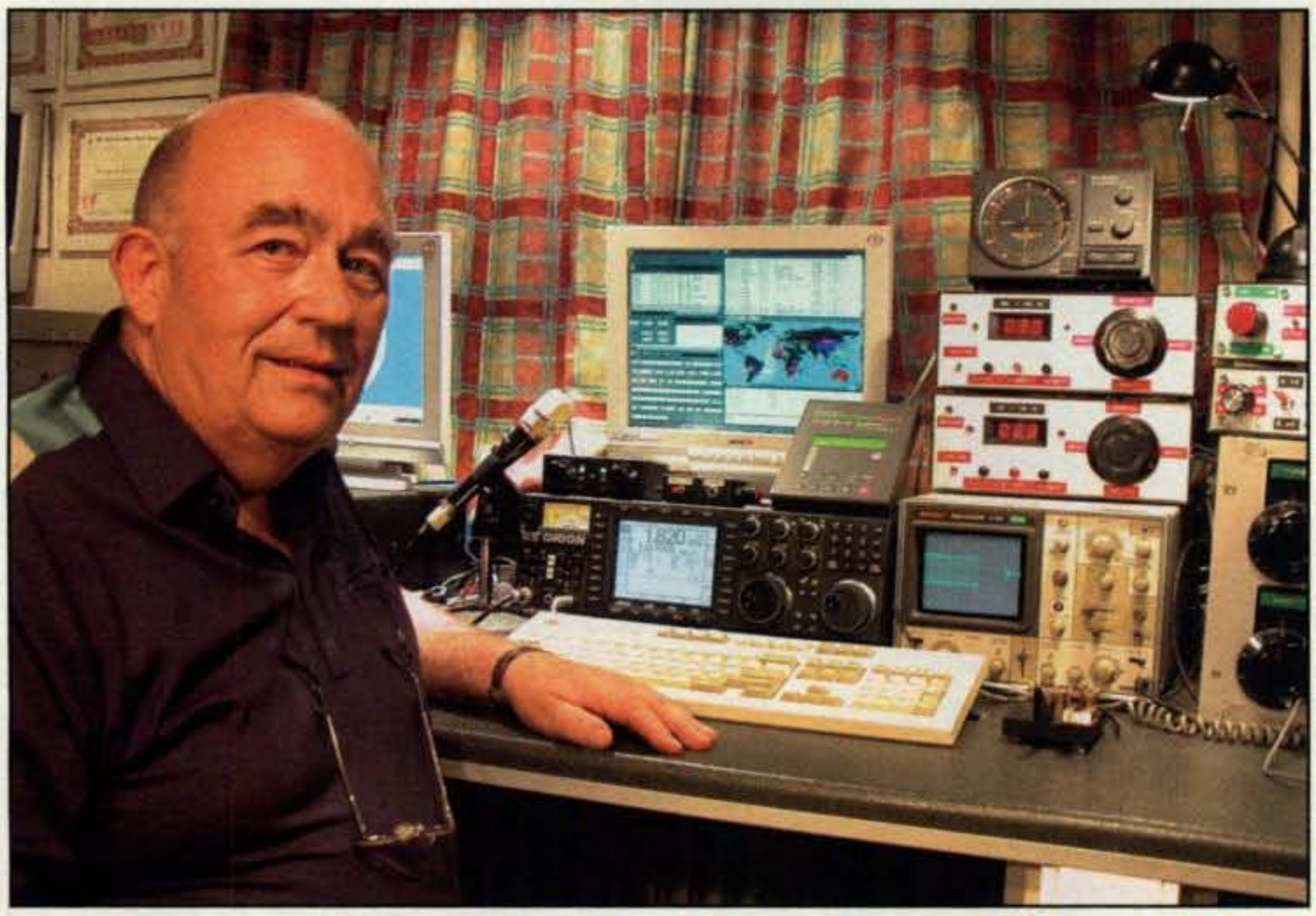
Contacts with Ten-Tec have been excellent. Jack (K4JU), Doug (KF6DX), Gary (AC4DL), and Scott (W4PA) were all very responsive and all ears for comments, suggestions and even complaints! *(Editor's note: You don't have to be ON4UN to get personal attention from Ten-Tec's top brass. According to Amateur Radio Products Manager Scott Robbins, W4PA, both company President Jack Burchfield, K4JU, and Vice President Gary Barbour, AC4DL, have been "in the trenches" with Orion owners, listening to their comments and suggestions.)* Response to my suggestions was swift, and in a matter of weeks a great number of the suggestions I made were implemented. For example, the first few firmware releases had some ergonomic shortcomings, mainly in the radio-control software. When revised software that took care of these problems was released, I did not have to return my Orion for improvements, or be stuck with an "outdated" version. I just got on the internet and downloaded the upgrades, some of which were the result of my suggestions. This way the final Orion has a little bit of me in it!

Above: Front view of the Ten-Tec Orion. Note the dual VFO controls at the lower right and the LCD screen which provides frequency readout and much more. (Ten-Tec photo)

A Semi-Steep Learning Curve

In the beginning, you will probably feel a little lost in the programming screens, although they are laid out in a very logical way, are easy to understand, and show real words instead of cryptic code

**215 Poelstraat, Merelbeke, B9820 Belgium*
e-mail: <john.devoldere@pandora.be>



The author at his station in Belgium, which now features the Ten-Tec Orion as his main transceiver.

that you need to decipher! However, there are so many things you can adjust! The original manual was not great (to be polite), but that's been taken care of now, and since September 22nd, anyone may download the latest manual from the Ten-Tec website (<http://www.tentec.com>). The manual covers just about every aspect of the radio. Of course, the radio is so flexible that there are literally hundreds of ways you can set it up to do exactly what you want it to do. I assume that lots of these configurations will be made available by the users on the Ten-Tec reflector. Rest assured, though, that any overwhelmed feelings will go away after a few weeks, and you will soon feel like a king on his throne being able to control just about all the parameters of this wonderful radio.

A Substantially Different Radio

As indicated in the manual, the Orion is indeed a substantially different radio from what we have known so far. The first thing that attracted me was the radio's excellent dynamic range (also at very close signal spacing), which should be a real asset for low-band DXing and contesting. Unlike some other manufacturers, Ten-Tec implemented the DXers' and contesters' wishes that were published in the third edition of my *Low Band DXing* book.[2]

After I picked up my unit in the U.S. in early June, I drove to visit Tom Rauch, W8JI, in Georgia, and we tested the dynamic range and sensitivity (MDS) in his well-equipped lab. What we found was within measurement error of what Ten-Tec publishes—in other words, excellent! We also had a really close look at the transmitted CW waveform, and it is excellent as well. Now I can be on CW without having to fear someone calling me with a "you have key clicks" comment.

I have played with the Orion in a few contests, where it gets really crowded, especially on 40 meters. Amazing: In between signals, the band sounds quiet. No blurps, beeps, or other alien-sounding weak signals that sometimes sound like CW using a different code. Nothing like that. What you hear is what's there! The narrow front-end roofing filters really do their job. My radio has all of them.

The AGC Issue

The use of programmable setting for the AGC (Automatic Gain Control) requires a good understanding of how the radio works. Now Ten-Tec could have left out the programmable settings and provided us with just three or four "fixed" standard settings, but after discussing this at great length, Ten-Tec's management decided to make all settings programmable—a sign that Ten-Tec trusts that its customers will take the time to understand the radio and use its capabilities to the fullest extent!

I have read on various reflectors that in the beginning some hams apparently started experimenting with the AGC without knowing what they were doing, and they were disappointed. They fooled themselves, I am afraid. I must admit it's easy to be fooled, as the lowest setting of the AGC threshold, as a rule, does not give you the best sensitivity! I found that approximately 2.0–3.0 µV is a good starting point for experimenting. It's not because you hear more noise at 0.4 µV, but you have a better signal-to-noise (S/N) ratio! The latest version of the Orion manual has a section explaining how to properly set the AGC variables (also available on the Ten-Tec website, <http://www.tentec.com>). Make sure you study this and fully understand it before you start to play around with changing the three variables involved.

On the same issue of sensitivity, I have done hundreds of A/B tests between my old radio (the brand most popular with low-band DXers and contesters) and the Orion (at the same time, not with one or two weeks in between!), and I have never found the Orion to not hear a weak CW signal that I could hear on the "old radio." To the contrary! It heard signals I couldn't copy on the other radio.

Bandwidth

One of the great assets of the Orion is its continuously variable IF bandwidth. If the band is not too crowded or if there is not too much QRN, you may want to use an 800- or 1000-Hz setting on CW; otherwise you can crank it down all the way to 250 or even 150 Hz. On SSB it is a joy to listen to good audio with 3- or 4-kHz bandwidth. It sounds much like AM. With

Nominal BW (Hz)	–6 dB BW (Hz)	–60 dB BW (Hz)	Shape factor
100	150	440	2.9:1
250	240	470	1.95:1
500	510	820	1.6:1
1000	980	1160	1.2:1
1600	1580	1880	1.2:1
2400	2300	2650	1.151
3000	2930	3270	1.12:1
4000	3960	4280	1.08:1

Table I– The measured bandwidths and resulting shape factors at various bandwidth settings.

the PBT (passband tuning), you can really adjust everything until it sounds just right—flexible, smooth, and easy.

The great thing is that there is not a trace of ringing, even at 150-Hz bandwidth. (The narrowest bandwidth setting reads out on the display as 100 Hz, even though it's really 150. Ten-Tec has informed me that they will change the display in a future upgrade.) Noise content in such a small bandwidth becomes very low, but you must be tuned right on the spot!

Measured bandwidths and resulting shape factors at various settings are shown in Table I. Although the shape factor at narrow bandwidths may not look spectacular, I have found this set-up, where CW ringing is totally absent, to be the smoothest and most efficient way of obtaining the most suitable BW for every individual situation.

Rear view of the Orion. Note the dual output connectors, which allow users to not only switch antennas but also certain operating parameters with the push of a button on the front panel. (Ten-Tec photo)

On the Air

CW: On CW transmit the Orion is a real joy to use. It has a beautiful waveform and good keying characteristics, and the continuously variable bandwidth down to 150 Hz makes it a real delight. The built-in keyer also works great, and the legendary Ten-Tec QSK (break-in keying) works as well as ever.

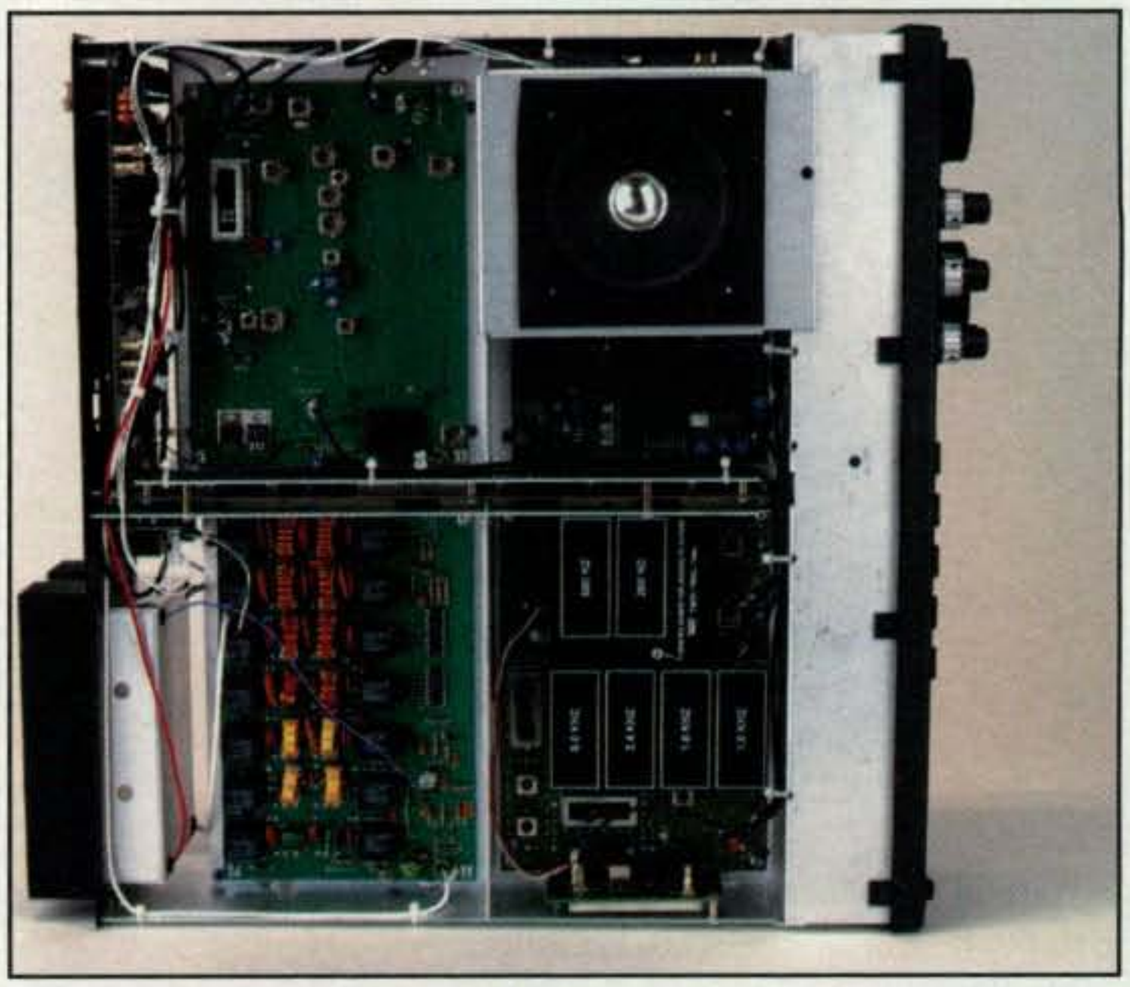
W8JI found out, and I can confirm this, that for weak-signal CW reception, especially in the presence of noise (QRN), it seems best to manually select the roofing filter and set it at 250 Hz, and then set the DSP bandwidth to approximately 500–800 Hz.

SSB: On SSB I have received nothing but excellent audio reports, even from the "experts" on 14178 kHz! The fact that you can adjust almost anything in software makes it possible to obtain good audio with a very wide range of microphones. There is digital audio enhancement (low and high), and you can adjust the "transmit filter" bandwidth from 1000 Hz (yes!) to 3900 Hz, set the low-end roll-off (between 50 and 300 Hz), etc. If you have it set all wrong, the audio can indeed sound bad, but once you find the proper settings success is guaranteed! In the Orion manual Ten-Tec has published a list of settings for the most common microphones, but I think it needs to add settings for the Heil HC-4 and HC-5 elements, as well as the Heil Pro Goldline microphone.

FSK & PSK: The Orion has true FSK, or frequency shift keying, capabilities (no need to mess with audio tones), and in FSK the tones on reception are automatically set for the high tones. Copy of RTTY is flawless, with bandwidth down to 150 Hz! If you are a PSK (phase-shift keying) fan, you can look at 5 kHz of PSK-31 signals, or narrow the bandwidth down to 150 Hz, and have just one signal going to your sound card. Ideal! In addition, if you narrow the BW down to 150 Hz, you will also *hear* the PSK signal. I've heard people say that in PSK we can work signals we cannot hear at all. This is not quite true, because the sound card uses very narrow BW, and if we use the Orion's "similar" BW we can definitely "hear" the PSK signals.

Speaking of Hearing...

The audio from the (large!) built-in speaker is much better than from all other transceivers I have had, and there is plenty of volume. There is also plenty of audio output on the headphones jack, even if you use not-so-sensitive headphones.



The inside of the Orion loos practically empty, but don't worry, as everything is there . . . even, says ON4UN, space for a sandwich and shoes. (Ten-Tec photo)

The Orion features a second receiver which sounds identical to the main one (unlike another two-receiver transceiver I had in which one sounded like the "good" radio and the other like the "cheaper" one). The second receiver in the Orion uses exactly the same DSP IF, with the only differences between it and the main receiver being that it does *not* have the narrow roofing filters and the higher first IF makes it possible to be a general-coverage receiver.

Diversity Reception?

While the Ten-Tec manual suggests that diversity reception is possible with the Orion, it really is not what I call true diversity reception. To me, true diversity reception is only possible if both receivers are phase locked and the phase delay through both receivers is nearly identical. This is not the case in the Orion, which permits *spatial* diversity reception. If you listen to the same signal through both receivers using the same VFO, you will hear the warble (flutter, rapid fading) caused by the phase difference. This warble is always there and in my eyes makes real diversity reception impossible. Even so, under certain circumstances you may find a bene-

fit in using different antennas on the two receivers on (nearly) the same frequency. While Ten-Tec doesn't claim that both receivers are phase locked, it thinks there are advantages in certain cases—such as when using a vertical and horizontal antenna or two horizontal antennas separated by at least a wavelength— to the Orion using both receivers into a single audio amplifier. The company claims that some of its customers have found this form of spatial diversity with non-phase-locked receivers useful.

Other Receive Features

The noise reduction works extremely well, a dramatic change from what I had in my previous radio. Another nice feature is that there are two notch filters—a DSP automatic notch for carriers on SSB, and a hand-adjusted notch (frequency and bandwidth are adjustable) for use in CW! Yes, a notch sometimes can also be very handy on CW.

Finally, the Panoramic Stereo receive feature is great fun. When using stereo headphones, signals move from one side through center to the other side in your phones as you tune across the band. This helps reduce fatigue when you are working long hours on CW. It should also be useful for quickly working multiple callers in a pile-up.

Two Transmitter Outputs

With two transmitter outputs you can almost configure the Orion for a two-radio contest station, with each output feeding a different amplifier. This does *not* mean the Orion has two transmitters; you transmit to *either* output A or output B. However, this is more than two antenna jacks. The Orion also has two band-data output connectors, one corresponding to each RF output connector, and this makes it possible to steer automatic antenna and amplifier switching to either output. Two TX-EN lines (one for each output) can be used to inhibit the transmitter in full QSK or when using a complex antenna switching system in which you want to prevent transmitting on the wrong antenna or while antennas are being switched.

Firmware Upgrades

Upgrading firmware takes less than five minutes. New upgrades are announced on and may be downloaded from the <http://www.rfsquared.com/> website. You start by downloading the Ten-Tec Flash Update utility program, update.exe, which you put in your Orion directory on the PC controlling the Orion. The

serial-port interface from the Orion to your PC will not only take care of the communication with your contesting or logging program, it will also talk to the flash update program. When a new firmware update is available, download it and save it in the same directory where you saved update.exe. Follow the instructions in the manual, and in a few minutes you have a new, latest model Orion! It's a great feeling!

"Under the Hood"

When you open the Orion's case, your first reaction will likely be, "Is that all?" It indeed looks like an almost empty box. No inch-thick bundles of wires, just a few (mostly coaxial) cables. The rest of the connecting is done by back-plane technology, where all the boards plug in. I always jokingly say that I can pack my sandwiches and my shoes inside the Orion, and it would still accommodate more. Another nice thing is its weight, just 20 lbs (9 kg). A 25-A 13.7-V power supply is required, as no PS is built in.

Additional Suggestions

About the only negative about this radio I can identify is that the voice memory keyer is much too slow in saving to memory (not useful at all in a contest). I also have a few other suggestions that may add to the radio's flexibility:

First, I would like to see the possibility of having different external T/R delays for SSB and CW. Now you can set one delay for output A (going to amplifier A) and another one for output B (going to amplifier B). Having separately adjustable delays for SSB and CW should (I think) be only a minor software change.

Second, it would be nice if the user could, from the PC, upload his (or her) own frequency/mode/bandwidth definitions to the Orion (a one-time task, without having to control the radio from a PC on a permanent basis). The operator could then just enter a frequency from the Orion keyboard and the radio would automatically make a corresponding standard bandwidth, in accordance with the uploaded frequency/mode/bandwidth chart. I understand this cannot be a standard thing, as band-planning differs in the various IARU regions, and even from operator to operator. Therefore, allowing customizable definitions would be ideal.

Even as I write the final lines of this review, I think I have found one or two very minor control software glitches, which I know Ten-Tec will correct in one of its next firmware upgrades. It's great not having to worry about such issues. The people are there at Ten-Tec to solve them, and the system is in place to provide every customer with the solution almost in real time. This is what I always dreamed about!

Of course, not every customer's every wish can be at the top of Ten-Tec's priority list for changes. However, I know they do listen to their customers and try to learn from them to make a better product. Wise strategy! By the time you read this, some of these "wishes" (mine and those of others) are very likely to have come true. Eminent Top-band DXer Bill Tippett, W4ZV, worded it very well on the internet:

"KUDOS to Ten-Tec for LISTENING to actual users! Japanese manufacturers must surely be watching the success Elecraft and Ten-Tec are having by incorporating real-time user feedback into their products...."

Conclusion

I have always dreamed of the ideal low-band DXing and contesting machine, and I must say that Ten-Tec has come very close. Congratulations to Ten-Tec for a wonderful product and for excellent service and customer care. The way Ten-Tec tries to satisfy the wishes of its customers is more than exemplary. The Orion transceiver clearly scores very near maximum on whatever scale you can imagine. My order for a second Orion for my two-radio contesting station is out, and I can't wait to get it! I will be proud to have a station with what seems to me to be the best radios on the market at this time. Don't forget, too, that the sunspot cycle is on its way down. As a result, the low bands will become more and more appealing. The Orion may well make the difference.

The Orion may be ordered directly from Ten-Tec. Base price is $3300; $3599 with a built-in antenna tuner. To order or for more information, contact Ten-Tec, 1185 Dolly Parton Pkwy., Sevierville, TN 37862 (phone: 865-453-7172; fax: 865-428-4483; on the web: <www.tentec.com>).

Notes

1. In order to get my radio last spring, I had to buy it and pick it up in the U.S., as it did not yet have "CE" certification, which is necessary for products to be sold in European Community (EC) countries. At press time, Ten-Tec was expecting to receive final CE approval in time for European hams to include the Orion on their Christmas shopping lists.

2. Devoldere, John, *ON4UN's Low-Band DXing,* Third Edition, ARRL, 1999. ■

Announcing:

2004 Nominations Open for The *CQ* Amateur Radio Hall of Fame

Amateur radio operators have been responsible for many advances in communications technology and entire industries have been built on the foundation of amateur radio experimentation and activity. In an effort to recognize outstanding amateurs and their achievements, and help the public appreciate the far-reaching and long-standing value of amateur radio in our society, we established the *CQ* Amateur Radio Hall of Fame. Nominations for the 2004 "class" are now open. Members of the 2003 "class" were announced last May and appeared in the July issue of *CQ*.

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

The Envelope, Please...

Between now and March 31, 2004 we will be accepting nominations for the 2004 "class" of the Amateur Radio Hall of Fame. Nominations received after that date will be considered for future selection. You may either use the form on the following page or on our website, or simply write us a letter stating your candidate's name, where to contact him/her if still living, for which category you are nominating him/her, and a brief one or two paragraph description of this person's accomplishments. Please include your name and contact information as well. E-mail to <hall-of-fame@cq-amateur-radio.com> or mail to *CQ* Amateur Radio Hall of Fame, 25 Newbridge Rd., Hicksville, NY 11801. If you feel someone has earned this recognition, please submit a nomination. Please *don't* assume that someone else will nominate the person you may have in mind.

We'll be making up our own candidate list at the same time and will announce this year's selections at the Dayton Hamvention in May 2004. Please help us recognize these "ham radio heroes" whose contributions have helped shape our hobby, our nation, or our world.

(Official nomination form is on the next page.)

CQ DX and Contest Halls of Fame

Nominations are also open for the *CQ* DX Hall of Fame and the *CQ* Contest Hall of Fame, which recognize those amateurs who have made major contributions to DXing and contesting, respectively. The activities and accomplishments that qualify one for membership in these elite groups involve considerable personal sacrifice and can usually be described by the phrase "above and beyond the call of duty."

Nominations for the Contest and DX Halls of Fame are made by contesting or DX clubs or national organizations, and must be submitted by March 1 of each year to be considered. A maximum of two (2) people may be inducted into each hall of fame each year. Nominations for the CQ Contest and DX Halls of Fame should be directed to Bob Cox, K3EST, c/o CQ Communications, 25 Newbridge Road, Hicksville, NY 11801; or via e-mail to <k3est@cqww.com>.

On the Cover

"The fire seemed like it was all over, not just off in one direction," recalled photographer and writer Ron Eggers, KA6RWK, of Costa Mesa, California, as he talked with *CQ* about photographing the wildfires that devastated southern California last fall. His photos are in our two articles in this issue on ham radio response to those fires (WB6NOA's "Southern California Firestorms" on p. 30 and WA3PZO's "Public Service" column on p. 36), as well as our cover.

"I spent two days shooting (photos) at the fires," Eggers continued, "one day at the command center and one day on the fire lines" in the Santa Barbara Mountains close to Lake Arrowhead, between Los Angeles and Big Bear. In the photo on the cover, Ron said a firefighting crew was on a road that served as a firebreak, waiting for the flames to come closer. Egger explained that "most of the fire was deep in wooded areas and firefighters couldn't get in. They had to wait for the fire to come to a break (such as a road) so they could fight it or light backfires," which are small, controlled fires set to burn away grass and brush and deprive the larger fire of fuel.

"The scale of the devastation surprised me," concluded Eggers, who noted that his work for a news feature service often leads him to disaster areas and whose ham radio activities are focused entirely on public service and emergency communications. "Block after block of burned houses, cars, firefighters still going after hot spots even after the fire was supposedly out. . . . The enormity of scale was unusual, as was the enormity of the response."

Also on our cover this month is a SOHO satellite photo of the largest solar flare ever recorded, which occurred on November 4 and is discussed in both our VHF (p. 86) and Propagation (p. 102) columns. No, the sun does not look green from out in space. It's an image shot at X-ray frequencies and intentionally colored green by NASA to differentiate it from ones taken at visual frequencies. (Fire photo © Ron Eggers, KA6RWK; solar flare photo courtesy NASA)

CQ Amateur Radio Hall of Fame Nomination Form

The purpose of the CQ Amateur Radio Hall of Fame is to recognize individuals who have made significant contributions to the amateur radio hobby, and/or radio amateurs who have made significant contributions to society at large.

Name of Person Nominated:_____

Callsign (if licensed amateur/if multiple callsigns, list most recent): _____

If your nominee is still living and you know how to contact him/her, please supply the following contact information:

Mailing address: _____

City: _____ State/Prov._____ Zip/Postal Code:_____

Country: _____

Phone: _____ Fax: _____

E-mail address:_____ @ _____

Please write a brief (one to two paragraph) description of this person's accomplishments/achievements and why you feel he/she should be elected to the CQ Amateur Radio Hall of Fame (if you need more room please attach a separate piece of paper):

Nominator Information

(This is only for the purpose of contacting you in case of questions, and will not be published.):

Your name: _____ Callsign: _____

Mailing address: _____

City: _____ State/Prov._____ Zip/Postal Code:_____

Country: _____Phone: _____Fax: _____

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BY FREDERICK O. MAIA,* W5YI

FCC Seeks Comments on More "Morse Code" Petitions

As countries around the world are ending mandated telegraphy testing in amateur radio, the road to ending Morse code testing in the United States is lengthening. This is because our government requires that the public be involved in regulatory proceedings.

It normally takes two years for proposals to wend their way through the *Notice and Comment* process. That means we can expect it will be 2005 before any changes to test rules in the United States will take effect.

Petitions Acknowledged by The FCC

As this is written in early November, the FCC has acknowledged a total of 14 petitions filed by the public asking the Commission to implement various changes to the international Amateur Service regulations made last summer by the International Telecommunications Union (ITU), and still more may be on the way. As mentioned in our November column, the first batch of seven petitions was distributed on August 29 for initial public comment. They included:

RM-10783, July 21, 2003, filed by Kieman Holiday, WA6BJH, Santa Fe, NM, and

RM-10785, July 30, 2003, filed by: Eric R. Ward, NØHHS, Durham, NC. Both seek immediate removal of Morse code testing.

RM-10782, July 18, 2003, filed by Dr. Pete Coppola, KG4QDZ, and family, Smyrna, GA,

RM-10786, August 13, 2003, filed by: No Code International (NCI), and

RM-10787, August 1, 2003, filed by National Conference of Volunteer Examiner Coordinators (NCVEC). These three petitions not only requested the removal of Morse code testing, but also requested granting all current Technician Class operators access to the Novice/Tech-plus-code HF subbands at 80, 40, 15, and 10 meters.

RM-10784, July 28, 2003: Dale E. Reich, K8AD, Seville, OH, requested that the 5 words-per-minute telegraphy requirement be removed from the General Class but retained for the Extra Class license.

RM-10781, July 15, 2003: Peter M. Beauregard, KI1I, Westfield, MA, asked that current Technician Class licensees be allowed to operate on segments of the 80, 40, 15, and 10 meter HF bands—including phone (voice) privileges, except on 15 meters.

Second Batch of Petitions

On October 8 the FCC distributed a second lot of seven petitions seeking changes in the Amateur Service licensing requirements. The preliminary comment period ended on these in early November. Unlike the first group, all of these petitions seek only partial removal of the code test requirement. They are:

RM-10805, Sept. 5, 2003, filed by Charles L. Young Jr, AG4YO (Cantonment, FL), asked the FCC to delete the 5 wpm Morse code test (Element 1) for Technician-plus-code privileges, formerly called "Tech Plus." He wants to retain Element 1 as an examination requirement for General and Extra applicants only. His proposal would give Technicians SSB access to the top 50 kHz of the General Class HF bands at 100 watts ERP, but no privileges on 17, 30, or 60 meters.

RM-10806, August 14, 2003, filed by Frank W. Napurano, K2OKA (Hopewell, NJ), requests that the current 5 wpm Morse code licensing requirement be permanently retained. He contends that an independent firm conducted a membership survey for the ARRL in the 1990s on retaining the Morse code requirement.

"The results showed that over 80% of the respondents voted to keep the status quo. ...Since then, however, in defiance and regardless of the wishes of the amateur community at large, the Morse requirement has steadily been eroded."

The petitioner claims "...CW is the purest, most accurate, efficient, reliable, and economical form of radio communications ever developed. Removing the code requirement would result in a drastic reduction of future operators skilled in the use of Morse."

RM-10807, Sept. 5, 2003, was jointly filed by Robert G. Rightsell, AE4FA (Lexington, SC), and Harry A. M. Kholer, NØPU (St. Louis, MO). They want to continue Morse testing, but offer applicants up to 24 points of exam credit according to their success on Element 1. The final exam score would be the sum of earned Element 1 points and the written test score, for a possible total of 100 points.

They also want to consolidate the Novice/Technician/Tech Plus and the Advanced/Extra Class licenses, and increase the number and complexity of the written test questions. The petitioners suggest new Technician CW and data privileges on 80, 40, 15, and 10, with 100 kHz additional Tech spectrum on 80 and voice privileges on 10 meters. A Technician could apply for a General Class license after one year; an Extra Class applicant would have to hold a General ticket for a minimum of two years.

They add, "When all else fails in emergency circumstances, International Morse code remains as the only useable option. CW is also an 'International Language,' by which peoples of the world who have differing spoken languages can communicate efficiently."

RM-10808, Sept. 8, 2003, filed by Joseph Speroni, AHØA, Honolulu, Hawaii, wants the FCC to delete code testing for applicants who want to operate phone on HF but retain Element 1 at 5

*Chairman, NCVEC Rules Committee
Member, Question Pool Committee
1020 Byron Lane, Arlington, TX 76012
e-mail: <w5yi@cq-amateur-radio.com>

wpm for those who want to operate CW. Speroni suggests that the Element 2 (Technician) exam be reduced to 20 questions, Element 3 (General) to 40 questions, with the Element 4 (Extra) exam remaining at 50 questions. These three exams would be related only to phone operation.

"Amateur operator licensees may be authorized additional emissions by passing separate mode privilege elements," Speroni proposes. He suggests mode privilege certificates for CW/MCW, RTTY, data, irnage, spread spectrum, pulse/test, RACES/ARES, and space communications.

RM-10809, Sept. 11, 2003, filed on behalf of the Puerto Rico Amateur Radio League (PRARL), San Juan, PR, by Victor Madera, KP4PQ. PRARL wants the FCC to delete Element 1 for the Technician and General classes and to increase the difficulty of the written elements. PRARL also wants exam applicants to be required to wait 30 days before retaking a failed test.

The 5 wpm Morse exam would remain for the Extra Class, however, which PRARL maintains is needed for emergency communications. Furthermore, says the petition, "CW equipment can be assembled from common, easily obtainable parts by amateur radio operators, who will enhance their skills by doing so."

RM-10810, Sept. 11, 2003, filed by James Roux, W4YA, Longwood, FL, requests that the number of amateur license classes be reduced to two: General and Amateur Extra. Only one written examination would be administered, with the difference between General and the Extra Class being only a 15 wpm telegraphy test.

Roux would give the General Class all amateur frequency privileges except the 25 kHz Extra Class CW sub-bands at the low end of 80, 40, 20, and 15 meters.

"There would be less paperwork for the FCC and the VECs—only one written test for everyone, and one code test for those who wish to obtain the Extra Class privilege of exclusive CW sub-bands," Roux argues.

RM-10811, August 22, 2003, filed by Nancy A. Kott, WZ8C, Hadley, MI, on behalf of the FISTS CW Club, which claims 10,000 members and of which she is Executive Director. FISTS wants to delete code testing for the Tech Plus class and merge Tech and Tech Plus into a single class (*The FCC eliminated Tech Plus as a distinct license class four years ago, but retained distinct HF privileges for those Techs who passed a code exam.—ed.*). The 5 wpm Morse exam would be retained for the General

Class, with Extra Class applicants being required to pass a 12 wpm test.

"Morse code strengths are well known," says the FISTS petition. "It is often the only usable mode during periods of unfavorable propagation and high noise levels. Then Morse code replaces Single Sideband (SSB) voice in transferring messages in and out of disaster areas, but only if amateurs still know Morse code."

FISTS also wants the General and Extra Class written exams to be more technically comprehensive and an end to "instant retesting" of failed exams. The Technician written exam would be reduced from 35 to 25 questions, and the topics would be mandated by the FCC (rather than the NCVEC Question Pool Committee).

ARRL: No Comment So Far

Nearly 2500 comments had been filed by press time in response to these petitions. Our tabulation indicates the amateur community narrowly sided with eliminating mandated Morse code proficiency in the Amateur Service (55% wanted to end code exams; 45% wanted to retain them). It is difficult to determine the actual percentages, since several amateurs filed multiple comments on the petitions.

Missing from among those comments is anything from the American Radio Relay League (ARRL). The League says it intends to first query its membership before developing a position on the future of Morse code testing in the U.S.

What the ARRL will do is anybody's guess. Its membership (more than 150,000 strong) consists mainly of long-term licensed radio amateurs who, like *CQ*'s readers, hold higher class tickets and whose primary interests include DXing and contesting. In the past a majority of them have supported CW proficiency, and many do not want the added band congestion and U.S. competition for their signals that is sure to result from ending code testing and expanding access to HF operation.

History has shown that ARRL members expect their leadership to support their collective position. Failure to do so will assuredly incur the wrath of League membership and could result in a mass defection. It happened before (35 years ago) when the ARRL supported retesting of amateurs in order to recover existing operating privileges—the so-called "incentive licensing" fiasco of the 1960s.

Incentive Licensing

Incentive licensing caused a firestorm of outrage among the then 100,000-plus General Class hams. The concept was originally proposed by the ARRL in 1963. The League wanted the Advanced license (which had not been available for 15 years) reactivated and the 75, 40, and 20 meter phone bands restricted to Advanced and Extra Class licensees. The thought behind the proposal was that not enough General Class hams were upgrading or improving their skills, and ham radio was believed to be slipping badly due in part to the wide acceptance of CB communications and great technological strides being made by industry.

Computers, digital logic, and solid-state electronics were appearing on the horizon. However, the average ham was still tinkering in his basement with vacuum tubes and clunky World War II analog devices. Homebrewing, experimenting, and the amateur's historical "contribution to the radio art" were declining.

Reacting to the ARRL proposal, the FCC released Docket No. 15928 on August 29, 1967. It provided "...for the remodeling and revitalization of the Amateur Radio Service without changing its basic character and spirit and without depriving any amateur licensee of the major portion of his present operating privileges."

The key word was *major,* and many amateurs did indeed lose privileges. To get them back, they had to pass the new, more comprehensive (difficult) written and high-speed (20 wpm) code examinations.

The objective of incentive licensing was to award choice exclusive additional frequency privileges to the Advanced and Extra Class in exchange for increased telegraphy skill and electronics knowledge. Among the "incentives" were new 25-kHz segments at the low end of the HF phone and CW bands, spectrum that was already available to the General and the old Advanced Classes. To say that they were furious is an understatement.

Actually, the FCC's version of incentive licensing was not as bad as the League's original proposal. The FCC would take away only about 50% of their phone frequencies on 75–15 meters. Many League members felt betrayed.

Incentive licensing has been blamed for the demise of many American amateur radio equipment manufacturers (such as Hammarlund and Hallicrafters), a temporary decline in the number of licensed hams, and bitter resentment and distrust of the ARRL and FCC, much of which last to this day.

The League learned its lesson. It never again proposed or supported a loss of privileges for radio amateurs and renewed its efforts to carefully listen to the wishes of its membership. However, the views of League members have changed over time, and the ARRL did support dropping the code requirement for Technicians in 1991 and restructuring in 2000.

The IARU

The League also has to deal with the fact that the International Amateur Radio Union (IARU) supports eliminating code requirements worldwide. The IARU has roots that go back nearly 80 years. It was formed by the ARRL in Paris in 1925 to represent the interests of amateur radio to the International Telecommunications Union (ITU). Today the IARU is made up of some 150 national amateur radio societies from around the world and is generally recognized as the official international voice of the Amateur Service.

The IARU Constitution requires that the operating expenses of the IARU be borne by the International Secretariat, which is currently the ARRL, and it is doubtful that any other amateur society could afford this expense. In exchange for paying the bills, the ARRL also administers the IARU and provides its president (currently former ARRL President Larry Price, W4RA).

The IARU is organized into three regional organizations that correspond to the three administrative regions of the

View the Current Petitions

The initial comment period on the first two groups of petitions is over. However, these petitions and the comments filed on them will form the basis for whatever the FCC decides to propose. You can view these petitions and comments by going to the FCC's Electronic Comment Filing System on the World Wide Web at: <www.fcc.gov/cgb/ecfs>. Once there, click on "Search for Filed Comments" under the "ECFS Main Links" box located on the right side of the page.

To get to a specific petition, enter the RM number in the "Proceeding" field. Type the full RM number, including the hyphen, and complete the required fields. "RM" must be in capital letters, and you must include the hyphen between "RM" and the five-digit number. The files are in reverse chronological order (most recent first), so the petition itself is always the last record in the document list.

Watch news reports from *CQ* and other sources for any additional petitions that may be filed (such as one from the ARRL), and/or (possibly sometime later this year [2004]) a Notice of Proposed Rule Making with the FCC's formal proposal.

ITU. Its governing body, called the Administrative Council, consists of the IARU President, Vice President, Secretary, and two members from each of the regional organizations.

In 2001, after considering the input from member societies in their three regions, the IARU Administrative Council met and adopted a new position on Morse code testing requirements for access to the HF ham bands. The resolution stated that while "Morse code continues to be an effective and efficient mode of communication ... Morse as a qualifying criterion for an HF amateur license is no longer relevant to the healthy future of amateur radio."

It urged its member societies "...to seek, as an interim measure, Morse code testing speeds not exceeding five words per minute," and said that future "...IARU policy is to support the removal of Morse code testing as an ITU requirement for an amateur license to operate on frequencies below 30 MHz." That resolution was very clear.

Therein lies the ARRL's dilemma. Overall, the amateur radio societies of the world clearly want an end to Morse code testing. Even though IARU leadership primarily lies in the hands of the ARRL, the IARU is bound to support the collective views of its three regions.

At home, though, if past surveys hold up, League members are likely to support keeping Morse testing, at least in some form. The current League position is to retain the Morse code examination requirement.

Thus, the ARRL is torn between two seemingly opposing factions: its membership, which has yet to be heard from officially but is likely to want to retain some code requirement, and the ARRL-led IARU, which wants an end to code testing worldwide.

The ARRL Executive Committee is reportedly in the process of formulating its own comprehensive amateur radio licensing proposal, including a Morse requirement. Once completed, the proposal will go to the ARRL Board of Directors for consideration and possible action at its January 2004 meeting.

Stay tuned. My bet is that the League will still want code testing as a prerequisite—at least for the Extra Class. It will be interesting to see how the FCC reacts to such a proposal, since it generally has been opposed to mandated Morse testing except to fulfill the requirements stated in the international Radio Regulations, regulations which now leave that decision up to each country.

73, Fred, W5YI

Announcing:

The 2004 CQ World-Wide RTTY WPX Contest

February 7–8, 2004

Starts: 0000 GMT Saturday Ends: 2359 GMT Sunday

Logs are due no later than March 12, 2004

I. Period of Operation: Single Operator stations may operate only 30 hours of the 48-hour contest period. Off time periods must be a minimum of 60 minutes in length and must be clearly marked on the Summary Sheet. Multi-Operator stations may operate the entire 48-hour contest period.

II. Objective: The object of the contest is for amateurs around the world to use RTTY to contact as many amateurs in other parts of the world as possible during the contest period.

III. Bands: The 3.5, 7, 14, 21, and 28 MHz bands may be used. No 1.8 MHz or WARC bands.

IV. Terms of Competition (for all categories): All entrants must operate within the limits of their chosen category when performing any activity that could impact their submitted score. Transmitters and receivers must be located within a 500 meter diameter circle or within the property limits of the station licensee, whichever is greater. All antennas must be physically connected by wires to the transmitters and receivers used by the entrant. All high power category entrants must not exceed 1500 watts total output power on any band. Only the entrant's callsign can be used to aid the entrant's score.

Any form of DX alerting assistance is permitted in ALL categories. However, no self-spotting of any form on DX spotting nets is permitted for any category. Self-spotting is defined as generating packet spots for your contest callsign, including, for example, the following methods: (a) using your own callsign; (b) spotting your callsign while using another callsign; or (c) spotting of your callsign by other stations as a result of prearranged solicitation. A different callsign must be used for each entry.

V. Categories:

Note: Category names for the Cabrillo header are shown in *(italics)* after each category definition.

1. Single Operator (Single Band and All Band)

(a) Single Operator stations are those at which one person performs all of the operating, logging, and spotting functions. Only one transmitted signal is allowed at any time. *(SINGLE-OP)*

(b) Low Power: Same as 1(a) except that output power is 150 watts or less. Stations in this category compete with other low power stations only.

(c) Rookie: An entrant in this category shall, at the time of the contest, have been licensed as a radio amateur three years or less. If you are entering this category, please indicate it on your Summary Sheet. *(ROOKIE)*

2. Multi-Operator (All band operation only)

(a) Single-Transmitter: Only one transmitted signal at any time. Limited to 6 band changes in any clock hour (0 through 59 minutes). For example, a change from 20 meters to 40 meters and then back to 20 meters constitutes two band changes. Violation of the 6 band change rule will result in reclassification to the Multi-Multi category. *(MULTI-ONE)*

(b) Multi-Two: A maximum of two transmitted signals are allowed as long as each transmitter is on a different band. Each of the two transmitters is limited to 6 band changes in any clock hour (0 through 59 minutes). For example, a change from 20 meters to 40 meters and then back to 20 meters constitutes two band changes. Violation of the 6 band change rule will result in reclassification of the entry to the Multi-Multi category. Each transmitter must keep a chronological log containing its own serial numbers and unique transmitter identifier (0 or 1 in the Cabrillo format). *(MULTI-TWO)*

(c) Multi-Transmitter: No limit to transmitters, but only one signal and running station allowed per band. *(MULTI-MULTI)*

3. SWL: SWLs are required to log the callsigns of both the heard and correspondent station. Scores are based only on the heard station, using the same rules as transmitting stations. Correspondent callsigns may not appear more than three times per band in your log.

VI. Modes: Baudot only. No unattended operation or contacts through gateways or digipeaters permitted.

VII. Exchange: RS(T) report plus a progressive contact three-digit serial number starting with 001 for the first contact. (Continue to four digits if past 999.) Your log MUST show the correct serial number sent and received for each contact.

VIII. Serial Numbers and Identification of Transmitters: Single Operator log entries must contain a progressive three- (or four-) digit serial number sequence starting with 001 for the first contact. Multi-Single log entries must follow the same serial number scheme and are required to identify which transmitter made each QSO in the log. Multi-Two and Multi-Multi entries must provide a separate log and serial number sequence for each transmitter.

IX. QSO Points:

1. Contacts between stations on different continents are worth three (3) points on 28, 21, and 14 MHz, and six (6) points on 7 and 3.5 MHz.

2. Contacts between stations on the same continent but in different countries, and contacts with maritime mobile stations, are worth two (2) points on 28, 21, and 14 MHz, and four (4) points on 7 and 3.5 MHz.

3. Contacts between stations in the same country are worth one (1) point on 28, 21, and 14 MHz, and two (2) points on 7 and 3.5 MHz.

X. Multiplier: The multiplier is the number of "valid" prefixes worked. A prefix is counted only once regardless of the number of times the same prefix is worked.

1. A prefix is the letter/numeral combination which forms the first part of the amateur call. Examples: N8, W8, AB8, DL5, DJ2, HG1, WD200, WF96, 3DAØ, GB75, ZS66, U3, etc. Any difference in the numbering, lettering, or order of same shall constitute a separate prefix. A station operating from a DXCC country different from that indicated by its callsign is required to sign

portable. The portable prefix must be an authorized prefix of the country/call area of operation. In cases of portable operation, the portable designator will then become the prefix. Example: AB5KD operating from Wake Island would sign AB5KD/KH9 or AB5KD/NH9. American DX (KL7, KH6, KP2, KH3, etc.) operating within the 48 states must sign with a full designator of their choice. KH6XXX operating from Ohio must use an authorized prefix for the U.S. 8th district (W8, K8, etc.). United States portable stations are not permitted to select a portable prefix designation. For example, WS7I/2 is permitted, but WS7I/WY2 or WS7I/KZ2 is not. Portable designators without numbers will be assigned a zero (Ø) after the second letter of the portable designator to form a prefix. Example: N8BJQ/PA would become PAØ. All calls without numbers will be assigned a zero (Ø) after the first two letters to form the prefix. Example: XEFTJW would count as XEØ. Maritime mobile, mobile, /A, /E, /J, /P, or interim license class identifiers do not count as prefixes.

2. Special event, commemorative, and other unique prefix stations are encouraged to participate. Prefixes must be assigned by the licensing authority of the country of operation.

XI. Scoring:

1. Single Operator: **(a) All Band** score = total QSO points from all bands multiplied by the number of different prefixes worked (prefixes are counted only once). **(b) Single Band** score = total QSO points on the band multiplied by the number of different prefixes worked.

2. Multi-Operator: Scoring is the same as Single Operator, All Band.

3. A station may be worked once on each band for QSO point credit.

XII. Awards: First-place certificates will be awarded in each category listed under Section V in every participating country and in each call area of the United States, Canada, Australia, and Japan. All scores will be published. To be eligible for an award, a Single Operator station must show a minimum of 12 hours of operation. Multi-Operator stations must operate a minimum of 24 hours. A single-band log is eligible for a single-band award only. (Single-band entrants who also operate on other bands are encouraged to submit their logs to aid in the log-checking process. *Note:* If a log contains more than one band, it will judged as an all-band entry unless specified otherwise.) In countries or sections where returns justify,second- and third-place awards will be made. All certificates and plaques will be issued to the licensee of the station used. To the extent sponsors or winners purchase plaques through the Contest Director, plaques will be awarded in the following geographical areas for each of the categories listed in Rule V: World, North America, USA, South America, Africa, Europe, Asia, and Oceania.

XIII. Instructions for Preparation of Logs:

1. Logs must be submitted no later than March 12, 2004.

2. Electronic Submissions. All electronic logs must be submitted in Cabrillo format via e-mail to **<wpxrtty@kkn.net>. Receipt of all e-mailed logs will be confirmed via return e-mail.**

(a) In the "Subject" line of your e-mail message please include your callsign and the category you entered—i.e., SOABL, M2, MS, etc. Logs should be sent as an e-mail attachment, not in the text of the e-mail, and the **filename** for the log should be **yourcall.log.**

(b) Entries from **Multi-Single, Multi-Two,** and **Multi-Multi** stations must be merged into a single chronological log that *clearly* indicates which transmitter made each QSO (column 81 of Cabrillo QSO template for CQ contests). Multi-Single and Multi-Two should designate their transmitters as 0 and 1.

(c) If the Cabrillo format is unavailable, contact the log checker, Joe Wittmer, K9SZ, at <k9sz@wittmer.us>.

3. Disks and paper logs may be submitted via mail to CQ RTTY WPX Contest, 25 Newbridge Road, Hicksville, NY 11801 USA. However, all logs containing more than 100 QSOs and which were generated using a computer program ***must*** be submitted via e-mail or on a 3.5 inch floppy disk. Log and summary sheets are available for download on the CQ website, <www.cq-amateur-radio.com>, or with SASE from CQ at the address listed above.

4. Questions pertaining to the CQ RTTY WPX Contest may be sent to the Contest Director, Glenn Vinson, W6OTC, 488 Locust Street #401, San Francisco, CA 94118; e-mail <w6otc@garlic.com>.

XIV. Disqualification: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest, unsportsmanlike conduct, taking credit for excessive duplicate contacts, unverifiable QSOs or multipliers will be deemed sufficient cause for disqualification. An entrant whose log is deemed by the RTTY WPX Contest Committee to contain a large number of discrepancies may be disqualified as a participant operator or station for a period of one year. If within a five year period the operator is disqualified a second time, he or she will be ineligible for any CQ contest awards for three years.

XV. Deadline: All entries must be postmarked **no later than March 12, 2004.** E-mail logs are subject to the same deadline. Logs postmarked after the deadline may be listed in the results but will be ineligible for any awards.

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X500HNA/X700HNA	$229/369
X510MA/510NA	$189/189
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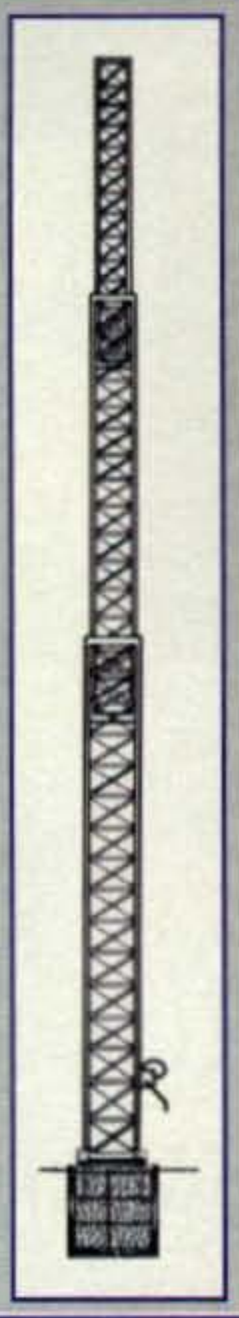

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TX-489MDPL	89'	23'4"	1800	$8,212	$6,429

HDX SERIES CRANK-UP TOWERS

- Heavy duty, handles 44.7 square feet of antenna load at 50 MPH, 35 square feet at 70 MPH.
- All models supllied with hinged T-base, anchor bolts, hand winch (except motor drive models), top plate, and rotor plate.
- MDPL models include motor drive
- Options include coax arms, raising fixtures, masts, motor drives, and more!

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HDX SERIES HEAVY DUTY CRANK-UP TOWERS					
TOWER MODEL	MAX. HT.	MIN. HT.	WT. (LBS.)	LIST PRICE	SALE PRICE
HDX-538	38'	21'6"	600	$1,642	$1,269
HDX-555	55'	22'	870	$2,874	$2,269
HDX-572MDPL	72'	22'8"	1600	$7,528	$5,899
HDX-589MDPL	89'	23'8"	2440	$9,855	$7,699
HDX-689MDPL	89'	23'8"	3450	$19,039	$14,999
HDX-5106MDPL	106'	24'8"	3700	$20,719	$15,999

MA SERIES CRANK-UP MASTS

- Handles up to 22 square feet of antenna load. (See chart below)
- MDP & MDPL models include motor drive.
- All models supllied with anchor bolts, load-actuated hand winch, and house bracket.
- Options include coax arms, raising fixtures, motor drives, self-supporting and rotator bases, remote control panel, and more!

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MA SERIES CRANK-UP MASTS							
MAST MODEL	MAX. HT.	MIN. HT.	WT. (LBS.)	50 MPH (sq. ft.)	70 MPH (sq. ft.)	LIST PRICE	SALE PRICE
MA-40	40'	21'6"	242	16.5	6.8	$1,007	$849
MA-550	55'	22'1"	435	22	9	$1,704	$1,399
MA-550MDP	55'	22'1"	620	22	9	$3,258	$2,729
MA-770	71'	22'10"	645	15.5	5.5	$2,810	$2,359
MA-770MDPL	71'	22'10"	830	15.5	5.5	$4,445	$3,729
MA-850MDPL	85'	23'6"	1128	15.3	6.3	$5,991	$5,029

TMM SERIES COMPACT CRANK-UP TOWERS

- Handles 20 square feet of antenna load at 50 MPH, 8 square feet at 70 MPH.
- Compact design is great for areas with tower restrictions, or where a less intrusive installation is desirable.
- All models supllied with hinged T-base, anchor bolts, load-actuated hand winch, 8' steel mast, top plate, and rotor plate.
- Options include coax arms, raising fixtures, motor drives, thrust bearing, remote control panel, and more!

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TMM SERIES COMPACT CRANK-UP TOWERS					
TOWER MODEL	MAX. HT.	MIN. HT.	WT. (LBS.)	LIST PRICE	SALE PRICE
TMM-433SS	33'	11'4"	315	$1,355	$1,139
TMM-433HD	33'	11'4"	400	$1,624	$1,379
TMM-541SS	41'	12'	430	$1,779	$1,499

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world of ideas

BY DAVE INGRAM,* K4TWJ

Expand Your Radio Horizons—Try HF!

This month's column is dedicated to our new and younger radio friends who are presently operating 2-meter FM but have yet to experience the many exciting aspects of HF-band activities. Possibly that is because you consider HF operations too complex, too time-consuming, or too expensive for your lifestyle or budget. Not so! HF operation can be just as easy as 2-meter FM. Some of the best contacts may be less than a minute long, and several brand-new economy-class HF transceivers are priced comparably to dual-band FM rigs. Yes, and all of the new big-name SSB transceivers are hot performers you will thoroughly enjoy owning and operating. It is an experience completely different from using the older gear.

If you are a code-free Technician licensee without HF band privileges, check some recent *CQ* and *QST* magazines and you will find an abundance of materials and programs for easy upgrading. It is a good move with lifetime benefits. Do it! My particular favorites are books and audio tapes by Gordon West, WB6NOA, available from the W5YI Group (1-800-669-9594 or <www.w5yi.org>). Gordon is an original "Good Guy of Amateur Radio," an excellent teacher, and his study materials are right on track. For a quick and easy way to learn Morse code at 5 wpm, also check out the new "NuCode" CD ROM from Tony Lacy, G4AUD, at <www.Nu-Ware.com>.

Now let's take a closer look at HF.

Attractions Unlimited!

HF operations are filled with globe-spanning DX communications, captivating weekend contests and QSO parties, unique special-event operations, and great folks just like you. Indeed, the ability to communicate on a person-to-person basis with fellow amateurs of all lands is the real backbone of amateur radio. Anyone can use the internet or a cell phone; that does not require a license. Radio amateurs, however, are in a class of their own! Furthermore, there has never been a better time than right now to join the HF fun. The bands are good, interference levels are low, and you can work the world while using only a 100-watt transceiver and multiband vertical or doublet antenna. Go for it!

Need more convincing? Listen in the hot SSB range of 14.225 to 14.350 MHz on 20 meters any weekend. You will hear amateurs transmitting from distant and exotic lands, and special operations from lighthouses, ships, submarines, famous landmarks, and much more (photos A and B). Many of these operations offer neat certificates for QSOs. Numerous other certificates/ awards are also available for making a fair number of contest QSOs, contacting 100 countries (photo C), 40 world zones, etc. Many of the activities and awards are highlighted monthly in *CQ* and *QST*. Consider HF mobiling, too: you can work toward certificates and awards while traveling or while parked. Any way and anywhere you go, you will have a ball on HF! It is truly the "bright lights and glamour" side of amateur radio!

Ten Bands!

New HFers understandably may become confused about which bands are best to operate at various hours of the day or night. The question is further complicated when we consider that there are ten bands from which to choose. They all are not "open" at the same time, and each person's interests differ. As a helpful guide, let's take a brief keep-it-simple look at various bands.

*4941 Scenic View Drive, Birmingham, AL 35210
e-mail: <k4twj@cq-amateur-radio.com>

Photos A & B– Special-event operations from famous U.S. landmarks such as Route 66, ships, and submarines such as the U.S.S. Cobia *make every weekend on 20 meters an exciting experience.*

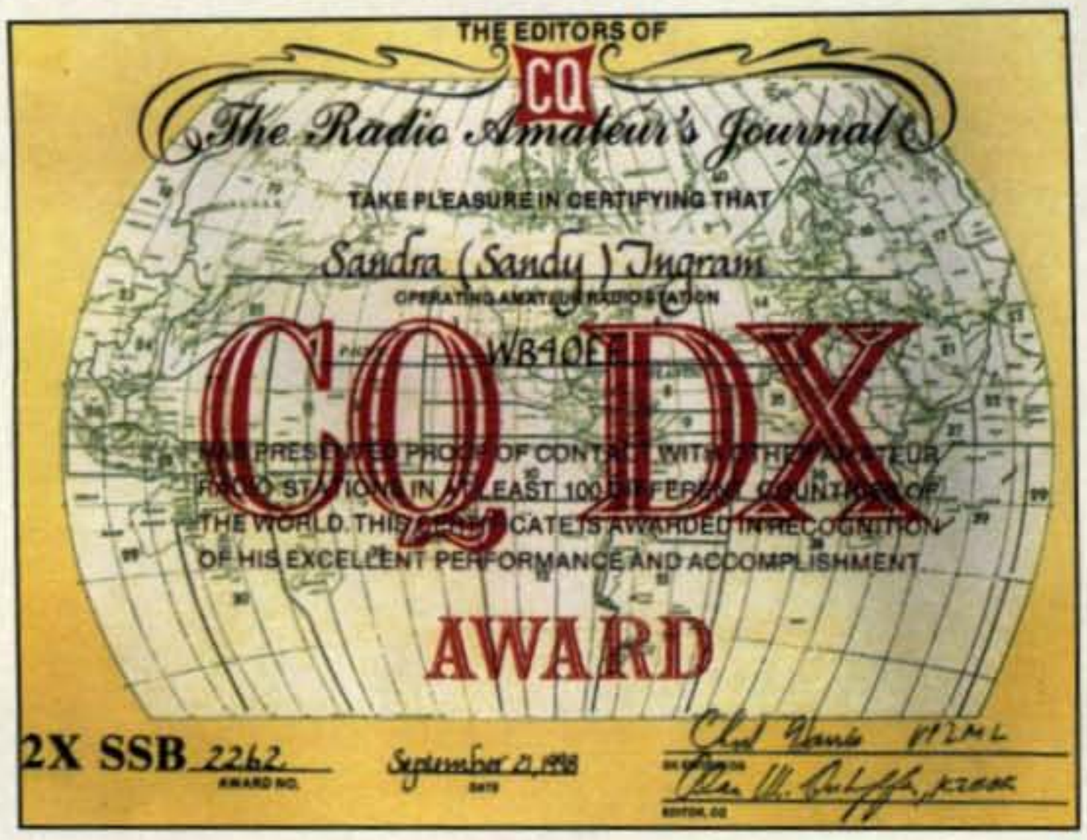

Photo C– Contact and exchange QSLs with radio amateurs in 100 countries, and you qualify for the world-famous CQ DX award from CQ and the DXCC award from the ARRL. Sandy, WB4OEE, worked her first 100 countries on 10 meters using only 100 watts. Now she is going for the next 100 on 20 meters.

Photo D– An HF setup need not be elaborate to span the globe and open up a new dimension in real radio enjoyment. A shining example of that fact is this ICOM IC-718 and mating IC-PS125 AC power supply. The transceiver is quite affordably priced and works out like crazy.

The upper bands of 10 and 12 meters are daytime bands. They are typically "open" from two or three hours after your local sunrise until an hour or two past local sunset, depending on sunspot counts. These bands are not crowded (except 10 gets quite busy during contests), and their general atmosphere is friendly and relaxed. Sunspot counts, incidentally, are listed in *CQ*'s "Propagation" column. Solar-flux information is also announced by WWV on 5, 10, and 15 MHz at 18 minutes past each hour. When counts are low (40 or 50), 10 and 12 meters are usually "closed" for DX. When counts are high (90 or more), you can talk worldwide with low power on both bands. Many amateurs overlook the super DX capabilities of 12 meters, so sharp-thinking new HFers can have a ball on this band, especially during late afternoons.

The low bands of 160 and 80 meters are almost reverse copies of 10 and 12 meters. That is, they generally are night-time and in-country bands especially good for chatting with other amateurs in nearby cities and states. The SSB portion of 80 meters (75 meters) is useful for following statewide nets, particularly during emergencies. DX is possible, especially in the wintertime.

The middle bands of 20 and 17 meters are prime focal points for working DX, with 20 continuously jumping with action and 17 supporting a more casual atmosphere that is ideal for getting started on HF. Most notable is 20 meters; it is open to more areas of the world and for longer periods of time every day and night than any other band. Indeed, 20 has it all—from global communications and blowout contest activity to special-event operation, plus much more. Like 12 meters, 17 is also a "sleeper" that is often overlooked by U.S. amateurs. It is typically open from sunrise until early evening.

The classic 40- and 15-meter bands are old-time favorites

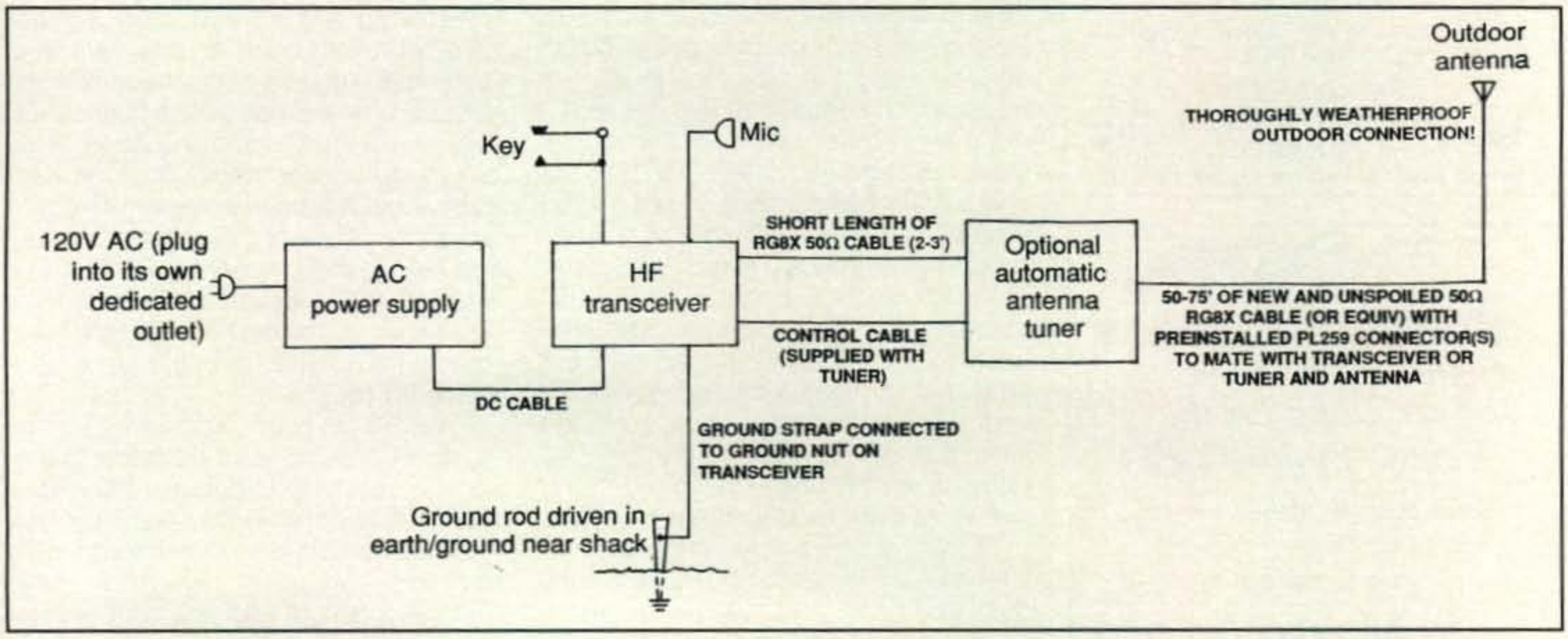

Fig. 1– Quick-and-easy cable interconnecting guide for setting up an HF station. (Discussion in text.)

Photo E– New-style multiband vertical antennas such as this Gap Titan are easy to install by yourself, work really well, and exhibit a clean, neighborhood friendly appearance. Use a support post-mounted door hinge at the base, and the antenna can even be tilted down and out of view when necessary.

among many amateurs. Forty typically supports extensive in-country activity at night (it is crowded and also shared with foreign shortwave broadcast stations). Fifteen hosts a mix of in-country and DX action during the daytime hours, primarily when sunspot counts are high.

Finally, there are two "specialty" bands: 30 and 60 meters. Thirty is our only all-CW band, and it is also power-limited to 200 watts. As a result, you can reach out great with a simple low-power rig on 30, and it is open up to 18 to 20 hours a day. Sixty meters is actually five exclusive SSB channels around 5.3 MHz. It is a nighttime band with a 50-watt ERP (effective radiated power) limit. It is not included in many transceivers at the present, so 60-meter activity is mild—and inviting!

There are two prime times ideal for DXing on all HF bands: the hours around dusk and dawn your local time. That is when the Earth's ionosphere—that invisible reflector of radio signals circling the Earth—is changing from hot to cold (or vice-versa) and when long-range signals peak. Dawn favors lower bands, dusk favors upper bands, and both enhance middle-band communications.

The Setups

Do you visualize all HF setups as a complex combination of large boxes, cables, and monster antennas? Relax. The super-stations are the exception rather than the rule. The average HFer typically uses a 100-watt transceiver, matching AC power supply, and vertical or doublet-type antenna, and you can assemble a similar station quite easily (photos D and E, and fig. 1). In fact, most of the steps involved are similar for both VHF and HF.

Start by planning a good location for your transceiver and antenna. The indoor location should be comfortable, clean, and dry (dust and humidity are detrimental to all electronic gear). Outside, the antenna should be mounted in a clear area 50 to 75 feet from the indoor setup so it can radiate a good signal toward far horizons rather than into house walls, telephone lines, or TV cables. A transceiver's mating power supply is equipped with an output cable and an indented plug to prevent misconnection. Three-prong AC plugs are included on all modern power supplies for safe grounding, but installing a separate ground wire or strap from the transceiver's cabinet to a minimum 4-foot rod driven into the ground outside your radio room is encouraged. That direct ground cable minimizes stray in-shack RF energy and/or RF feedback that can cause erratic meter readings, a strange-acting VOX, and hum or distortion on your transmitted signal. FM and 2-meter setups are not quite as susceptible to these little entanglements, because they usually run lower power and their antennas, wavelengths, and induction fields are shorter. For simplicity, you can visualize an area around an antenna roughly equal to its height or length as its induction field. Almost everything within that area (19 or 38 inches for 2 meters, 16 or 32 feet for 20 meters) affects SWR and transmitted signal strength and influences RF feedback.

The 50-ohm coax cable interconnecting an HF transceiver and outdoor antenna is especially important, as it is a radio's lifeline or link to the outside world. It should be a solid and unspliced length of new, top-grade, low-loss cable (marine-grade RG-8X is ideal) without sharp bends, coiled-up excess, or jacket nicks, and with rig/antenna connec-

tors soldered on ends. Many big-name amateur radio dealers carry or make up plug-in-and-use 50-ohm cables (with connectors) in 50, 75, and 100 foot lengths, so a couple of telephone calls should cover both antenna and cable needs. Remember to include a roll of CoaxSeal® in that purchase, and use it to thoroughly waterproof outdoor connections. No, all-weather tape is not sufficient, and yes, the CoaxSeal® step also applies to 2-meter antennas—especially mobile antennas. They really catch the brunt of rough weather. Even the slightest amount of moisture quickly degrades the best coax-cable runs.

Antenna choice is usually a matter of personal preference, budget allocations, and available supports, but never short change this vital area by settling for anything less than the best you can install in your particular situation. If you like horizontal multi-band doublets, consider the W5GI "Mystery Antenna" described here in July 2003 *CQ*. It requires an antenna tuner, but it is a winner. The new "no radials required "and mild-gain-type verticals are also terrific. They are easy to install by yourself, easy to tune, pump out a great signal, and even can be configured to tilt and hide from view when necessary (just use a big door/gate hinge and a strap on a deck rail or post for tilting). Most commercially made antennas can be adjusted for lowest SWR in your favored band areas, but again the easy route for quick plug-and-play is simple: Just add an automatic antenna tuner to the setup. Punch it on, let it tune on your first transmission, and enjoy. Later, as you become more familiar with HF, you can add a custom microphone and key to your setup, a world map (photo F), plus awards/certificates to shack walls and maybe a small linear amplifier for more power. The expansions are endless and fun all the way.

One final note: Remember to disconnect your rig's AC power cord, antenna cable, and ground strap (all three) when switching it off for the day (or night). Surprise thunderstorms can cause unnecessary and avoidable damage.

The Fun!

Even if you talk with friends daily on 2-meter FM, there will be a natural feeling of hesitancy (mic fright?) when first operating SSB on HF. Indeed, chatting on a local repeater is one thing, but transmitting nationwide and worldwide when everyone can listen to you is a different matter (actually, it's exciting!). Just remember a few basics, however,

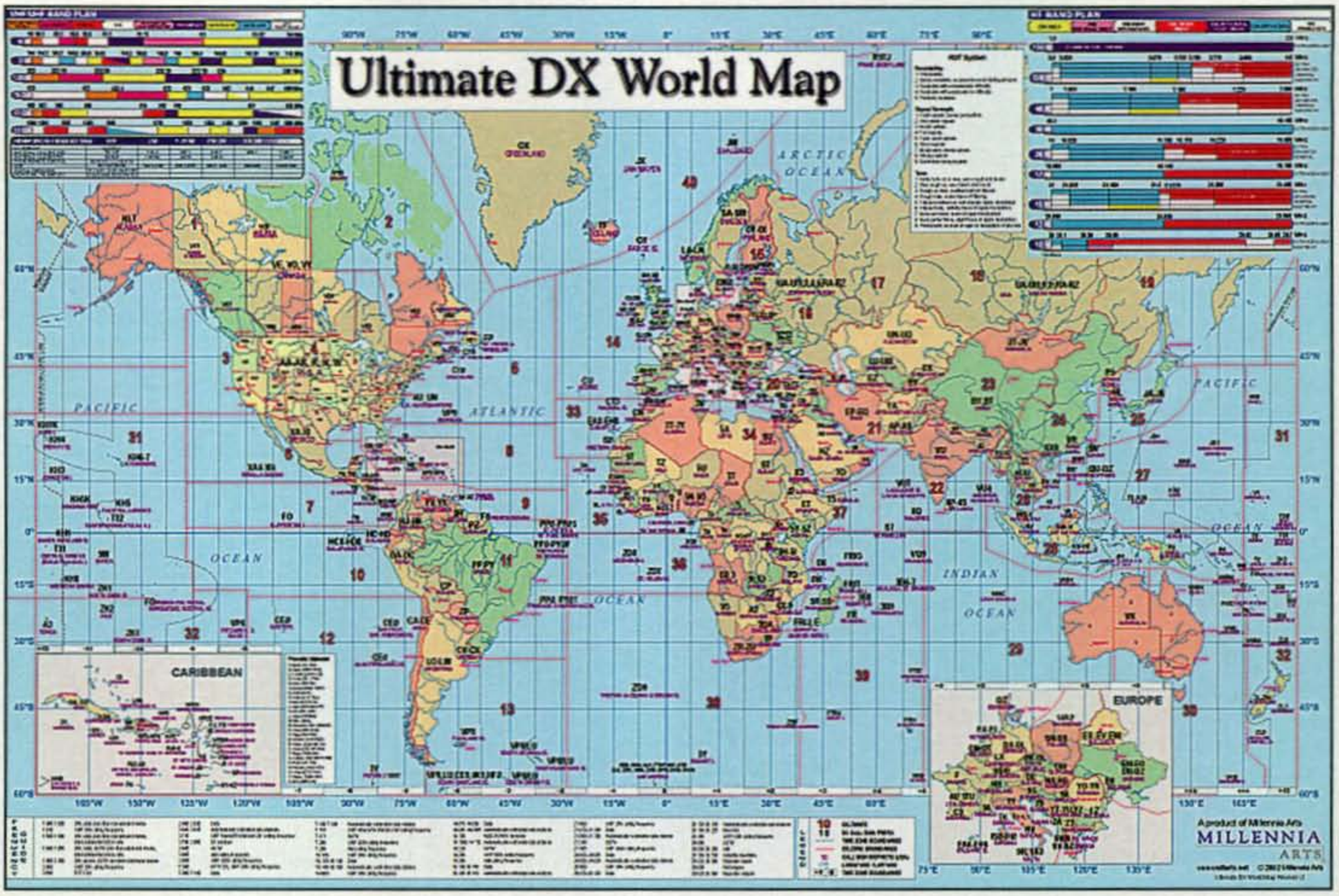

Photo F– An HF station always looks impressive when complemented with a global background, and the Ultimate DX World Map from <www.hammaps.com> does it in style. Colorful map shows countries and their radio prefixes, world zones, bands and frequency allocations, RST signal reporting system, and more.

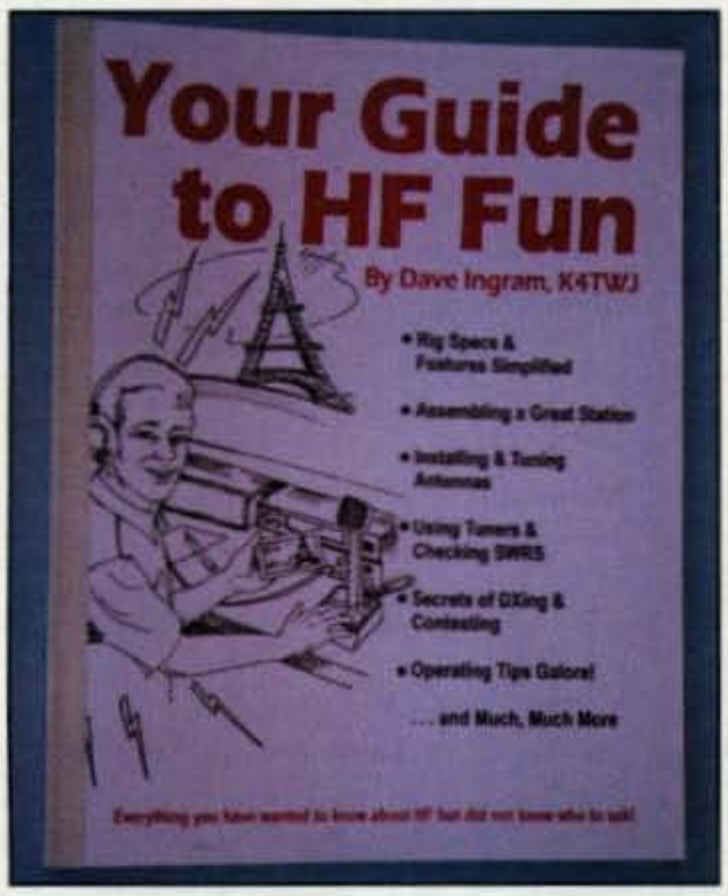

Photo G– Like more guidance on HFing? Check out my Guide to HF Fun *available directly from my house (K4TWJ) to yours.*

and you will sound like (or better than!) an old pro.

Unlike 2-meter activities, most HF QSOs follow a sort of format, with signal report, QTH, and name usually comprising the first reply. During the next transmission, you might describe your setup/gear, what you have heard on the bands, or some interesting facts of your location—and ask similar questions of the other station. Either operator may then continue the QSO or simply pass along thanks and 73, as desired or appropriate (some foreign amateurs have a limited understanding of English; your clue is when they continue repeating signal report and QTH).

Remember to "go with the flow of the action." Contest QSOs and DXpedition contacts will be short. You can usually determine the format to use by listening to a few stations exchanging information. Within a couple of minutes you can also determine if the other station is hearing callers well or is only making a few haphazard QSOs. Do not expect to reach DX stations or even in-country stations through unruly pile-ups and lots of interference. When possible, operate quieter and less crowded bands (a real confidence builder). Remember, too, there are no FM-like squelch tails or "repeater drops" on SSB. When you are not talking, other stations hear only band noise. Make your switch from transmit to receive obvious by saying "over," "go ahead," or by stating both stations' callsigns. The latter is especially beneficial when signals are fading. Talk up, talk clear, and speak with confidence—even if you have mic fright. Project a good image and the results will be more good contacts, more DX success, and greater on-the-air enjoyment—and that, dear friends, is the real fun of HF!

If you would like more getting-started-in-HF guidance, drop me a note stating what topics you would like discussed here in future columns. Also, check out my new full-length book written especially to help new amateurs. *Your Guide To HF Fun* (photo G) is available directly to your house from mine (Dave Ingram, K4TWJ, 4941 Scenic View Drive, Birmingham, AL 35210) for $16 plus postage of $3.85 Priority Mail or $2.50 book rate. It is packed with more "how to do" notes on gear, antennas, accessories, operating tips, etc., than we can squeeze into 12 columns. Now go for the HF fun, and may the force of good signals be with you!

73, Dave, K4TWJ

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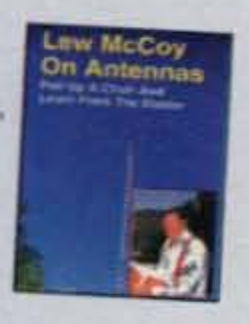

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magic in the sky

BY JEFF REINHARDT,* AA6JR

I Am Ham Radio

Writing a quarterly column has advantages and disadvantages. One advantage is the relatively long time between articles, which allows one to accumulate material. One disadvantage is that you don't have the opportunity to respond to "timely" topics or seasonal events. As this appears in the January issue (which arrives in December), I pass along my greeting for the new year with an essay I hope you'll enjoy. – *AA6JR*

I am ham radio. I follow in the tradition of Marconi, but there are many others who are part of me, names such as Faraday, Hertz, Armstrong, and the scores of experimenters who were mystified by forces they knew were real, but could not see. Your name is now among theirs.

I am the quivering hand of a new operator making a first contact. I am also the uncontrollable smile when that first contact returns a call to you.

I am the calm, experienced voice telling someone in distress that help is on the way.

I am a scout troop reaching across the sky to greet another troop hundreds of miles away. I am an anxious mother hearing word that her child in the military is safe and secure. I am a storm chaser relaying a report that will save lives. I am Santa talking on the radio to a child who will spend Christmas in a hospital.

I am present on a remote island, providing a contact from an exotic location to others who helped me get here. I am the voice of a commuter who enjoys a gathering of friends each day on the way to work.

I am ham radio. I am that warm feeling of satisfaction that comes with passing a license exam. I am also that inner stirring of pride that makes you hang that framed license on the wall.

I am dots and dashes. I am amplitude and frequency modulation. I am single sideband. I am images. I am information coded in "ones" and "zeroes." I am a beacon to the universe that there is intelligent life to be found on this planet.

I am a group of friends who meet in person every month. For those who may not be able to move, or see, I can bring some friends to you, every day, if you like.

I am ham radio. Some of my members have contributed to man's most notable achievements. I float above the Earth with astronauts. I am a gateway to scientists at the South Pole. I make it possible for those people to visit your home.

I am ham radio. I am a collection of cards from friends near and far. I am the dried ink on the pages of a logbook, and each entry has its own story to tell.

I am a link to the outside world from a Red Cross evacuation center. I help restore calm in the midst of chaos. I help convey news of a new son or daughter to a proud father serving his country in a faraway place. I am the everyday contact with a spouse informing her you're on the way home.

*5904 Lake Lindero Drive, Agoura Hills, CA 91301
e-mail: <aa6jr@cq-amateur-radio.com>

I am the friend of a senior citizen who has known me for decades. I am a curiosity to a youngster waiting for his two front teeth to appear.

I am ham radio. I am a convention where people gather to learn more about who and what I am. I am a study guide that challenges you to learn something new. I am a manual that allows you to create something that actually works.

Some say I'm a hobby. Some say I'm a service. I am those things and much more. I am a teacher. I am a servant. I am a friend. I am a prankster who can pose befuddling problems. I am a blend of the forces of nature and the genius found in man. I can also be a lifesaver.

I am a weak signal that can be heard faintly. I am also a powerful transmission that skips around the globe with ease.

I am ham radio. I am the precursor to all those who came after me. I am the parent of broadcast radio, television, and satellite communications. I made it possible for police and fire personnel to protect others more effectively. My ancestry lives in your microwave oven and your cellular phone.

I am hundreds of operators who gather every day to ensure the safe travel of crafts at sea or traveling our roads. I am a lonely operator calling CQ in the hope of making a new friend. I am a dedicated volunteer standing watch in a hospital during a power failure.

I am a network of women who meet every day. I am the link of father to child. I have inspired careers in engineering. I have helped Eagle Scouts earn their wings. I am the request to bring home a loaf of bread.

I am ham radio. I am a store filled with expensive treasures. I am also a box of discarded parts that can me make come alive with enthusiasm. I am a tiny microcircuit or I can fill a room. I am a tower a hundred feet high or a thin wire hung between two trees.

I am a citizen of the world. I cross borders without a thought. I don't care about your color, gender, or faith. I am a base set of codes that are a universal language.

I am ham radio. I am a monthly magazine you kept for years because it offered you something of interest from someone who shares your passion. I am governed by the laws of physics and the laws of men, but really I have a mind of my own. I can be as fickle as a teenage romance or as faithful as your dearest friend.

I am a ready companion worn on the hip, the friend who is ready to ride along in a car or be at the home station and feels as comfortable as an old pair of shoes.

I am an annual Field Day gathering of friends, in person and on the air. I will challenge your skills and punish the silly mistake.

I am ham radio and you make me what I am today while you define what tomorrow may bring.

I am ham radio. Together, you and I, we put "Magic In The Sky."

73, Jeff, AA6JR

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MODEL SS-18

DESKTOP SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-10	7	10	1⅛ x 6 x 9	3.2
SS-12	10	12	1⅛ x 6 x 9	3.4
SS-18	15	18	1⅛ x 6 x 9	3.6
SS-25	20	25	2⅞ x 7 x 9⅛	4.2
SS-30	25	30	3⅞ x 7 x 9⅛	5.0

MODEL SS-25M

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2⅞ x 7 x 9⅛	4.2
SS-30M*	25	30	3⅞ x 7 x 9⅛	5.0

MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9⅛	6.5
SRM-30	25	30	3½ x 19 x 9⅛	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅛	6.5
SRM-30M	25	30	3½ x 19 x 9⅛	7.0

MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25-2	20	25	3½ x 19 x 9⅛	10.5
SRM-30-2	25	30	3½ x 19 x 9⅛	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9⅛	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅛	11.0

MODEL SS-12SM/GTX

MODEL SS-10EFJ-98

CUSTOM POWER SUPPLIES FOR RADIOS BELOW

EF JOHNSON AVENGER GX-MC41
EF JOHNSON AVENGER GX-MC42
EF JOHNSON GT-ML81
EF JOHNSON GT-ML83
EF JOHNSON 9800 SERIES
GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
UNIDEN SMH1525, SMU4525
VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

CIRCLE 134 ON READER SERVICE CARD

NEW SWITCHING MODELS

SS-10GX, SS-12GX
SS-18GX
SS-12EFJ
SS-18EFJ
SS-10-EFJ-98, SS-12-EFJ-98, SS-18-EFJ-98
SS-12MC
SS-10MG, SS-12MG
SS-101F, SS-121F
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

*ICS – Intermittent Communication Service

beginner's corner

BY WAYNE YOSHIDA,* KH6WZ

Microwaves: Not Just for Leftovers

Last month I described my first venture into the microwave bands as a "successful failure." This month I am happy to report that I did get the 10-GHz rig working, and I want to share the very positive experience. I named my rig *Morpheus,* because even before it was completed it changed several times, and it is still undergoing some changes and modifications. As Walt Disney once said about Disneyland, Morpheus will probably "never be completed" (see photos A and B).

First, however, I must thank my microwave elmers from the San Bernardino Microwave Society (SBMS). Without their help and generosity, I probably would still be only dreaming about getting on the microwave bands and not actively contesting on them. I am very grateful for all of the help, advice, special components, testing and tweaking, and knowledge that came from the SBMS members.

I want to share a few of my thoughts about the reasons why I decided to give the microwave bands a try. I hope this will encourage and inspire you to get on the air in this "new frontier" as well.

Readers of this column already know that one of my ham radio passions is building stuff. In fact, this is how I got interested in ham radio. I liked the idea of making something I could actually put on the air. Homebrewing equipment is a very big part of getting on the microwave bands. Almost all microwave equipment is home-built, or home-modified, just like radios from the "good old days." Even the "complete kits" that are available for the microwaves are not complete units that will allow you to get on the air. They are "transverters" or "transceiver-converters" that take signals from a VHF or UHF transceiver and "convert" them to microwave frequencies by multiplying the signal's original frequency a bunch of times and then sending the microwave signals to the antenna. It works in reverse on receive, pulling in the microwave signal and then dividing the frequency down to signals readable by a VHF or UHF transceiver.

Speaking of antennas, I am not fortunate enough to have a house on a hill with a lot of space for an antenna farm. However, I can operate ham radio while mobile and portable, although things can get pretty cumbersome with HF gear. For example, the HF vertical I use while traveling is about 17 *feet* tall when fully assembled. On the other hand, a lot of microwavers are successfully using modified satellite-TV dish antennas that are around 18 *inches* in diameter.

Contesting is another big part of microwave ham radio activity. I've always loved a good radio con-

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Photo A– Blue Morpheus looked really neat, but the enclosed chassis box restricted access to fix and modify the system, and there were many repairs and modifications needed. This was the "successful failure" rig mentioned in the December column.

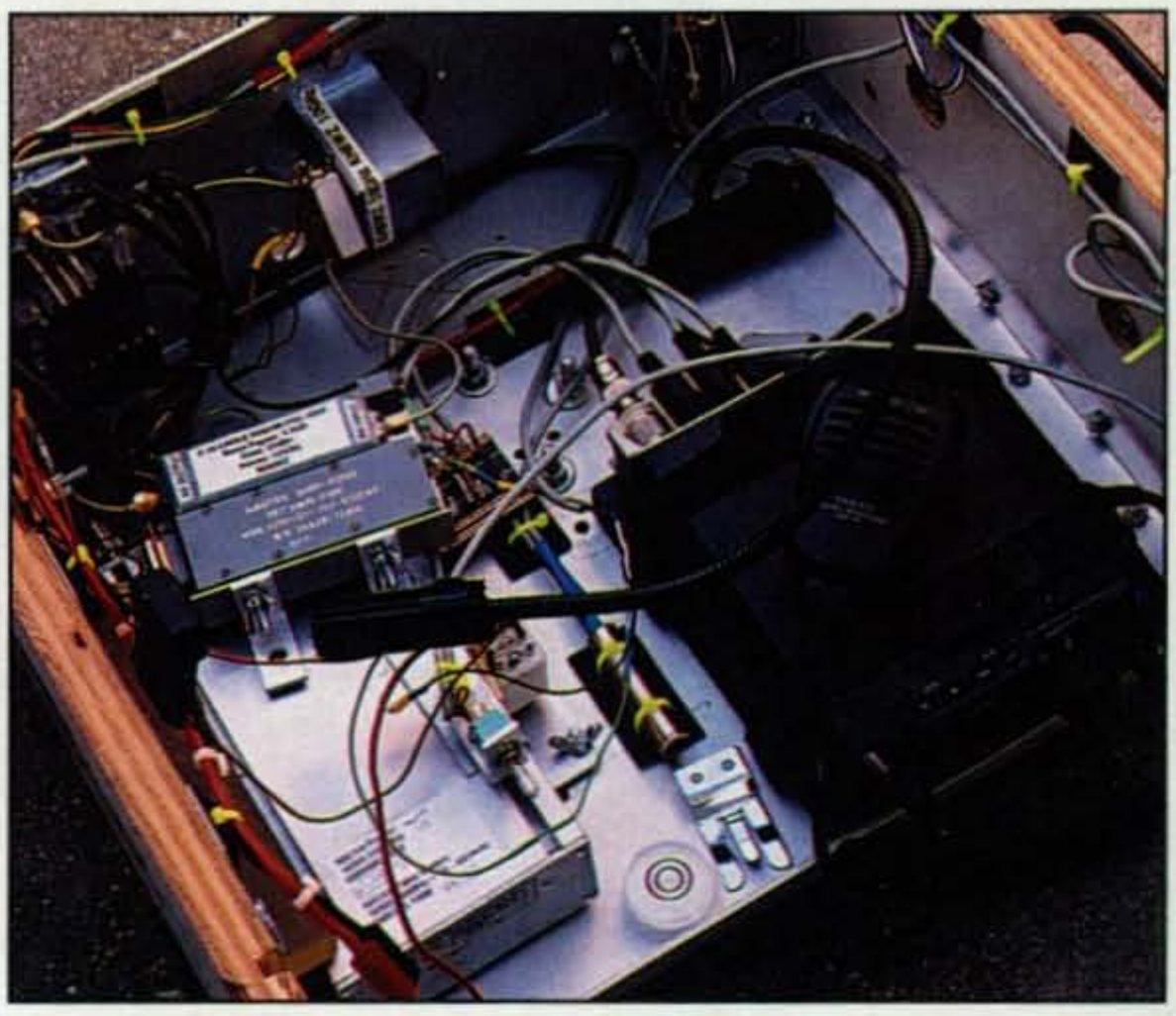

Photo B– Morpheus II in its current form. The "tray-chassis" allows easier access to the various modules. The receiver pre-amplifier (gray box at the middle-left) is from an F-15 Eagle radar receiver. The DEMI 10-GHz transverter is in the lower left corner, and the IF radio (FT-817) is the black box on the right. There's a push-to-talk trigger on the right handle.

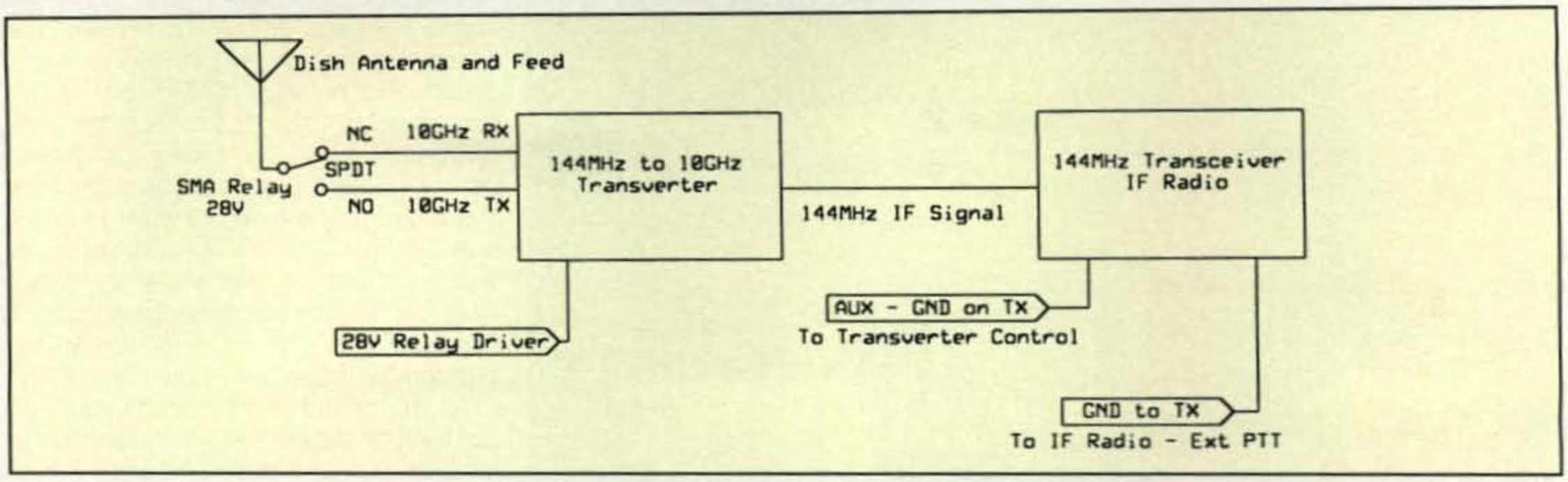

Fig. 1– A simplified block diagram of Morpheus, the 10-GHz rig.

test. For me it's a chance to compress months of inactivity into a single weekend. It is also a good way to exercise both radio skills and equipment capability at the same time . . . and it's just plain fun.

I chose 10 GHz because of the seemingly greater number of operating activities 10 GHz offers in my area. Since microwave activity is local in nature, it makes sense to check around to see what bands are popular in your area. The easiest way to do this is to go to the ARRL website and look at the contest results from the various VHF and UHF and above contests to see who is doing what. This is another really good reason to join a VHF-plus or microwave-specific club. I also decided to build my rig so that it could be portable, letting me pack up the station, throw it into the car, and operate as a "rover."

Topsy-Turvy Things

Operating "way up here" is interesting to me, because I am learning so much. It is just like starting out in ham radio all over again. Almost nothing makes sense any more. Propagation is very strange and different, and even fog, rain, and humidity affect communications. I cannot use any of my HF test gear for these bands. My new battery-operated, portable HF/VHF/UHF, all-mode transceiver is now called an "IF rig" and is just a "stage" or "module" for the rest of my system. It's frustrating and fascinating and fun all at the same time.

I began my venture into the microwave world via the internet when I came across the SBMS website. A really neat-looking project graced the group's home page—a 24-GHz conversion project based on a surplus 23-GHz outdoor unit (ODU) used for microwave point-to-point communications. Wow. Twenty-four thousand million Hertz—that's a really high frequency! That ODU looks like either a landmine or an electronic porcupine. I just have to get one of those.

I recruited my Huntington Beach RACES friend Bill Honeyman, KG6CNL, into this microwave adventure, and we carpooled to our first SBMS meeting (after driving about 40 miles) in February 2003. We both joined the club on the spot. I also went to my local ham radio store and bought a bunch of books. After spending a few hours skimming and reading, I realized that I did not understand a lot of stuff. Sure, the books are written in English, but they may as well have been written in Greek. I started feeling very sleepy, and my mind was wandering to simpler thoughts such as "What's for dinner? . . ."

Then, just as I dozed off, a flash of understanding hit me: Getting on the air with microwaves is not rocket science. It is still basic radio receiving and transmitting—well, more like having a rig with a separate receiver and transmitter, with a transmit/receive change-over relay and control circuits. The way to visualize this is to make up a simple block diagram (see fig. 1).

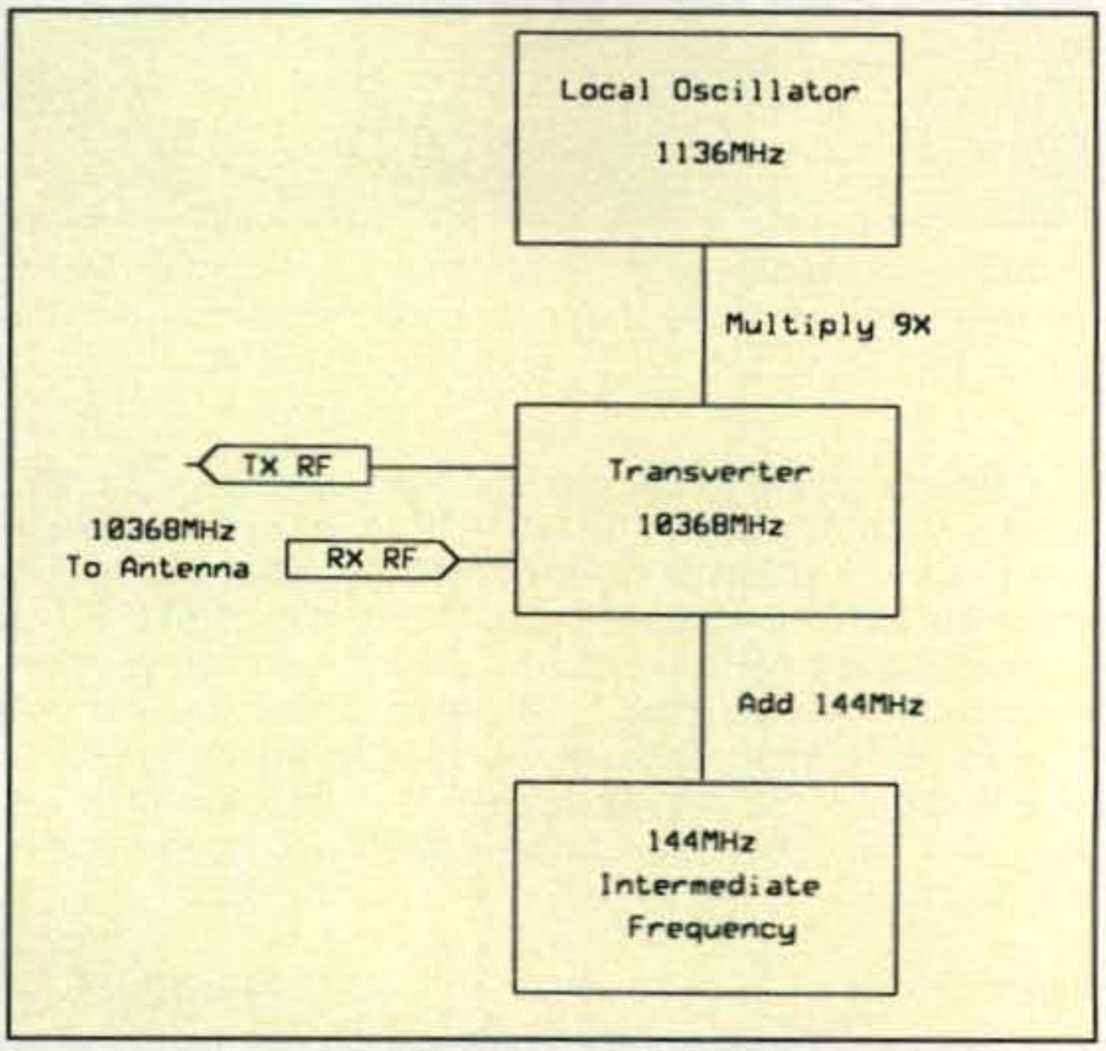

Fig. 2– An over-simplified block diagram of a 10-GHz transverter.

Yuk . . . Some Math

Digging a little bit deeper, an over-simplified block diagram of a 10-GHz transverter looks something like fig. 2. A little bit of arithmetic is in order, and this is as technical as I want to go. Anyway, the local oscillator (LO), which is the heart of the system, generates an 1136-MHz signal. That 1136 MHz is multiplied by 9 to produce 10,224 MHz, and then is added to the 144-MHz intermediate frequency (IF) to produce the final operating frequency of 10,368 MHz. Similar "numbers" are moved around to produce usable radio signals for the various microwave (or any other radio frequencies, for that matter) radio bands. For example, a typical conversion scheme for the 2304-MHz (13-cm) band would go like this: LO output of 1080 MHz times 2 produces 2160 MHz, and an IF of

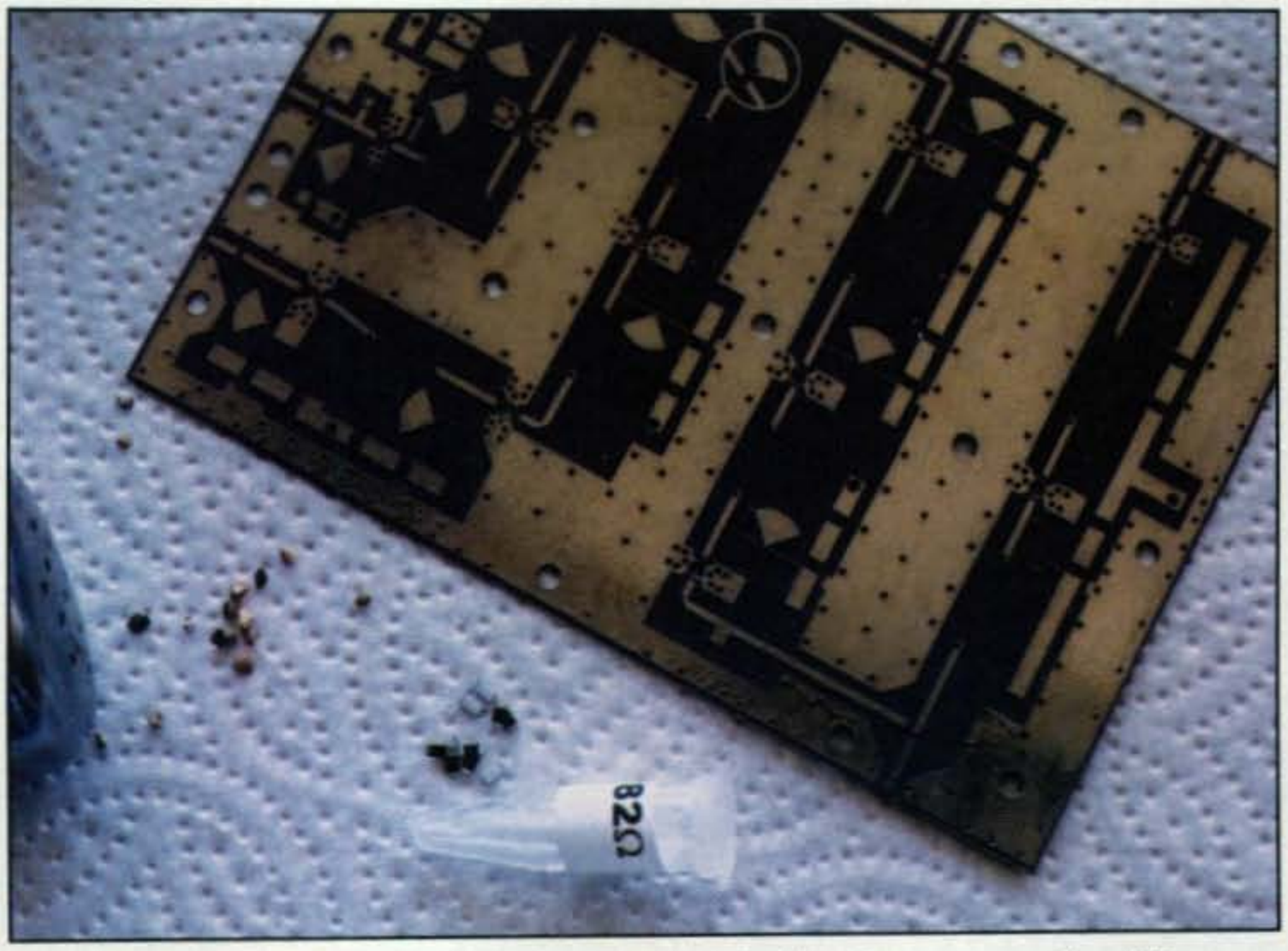

Photo C– Surface-mount components are really tiny. Can you see the difference between the coarse-ground pepper and the 82-ohm resistors? Some components are even smaller.

144 MHz is added to get the final frequency of 2304 MHz. For the 3456-MHz (9-cm) band, it would go LO 1104 MHz, times 3 is 3312 MHz, plus the 144-MHz IF equals 3456 MHz. To get to 5760 MHz (5 cm), you would go 1123.2 MHz times 5 (5616 MHz) and add the 144-MHz IF to get 5760 MHz. All these numbers give me a headache, so we will stop for now.

Let's Do It!

A microwaver goes through several stages in building a working system. In my case, I also had a lot of emotional ups when it worked, downs when something went wrong, and ups again after something got fixed and started working again. At first I was going to be happy if I successfully built and soldered everything correctly. Then it changed to "Let's see if it will receive the N6CA beacon on 10.368310 GHz atop Frazier Peak (DM04MS) and the N6CA beacon on 10.368300 GHz atop Palos Verdes (DM03TS)." Then, after knowing that the receiver was working, I hoped to verify that the unit would transmit as well.

I looked around to find suitable gear. Converting surplus seemed like a great idea, but I had trouble finding "good old stuff" to modify. I decided to see if I could save some time and money, and selected the Down East Microwave (DEMI) 10-GHz transverter in kit form. I chose the DEMI unit because of the company's unique guarantee: You can purchase the kit, and when it arrives, you can check the parts and assembly procedures to see if you can build it. If you decide that you are not able to put it together, you can return the unassembled kit and exchange it for credit towards a "factory-built" unit. I actually took a week to clean up my workbench and bought some really tiny soldering-iron tips.

Building It?

When the kit arrived, I eagerly tore the box open. As I took a parts inventory, I noticed that the majority of the parts came in very tiny plastic vials and almost all of the parts were surface-mount-technology (SMT, or "chip") components (see photo C). I thought, hmmmm, okay, I've never really built anything like this but maybe I can. But then again, I really don't want to botch something up and then get stuck, or worse, destroy something in the process. So after a week of procrastination, I called DEMI and arranged for an exchange for the factory-built unit.

As I mentioned earlier, even after you get the transverter, you still need to get through the "integration" stage. This is where each module or sub-system is hooked together to form a complete system. I sketched out a preliminary layout for the various modules and put the whole thing into a nice aluminum cabinet.

After working on the rig for several weekends, I finally had something that looked sort of like a rig I saw on some web page. It was a box containing the transverter, various switches for power and other functions, and a neat, old-fashioned analog panel meter I wanted to use later as a transmit monitor. I mounted a satellite TV dish to the top of the cabinet. I made the cabinet as rugged as I could, reinforcing the aluminum box with plywood and using quarter-inch bolts to securely fasten everything—truly "Battlebot® inspired" construction. I even painted it a pleasant blue color with engine enamel that was on sale in the discount bin at the local auto parts store.

Now that I had some sort of rig, I needed to test the thing to see if it actually worked. At about the same time, fellow SBMS member Dave Glawson, WA6CGR, held an open house at his

Websites to Visit

Just about all of these sites have links to other VHF and above information. Other sites can be found with your favorite search engine. Spend some time browsing; you will gain a lot of useful microwave knowledge.

The San Bernardino Microwave Society (SBMS): <http://www.ham-radio.com/sbms>.

2003 10 GHz & Up Contest Pictures: <http://www.ham-radio.com/sbms/03_testpics/ylz_pics/xe2.html>.

Click on the images from XE2: W6YLZ, W6DTA, AD6FP, K6DYD, and click on sound file 6. You can hear XE2/K6DYD working KH6WZ (578 km/360 mi).

SBMS/SDMG Picnics (rig evaluations in the park): <http://www.ham-radio.com/sbms/sd/mdserpindx.htm>.

Randy Bynum, NR6CA: Good information on surplus conversion and images of test gear, <http://www.nr6ca.org>.

Dave Fifield, AD6A: Take a look at Dave's mobile station for 10 GHz, <http://www.ad6a.com>.

Michael L. King, KMØT: Lots of pictures, great source of inspiration, <http://www.qsl.net/km0t>.

The World Above 1000 MHz, Peter Day, G3PHO: Take a look at Peter's home laboratory, <http://www.g3pho.org.uk>.

Paul Wade, W1GHZ: Paul has tons of useful information on antennas, feeds, and other projects, <http://www.w1ghz.org>.

Photo D– The SBMS/SDMG summer picnic is a great place to get microwave-rig inspiration. Kerry Banke, N6IZW, Chuck Houghton, WB6IGP, and Ed Munn, W6OYJ, evaluated over a dozen 10-GHz stations in the field in the 2003 event.

new workshop. He invited all club members to a barbecue/tune-up/rig-check party. I took advantage of this wonderful opportunity, and with the help of some of the more experienced guys, did some testing and adjusting and more building. Having a friend with a well-equipped workshop is wonderful.

Meanwhile, I still needed to figure out how to support the system and antenna. The antenna system must be "steerable" in both azimuth (left and right) and elevation (up and down). Tripods of various types are most commonly used, although I have seen a station that was built around an oscilloscope cart.

I think every experienced microwaver has a horror story about his or her rig being blown down by a gust of wind, smashing the antenna or rig (or both) to bits. I know of at least one entire station that got caught in a dust devil in the desert and actually took flight! Of course, what goes up must come down with a crash!

More Words of Praise and Inspiration

Thanks to all the microwave ham radio webmasters out there, I learned a lot from just looking at the pictures posted on the various microwave websites. Take a look at the URLs mentioned in the References section. I especially like the sections on test equipment, antennas, and pictures of stations in action.

Speaking of inspiration, every summer the SBMS and San Diego Microwave Group (SDMG) get together at a local park to test and compare equipment performance on a test range. The SBMS/SDMG picnic is a great club activity that allows members to compare theoretical expectations with actual performance several months before the ARRL 10 GHz and Up contest (see photo D). Kerry Banke, N6IZW, Chuck Houghton, WB6IGP, and Ed Munn, W6OYJ, evaluated over a dozen 10-GHz stations in the field in the 2003 event.

As I looked around at other people's rigs, I noticed that each and every rig was completely different. Seeing all the homebrewed rigs really made me excited and inspired!

Based on what I saw at the field test, I tore everything apart and completely rebuilt my rig somewhere between the August and September 10 GHz and Up contests. Morpheus went from a cramped, enclosed box that was difficult to work on to an open tray-like chassis meant to simplify repair, modification, and expansion.

The Devil is in the Details

Past SBMS president Doug Millar, K6JEY, advises that a microwave project will never be completed if you stop working on it. If you are stuck either because you are missing a component or two or have trouble understanding something, either move on to another aspect of the project or ask for help. I found this to be very good advice, because there are many details and details within details when building a microwave rig.

This Conclusion is Only the Beginning

I hope this simplified overview of my first steps into microwave activity has inspired your interest in one of ham radio's newest frontiers. Getting on the microwave bands is a challenging experience in building (or even "integrating") and operating. Joining a VHF-plus or microwave radio club is highly recommended, and if there isn't one in your area, you may consider getting some friends together to start one!

73, Wayne, KH6WZ

Kits and Parts for Microwavers

Down East Microwave: Transverters, pre-amplifiers, antennas, kit and assembled, <http://www.downeastmicrowave.com>.

SSB Electronic USA: Transverters, pre-amplifiers, and antennas, kit and assembled, <http://www.ssbusa.com>.

Troy Dennen, NW1B: Dish antennas and feeds, <http://mysite.verizon.net/vze1on0x>.

References

The ARRL UHF/Microwave Projects Manual, Volume 1, The American Radio Relay League (ARRL), ISBN: 0-87259-499-1. (No longer published, but may still be available.)

The ARRL UHF/Microwave Projects Manual, Volume 2, The American Radio Relay League (ARRL), ISBN: 0-87259-631-1. (No longer published, but may still be available.)

International Microwave Handbook, published jointly by Radio Society of Great Britain (RSGB) and ARRL, edited by Andy Barter, G8ATD, ISBN: 1-872309-83-6.

Microwave Projects, Edited by Andy Barter, G8ATD, published by RSGB (ISBN: 1-872309-90-9).

Proceedings of the Microwave Update, various years, published by ARRL.

"24 GHz SSB Conversion of the P-Com Tel-Link 23 GHz ODU," by Dave Glawson, WA6CGR, San Bernardino Microwave Society <http://www.ham-radio.com/sbms/24GHz>.

"10 GHz and Up Contest Results," published in *QST*. Also check the ARRL website at <http:www.arrl.org>.

Note: RSGB books may be ordered from the CQ bookstore as well as the ARRL.

math's notes

BY IRWIN MATH,* WA2NDM

Nostalgia

Before beginning this month's topic, I would like to wish a very happy and healthy New Year to all the readers of my column. Hopefully this will be the year when all of your hopes and dreams are realized.

At this time of the (new) year I always like to reflect on where I have been and know that I am truly in "resonance" with the many readers of this column who also remember the "good old days." In fact, any mention of older equipment or techniques usually results in a good deal of mail. That being said, this month I would like to cater to those nostalgic readers among us with a description of a "new" amateur radio station I put together last year.

I have always been a homebrewer (at least up to the popular use of SSB), and my very first station, back in the 1950s, was a 20-watt (input) plate-modulated transmitter using a 2E26 in the final driven by a couple of 6AG7s. The modulator, as I recall, used a couple of 6V6s, a 12AX7, and an ARC-5 modulation transformer. The output was a pi-network (the coil wound on the ceramic form from the same cannibalized ARC-5), and the feel of "dipping" or resonating the plate circuit and then slowly increasing the loading to the antenna to squeeze out every last drop of RF was something I never forgot. The receiver, by the way, was a Hallicrafters S38A, which I still have.

Time went on, and by the 1960s the single 2E26 evolved into push-pull 6146s (with 6L6s in the modulator), but the pi-network and the "dip and load" technique remained. Eventually, in the '70s I became very interested in 6 meters, and the fortunate acquisition of a few 4X150s from surplus sources (Canal Street and Cortland Street in New York City) allowed me to build a really powerful "TV channel 2 and 4 interference generator." I managed to work 40 states on 6, however, and prove to one and all that Drake filters at the transmitter and on the twin-lead input to the TV set would indeed eliminate interference. Those were the days!

Then the transistor came on the scene big-time, and automatic tuning became the rage. This, of course, has carried into the 21st century, and I don't believe that anyone buying new equipment today even remotely thinks of any sort of manual tune-up of a final. Even outboard antenna tuners are slowly becoming totally automatic, and the manufacturers are proud to let you know that fact.

Well, that may be the "modern way," but this past year I had the opportunity to purchase an older Kenwood TS-530S transceiver (complete with the 6146s in the final and a 12BY7 driver) and jumped at the chance. Although I was proud of my homebrew equipment, I had always secretly coveted such "top of the line" equipment, but alas could never afford it "back then." For about 25% of what it originally cost, though, I had the opportunity to travel back in time to the early 1980s, so I took it. The rig arrived spotless (along with an instruction manual that was in such new condition it seemed never to have been read) and appeared to have been manufactured yesterday. I immediately opened the cabinet and of course the RF cage (how could I resist?) to take a look at the 6146s. Yes, there they were, side by side ready to pump out RF and made by RCA to boot. The glass envelopes were spotless, and there was not even a layer of dust to be seen anywhere. Truly this rig was previously owned by someone who at least understood and appreciated what he had.

Next came the acid test. With my 30-watt dummy load (made of 2-watt carbon resistors as described in a column last year) connected to the SO-239 UHF antenna connector I turned on the rig and set the bandswitch to 14 MHz. Immediately, even though no antenna was connected, I could pick up a couple of stations while tuning through the 20-meter band. With baited breath I turned on the heater switch (you newcomers might not know what that switch was for) and waited a minute or so for the tubes to warm up. Setting the rig to TUNE and TRANSMIT, I slowly increased the CARRIER control while peaking the DRIVE control (as per the instructions in the manual), and was happy to easily get the correct reading on the ALC position of the meter switch.

Next was to switch to Ip (plate current) and of course dip the final. The dip was small but definitely there. Now with an RF voltmeter connected across the dummy load and the rig switched to CW,

*c/o CQ magazine

The Kenwood TS-530S, a top-of-the-line transceiver from the early 1980s.

I once again flipped the switch to TRANSMIT. What a thrill! Plate current came right up to a couple of hundred milliamperes, the RF voltmeter indicated "life" across the dummy load, and the high voltage peaked at around 800 volts (definitely not solid state). The dip was quite prominent, just like in the old days. The loading control also worked fine, just as I remembered it should, and the dummy load began to heat up rather quickly. In fact, everything seemed to work as well as it did when the rig was new. I must congratulate Kenwood for the great job they did in those days.

For those who are interested, by the way, the 6146s in the output stage produced a solid 120 watts (at 14.300 MHz) when tuned and loaded into a 50-ohm resistive load. A $40 manual antenna tuner completed the "vintage" station and allowed a better than 1.3 to 1 match to a 20-meter dipole on all bands from 20 up to the top of 10. Needless to say, operation was (and continues to be) a pleasure. This is truly a combination of the old (three vacuum tubes) and the new, since the rest of the rig is completely solid state.

I relate this adventure to you for two reasons: The first is to convey that the pleasure I got from operating this "antique" rig was (and is) well worth the price I paid, not to mention the memories it brought back of my earlier years in amateur radio. The second is that the higher quality 20-year and older equipment that is still around has a good deal of steam left and easily can compete with more modern rigs. In fact, a friend of mine with a $2000+ solid-state DSP rig cannot hear much more than my TS-530S, although to be fair, he is able to deal with some forms of QRM better, but electronics is doing the job, not necessarily operator skill. The more than $1700 in savings, however, easily compensates for this "human shortcoming."

The bottom line is that anyone with a limited budget just starting out in or deeply involved in amateur radio can get really top value from equipment such as the TS-530S without breaking the bank. If this excites you, first find some old copies of *CQ* or *QST* and read the various reviews to determine what your dream station (circa 1980) would consist of. Then do a search or take a look at <www.qsl.net> to see what the older equipment looks like. Finally, search at hamfests, dealers, and on the web at <www.e-bay.com>, <www.arrl.org>, <www.eham.net>, <www.classifieds.qth.com>, etc., for your prize. It may take a while to locate it, but it is out there waiting for you! 73, Irwin, WA2NDM

how it works

BY DAVE INGRAM,* K4TWJ

More Notes on Basic Components

A number of readers have asked us to feature more ground-floor details and information on basic components such as resistors, capacitors, and coils, so this month's column honors those requests. As an extra benefit, I will share a few of my own notes and views along the way to add to your general knowledge. An introductory "what they are and what they do" prelude to this discussion was included in my March 2003 "How It Works" column, and it is well worth reviewing at this time. If you misplaced or lost your copy, back issues are still available directly from the *CQ* offices in New York.

Unlike our previous discussion, this month's column highlights many "assumed known" and seldom-printed facts useful for a lifetime. I am sure you will find it most enlightening. Once again we will move quickly to squeeze as much information as possible into our allotted space. Read carefully to absorb all the fine points!

Photo A– Need a specific-value resistor not available in your junkbox? File one to fit using the simple procedure described in the text.

Resistors

As you may recall from our previous discussions, resistors can be separated into two general categories: carbon-granule types in sizes up to 2 watts and wire-wound types in sizes up to 250 watts. With respect to carbon resistors, the only significant difference between an expensive 1%-tolerance type and an ordinary 10%-tolerance type is how close its actual ohmic resistance is to its marked/stamped value. If you have several same-value resistors on-hand, you can use an accurate (20,000 ohms-per-volt or higher) volt/ohm meter to check values and pick your own "1 percenters" from ordinary "10 percenters."

If you still cannot find a specific/desired value (carbon) resistor (isn't that always the case?), you can "make one" by connecting two resistors of double the desired value in parallel (two 1000-ohm resistors are equivalent to one 500-ohm resistor, for example), or by connecting a combination such as a 470-ohm and 27-ohm resistor in series (470 + 27 = 497 ohms). Still inconvenient? Find the closest, but slightly lower value resistor you have, grab a round ("rattail") file, and start filing as illustrated in photo A. Check the resistor's value as you file a "U"-shape groove in its body, and you will notice its ohmic value increases as the groove gets deeper. The resistor's wattage rating also drops with groove depth, so starting with a 1- or 2-watt resistor is a good idea (and it is also easier to file). Check the resistor's value often as you approach the target value, and attaining 1% tolerance/accuracy is easy. Finished? Spray the resistor's open groove with clear non-metallic paint (e.g., Krylon®) or coat it with fingernail polish and connect it in your awaiting circuit. It's that easy.

Another useful technique applicable to resistors in circuits of all types is limiting the range or span of potentiometers. Two examples follow: Let's say you wish to limit the high and low volume levels of a radio, transceiver, or home TV set, or customize the frequency span of a VXO with potentiometer control for tuning. By installing fixed-value resistors at the minimum and maximum ends of the potentiometer, as shown in fig. 1A, the control's overall span is reduced and spread over its full arc of rotation. The amount of reduction obviously depends on the value of the potentiometer and the added resistors. If the potentiometer originally is 50K ohms and we change it to 25K ohms plus add a 12K-ohm resistor "above" and "below" the pot, for example, the control's span will roughly be

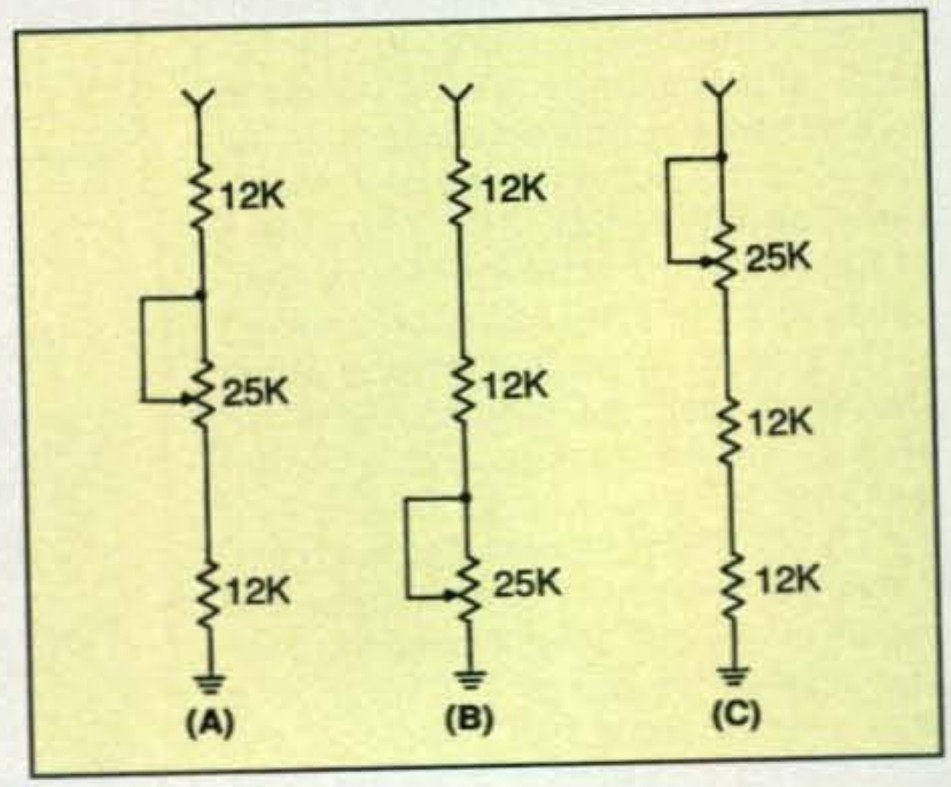

Fig. 1– By adding fixed resistors electrically "above" or "below" a potentiometer (as in [A]), the middle part of its range can be limited and spread over the pot's full arc of rotation. By placing both resistors at the "top" or "bottom" of the potentiometer as in (B) or (C), the upper or lower portion of its range can be limited or spread out. (Discussion in text.)

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e-mail: <k4twj@cq-amateur-radio.com>

Photo B– Have you ever noticed how the rear rotor plates on some tuning capacitors are slotted? It permits slight bending in or out of various areas on the plate so tuning coincides with dial calibration marks.

halved and centered. If we reposition the two 12K-ohm resistors (which may be changed to a single 24K-ohm resistor, if desired) "above" or "below" the pot as illustrated in fig. 1B or 1C, we can shift the control's span up or down from center as desired. Interesting, eh? The more you learn about resistors and potentiometers, the more possibilities for use you will find. Dink, learn, and enjoy!

Yet another "taken for granted" fact worthy of mention here is that potentiometers are produced in both audio-taper and linear-taper versions, and selecting the proper version for a particular application is quite important. Notice the volume control on your transceiver or even your car radio. Most of its effect is right at its low-volume end (a small movement makes a big difference). That is what's called *audio taper*. Then notice the IF Shift or RIT control on your rig. A small movement makes a small difference anywhere within its arc of rotation. That's what we call *linear taper*. Now visualize the result of installing or replacing a volume control with a linear- rather than audio-taper curve. You would "crank up" the volume past half open and hear only mild increases, so the radio would seem weak in audio output. Install an audio-taper pot in a VXO or RIT circuit, and all the bandspread would be crowded into one end of its arc.

How can you ensure you purchase/use the right pot for the application? Some linear-taper pots are stamped with a "Z" after their value. Double checking the arc/action with your volt/ohm meter, however, is always a good idea.

Capacitors

The span-limiting idea mentioned earlier can also be applied to variable capacitors, but we must remember that capacitors connected in series divide in value, while capacitors connected in parallel add in value. As an example, let's say we wish to increase the tuning ease or bandspread of an oscillator or VFO (fig. 2A, B, and C). We simply change the tuning capacitor from a random-example value of 150 pFd to 75 pFd and connect a (fixed) 50-pFd capacitor "across," or in parallel with, its terminals. Then when the tuning capacitor is set to minimum, total capacity is (0 + 50) 50 pFd. When the tuning capacitor is set to maximum, total capacity is (75 + 50) 125 pFd and total span/range is 50 to 125 pFd. Prefer to bandspread only the lower rather than higher end? Just connect the (fixed) 50-pFd and (variable) 75-pFd capacitors in series rather than in parallel (fig. 2C). When the tuning capacitor is then set to minimum, total capacity is (0 and 50) 50 pFd. When the tuning capacitor is set to maximum, total capacity is approximately

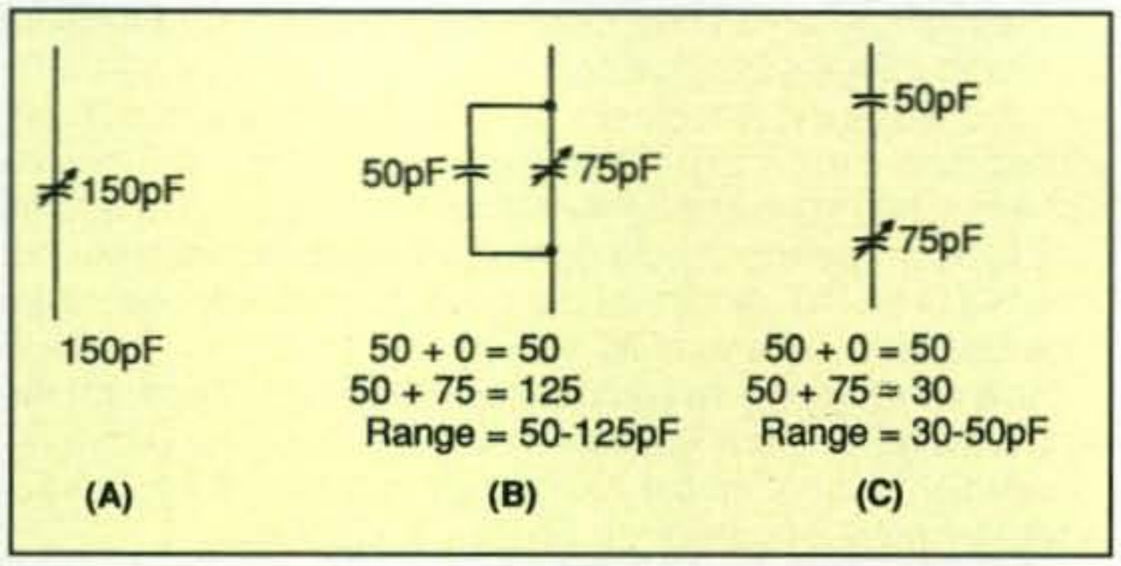

Fig. 2– A variable capacitor's tuning range can also be limited by using a fixed and a variable capacitor connected in parallel or series as discussed in the text. Here (A) is the original capacitor, (B) is parallel capacitors for greater high-end bandspread, and (C) is series capacitors for greater low-end bandspread.

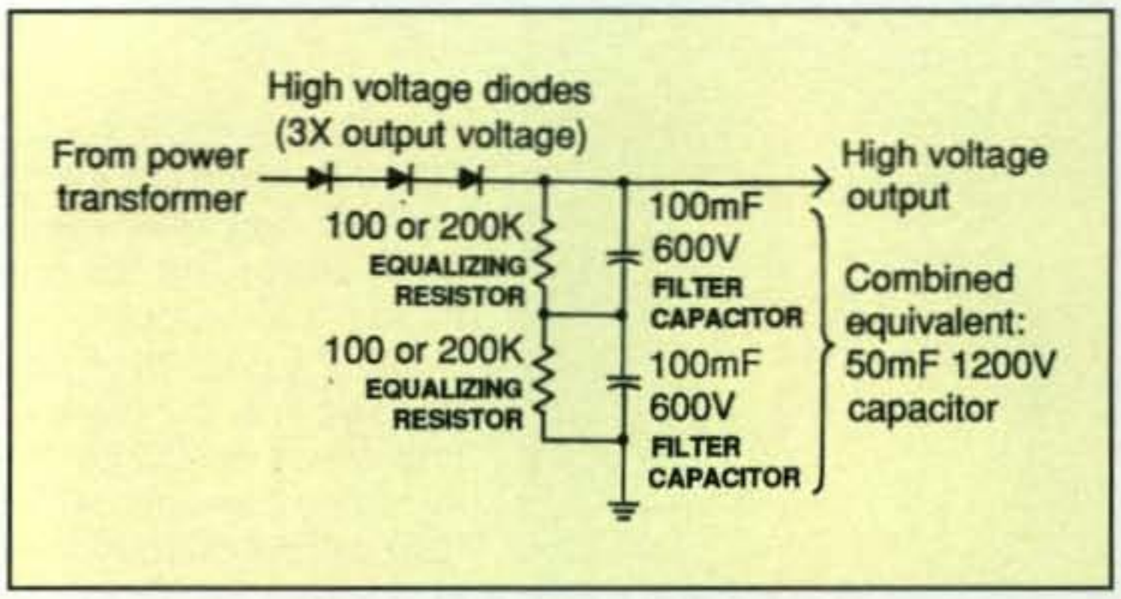

Fig. 3– Many high-power linear amplifiers employ large series-connected filter capacitors to obtain a high voltage rating at fairly high capacitance. In the example shown here, two 100-mFd, 600-volt capacitors produce the equivalent of a 50-mFd capacitor with a 1200-volt rating.

(50 and 75) 30 pFd. The total span/range is 30 to 50 pFd.

Do I sense some readers asking how to bandspread the very low (0 to 30 pFd) range? Delete the fixed capacitor and use a pair of thin/flat needlenose pliers to pull rotor plates one at a time while checking in-circuit tuning range after each "pull." The process here is simple: Firmly grasp the back-most plate with pliers, twist, twist, and pull—just like pulling teeth, except different (photo B)! Avoid bending or warping adjacent plates so they do not scratch or short to stator plates, and the process is a cinch.

If you really get into studying variable capacitors, you may notice some types have slots on their end rotor plates. Why? By bending various plate sections between slots, the capacitor's tuning range can track with fixed dial calibrations. It's wacky, but it works!

Another interesting trick with capacitors is often used in power supplies for high-power linear amplifiers (fig. 3). Here two (and occasionally more) large-value filter capacitors are wired in series and connected "after the diodes" or at the high-voltage output of the power supply. Since high capacity is desired for best filtering and steady output and since capacitors divide in series, you understandably may ask what the benefit is. The answer is an increased high-voltage rating. Each capacitor can handle up to 600 volts, but a pair wired in series can handle 1200 volts. There is a hitch, however. Extra-large-value capacitors must be used so their total (halved) value is still sufficient for good filtering. In our example, dual 100-mFd, 600-volt capacitors act like a single 50-mFd, 1200-volt capacitor. What about the 100K-ohm or 200K-ohm resistors connected in parallel with each capacitor? They equalize voltage across each capacitor so one does not carry excess voltage. When designing/homebrewing power supplies, incidentally, a good rule of thumb is to allocate 1.5 times the output voltage in filter ratings (1200 volts for 800 volts output) and three times the voltage in diode ratings (2400 piv for 800 volts output).

Coils

A coil's inductance can be changed by varying its number of turns—more turns equal more inductance, and vice-versa. Although less known, a coil's inductance can also be changed by a parallel-connected tuning capacitor. This fact becomes attractive when devising tuned circuits for transmitters or antenna matching units from on-hand components. How so? If you feel uncomfortable winding a coil without an exact size form or set gauge of wire, just wind three or four extra turns and mate the coil with a slightly larger value tuning capacitor. Then capacitive reactance (X_c) can cancel excess inductive reactance (X_i) and resonate the circuit.

Notes on Antennas

Similar to tuned circuits, antennas exhibit both inductance (resulting from the length of their conductor[s]) and capacitance (resulting from the space be-

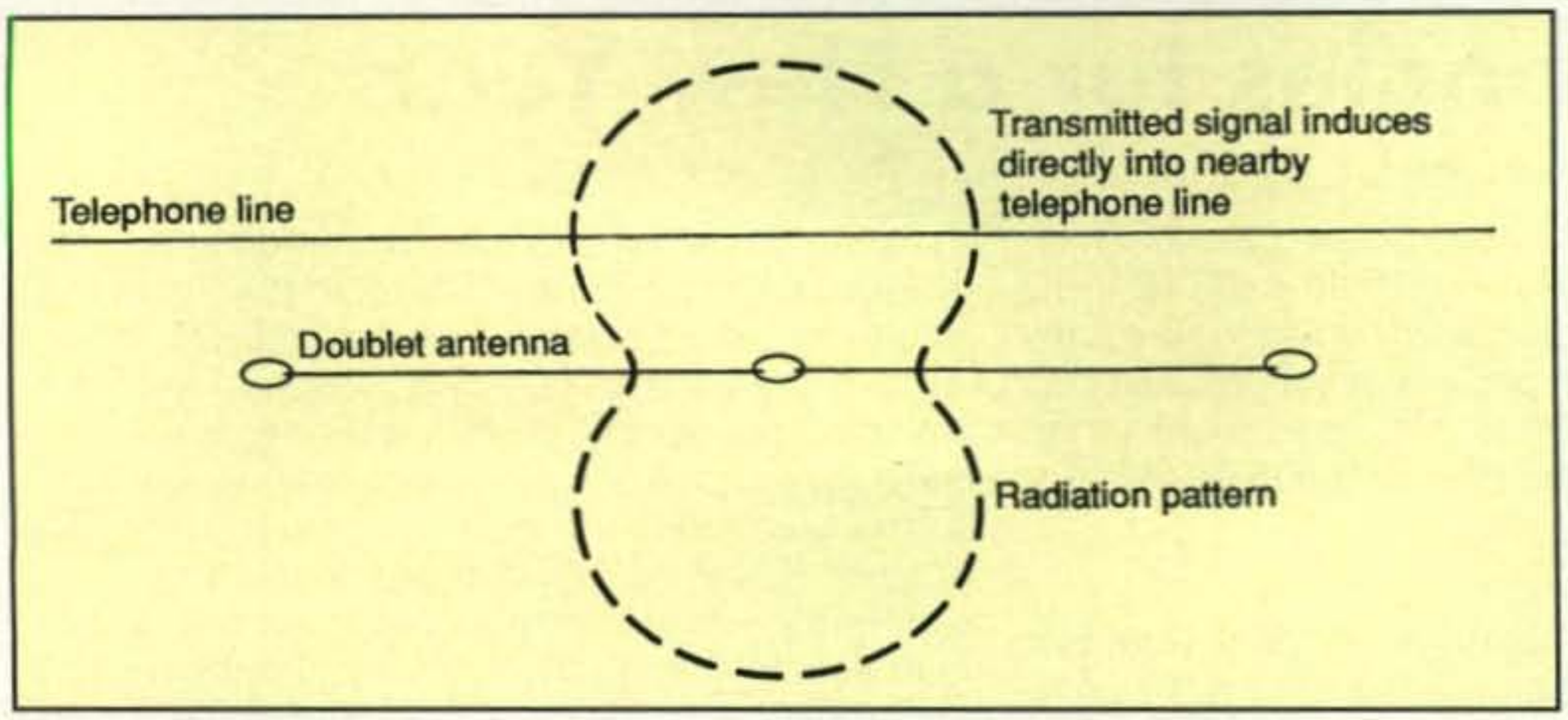

Fig. 4– If a horizontal antenna (such as a doublet) is installed near and parallel to TV cables or telephone lines, RF energy can induce into the cables/lines through sheer inductive coupling, just like open-air coils in a transformer. (Discussion in text.)

tween their conductor[s] and ground). If the antenna is untuned (off resonance), it exhibits inductive reactance if it is too long/too low in frequency, or capacitive reactance if it is too short/too high in frequency. When you use an antenna tuner and switch taps on its coil/inductor, you introduce inductance to cancel the antenna's excess capacitance. When you adjust the tuner's capacitors, you introduce capacitance to equal and/or cancel inductance. When both inductance and capacitance are canceled . . . you guessed it—resonance is achieved. That is the electronic action taking place behind the front panel of an antenna tuner as you adjust its knobs. You control an invisible mix of Inductive Reactance and Capacitive Reactance to support a smooth transfer of RF energy from your transceiver to your antenna. There is no doubt about it, friends: Electronics and amateur radio are captivating pursuits of the best kind!

Column space is now short, but before leaving antennas, I wish to briefly mention today's common idiosyncrasy of RFI (which is often mistaken for TVI). This phenomenon results when signals radiated from your antenna directly couple into close-by TV antennas, telephone lines, or power cables. The weaker the TV or telephone signals and/or the stronger your transmitted signal (and the closer your antenna to TV/telephone lines), the more pronounced the interference. It is a simple case of RF overload, and it is also most pronounced when your ham antenna is installed parallel to TV/telephone lines (it produces an open-air transformer), fig. 4. Remember, too, unseen wiring in the attics of many houses may easily be oriented parallel to your antenna. What to do? Reduce power or reposition your antenna at right angles to other lines. Raising the antenna higher also helps, and it improves your transmitted signal to boot.

On that final note we must now bow out for another month. Thanks to one and all for your continuing support and interest in this column. Our greatest reward is knowing you find it helpful.

73, Dave, K4TWJ

what's new

BY KARL T. THURBER, JR.,* W8FX

New Goodies for a New Year

A very hearty and happy New Year to all our readers! That having been said, let's dig right in. We'll focus on some noteworthy ham shack radio gear and accessories, antennas and antenna accessories, Net news, books, and other items of interest in this brand new year.

Radio Gear

The Family Radio Service ICOM IC-4088A. Okay, most *CQ* readers are licensed radio amateurs, not CB-type radio users. However, "personal communications" has grown up since the "glory days" of 27-MHz CB radio, so we should seriously consider personal-comm services such as the relatively new, UHF-based, low-cost, no-license Family Radio Service (FRS). Let's do just that before we get into new hardware for this interesting radio service.

The FRS arguably is the first really useful license-free radio service for the general public. These radios are not kiddie talkies; the quality of most of the radios is amazing! They're great for camping, biking, hiking, visits to the mall and amusement parks, and neighborhood watches. Even family members with no particular technical interest will likely use these radios. There are indeed many great radios to choose from today.

Some manufacturers have received approval to market radios certified for use in both the Family Radio Service (FRS) and the General Mobile Radio Service (GMRS). Radios marketed as "FRS/GMRS" or "dual-service radios" are available from many manufacturers. The manual that comes with the radio, or the label placed on it by the manufacturer, should indicate the service for which the unit is certified.

Photo A– The ICOM IC-4088A is a Family Radio Service (FRS) radio that combines simplicity, convenience, and range. ICOM developed the radio in response to consumer feedback that said people loved FRS, but often were frustrated by the radios' typically short range. A "stubby" antenna is an available option. (Photo courtesy ICOM America)

Not to be outdone, ICOM is promoting the new IC-4088A (photo A), an FRS radio that combines simplicity, convenience, and range. ICOM developed the radio in response to consumer feedback that said people loved FRS, but often were frustrated by the radios' typically short range. Because it isn't possible to increase the power in an FRS system, ICOM instead redesigned the antenna to reportedly provide up to 20 percent more range.

In addition to sturdy, water-resistant construction, the IC-4088A features a built-in voice scrambler for increased privacy, rechargeable NiCd batteries, a wide selection of optional headsets and microphones, 14 channels, and 38 CTCSS frequencies. For more information and pricing, contact ICOM America, Inc., 2380 116th Ave. N.E., Bellevue, WA 98004 (425-454-8155; on the web: <http://www.icomamerica.com>).

Postscript: Be sure to note our coverage of the Popular Wireless Magazines web page, a series of free online magazines for various wireless services, including FRS and GMRS. You'll find the web page described later on in this column.

Antennas and Accessories

Isotron 20/15/10 Combo Antenna. The Bilal Company produces the popular Isotron antennas. Proprietor Ralph Bilal, WDØEJA, began marketing the compact antennas in the mid-1970s for those with space restrictions and those who were looking for "something different" in their antenna systems.

The Isotrons are compact, horizontally polarized HF antennas. They handle up to 1000 watts PEP; require no tuner, radials, or motors; and are designed to solve portable and restricted-space problems with easy, quick, and simple installations. As such, they lend themselves to emergency, Field Day, motel, maritime, and similar use where large antennas are out. Their durable construction is of tempered aluminum, PVC, and cast acrylic, with stainless-steel fasteners, for use even under extreme weather conditions. Back-to-back mounting for multiband use is possible. All models have an SO-239 coax connector. A one-year warranty on material and workmanship is standard.

Single-band Isotrons are available for 160 through 6 meters, including individual units that cover the 15-, 17-, 12-, or 11-meter band. Also available are combination models that allow two- or three-band operation with a single feedline.

A new, rugged three-band package is the Isotron 20/15/10 Combo (photo B). It comes complete with a wiring harness so that all three antennas can be fed with one feedline. Mounting is on a standard metal mast. Complete coverage of the 20- and 15-meter bands is possible with a 2:1 SWR or lower; 10-meter coverage is 1 MHz. All antennas are tunable for desired center frequency.

The array is 32 inches across and boasts an omnidirectional pattern. The package retails for

*289 Poplar Drive, Millbrook, AL 35054-1674
e-mail: <w8fx@cq-amateur-radio.com>

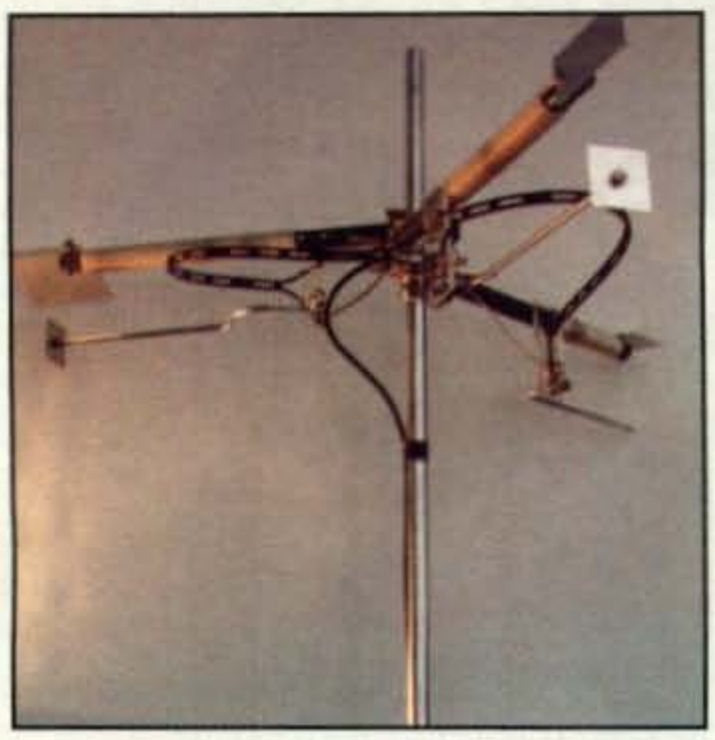

Photo B– The Isotron 20/15/10 Combo is a rugged, three-band antenna package which comes complete with a wiring harness so that all three antennas can be fed with one feedline. (Photo courtesy the Bilal Company)

$198.95 plus s/h; 17- or 12-meter coverage can be substituted if desired. You can order directly, through Isotron dealers, or via the web.

For more information, contact the Bilal Company, 137 Manchester Drive, Florissant, CO 80816 (719-687-0650; on the web: <http://www.catalogcity.com>). Also check out the website for a discussion of Isotron antenna technical details and performance, as well as magazine reviews.

Remotely Controlled Antenna Switcher. In these days of "high-tech everything," are you tired of manually switching among antennas, bands, and radios? Relief may come in the form of the Remotely Controlled Antenna Switcher (photo C), invented by Ranko Boca, YT6A. An essential device for every ham shack, it lets you automatically switch among antennas, bands, and radios.

The main benefit of the Remotely Controlled Antenna Switcher is that you can keep the switcher unit and all of the coax cables coming into your shack away from your desk, bringing just one feedline to your rig. Only the controller unit needs to sit next to it. The switcher is equipped to handle up to 5 KW power output, key down.

All of the controllers and switches are assembled using the highest quality of PC boards, mounted in sturdy enclosures. The 2 KW unit has a PL connector and the 5 KW unit has an N connector. Both units work with two pairs of relays in the switching points. Reportedly, insulation between outputs is more than 50 dB, and insertion loss on 30 MHz is less than 0.018 dB. The six-way SO2R

Photo C– The SO2R Antenna Switch with two MB-1 Controllers. The antenna switch has six inputs and two outputs or reverse; the unit can fully automate switching for a single operator and two transceivers. The prices noted in the column for the Remotely Controlled Antenna Switcher include the switcher itself and two controllers. A control cable is sold separately. (Photo courtesy Jovan Peric, KB9K)

Antenna Switch with MB-1 Controllers is priced at $405 for the 2-KW model, or $635 for the 4-KW model.

For more information, contact Jovan Peric, KB9K, at Mr. Ham Radio, 3425 W. Ardmore Ave., Chicago, IL 60659 (e-mail: <kb9k@mrhamradio.com>; on the web: <http://www.MrHamRadio.com>). Be sure to visit the website, where you can view technical details and see the various antenna switchers displayed.

MAXRAD Adds Grids to its WISPerformance™ Antenna Line. Antenna manufacturer MAXRAD, Inc. has announced the addition of a new series of parabolic grid antennas to its successful WISPerformance line of affordable wireless internet antennas. The new lineup consists of three new

Photo D– MAXRAD, Inc. has announced the addition of a new series of parabolic grid antennas to their WISPerformance™ line. The three new models are designed for use in wireless ISP applications requiring minimum wind loading and maximum durability. The new WISP24019PTNF, shown here, provides 19 dBi of gain, with a VSWR of less than 1.5:1. (Photo courtesy MAXRAD) ⟶

models designed for use in wireless ISP applications requiring minimum wind loading and maximum durability.

The WISPerformance™ parabolic grids are ideal for point-to-point or wireless bridging applications operating in frequencies between 2.4 GHz and 2.7 GHz. They are vertically polarized and DC grounded, and their rugged, zinc-plated, cold-rolled steel design features a polyester-powder-coat finish that provides maximum protection against weather elements.

The three models are intended to provide high gain and maximum value and reliability in a compact, rugged design. The WISP24019PTNF (photo D), the WISP24021PTNF, and the WISP24024PTNF provide 19 dBi, 21 dBi, and 24 dBi of gain, respectively, with a VSWR of less than 1.5:1. All models include a 24-inch RG-58/U pigtail terminated with an N-type female connector. The antennas are designed for mast mounting and are shipped complete with all required mounting hardware.

Contact MAXRAD, Inc., 4350 Chandler Drive, Hanover Park, IL 60133 (phone 1-800-323-9122; e-mail: <sales@maxrad.com>; on the web: <http://www.maxrad.com>). You can view various MAXRAD catalogs online, including a the "Quarterly Specials" catalog of attractive offers, as well as a quarterly MAXRAD newsletter.

New on the Net

Popular Wireless Magazines. This interesting and informative web page actually is a series of "popular wireless magazines." The free online magazines were originally developed for anyone interested in exploring various two-way radio options, including GMRS or FRS for family communication. The site was described by its author as a way of sharing what he gleaned from the internet and other sources after obtaining his own GMRS license.

Now, the website includes a variety of offerings, including the GMRS Web Magazine (see fig. 1), CB Web Magazine, the BCB (Broadcast Band) DX Web Magazine, and the Personal Wireless Bulletin Board, among other features. The bulletin board includes various communications options such as GMRS, FRS, CB, amateur radio, weather radio, scanner radio, SWLing, Global Positioning System (GPS), and several other wireless and related areas of interest. The website is designed to provide helpful information to the public for all of these options, so go to <http://www.gmrsweb.com>; or e-mail: <Wireless@popularwireless.com>.

From the Bookshelf

Sparks what's going on? Richard Brunner, AA1P (rbrunner@gis.net), sent *CQ* an e-mail that described an ambitious publication project he was involved with, one which should be of interest to many amateurs who have a curiosity about radio history.

It seems that some of his friends in Germany, retired ship radio operators, have published a collection of sea stories from 20 countries, in English, for wide dissemination. *Sparks what's going on?* (fig. 2) had four or five translators—and five English reviewers from Switzerland, England, Australia, New Zealand, and America—involved in the project. Richard was one of the reviewers correcting the manuscript for acceptable English prose. Most of the stories are funny, some are touching, and all are interesting and very rewarding.

Some background: On February 1, 1999 radiotelegraph service on board ships was ended. The radio officers were no longer needed, so they left the ships; the majority of coastal stations

terminated their services. The grand era of the transmission of messages via Morse code had lasted almost 100 years. Former German ships radio officer Sylvester Focking, DH4PB, distributed 700 copies of his CD album "Radio Telegraphy Worldwide News." In many letters the operators confessed that they listened to the recordings with tears in their eyes, and they raved about the tremendous years of this profession. To prevent total oblivion of a profession, DH4PB—together with ex-colleagues Rolf Marschner, DL9CM, and (Dutchman) Hans Polak—collected radio stories of colleagues from all over the world to publish them in *Sparks what's going on?*

In 300 pages some 64 colleagues from 20 nations tell more than a hundred partly illustrated stories in English. These include many dramatic and funny stories of life at sea and at the coastal stations. There is something for everyone in the book, and for 13.00 Euros (plus postage and packing), it's quite affordable. The book is published on a nonprofit basis, and the authors declined the author's fee.

For more information, as well as details on pricing, shipping, and payment, go to <http://www.seefunker.de> and click on "Sparks what's going on?" Then click on the German or English flags on the right (your choice of language).

Three from Que Publishing. Three very interesting and helpful computer books from Que Publishing crossed our desk recently.

First up, and smallest in size, is *Best of the Internet,* 2004 Edition, by Joe Kraynak. Priced at $9.95, the 432-page book is for those with beginning to intermediate computer skills. The book is billed as "the ultimate mini-guide for finding the best information on the internet fast and conveniently." As such, it's

Fig. 1– The informative GMRS Web Magazine Page is part of a series of "popular wireless magazines" presented on the Popular Wireless Magazines website. The free online magazines, plus the Personal Wireless Bulletin Board, are for exploring various two-way radio options, including GMRS, FRS, and even amateur radio. Go to <http://www.gmrsweb.com>. (Screen capture from the Popular Wireless Magazines website)

a small, convenient, informative guide to those websites deemed to have the "best" information on the topic. New for 2004: All the sites are identified either as kid-friendly or adults-only, plus there's a very informative section on the wireless web.

Next up is Que's *Official Internet Yellow Pages,* 2004 Edition, also by Joe Kraynak. At $19.99, the 1136-page book is for beginners. With links to thousands of the best sites on the web, it's billed by the publisher as the ultimate resource for quickly finding information on the internet. The book uses icons to designate which sites are considered the "best of the best," as well as those which are appropriate for children, are ecommerce sites, and are most usable.

Finally, just for advanced users, is *Platinum Edition Using® Microsoft® Windows® XP,* by Robert Cowart and Brian Knittel. It's a massive, super-comprehensive opus, clocking in at about 1440 pages and priced at $59.99. The book contains high-gear content for the Windows user who wants to set up complicated networks, manage multiple users, keep everything secure, hack the registry, and write time-saving scripts. It doesn't waste time telling you how to simply live with Windows®. Instead, it tells you how to squeeze every last drop of performance from it. The accompanying CD contains one hour of full-motion, how-to video presenting Windows® XP topics by the book's authors.

The three new Que books are available in bookstores, or contact Pearson Education, 200 Old Tappan Rd., Tappan, NJ 07675 (1-800-922-0579; web: <http://www.quepublishing.com>).

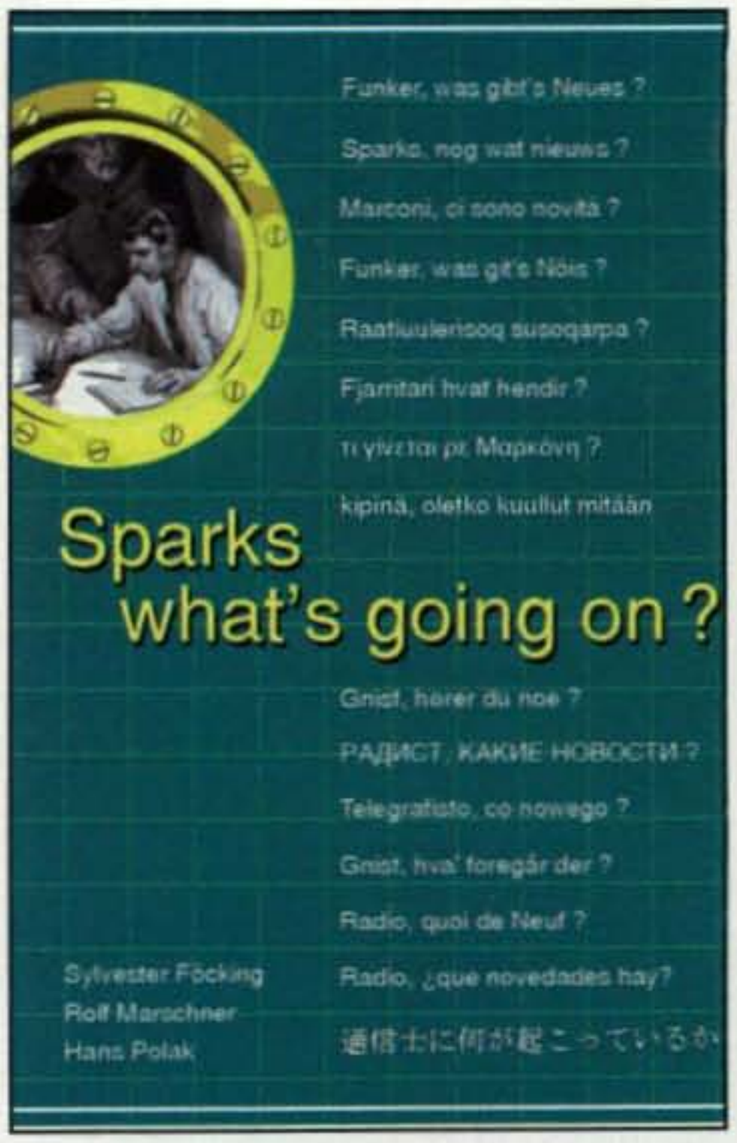

Fig. 2– Retired ship radio operators in Germany have published a collection of sea stories from 20 countries, in English. Most of the stories are funny, some are touching, and all are interesting. (Screen capture from the <www.seefunker.de> website)

Wrap-Up

That's all for this time, gang. Next time, more "What's New." See you then.

Overheard: Remember that when embarking on a new venture or adventure, you should ask as many successful people as you can for their valuable advice and suggestions. You might be surprised at what you learn!

73, Karl, W8FX

7 GREAT New Books from CQ

Heathkit - A Guide to the Amateur Radio Products

by Chuck Penson, WA7ZZE

This greatly expanded Second Edition is a must for collectors and Ham history buffs, but is a terrific trip down memory lane for any Ham who was there or wishes he had been. Pick up this 328-page volume and you won't be able to put it down!

Order No. HEATHKIT ***$29.95***

The Short Vertical Antenna and Ground Radial

by Jerry Sevick, W2FMI

This small but solid guide walks you through the design and installation of inexpensive, yet effective short HF vertical antennas. With antenna restrictions becoming a real problem, this book could keep you on the air!

Order No. SVERT ***$10***

Understanding, Building & Using Baluns & Ununs

by Jerry Sevick, W2FMI

The successor to the popular and authoritative *Baluns and Ununs.* Great deal of new tutorial material, also includes new designs not in his previous book, and crystal clear explanations of how and why they work.

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Ham Radio Magazine Anthologies

Introducing the first four of a new series of anthologies drawn from the pages of *Ham Radio* magazine. Now you can enjoy collections of the best material published in *Ham Radio* magazine, conveniently arranged by subject and by original publication date. Choose your interest, your time period, and choose your Anthology.

Homebrewing Techniques - This anthology brings together the most useful and practical advice and techniques for the person who wants to build anything from small solid state projects to beam antennas.

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Test Equipment & Repair Techniques - From building test gear to trouble shooting the rig, this anthology of the best articles on the subject has been carefully selected to meet today's needs. Includes techniques and devices that work and are easily duplicated, and gives today's Hams a much-needed helping hand at solving equipment problems on their own. **Order No. ATEST $19.95**

Ham Radio Anthology: Antennas - Carefully selected, these first two antenna anthologies cover all types of antenna designs and theory from 160 meters through microwaves. All articles have been selected to be as timely and valuable to today's Ham as they were to *Ham Radio* readers of the time. These first two volumes will be followed by two additional volumes.

Antennas - 1968-1972.....**Order No. ANT1 $19.95** **Antennas - 1973-1975**.....**Order No. ANT2 $19.95**

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BY JOE LYNCH,* N6CL

New Ultra-High Microwave Records

Brian Justin, WA1ZMS, reports what he believes to be the first QSO above 400 GHz in the U.S. This past November 11 at 0215 UTC, Brian worked Pete Lascell, W4WWQ, on 403 GHz over a distance of approximately 1709 feet. Both stations were in Virginia. Brian set new North American records on 241 and 322 GHz in December 2002, and he reports that the pair used the same basic gear that was put into service for their then-record-making 241-GHz QSO, but with new 30-cm parabolic dishes.

Not being content with their 403-GHz accomplishment, three days later, on November 14 at 0157 UTC, Brian and Pete broke their old 241-GHz record. Pete writes: "The weather was too good to ignore last night, so we busted our old record by three times on 241 GHz. We were very surprised with the results, thinking we had stretched our limit, and when the signals were rocking at ~35 km, we were not prepared to move on out for a greater distance. We had not preplanned for another high location to the east to get back to the Blue Ridge Parkway in Virginia. The locations were the Apple Orchard Overlook on the parkway, east to the parking lot of the Wingate Inn on the side of Candlers Mountain. I couldn't find a location in their parking lot to claim 35.00 km, so we will live with the 34.9 for now. By the time you read this, there should be pictures and audio files on the MGEF website, <http://www.mgef.org/>."

Brian writes: "The cold and dry weather was calling and we just had to try to break our own world DX record of 11.4 km on 241 GHz. Here are the specifics of the new claimed 34.9-km record: Date, November 14, 2003; time 01:57 UTC; WA1ZMS/4 (FM07fm), 37-31-19.3N, 79-30-14.4W and W4WWQ/4 (FM07ji), 37-21-14.1N, 79-10-13.6W; and distance 34.9 km.

"The weather at the time of the QSO at the WA1ZMS/4 QTH: Temp –3.3° C; dew point –14.4° C; relative humidity 42%; and station pressure 874 millibars. The weather conditions resulted in a total atmospheric loss of 0.673 dB per km.

"The weather at the time of the QSO at the W4WWQ/4 QTH: Temp 3.3° C; dew point –12.2° C; relative humidity 31%; station pressure 992 mb. The weather conditions resulted in a total atmospheric loss of 0.820 dB per km.

"The WX conditions being different at each end of the QSO made for some interesting predicted signal margin calculations. The actual measured signal margin on the WA1ZMS/4 end was as high as 13 dB. The wind was very strong at both locations and that made for some signal fading."

(Sources for this report include Buck Rogers, K4ABT, and the ARRL Letter, *Vol. 22, No. 45.)*

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Using a safely filtered telescope, Ginger Mayfield, of Divide, CO, captured this view of the November 2, 2003 X8 flare shortly after its peak. (Photo used with permission)

VHF Plus Calendar

Jan. 4	*Quads* meteor shower predicted peak; Poor EME conditions
Jan. 5	Full Moon
Jan. 6	Highest Moon declination
Jan. 11	Good EME conditions
Jan. 15	Last quarter Moon
Jan. 18	Poor EME conditions
Jan. 19	Moon perigee
Jan. 20	Lowest Moon declination
Jan. 21	New Moon
Jan. 24–26	ARRL VHF Sweepstakes Contest
Jan. 25	Good EME conditions
Jan. 29	First quarter Moon
Jan. 31	Moon apogee
Feb. 1	Poor EME conditions

—EME conditions courtesy W5LUU.

The Sun Illuminates the VHF-Plus Ham Bands

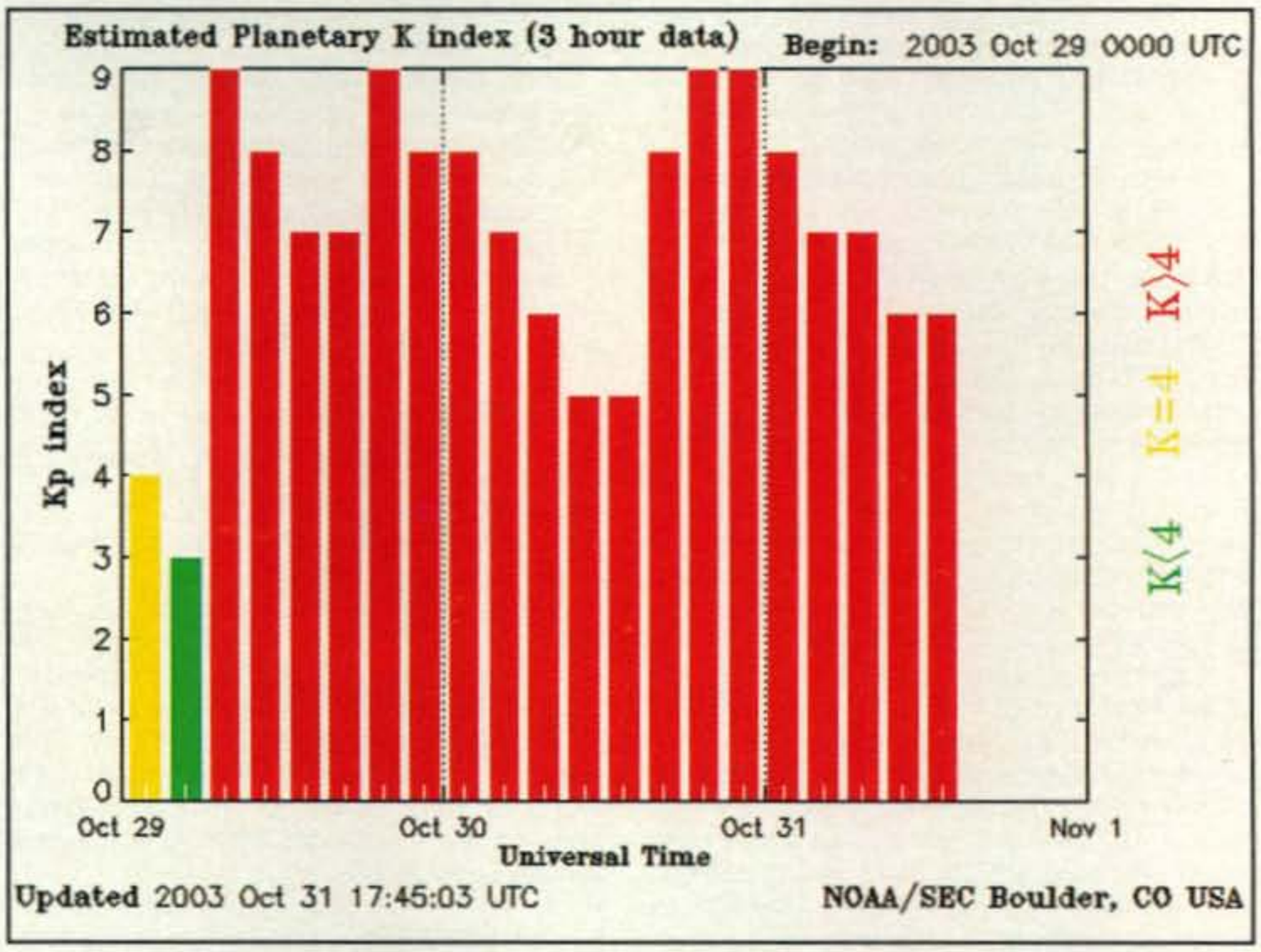
Late October through early November last year was marked by several days of Sun-induced propagation. This propagation included both aurorae on 6, 2, and 1.25 meters, as well as *F2* propagation on 6 meters.

The genesis of all of this excitement was a sunspot cluster known as sunspot 10486, or simply sunspot 486. This Jupiter-size cluster was the site of several eruptions, beginning with an X17-class flare on 28 October. The result on earth was that a coronal mass ejection (CME) aimed straight at Earth forced the three-hour running average of the *K*-index, as reported by NOAA/SEC Boulder (http://www.sec.noaa. gov/rt_plots/kp_3d.html) to go from an average value of 3, to 9, beginning at 0700 UTC. Dropping off to 8, then 7 for the next nine hours, it again rose to 9 when another CME—this one caused by an X10-class flare—hit the Earth at around 1700 UTC on 30 October. The *K*-index remained high for the next 42 hours. There would be another six hours when the average would be at the 9 level. Gradually tapering off to the 6 level, then 5 and 4, it finally returned to high normal on 1 November.

Sunspot 486 was not through with its eruptions, however. On 2 November an X8-class flare delivered a CME to Earth, causing the average *K*-index to rise to 7 for approximately three hours. Then on 4 November an estimated X28-class flare exploded from this sunspot. By this time, however, the sunspot had rotated to near the edge of the west limb of the Sun. This position of the sunspot caused the flare to give Earth just a glancing blow, thereby causing the three-hour average *K*-index to rise to only the 7 level on 6 November.

All told, this cluster delivered three X10 or above class flares during late October and early November. These three flares each landed in the top ten of the record keeping of flares dating back to 1978. The X28-class flare is still an estimated number, since during its eruptions it saturated the sensors on the Geostationary Operational Environmental Satellites (GOES) for several minutes. A GIF movie of the eruption is available at <http://sohowww.nascom.nasa.gov/hotshots/2003_11_04/>. The file is 34 megs, so you will need a DSL or cable service to download it during a reasonable time. More information on this solar activity may be found in the "Propagation" column by Tomas Hood, NW7US, elsewhere in this issue.

As of this writing, indications from the far side of the Sun are that sunspot 486 remains an active cluster. Next month I will report on whatever transpired during late November and early December. Below are reports your editor received from several hams who took advantage of the Sun's activities during late October and the first few days in November.



This is a plot of the estimated planetary K-index. This index is derived (at the U.S. Air Force Space Forecast Center) using data from ground-based magnetometers at Meanook, Canada; Sitka, Alaska; Glenlea, Canada; Saint Johns, Canada; Ottawa, Canada; Newport, Washington; Fredericksburg, Virginia; Boulder, Colorado; and Fresno, California. These data are made available through the cooperation of the Geological Survey of Canada (GSC) and the US Geological Survey. K-indices of 5 or greater indicate storm-level geomagnetic activity. Geomagnetic storms have been associated with satellite surface charging and increased atmospheric drag. (Graph courtesy NOAA)

Activity Reports

Pete Heins, N6ZE, reports: "Rare, bright visual display of aurora noted by N6ZE on 30 October 2003, between 0100–0215 UTC. Flight altitude 39,000 ft. This aurora was observed from NJ to Columbia, SC, even with a bright half moon in the SW sky. The aurora curtain was typically up to 5 degrees up from the horizon between Gordonsville, VA and Greensboro, NC, reaching up 15 degrees from the horizon at its brightest. I saw the aurora curtain from bearing approximately 240 degrees to 330 degrees at 0130 UTC. The aurora curtain was white and exhibited no shimmering. I made turn to the south at Columbia, SC and lost sight of the aurora, but it was still above the horizon at that point. (I couldn't inconvenience the passengers!)"

Paul Kelley, N1BUG, reports: "There were weak traces of 50 MHz radio aurora here from 1000–1800 UTC on 29 October. The buzz turned strongly southward at 1800 and by 1830 signals were rapidly increasing. By 1900 there was strong aurora on 144 MHz and some on 222 MHz. By 2000 the signals had mostly faded, as the aurora had gone south of my location! Later images from Polar VIS confirmed this.

"Aurora continued weakly on and off until approximately 0200 UTC. No long-range DX was worked. Signals were generally weak and few, with brief good periods. I made contacts on 144 and 222 MHz. Heard several stations briefly on 432 but could not attract their attention!

"There was a brief time around 0130 UTC on 30 October (Note the same time as with N6ZE above.—ed.), just before the aurora faded out, that I heard WØVB (EN34) on 144 MHz with an almost T9 note and very strong for that distance (S9+). There appeared to be auroral-*E* for about 10 minutes, and then everything was gone.

"This was not a good aurora here, as it was too far south. However, I'm sure the guys in the southern U.S. had a great time!"

John Butrovich, W5UWB, reports: "The following was worked on 6 meters: On 29 October: NH7RO, BK29; KH6IAA, BK29; HC3AP; WA5LFD, EM12; W4SO, EL96; and XE1AVM, DK79. On 30 October: ten W7s; five W6s; YV4DDK, FK60; YV4YC, FK60; HP1DCP, FJ09; and HP1AC, FJ09.

"Continuing on 30 October, the aurora did reach this far south, but only on receive. The following stations were heard but I was unable to get their attention: K5CM, W5HUQ, K5CM again, and K5YY. At 2004 UTC I did manage to work K5CM (55A) on 144.205. A minute later I had a partial QSO with K5JL. Unfortunately I had to leave for the big city and missed the rest of the opening. Antenna heading was best at 030 degrees."

Sam Whitley, K5SW, reports: "I was gone until 2045 UTC on 29 October. I'm not sure how long it had been going before then. From Oklahoma (on 144 MHz) I worked west Texas (DM95) and Colorado (DM79) to the west. Never heard the Wyoming station; others such as NØPB in northern Missouri worked—just stuff to the north like Nebraska, Iowa, Illinois, Indiana, but the best signals came from the northeast such as New York, VE3, New Jersey, Maryland, Virginia, North Carolina, Pennsylvania. I missed the Rhode Island and Connecticut stations as I had to leave three times for family duties. I worked Tennessee, Kentucky, and south Texas (EM20/31/00/EL29). Most signals peaked near 30 degrees, at one time had a peak at 60 degrees, and K9MRI (EN70) peaked at 20 degrees west of northernmost opening (I'm sure it relates to where he was pointing his antenna).

"Most consistent signals were from K2AXX (FN12), VE3AX (FN02), K2SMN (FN20, K2TXB (FM29), K4QI (FM06), and K9MRI (EN70). This aurora was not as southerly as the one (from OK) March 13–14, 1989, where with the antenna due east I worked South Carolina, Georgia, Florida, and so forth, and due west worked Nevada, Arizona, New Mexico, Colorado, and Wyoming. As the opening began to drop out after 0100 UTC 30 October, I heard NØPB and WBØDRL still making QSOs when I couldn't hear the other station being worked.

"On 222 MHz I only spent a little time there working close-in stations such as NØLL EM09, WRØF EM29, and WØEKZ EM17. I never heard any real DX in the short time I spent there.

"This was a nice opening after a long dry spell especially after all the hype from the news services over the last few days. I listened a little (on breakup of the aurora) on 50 MHz but never heard the KH6 stations coming through to 9-land stations being reported on prop logger."

Doug Beck, K6ZX, reports: "I found the band open at noon PST today. Worked four more contacts, including one in Bakersfield, California, way to the south of me. I was aimed somewhat east of north for the contact."

David Tanner, VK3AUU, reports: "We have just finished an aurora opening in VK [on 30 October]. It ran from around 2000 UTC to 2250 UTC or a little later. Signals showed a negative offset of between 400 and 1200 Hz on 144 MHz. From my QTH at QF21wt signals were heard from Kangaroo Island about 700 km west, Hobart 600 km south, 650 km due north, and Taree, which I guess is at least 700 km northeast. Some signals were also heard/ worked by others on 432 MHz, I don't have any details."

Kent Britain, WA5VJB, reports: "This afternoon we did indeed have quite an opening on 144 and 222 MHz. The 2-meter calling frequency sound like quite a pile-up, but I worked a couple of zeroes from Texas on 222.1 MHz

CW. This is only the 5th aurora that I've ever heard in Texas during 30 years of operating."

Pat Dyer, WA5IYX, reports: "Between 2130–2220 UTC on 20 October severe co-channel QRM was noted to KBEJ-2 here. It seemed to be peaking south (hard to be exact, as KBEJ is <50 miles north), and using the FT-847 the 55.24/25 MHz video carriers sounded like backscatter. No audio was noted (or could override the local and its slop on 59.760).

"Between 2220 UTC on 30 October and 0000 UTC on 31 October, some seven KH6's were worked on 50 MHz amidst many huge backscatter mainland signals. Around 2300 UTC it finally dawned on me that many of the Pacific NW signals were 'too clean' to be backscatter, so I turned the antenna direct—it had been at the endstop at 270 via south—and was greeted with monster Washington and Oregon signals, up to 40 over S9.

"The only sustained prior Pacific NW W7 direct *F2* event that I've noted down here was on November 27, 1989, c. 1800–1830 UTC, and mostly Washington (with VE7 preceded by VE6). No magnetic storm for that—SFX = 246. ABo = 12. This one got even shorter, with WA6KLK heard direct at 2342 UTC and K6UM QSO at 2347 UTC (BD.EXE puts CM88nk at 1519 miles—so *very* short *F2*).

"I was hoping that it might even shorten to the SF Bay area. The W6–7 direct paths were gone by near 0000Z (about local sunset). I don't know how many fully appreciated the extreme rarity of the event. This all would agree well with the report of KHON-2 from Honolulu being logged in Shreveport, LA during the time period."

Jan Carman, K5MA, reports: "Here are two rather unusual aurora QSOs that took place on October 30, 2003 during two of the many aurora-enhanced long-range DX sessions on the 2-meter band. During both sessions (October 29, evening east coast time and October 30 mid-afternoon east coast time) I had been working aurora contacts on both 144 and 222 MHz to the southeastern and midwestern states (and also to VE3).

"The aurora signals all peaked up within 20 degrees of due west from my Cape Cod, MA location (FN41QO). Both of the following two QSOs occurred near the end of the enhanced condition sessions: (1) October 30, 0041 UTC, 144.210 MHz CW K5YPV EM54MR, Mississippi, both reports 55A; (2) October 30, 2034 UTC, 144.213 MHz CW AD4OK EM54KF, Mississippi, sent 55A, received 59A.

"Using the 6-digit grid squares, the ranges for these two QSOs are: K5MA to K5YPV, 1774 km and K5MA to AC4OK 1816 km. These two ranges fall short of the current aurora records (continental North America) by about 300 km. I'm assuming these two QSOs were aurora, not auroral-*E*. The sound characteristics of the contacts were slightly different from a pure-aurora QSO, and they could possibly have been auroral-*E*. However, the sound characteristics were definitely not as pronounced as those during my June 1991 auroral-*E* QSO with VE4AQ (on the ARRL's Claimed Distance Records list).

"It would be interesting to see if any other long-range aurora QSOs were made around the same time as these and have possible auroral-*E* characteristics. Also, auroral-*E* normally occurs on the east/west paths near the US/Canadian border. These two QSOs were a much farther path. However, the degree of aurora enhancement from the current huge solar disturbance could possibly explain this rather unusual event."

John Geiger, NEØP, reports: "Wow! Who would have thought that Wednesday's aurora was just a warm up for the big event Thursday! The aurora this far south was definitely better on Thursday. I left work early when I saw aurora reports on the reflector, and got home to find 2 meters going strong. K4QI was booming in here from FM06, at times hitting S7. WØAH was hitting S9 at times from DM78.

"Stations worked on 2 meters were K4QI, FM06, 1083 miles; W4MYA, FM07, 1153 miles, best DX; K9MRI, EN70; K5QE, EM31, farthest south; WØBJ, DN91, new grid; N5FAC, EM35; and WØAH, DM78. I heard N5BLZ from EL29 on aurora, but didn't get him. Also heard EM00 on AU, so this got pretty far south.

"Then I went to 6 meters for some auroral-*E* and *F2*. The KH6's were really coming in last night—reaching S9 at times. I worked KH6/K9FD from BL11, AH6RE from BL02, and KH6/WA2HFI from BK29. The first two were new grids on 6 meters. Worked NØLL from EM09, and then picked up two additional new grids on 6 meters from W5HUQ EM35 and WA5IYX from EL09.

"It was also exciting to hear Mike, NH6CJ, and Art, KA5DWI, work W5HUQ for state number 49 for both of them. They now join myself, NL7CO, and WB5AFY as needing only RI for 6-meter WAS."

Jeff Klein, K1TEO, reports: "Lots of fun on the Aus the last two days. I didn't find either quite as good as the March 1989 or July 2000 events, but still great. And, two straight days of this level Au is amazing in itself. Had about 100 QSOs on 144 MHz and about a dozen or so on 222 MHz. While I heard quite a few aurora signals on 432, I never heard any real DX. Probably didn't try hard enough.

"Wednesday's aurora was better to the west and W5/Ø than was Thursday's aurora from my QTH.

"WBØDRL and K5CM were both loud for a long time on Wednesday. Worked both yesterday, but they were only in briefly and not as loud. But the deep south was in on Thursday with lots of QSOs on both 144 and 222 MHz in GA, TN, and MS. My best DX was WBØDRL on 144 MHz at 2108+ km. I'm guessing that others had as long as or longer QSOs this time, but according to the DX records on the ARRL website that would be the 4th longest reported 2-meter aurora contact (and WBØDRL's station already has the top 2!).

"During the March 1989 Au I listened to W5RCI in MS/EM44 for a long time on 222 MHz (actually 220 back then) but could never get his attention. In all the years since, I'd never been able to work MS, though I had worked RCI with good signals on 144 MHz a couple of times. Yesterday I worked a station in EM44 on 144 MHz and quickly switched to 222 MHz to see if maybe by chance W5RCI was on. Amazingly the first signal I heard was W5RCI! After a couple of calls (and a nervous minute when he didn't hear my first call) we worked for a new state for me on 222 MHz. All told, two new grids on 222 MHz and one on 144 MHz during the aurora, and of course the new state on 222 MHz. I did listen on 50 MHz a lot during the aurora but never bothered to transmit there.

"One final note: When I first got on the band on Wednesday at about 2100Z I noticed S9+ noise on 144 MHz with the antenna between 240 and 300 degrees or so. I was really frustrated, since the real DX (W5/Ø) was at about 285 degrees or so. The noise lasted for about 20 minutes. Only later did I find out about the second X flare. Glad to have the problem so we could have more fun on Thursday, hi!"

Peter Shilton, VE3AX, reports: "Here's what happened in FN02cw. I had a customer meeting for 1 PM Wednesday and got back to the 'home office' at 3:30 PM local and by then the aurora was in full swing. Signals were very weak, though, until I figured out that this thing was already south of me and the best antenna direction was 250–260 degrees. That is the farthest south I have ever pointed during an aurora—and I look west and south a lot! K5YY peaked at 257 degrees. Lots of W5's were coming through from OK, KS, AR, but no TX, LA, or MS stations.

"I had fun on 2 meters and caught several on 1.25 cm, too, but signals were definitely much weaker until later when the aurora went north a bit. I had to keep swinging farther north as time went on to peak up even the southern stations. I did hear several stations on 70 cm; the loudest was Russ, K2TXB, and he was working stations I did not hear, including WRØF, who I had just worked on 144 and 222 MHz.

"As things faded on 144/222 MHz I moved to 50 MHz and caught VE5UF, VA5DX and a ND station with absolutely no buzz. Then called what I thought was an NA7 station, which turned out to be NH7RO in Hawaii! Heard VE1YX work him; he worked VE2DFO as well. My antenna was at 355 degrees at the time and Jeff had aurora buzz to some degree on the signal. Nice to get Hawaii in the log again.

"Thursday PM I was around and ready to go and the antenna went south right away as signals peaked again 250–260 degrees. Lots of W5's this time. Al, W5LUA, was S-9a on 222 MHz! K5JL, K5CM, and K5SW were in most of the night. Missed Rex, W5RCI; where were you? Gary, KE8FD, in SC was loud on 144/222 MHz, and Ron, W4WA, in GA was heard calling lots of CQs, though we had worked Wednesday.

"I worked Phil, NØPB, while mobile in EM38. Also Jon, NØJK, made it through a pile-up Wednesday while portable with a 4-el beam and 50 watts from a cow paddock in Kansas—not bad! He even sent a picture!

"I had fun, though disappointed not to hear WØIPL, KØGU, WØAH, in WY and CO. Have worked Jay before on aurora (personal best aurora is at 1300+ miles). Heard lots of W5's and W9's working these guys but no signals here.

"Results . . . 50 MHz: 13 QSOs/13 grids; 144 MHz: 94 QSOs/64 grids; 222 MHz: 33 QSOs/26 grids. Best 2 meter DX: K5QE at 1068 miles. Other notables: K5JL, NØLL, WØEKZ, NØJK, WRØF, 21 stations over 700 miles. Heard N5ITO/EM12 and answered his CQs many times but he never answered me.

"Best 222 MHz DX: W5LUA at 1133 miles. Other notables: K5UR, NØLL, WD5AGO, and WRØF. Worked K1WHS on 432 MHz. Only 100 watts here, as amp is down. Lots of fun! Will keep looking for the elusive W7 on aurora!"

George Carr, WA5KBH, reports: "Let me give you a little report for October 2003. The big event for me was the opening from October 30 at 2303 until October 31 at 0024 to KH6. I worked my first KH6's on 6 meters. If one of the four stations worked QSLs (in either BK29 or BL11), I will have 39 states confirmed (including KL7)."

Roger Amidon, K2SMN, reports: Stations worked during the aurora October 29–30 include . . . On 144 MHz: WA9JML, EN51;

KØPFX, EM48; WO4Y, EM66; KA9ZAP, EN61; W4LK, EM93; W8ZD, EN81; WA2AEY, FN23; W3ANX, FN00; K8DEO, EM89; WN4M, EM66; NY3A, FM19; W8IDT, EN83; W3ZZ, FM19; K4EJQ, EM86; N0JA, EM49; K5CM, EM25 (loud); WN2R, FM14; WA4FKI, FM05; NW5E, EL98 (Wow! So far south!); K9EA, EN71; W4WSR, EM85; K3HX, FN00; AG4V, EM55; K5YY, EM26; K5SW, EM25; K7SV, FM18; N4GN, EM78; and N3FZ, EN90.

"On 222 MHz: WB4ECR, EM66 (new grid); K4EJQ, EM86; W9ZIH, EN51; and WA8RJF EN91. On 432 MHz: K9EA, EN71; W8CAR, EN81; WBØDRL, EM18; and WØVD, EM27.

"I heard: W3EME, WA1FVJ, WA1T, K3ZO, W4DEX, K5JL, K$$PFX, K4PTN, WØVD, K8DIO, VE3AX, N9LR, K5MA, KL7ATE, K9MRI, W9SR, VE3IEY, and AD4TJ.

"I missed some due to the amazing amount of activity! Lots of QRM, plus a long burst of S9+10 dB sun noise. Actually moved the beam to NULL the sun noise to continue operating."

Ed Bruns, W3EKT, reports: "Good aurora here 30 miles north of DC. Worked 30 stations in five new grids, all on 2 meters. I have been stuck at 97 for several months so this should get me over the hump."

Ev Tupus, W2EV, reports: "I won't bore you with copying my logbook to the list, but I thought that the remarkable part of the aurora for me was the fact that I participated using a 4× Halo for an antenna. What I noticed was that the tropo signal for many stations was as strong as their aurora signals . . . even for stations normally beyond tropo range. It provided a fascinating personal study of auroral Doppler shift.

"I have a 35 foot pole with 4× KU4AB loops for 2 meters and 2× KU4AB loops for 6 meters. The KU4AB's were purchased from eBay (he makes them himself and sells them there). The 'downside' is that they didn't use stainless-steel hardware. I changed that out and all is well.

"I didn't work any 'super DX' during the Au, but I was active for only an hour or so on Thursday night. I really need to compare my log with others who were on from 6 to 7 PM Eastern to see how things compared. Even so . . . from memory, I worked Sean (the Jazz Man), KX9X. I also worked Brad (W9FX), which, according to QRZ's 6-digit Maidenhead locator is a distance of 1083.573 km.

"As I remember, this wasn't a marginal QSO either. There you have it: 1000 km DX on aurora with Halos at my end. That's eastern FN03 (me) to western EN60ac for a DX of some 900 km to the west. Also, this experience has convinced me that a 4× stack of Halos on a pole is an excellent alternative to not being active at all. If 'topped' with a TV antenna, it forms an excellent 'stealth stack' that performs well. The extra bonus is that I can put the Halo's higher in the air than I can put the Yagis. I get different DX on 6 meters between the two systems. When all is said and done, I'll be running 6m@kw and 2m@300w. I'm now considering a 6× for 222 MHz and an 8× array for 432 MHz.

Lee Wical, KH6BZF, reports: "On the 31st October 2003 at 2318–2325 UTC several Hawaiian stations were worked by numerous Mainland stations between 50.105 and 50.148 MHz. A few of these Hawaiian stations were: NH7RO, KH6SX, and KH6/WA2HFI. By the way, the solar flux index at 1700 UTC on 2 November was 404.0. At 1700 UTC on the 26 October 2003 was 398.4. Those X-class flares in late October and early November dealt a deal to many DX VHFers.

Andy Furlong, WA2FGK, reports: "I spent last's week aurora opening on 222 MHz. The first evening I worked the following: W3IY/R, FM19; K8MD, EN82; NM9H; WRØF, EM29; W9GA, EN54; K4EJQ, EM86; and WA8TJL, EN91. The next evening I worked the following: W1AIM, FN34; K4RF, EM84; W4WA, EM84; W4DEX, EM95; W3STU, FM19; N9GH, EN51; N3IQ, FM19; K9HMB, EN52; K5UR, EM35; K8RYU; and K1WHS.

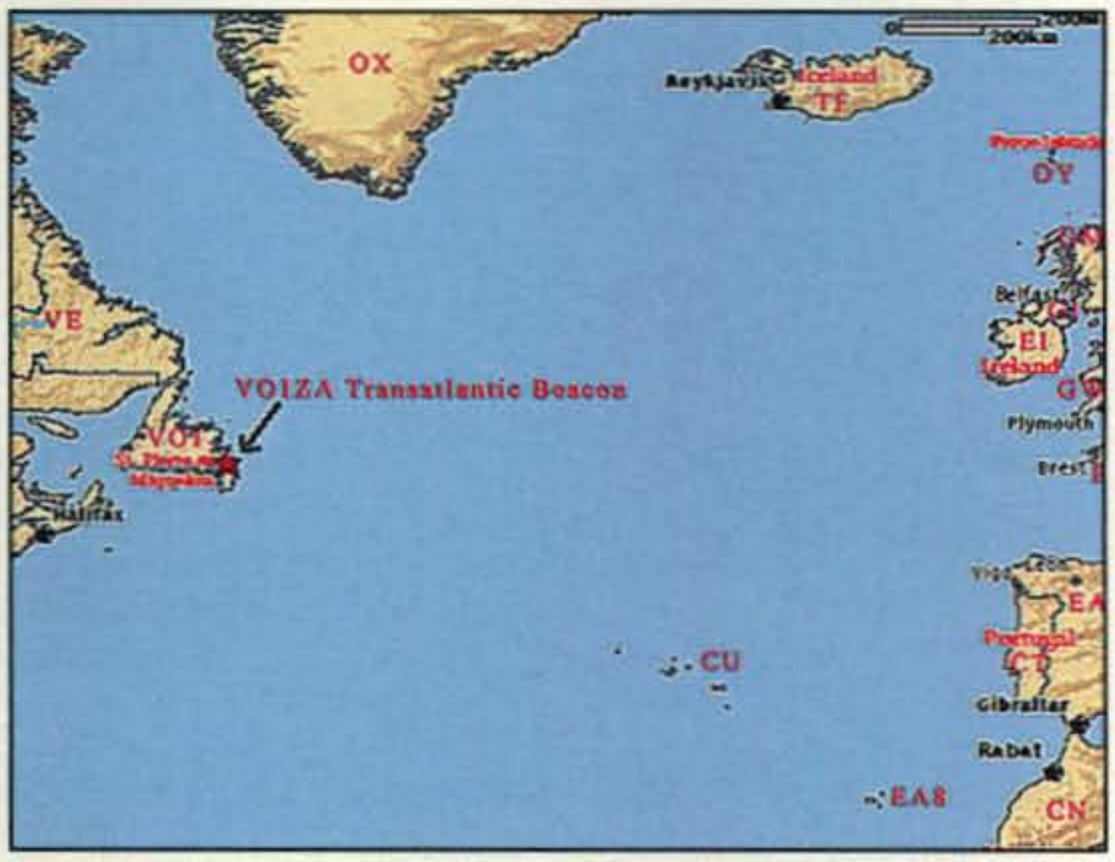
"What a thrill to work as far south as Georgia on aurora. My antenna was pointed almost due west to peak signals. The other amazing thing was the Doppler effect on signals. There was as much as minus 3 kHz on receive signals. I added five new grids to get my total to 72 and three new states, totaling 25. Great to hear so much activity on 222 MHz!"

Your editor did manage to work KH6/ K9FD on CW during that wild 6-meter Hawaiian to North American opening. The KH6HI beacon was in here as well for over an hour. Reports here do not show the sheer number of stations working the Hawaiians, several of them for their 50th state.

New VO1ZA Transatlantic Beacon on the Air

The following is from **Udo Langenohl, DK5YA:**

The Marconi Radio Club of Newfoundland and the Baccalieu Amateur Radio Club of Carbonear have been successful in placing a VHF transatlantic beacon on the air. The beacon is transmitting on 144.400 MHz. The transmitter 250W PA is the same one previously used by VE1SMU beacon. The VHF exciter board and the CW ID board have been built by Joe Craig, VO1NA. The 11-element Cushcraft Yagi, 1/2-inch hard-



The location of the new VHF VO1ZA transatlantic beacon, which operates on 144.400 MHz from grid locator GN37js. (Map courtesy of DK5YA)

line feeder and 35-amp power supply to run the beacon were donated by Frank, VO1HP. The Yagi and feeder were installed by Boyd, VO1CBS, Roy, VO1XP, and Joe, VO1NA, on August 30, 2003. The repeater site is in the middle of a large field on a turkey farm! It has a clear view of the North Atlantic Ocean through the mouth of Conception Bay on the southeast coast of VO1 land. It is in the town of Carbonear at coordinates N47 45'24" W53 12'59" (GN37js) with the antenna at about 300 ft. (90 m) ASL.

Transatlantic VHF beacon VO1ZA was placed on the air October 19, 2003 at 1330 UTC on 144.400 MHz by Frank, VO1HP, and Boyd, VO1CBS. The beacon is sponsored by the Marconi Radio Club of Newfoundland and the Baccaleiu Amateur Radio Klub. All beacon coordinates and information previously released to the public are still valid. Any amateur radio operator who claims to have heard this beacon is asked to send reports via e-mail to either <vo1hp@rac.ca> or <vo1na@rac.ca>. Please describe what you have heard and if possible the complete information being transmitted by the beacon.

Current Contest

The ARRL VHF Sweepstakes is scheduled for the weekend of January 24–26. Complete rules for the ARRL contest can be found on p. 97 in the December issue of *QST*. Complete rules can also be found on the League's website, <http://www.arrl.org>.

Current Meteor Shower

The *Quadrantids*, or *Quads*, is a brief, but very active meteor shower. The expected peak is at around 0450 UTC on 4 January. The actual peak can occur three hours before or after the predicted peak. The best paths are north-south. Long-duration meteors can be expected about one hour after the predicted peak.

For more information on the above meteor shower prediction see NW7US's "Propagation" column. Also visit the International Meteor Organization's website, <http:// www.imo.net>.

And Finally . . .

This month's column is dominated by the Sun, and rightly so. The excitement generated by the Sun's activities even made headlines in the regular media. There were lots of conversation opportunities for us hams to talk about sunspots and how ham radio activity is affected by them. Did you talk to any non-hams about the Sun and its connection to our hobby?

As also relates to the Sun, the smoke from the terrible California fires last fall was so intense that the Sun was obscured for days in that area. The obscurity was sufficient such that some looking at the Sun with their unprotected eyes (a definite no-no!) saw the blotches of the sunspots; they were that huge!

Until next month . . .

73 de Joe, N6CL

dx

BY CARL SMITH,* N4AA

DX Update

Remember the old saying "The best laid plans of mice and men . . ."? Well, it happens from time to time, even to the best of us. The DXpedition to Peter I has been postponed for one year. Just when everything seemed to be falling into place to bring this Most Needed one to us, a glitch developed in the transportation plan. Nothing could be done about it by the planners of the DXpedition, and the very difficult decision had to be made to postpone the trip for a full year. Why a year? Transportation and weather are the primary factors, and we all know you can't do anything about weather, plus in this case there was nothing that could be done about the transportation either. A great deal of work had already been done to prepare the equipment for shipment to the port. Radios and amplifiers were being tested, airline schedules worked out, and dozens of other little details that go along with a trip of this magnitude were being attended to. The team was very disappointed to have to make this announcement. It will happen, just not as soon as we all would have liked it to happen.

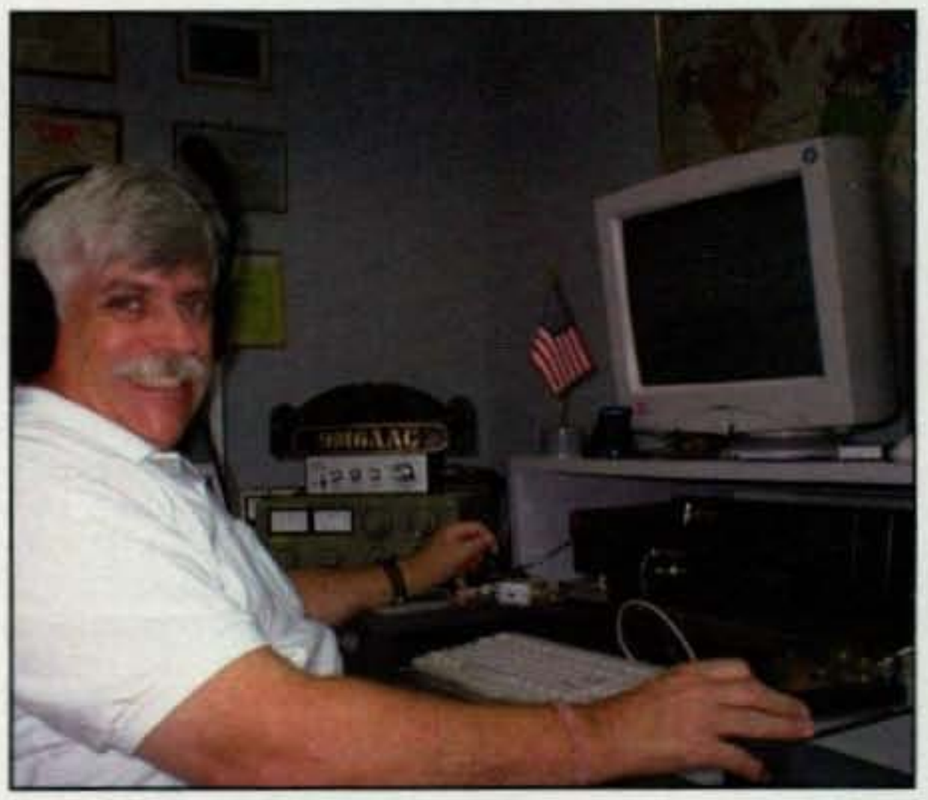
A small DX meeting at the headquarters of the OK DX Foundation. Left to right: Gerold, DL6RBG; Tom, N4XP; Vrata, OK1KT; Roger, DL5RBW; and Markus, DL9RCF. (Photo courtesy of Markus, DL9RCF)

Early 2004 DX

We still have other DXpeditions to look forward to in early 2004. A major operation by the Five Star DX Association to the island of Rodrigues, as 3B9C, will be coming up in the March-April time frame. Also, the Banaba (T33) operation is still on for April. I didn't know in time for this month's column how the French DXpedition to Europa (FR/E) turned out, as it was scheduled for late November, early December. At this point in mid-November as I write this, all I can do is wish them well and look forward to "reasonable" propagation so we all can work them—at least once.

The Rodrigues DXpedition, 3B9C, is worthy of more commentary. This is the same group that brought us 9MØC in 1998 and the very successful D68C operation in 2001. They will be taking a huge group of 27 operators from several countries to operate up to 15 high-power HF stations, active simultaneously when conditions allow, using large, full-size antennas. They will operate SSB/CW/RTTY/PSK31 and as appropriate FM. There will be satellite activity and possibly EME (Earth-Moon-Earth). The operation will span four weekends, including an opportunity for them to enter the CQ WPX SSB Contest the end of March. For more detailed, up-to-date information go to: <http://www.fsdxa.com/3b9c/>.

A number of operators have managed to gain access to the UN Headquarters station, 4U1UN, in recent months. Although they were only able to be active for relatively short periods of time, they have provided hundreds of contacts. We can look forward to more activity from the station in the near future. As of this writing there is only a multi-band dipole antenna available, but hopefully bigger and better antennas will be available soon.



Bob, N2OO/9M6OO, at the "controls" of the Hillview Gardens Resort station, 9M6AAC, in East Malaysia. He spent a few weeks at the resort following his participation in the BQ9P DXpedition to Pratas. (Photo courtesy of Bob, N2OO)

Solar Flares

Solar flares were the topic of conversation for many days back in October and November. Some

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The WPX Program

CW

3122	N7WO	3125	EA5ERY
3123	WA8AF	3126	CN2PM
3124	DS4DRE		

SSB

2879	LU1DHM	2881	IK8WTM
2880	DS4DRE	2882	VE6BF

CW: 400 KG6DFM, CN2PM. 1350 WA3GNW. 1950 VE6BF.
SSB: 600 IK8WTM. 650 VE6BF. 850 W2OO. 1000 G3TSZ, EA5ERY. 1150 AI6Z. 1300 WA3GNW. 1550 AA1KS. 2000 W9JDX.
MIXED: 550 WB5JID. 800 WK5K. 1050 W2OO. 1400 WD6CKT. 1800 KØKG. 2050 WA3GNW. 2100 VE6BF. 2650 ON4CAS. 3850 WB2YQH.
10 Meters: N7WO
15 Meters: N7WO, DS4DRE
20 Meters: N7WO, VE6BF
40 Meters: N7WO
80 Meters: N7WO, EA2CIN, W2OO, VE6BF
160 Meters: N7WO
Asia: N7WO, DS4DRE
Africa: N7WO, VE6BF
No. America: N7WO, VE6BF
So. America: N7WO, W2OO, VE6BF, WA2VQV
Europe: N7WO, VE6BF
Oceania: N7WO, DS4DRE, W2OO
Award of Excellence Holders: N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP K0JN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, ABØP, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POF, DJ4XA, IT9TQH, ONL-4003, W5AWT, KBØG, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1PO, K9LNJ, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MC, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, KZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, I7PXV, S57J, EA8BM, DL1EY, KØDEQ, KUØA, DJ1YH, OE6CLD, VR2UW, 9A9R, UAØFZ, DJ3JSW, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH, EA7TV, W9IAL, LY3BA, K1NU, W1TE, UA3AP, EA5AT, OK1DWC, KX1A, IZ5BAM, W4BP, K4LQ, KØKG, DL6ATM, VE9FX, DL2CHN.
160 Meter Endorsement: N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF, N4NX, SM0DJZ, DK3AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR1QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N8JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, WBØDD, IØRIZ, I2MQP, F6HMJ, HB9DZZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA5CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDEQ, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, UAØFZ, CT4NH, W1CU, EA7TV, LY3BA, RW9SG, K1NU, W1TE, UA3AP, OK1DWC, KX1A, IZ5BAM, W4GP, DL6ATM.
Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101 USA. ***NOTE:*** *WPX will not accept prefixes/calls which have been confirmed by computer-generated electronic means.*

George, K8GG (right), met Garry, VE3XN/VE3GCO, for lunch in Stratford, Ontario. Garry is the "first sorter" for the VE3 bureau and handled the QSL chores for the VP8THU and VP8GEO DXpedition. (Photo courtesy of George, K8GG)

of the biggest flares ever recorded were observed.

I've been hamming for 50 years now, and I personally had never before heard the effects of these things. I got my chance during the ARRL CW Sweepstakes in early November. On Sunday morning I was doing my search & pounce thing on 20 meters. As I finished a contact, the signal of the other station just seemed to fade into the noise. As I tuned up the band I didn't hear any more signals. I tuned back down the band and again no signals. I listened to 15—no signals. I went to 40 and found—no signals. Every band I went to was "empty."

I did the usual quick check to see if the antennas were still connected and they were okay. Then I took a quick look at the propagation website and there was the answer: That massive solar flare had done its dirty deed. Oh well, it was time for coffee anyway. The effects of the solar flare only lasted a few hours, but it was quite an experience at the time. Let's see . . . that was the first time in 50 years it had happened while I was on the air. If it takes that long for it to happen again . . . Well, I won't be here to observe it anyway.

Pile-up Behavior

I just have to return to the subject of pile-up behavior. I've been on the air—well, listening anyway—a bit more in recent weeks. As I listen to the dozens of signals competing for a contact, I am starting to hear those bad habits creeping in again. Folks, you don't have to give your call a dozen times. Signing your call once, maybe twice, and then *listening* would make things a lot easier for everyone. Admittedly, some of the DX stations were allowing bad things to happen by working "simplex," always a bad practice with any decent-size pile-up. Split-frequency operation is always preferred, allowing those calling to hear the DX station when he/she comes back to a caller. Calling stations should avoid calling exactly on the DX frequency. I had an experience recently that demonstrated that very well.

A few dozen stations were giving their calls on the DX frequency. I slid up 500 Hz, gave my call twice, and the station

Rick, NE8Z, spends a lot of time traveling in South America. One of his friends is Mariana, CX1JJ, in Salto, Uruguay. Rick says, "She is a very active DXer and very QRQ on CW also. In this photo she proudly holds her first-place trophy for the 2003 OM/YL CW Contest. Mariana will soon be graduating as a lawyer." (Photo courtesy of Rick, NE8Z)

The WAZ Program

10 Meter SSB
556 ..... I8PND

12 Meter SSB
31 ..... HB9BGV

17 Meter SSB
33 ..... HB9BGV

20 Meter SSB
1117 ..... EA8LS
1118 ..... EA8AYV

10 Meter CW
183 ..... N7WO

12 Meter CW
44 ..... HB9BGV

160 Meters
190 ..... K3JGJ (30 zones)

All Band WAZ SSB
4887 ..... KB5VNM
4888 ..... NK7C
4889 ..... AH7G
4890 ..... IK8WTM
4891 ..... W2IRT

Mixed
8264 ..... W7GOY
8265 ..... KZ7N
8266 ..... N9WI
8267 ..... WA2OCG

All CW
391 ..... NT5O
392 ..... JA1GV (QRP)
393 ..... UA0ZY
394 ..... W5DB

RTTY
142 ..... JA7IC

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75089. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to Paul Blumhardt. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. K5RT may also be reached via e-mail: <k5rt@cq-amateur-radio.com>.

5 Band WAZ

As of November 15, 2003, 639 stations have attained the 200 zone level and 1347 stations have attained the 150 zone level.

New recipients of 5 Band WAZ with all 200 zones confirmed:

none

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
W4LI, 199 (26)
K7UR, 199 (34)
W0PGI, 199 (26)
W2YY, 199 (26)
VE7AHA, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
NN7X, 199 (34)
IK1AOD, 199 (1)
DF3CB, 199 (1)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W6SR, 199 (37)
W3NO, 199 (26)
K4UTE, 199 (18)
HB9DDZ, 199 (31)
RU3FM, 199 (1)
HB9BGV, 199 (31)
N3UN, 199 (18)
OH2VZ, 199 (31)
K5MC, 199 (22)
W1JZ, 199 (24)
K2UU, 199 (26)
W1WAI, 199 (24)
W1FZ, 199 (26)
SM7BIP, 199 (31)
PY5EG, 199 (23)
SP5DVP, 199 (31 on 40)
W8AEF, 199 (40)
K8RR, 199 (26)
UU5JR, 199 (4)
W8GF, 199 (22)
N4NX, 199 (26)
OE2BZL, 199 (1)
EA5BCX, 198 (27, 39)
G3KDB, 198 (1, 12)
KG9N, 198 (18, 22)
JA1DM, 198 (2, 40)
9A5I, 198 (1, 16)
K5PC, 198 (18, 23)
K4CN, 198 (23, 26)
KF2O, 198 (24, 26)
G3KMQ, 198 (1, 27)
N2QT, 198 (23, 24)
OK1DWC, 198 (6, 31)
W4UM, 198 (18, 23)
US7MM,198 (2, 6)
K2TK, 198 (23, 24)
K3JGJ, 198 (24, 26)
W4DC, 198 (24, 26)
N4XR, 198 (22, 27)
N4PQX, 198 (24, 26)
RU3DX, 198 (1, 6)
UT5JAJ, 198 (12, 30)
N6HR/7, 198 (34, 37)
N4MM, 198 (24, 26)
OE2LCM, 198 (1, 31)
EA7GF, 198 (1, 27)
W7SX, 198 (18, 23)
UT3UA, 198 (1, 6)

The following have qualified for the basic 5 Band WAZ Award:

JR7ILA (150 zones)
K2EP (180 zones)
EA8LS (197 zones)
UT3UA (198 zones)
KL1V (166 zones)
JA7IC (190 zones)
OK1DAU (170 zones)
IZ1GOT (151 zones)
RA4CC (197 zones)

Endorsements:

K4QL (197 zones)
N7WO (184 zones)

****Please note: Cost of the 5 Band WAZ Plaque is $80 ($100 if airmail shipping is requested).**

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came back immediately. I had moved out of the QRM "window," allowing him to hear me. As soon as I finished my contact, I almost laughed when I heard every other station calling had moved up at least 500 Hz. The DX station started making a lot more contacts than he had made when everyone was on his frequency. Again, the DX station allowed this to happen, but once I split and others moved up, things settled down and a lot of stations worked the guy.

With some major DXpeditions on the horizon, I urge all DXers to use some

Yuli Sproat, the wife of Jack, W4JS, and three Indonesian hams who met her at the Jakarta Airport on a recent trip. Left to right: Wisnu, YBØAZ, Suryadi, YBØLBK, and Rezky, YBØIR. Jack is QSL Manager for YBØLBK and YBØIR (among a few others). Jack says, "When Yuli goes to visit her family, she carries all the QSLs I've received for these Indonesian hams. There were a few thousand cards in her bag on this trip!" (Photo courtesy of Wisnu, YBØAZ)

common sense in their operating techniques. We will all benefit from it. Also, whatever you do, *do not* respond to the frequency cops, etc. It just causes more QRM that we don't need.

Logbook of The World

Activated on September 15, 2003, the LoTW has taken off like a rocket. Tens of thousands of QSOs are already loaded

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries. With few exceptions, the ARRL DXCC Countries List is used as the country standard. The CQ DX Award currently recognizes 335 countries. Honor Roll listing is automatic when an application is received and approved for 275 or more active countries. Deleted countries do not count and all totals are adjusted as deletions occur. To remain on the CQ DX Honor Roll, annual updates are required. All updates must be accompanied by an SASE if confirmation of total is required. The fee for endorsement stickers is $1.00 each plus SASE. Please make checks payable to the awards manager, Billy F. Williams. All updates should be mailed to P.O. Box 9673, Jacksonville, FL 32208.

CW

K2TQC	334	K4MQG	334	N7RO	333	W1WAI	331	KZ4V	329	W6OUL	327	9A2AJ	323	F5OIU	317	VE7KDU	300
K2FL	334	EA2IA	334	K4CN	333	K2JF	331	N5HB	329	IT9TQH	326	W6SR	323	YT1AT	317	W9IL	300
K9BWQ	334	PA5PQ	334	W4MPY	333	K3JGJ	331	W4UW	329	I2EOW	326	KUØS	322	K8JJC	315	KØHQW	299
K9MM	334	K3UA	334	PY2YP	333	PT2TF	331	K1HDO	328	NC9T	326	KE5PO	322	CT1YH	313	WG7A	295
W7OM	334	DL3DXX	334	K6GJ	332	W2VJN	331	K7JS	328	W7IIT	326	K6CU	321	PY4WS	313	KE3A	295
K2JLA	334	K2ENT	334	KA7T	332	N4CH	331	K9OW	328	W4LI	325	HA5DA	321	N1HN	313	K4IE	291
N7FU	334	OK1MP	334	W8XD	332	W2UE	330	WA8DXA	328	I5XIM	325	IKØTUG	321	K9DDO	312	KD8IW	288
K2OWE	334	WB5MTV	333	WØJLC	332	I4LCK	330	K8PV	327	K5UO	325	VE7DX	320	W3II	312	EA3BHK	282
N4MM	334	W7CNL	333	K8LJG	332	VE7CNE	330	W4QB	327	IK2ILH	325	IKØADY	320	W6YQ	312	YC2OK	282
F3TH	334	YU1HA	333	YU1AB	332	4N7ZZ	330	I1JQJ	327	N5FW	325	WG5G/QRPp	320	UA9SG	309	DJ1YH	281
F3AT	334	IT9QDS	333	K5RT	332	W6DN	330	I4EAT	327	9A2AA	325	HA5NK	319	KF8UN	308	XE1MD	278
DJ2PJ	334	G4BWP	333	NØFW	332	K7LAY	330	DL8CM	327	N4OT	325	F6HMJ	319	YU7FW	306	EA2CIN	278
WA4IUM	334	K4CEB	333	N4AH	332	WB4UBD	330	SM6CST	327	LA7JO	324	OZ5UR	319	LU3DSI	302	I3ZSX	276
W4OEL	334	K4IQJ	333	HB9DDZ	332	YU1TR	330	N4KG	327	SM5HV/HK7	324	N7WO	318	N1KC	302	G3DPX	275
W2FXA	334	WØHZ	333	K6LEB	331	K9IW	330	K4JLD	327	K1FK	324	G3KMQ	317	KH6CF	301	WA4DOU	275
N4JF	334	N5FG	333	VE3XN	331	G3KMQ	329										

SSB

K6YRA	335	4Z4DX	335	N4CH	334	K9HQM	332	DU1KT	329	IT9TGO	327	EA3CYM	323	IZ6CST	314	K6GFJ	299
K2TQC	335	N7RO	335	K3UA	334	CT1EEB	332	I2EOW	329	DK5WQ	327	F6BFI	322	K9YY	313	VE7SMP	297
W6EUF	335	IØZV	335	K4JLD	334	EA3BMT	332	VE7DX	329	UY5XE	327	K6CF	322	NØMI	313	AC6WO	297
K2JLA	335	EA2IA	335	N5ZM	334	W2FKF	332	W2FGY	329	KW7J	327	LU7HJM	322	W7GAX	312	WA1ECF	295
K4MQG	335	IN3DEI	335	PY2YP	334	DL9OH	331	CT1EEN	329	KE5K	327	K5NP	322	VE3CKP	311	KW1DX	295
IK1GPG	335	EA4DO	335	AA4S	334	N2VW	331	CT1CFH	329	I1JQJ	327	WA4ZZ	322	CT1YH	311	N5WYR	293
K5OVC	335	PA5PQ	335	K1UO	334	YZ7AA	331	KE4VU	328	CP2DL	327	WN9NBT	322	YV5NWG	311	K7ZM	292
NØFW	335	K9OW	335	CT3DL	334	YV1JV	331	K1HDO	328	NI5D	327	LU5DV	322	LU3HBO	310	OA4EI	292
K9MM	335	W6DPD	335	4N7ZZ	333	WA4WTG	331	K5UO	328	EA1JG	327	WW1N	322	SV3AQR	310	KØOZ	291
W6BCQ	335	XE1VIC	335	KE5PO	333	W8KS	331	KF8UN	328	W6SR	326	W6OUL	322	HA6NF	310	W4PGC	290
XE1AE	335	K2ENT	335	VE1YX	333	YV5IVB	331	EA3EQT	328	N4KG	326	N3RX	321	WA5MLT	310	I3ZSX	290
W7OM	335	OK1MP	335	I4LCK	333	KX5V	331	WØULU	328	K7TCL	326	XE1CI	321	XE2LV	310	WØROB	287
KZ2P	335	IZ6GPZ	335	W2JZK	333	I8LEL	331	K1EY	328	W9HRQ	326	CT1ESO	321	EA3BHK	307	KKØDX	285
IK8CNT	335	WDØBNC	334	K8LJG	333	K3JGJ	331	KZ4V	328	W4QB	326	EA8TE	321	RW9SG	307	VE7HAM	285
VK4LC	335	DU9RG	334	VE4ACY	333	N5ORT	331	XE1D	328	K8PV	326	W6MFC	321	XE1MDX	305	F5RRS	284
OE7SEL	335	K2FL	334	KØKG	333	PT2TF	331	KD8IW	328	DL6KG	326	N4CSF	320	EA5OL	305	N8LIQ	284
VE3MR	335	WØYDB	334	W4WX	333	CT1AHU	331	KE3A	328	W4LI	326	N4HK	320	WB2AQC	305	WØIKD	283
VE3MRS	335	W4UW	334	VE2WY	333	EA3JL	331	W9IL	328	WR5Y	326	KØFP	320	KC4FW	304	W9ACE	283
K4MZU	335	K9BWQ	334	WB3DNA	333	W6DN	330	K3LC	328	W5LLU	326	EA7TV	320	K3BYV	303	KBØRNC	282
OZ5EV	335	W4NKI	334	W9SS	333	K8CSG	330	K8DXA	328	N1ALR	326	SV1RK	320	YC2OK	303	WN6J	281
N7BK	335	WB4UBD	334	K9PP	333	YV1CLM	330	I1EEW	327	HB9DDZ	326	N1KC	320	WB2NQT	303	IK8TMI	281
K7LAY	335	W4UNP	334	W2CC	333	LA7JO	330	SV1ADG	327	WA4JTI	325	W5GZI	320	VK3IR	303	F5JSK	281
ZL3NS	335	W8AXI	334	VE7WJ	333	AB4IQ	330	DL8CM	327	KC4MJ	325	WA4DAN	319	VE7KDU	302	KA5OER	280
N4MM	335	VE2GHZ	334	W3AZD	333	AE5DX	330	F9RM	327	PY2DBU	325	CE1YI	318	W2GZI	302	KK5UY	280
OZ3SK	335	OE2EGL	334	DL3DXX	333	KB2MY	330	XE1MD	327	IKØIOL	325	W5OXA	317	N5QDE	302	F5INJ	279
K7JS	335	WA4IUM	334	VE2PJ	332	K3PT	330	I4EAT	327	YT1AT	325	YV4VN	317	KD4YT	302	EA3CWT	278
XE1L	335	K5RT	334	YV1KZ	332	ZL1BOQ	330	W3GG	327	K7HG	324	EA5GMB	317	KK4TR	301	VE2DRN	277
YU1AB	335	W2FXA	334	YV1AJ	332	K9IW	330	AA6BB	327	AC7DX	324	NK5X	317	VE7SMP	301	9A9R	277
OE3WWB	335	N4JF	334	KSØZ	332	WS9V	329	SM6CST	327	KØHQW	324	K6RO	316	SV2CWY	300	W6UPI	276
K5TVC	335	W6SHY	334	I8KCI	332	K2JF	329	WD8MGQ	327	EA3BKI	323	N5HSF	316	4X6DK	300	Z31JA	275
N5FG	335	W5RUK	334	LU4DXU	332	ZL1AGO	329	CX4HS	327	K4JDJ	323	N8SHZ	316	YT7TY	300	G4URW	275
DJ9ZB	335	K4CN	334	VE4ROY	332	N5FG	329	IØSGF	327	EA3BMT	323	KE4SCY	315	XE2NLD	300	VE2AJT	275
PY4OY	335	EA3KB	334	W7FP	332	W9OKL	329	IT9TQH	327	W6WI	323	WZ3E	314	K4IE	300	4Z5FL/M	275
VE3XN	335														

RTTY

K2ENT	333	NI4H	325	EA5FKI	320	G4BWP	312	PA5PQ	311	W4EEU	299	I2EOW	291	W4QB	280	YC2OK	280
WB4UBD	330	K3UA	325	W2JGR	316	OK1MP	312	N5FG	305	KE5PO	297	I1JQJ	289				

Charles, S9SS, really enjoys his location. He sent this photo saying, "A Sao Tome sunset from our veranda, November 2. The view is looking south toward Santana Island." (Photo courtesy of Charles, S9SS)

into the system. Many DXpedition logs have been uploaded, making those contacts available for DXCC credit. More and more are coming on board each week, creating a huge database from which to collect those sought-after confirmations. If you haven't checked it out for yourself, you really should. The process is fairly simple, with good instructions on how to go about request-

QSL Information

5W0MW via DJ7RJ
5W0VB via AC4LN
5W1AN via DF8AN
5W1DJ via ZK1CG
5W1DT via AA6AD
5W1EA via KØCS
5W1HA via DJ9ZB
5W1HX via DJ9ZB
5X1CW via F6GQK
5X2A via K4ZLE
5Z4DZ via PC1A
5Z4KE via DF8AN
5Z4RH via WA4WTG
5Z5BH via KB7NK
6KØIS via HL1IWD
6K97WFK via HL1IWD
6MØHZ/2 via HL1IWD
6O1Z via DJ9ZB
6W1AE via F5OGL
6W1RE via F5OGL
6YØA via WA4WTG
6Y1A via WA4WTG
6Y2A via WA4WTG
6Y4A via WA4WTG
6Y5/K1XM via KQ1F
6Y5/K2KW via WA4WTG
6Y5/PA3ERC via PA2R
6Y5/PA3EWP via PA2R
6Y5/W4SO via WA4WTG
6Y5MC via WA4WTG
6Y5RL via WA4WTG
6Y8A via WA4WTG
6Y9A via WA4WTG
6Y9X via KQ1F
7J1AAS/3 via KQ1F
7J1AEN via KC7V
7J1AEX via DJ9ZB
7P8/ZS6CAL via ZS6RVG
7P8/ZS6HZ via ZS6RVG
7P8AD via IK2ANI
7P8NI via IK2ANI
7Q7WW via KC4D
7X5AB via F6BFH
7X5AH via F6BFH
8PØA via WA4WTG
8P61B via WA4WTG
8P6AH via WA4WTG
8P6BN via WA4WTG
8P6GY via KU9C
8P9/AC4LN via AC4LN
8P9BV via AC4LN
8P9HA via WA4WTG
8P9IK via VE3BW
8P9JR via PA2R
8P9JS via PA2R
8P9JT via PA2R
8P9JU via PA2R
8Q7ET via PA2R
8Q7WP via PA2R
8R2USA via 8R1AK
8S7A via W3HNK
8Z4/HZ1BS via DJ9ZB
9A/F2CW via KC7V
9A5CW via KC7V
9A5PC via NF4A
9G1MR via IK3HHX
9G1RT via KB7NK
9G5MF via KC7V
9G5XA via G3XAQ
9H3GQT via YL2GQT
9H3KKL via YL2KL
9H3MMD via YL2MD
9H4L via W3HNK
9J2BO via G3TEV
9J2VK via ZS6MG
9K2HE via DJ9ZB
9L1JT via K4ZIN
9L2SH via K4ZLE
9M2PV via WA4WTG
9M6AAC via N2OO
9M6BQ via N2OO
9M6CTC via N2OO
9M6HIL via N2OO
9M6MU via N2OO
9M6OO via N2OO
9M6P via F6BFH
9M6SEA via N2OO
9M6TCR via KQ1F
9M6TF via F6BFH
9M6TPR via KQ1F
9M6US via N2OO
9M6US/Ø via N2OO
9M8MG via WA4WTG
9M8PV via WA4WTG
9N1AN via DF8AN
9N1MM via KE7EQ
9N1MM/7 via KE7EQ
9Q2L via PC1A
9Q5BB via W3HNK
9Q5LI via F6BFH
9Q5MJ via F6BFH
9R1A via PC1A
9V1DX via VK4AAR
9V1GO via G4VGO
9V1SM via W3HNK
9V8YC via AA5BT
9V9HQ via N5ID
9X5EE via PC1A
9Y4/PA3BBP via PA2R
9Y4/PA3ERC via PA2R
9Y4/PA3EWP via PA2R

(The table of QSL Managers is courtesy of John Shelton, K1XN, editor of "The Go List," 106 Dogwood Dr., Paris, TN 38242; phone 731-641-4354; e-mail: <golist@golist.net>.)

CQ DX Awards Program

SSB

2417 ..... YBØCBI 2418 ..... CT3DL

CW

1054 ..... KH6DX/M

SSB Endorsements

320 ..... CT3DL/334
320 ..... YU1TR/330
320 ..... K9IW/320
320 ..... W5GZI/320
310 ..... W7GAX/312

CW Endorsements

320 ..... K9IW/330
310 ..... PY4WS/315
200 ..... K6UXO/231
1.8 MHz KH6DX/M

The basic award fee for subscribers to *CQ* is $6. For non-subscribers, it is $12. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00 each plus SASE. Updates not involving the issuance of a sticker are free. All updates and correspondence must include an SASE. Rules and application forms for the CQ DX Awards may be found on the <www.cq-amateur-radio.com> website, or may be obtained by sending a business-size, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 335 active countries. Please make all checks payable to the award manager.

ing your "identity," etc. Just log onto the ARRL website, <http://www.arrl.org/lotw/> and follow the directions.

The *ARRL Letter* for November 7 says, "In the six weeks the system has been open to the public, Logbook of the World has accepted logs from 4000 users from 158 DXCC entities. These users—all with secure digital certificates—have uploaded nearly 21 million QSO records into the system, as of November 3. All of those contacts have so far resulted in more than 350,000 records being generated."

Was it worth waiting for? I think time will prove that it was definitely worth the wait. There will no longer be any reason for us to hear "Logs Are Closed" and similar statements. Those who don't want to be bothered with QSLing from logs five, ten, or more years old can make them available to the LoTW. There are many, many DXers who have, for whatever reason, never requested cards from some very good DX contacts and find now that those logs are no longer available. By making use of the LoTW, those old logs can be opened to the world and make a lot of DXers very happy to be able to confirm those old contacts. How about it? Are you older DXpeditioners ready to make those logs available?

Let me take this opportunity to wish all of you the very best for the new year.

73, Carl, N4AA

contesting

BY JOHN DORR,* K1AR

Goodbye Sunspots—Hello QRM!

January's Contest Tip

One of the common debates in contesting is CW speed. The November 2003 ARRL CW Sweepstakes supported at least one position about speed yet again. It's good operating practice not to send at a speed that's higher than you can copy. In other words, if you're going to send at 40 wpm, you need to be able to copy 100% at 40 wpm. The name of the game is not simply how fast you work stations, but how fast you can *accurately* get one another into your respective logs.

The recent solar activity we experienced was spectacular (from an astronomical point of view). Record levels of flares and enormous CMEs (coronal mass ejections) have "attacked" our planet, causing the WWV numbers that we monitor so closely to reach levels we will talk about for years to come. Some wonder if we'll be having those discussions on the radio or need a telephone to communicate!

As solar conditions continue to decline, we're reminded that few topics are more contentious than the issues that come from the way we utilize our precious frequencies—and for good reason. Perhaps now, more than at any other time in the history of our hobby, the encroachment of commercial interests and others are threatening the amateur spectrum. The problem is further compounded by the way we sometimes trivialize examples such as the loss of a portion of the 220 MHz band years ago. After all, many of us have never seen a transceiver display a frequency above 28.900 MHz, right?

I strongly believe that the amateur spectrum is being watched by predatory interests. Having said that, let's take a few minutes to examine amateur spectrum use from a contesting perspective.

Contesting and the Amateur Spectrum

Let's be honest with ourselves and call a spade a spade. There are many weekends on which a contesting event dominates the majority of our HF amateur bands—albeit usually only on one mode. Obvious examples include the CQ WW, CQ WPX, ARRL DX, and ARRL Sweepstakes contests. In contrast, it's also fair to say even with contests on nearly every weekend of the year, the vast majority of these events are not disruptive to "non-contest" operating. Is this acceptable to amateurs?

Before I go on, I think it's important to point out that contests are not the only area of our hobby that some amateurs find disruptive. There are very few active hams who can forget the chaos that has originated from some of the major DXpeditions in recent years. Operating practices such as listening on 20 meters SSB from 14200–300 kHz come to mind. And while I'm not here to judge the value of that approach, it most certainly has an impact on our use of the bands. There are still others who feel the growth of DX nets is poor use of our bands. Also, haven't you heard some folks complain about the inefficient emergency/traffic nets operating above 14300? What about those Slow Scan TV operators around 14230? The ability to create your own list goes on and on. The point, however, is that everyone has his or her view on frequency spectrum usage. DXers and contesters are not going to go away, so the only workable approach had better be focused on coexistence for all of us.

Probably the most commonly proposed suggestion concerning contest frequency spectrum use coming from my contest surveys of the past and scores of personal conversations is the idea of a "contest-free operating zone." While in theory this idea may have some merit, it really doesn't address the fundamental issue—the growth of contest participation. From my experience, although contest activity does often extend itself all the way to the upper edge of certain bands (e.g., 15 and 20 meters), it generally tails off dramatically well before that point. For example, I am so confident about the availability of a clear channel in upper parts of most bands that I use them myself as a safe haven for passing multipliers. Rarely has there been a time when I could not have a normal QSO with a new multiplier (and casual contester) on any band and at any given time. Sure, I wasn't running a phone patch, but the techniques for getting someone to move off my frequency were no different than any other midweek-type operating scenario.

Calendar of Events

Dec. 19	Russian 160M Contest
Dec. 20	OK DX RTTY Contest
Dec. 20-21	Croatian CW Contest
Dec. 27	RAC Canada Winter Contest
Dec. 27-28	Stew Perry Topband Distance Challenge
Jan. 1	ARRL Straight Key Night
Jan. 3-4	ARRL RTTY Roundup
Jan. 4	Kid's Day Contest
Jan. 10-11	North American CW QSO Party
Jan. 17	LZ Open CW Contest
Jan. 17-18	Hungarian DX Contest
Jan. 17-18	North American SSB QSO Party
Jan. 17-19	ARRL January VHF Sweepstakes
Jan. 24-25	**CQ WW 160M CW Contest**
Jan. 24-25	REF CW Contest
Jan.31-Feb.1	UBA SSB DX Contest
Feb. 21-22	ARRL CW DX Contest
Feb. 28-29	**CQ WW 160M SSB Contest**

2004 CQ Contest Dates

Jan. 24-25	CQ WW 160M CW Contest
Feb. 14-15	CQ WW WPX RTTY Contest
Feb. 28-29	CQ WW 160M SSB Contest
Mar. 27-28	CQ WW WPX SSB Contest
May 29-30	CQ WW WPX CW Contest
July 17-18	CQ WW VHF Contest
Sept. 25-26	CQ WW RTTY Contest
Oct. 30-31	CQ WW DX SSB Contest
Nov. 27-28	CQ WW DX CW Contest

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e-mail: <K1AR@contesting.com>

As I've said, contesters' use of frequency spectrum is directly related to the amount of participation. Years ago it was a rare occurrence to witness someone calling "CQ Contest" on 21405. However, the broadening of spectrum use in recent times is not because contesters are inherently inconsiderate. Rather, it has happened because the amount of operating interest and activity has grown, warranting its use.

The beauty of amateur radio is that our use of spectrum is not pre-programmed. In fact, I had this very discussion the other day with a non-amateur. He noted that the internet was probably taking over the appeal of talking to far-off places via ham radio. I noted that while there may be some truth to that claim, there is nothing that replaces the randomness of our spectrum, and the fact that we can tune a dial, use an antenna that we put up with our two hands, and potentially hear individuals next door or from across the globe. Furthermore, we are not like a radio or television network with strict guidelines for what we say and when we can say it, even though we do have some rules to follow. Amateur operating activity is defined by what the majority wants at any point in time. The use of our allocated spectrum is decidedly in our own hands—at least for now.

When Peter I (3Y) comes on the air a year from now, you can bet that the majority at that time will want to call and try to work them. You also can count on the fact that during the next CQ WW contest the bands will be filled again with great DX, fine operators, and more participants than ever before. The great news is that there will be a high availability of interesting radio activity to pursue. The challenge is that we all will be doing it in a limited portion of radio spectrum—especially as the solar conditions continue to decline.

However, let's close with one final consideration. Setting aside the debate on whether or not the majority is spoken for during contest weekends, contesters have an obligation to show courtesy and consideration to their fellow hams. While it's easy to get caught up in the heat of competition, we should view our operating practices by asking two key questions: (1) Would my operating practices be acceptable if I were on the other end (especially a non-contester), and (2) Do my operating methods mirror the way I am "on the air" outside of contests? If you can honestly answer yes to these two questions, then by my definition you have passed the operating fairness test.

As the sunspot minimum approaches, now is the time to evaluate your operating courtesy. This point spans beyond contest operating, but from the perspective of a contester reading this month's column, it may begin exactly there. Let me know what you think!

Final Comments

A new year is upon us (where did 2003 go?). I hope you've decided what your goals are for 2004. More important, hopefully you've already exceeded the ones you set for 2003. Last year was replete with lots of debate in our hobby—Logbook of The World, BPL, propagation, etc. The good news is that we still care about a hobby that is very much alive and well. Let's keep our enthusiasm at an all-time high. We have a lot to look forward to in 2004, even if those nasty sunspots are a little off their game.

73, John, K1AR

awards

BY TED MELINOSKY,* K1BV

Awards Around the World

"What is there about this hobby of ham radio that holds us to it? Are we goal driven? Are we compulsive square fillers? Do we just enjoy the magic of making a two-way contact with the power of a light bulb? Maybe it's all of the above. There is magic there somewhere."

The above was written by Terry, WQ7A, who achieved *CQ*'s USA-CA All Counties on September 26, 2003. Here is the story of his county hunting experience.

Terry Dummler, WQ7A
USA-CA All Counties #1075

My first exposure to the hobby came from my older brother, W7QLY, before I even entered high school. I fondly remember Paul calling CQ on 75 meter AM from the attic of our childhood home. The magic had taken hold of me. Hot tubes and a microphone that bites! My college professor, Virgil Vail, W7PSC, continued that magic by showing me how even I could participate in this magical hobby during the fall semester of 1958. There was that first license in 1959 so that we could communicate with Morse code, then advancing to AM voice the same year. Those were the days.

Over a lifetime of working and moving for career reasons, and testing for upgraded licenses, I have changed callsigns several times, previously holding the calls K7GVF and WØFYO. My current call was earned several years ago when I moved to the Pacific NW and obtained my Extra Class license. Throughout my lifetime of enjoying ham radio, I have embraced most popular modes. I have dabbled in PSK31, packet, VHF/UHF FM, and of course SSB. One of the fun modes I was able to operate was aeronautical mobile. It was a pleasure to be over the far north at high altitudes and chat with folks around the world. After retirement it seems that most of my efforts are on HF SSB. More recently, I have spent most of my time on the air collecting county contacts.

The problem of collecting counties is that it sneaks up on you. As new hams many of us aspire to getting WAS (Worked All States). Then there is DX, a seemingly never-ending pursuit. Along the way someone mentions 5 Band WAS. Now there is a challenge! But after that, what? Somewhere along the way, several years ago, I started noticing that states were having QSO parties. I thought, wouldn't it be fun to keep track of all those counties on a map? My wife presented me with a very nice wall map showing only the counties, so I began coloring those confirmed by QSL with colored pens. Now there is a real goal . . . let's work *all* the counties. I began haunting the 10-10 nets, state QSO parties, 3905 Century Club, and even local traffic nets. New counties came a little slower eventually.

Then in the summer of 2001 while mobile in Texas, I discovered the county hunter frequency of 14.336 in the 20 meter band. Up until then I had confirmed about 1000 county contacts. Now began the work in earnest. With this new tool in hand I began the daunting task of working the mobiles. I found that these dedicated folks travel and transmit from counties all along their journeys and even make special trips to "put out" counties. I also discovered that even I could put out counties and collect them at the same time. What a revelation! New counties poured in. Then the remain-

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e-mail: <k1bv@cq-amateur-radio.com>

USA-CA Special Honor Roll

Thomas P. Conroy, K7REL
USA-CA All Counties #1076
September 27, 2003

Alan Carpenter, W8OP
USA-CA All Counties #1077
October 2, 2003

Clifford Bilston, VK3CB
USA-CA All Counties #1078
October 2, 2003

Robert Gedemer, KA9JAC
USA-CA All Counties #1079
September 30, 2003

James R. Catlin, N1BY
USA-CA All Counties #1080
October 9, 2003

Bernd Keitemeier, DJ4GJ
USA-CA All Counties #1081
October 15, 2003

USA-CA Honor Roll

500

K7REL	3261
VK3CB	3262
KU4YM	3263
KA9JAC	3264
W2YR	3265
JA1IZ	3266
SP-0142-JG	3267
N1BY	3268
JR5JAQ	3269
N4EWK	3270

1000

K7REL	1639
VK3CB	1640
KU4YM	1641
KA9JAC	1642
N1BY	1643

1500

K7REL	1366
VK3CB	1367
KA9JAC	1368
N1BY	1369

2000

K7REL	1266
VK3CB	1267
KA9JAC	1268
N1BY	1269

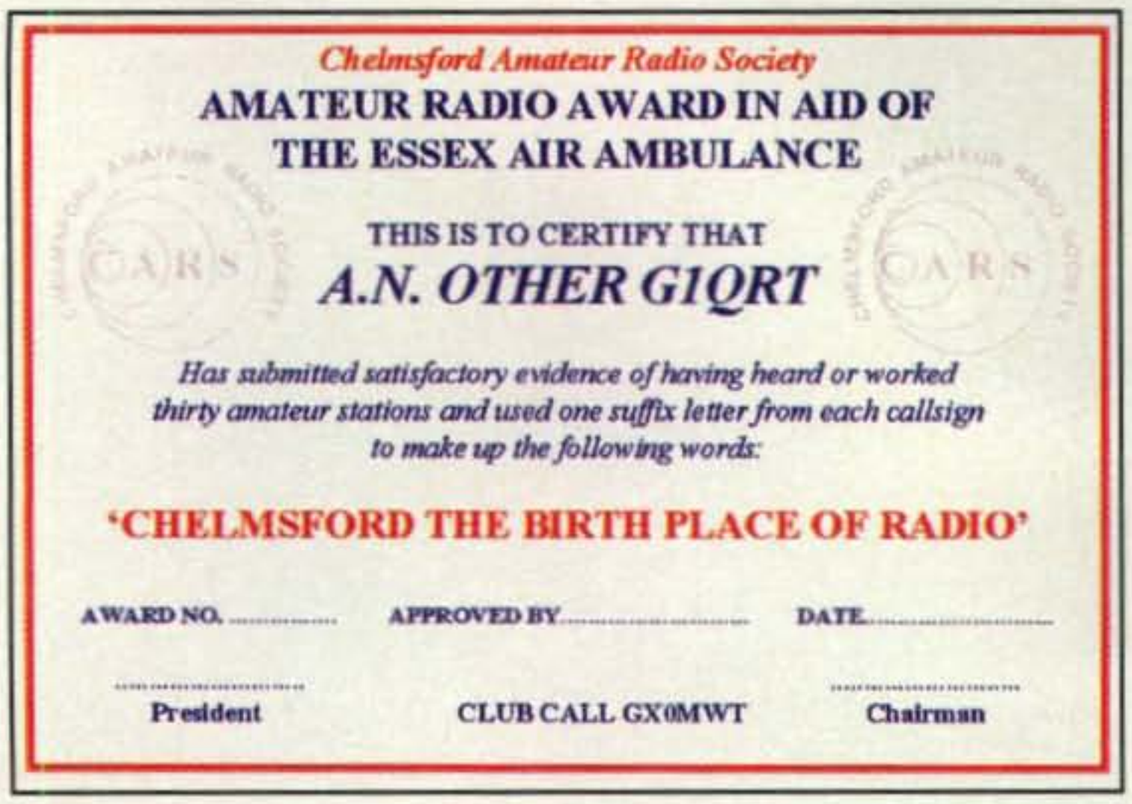
2500

K7REL	1186
VK3CB	1187
KA9JAC	1188
N1BY	1189

3000

K7REL	1098
VK3CB	1099
KA9JAC	1100
N1BY	1101

The total number of counties for credit for the United States of America Counties Award is 3077. The basic award fee for subscribers is $6.00. For nonsubscribers it is $12.00. To qualify for the special subscriber rate, please send a recent CQ mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 1, 2000. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 12 Wells Woods Road, Columbia, CT 06237 USA. DX stations must include extra postage for airmail reply.



The Chelmsford Award is sponsored by the Chelmsford ARS to commemorate the centenary of Marconi's first transatlantic radio transmission.

ing ones became the "rare" ones. It was a struggle to get them all, but a great chase.

In the last two years I not only finished all 3077 counties, but my wife and I have met a great group of people. It has been our pleasure to host several county hunters at out QTH and to have met many others while on our own trips across the country. County hunting is not just about getting them all, but meeting people—good people.

In my 40-plus years of ham radio, attaining this goal of working all U.S. counties has been the most satisfying. A big thank you to all those along the way who helped. It would have been nearly impossible without them. In particular, thanks to my wife, who puts up with this nonsense and even did logging in the beginning. I thank the net controllers who keep things moving smoothly, making efficiency out of chaos. Thanks to the many mobiles who went miles out of their way for my last county in a state. A big thank you to K6TEX in his "big rig" tractor-trailer, who went off his route for a county very near the end of my chase. My very last county was given to me by N3HOO, who drove many miles just for this one contact. Thank you, Ed.

What's next? Once bitten by the county hunting bug you discover that there are even more ways to work a county. Big rigs, OM/YL, prefixes, and something called "Master County Hunter," where the suffix of the call must contain a letter matching the first letter of the county. Now there's a challenge!

During my working career I managed to put in many thousands of hours looking down on this great land of ours from very high altitudes, and now I am enjoying my travels via the roads. You will continue to hear us as we travel the back roads making those county contacts. We hope to make a contact with you, too.—*73, Terry, WQ7A*

DX Awards

The Chelmsford Award. Chelmsford, England has a connection to the great Italian radio pioneer Marconi. It seems that Marconi's first radio factory for the design and production of equipment was located in this city. Therefore, while their claim that Chelmsford is the "Birthplace of Radio" may be a little inflated, we'll chalk this up to enthusiasm.

Sponsored by the Chelmsford Amateur Radio Society to commemorate the centenary of Marconi's first transatlantic radio transmission on 12 December 1901, use any of the suffix letters from a station's call to spell the following: CHELMSFORD THE BIRTHPLACE OF RADIO. Only one callsign may be used per letter, and a total of 30 calls is required. One of the callsigns used must be from a station located in the Chelmsford UK postal district, which is "CM" (e.g., the "R" from G1QRT could be used for the "R" in RADIO).

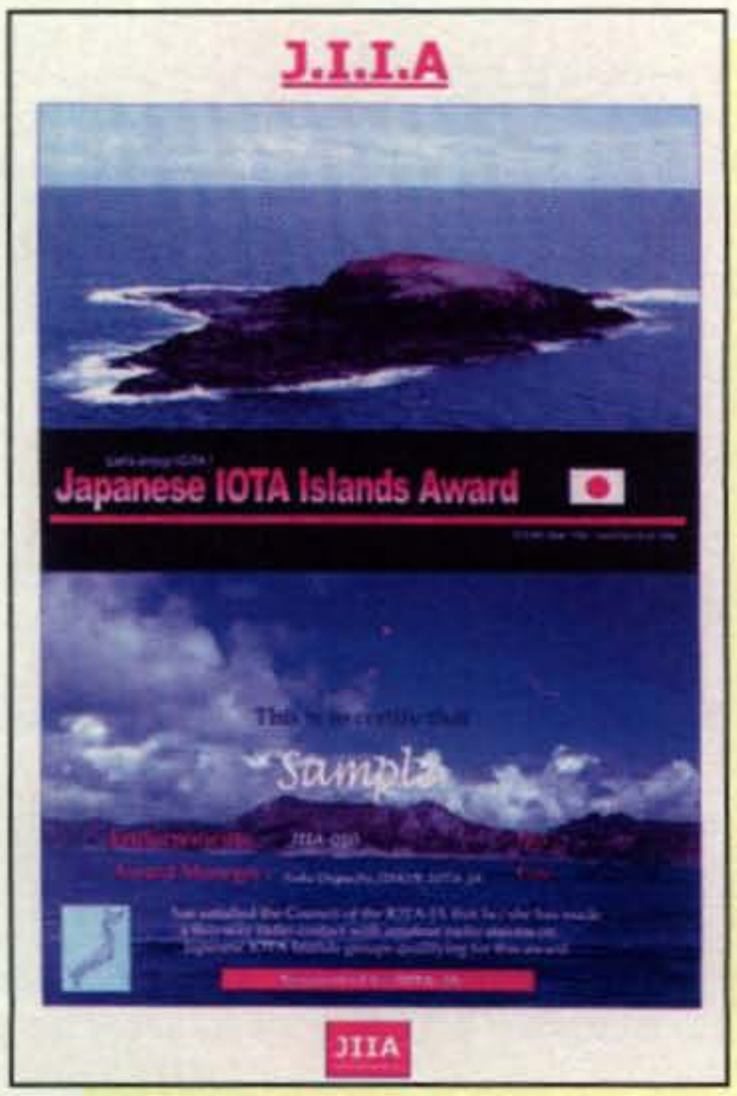
All bands and modes are accepted, no repeater contacts. Contacts must have been on or after 12 December 2001. Send GCR list and fee of 10 IRC or $US10 (excess fees collected will be donated to the Essex Air Ambulance fund) to Martyn Medcalf, M3VAM/G1EFL, 47 Paddock Dr., Chelmsford CM16UX, Essex, UK. For more information go to <http://www.g0mwt.free-online.co.uk/> and browse to the Chelmsford Award page.

Japan's IOTA Islands Award (JIIA). Japan has joined the growing list of countries that sponsor a subset of the IOTA (Islands On The Air) award. This award requires working different Japanese islands. There are literally hundreds and hundreds of islands which comprise Japan. The rules below list a website that contains a complete list of valid islands and provides a link to the official application needed to apply for the award. The entry level of the award is set at just ten islands, which I think is a great idea, since it allows the applicant to earn the award right away and then pursue the higher endorsements at a future time.

Contact Japanese islands that are allocated IOTA numbers on HF or on 50 MHz. The basic award requires contacts with at least ten Japanese Islands that have JIIA numbers. More than five different islands are required among the ten, including Islands with different IOTA numbers. Endorsements are available for 25, 50, 75, 100, 200, 300, and 400 islands. Contacts must have been on or after 15 November 1945. Applicants should download an official JIIA application from the website listed below. Cards are not needed, only a GCR list. A list of the contacts should look like this:

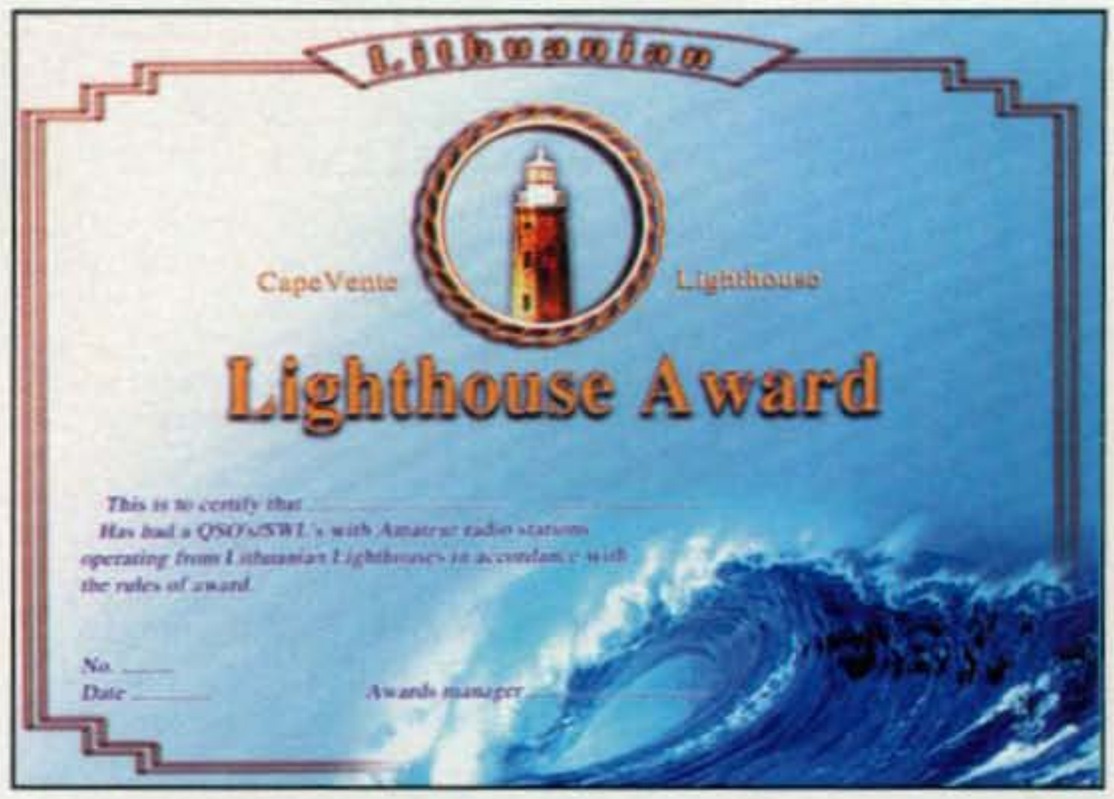
Date	JIIA No.	Call	Isl. Name	Band/Mode
23 June 1997	AS-067-006	JI6KVR/6	Uji Isl.	21 SSB

Special endorsements for band and mode are available on request. Application fee for the basic award is US$6, 5 Euros or 5 IRCs. Endorsement stickers for 25, 50 and 75 islands will cost SASE plus $US3, 2 Euros, or 2 IRCs. A separate



The Japanese IOTA Islands Award requires working different Japanese islands. The entry level of the award is set at just ten islands.

The Kaliningrad-Konigsberg 750 Award, sponsored by the Kaliningrad Radio Amateurs Association and the UA2 Contest Club, commemorates the 750th anniversary of the founding of Kaliningrad City (previously known as Konigsberg).



The Lithuanian Lighthouse Award is issued by the Klaipeda region radio club Svyturys for contacts with the eight light houses in Lithuania.

award is available at the 100, 200, 300, and 400 island levels; the fee is $US5, 4 Euros, or 4 IRCs. Apply to: Yukihiro Deguchi, IOTA-JA, 4796 Takashima-cho, Yatsushiro City, Kumamoto 866-0014 Japan. (Internet site:<http://www3.ocn.ne.jp/~iota/newpage61.htm>)

Kaliningrad-Konigsberg 750 Award. Kaliningrad was the scene of desperate battles during the closing days of World War II, and much of the city was destroyed and then rebuilt, duplicating many of the medieval buildings. The city used to be known as Konigsberg prior to 1956, when it was a part of German East Prussia. Its history goes back 750 years to its founding, which is celebrated by this award sponsored by the Kaliningrad Radio Amateurs Association and the UA2 Contest Club.

You can earn this one! There is no starting date for contacts, so you can hit your QSL collection and probably come up with more than a sufficient number of contacts. Earn 750 points by working UA2 stations on all bands and modes, and on VHF or via satellites, make contact with two UA2's. SWL okay. Scoring is as follows:

100 points for any RK2F, UE2F stations and for RW2F and R2MWO.

50 points for any other UA2 stations.

Same station may be worked on different bands for credit.

Earned points may be doubled if:

You were born in or lived in Konigsberg or East Prussia before 1945.

You were born in or lived in Kaliningrad or the Kalingrad region after 1945 and later moved away.

You ever had a UA2 license and later moved away.

Special rule for old timers: If you had at least one QSO with a Konigsberg station before 1945 (prefixes were D3 or D4), you only have to work one UA2 station to earn the award. Send a copy of this card with your application.

Send log extract and fee of 30 rubles for Russia/CIS applicants, or 3 IRCs for all others. The application goes to: Yuri Trubey, UA2FAO, P.O. Box 810, 236016 Kaliningrad, Russia. Send the fee to: Ulrich Mueller, DK4VW, Kreutzacker Str. 13, Marburg D-35041, Germany. (e-mail: <kda@aalog.com>)

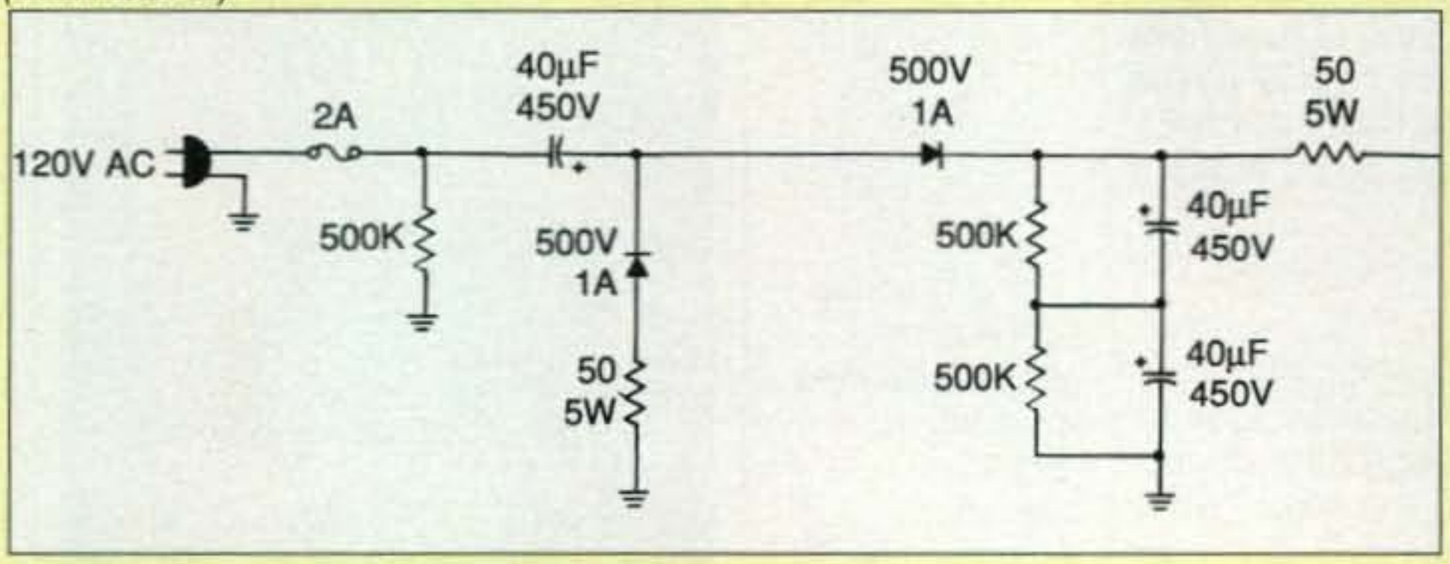
Look for the special station R2MWO on board the museum research vessel *Vityaz*. The UA2 Contest Club station, RW2F, is active in most contests.

Lithuanian Lighthouse Award. Lithuania has a small shoreline on the Baltic Sea; and where there's an ocean, you'll usually find lighthouses. Lithuania now has a lighthouse award, as do quite a few other countries. In July 2003, just about the time the award was released, there was a flurry of activity by LY/portable lighthouses, so support is in place and probably will be repeated in the future. There are only eight lighthouses on their list (as I said, it's a small coastline): Juodkrante, LIT-001; Klaipeda, LIT-002; Klaipeda (north pier), LIT-003; Nida, LIT-004; Pervalka, LIT-005; Sventoj, LIT-006; Uostadvaris, LIT-007; Ventes Ragas (Cape Vente), LIT-008.

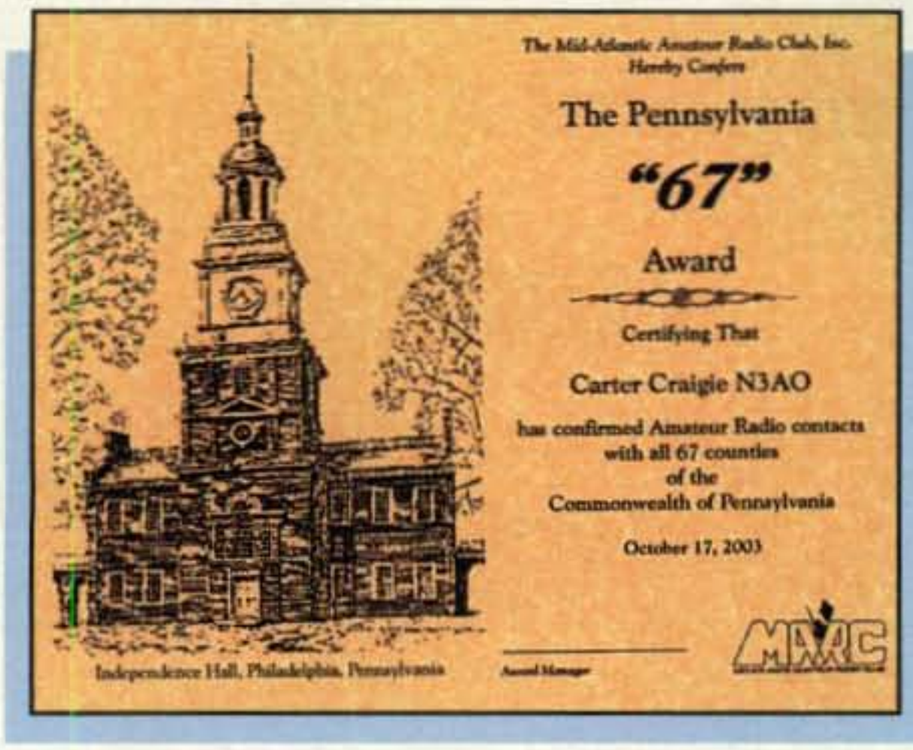
The award is sponsored by Klaipeda region radio club Svyturys for contacts with Lithuanian lighthouses after 1 January 1998. In activating a lighthouse

Oops...

We had a couple of misplaced components in the schematic that appeared on page 81 of the November issue, in K4TWJ's "World of Ideas" column. In the AC power line, the 40 µF, 450V electrolytic capacitor has to come *before* the diode and resistor to ground; otherwise the circuit will immediately short out and blow the fuse. In addition, the polarity on that capacitor was reversed. The corrected parts order is shown here. *(Tnx K6DPZ)*



Also in the November issue, we erroneously identified a GAP Titan antenna (p. 36) as being an example of a linear-loaded antenna. According to the folks at GAP, the Titan uses patented technology in which sections for some bands are fed as asymmetrical dipoles and sections for other bands are fed as vertical dipoles. We regret the error.



Contact the 67 counties in Pennsylvania to earn the Pennsylvania "67" Award.

the station must be in the lighthouse itself or at least one end of the antenna must be fixed to the lighthouse building. Requirements are as follows:

LY stations must contact at least four lighthouses, EU stations three, and DX two. SWL okay. Send GCR list and fee of 5 Euros or $5US to: Bronius Sriubas, LY1CM, Amerikos Lietuviu gt. 4, Kaunas LT-3018, Lithuania (e-mail: <ly1cm @qsl.net>).

Pennsylvania "67" Award. Each October for the past 35 years (with few exceptions) I've participated in the Pennsylvania QSO Party. The sponsors try to make sure that all of the state's 67 counties are activated, and this contest, together with the California QSO Party the preceding week, ignites the fall contest season for so many of us. In the course of a weekend I contacted 45 of Pennsylvania's counties. The Mid-Atlantic ARA sponsors the Pennsylvania "67" Award for contacting all of the counties, so you can see that the contest can get you off to a great start for this handsome award.

To apply for this award the QSLs for the contacts must be in your possession. All bands and modes are acceptable; no time limits. Repeater-type devices are okay, but contacts must be made in real time, not on stored BBS, and entirely with ham radio, not using internet relay systems. The optional application form is available in PDF format from sponsor. Send GCR list and fee of $US2 for U.S. applicants; all others send 1 IRC. Also enclose an SASE large enough to hold an $8^1/2 \times 11$ inch (21.5 × 28 cm) certificate. Apply to: Mid Atlantic ARC, Attn: Pennsylvania "67" Award, P.O. Box 2154, Southeastern, PA 19399-2154 (e-mail: <n3kn@arrl.net>).

URL of the Month

Canada's national ham organization, the Radio Amateurs of Canada, has a great page of Canadian awards at <http://rac.ca/awards.htm>. It includes not only their own series, but a good selection of those sponsored by Canadian clubs and specialty groups as well.

Attention radio clubs and specialty operating groups: I need to hear from you. *CQ* magazine is an excellent way to tell the world about your awards.

73, Ted, K1BV

Correction

The March 2003 column included an error in the mailing address of F5PBL, the custodian for the Work The Caribbean Award (WTC). It should have read: Claude Terrier, F5PBL, 18 allee du Mail, F-92360 Meudon-la-Foret, France.

BY TOMAS HOOD,* NW7US

History Made with a Bang and A Flash! X28—That's the Final Word

A Quick Look at Current Cycle 23 Conditions

(Data is rounded to nearest whole number)

Sunspots
Observed Monthly, October 2003: 66
Twelve-month smoothed, April 2003: 70

10.7-cm Flux
Observed Monthly, October 2003: 153
Twelve-month smoothed, April 2003: 136

***Ap* Index**
Observed Monthly, October 2003: 32
Twelve-month smoothed, April 2003: 20

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for January 2004

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 1-2, 13, 16, 24 26, 28-29	A	A	B	C
High Normal: 15, 17-18, 23, 27	A	B	C	C-D
Low Normal: 3, 22, 30	B	C-B	C-D	D-E
Below Normal: 4, 6-10, 12, 14, 25, 31	C	C-D	D-E	E
Disturbed: 5, 11, 19-21	C-D	D	E	E

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

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing on the following pages.
2. With the *propagation index,* use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 3 will be excellent (A) on Jan. 1st and 2nd, fair-to-good (C-B) on the 3rd, fair-to-poor (C-D) on the 4th, etc.

It was spectacular! On November 4, 2003 the high-frequency shortwave bands suddenly went dead. After many days of high solar activity with moderate to major flares, it was not surprising to many operators that the bands would go dead yet again. However, those who were watching the solar activity saw the X-ray data literally peak the instruments that record solar flares. At 1929 UTC, a very bright X-ray flash was observed. Quickly all instruments were saturated at the X17.4 level. For the next nearly 13 minutes this historic flare continued to be too strong for the sensors to handle. Finally, at 2006 UTC, the flare ended.

I called Christopher Balch at the Space Environment Center, NOAA, regarding this super flare. He explained that accurate measurement of the flare's intensity was difficult because none of the instruments was able to record anything above X17.4. The scientists and engineers who designed the original sensor equipment back in the 1970s had witnessed a number of events that caused saturation at that time. They went back to the drawing board and redesigned their instruments so that they would handle at least X17-class events, thinking that it would be enough. This time, it was not.

Since we do not have any accurate record of flare intensity prior to the 1970s, our perspective of this latest series of flares is somewhat limited. Certainly, X-class flares of this magnitude are not regular events. However, they're not unheard of. At least looking at the last 30 years, we can now say that this level of flaring is something we possibly could see every 20 to 40 years.

The Space Environment Center, the official last word on what a flare's classification is, took some time to finalize its analysis of this super flare. Christopher obtained two likely candidates: Using a standard log-normal fit analysis, the flare was shown to be X25. Using a result from an individual from the University of Colorado, Boulder, who analyzed HESSI data event <http://hessi.ssl.berkeley.edu/>, the flare was an X28-class. The SEC also has procedures that Christopher was exploring and validating. Finally, the SEC announced the official word: The flare of November 4, 2003 was an X28-class flare. This is the largest flare on record since observations have been made.

Flares are categorized by assigning a letter followed by a number, which tells us the specific intensity of the flare. X-ray flare intensity is measured in units of power per area or watts per meters squared. Each letter (A, B, C, M, or X) represents a certain numeric value, and the numbers following the letter in the flare classification multiply that value. The numeric values of the letter classes are:

A = 1.0×10E-8 (W m-2)
B = 1.0×10E-7 (W m-2)
C = 1.0×10E-6 (W m-2)
M = 1.0×10E-5 (W m-2)
X = 1.0×10E-4 (W m-2)

(The "W m-2" means watts per square meter)

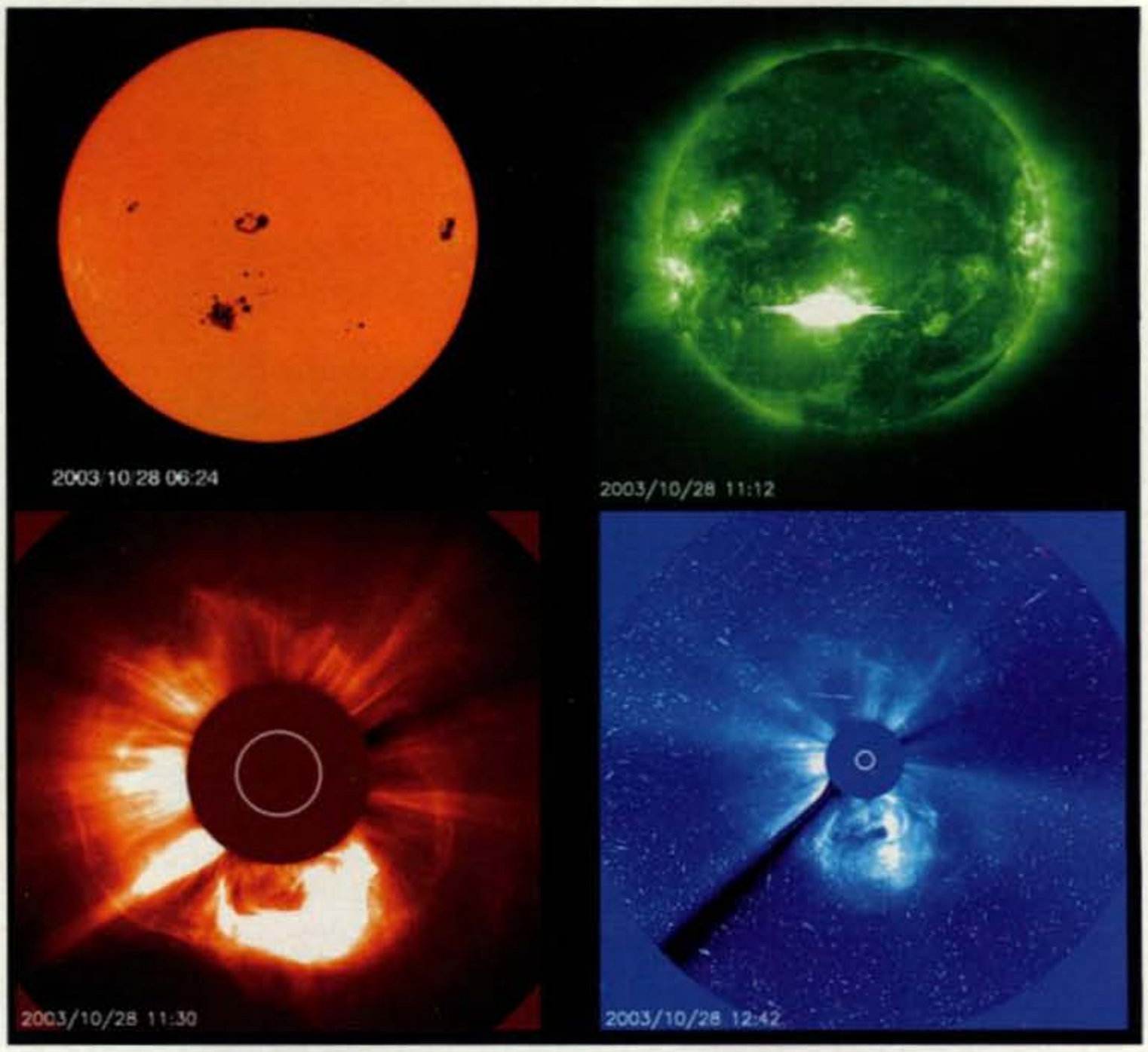
To determine the exact intensity of the flare, you multiply the number in the x-ray classification of that flare by the value of its class listed above. For example, the historic flare that was finally determined to be an X28 flare had an intensity of at least 28.0×10E-4 watts per square meter. That's big!

In addition to the flare, there was a coronal mass ejection (CME) hurled out to the side of the Earth. However, during many of the previous flares over the weeks leading up to this big one, many CMEs were hurled directly at Earth, causing very strong to severe geomagnetic storms.

*P.O. Box 213, Brinnon, WA 98320-0213
e-mail: <cq-prop-man@hfradio.org>

Ranking	Day/Month/Year	X-Ray Class
1	04/11/03	X28
2	02/04/01	X20.0
	16/08/89	X20.0
3	28/10/03	X17.2
4	06/03/89	X15.0
	11/07/78	X15.0
5	15/04/01	X14.4
6	24/04/84	X13.0
	19/10/89	X13.0
7	15/12/82	X12.9
8	06/06/82	X12.0
	01/06/91	X12.0
	04/06/91	X12.0
	06/06/91	X12.0
	11/06/91	X12.0
	15/06/91	X12.0
9	17/12/82	X10.1
	20/05/84	X10.1
10	29/10/03	X10
	25/01/91	X10.0
	09/06/91	X10.0
11	09/07/82	X9.8
	29/09/89	X9.8
12	22/03/91	X9.4
	06/11/97	X9.4
13	24/05/90	X9.3
14	06/11/80	X9.0
	02/11/92	X9.0

Table I– X-ray flare ranking (based on data from IPS Australia).



X-flare and coronal mass ejection (CME) of October 28, 2003. (SOHO/NASA photos)

Certainly, the period of solar activity and the resulting geomagnetic storming during the last part of October and the first part of November is one of the highest periods of activity in many years. It is officially number six on the scale of intensity in the last 30 years. The two major sunspot groups from where most of these flares came (NOAA sunspot regions 486 and 488) are the largest sunspot groups of Cycle 23. We have witnessed a truly spectacular historical moment!

Where does this X28-class flare fit in the ranking of X-class flares? On April 2, 2001 and on August 16, 1989 an X20-class flare was observed. On October 10, 2003 we witnessed an X17.2-class flare. These are listed in Table I.

CQ WW DX SSB Contest How Did You Fare?

How did this period of high solar activity, massive flares, and major geomagnetic activity impact the CW WW DX SSB Contest on October 24 and 25 last year? My original forecast called for excellent conditions. This had to be modified in light of the resurgent solar activity, but I continued to predict that conditions would be fair to good, rather than a complete loss with poor conditions.

I had a long talk with NOAA's Bill Murtagh, the solar forecaster on duty just prior to the contest period. We discussed several things, including the press's obsession with the seemingly unusual solar conditions. The press got all excited about a press release from NASA regarding a historical solar sunspot back in the 1800s (see <http://science.nasa.gov/headlines/y2003/23oct_superstorm.htm>. Many journalists and news outlets did not get past the headline. They incorrectly thought that we were in for a massive, historic storm by the contest weekend.

I maintained a different outlook, which Bill agreed with. I thought that after the initial high geomagnetic activity resulting from a heavy shockwave from a CME, the activity would settle down to active levels during day one of the contest. Then, sometime on Sunday, another CME might glance the Earth. I also warned that flares would present a constant challenge.

Bill and I agreed: It is hard to assess ahead of time what will happen in the real world of propagation, because we don't have enough data to create a working model. We cannot say for certain—yet—who will have a great weekend and who will have a lousy weekend. Conflicting reports tend to come in after such a chaotic event. Some find that these conditions don't degrade their working conditions, while others report a complete loss of signal. Also, there's no real pattern. I find that has held true in the past contests when conditions were rough. Some said that they had record-breaking results, even so. Others said that they decided that it was a waste of their contesting energy. Go figure!

One thing I came away with from this discussion with Bill is that we amateurs really need to become more scientific in our data-collection process. We need to record more information about our working conditions, our QSOs, and the other details that, when gathered together into a database, would allow us to begin to unlock the secrets of propagation such that we can begin to forecast better how these events will affect us.

Bill is hoping that by the end of this current solar cycle enough new data will have been collected such that we can begin to make correlations about these events with something of a pattern so that we can model propagation and space weather more accurately.

Did my revised forecast prove accurate? Yes. Day one, Saturday, saw active to minor geomagnetic storminess, but with very high 10.7-cm flux levels. I heard many live reports, especially from the low-latitude participating

stations, that the conditions were at least good, if not hot. While some did not have a record-breaking number of new multipliers, some had very high QSO rates. Flares did cause some degradation, and this continued through Sunday. How did you fare? I'd like to hear reports from you about this weekend so that we can get a good picture of how all of the solar activity impacted your operation.

Current Solar Cycle Progress

The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for October 2003 is 66, up from 49 in September. The 12-month running smoothed sunspot number centered on April 2003 is 70, down from March's74. The lowest daily sunspot value during October 2003 was recorded on October 13, 14, and 15 with a count of 13. The highest daily sunspot count for October was 167 on October 29 and 30. A smoothed sunspot count of 52 is expected for January 2004.

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 153 for October 2003, compared to 112 for September. The 12-month smoothed 10.7-cm flux centered on April 2003 is 136, down from September's 140. The predicted smoothed 10.7-cm solar flux for December 2003 is about 102, give or take about eight points.

The observed monthly mean planetary *A*-index (*Ap*) for October 2003 is 32. The 12-month smoothed *Ap*-index centered on April 2003 is 20.

Good Conditions for 2004

The following is an overview of expected propagation conditions on each amateur band between 6 and 160 meters for 2004.

6 meters: This band will see very little *F*-layer propagation compared to the years of the solar cycle maximum. The summer season will bring the usual troposcatter and sporadic-*E* activity. Aurora will still play a major role during spring and fall.

10 and 12 meters: These bands will be fair to poor, except during times of sporadic-*E* activity. Expect most DX openings to be mostly on north and south paths. Most of the time the solar activity will not support propagation at higher bands.

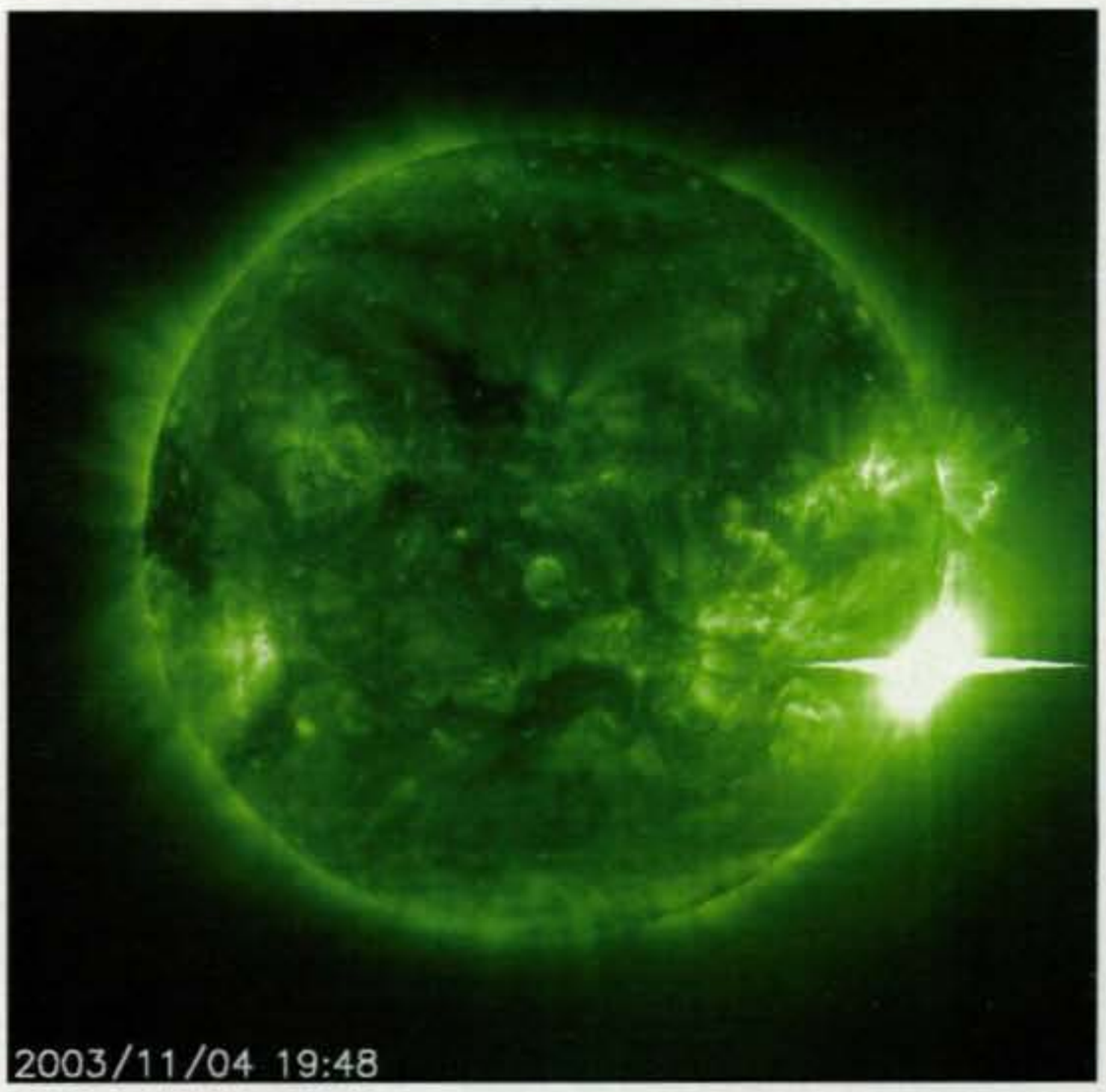
15 meters: This band will be fair to good, seeing worldwide openings during the daylight hours of all seasons. Most openings, though, will be short, except for the strong and frequent north-south path openings.

17 meters: This band should behave much like 15 meters, but you will find it open more often, with it remaining open for DX an hour or two longer than 15 meters.

20 meters: This band is going to be the main player during this year of moderate solar activity. Expect good conditions during the daylight hours, with worldwide DX openings possible throughout the year. DX conditions on 20 tend to peak for a few hours after local sunrise and again during the sunset period. During the summer, expect this band to remain open for DX several hours after local sunset, occasionally later into the night. In the winter months of 2004, some nighttime DX openings are expected.

30 meters: As Cycle 23 gradually declines in activity 30 meters will have moderate openings, especially a few hours before sunset until a few hours after sunrise. In 2004, this band will be an exciting one for those low-power digital signals. Winter brings longer nights, providing the right mix for exceptional worldwide DX.

40, 60, 80, and 160 meters: These are nighttime DX bands. Great worldwide DX should continue on 40 meters



The largest flare yet on record, this is the X28-class flare of November 4, 2003. (SOHO/NASA photo)

from about two hours before sunset to approximately two hours after sunrise during all seasons. Expect coast-to-coast DX on 60 meters. DX openings on 80 and 160 should peak during the early spring, late fall, and winter months. Expect somewhat stronger signals than those of the last few years.

January Propagation

It should be a toss-up between 15 and 17 meters for some great DX propagation openings during the daylight hours. These bands should open to most areas of the world, often with very strong signals. Fifteen meters may have a slight edge before noon, with 17 meters taking the lead after noon and becoming the optimum DX band during the late afternoon hours. Short-skip openings between distances of about 1200 and 2300 miles should be excellent during the daylight hours. Excellent short-skip openings are expected on 15 and 17 meters from shortly after sunrise through the early evening hours for distances between 1000 and 2300 miles.

Twenty meters is expected to be a solid band with excellent around-the-clock openings for both DX and short-skip. DX conditions should peak during a window of an hour or so right after sunrise and again during the late afternoon and early evening hours. Short-skip openings between approximately 1300 and 2300 miles should be possible from just after sunrise to as late as midnight. Shorter distance openings should also be possible from mid-morning to mid-afternoon.

The optimum band for DX conditions during the hours of darkness should be 40 meters. Expect openings to most areas of the world from shortly before sundown, through the hours of darkness, and until shortly after sunrise. Signal levels may be exceptionally strong at times. During the daylight hours short-skip conditions should be optimal for openings between approximately 100 and 600 miles. Skip will lengthen during the late afternoon, and by nightfall short-skip conditions should be optimal for openings between 800 and 2300 miles.

Expect 60 meters to play a significant role in nightly DX across the United States. With very low noise levels this month, the weaker signals of 60 meters will be easy to copy.

Because atmospheric noise levels will be at seasonally minimum levels in the northern hemisphere during January, the 80- and 160-meter bands should also be hot. Expect some good openings to many parts of the world on 80 meters during the hours of darkness and the sunrise period. Short-skip openings between distances of 50 and 250 miles should be optimal on 80 meters during the daylight hours. During the later afternoon and early evening hours short-skip openings should increase to between 250 and 1500 miles, and by nightfall openings up to and beyond 2300 miles should be possible.

Expect some DX openings on the 160-meter band during the hours of darkness. Openings towards Europe and the east should peak at about midnight. Openings towards the South Pacific and in a generally southerly direction may be possible just before daybreak, as well as openings into Asia and North Pacific. Short-skip openings up to 1300 miles should be possible during the hours of darkness, and frequently the skip will extend out as far as 2300 miles. During the daylight hours intense ionospheric absorption will severely limit openings, although some may be possible at times up to 150 miles or so.

VHF Conditions

Sporadic-*E* can occur during January, so be on the lookout. Very little aurora is likely to occur, however, so don't expect auroral-*E* propagation. The *Quadrantids* meteor shower is the major meteor shower for January, and it can appear any time during the first week of January. It sometimes can be quite intense, so it may be a good idea to set up some 2- and 6-meter schedules. Morning meteor openings may be the best bet during this month.

Check out my *CQ VHF* magazine propagation column for an in-depth look at propagation on VHF and above.

Discussion Forum

I've created an online discussion forum for you to come and ask questions about propagation and solar weather. There is a lot of useful information there. Visit <http://hfradio.org/forums/>, and don't forget to also check out the NW7US Propagation Center at <http://prop.hfradio.org/>. I look forward to hearing from you. Happy DXing!

73, Tomas, NW7US/AAMØEWA

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular meter band (10 through 160 meters) as shown in the left-hand column of the chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate meter band column (15 through 80 meters) for a particular geographical region of the continental USA as shown in the left-hand column of the charts. An * indicates the best time to listen for 80 meter openings.

2. The propagation index is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parentheses, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of days during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

3. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 AM; 13 is 1 PM, etc. On the Short-Skip Chart appropriate *standard* time is used at the path midpoint. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between New York and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones add 2 hours in the PST zone; 3 hours in the MST zone; 4 hours in the CST zone; and 5 hours in the EST zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 PM in Los Angeles; 17 or 5 PM in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA subtract 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone; and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 PM in New York City.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts CW or 300 watts PEP on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts CW or 1 kw PEP on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

5. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado 80302.

CQ Short-Skip Propagation Chart
January & February 2004
Local Standard Time at Path Mid-Point (24-Hour Time System)

Band (Meters)	*Distance From Transmitter (Miles)*			
	50-250	250-750	750-1300	1300-2300
10	Nil	Nil	10-15 (0-1)	08-10 (0-1) 10-15 (1-2) 15-17 (0-1)
15	Nil	10-16 (0-1)	08-09 (0-1) 09-10 (0-2) 10-15 (1-3) 15-16 (1-2) 16-18 (0-1)	07-08 (0-1) 08-09 (1-3) 09-10 (2-3) 10-15 (3-4) 15-16 (2-3) 16-18 (1) 18-19 (0-1)
20	Nil	08-10 (0-1) 10-14 (0-3) 14-16 (0-2) 16-18 (0-1)	06-07 (0-1) 07-08 (0-2) 08-10 (1-4) 10-14 (3-4) 14-16 (2-4) 16-18 (1-2) 18-19 (0-2) 19-21 (0-1)	06-07 (1) 07-08 (2) 08-10 (4) 10-14 (4-3) 14-16 (4) 16-17 (2-4) 17-18 (2-3) 18-19 (2) 19-21 (1)
40	07-08 (0-1) 08-09 (1-2) 09-10 (2-4) 10-16 (3-4)	07-08 (1-2) 08-09 (2-3) 09-11 (4) 11-15 (4-3)	07-08 (2) 08-09 (3-1) 09-11 (4-1) 11-15 (3-1)	07-08 (2-1) 08-15 (1-0) 15-17 (2) 17-19 (4-3)
80	07-08 (1-2) 08-09 (3-4) 09-19 (4) 19-21 (3-4) 21-23 (2-1) 23-03 (1-2) 03-07 (1)	07-08 (2) 08-10 (4-2) 10-16 (4-1) 16-18 (4-2) 18-21 (4) 21-23 (3-4) 23-03 (2-3) 03-07 (1-3)	07-08 (2-1) 08-10 (2-0) 10-16 (1-0) 16-18 (2-1) 18-20 (4-3) 20-23 (4) 23-05 (3) 05-07 (3-2)	07-08 (1) 08-16 (0) 16-18 (1-0) 18-20 (3-2) 20-23 (4) 23-03 (3) 03-05 (3-2) 05-07 (2-1)
160	09-17 (1-0) 17-19 (3-2) 19-05 (4) 05-07 (3) 07-09 (2-1)	17-18 (2-1) 18-19 (2) 19-21 (4-3) 21-05 (4) 05-06 (3) 06-07 (3-1) 07-09 (1-0)	17-18 (1-0) 18-19 (2-1) 19-21 (3-1) 21-03 (4-3) 03-05 (4) 05-06 (3-2) 06-07 (1)	18-19 (1-0) 19-21 (2-1) 21-03 (3) 03-05 (4-2) 05-06 (2) 06-07 (1-0)

ALASKA
January & February 2004
Openings Given In GMT#

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	Nil	18-20 (1) 20-22 (2) 22-23 (1)	16-22 (1) 22-00 (2) 00-02 (1)	04-13 (1) 07-12 (1)*
Central USA	20-23 (1)	19-22 (1) 22-00 (2) 00-01 (1)	17-23 (1) 23-01 (2) 01-03 (1)	03-14 (1) 07-12 (1)*
Western USA	20-00 (1)	19-22 (1) 22-00 (2) 00-02 (1)	18-20 (2) 20-01 (3) 01-02 (2) 02-04 (1)	04-05 (1) 05-12 (2) 12-15 (1) 15-16 (2) 16-17 (1) 05-12 (1)* 12-15 (2)* 15-17 (1)*

HAWAII
January & February 2004
Openings Given in Hawaiian Standard Time

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	08-13 (1)	06-08 (1) 08-12 (2) 12-15 (3) 15-16 (2) 16-17 (1)	06-08 (2) 08-12 (1) 12-15 (2) 15-16 (3) 16-17 (2) 17-19 (1)	17-19 (1) 19-21 (2) 21-00 (3) 00-03 (2) 03-04 (1) 19-21 (1)* 21-01 (2)* 01-03 (1)*
Central USA	07-09 (1) 09-12 (2) 12-14 (1)	06-07 (1) 07-08 (2) 08-13 (3) 13-15 (4) 15-16 (2) 16-18 (1)	06-07 (1) 07-10 (2) 10-13 (1) 13-14 (2) 14-17 (3) 17-18 (2) 18-20 (1)	17-19 (1) 19-20 (2) 20-03 (3) 03-04 (2) 04-06 (1) 19-20 (1)* 20-22 (2)* 22-01 (3)* 01-03 (2)* 03-05 (1)*
Western USA	09-11 (1) 11-14 (2) 14-16 (1)	06-07 (1) 07-08 (2) 08-14 (4) 14-15 (3) 15-16 (2) 16-18 (1)	06-07 (2) 07-10 (4) 10-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	16-18 (1) 18-19 (2) 19-22 (4) 22-02 (3) 02-04 (2) 04-09 (1) 19-20 (1)* 20-22 (2)* 22-04 (3)* 04-05 (2)* 05-07 (1)*

**Indicates best times to listen for 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.*
***Indicates best times to listen for F-2 layer openings on 6 meters.*
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.

Propagation charts prepared by George Jacobs, W3ASK.

Results of the 2003 CQ WW WPX SSB Contest *(from page 29)*

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, and Prefixes. An asterisk (*) before a call indicates low power. Certificate winners are listed in boldface. (Note that the country names and groupings reflect the DXCC list at the time of the contest.)

SSB RESULTS

QRP/p

ZS6DX	A	1,440,318	1043	471
HG5Z	A	1,212,640	1106	520
TM9K	A	756,510	772	453
				(Op: F5BEG)
S53D	A	718,530	784	430
SP6T	A	547,272	653	396
LU1VK	A	543,040	621	320
N8IE	A	456,120	655	360
N4JF	A	326,655	490	305
KB3TS	A	243,243	380	273
SM3C	A	228,810	434	290
				(Op: SM5CCT)
W7RAB	A	212,241	446	263
				(Op: KH7YD)
LY1DT	A	208,514	370	274
YT1CS	A	152,399	318	247
RW3TX	A	112,668	249	246
				(Op: UA3TU)
SP9RQH	"	108,834	245	194
WB6BWZ	A	101,556	341	182
UA3MRP	"	101,454	311	222
G8DCK	A	98,674	295	206
K6TV	"	80,808	297	168
DF1DX	A	79,712	253	188
HB9DSU	A	63,336	229	168
YO5BEU	A	60,116	315	154
AI2P	A	55,390	185	145
RV9JR	A	53,179	144	107
KVØK	A	50,666	197	154
UA4YJJ	"	44,545	185	151
RA6LW	"	39,552	160	128
VA3MA	A	37,471	166	101
RV3QX	"	35,685	146	117
W3CQH	"	34,048	179	133
OZ6XR	A	33,000	135	120
N8XA	"	27,977	128	101
SM6CRM	"	26,793	132	117
DL4NT	"	24,582	119	102
JI1AQY	A	23,055	103	87
KL7FDQ/W7	"	22,890	142	109
K1HJ	A	22,560	127	94
PR7AR	A	21,244	110	94
KP4KE	A	15,249	76	69
W2JEK	"	13,124	90	68
AB8DF	"	10,824	74	66
KC8LTL	"	9,782	77	67
W1CEK	"	8,840	79	68
UA3OG	"	7,448	59	56
UZ5UA	"	6,882	81	62
IZØFKE	A	5,040	42	42
N7HWW	"	3,870	57	45
KB6MIF	"	1,539	38	27
KB1CKT	"	1,428	36	34
PA9TT	"	858	27	26
OH6GFI	"	150	10	10
UA3TT	"	144	8	6
RZ3TWW	"	9	3	1
				(Op: R3T-15)
RK3TYA	"	9	3	1
				(Op: R3T-13)
UK8GZ	"	6	2	1
LU6HPF	28	470,272	522	334
LW7DQW	"	297,548	407	292
CX2PI	28	146,520	282	185
LU8CM	"	125,257	249	193
JR3RWB	28	97,125	221	185
VE5UF	28	74,910	201	165
UT8QQ	28	49,815	153	123
WWØWB	28	46,018	164	133
N4ZAK	28	24,480	119	96
K5ALE	28	18,905	109	95
N2JNZ	28	18,700	105	85
CA1RQZ	28	18,612	116	94
LU5DIT	"	15,920	95	80
JA2MWV	"	14,552	86	68
WBØIWG	"	6,534	67	54
SQ9UM	28	4,719	47	39
AD6G	28	1,856	33	32
UR5FCM	28	1,600	30	25
EW6CU	28	1,060	21	20
SP9KAG	"	468	14	13
N4EUK	"	240	10	10
RU9BB	21	788,190	747	390
RZ6HX	21	385,917	613	391
T94OM	21	193,764	359	268
9A7ZZ	21	138,125	293	221
SP5AKG	21	107,520	222	210
RKØAZC	21	106,106	227	182
				(Op: RUØAKB)
AE9F	21	72,436	223	182
JR1NKN	21	50,960	154	130
W2IQL	21	39,038	131	131
SP4GFG	"	33,990	139	110
ES6MT	21	10,626	70	69
JI8GZS/1	"	3,528	46	42
DL2MIH	21	3,045	37	35
SM6D	21	608	18	16
				(Op: SM6DER)
EA4DQD	14	135,200	328	260
WA8WV	14	110,664	238	212
YU1LM	14	92,868	298	218
ES8SW	14	78,440	260	212
AG4PJ	14	49,454	182	158
R4/V31YM	14	35,960	166	145
YO5BWI	14	33,491	214	107
LY3BY	14	32,430	174	141
LA8WG	14	31,373	189	137
JA2JSF	14	27,846	121	102
LU3DR	14	23,136	99	96
RA3XEV	"	22,176	123	96
SP9BMH	14	18,540	125	103
OK1UHZ	14	15,655	125	101
K9PO	14	14,406	104	98
AD8J	"	297	11	11
RUØAIG	7	96,614	197	134
W6QU	7	15,088	105	82
				(Op: W8QZA)
UW6N	7	14,896	84	76
				(Op: UR5NX)
JL6IPK	7	11,664	61	54
WB7OCV	7	1,638	22	21
OL4W	3.7	33,292	159	116
				(Op: OK1IF)
RW3VZ	3.7	31,740	139	115
SP3J	3.7	24,108	127	98
OK1IR	"	10,557	83	69
US8IGL	1.8	27,976	136	104
SQ2BXI	1.8	740	20	20
KR1ST	1.8	100	10	10

SINGLE OPERATOR

NORTH AMERICA

UNITED STATES

KQ2M	A	7,089,792	2928	998
NB1B	A	4,355,175	2122	825
W1CU	A	1,602,124	1127	586
N1BCL	"	728,280	818	420
KG1E	"	377,538	529	303
K5ZD	"	312,504	352	348
WA1JMP	"	259,891	887	293
KC1ME	"	225,680	409	280
N1IW	"	223,808	375	269
K5MA	"	190,650	340	246
W1TO	"	130,743	299	199
K1ZZ	"	122,912	248	184
K1WMQ	"	19,796	114	98
AA1BU	3.7	960,245	628	395
***KE1LI**	A	1,005,928	1026	506
***WS1A**	A	970,752	914	474
***WR1TE**	A	684,600	776	420
				(Op: W1JQ)
*NA1QP	"	618,230	822	422
*N1UR	"	563,665	714	395
*KA1EKR	"	277,656	393	276
*K1HT	"	182,584	301	232
*NE1V	"	154,287	380	237
*N1LW	"	154,080	327	214
*W1EBI	"	89,910	242	185
*KS1J	"	71,012	182	164
*WA2IAU	"	66,612	202	156
*AE1D	"	41,472	185	128
*K1SWG	"	36,533	149	119
*W1MO	"	29,920	147	110
*NJ1Q	"	28,380	126	110
*K1SND	"	26,104	114	104
*W1AMF	"	23,544	155	109
*WA1GLS	"	21,336	184	126
***W1GOU**	21	85,260	266	196
***WG1Z**	14	259,985	457	319
*KB1ICX	"	780	20	20
***W1AAD**	3.7	2,916	41	36
W2OO	A	575,250	620	375
N2GC	A	190,162	376	238
WR2V	A	183,529	303	223
W2MKW	"	165,200	334	236
N2SQW	"	122,688	302	192
W2FUI	"	89,000	273	178
WC2W	"	28,589	139	113
KC2HZW	"	26,784	147	108
KD2HE	21	27,911	134	113
W2ZQ	14	21,944	124	104
				(Op: KC2DLA)
***NY6DX**	A	2,464,378	1613	721
***W2RDS**	A	835,278	816	431
***KC2DTJ**	A	378,653	570	319
*KV2M	"	367,846	696	349
*WA2JQK	"	353,384	479	326
*WB2OQQ	"	267,859	435	277
*N2MUN	"	263,304	457	276
*KC2KEU	"	255,750	445	275
*W2IRT	"	247,096	454	268
*KX2J	"	236,800	547	296
*KW2O	"	158,400	328	225
				(Op: N2FF)
*N2MTG	"	144,768	358	208
*K2PH	"	101,920	268	182
*N2LK	"	96,996	254	177
*K2YLH	"	88,328	255	181
*WM2Z	"	63,742	198	157
*N2MH	"	40,005	159	127
*KC2KGZ	"	27,195	140	105
*N2LQQ	"	26,631	151	99
*W2STM	"	24,459	116	93
*WB2HWI	"	24,380	130	106
*WA2BKN	"	20,540	99	65
*W2CWA	"	20,240	121	88
*WB2AIV	"	3,741	54	43
*K2SZ	"	126	7	7
***NS2P**	28	29,505	138	105
*KC2FBV	"	130	10	10
***W2VU**	21	57,305	179	157
***KS2G**	21	42,117	179	139
***NW2J**	14	47,450	157	146
***K2HVE**	14	24,045	112	105
*KA2NRR	"	6,868	70	68
*K2BF	"	136	8	8
***N2KX**	7	118,272	208	176
K3PN	A	2,010,096	1472	648
K3ZO	A	1,910,853	1301	619
N3UM	A	1,140,990	1001	521
K3MD	"	1,048,173	998	497
N3FX	"	135,660	285	204
W3KLG	"	103,870	226	170
				(Op: K3ND)
4U1WB	"	61,650	206	150
				(Op: AJ3M)
AA3VA	"	1,008	22	18
W6AXX	28	71,214	205	166
N3HBX	21	1,398,852	1125	588
K3VA	"	84,231	223	191
WY3T	14	97,785	333	205
WA3AAN	7	43,401	135	111
W3BGN	3.7	460,836	516	306
***W3LL**	A	635,064	718	376
***W3MEL**	A	276,640	423	280
***KB3HOT**	A	162,368	334	236
*K3DSP	"	142,560	309	216
*NS3T	"	122,688	362	213
*WA3EQJ	"	92,925	262	175
*N3VOP	"	70,518	240	161
*KA3ZAT	"	61,457	215	151
*WA3KYY	"	46,560	152	120
*W3DSX	"	44,323	160	127
*AB3AI	"	41,958	166	126
*AA3WI	"	29,700	138	110
*KA3PVA	"	17,430	117	83
*N3XL	"	10,710	90	70
*K3MI	"	8,151	73	57
*WB3LKO	"	5,136	53	48
*N3FNE	"	3,780	48	42
*N3RQV	"	2,484	38	36
K4ZA	A	4,975,719	2416	861
NR3X	A	3,750,875	2107	811
AB1HZ	A	2,946,372	2200	748
				(Op: K5KG)
NE4AA	"	1,676,189	1353	601
K4BBN	"	1,247,940	1041	540
WW4R	"	832,194	992	467
				(Op: K4WX)
KO7X	"	765,887	843	431
NW4Z	"	719,532	701	414
				(Op: K4HA)
N4SEA	"	694,216	736	428
KO1N	"	666,144	798	432
				(Op: K1KO)
W4ARM	"	585,396	886	404
KG4FPJ	"	567,777	789	399
				(Op: N4GI)
NX9T	"	451,418	613	374
KG4FPK	"	365,392	696	328
				(Op: K4VUD)
W2YE	"	334,937	477	307
KY4AA	"	279,128	550	296
				(Op: N4GN)
N4CW	"	266,084	391	301
W4YE	"	224,664	344	264
W4RK	"	148,296	359	222
N4MM	"	56,474	157	151
W3BP	"	45,630	162	130
N4UH	"	28,704	108	92
W4OGG	"	7,098	100	39
N4BP	28	565,995	903	389
NA4W	28	545,528	811	388
				(Op: K4WI)
WC4H	"	84,898	299	187
NQ4I	21	2,291,256	1558	726
				(Op: K4BAI)
AG4W	"	162,426	362	253
KU4FP	"	15,996	97	86
AA4MM	1.8	47,196	250	138
W4KZ	"	3,124	49	44
***N4NX**	A	972,252	977	478
***N4IG**	A	751,608	797	429
***KO4MM**	A	707,736	705	444
*WO4O	"	537,930	615	387
*NJ2F	"	455,034	671	362
*KK4TA	"	368,192	618	352
*N4JED	"	346,998	555	302
*NA4K	"	340,974	511	342
*WD4AHZ	"	319,476	508	337
*KT4Q	"	315,880	512	298
*N4WQH	"	271,728	484	272
*K4UTE	"	258,912	391	288
*KI3O	"	236,954	408	257
*K4BEV	"	206,180	404	244
*KK6MM	"	177,135	428	241
*WB4SQ	"	154,921	311	221
*K8OSF	"	150,480	353	220
*K4MA	"	118,007	273	199
*W4NTI	"	116,200	289	200
*K3HE	"	109,061	263	191
*KB4N	"	97,614	262	198
*K4WES	"	81,483	240	173
*KG4OJT	"	78,030	247	170
*KG4KZZ	"	68,222	218	154
*NN4DF	"	65,121	176	147
*WA4JA	"	64,684	254	157
*W4BD	"	61,350	206	150
*WV8AA	"	53,784	193	162
*WA4OSD	"	50,508	218	138
*KE4MIL	"	47,428	171	142
*N4TKD	"	47,360	189	128
*AG4VG	"	42,408	202	124
*K8FK	"	40,051	166	121
*KG4RZH	"	37,392	166	123
*KG6AR	"	35,695	143	121
*KN4FC	"	31,395	141	115
*K4RFK	"	28,405	143	115
*K3MZ	"	26,522	112	89
*AE4EC	"	19,866	113	86
*W4TME	"	19,710	113	90
*AE4Y	"	19,152	106	84
*W4PA	"	18,656	100	88
*N1XC	"	17,352	87	72
*W4IDX	"	16,965	100	87
*K4NYS	"	14,972	86	76
*NO4S	"	14,320	103	80
*N4NTO	"	9,856	82	64
*KK4LH	"	7,802	50	47
*KG4MWO	"	2,700	66	30
*KG4TDJ	"	1,760	35	32
*W4BCG	"	464	19	16
***KA2DIV**	28	17,974	105	86
				(Op: N4GM)
*KF4ZEO	"	13,752	88	72
*KG4LTB	"	1,378	26	26
***W4NZ**	21	34,104	126	116
***WN4DX**	21	21,412	111	101
*AB4EJ	"	15,130	98	85
*K4BP	"	4,140	47	45
***AG4PM**	14	97,693	263	211
***KZ5OH**	14	73,872	187	171
*AA4KD	"	19,404	105	98
***K4WI**	1.8	1,363	33	29
K5TR	A	6,353,784	3476	986
W5WMU	A	3,168,066	2426	759
KW5DX	A	1,532,068	1489	607
				(Op: K1NT)
K5TWJ	"	1,300,044	1587	524
K5ZO	"	1,161,728	1432	512
W5EKF	"	751,210	1076	430
N6ZZ	"	691,050	985	425
KC5FU	"	319,144	595	328
				(Op: W5WW)
N5PA	"	241,668	387	252
N5KA	"	3,348	36	36
NN5P	28	1,543,986	1692	558
				(Op: W5PR)
NU5A	28	1,386,371	1553	553
				(Op: K5GN)
NQ5K	21	788,732	1043	476
				(Op: W5ASP)
W5FO	3.7	130,625	328	209
NE5D	1.8	104,076	385	196
				(Op: K5RX)
***WD5K**	A	1,897,101	1677	633
***KU5S**	A	372,570	592	330
***W5PUF**	A	304,470	498	306
*AB5C	"	249,228	406	301
*N5PU	"	231,572	459	277
*NI5F	"	190,120	419	245
*KD5LNO	"	186,944	430	254
*N5VMF	"	134,942	369	218
*WM5DX	"	130,634	311	217
*W5ETM	"	109,980	314	188
*KA5BAY	"	109,956	326	196
*K5WAF	"	108,388	321	196
*AB5XZ	"	81,702	275	178
*WA2ZOU	"	74,085	244	165
*KE5OG	"	43,960	171	140
*KC5HAV	"	35,916	154	123
*W5IL	"	34,290	127	127
*WD5JNC	"	26,840	139	110
*KOCIE	"	26,076	138	106
*W5RW	"	16,592	94	68
*AD5LU	"	13,760	115	80
*KA5PQD	"	12,403	100	79
				(Op: W5GN)
*W5TM	"	11,220	87	66
*KD5HBM	"	10,064	93	74
***NN5Z**	14	158,589	401	263
				(Op: K5PX)
KI6CG	A	1,547,800	1412	568
W6TK	A	1,422,984	1376	562
AD6WL	A	1,359,336	1371	542
NW6H	"	1,219,392	1523	522
				(Op: K6RB)
W6AFA	"	1,214,906	1165	539
W6QEU	"	1,123,500	1169	500
WT6TT	"	1,059,276	1285	492
				(Op: N6NZ)
NG6O	"	1,009,944	1080	468
				(Op: AD6TF)
N6AA	"	979,484	1053	452
AE6Y	"	929,667	1190	431
				(Op: W6IXP)
AI6V	"	812,955	1136	429
				(Op: K6GT)
KE6ZSN	"	761,823	1414	423
WR6M	"	499,680	694	360
K6LRN	"	458,547	630	353
NR3Y	"	377,740	686	340
KC6X	"	330,332	471	307
KG6ENA	"	272,783	511	293
K6JAT	"	243,586	471	254
KI6T	"	159,060	382	220
W6SJ	"	144,228	347	204
WW6O	"	136,746	319	214
NI6T	"	104,525	238	185
N6TW	"	77,880	222	165
W6TKV	"	73,304	259	154
W6ISO	"	70,422	202	194
W7CB	"	65,826	186	159
KI6IV	"	59,200	243	160
KJ6RA	"	39,330	142	115
W6ISQ	"	22,422	101	101
WM6A	"	21,630	139	103
				(Op: K6TA)
NO6X	"	11,220	87	66
AA6EE	21	10,034	58	54
NT6K	3.7	269,575	507	263
WI4R	"	63,700	197	140
K6OY	1.8	4,929	70	53
***N6NF**	A	2,010,580	1997	572
***WK6I**	A	1,094,952	1173	516
***NX6T**	A	370,440	595	343
*WX6V	"	343,735	607	305
*WD6DGS	"	275,937	555	309
*K7JJ	"	272,987	508	299
*AK6DV	"	212,715	411	261
*KG6NDO	"	211,548	400	244
*N6EM	"	161,935	385	233
*KE6FI	"	161,690	374	230
*KE6QR	"	151,369	370	229
*WX7B	"	145,842	340	223
*W8KIE	"	137,522	359	209
*K6VFF	"	133,045	312	205
*K6DGW	"	115,825	324	205
*N6QQ	"	102,440	266	197
*NU6T	"	86,880	268	181
*K6OWL	"	72,450	261	150
*KD6PQF	"	67,179	239	147
*N6HC	"	64,672	255	172
*KQ6TW	"	56,648	236	146
*AK6X	"	49,178	221	134
*N6PZ	"	48,556	166	122
*K6BIR	"	46,498	210	134
*KA6MAL	"	41,880	179	120
*NN6O	"	34,720	182	112
*K6CSL	"	26,208	137	104
*K6CA	"	23,958	120	99
*WB6NL	"	19,400	135	97
*KO6IS	"	18,170	99	79
*W6YL	"	13,912	92	74
				(Op: W6CT)
*K3KOA	"	13,430	109	85
*KG6OEY	"	12,240	69	60
*W6CIT	"	1,590	32	30
				(Op: N6AN)
*NC6P	"	66	6	6
***WA7BNM**	28	199,320	457	264
***N6WR**	28	23,520	123	105
*WB6NFO	"	16,683	93	83
*K6KO	"	5,546	51	47
***KG6HAF**	21	37,808	161	136
*KN6Y	"	25,651	134	113
*W6ZZZ	"	23,278	130	113
***K6HNZ**	14	561,321	826	423
*WR6WR	"	28,314	156	121
***KU6T**	7	10,168	74	62
N7GYD	A	3,986,362	2740	757
WA7LT	A	1,966,266	1822	626
N7TT	A	1,610,180	1611	572
K7ZS	"	1,603,368	1599	571
K7XN	"	1,458,498	1388	543
K7VI	"	693,240	879	424
K7RI	"	588,596	817	388
W7QN	"	471,213	745	369
AC7LX	"	334,628	601	323
NR7DX	"	188,480	434	248
				(Op: K7ABV)
NB7V	"	174,752	495	254
KX7J	"	143,376	248	232
KC7UP	"	137,145	317	223
KS7T	"	110,986	293	211
W7YVK	"	81,270	201	135
K7WM	"	23,653	135	109
NQ7V	"	1,032	18	9
KI7LS	"	80	8	8
W7EB	28	665,133	1213	399
K7ZZ	21	1,435,280	1532	560
KZ7X	21	339,636	666	332
				(Op: W7WW)
KØJJ	"	158,340	343	260
W7AYY	"	152	58	57
AD7J	14	789,786	906	522
K7ZSD	7	499,337	483	281
K7WP	"	119,616	243	168
***N9ADG**	A	576,725	802	391
***K7TR**	A	544,896	879	384
***WS7V**	A	513,220	753	383
*KE7RT	"	457,240	700	355
*KI7Y	"	266,107	506	281
*W7TSQ	"	247,680	443	288
*W7GTO	"	166,855	406	221
*K7VAL	"	75,143	254	163
*W7ZMD	"	40,831	193	133
*KJ7WN	"	31,236	157	114
*K7AWB	"	17,143	98	79
*W7YS	"	7,062	78	66
*N7JO	"	5,928	63	57
***W7UPF**	28	319,746	656	322
*NF7J	"	322	14	14
***K8IA**	21	695,310	834	462
***W7ZR**	21	410,916	720	363
*WG7Y	"	102,342	307	222
***K7OX**	14	15,743	108	91
N8II	A	1,759,313	1243	629
WB8TLI	A	1,101,126	920	494
K2UOP	A	659,750	722	406
KV3R/8	"	434,676	662	356
K8SAK	"	301,158	548	297
N8GX	"	70,416	216	163
WA8TNO	"	59,535	172	147
W8TAH	"	6,328	69	56
KC8VC	7	160,004	324	221
				(Op: W8JWN)
***KI8IZ**	A	488,961	711	363
***AK8B**	A	404,010	612	335
***N8WK**	A	345,440	553	340
*W8KNO	"	334,704	540	304
*NG8U	"	186,248	382	248
*N8BV	"	136,912	323	199
*AB8PD	"	127,458	328	194
*AF8C	"	111,688	289	184
*N8NYI	"	92,800	248	200
*N8NX	"	73,920	208	168
*N8QGC	"	67,554	198	139
*NA8W	"	60,741	216	153
*WB8AEV	"	51,940	209	140
*W8CK	"	36,905	203	121
*K8CV	"	33,480	123	108
*KZ8E	"	25,947	133	93
*K8GT	"	24,684	113	102
*AB8ND	"	20,367	108	93
*W8XF	"	10,360	77	70
*AG8Y	"	4,860	48	45
*KC8HWV	"	2,080	26	26
***KB8ITX**	14	15,120	104	90
KW9N	A	5,088,432	2296	908
				(Op: N9RV)
K9ZO	A	1,341,992	1294	542
NA9D	A	1,199,863	1371	521
W9BCV	"	240,908	419	263
WT9U	"	162,500	370	250
K9IG	"	150,528	301	224
KQ9L	"	137,795	354	217
K7EG	"	111,504	256	202
KG9N	"	21,492	134	108
KF9YR	21	132,710	297	230
KX9DX	14	599,808	1028	426
K9OP	"	143,406	369	257
KE9S	"	56,448	245	168
W9SE	7	154,874	326	211
K9IDQ	3.7	288	12	12
WO9S	1.8	25,425	167	113
***K9JE**	A	427,344	597	348
***K9BIG**	A	169,904	448	259
***NV8V**	A	142,830	362	207
*W9CEO	"	125,050	323	205
*N9UPG	"	104,286	348	191
*W9IL	"	70,192	197	164
*AB9FK	"	62,790	233	161
*W9JTT	"	61,600	221	160
*W9AEM	"	40,640	182	127
*WD9IYT	"	37,570	166	130
*KA9VHG	"	32,964	172	123
*K9JIG	"	30,590	144	115
*K9TTT	"	29,304	130	99
*KB9WQJ	"	22,881	120	87
*W9LYN	"	21,600	121	90
*N9MBR	"	16,268	100	83
*W9LYA	"	14,028	113	84
*K9WWT	"	13,416	96	86
*KG9IL	"	3,150	50	42
***KI9DX**	28	49,343	171	133
*WA4AME	"	12,567	88	71
***NI9C**	21	232,935	419	293
***WD9DJD**	14	24,780	133	118
*W9/SP3GHK	"	7,672	60	56
KØGAS	A	792,096	1068	446
KTØR	A	745,149	1053	447
WAØMHJ	A	447,125	642	365
K4IU	"	186,468	433	246
WØPPF	"	128,030	328	217
KØDEQ	"	124,176	292	208
WA2MND	"	101,772	345	198
KØAD	"	80,080	291	182
KØRH	28	331,593	574	321
NØUU	"	264,286	454	293
KE9KD	21	1,212,066	1171	578
KØDAT	"	101,175	230	213
***ACØW**	A	1,436,856	1699	548
***NØYO**	A	401,322	690	317
***KBØBUV**	A	252,108	457	282
*KCØIGY	"	156,156	395	231
*W9BNO	"	148,608	386	216
*KØJJM	"	120,267	313	207
*NØWY	"	113,678	286	226
*KC7QY	"	110,075	319	185

*KBØARZ	*	72,501	226	169
*KØHW	*	71,520	233	160
*NØYY	*	56,420	158	140
*KØKX	*	50,862	149	147
*KAØEIC	*	49,773	214	141
*NØLGU	*	49,704	165	109
*ABØMV	*	40,278	182	137
*KCØLUX	*	26,000	154	104
*KMØR	*	25,338	137	103
*KØBX	*	21,000	101	75
*AAØNK	*	8,418	83	61
*AEØQ	*	8,122	71	62
*KGØTX	*	4,730	60	55
*ABØOX	*	2,415	46	35
*NØLZ	*	425	19	17
***KØFA**	**28**	**26,986**	**131**	**103**
*NØIBT	*	18,601	97	89
*WDØGQA	*	608	16	16
*KCØGTR	*	390	18	15
*KCØGTR	*	390	18	15
***KJØB**	**21**	**62,080**	**195**	**160**
*KJ9C/Ø	*	15	3	3
***WØIE**	**14**	**20,383**	**124**	**109**

BARBADOS

8P6EX	**A**	**931,662**	**980**	**426**

CUBA

***CO2JG**	**A**	**1,336,238**	**1365**	**433**
***CM8WAL**	**28**	**1,056,054**	**1260**	**482**
*CO2TK	*	411,536	728	272
***CO2PH**	**21**	**315,537**	**569**	**269**

MARTINIQUE

TO3M	**A**	**13,235,250**	**4647**	**1050**
			(Op: T93M)	
***FM5FJ**	**21**	**1,371,075**	**1129**	**543**

DOMINICAN REPUBLIC

***HI3NR**	**21**	**766,665**	**864**	**405**

PANAMA

HP1XVH	**21**	**1,865,920**	**1381**	**595**
***HQ9R**	**A**	**1,535,936**	**1573**	**466**
			(Op: WQ7R)	

HONDURAS

***HR1CP**	**A**	**449,210**	**780**	**290**
***HR1AAB**	**A**	**211,850**	**471**	**210**
*HR1RBM	*	50,490	147	135

GRENADA

J37K	**28**	**1,232,568**	**1407**	**424**
			(Op: AC8G)	

ALASKA

AL1G	**A**	**174,012**	**334**	**294**
***WL7UQ**	**14**	**7,752**	**60**	**51**

US VIRGIN IS.

***KP2BH**	**A**	**1,491,968**	**1161**	**496**
*KP2F	*	102,306	266	177
			(Op: W9VA)	

PUERTO RICO

***WP4LNY**	**A**	**255,794**	**440**	**242**
*WP3GW	*	187,200	326	225
***NP3P**	**28**	**1,351,960**	**1369**	**463**
			(Op: NP3E)	
***KP4AH**	**14**	**1,453,956**	**1195**	**532**
			(Op: WP3C)	

COSTA RICA

***TE2M**	**A**	**1,543,755**	**1316**	**485**

BELIZE

***V31MX**	**21**	**659,186**	**872**	**361**

ST. KITTS/NEVIS

V44NK	**A**	**1,313,264**	**1362**	**422**

CANADA

VC1R	**A**	**8,599,776**	**3234**	**928**
			(Op: K6IF)	
VE3AT	**A**	**5,704,619**	**2582**	**859**
VO1MP	**A**	**3,794,700**	**1728**	**695**
VY2LI	**A**	**1,575,090**	**1185**	**555**
VY2SS	*	927,607	701	439
VE5CPU	**A**	**871,202**	**1109**	**386**
VE3EJ	*	608,025	636	335
VE9MY	**A**	**298,291**	**357**	**301**
VO1TA	*	245,300	330	220
VE7XO	**A**	**181,192**	**313**	**232**
VE7KET	*	114,950	225	190
VA6XDX	**A**	**109,210**	**250**	**163**
VA7AM	**21**	**1,631,370**	**1356**	**534**
VA6MA	**21**	**779,667**	**847**	**411**
			(Op: VE6MAA)	
VA3FP	**21**	**131,456**	**252**	**208**
VA3HUN	*	3,430	38	35
VA7RR	**14**	**3,340,974**	**1994**	**754**
VE6JY	**14**	**1,845,168**	**1201**	**624**
			(Op: VE5MX)	
VE1OP	**14**	**335,160**	**463**	**315**
VE7AV	*	16,324	85	77
VE8GB	**14**	**5,280**	**52**	**48**
VE7SZ	**3.7**	**573,165**	**496**	**271**
***VE3OJ**	**28**	**120,960**	**281**	**189**
***VE1ASJ**	**28**	**111,936**	**292**	**176**
***VA3XRZ**	**21**	**153,870**	**287**	**223**
*VE3RCN	*	106,005	245	185
***VE3MGY**	**1.8**	**82,404**	**202**	**109**
*VE3DZ	*	2,197,526	1315	622
*VE3NE	*	2,102,065	1324	551
***VE7IN**	**A**	**953,608**	**968**	**398**
*VE3AGC	*	941,287	901	397
*VE3CR	*	864,560	797	428
*VE3XD	*	730,992	752	388
***VE6ZT**	**A**	**701,600**	**794**	**400**
*VA3SWG	*	651,226	684	359
*VE7UQ	*	635,436	788	342
***VE2AWR**	**A**	**476,604**	**569**	**324**
*VA3OX	*	402,936	517	309
*VE1JS	*	389,120	449	320
*VE5SF	*	346,860	596	282
*VE3KP	*	297,528	422	253
*VE3KPP	*	213,003	371	207
*VE6AX	*	163,776	351	192
*VE4HAZ	*	134,976	309	192
*VE3UOT	*	118,816	269	188
			(Op: VE3GD)	

***VE4YU**	**A**	**109,242**	**271**	**153**
*VE3BHP	*	98,072	233	164
*VA3IX	*	86,620	244	142
*VE3WIB/M	*	71,485	201	145
***VO1MX**	**A**	**49,680**	**161**	**120**
***VE9GLF**	**A**	**34,456**	**121**	**118**
*VE3OM	*	33,124	130	98
*VE3BDN	*	23,970	96	94
***VY1AC**	**A**	**20,216**	**116**	**76**
*VE4VID	*	15,450	96	75
*VE3IGJ	*	11,151	87	63
*VE4HUM	*	7,598	61	56
*VA3KOC	*	4,223	46	41
*VE3OIL/M	*	360	12	12
*VA3PL	*	115	5	5

ANGUILLA

VP2E	**21**	**9,616,596**	**3625**	**1074**
			(Op: N5AU)	

BRITISH VIRGIN IS.

***VP2V/AH7G**	**A**	**214,720**	**485**	**244**

TURKS AND CAICOS

***VP5V**	**A**	**9,427,791**	**4416**	**883**
			(Op: W5AO)	

MEXICO

XE1MM	**A**	**909,063**	**1006**	**387**
***XE2AUB**	**A**	**1,520,040**	**1427**	**478**
***XE1CRO**	**A**	**1,280,078**	**1314**	**418**
*XE2AC	*	133,760	328	190
*XE2MVS	*	9,920	69	62
***XE1BEF**	**21**	**167,919**	**344**	**223**

NICARAGUA

***H7A**	**A**	**1,804,944**	**1739**	**496**

CAYMAN IS.

ZF2NT	**A**	**10,136,175**	**4548**	**983**
ZF2AH	**28**	**2,551,145**	**2202**	**545**

AFRICA

MAURITIUS

***3B8MM**	**A**	**4,406,028**	**2317**	**638**

TUNISIA

3V8BB	**A**	**12,570,572**	**3792**	**959**
			(Op: YT1AD)	

GUINEA

***3XY8B**	**A**	**9,240**	**59**	**56**

MADAGASCAR

***5R8FU**	**21**	**433,840**	**458**	**319**

NIGER

5U7JK	**A**	**2,967,591**	**1599**	**627**
5U7JB	**A**	**1,780,496**	**1115**	**514**
			(Op: N4HX)	

GHANA

***9G5MD**	**A**	**4,924,140**	**2166**	**767**

ZAMBIA

***9J2KC**	**A**	**85,760**	**234**	**128**
			(Op: JL1NKC)	

CONGO

9S1X	**A**	**7,214,928**	**2785**	**872**
			(Op: F6BLQ)	

MADEIRA ISLAND

CQ3E	**14**	**489,090**	**462**	**357**
			(Op: CT3FQ)	
***CT3HF**	**A**	**565,515**	**518**	**295**

CAPE VERDE

D48	**A**	**25,937,444**	**6274**	**1258**
			(Op: 4L5A)	
D44TD	**A**	**21,039,355**	**5451**	**1189**

CANARY IS.

EA8AH	**A**	**5,643,486**	**1995**	**738**
			(Op: OH1RY)	
EA8URA	**A**	**603,715**	**499**	**329**
EA8EW	**28**	**466,745**	**477**	**337**
			(Op: OH1MA)	
***AN8AG**	**A**	**1,238,523**	**874**	**429**
*EA8ARG	*	31,108	106	101
*AM8AD	*	19,656	84	78

GUINEA BISSAU

***J5UDX**	**28**	**3,561,032**	**1742**	**692**
			(Op: IV3NVN)	

SUDAN

***ST2CF**	**28**	**5,779,768**	**2738**	**709**

EGYPT

***SU9NC**	**A**	**11,402,253**	**4228**	**873**

BURKINA-FASO

***XT2TI**	**A**	**5,059,698**	**2294**	**742**

REPUBLIC OF SOUTH AFRICA

ZS6HO	**A**	**1,364**	**22**	**22**
***ZS6RAE**	**A**	**48,236**	**139**	**124**

ASIA

GEORGIA

4L6AM	**14**	**4,323,942**	**2151**	**738**

ISRAEL

***4X6DK**	**A**	**1,824,100**	**1081**	**493**
*4Z5MO	*	59,909	159	139
***4X1VF**	**28**	**1,298,448**	**1158**	**426**
***4X8T**	**3.7**	**10,000**	**43**	**40**
			(Op: 4Z5FI)	

CYPRUS

***H22H**	**A**	**6,213,598**	**2951**	**719**
			(Op: 5B4MF)	

KUWAIT

9K2HN	**21**	**290,772**	**412**	**245**

MALAYSIA

***9M2TO**	**A**	**2,908,062**	**1881**	**619**
			(Op: JA0DMV)	

SINGAPORE

9V1UV	**A**	**283,920**	**428**	**280**
9V1YC	**21**	**4,781,420**	**2553**	**820**

OMAN

***A45WD**	**A**	**8,073,000**	**3358**	**828**
			(Op: YO9HP)	

TAIWAN

***BV4/7N4TEN**	**21**	**49**	**7**	**7**

CHINA

***BD5RI**	**21**	**1,418,998**	**1312**	**553**

KYRGYZSTAN

EX8AA	**A**	**2,557,898**	**1668**	**607**
EX2T	**A**	**491,836**	**390**	**247**
EX8O	*	68,376	258	148
EX7ML	**21**	**1,001,470**	**873**	**430**

TAJIKISTAN

EY3M	**A**	**568,106**	**599**	**341**

TURKMENISTAN

***EZ8CW**	**A**	**4,230**	**50**	**45**

KOREA

HL5UOG	**A**	**229,080**	**382**	**249**
HL3AHQ	**A**	**186,816**	**353**	**224**
DS5KJR	*	74,730	257	141
HL3GOB	**14**	**27,400**	**112**	**100**
HL3AMO	**3.7**	**1,088**	**20**	**17**
***HL2FDW**	**A**	**341,040**	**536**	**294**
***HL1/WX8C**	**A**	**107,198**	**241**	**182**
*HL9TY	*	26,208	123	96
*DS5ACV	*	15,228	111	105

THAILAND

E21CJN	**21**	**282,982**	**398**	**287**
HS1JNB	*	3,854	42	41
***HS1PDY**	**A**	**1,125,856**	**921**	**466**
***HS5AYO**	**21**	**23,904**	**113**	**96**

JAPAN

JH4UYB	**A**	**5,386,800**	**2424**	**804**
JR6EZE	**A**	**4,169,440**	**2085**	**736**
JA7NVF	**A**	**3,115,042**	**1648**	**707**
JH1EAQ	*	3,052,944	1639	666
JA8RWU	*	2,968,735	1583	701
JA6GCE	*	2,619,640	1513	632
JQ2EHG	*	499,278	587	346
			(Op: JQ1BVI)	
JA2FSM	*	371,059	439	299
JA5IP	*	173,635	296	205
JR3NZC	*	108,147	223	177
7J1ABD	*	45,475	142	107
JA1ISJ	*	21,912	94	88
JA4BAA	*	18,750	100	75
JA5APU	**28**	**118,767**	**251**	**183**
JA1AAT	*	147	7	7
JI3OPA	**21**	**3,756,425**	**1767**	**775**
JR4QZH	**21**	**627,008**	**604**	**388**
JA2XCR	*	211,640	312	260
JH1BUB	*	48,174	180	111
JH2BTM	*	20,967	93	87
JA1JLP	*	7,080	74	59
JJ4CDW	*	3,690	42	41
JEØVFV	*	1,728	28	27
JA8TEZ	*	1,224	25	24
JG1GCO	*	1,113	21	21
JA2QVP	*	1,026	20	19
JH1AZO	**14**	**66,748**	**197**	**148**
JJ2PUG	*	34,884	117	108
***JH7XMO**	**A**	**1,163,778**	**886**	**462**
***JA5EO**	**A**	**428,085**	**525**	**315**
***JR3RIY**	**A**	**294,958**	**392**	**278**
*JA3AOP	*	264,966	402	237
*JA1BUI	*	264,000	378	275
*JG4OOU	*	196,272	334	232
*JA1RKI	*	159,528	303	204
*JE1REU	*	129,980	260	194
*JA3UWB	*	127,204	255	196
*JL7XBN	*	96,744	229	174
*JA1BNW	*	88,644	204	166
*JA7DNO	*	87,120	196	165
*JH3OXM	*	86,022	206	162
*JA1GYO	*	79,650	197	150
*JA3PYC	*	74,292	189	151
*JA1ALX/9	*	70,500	200	141
*JA2GHP	*	65,100	197	140
*JQ1AHZ/2	*	63,980	187	140
*JR1MRG	*	62,464	181	128
*JA4AQR	*	54,627	149	131
*JL3RDC	*	49,028	168	119
*JA1XPU	*	48,888	149	126
*JA1IZ	*	37,030	126	115
*JJØJDK	*	32,384	107	92
*JA1BBA	*	30,336	126	96
*JS1KQQ	*	29,900	115	100
*JA3PYH	*	24,472	102	92
*JR2AWS/1	*	22,176	104	84
*JR3NDM	*	19,602	100	81
*JA3LEZ	*	18,486	86	79
*JA1HG	*	15,768	82	73
*JH1RDU	*	12,444	70	61
*JH1FNU	*	12,285	73	63
*JL7AIA	*	9,129	55	51
*JA2VZL	*	8,370	63	54
*JJØAEB	*	6,528	50	48
*JH1OLB	*	5,289	47	41
*JG1FGL	*	5,246	51	43
*JAØGZ	*	4,216	49	16
*JO1UOE	*	2,624	36	32
*JJØACA	*	1,488	24	24
*JH1RMH	*	1,092	22	21
*JA1STY	*	912	21	19
*JM3HYL	*	585	16	15
*7N4TDG	*	36	6	
***JF3BFS**	**28**	**205,204**	**355**	**244**
*7N2UQC	*	25,484	111	92
*JA6EFT	*	9,072	60	56
*JR3CVO	*	6,600	50	44
***JA1SWB**	**21**	**599,325**	**589**	**393**
***JA6WFM**	**21**	**277,722**	**389**	**278**
*JHØNVX/1	*	116,226	233	198
*JQ1COB	*	114,260	226	197
*JL8AQH	*	108,852	198	193
*JM1GHT	*	99,176	211	184
*JA2KKA	*	53,856	166	132
*JI8BUR	*	53,856	154	136
*JK1BII	*	19,749	93	87

*JA3BBG	*	5,896	48	44
*JA7ADV	*	3,036	34	33
*JA3FZI	*	2,079	30	27
*JF7GDF	*	1,488	24	24
*JR3KAH	*	1,210	23	22
*JF2FKJ	*	196	18	7
***JA7YAA**	**14**	**274,596**	**372**	**294**
***JI1FDF**	**14**	**108,836**	**224**	**182**
*JF2QNM	*	95,586	225	178
*JH1UUT	*	77,368	201	152
*JR4FLW	*	54,270	148	134
*JHØEPI	*	53,466	151	134
*JE1GZB	*	14,850	78	75
*JG1OWV	*	675	15	15
***JA7JHT**	**7**	**2,990**	**25**	**23**
***JM4WUZ**	**3.7**	**3,348**	**32**	**31**
*JE1SPY	*	2,232	27	24

OGASAWARA

***JD1BIA**	**28**	**3,496**	**40**	**38**

MONGOLIA

JT1CO	**14**	**86,655**	**261**	**159**

TURKEY

TA3EL	**21**	**26,112**	**106**	**96**
TA2IJ	**7**	**1,001,520**	**553**	**321**
***YMØT**	**A**	**2,451,570**	**1484**	**510**
			(Op: TA2RC)	
***TA2IB**	**21**	**438,079**	**549**	**281**

ASIATIC RUSSIA

UA9AYA	**A**	**7,563,884**	**2786**	**769**
			(Op: UA9BA)	
UA9CLB	**A**	**3,846,144**	**1826**	**626**
UA9JDP	**A**	**1,799,192**	**1247**	**478**
UA9BS	*	1,326,295	950	437
RU9WX	*	1,307,481	973	483
RV9BI	*	461,340	522	330
RV9XO	*	424,109	481	301
RW9TA	*	413,136	491	304
RK9QWZ	*	291,357	403	243
			(Op: UA9QFF)	
UA9OS	*	186,824	288	242
RW9WA	*	109,956	196	196
RA9MJ	*	78,523	185	149
UA9HN	**28**	**21,945**	**125**	**95**
RV9JD	*	19,000	112	95
UA9KM	**21**	**710,151**	**711**	**417**
UA9FM	*	114,114	235	182
UA9JBA	*	44,045	139	115
UA9YA8	**7**	**989,140**	**662**	**361**
RZ9IR	*	8,621	46	37
RA9MX	**3.7**	**23,312**	**68**	**62**
***RZ9SWP**	**A**	**1,715,218**	**1107**	**514**
			(Op: RX9SN)	
***UA9ACJ**	**A**	**1,099,717**	**759**	**361**
***UA9OFA**	**A**	**913,906**	**802**	**406**
*RK9CR	*	597,526	588	334
*RV9AZ	*	505,686	482	311
*UA9MR	*	470,615	479	305
*RA9OZ	*	436,560	513	321
*RA9XF	*	417,852	494	318
*RW9UX	*	212,760	326	216
*UA9ORQ	*	210,090	310	235
*UA9OUB	*	181,902	334	213
*RV9UF	*	155,496	302	209
*RZ9IB	*	146,672	292	206
*RV9BB	*	135,890	234	214
*RA9XU	*	49,742	152	133
*RX9WN	*	35,800	111	100
*UA9XL	*	32,616	120	108
*RA9UA	*	32,373	129	109
*RN9XA	*	28,764	121	102
*UA9OSV	*	25,200	104	90
*UA9XAB	*	3,895	41	41
*UA9WZ	*	2,352	36	28
*UA9OA	*	35	5	5
***UA9LAU**	**28**	**26,656**	**132**	**98**
***RA9JR**	**21**	**1,086,804**	**884**	**522**
***RA9FEL**	**21**	**681,351**	**735**	**363**
*RA9FRD	*	446,709	525	323
*RA9JM	*	245,520	354	264
*UA9MQR	*	151,329	273	219
***UA9AMF**	**14**	**1,341,811**	**979**	**499**
***RK9AX**	**14**	**683,196**	**638**	**394**
*UA9LCY	*	284,580	368	279
*RX9CEL	*	249,162	347	262
*RU9AC	*	229,400	335	248
*RA9AU	*	228,816	322	252
*UA9FGJ	*	166,618	272	227
*UA9LAC	*	50,838	158	111
*RA9KM	*	9,028	62	61
*RA9UAG	*	4,859	47	43
*RK9XWV	*	495	15	15
			(Op: UA9XRV)	
RAØFU	**A**	**1,542,218**	**1408**	**573**
UAØAZ	**A**	**478,130**	**483**	**349**
RWØCF	*	110,880	222	180
RUØAT	*	26,680	102	92
UAØZFK	*	11,160	120	60
UAØCW	*	9,577	64	61
UAØAPV	**21**	**1,216,116**	**1054**	**498**
RWØAQ	*	126,831	271	201
RMØA	**14**	**1,793,600**	**1176**	**608**
			(Op: UAØANW)	
UAØSR	**7**	**186,722**	**370**	**178**
***RAØFF**	**A**	**469,868**	**679**	**346**
***UAØSMF**	**A**	**119,796**	**312**	**201**
***RWØUU**	**A**	**105,336**	**276**	**171**
*UAØIV	*	21,148	126	97
*RAØALM	*	6,426	52	51
*UAØAPP	*	1,920	60	32
*RAØSDW	*	60	4	4
*RAØANO	*	9	3	3
***RWØLZ**	**28**	**200**	**9**	**8**
***UAØJQ**	**21**	**711,048**	**893**	**424**
*UAØLOD	*	459	19	17
***RXØAE**	**14**	**796,975**	**733**	**449**
*RUØAE	*	132,719	251	211

UZBEKISTAN

***UK8IG**	**A**	**244,856**	**336**	**241**
*UK/JI2MED	*	121,830	264	186

KAZAKHSTAN

UN4L	**A**	**3,812,187**	**1886**	**677**
UN9L	*	5,520	46	46
UN7JJ	**28**	**438,144**	**550**	**326**
UN9LY	**21**	**1,376,424**	**1031**	**504**

UP5G	**7**	**1,421,718**	**799**	**422**
***UN7JX**	**A**	**1,867,715**	**1292**	**545**
***UN9LW**	**A**	**1,527,448**	**1102**	**494**
***UQ1D**	**A**	**1,113,400**	**884**	**475**
*UN7ED	*	20,713	79	77
***UO1E**	**28**	**780**	**21**	**20**
***UN6LN**	**21**	**429,238**	**505**	**314**
*UN4PG	*	390,184	470	323

HONG KONG

VR2BG	**21**	**197,112**	**418**	**258**

INDIA

***VU2NXM**	**A**	**237,390**	**343**	**246**
***VU2HNN**	**21**	**608**	**16**	**16**
***VU3DJQ**	**14**	**31,886**	**128**	**107**

MACAU

XX9TRR	**A**	**5,179,380**	**3200**	**755**
			(Op: OH2PM)	
***XX9AU**	**21**	**6,105**	**67**	**55**

EUROPE

CROATIA

9A8A	**21**	**3,449,940**	**1713**	**780**
9A5E	**14**	**4,089,132**	**2470**	**873**
9A8M	**14**	**1,018,332**	**1040**	**567**
9A7V	**3.7**	**1,874,670**	**1194**	**565**
***9A/OK5DX**	**A**	**1,370,852**	**1135**	**566**
			(Op: OK1VD)	
***9A8YL**	**A**	**165,189**	**387**	**237**
*9A2GA	*	119,700	299	210
*9A3ZO	*	28,614	151	114
*9A4VM	*	23,140	95	89
*9A/S57CQ/P	*	2,920	40	40
*9A3CY	*	532	14	14
***9A5V**	**28**	**113,220**	**260**	**185**
*9A5AVC	*	5,040	44	40
***9A4RV**	**14**	**150,884**	**357**	**268**
*9A3ND	*	39,858	191	146

MALTA

***9H1DE**	**A**	**235,956**	**524**	**318**

PORTUGAL

CT7P	**A**	**5,287,873**	**2983**	**933**
			(Op: CT1DIZ)	
CT2HAR	A	11,446	67	59
CQ2H	**28**	**148,674**	**380**	**213**
			(Op: CT1AHU)	
CQ0AUO	*	80,522	250	163
***CT1ILT**	**A**	**1,969,428**	**1422**	**674**
*CT1GFQ	*	11,760	87	80

AZORES

***CU/DJ7MGQ**	**A**	**98,020**	**233**	**169**
***CU2AF**	**28**	**16,401**	**91**	**77**

GERMANY

DK9TN	**A**	**1,261,458**	**1081**	**554**
DK2DQ	**A**	**704,585**	**866**	**431**
DL4WA	**A**	**694,595**	**739**	**435**
DL8QS	*	493,837	627	379
DL1DTC	*	408,421	526	353
DL9DYL	*	278,289	411	297
DL1NEO	*	113,696	293	209
DL6UNF	*	106,128	271	201
DL6RBH	*	100,045	259	187
DF3IS	*	88,200	236	196
DH1TW	*	78,925	239	175
DL9NEI	*	20,286	118	98
DL3TD	**21**	**1,979,691**	**1263**	**651**
DL2QT	**14**	**40,826**	**154**	**137**
DJ4PT	**7**	**2,488,246**	**1267**	**599**
***DF7YU**	**A**	**1,431,384**	**1107**	**584**
***DF3KV**	**A**	**1,327,092**	**1081**	**543**
***DH9SB**	**A**	**776,112**	**762**	**456**
*DJ8UV/P	*	682,675	842	415
*DL3ZAI	*	318,472	484	308
*DH5AO	*	276,464	490	296
*DK6BT	*	176,988	332	258
*DL1DVE	*	173,215	330	245
*DLØGL	*	165,243	395	247
*DK5LF	*	160,200	333	225
*DF1ZN	*	152,760	336	228
*DL3KDC	*	137,535	301	265
*DF6WE	*	128,140	310	215
*DL1YAW	*	124,488	240	182
*DL2VB	*	121,303	286	217
*DJ9AO	*	120,540	343	210
*DK6AY	*	114,695	317	203
*DK7FP	*	88,784	243	179
*DH8BM	*	85,794	269	181
*DL2RTJ	*	82,694	261	173
*DH2MA	*	79,210	258	178
*DL9GMN	*	77,010	226	170
*DL2AMT	*	70,218	233	166
*DH5WB	*	61,451	222	163
*DL8HCO	*	55,680	204	160
*DM2CKK	*	54,604	185	146
*DL2YET	*	44,437	188	143
*DL8NY	*	38,556	172	153
*DH6AB	*	32,214	144	118
*DJ8RX	*	23,958	111	87
*DL1KUR	*	23,594	117	94
*DK3GI	*	22,705	97	95
*DH2PL	*	21,080	107	85
*DJ7LH	*	20,648	105	89
*DL8DXL	*	17,444	106	89
*DL2ANM	*	16,686	96	81
*DF2AP	*	14,193	101	83
*DL4JTW	*	13,520	105	65
*DL1OFD	*	10,010	87	70
*DL8UGF	*	3,852	37	36
*DL8SDI	*	3,567	47	41
*DL7CU	*	2,774	39	38
*DH6YMC	*	2,318	39	38
*DL5ANS	*	2,232	32	31
*DK3WE	*	1,593	28	27
*DL1ARD	*	504	14	12
*DN3ASB	*	444	13	12
***DJ1AA**	**21**	**180,440**	**346**	**260**
*DL3BRA	*	63,640	182	148
*DL7LZ	14	735	21	21
*DJ6XB	*	81	9	9
***DF2DJ**	**3.7**	**113,290**	**620**	**130**
*DL2RZG	*	6,608	63	56

SPAIN

AN5KB	**A**	**533,280**	**798**	**440**
			(Op: EA5KB)	

EA7NK	A	271,566	522	321
EC1DQK	A	205,205	503	287
AN1MK	*	190,754	390	254
			(Op: EA1MK)	
EA1JO	*	186,099	375	267
EA3CCN	*	125,190	270	214
EA5FID	*	74,480	182	140
EA4NP	*	4,370	43	38
AM2KB	28	18,032	130	98
EA4PL	14	1,041,485	1189	577
AM4KD	7	994,516	669	436
			(Op: EA4KD)	
EA5GCT	3.7	5,336	52	46
EA5AT	1.8	12,529	72	67
*AN3FCQ	A	968,626	1125	527
			(Op: EA3FCQ)	
*AM3DUW	A	813,408	1172	458
			(Op: EA3DUW)	
*ED1WS	A	536,360	868	440
*EA4TV	*	398,044	658	382
*EA1BXQ	*	301,126	523	314
*EA2AAZ	*	291,828	526	332
*EA3NP	*	146,265	325	245
*EA3ALV	*	136,080	304	210
*EF5AMK	*	134,246	363	223
*AM1OT	*	130,733	397	239
*EA3NA	*	128,896	270	212
*AN2ADI	*	125,895	310	231
*AN1EB	*	114,399	301	223
*EA2BNU	*	108,990	267	210
*AN3EFQ	*	101,764	261	206
*AM1CJH	*	101,232	261	222
*AN1UY	*	98,946	262	207
*AM7EWX	*	90,321	250	187
*AM3GHZ	*	86,304	236	186
*EA5FFC	*	79,866	217	174
*EA7FIQ	*	56,943	182	171
*EA1ET	*	55,840	201	160
*EA7ATF	*	55,536	203	156
*EA3EYD	*	35,862	154	129
*AN3AGB	*	29,512	130	119
*EA3EZD	*	29,484	132	108
*EA3AKA	*	27,120	140	120
*AM5AAJ	*	22,792	97	88
			(Op: EA5AAJ)	
*EA2AGB	*	22,155	123	105
*EA7HE	*	22,050	126	98
*AM7RM	*	19,902	132	107
			(Op: EA7RM)	
*EA3ARN	*	15,974	122	98
*EA2AVM	*	15,228	114	94
*AN5VR	*	12,936	103	88
*EA5AJX	*	10,176	67	64
*EA5FWW	*	7,567	57	47
*EA3FHP	*	6,912	80	72
*EC2AH	*	5,457	54	51
*EA7CA	*	3,675	37	35
*EA4CU	*	3,108	44	42
*AM1FDI	28	31,512	141	104
*AM7IA	21	209,988	392	307
*EA7HF	21	173,808	366	284
*EC3CJN	*	82,209	301	201
*ED7ANM	*	65,860	324	185
*EA7FRX	*	49,612	190	158
*EF3PL	*	8,694	76	69
			(Op: EC3CMT)	
*EA1FFH	*	8,190	70	65
*EC3AJL	*	4,895	59	55
*AM1BYA	*	1,260	30	30
*EA1CS	14	282,960	518	360
*EA1AAW	14	180,873	365	297
*EA5DJI	*	133,867	365	263
*EA3DVJ	*	42,606	191	162
*EA2CHL	*	1,704	65	24
*EA5EOR	7	79,048	191	164
*EA4WC	7	52,269	140	131
*AM3GCJ	*	19,656	92	84
*EA1AUT	*	10,168	66	62
*EA1HP	3.7	40,341	136	119

BALEARIC IS.

ED6DD	A	1,799,903	1543	661
EA6/DL6KAC	21	99,938	289	214
*EA6XD	A	81,406	257	202
*EF6TU	*	41,748	176	142
			(Op: EC6TU)	
*EA6VQ	28	28,179	115	93
*EA6EA	*	2,296	28	28

IRELAND

EI2JD	A	255,112	478	286
EI4DW	*	57,186	173	162
*EI/DH5ST/P	A	94,348	333	229
*EI2CH	*	41,325	183	145
*EI4CF	21	127,880	340	230

MOLDOVA

ER1Q	21	2,168,357	1467	619
			(Op: ER1QQ)	
ERØND	14	2,762,875	2021	775
			(Op: UT7ND)	
*ER5DX	A	968,192	901	488
*ER3ZZ	A	731,728	721	464
*ER3CT	*	576,972	810	423

ESTONIA

ES1QD	A	33,229	132	101
ES6CO	28	12,462	74	67
ES5GI	21	943,413	881	471
ES5RW	14	1,679,352	1438	668
ES5MC	7	1,727,088	1144	528
ES5TV	3.7	870,255	899	415
*ES6KW	A	75,690	224	174
*ES6RMR	21	8,418	66	61
*ES2EZ	14	248,640	498	336
*ES1CN	*	197,208	410	297
*ES5RAH	3.7	34,748	143	119
*ES6PA	*	28,196	131	106

BELARUS

EU1SA	A	1,158,675	1093	525
EW8MW	*	317,226	454	294
EW6AF	21	161,935	323	233
*EW1GA	A	422,832	614	368
*EU6TV	A	120,042	307	234
*EU6PW	*	105,001	275	197
*EU6NN	*	74,550	223	175
*EW3LN	*	3,600	40	36
*EW1NA	*	1,536	32	32
*EW6AW	*	946	23	22
*EW1ABF	28	1,525	25	25
*EW6AL	21	35,952	132	107
*EU2MM	14	296,514	555	342
*EU6DX	3.7	42,930	150	135

FRANCE

F5BBD	A	998,880	968	480
F5NBX	A	629,408	721	416
F6FYD	*	291,885	447	319
F5CQ	*	216,489	379	273
F5YJ	*	133,076	289	206
F5RZJ	3.7	812,441	751	419
*F6DZU	A	580,086	702	402
*F8AAN	A	219,483	514	297
*F6FTB	A	176,043	354	249
*F5TLN	*	110,986	272	211
*F5TYY	*	64,592	227	176
*F6BAT	*	53,720	191	158
*F2RO	*	51,824	202	158
*F5TVL	*	47,376	179	141
*F6DRP	*	43,365	175	147
*F5NBK	*	20,370	133	105
*F5RPB	*	14,800	86	80
*F8AKS	21	79,560	290	180
*F5LIW	*	24,108	110	98
*F5NQL	*	1,755	29	27

ENGLAND

G6UW	21	242,256	486	309
			(Op: 5B4AFM/MØBBB)	
G3UEG	3.7	35,765	148	115
*G3VAO	A	1,021,054	988	509
*GØWJN	A	184,667	423	259
*MØDDT	A	117,502	290	218
*G4XBL	*	106,434	309	219
*GØ/N9LYE	*	60,750	238	162
*MØCOP	*	28,544	143	128
*GØEYO	*	17,100	109	100
*M3EZT	*	14,664	100	94
*GX6UQ	*	11,900	82	68
			(Op: GØRXA)	
*GØICJ	*	5,824	69	64
*GØMRH	*	3,066	48	42
*M2Z	21	51,038	244	151
			(Op: M5RIC)	
*MØRHI	*	3,552	52	48
*G3PJV	14	272,895	585	339
*M4T	*	8,208	78	72
			(Op: GØVQR)	
*G4VGO	1.8	168,720	339	228

NORTHERN IRELAND

GI4AAM	A	55,728	217	162
*GIØKVQ	A	57,460	242	169

JERSEY

*MJ3FHT	A	48	6	6

SCOTLAND

MMØDFV	21	62,264	224	172
GM3YOG/P	*	28,614	145	114
*GM3BCL	A	129,299	334	239
*MMØLEO	*	41,180	175	145
*GM4ELV	*	7,584	90	79

GUERNSEY

*MUØFAL	A	13,520	91	80

WALES

GW4BLE	A	433,313	594	359

HUNGARY

HA8JV	A	5,685,856	2550	928
HG8W	21	508,208	563	368
			(Op: HA8ZO)	
HG9X	14	1,617,015	1327	645
			(Op: HA8IB)	
*HA6IAM	A	325,864	497	308
*HA5PT	*	10,248	69	61
*HA9MDP	*	3,362	48	41
*HA9PP	28	17,447	83	73
*HA6IGM	21	55,744	168	134

SWITZERLAND

HB9ACA	28	9,558	62	59
*HB9AYZ	A	2,925	43	39
*HB9DOZ	*	1,312	33	32

ITALY

IO4T	A	3,745,854	2067	822
			(Op: IK4VET)	
IR4B	A	1,495,872	1137	588
			(Op: IK4AUY)	
II4A	A	1,132,866	975	518
IK2UCK	*	876,480	804	480
IZØBVU	*	250,536	494	292
IZ2ACG	*	167,539	308	239
IRØN	*	21,032	97	88
			(Op: IKØNFV)	
IZ7EUB	*	8,639	60	53
IZ6CLN	*	1,876	34	28
IKØVAQ	28	2,520	30	28
IKØYVV	14	2,280,096	1684	754
IK6SNQ	14	851,594	1053	526
IO7J	*	323,701	635	353
			(Op: IK7JWX)	
IR4R	*	120,461	345	233
IK2AOO	*	21,901	139	121
IZ8FBU	*	19,985	130	119
IZ3DBE	*	5,100	72	60
IK4CBM	*	2,133	79	27
IQ2CJ	3.7	1,260,504	967	488
			(Op: IK2NCJ)	
IK8HCG	*	495,968	596	352
*IR2G	A	268,793	442	301
*IZ7EDO	A	235,300	432	260
*II3L	A	224,874	443	279
*IK2THN	*	186,252	321	249
*IK4QJM	*	180,720	392	251
*IKØWHN	*	130,112	310	214
*IK2ULM	*	121,747	272	211
*IZ2ABN	*	101,840	229	190
*IK7WPD	*	98,328	248	204
*II4G	*	96,462	285	207
			(Op: IZ4DJZ)	
*IK7RVY	*	94,478	238	194
*IK3OII	*	74,094	194	159
*IZØBXZ	*	64,240	231	176
*IV3WMS	*	60,962	203	163
*IK5ZTT	*	57,575	200	175
*I8TWB	*	54,984	187	158
*IK2YSJ	*	53,856	207	153
*IK2RPK	*	45,156	193	142
*IK8IFW	*	42,104	186	152
*IK4DCS	*	40,986	199	138
*IK2WFN	*	19,272	103	88
*I1YGQ	*	14,616	100	84
*IZ1ADD	*	10,731	91	73
*IK8NBL	*	7,125	63	57
*IK2MPR	*	6,321	53	49
*IKØWRB	*	4,600	52	46
*IZ1DLY	*	3,430	50	49
*IK2VUC	*	1,984	31	31
*IZØFIU	*	1,943	29	29
*IZØBPI	*	1,632	36	34
*IV3KSE	*	513	19	19
*IZ4DIG	*	180	10	9
*II8A	21	887,040	958	495
*IK7XNF	*	66,030	200	155
*IZ7DOK	*	4,560	66	57
*IZ8CGS	14	231,504	416	312
*IL7/IK7YTT	*	184,782	430	299
*IZ5FDD	*	33,654	167	142
*IKØOTJ	*	625	25	25
*I2IFT	7	492,660	634	340
*IV3SDE	*	140,901	236	201
*II3M	3.7	825,300	841	420
*IQ5B	*	212,014	339	253
*IZ1DAT	*	35,264	125	116
*IK7WUE	1.8	8,184	74	66

SICILY

IT9VCE	A	80,262	255	182
IT9ZMX	28	491,412	589	372
IU9S	14	3,544,380	2270	870
			(Op: IT9BLB)	
IT9STX	14	1,929,620	1633	716
*IT9AJP	A	59,512	214	172
*IT9ORA	*	22,866	130	103
*IT9RJE	*	7,076	68	61
*IT9XTP	*	192	8	8

SARDINIA

*ISØVSG	A	199,440	352	277

NORWAY

LA2Z	A	1,401,280	1198	580
			(Op: LA3BO)	
LA6FJA	21	23,751	105	87
LN8W	3.7	886,608	943	423
			(Op: LA5KO)	
*LB8AE	A	50,086	196	158
*LA9DK	14	58,825	205	181
*LA9AU	*	1,960	41	40

LUXEMBOURG

LX7I	7	3,115,494	1610	657
LX1KC	7	1,105,280	1029	440

LITHUANIA

LY2CY	A	2,981,460	1760	740
LY5W	A	1,504,360	1193	572
			(Op: LY1DR)	
LY2MM	*	336,444	468	318
LY2KM	*	194,220	364	260
LY1DM	*	16,428	89	74
LY3BU	*	6,771	70	61
LY2IJ	14	1,966,041	1593	693
LY9A	14	1,604,688	1458	662
			(Op: LY3BA)	
LY3BS	3.7	355,511	536	299
LY2BW	*	132,635	299	205
*LY1FW	A	384,180	557	337
*LY3BX	A	365,160	488	340
*LY3CY	A	278,760	489	303
*LY2BVB	*	183,732	378	251
*LY2DM	21	333,975	439	305
*LY2TE	*	171,522	305	234
*LY5A	7	1,070,788	895	452
			(Op: LY2PAJ)	
*LY2DX	3.7	194,728	392	241
*LY2OU	1.8	160,552	408	188
*LY3UM	1.8	149,100	332	213

BULGARIA

LZ2PL	A	1,288,368	1136	552
LZ5ZI	*	92,020	223	172
LZ9X	28	552,948	626	354
LZ1NG	28	526,338	587	342
LZ2L	3.7	237,820	391	253
			(Op: LZ2LDS)	
*LZ2SX	A	281,556	434	297
*LZ1AQ	A	188,250	323	251
*LZ9R	*	47,996	194	142
			(Op: LZ3YY)	
*LZ2JA	28	122,388	251	188
*LZ2DB	21	40,506	162	129
*LZ1EP	*	24,544	120	104
*LZ2BE	14	197,206	479	302

AUSTRIA

OE8SKQ	A	5,790,360	2576	876
OE2S	A	4,135,120	2126	814
			(Op: OE2VEL)	
OE1WWL	21	16,875	83	75
OE5CWL/5	7	125,216	272	208
*OE7AJT	A	73,383	233	183

FINLAND

OH2U	A	4,414,245	2280	863
			(Op: OH6EI)	
OH3OJ	A	657,744	792	426
OH5NE	*	409,542	673	343
OH2K	*	337,400	610	350
			(Op: OH2LNH)	
OH1BOI	*	137,241	294	221
OH2MPO	*	270	10	9
OH7M	21	2,083,290	1302	649
			(Op: OH4XX)	
OH8L	14	1,878,504	1569	696
			(Op: OH8LQ)	
OH3BU	7	157,500	306	210
*OI4PM	A	1,595,538	1425	603
			(Op: OH4JFN)	
*OH2BJ	*	13,575	83	75
*OH4TY	14	62,834	207	178
*OH1TD	*	928	30	29

ALAND IS.

OHØB	21	1,747,824	1205	624
			(Op: OH2JTE)	

CZECH REPUBLIC

OK1RI	A	7,905,744	2954	1023
OK1EP	A	1,235,068	1085	524
OK1DRQ	A	499,112	575	356
OK2ABU	*	234,464	454	272
OK1DOS	*	13,280	96	80
OK2SG	*	12,028	69	62
OK2EQ	28	18,732	99	84
OL5Y	21	2,186,658	1316	639
OK1DSZ	14	808,254	901	498
OK1IE	7	334,313	391	293
OK2FB	*	59,904	169	144
OK2PVF	3.7	636,270	747	381
OK1WF	3.7	480,930	656	345
OL8R	3.7	451,906	615	338
			(Op: OK1FCJ)	
*OK2ZV	A	1,361,360	1157	572
*OK1FRG	A	830,130	774	469
*OK2PTZ	A	648,372	745	426
*OK2MBP	*	571,815	720	393
*OK2DU	*	462,021	647	343
*OK2CLW	*	433,840	542	340
*OK1VVW	*	429,619	605	349
*OK1FMX	*	404,400	611	337
*OK2SGY	*	322,920	421	312
*OK1SMU	*	306,940	484	298
*OK2BQL	*	182,055	372	229
*OK2BEN	*	171,487	341	223
*OK2BRX	*	162,132	334	236
*OK1FXX	*	156,657	340	237
*OK1MJA	*	133,744	302	208
*OK2TCW	*	121,360	246	205
*OK2BRA	*	114,918	275	214
*OK1CJN	*	103,550	224	190
*OK2TBC	*	71,121	229	157
*OK2BDF	*	47,085	165	129
*OK1VBA	*	41,910	152	127
*OK2SWD	*	30,128	143	112
*OK2BND	*	28,175	141	115
*OK2BMT	*	26,885	104	95
*OK2CMX	*	25,056	129	108
*OK1WWJ	*	14,342	92	71
*OK1FCA	*	12,470	99	86
*OK2PBG	*	8,856	60	54
*OK1FHI	*	4,408	46	38
*OK1TRM	*	990	23	22
*OK1DKA	21	171,336	300	236
*OK6A	*	124,528	250	181
			(Op: OK2INW)	
*OK2PTS	*	89,268	213	172
*OK1DKO	*	21,637	97	77
*OK2WTM	14	385,020	611	372
*OK1DSA	*	61,404	247	172
*OK1CAZ	*	10,742	99	82
*OK1DCF	7	374,528	508	308
*OK1CRM	3.7	127,281	322	203

SLOVAKIA

OM3YK	A	236,462	423	274
OM5M	14	1,725,466	1449	646
			(Op: OM4DW)	
OM8AA	*	11,100	86	74
*OM6RM	A	741,009	874	417
*OM4DN	A	605,952	746	384
*OM7PY	A	213,498	368	261
*OM6TX	*	118,776	289	196
*OM4DA	*	63,024	231	156
*OM7AG	*	21,156	102	86
*OM8HG	*	14,874	85	74
*OM5CD	28	101,493	229	179
*OM4WW	14	140,162	350	253
*OM7YC	7	22,386	99	91
*OM7AB	3.7	230,736	411	264

BELGIUM

*ON4AAM	A	234,555	477	285
*ON4XG	A	79,020	243	180
*ON7VZ	*	39,420	185	146
*ON7DQ	*	29,412	136	114
*ON4KVA	*	9,828	86	78
*ON5JD	*	2,756	53	52
*ON4ACA	1.8	50,085	189	135

DENMARK

OZ5EV	A	566,370	576	434
OZ8J	A	122,822	292	217
OZ3SK	1.8	313,404	530	287
*OZ1ACB	A	276,318	472	301
*OZ8AE	A	149,614	307	239

THE NETHERLANDS

PAØJNH	A	429,120	582	360
PA3AAM	14	11,703	83	83
PAØLJM	3.7	267,104	450	272
*PA3FNE	A	448,920	634	360
*PA1TT	A	228,800	370	286
*PA8MO	A	213,759	403	273
*PA2SWL	*	206,832	422	248
*PA5EA	*	64,325	162	155
*PAØKDM	*	60,648	194	152
*PB7RP	*	57,090	198	165
*PA3GGW	*	43,472	169	143
*PA3GBI	*	41,310	168	135
*PAØLRK	*	34,892	131	122
*PA1FIB	*	31,500	157	125
*PA3HGF	*	14,596	92	82
*PAØLSK	*	6,466	72	61
*PA1TON	*	3,818	49	46
*PAØEHF	*	1,342	24	22
*PA3AAV	*	666	19	18
*PAØMIR	21	102,366	235	198

SLOVENIA

S51DX	A	252	10	9
S58A	21	2,955,936	1564	751
S51FB	21	2,551,625	1495	685
S57DX	14	1,954,404	1546	699
S51U	*	9,380	72	70
S5ØA	7	3,816,165	1648	705
*S57IIO	A	663,264	684	423
*S56A	A	607,321	634	403
*S51NZ	*	498,200	649	376
*S58RU	*	312,634	490	326
*S57OAM	*	90,321	241	187
*S59W	21	1,388,044	1014	557
*S58M	14	579,420	753	444
*S52W	*	480,872	718	434
*S53F	3.7	707,445	792	395

SWEDEN

SM5Q	A	883,470	869	490
			(Op: SM5AOE)	
SM7CQY	A	577,962	700	417
7S3A	A	523,404	662	402
			(Op: SM3CER)	
SM2CEW	*	433,228	605	391
SM3W	*	345,000	726	375
			(Op: SM3WMV)	
SM4XIH	*	320,458	479	326
SM6E	*	185,640	399	260
			(Op: SM6FUD)	
SM6IQD	*	100,606	275	187
SM3LIV	*	97,236	321	219
SLØW	21	187,748	326	251
			(Op: SMØAJU)	
SM3FJF	14	4,015	57	55
SM6CDG	*	2,772	47	44
SM2EKA	7	31,460	132	110
*7S2E	A	830,886	923	511
			(Op: SM2DMU)	
*7S7V	A	285,968	446	293
*SM4V	A	136,072	336	233
			(Op: SM4VPZ)	
*SM5U	*	124,986	301	222
			(Op: SM5UGC)	
*SM7BJW	*	106,387	262	191
*SM4AID	*	93,181	267	197
*SM5S	*	73,164	230	182
			(Op: SM5SIC)	
*SMØBDS	*	51,508	174	163
*SM3EAE	*	42,600	192	150
*SK4UW	*	28,860	147	
*SMØFM	*	23,587	118	103
*SM3XRJ	*	4,345	55	55
*8SØW	*	330	10	33
*SM6RXZ	28	585	15	15
*SM6BSK	21	27,984	124	106
*SM5DYC	*	8,940	63	60
*SL5ZXR	*	3,393	47	39
			(Op: SM5ARR)	
*8SØF	14	82,130	304	215
			(Op: SMØOGQ)	

POLAND

SO2R	A	7,549,802	2948	986
			(Op: SP2FAX)	
SN7Q	A	4,949,875	2279	875
SP9QMP	A	1,909,377	1308	601
SP6EKS	*	1,731,645	1163	635
SP5GMM	*	258,210	381	285
SP5BB	*	89,300	210	188
SP7JQQ	*	86,880	207	181
SP9W	28	130,878	271	198
SQ6ELV	*	21,730	93	82
SP9P	21	405,810	491	334
SP3FYX	*	68,689	187	149
SP4DEU	14	933,324	918	542
SP4HHI	*	1,080	33	24
SP6IXF	7	1,624,671	1266	513
SP8BRQ	3.7	971,388	836	446
SP5MXZ	*	256,320	414	267
SP1JON	*	22,176	110	99
*SP9HQC	A	510,048	604	396
*SP2DNI	A	329,840	544	310
*SQ9IDE	A	272,100	436	300
*SP4SHD	*	247,900	467	268
*SP9EWO	*	198,396	378	297
*SP9MRQ	*	190,026	369	243
*SQ8FEW	*	169,694	341	238
*SP3GXH	*	161,325	328	225
*SQ7BCG	*	160,686	359	226
*SQ9FMU	*	143,620	292	215
*SP4AQD	*	137,824	314	236
*SO5M	*	120,694	297	233
			(Op: SP5MXA)	
*SN9A	*	120,510	262	206
*SP8EDD	*	119,548	307	209
*3Z8Z	*	104,811	269	217
*SP2FTL	*	84,168	219	168
*SP9SOU	*	83,963	257	187
*SP2AVE	*	74,592	194	168
*SP2GCE	*	57,038	183	158
*SP6JUD	*	56,682	189	134
*SP6IEQ	*	42,966	156	126
*SQ9DXT	*	42,545	176	127
*SQ9ZM	*	41,031	172	141
*SP6NVK	*	33,677	166	119
*SQ5ABG	*	30,044	148	116
*SQ6R	*	29,304	142	111
*SP1MVG	*	27,030	112	85
*SP4CQU	*	23,478	100	86
*SP1DMD	*	22,836	116	94
*SP3BVI	*	20,999	111	83
*SQ4NR	*	20,475	102	91
*SP9OJQ	*	19,404	107	84
*SP9XUE	*	17,325	92	75
*SQ9IWT	*	16,625	118	95
*SP2DKI	*	13,002	75	66
*SP4CGJ	*	9,825	86	63
*SP9ADV	*	9,425	72	65
*SP3XR	*	8,208	64	54
*SP5ELA	*	6,762	55	49
*SP8EEX	*	6,030	50	45
*SP2AYC	*	5,734	49	47
*SP9IKN	*	2,612	66	48
*SP6DHD	*	2,244	66	34
*SP8GNF	*	1,000	26	25
*SP5OXJ	*	27	3	3
*SQ2HL	*	2,144	50	32
*SP6FIB	*	360	12	10
*SP4JCQ	28	73,606	188	149
*SQ8GHJ	*	585	15	13
*3Z6V	21	910,344	820	457
*SP9H	21	288,600	403	296
*SP9EML	*	94,245	220	183
*SP4DZT	*	51,300	152	135
*SQ9AOR	*	33,532	120	101
*SP7FBQ	*	18,942	99	82
*SP2BLC	14	277,704	470	348
*SP2QG	14	148,005	361	253
*SP6FJ	*	37,960	146	146
*SP5DRE	*	23,919	137	119
*SP9EMI	7	13,650	76	75
*SP6LUV	3.7	362,368	499	304
*SP2CMD	*	5,427	104	27
*SO6A	1.8	111,926	292	191
			(Op: SP6IHE)	

GREECE

*SV1DKL	A	1,305,751	1294	577
*SV1BJW	*	153,765	355	255
*SV1DZB	14	208,010	515	310

BOSNIA & HERCEGOVINA

Call	Band	Score	QSOs	Mults
T99W	28	437,834	557	358
*T95MMX	21	14,874	81	74
*T97J	"	4,360	41	40
*T95A	3.7	33,681	145	109
*T94DO	1.8	102,780	272	180

EUROPEAN TURKEY

Call	Band	Score	QSOs	Mults
*TA1BM	A	58,870	167	145
*YM1DX	"	40,128	182	152
*TA1GS	"	18,036	133	108
*TA1EQ	28	27,840	114	96
*TA1ED	7	121,624	245	184

ICELAND

Call	Band	Score	QSOs	Mults
*TF3MA	A	6,664	72	68
*TF8GX	"	3,552	50	48

EUROPEAN RUSSIA

Call	Band	Score	QSOs	Mults
RK4FF	A	5,676,880	2856	880
RU4HP	A	3,858,864	2272	816
UA3ASZ	A	2,999,808	1667	768
UA3TCJ	"	2,553,714	1860	722
RA3AJ	"	2,379,520	1771	676
RM3C	"	2,122,452	1709	684
RK4FD	"	1,329,996	1154	548
RD3A	"	1,134,406	1074	542
RV3BQ	"	673,680	849	401
RU3DX	"	299,880	489	294
RA3FC	"	276,276	424	322
RX3AEX	"	193,035	394	255
RN4LP	"	172,299	313	237
RN1CW	"	133,800	302	223
RU3RQ	"	109,382	237	182
RV1CC	"	74,690	207	154
RK3BA	"	56,950	229	170
UA4NC	"	52,848	190	144
RN6CD	"	52,662	159	134
RN6FK	"	47,677	180	139
RN1AO	"	15,570	104	90
RU3FS	"	15,480	81	72
UA4CJJ	"	8,316	64	44
RW3TN	"	5,476	49	37
RA6DB	"	4,879	43	41
RU6MM	"	3,638	39	34
RK6CM	"	969	19	19
UA3DPX	21	1,420,467	1073	573
RK4HWW	21	1,200,960	1352	556
RA6LBS	14	1,022,554	1104	587
UA3AGW	14	961,056	1148	564
RW3GU	"	71,208	233	184
UA6AKD	3.7	39,480	154	120
RA6AFB	"	30,832	132	94
*UA4FER	A	2,228,814	1872	686
*RV3FF	A	1,196,512	1131	556
*UA3ABJ	A	993,648	998	489
*UA3SAQ	"	927,500	969	500
*UA3BL	"	908,633	1042	473
*UA4CC	"	745,668	910	462
*RW4FX	"	585,190	681	421
*RA3DNC	"	551,690	727	430
*RN3FS	"	547,624	721	392
*UA3LHL	"	422,331	581	357
*RZ6HN	"	367,667	678	337
*RX3OM	"	364,665	591	345
*RW3VI	"	293,564	528	316
*RA4AOR	"	292,623	545	309
*RX3DCN	"	284,282	442	307
*UA6JAD	"	263,250	519	325
*RV3LO	"	226,366	385	259
*U1BA	"	217,280	456	280
*UA4ACP	"	197,824	505	281
*UA1AFZ	"	166,941	387	243
*RZ3FR	"	154,836	363	253
*RU1AB	"	140,466	333	246
*RW3DL	"	134,674	295	233
*UA1WBV	"	106,555	279	211
*RU3WR	"	100,392	261	178
*RW1AI	"	86,963	256	199
*UA4FCO	"	69,048	198	168
*RV6AHJ	"	64,272	186	156
*RU3DM	"	60,295	185	155
*UA4AN	"	54,715	203	155
*RL3AW	"	37,720	128	115
*RW1QN	"	36,146	158	106
*RW3TA	"	27,848	140	118
*RX3MM	"	27,840	110	96
*RU4LM	"	23,640	128	120
*UA3UBT	"	22,892	107	97
*RZ1AZ	"	22,464	113	108
*UA3WF	"	21,930	98	86
*RW3DY	"	19,950	108	95
*UA3VHO/3	"	18,426	122	111
*RA3TYL	"	13,983	86	79
*UA3UNP	"	12,931	78	67
*UA4FEN	"	7,638	60	57
*RN3DN	"	6,762	56	49
*RA3TAR	"	5,936	54	53
*RV6ASU	"	1,320	25	24
*RW3SU	"	855	19	19
*UA4WAG	"	66	6	6
*RA4FY	28	14,271	75	71
*UA3MEJ	"	5,635	51	49
*RV3DCC	"	2,856	34	34
*RA4PJY	"	2,697	31	31
*UA3IIH	"	96	4	4
*RU6FA	21	544,808	790	451
*RK3XWD	"	72,645	211	167
*RW4LQ	"	26,775	111	105
*RA3DGH	"	21,360	142	120
*UA6LP	"	10,080	66	63
*RA6CT	14	646,736	846	487
*RK3QWM	14	458,298	735	414
*RK3XXA	"	103,075	311	217
*RV6AMI	"	46,587	173	159
*RN3AQ	"	13,992	95	88
*RV3YR	"	11,176	97	88
*UA4ASE	"	510	18	17
*RW3GB	7	227,584	342	254
*RV6AJO	3.7	130,345	297	199
*RW6AH	"	63,688	203	152
*RZ3VA	"	61,770	195	145

KALININGRAD

Call	Band	Score	QSOs	Mults
*UA2CZ	A	66,339	194	189
*RU2FL	"	27,560	127	104
*UA2FAO	14	89,117	277	203

UKRAINE

Call	Band	Score	QSOs	Mults
UT7DK	A	2,156,800	1453	674
EN1U	A	1,069,120	1040	520
			(Op: UX1UA)	
EO6F	A	1,002,762	1004	493
UW7M	"	338,880	533	320
			(Op: UR3MP)	
UT4MW	"	217,560	425	296
UR5AKU	"	183,467	335	271
US3WD	"	163,928	278	248
UR5E	"	157,528	323	232
			(Op: UR5EDX)	
US1MM	"	87,608	238	188
UW2N	"	20,935	94	79
			(Op: UT9NA)	
UV8M	14	1,168,482	1261	602
			(Op: UX3MR)	
UUØJM	7	1,992,381	1191	577
*UU7JX	A	1,623,360	1601	608
*UY5TE	A	353,238	567	339
*UR6QS	A	299,490	505	298
*UT5MB	"	294,152	506	332
*UT7CR	"	253,732	396	277
*UR5ZIB	"	149,568	333	246
*UX3HA	"	144,072	353	232
*UYØIX	"	142,600	282	200
*UT5UML	"	101,493	223	189
*UT5UKY	"	99,297	240	187
*UR5MQX	"	93,002	231	182
*UT1UA	"	66,591	173	151
*USØYA	"	40,567	136	113
*UU2JA	"	39,910	156	130
*UT7MD	"	39,243	143	127
*UX1IL	"	20,271	100	87
*US5II	"	16,236	83	66
*UX8IX	"	10,880	96	80
*UU5SP	"	5,610	60	55
*UZ2H	"	3	1	1
*UR1V	28	122,802	253	194
*UU5JTN	"	532	14	14
*UR3HC	21	882,180	836	507
*US7IGF	21	799,167	899	487
*US9QA	"	187,498	346	241
*UTØH	"	92,000	244	200
*UR6IJ	14	489,485	713	439
*URØUL	"	170,016	358	264
*UR8QR	"	154,593	387	267
*UT2UZ	"	7,236	72	67
*UT2II	3.7	129,480	300	195
*UX5NQ	1.8	217,968	441	239
*US8ICM	"	44,032	174	128
*UR5MNZ	"	1,644	138	51

LATVIA

Call	Band	Score	QSOs	Mults
YL2KO	A	3,360,936	1997	786
YL6W	A	3,242,725	1960	755
YL2PA	"	116,745	280	215
YL2CI	3.7	523,260	690	342
*YL3AD	A	9,042	73	66
*YL3BZ	10	7,696	56	52
*YL2BJ	21	31,625	133	115
*YL2II	14	18,720	122	104
*YL8M	"	1,260	29	28
			(Op: YL3GCZ)	
*YL5M	1.8	28,912	130	104

ROMANIA

Call	Band	Score	QSOs	Mults
YO3FRI	A	118,932	250	204
YO5KAI	28	34,300	125	100
			(Op: YO5TE)	
YP3A	14	2,422,602	2059	754
YO4US	7	10,920	83	60
YO2KJI	3.7	826,472	851	412
			(Op: YO2DFA)	
YR5A	"	296,348	494	278
			(Op: YO5OHO)	
YO2BEH	1.8	29,505	137	105
*YO4KBJ	A	943,525	1271	517
*YO7LFV	A	539,049	747	399
*YO3RU	A	491,380	648	395
*YO3CZW	"	274,160	452	298
*YO9FYP	"	248,171	507	293
*YO4AAC	"	205,578	398	243
*YO5OSF	"	109,172	307	196
*YO5CRQ	"	105,450	257	190
*YO8MI	"	96,064	199	159
*YO6CFB	"	73,500	192	147
*YO3FLQ	"	71,380	227	172
*YO8CHF	"	23,970	116	94
*YO3GCL	"	13,662	72	69
*YO3GCL	"	10,443	65	59
*YO6KNY	"	8,100	60	56
*YO3HOT	"	3,640	38	35
*YO4GNJ	"	201	11	9
*YO6BHN	28	52,000	146	130
*YO5ODC	"	30,912	118	96
*YO4ATW	"	3,500	36	35
*YO2AQB	21	64,834	182	154
*YO8KGA	14	172,288	411	256
*YO6KQQ	"	31,860	156	135

YUGOSLAVIA

Call	Band	Score	QSOs	Mults
YT6A	A	6,681,425	2765	995
YU1JW	21	1,854,666	1275	646
4N1K	21	1,538,160	1144	580
			(Op: YU1WS)	
YZ1KA	21	1,469,125	1091	575
YU7KM	"	107,151	561	191
YT1BB	14	1,867,322	1674	683
YU1ZZ	3.7	653,520	683	389
*YT1LT	A	882,980	911	476
*4N1N	28	185,736	330	218
			(Op: 4N1JA)	
*YU1EQ	"	34,104	122	98
*YZ1ZI	21	3,864	46	42
*YT1AT	14	116,144	300	244
*4N1A	3.7	542,059	607	367
*YT1RA	"	46,364	172	134

MACEDONIA

Call	Band	Score	QSOs	Mults
Z33AA	21	1,011,844	1073	524
*Z36W	A	284,016	398	291
*Z35G	21	703,545	807	445

ALBANIA

Call	Band	Score	QSOs	Mults
*ZA/Z35M	A	100,188	305	207
*ZA/UT7DW	A	73,569	238	179

OCEANIA

TONGA

Call	Band	Score	QSOs	Mults
*A35WE	A	610,883	635	343

THE PHILIPPINES

Call	Band	Score	QSOs	Mults
*DZ1BP	A	1,278,084	974	438
			(Op: DU1BP)	
*4F4ACV	"	91,550	286	199
*DU1SAN	28	126,984	330	132
*DU1LKY	21	548,114	589	329
*DU4JT	"	8,680	58	56

NEW CALEDONIA

Call	Band	Score	QSOs	Mults
*FK8HN	A	822,180	748	386

FRENCH POLYNESIA

Call	Band	Score	QSOs	Mults
*FO/W3SE	A	98,236	221	164

GUAM

Call	Band	Score	QSOs	Mults
KG6DX	21	5,920,876	2498	806
*KF6ILA/KH2	A	89,046	208	153

HAWAII

Call	Band	Score	QSOs	Mults
AH6RQ	A	19,404	85	77
NH7S	21	7,536,826	3159	814
			(Op: K9NW)	
KH6ND	14	6,493,727	2503	887
WH7Z	3.7	1,208,900	667	308
			(Op: K9QQ)	
*KH6/WA2HFI	A	149,600	278	176
*AH6HH	"	69,440	187	124
*WH6O	28	58,344	152	132

WESTERN KIRIBATI

Call	Band	Score	QSOs	Mults
*T3ØONM	A	134,676	256	174

AUSTRALIA

Call	Band	Score	QSOs	Mults
VK8AA	A	4,841,184	2150	717
VK5GN	A	2,166,004	1224	601
VK4WPX	28	2,148,966	1343	554
VK1MJ	28	383,670	497	270
*VK4UH	A	226,502	373	218
			(Op: W3UL)	
*VK4SN	"	186,010	306	209
*VK3DBQ	A	181,152	297	222
*VK2AAC	A	60,030	153	138
*VK4FJ	21	109,820	228	170
*VK7VH	14	110,048	214	181

INDONESIA

Call	Band	Score	QSOs	Mults
YBØAJR	A	2,351,888	1345	581
			(Op: OK1JR)	
YB2DGR	"	44,982	136	119
YB2EMK	14	223,390	304	251
*YB2LAB	A	806,985	675	395
*YC9WZJ	A	460,423	529	313
*YB1AR	"	194,910	315	219
*YB1TC	"	142,681	254	187
*YB2VTO	"	79,002	183	154
*YC3TT	"	432	12	12
*YC4VD	28	1,609,458	1074	509
*YBØIR	"	328,718	414	269
*YC3MM	21	494,882	486	349
*YC1ANA	"	14,904	73	72
*YC5OCL	"	13,200	68	66
*YC1YIA	"	12,462	67	62
*YBØAZ	14	2,889,354	1472	663
*YBØHD	7	4,089	31	29

NEW ZEALAND

Call	Band	Score	QSOs	Mults
ZL1ALZ	A	1,061,949	852	427
ZL1ANH	A	947,606	781	418
*ZL3DW	A	23,760	94	88

SOUTH AMERICA

CHILE

Call	Band	Score	QSOs	Mults
CB4Y	28	3,193,823	1707	653
			(Op: CE4FXY)	
3G3N	14	528,938	552	331
			(Op: CE4PBB)	
*CB5A	A	2,335,458	1495	538
			(Op: XQ5SM)	
*XQ1SCQ	28	671,025	715	345
*CA2WUI	28	278,146	404	269
*XQ2AX	"	1,860	32	30
*XQ2PPA	"	1,128	25	24

ANTARCTICA

Call	Band	Score	QSOs	Mults
DP1POL	28	411,292	550	259

BOLIVIA

Call	Band	Score	QSOs	Mults
*CP1FF	28	111,386	267	166

URUGUAY

Call	Band	Score	QSOs	Mults
CX5BW	28	6,675,724	2632	877
CX7BY	21	3,363,000	1542	750
CX7BF	21	1,432,616	964	524
*CX4DX	28	536,400	522	360

FRENCH GUIANA

Call	Band	Score	QSOs	Mults
FY5FY	A	16,135,200	4854	1080

ECUADOR

Call	Band	Score	QSOs	Mults
*HC1JQ	21	278,210	442	215

COLOMBIA

Call	Band	Score	QSOs	Mults
*HK6PSG	A	1,472,625	1169	425

ARGENTINA

Call	Band	Score	QSOs	Mults
LO7H	A	6,691,734	2636	882
			(Op: LU7HN)	
LTØH	A	6,613,056	2663	864
			(Op: LU3HY)	
L79H	A	2,895,447	1519	667
LU2OF	"	925,056	760	438
LU1HF	28	5,429,214	2300	813
LT1D	"	734,976	678	384
			(Op: LU4DJC)	
LU1BJW	21	1,514,304	990	528
LU6FF	14	657,951	589	399
*LV5V	A	4,547,160	2082	765
			(Op: LU5VV)	
*LV7H	A	4,249,687	1907	793
*AY9H	A	3,482,948	1664	742
*LU7FJ	"	3,050,036	1578	673
*LR1F	"	1,461,208	996	538
			(Op: LU5FD)	
*LU1FF	"	1,339,728	969	494
*LU2EE	"	356,160	446	280
			(Op: LW5EE)	
*LU4OJS	"	338,688	426	288
*LU1AS	"	110,356	261	188
*LU1ARV	"	77,024	192	166
*LU5EVK	"	1,045	21	19
*LU3HIP	28	2,931,560	1551	664
*LW9EOC	28	2,917,393	1553	659
*LW1HDJ	"	666,740	650	370
*LU7YW	"	290,296	384	277
*LW8EXF	"	27,832	108	98
*LU7DUE	"	11,616	72	66
*L44DX	21	2,475,576	1364	628
			(Op: LW1DTZ)	
*LU4FXI	14	100,956	209	188
*LU3HEO	"	18,122	93	82

ARUBA

Call	Band	Score	QSOs	Mults
P4ØY	A	15,142,440	4770	982
			(Op: AE6Y)	
P41P	A	13,390,603	4364	953
			(Op: P43P)	
*P4ØA	A	14,010,480	4794	976
			(Op: KK9A)	

NETHERLANDS ANTILLES

Call	Band	Score	QSOs	Mults
*PJ2C	28	1,636,760	1370	415
			(Op: N8NR)	
*PJ2T	21	4,856,093	2241	737
			(Op: N8BJQ)	

BRAZIL

Call	Band	Score	QSOs	Mults
PY7ZY	A	4,842,665	2147	785
PT5A	A	2,596,649	1417	649
			(Op: PP5KE)	
PY3PA	A	756,400	677	400
PP7ZZ	"	560,545	559	355
PY2MR	"	438,606	453	354
PY3PAC	"	5,265	48	45
PX2W	28	6,977,484	2652	909
			(Op: PY2YU)	
ZX2B	28	6,144,213	2505	849
			(Op: PY2MNL)	
PP5WG	28	5,587,280	2278	844
PY5JO	"	430,107	489	307
PU1LGW	"	7,750	73	62
PX5E	21	12,428,386	3699	1142
			(Op: PP5JR)	
PY2OZF	"	23,660	107	91
PR5B	14	5,453,825	2147	865
PS5K	7	806,766	456	318
			(Op: PY3FOX)	
PV8DX	7	676,746	417	287
PP5ZD	3.7	24,420	72	66
*PT2ND	A	2,193,755	1425	541
*PY2NA	A	1,767,428	1132	533
*PR7FMT	A	1,320,299	949	491
*PY7EG	"	1,257,605	923	485
*PP5ZP	"	988,320	799	464
*PY2NY	"	814,936	682	412
*PR7AB	"	446,907	544	311
*PT2BW	"	350,073	489	291
*PR7FN	"	332,937	429	297
*PY7IQ	"	285,355	385	263
*PY2DJ	"	238,579	363	253
*PS8HF	"	190,728	302	216
*PT2TF	"	107,616	228	177
*PY5Z	"	70,839	205	153
*PY1PIG	"	49,594	180	137
*PY3CAL	"	23,862	106	97
*PT2CMN	"	23,529	97	93
*PV8IG	"	11,895	64	61
*PS7AHR	"	7,923	69	57
*PY1AFS	"	5,940	52	45
*PS8ACL	"	5,900	50	50
*PY1WAG	"	2,349	29	29
*PR7BCP	"	946	26	22
*PY1JRS	"	768	16	16
*PY5DL	28	4,024,980	1838	758
*PS5S	28	2,364,253	1363	599
			(Op: PP5MQ)	
*PY4DBU	28	1,199,904	904	464
*PY4ZN	"	788,838	649	438
*PY2LTY	"	626,865	585	395
			(Op: PT2IC)	
*ZW2TV	"	437,908	493	332
			(Op: PY2TV)	
*PY1ZV	"	394,714	475	302
*PU7EEL	"	196,245	321	245
*PY2BT	"	180,264	304	222
			(Op: PY2GEC)	
*PY2DA	"	166,400	290	208
*PY7VI	"	155,507	277	211
*PY3YD	"	77,190	188	155
*PS8NF	"	67,497	187	149
*PY4PW	"	67,080	188	156
*PU2PTO	"	64,800	170	150
*PY3ML	"	32,545	119	115
*PY5DC	"	14,673	83	73
*PY2SAA	"	5,734	48	47
*PY3OS	"	3,060	37	36
*PY3MSS	"	765	17	17
*PY2NDX	21	3,465,450	1586	755
*PP5UA	21	1,516,700	1000	523
*PY2EJ	"	483,458	525	326
*PR7AA	"	23,616	104	82
			(Op: PR7AYE)	
*PY2APQ	"	22,908	107	92
*PY2SRB	"	14,852	88	79
*PY3FBI	"	1,541	25	23
*PS8ET	"	855	21	19
*PR7QI	"	315,545	389	283
*PY5HSD	"	240,750	349	250
*PR7SM	"	22,792	93	88
*PY6KY	7	18,096	59	58

FERNANDO DE NORONHA

Call	Band	Score	QSOs	Mults
PYØFF	7	3,059,100	1016	515

VENEZUELA

Call	Band	Score	QSOs	Mults
YW5NN	A	3,037,905	1529	585
			(Op: YV5NWG)	
YV4DDK	7	197,664	201	174
*YY5JRU	A	590,562	683	327
*4M5T	A	113,692	206	172
			(Op: YV5JBI)	
*YV7QP	A	98,941	214	163
*YV6BTF	28	434,754	556	291
*YY5BDP	"	33,280	142	104
*YY5POP	"	3,432	42	39
*YY5YMA	21	889,602	858	359
*YY5JMM	"	840,177	749	387
*YV5OIE	14	1,569,712	1078	493
*YV4BK	"	652,740	670	330

TRIBANDER/SINGLE ELEMENT

UNITED STATES

Call	Band	Score	QSOs	Mults
K7ZS	A	1,603,368	1599	571
W1CU	A	1,602,124	1127	586
KW5DX	A	1,532,068	1489	607
			(Op: K1NT)	
W6TK	A	1,422,984	1376	562
W6AFA	"	1,214,906	1165	539
NA9D	A	1,199,863	1371	521
N3UM	A	1,140,990	1001	521
WB8TLI	A	1,101,126	920	494
K3MD	"	1,048,173	998	497
K7VI	"	693,240	879	424
KG4FPJ	A	567,777	789	399
			(Op: N4GI)	
W7QN	"	471,213	745	369
NX9T	"	451,418	613	374
WAØMHJ	A	447,125	642	365
AC7LX	"	334,628	601	323
K8SAK	"	301,158	548	297
K6JAT	"	243,586	471	254
N1IW	"	223,808	375	269
N2GC	A	190,162	376	238
WT9U	"	162,500	370	250
N3FX	"	135,660	285	204
4U1WB	"	61,650	206	150
			(Op: AJ3M)	
WA8TNO	"	59,535	172	147
N4MM	"	56,474	157	151
NO6X	"	11,220	87	66
KE9KD	21	1,212,066	1171	578
KF9YR	21	132,710	297	230
AA6EE	21	10,034	58	54
WA3AAN	7	43,401	135	111
NT6K	3.7	269,575	507	263
*WD5K	A	1,897,101	1677	633
*KE1LI	A	1,005,928	1026	506
*KO4MM	A	707,736	705	444
*WR1TE	"	684,600	776	420
			(Op: W1JQ)	
*W3LL	A	635,064	718	376
*N9ADG	A	576,725	802	391
*K7TR	"	544,896	879	384
*WS7V	"	513,220	753	383
*NJ2F	"	455,034	671	362
*K9JE	A	427,344	597	348
*NØYO	A	401,322	690	317
*KK4TA	"	368,192	618	352
*WD4AHZ	"	319,476	508	337
*KT4Q	"	315,880	512	298
*KI7Y	"	266,107	506	281
*W2IRT	A	247,096	454	268
*N5PU	"	231,572	459	277
*NG8U	A	186,248	382	248
*KE6FI	A	161,690	374	230
*WM5DX	"	130,634	311	217
*AB8PD	"	127,458	328	194
*AF8C	"	111,688	289	184
*WA3EQJ	"	92,925	262	175
*K6OWL	"	72,450	261	150
*KD6PQF	"	67,179	239	147
*N6HC	"	64,672	255	172
*KE5OG	"	43,960	171	140
*KA6MAL	"	41,880	179	120
*W9AEM	"	40,640	182	127
*N2MH	"	40,005	159	127
*KC5HAV	"	35,916	154	123
*NN6O	"	34,720	182	112
*W5IL	"	34,290	127	127
*WD5JNC	"	26,840	139	110
*W9LYA	"	14,028	113	84
*KK4LH	"	7,802	50	47
*WB3LKO	"	5,136	53	48
*AG8Y	"	4,860	48	45
*W7UPF	28	319,746	656	322
*KI9DX	28	49,343	171	133
*KØFA	28	26,986	131	103
*KA2DIV	28	17,974	105	86
			(Op: N4GM)	
*K8IA	21	695,310	834	462
*KN6Y	21	25,651	134	113
*W6ZZZ	"	23,278	130	113
*K4BP	21	4,140	47	45
*KJ9C/Ø	"	15	3	3
*K2BF	14	136	8	8

DX

Call	Band	Score	QSOs	Mults
ZF2NT	A	10,136,175	4548	903
9S1X	A	7,214,928	2785	872
			(Op: F6BLQ)	
LTØH	A	6,613,056	2663	864
			(Op: LU3HY)	
HA8JV	A	5,685,856	2550	928
EA8AH	A	5,643,486	1995	738
			(Op: OH1RY)	
CT7P	A	5,207,073	2903	933
			(Op: CT1DIZ)	
XX9TRR	A	5,179,300	3200	755
			(Op: OH2PM)	
PY7ZY	A	4,842,665	2147	785
IO4T	A	3,745,854	2067	822
			(Op: IK4VET)	
JA7NVF	A	3,115,042	1648	707
RA3AJ	A	2,379,520	1771	676
ED6DD	A	1,799,903	1543	661
VY2LI	A	1,575,090	1185	555
LY5W	A	1,504,360	1193	572
			(Op: LY1DR)	
IR4B	"	1,495,872	1137	588
			(IK4AUY)	
LA2Z	A	1,401,280	1198	580
			(Op: LA3BO)	
LZ2PL	A	1,288,368	1136	552
OK1EP	A	1,235,068	1085	524
EU1SA	A	1,158,675	1093	525
EN1U	A	1,069,120	1040	520
			(Op: UX1UA)	
VE5CPU	A	871,202	1109	386
OZ5EV	A	566,370	575	434
EX2T	A	491,036	390	247
PAØJNH	A	429,120	582	360
DL1DTC	A	408,421	526	353
SM3W	A	345,000	726	375
			(Op: SM3WMV)	
VO1TA	A	245,300	330	220
OM3YK	A	236,462	423	274
OK2ABU	"	234,464	454	272
AN1MK	"	190,754	390	254
			(Op: EA1MK)	

OH1BOI	A	137,241	294	221
F5YJ	A	133,076	289	206
VA6XDX	A	109,210	250	163
IT9VCE	A	80,262	255	182
RV1CC	*	74,690	207	154
EX8O	*	68,376	258	148
EI4DW	A	57,186	173	162
JA1ISJ	*	21,912	94	88
UW2N	*	20,935	94	79
			(Op: UT9NA)	
OH2MPO	*	270	10	9
JA4BAA	*	18,750	100	75
ZX2B	28	6,144,213	2505	849
			(Op: PY2MNL)	
OE1WWL	21	16,875	83	75
RA6LBS	14	1,022,554	1104	587
UA3AGW	*	961,056	1148	564
CQ3E	14	489,090	462	357
			(Op: CT3FQ)	
VE1OP	14	335,160	463	315
RW3GU	*	71,208	233	184
VE8GB	14	5,280	52	48
OH3BU	7	157,500	306	210
OE5CWL/5	7	125,216	272	208
G3UEG	3.7	35,765	148	115
*P40A	A	14,010,480	4794	976
			(Op: KK9A)	
*SU9NC	A	11,402,253	4228	873
*9G5MD	A	4,924,140	2166	767
*VE3DZ	A	2,197,526	1315	622
*LR1F	A	1,461,208	996	538
			(Op: LU5FD)	
*DF7YU	A	1,431,384	1107	584
*9A/OK5OX	A	1,370,852	1135	566
			(Op: OK1VD)	
*HS1PDY	A	1,125,856	921	466
*G3VAO	A	1,021,854	988	509
*UA9ACJ	A	1,009,717	759	361
*UA3ABJ	A	993,648	998	489
*VE3CR	*	864,560	797	428
*OK1FRG	A	830,130	774	469
*YB2LAB	A	806,985	675	395
*OM6RM	A	741,009	874	417
*VE3XD	*	730,992	752	388
*VE6ZT	A	701,600	794	400
*OK2PTZ	*	648,372	745	426
*VE7UQ	A	635,436	788	342
*RA3DNC	*	551,690	727	430
*S51NZ	A	498,200	649	376
*YO3RU	A	491,380	648	395
*PA3FNE	A	448,920	634	360
*UA3LHL	*	422,331	581	357
*EA4TV	A	398,044	658	382
*VE1JS	A	389,120	449	320
*LY1FW	A	384,180	557	337
*VE3KP	*	297,528	422	253
*JR3RIY	A	294,958	392	278
*OZ1ACB	A	276,318	472	301
*PY2DJ	A	238,579	363	253
*9H1DE	A	235,956	524	318
*OM7PY	*	213,498	368	261
*UA9ORQ	*	210,090	310	235
*GØWJN	*	184,667	423	259
*VE6AX	*	163,776	351	192
*JE1REU	*	129,980	260	194
*SO5M	A	120,694	297	233
			(Op: SP5MXA)	
*VE4YU	A	109,242	271	153
*OK1CJN	*	103,550	224	190
*KF6ILA/KH2	A	89,046	208	153
*JA1GYD	A	79,650	197	150
*IK3OII	A	74,094	194	159
*SM5S	A	73,164	230	182
			(Op: SM5SIC)	
*YO3FLQ	A	71,380	227	172
*PA5EA	*	64,325	162	155
*JR1MRG	*	62,464	181	128
*PB7RP	*	57,090	198	165
*SP6JUD	*	56,682	189	134
*F6BAT	A	53,720	191	158
*ZS6RAE	A	48,236	139	124
*LZ9R	A	47,996	194	142
			(Op: LZ3YY)	
*OK1VBA	*	41,910	152	127
*YM1DX	A	40,128	182	152
*EA3EYD	*	35,862	154	129
*JS1KQQ	*	29,900	115	100
*ON7DQ	A	29,412	136	114
*RN9XA	*	28,764	121	102
*MØCOP	*	28,544	143	128
*EA3AKA	*	27,120	140	120
*DJ7LH	*	20,648	105	89
*SQ4NR	*	20,475	102	91
*AM7RM	*	19,902	132	107
			(Op: EA7RM)	
*GØEYO	*	17,100	109	100
*OM8HG	*	14,874	85	74
*OH2BJ	*	13,575	83	75
*JH1RDU	*	12,444	70	61
*GX6UQ	*	11,900	82	68
			(Op: GØRXA)	
*JA2VZL	*	8,370	63	54
*JJØAEB	*	6,528	50	48
*IK2MPR	*	6,321	53	49
*GØICJ	*	5,824	69	64
*OK1FHI	*	4,408	46	38
*EA4CU	*	3,108	44	42
*JO1UOE	*	2,624	36	32
*SO2HL	*	2,144	50	32
*J5UDX	28	3,561,032	1742	692
			(Op: IV3NVN)	
*4X1VF	28	1,298,448	1158	426
*YY5JMM	21	840,177	749	387
*PAØMIR	21	102,366	235	198
*G3PJV	14	272,895	585	339
*LZ2BE	14	197,206	479	302
*JG1OWV	14	675	15	15
*ON4ACA	1.8	50,085	189	135

ROOKIE
UNITED STATES

AD6WL	A	1,359,336	1371	542
K5TWJ	A	1,300,044	1587	524
W5SJ	*	144,228	347	204
KQ9L	A	137,795	354	217
N8GX	A	70,416	216	163
*W2RDS	A	835,278	816	431
*AK6DV	A	212,715	411	261
*KD5LNO	A	186,944	430	254
*K9BIG	A	169,904	448	259
*KB3HOT	A	162,368	334	236
*KCØIGY	A	156,156	395	231
*NU6T	*	86,880	268	181
*KG4OJT	A	78,030	247	170
*N3VOP	*	70,518	240	161
*KG4KZZ	*	68,222	218	154
*AG4VG	*	42,408	202	124
*KG4RZH	*	37,392	166	123
*KC2KSZ	*	27,195	140	105
*KCØLUX	*	26,000	154	104
*KB9WQJ	*	22,881	120	87
*NQ4S	*	14,320	103	80
*KG6OEY	*	12,240	69	60
*W8XF	A	10,360	77	70
*KD5HBM	*	10,064	93	74
*KG6HAF	21	37,808	161	136
		DX		
PT5A	A	2,596,649	1417	649
			(Op: PP5KE)	
SM4XIH	A	320,458	479	326
RK9QWZ	A	291,357	403	243
			(Op: UA9OFF)	
VE7KET	A	114,950	225	190
AH6RQ	A	19,404	85	77
YZ1KA	21	1,469,125	1091	575
VA3HUN	21	3,430	38	35
4L6AM	14	4,323,942	2151	738
IZ8FBU	14	19,985	130	119
*RZ9SWP	A	1,715,218	1107	514
			(Op: RX9SN)	
*VE3AGC	A	941,287	901	397
*YT1LT	A	882,988	911	476
*YY5JRU	A	590,562	583	327
*HR1CP	A	449,218	700	290
*OK2CLW	A	433,848	542	340
*OK1SMU	*	306,940	484	298
*EA1BXQ	A	301,126	523	314
*OK2BEN	*	171,487	341	223
*OLØGL	A	165,243	395	247
*DJ9AO	*	120,540	343	210
*OK1CJN	*	103,550	224	190
*VE3BHP	*	98,072	233	164
*EU6NN	A	74,550	223	175
*PY1PIG	A	49,594	180	137
*JJØJDK	A	32,384	107	92
*TA1GS	A	18,036	133	108
*M3EZT	A	14,664	100	94
*RA3TYL	A	13,983	86	79
*DL1OFD	*	10,010	87	70
*SP9ADV	A	9,425	72	65
*IZØFIU	A	1,943	29	29
*SQ2HL	*	2,144	50	32
*PY5DL	28	4,024,980	1838	758
*PY2LTY	*	626,865	585	395
			(Op: PT2IC)	
*VE1ASJ	28	111,936	292	176
*YY5BDP	28	33,280	142	104
*9A5AVC	28	5,040	44	40
*YY5YMA	21	889,602	858	359
*UR3HC	21	882,180	836	507
*YY5JMM	*	840,177	749	387
*MØRHI	21	3,552	52	48
*YT1RA	3.7	46,364	172	134

BAND RESTRICTED

*UN9LW	A	1,527,448	1102	494
*S57IIO	A	563,264	684	423
*YY5JRU	A	590,562	583	327
*JA5EO	A	428,085	525	315
*OK1MJA	A	133,744	302	208
*EF6TU	A	41,748	176	142
			(Op: EC6TU)	
*UA4WAG	A	66	6	6
*KF4ZEO	28	13,752	88	72
*YY5POP	28	3,432	42	39
*YY5JMM	21	840,177	749	387
*EC3CJN	21	82,209	301	201
*RX9CEL	14	249,162	347	262
*M4T	14	8,208	78	72
			(Op: GØVQR)	

SINGLE OPERATOR ASSISTED
UNITED STATES

KS9K	A	2,427,131	1643	707
			(Op: N4TZ)	
WN9O	*	2,186,800	1681	710
K3WW	A	971,000	906	500
N2BJ	*	969,744	920	534
WF2B	A	797,680	754	472
			(Op: K2ONP)	
AA3B	A	696,370	626	415
AI9U	*	664,848	883	432
			(Op: K9JS)	
N7YX	A	664,490	811	415
K3KO	A	662,814	584	414
KØDG	A	580,682	863	398
N6CCL	A	559,200	768	400
W5GN	A	548,334	627	369
KC1F	A	540,962	599	394
N5JR	*	488,430	587	402
KB9KEG	*	380,379	610	309
NA2M	*	327,750	564	345
WØYK	*	311,508	486	306
AD6E	*	256,464	437	274
K8OQL	*	200,460	393	257
K6TIM	*	188,328	354	228
K4YT	*	177,593	316	247
W7SW	*	168,750	361	250
W3FVT	*	106,960	243	191
N2PGD	*	48,714	156	138
N7XY	*	43,215	177	129
K3DNE	*	42,980	257	140
KD6WW	*	42,125	146	125
W4ATL	*	34,364	164	121
KF2O	*	33,240	128	120
W3FV	*	30,294	133	102
K6TA	*	26,208	111	91
W6OAT	*	21,450	99	78
K9SWX	*	16,766	122	83
W3HVQ	*	14,784	90	84
K7VIT	*	9,794	69	59
N9IO	*	290	11	10
K3IXD	*	91	9	7
NJ7I	28	604,750	991	410
N5MT	28	136,730	315	226
KX7M	21	3,041,375	2108	725
N9LCR	21	185,031	376	267
K9UQN	*	96,418	225	194
W6RKC	21	64,400	294	175
W2MF	1.8	67,466	273	158
*N9LF	A	481,794	624	354
*ND2T	A	259,875	583	275
*NG1J	A	118,948	243	227
*W2GG	A	118,007	298	199
*NU9Y	*	115,836	255	197
			(Op: K9MI)	
*K6ACZ	*	97,240	298	170
*W2QQB	A	75,026	216	161
*N4DW	A	51,569	182	139
*W5CTV	A	24,720	123	103
*K9IJ	*	19,392	109	96
*AA8CY	*	16,965	114	87
*NZ5G	*	900	20	18
*K5WW	28	87,044	242	188
*KK1H	21	304,942	531	334
*WB2BXO	21	9,438	72	66
		DX		
ZW5B	A	12,395,196	3694	1108
			(Op: PY5EG)	
OD5/OK1MU	A	9,623,688	3909	843
UA9AM	A	7,366,392	2705	852
UT7QF	A	5,374,900	2655	911
DL6FBL	A	5,164,670	2417	890
RN3QO	A	5,072,721	2516	933
RO4M	*	4,230,152	2582	857
			(Op: RA4LW)	
S53O	A	3,882,112	1915	832
LY6A	A	3,383,432	1949	774
			(Op: LY2BM)	
RX4HZ	*	3,039,088	2077	769
RA6CM	*	2,872,640	2014	752
PV2M	*	2,326,016	1359	616
			(Op: PT2ADM)	
JM1LPN	A	1,764,848	1125	584
9A9R	A	1,448,541	1112	591
RD4M	*	1,442,856	1307	632
			(Op: UA4LU)	
DH1NFL	*	1,088,244	1000	516
OE5OHO	A	1,026,745	881	485
RTØQ	A	1,004,220	1240	420
OH6NIO	A	954,162	931	549
EA1CUB	A	759,473	953	517
SM7E	A	484,526	614	371
			(Op: SM7BHM)	
EA3QA	A	479,842	601	374
IV3GCH	A	421,260	543	354
LN3R	A	413,632	676	368
			(Op: LA5LJA)	
DL8NFU	*	383,575	555	335
OZ4O	A	360,030	528	330
YL2KF	A	333,645	459	295
OK1KT	A	311,688	437	312
EW1CQ	A	284,900	414	308
OK2ZW	A	282,141	397	261
RA3TT	*	178,080	374	280
DJ9MH	*	152,149	301	233
OH4RH	*	144,204	353	244
JG2REJ	*	140,812	229	214
DL1DTL	*	118,921	263	209
PA9ZZ	A	98,697	262	197
OK2ZJ	*	74,253	181	159
JI1CQA	*	73,005	203	155
JA2VQF	*	58,695	164	129
UAØAGI	A	57,960	148	115
OH2CI	*	43,815	156	127
JK2VOC	*	34,006	150	98
SP3IQ	A	11,424	65	56
EA4DEC	*	4,558	46	43
RA9FTM	*	2,870	38	35
JG3WCZ	*	180	6	6
JM2RUV	28	11,154	77	66
HA3NU	21	2,081,968	1256	641
OH5BM	21	1,793,847	1205	627
OK5H	21	1,266,540	952	505
			(Op: JK3GAD)	
ES5RY	21	1,261,260	972	539
DF9ZP	21	996,400	812	530
OE3I	21	995,032	837	488
			(Op: OE3JNB)	
RAØBA	21	968,906	765	478
JL3VUL/3	21	510,840	510	387
JQ1NGT	*	297,920	432	280
I1NVU	21	219,938	390	277
RZ4AG	21	2,640	34	33
9A3TR	14	2,505,510	1783	738
S51CK	14	2,073,732	1565	708
DF3CB	14	1,821,136	1309	688
			(Op: DL3NED)	
AN1DAX	14	87,800	219	200
UY2UF	14	640	20	20
S53M	7	2,263,059	1194	603
			(Op: S51ZO)	
DJ6QT	7	1,168,410	1037	474
JA1IZZ	3.7	1,729	22	19
UT4UXW	1.8	1,537	30	29
*ZV2W	A	1,233,552	923	496
			(Op: PT2GE)	
*RW3DU	A	764,957	909	421
*9A7P	A	612,997	679	419
*DJ7YP	A	575,706	661	419
*AM5YJ	A	496,839	807	413
			(Op: EA5YJ)	
*PAØKHS	A	305,888	512	316
*DL4RCK	A	192,066	360	269
*PP2KR	*	177,840	321	228
*JA1XUY	A	160,800	298	201
*SM6WQB	A	142,527	324	231
*DS3GLW	A	134,940	265	195
*OH2FS	A	118,464	239	192
*EA1AJV	*	108,732	301	221
*IK1SPR	A	78,831	211	171
*AH6NF	A	75,140	182	130
*YO7ARY	A	71,604	210	162
*OK2PMS	A	31,415	126	103
*OK1FJD	*	23,478	114	86
*DJ2QV	*	14,904	74	72
*AM1FBJ	*	9,348	92	82
*MMØBQI	A	3,773	58	49
*EA1JW	*	2,400	30	25

*7N2DAB	*	1,311	23	23
***ZY2Z**	**28**	**414,020**	**492**	**326**
			(Op: PT2FM)	
***JG3NKP/1**	**28**	**24,196**	**101**	**92**
***IV3JVJ**	**21**	**841,932**	**729**	**468**
***RUØBB**	**21**	**434,256**	**482**	**332**
*IR2V	*	96,693	229	193
			(Op: I2WUJ)	
*BW4/7M4TME	21	9	3	3
***SP4XQN**	**14**	**72,705**	**245**	**185**
*JA1PYP	7	520	10	10

MULTI-OPERATOR SINGLE TRANSMITTER
UNITED STATES

NF4A	**7,309,170**	**3674**	**1070**
NO5W	**7,217,808**	**3688**	**1032**
NØNI	**5,963,220**	**2997**	**972**
WT4Q	**4,999,428**	**2578**	**918**
KØOU	4,953,300	3313	869
WØGU	4,931,880	3063	876
N3AD	**4,603,804**	**2378**	**857**
K9ES	4,306,911	2606	851
WS4NC	4,091,838	2068	894
KD9ST	**3,436,890**	**2435**	**782**
WR3Z	3,373,056	1891	768
WE1H	**2,959,341**	**2005**	**759**
WØNO	2,536,398	2087	678
KDØS	2,487,012	2294	681
NZ1U	2,464,894	1634	718
NZ6Q	**2,407,183**	**1965**	**629**
WA1RR	1,920,072	1368	616
NJ2YL	1,748,406	1322	649
K5UA	1,571,304	1289	597
KM4M	1,516,276	970	562
WX7P	**1,442,814**	**1592**	**573**
WD4DDU	1,417,948	1215	569
KT5E	1,333,283	1206	553
KC9ARR	1,203,102	1225	534
KØRAY	1,185,284	1498	514
N8SHZ	**950,184**	**1107**	**477**
KC9CCQ	819,470	984	454
WK3X	676,865	864	415
NY2L	430,100	653	340
W1AF	405,552	513	336
NC1I	332,426	562	347
ABØRX	326,340	524	315
N7IH	310,720	497	320
K8III	285,215	512	281
NF1D	239,412	521	281
NA1Q	200,943	366	269
W5LCC	195,640	498	268
WA1ZYX	120,176	273	203
W4ZE	86,172	227	167
N8UZE	41,958	179	126

AFRICA

C5P	**24,012,075**	**6104**	**1275**
EA8ZS	**23,255,830**	**4892**	**1238**
CQ9K	**16,670,430**	**4032**	**1125**
AN8OK	7,410,080	2543	928
ZSØM	**3,730,510**	**1838**	**685**

ASIA

RK9CZD	**5,894,656**	**2272**	**794**
JA1YPA	**3,297,773**	**1682**	**703**
JH2UVL	2,341,812	1405	628
JI2ZEY	1,655,906	1074	554
6NØYO	**1,547,288**	**1265**	**538**
JU1DX	**1,364,192**	**1427**	**479**
YM3WW	**1,338,784**	**1045**	**428**
TA2KK	1,145,326	830	403
BV2B/1	**291,500**	**685**	**265**
RN9WWW	194,814	305	237
JA1ZKZ	154,224	253	216
UK8IWW	**53,874**	**178**	**123**
RK9AZZ	25,802	110	97

EUROPE

IR4T	**10,078,080**	**3393**	**1086**
TM5C	**9,913,392**	**3567**	**1032**
HG1S	**9,414,900**	**3398**	**1100**
OM7M	**9,001,440**	**3253**	**1120**
EN7Z	**8,190,976**	**3539**	**1024**
OMØM	**6,063,755**	**2693**	**899**
DL2ARD	**5,549,760**	**2484**	**940**
OE3A	**5,296,500**	**2436**	**900**
TM7F	5,110,312	2465	904
DL5RMH	4,669,028	2078	889
YT7A	**4,664,946**	**2365**	**858**
S5ØR	**4,300,569**	**2174**	**819**
G5W	**4,196,952**	**2311**	**852**
Z37M	**4,040,107**	**2383**	**823**
RF3A	**3,644,032**	**2505**	**784**
EA3RKG	**3,415,720**	**1990**	**770**
G6PZ	3,066,069	1844	761
OT3L	**2,931,768**	**1790**	**756**
M5D	2,917,215	1949	735
SZ3PTR	**2,782,594**	**2254**	**734**
SP9LJD	2,395,640	1565	680
IO2L	2,298,706	1538	697
UZ4E	2,142,504	1761	654
YT7W	1,990,656	1399	648
RK4WWA	1,900,656	1642	603
RK3DZB	1,762,190	1445	626
CS6RPA	**1,674,432**	**1454**	**684**
OH6K	**1,538,644**	**1673**	**602**
OL5Q	**1,623,344**	**1214**	**568**
DLØDX	1,607,970	1331	589
YL7C	**1,575,936**	**1292**	**608**
M8C	1,559,250	1441	594
RK3MWD	1,344,866	1313	562
SV9FBG	**1,297,440**	**1761**	**544**
IO3T	1,232,395	1227	515
UV7M	1,226,404	1318	514
G8A	1,224,544	1105	544
OK1KZE	1,113,552	943	528
IR9K	**992,256**	**1166**	**544**
LY3VM	**984,714**	**966**	**487**
SP9KDA	978,942	1005	482
US0Q	958,320	1077	495
IV3WZG	941,825	884	505
GX0FUN	933,570	1066	495
OR3P	926,590	935	490
HE2AG	**875,196**	**797**	**483**
DN1CUR	870,881	1000	451
DLØMBG	799,236	766	447
GX3SAD	661,300	816	425
OE8YDQ	648,420	785	428
LZ1KSC	**633,213**	**745**	**399**
TM6R	593,957	756	427
M4U	513,776	740	394
OH6BG	501,630	544	345
OK1KDT	489,003	637	373
OL7C	422,639	579	349
AM7HZ	401,802	482	334
SN75PRK	384,540	590	340
LN1B	**364,296**	**564**	**344**
UR4IYZ	357,028	590	311
OR3A	318,422	508	331
SL2ZA	**315,898**	**591**	**346**
AM2URV	311,320	531	344
TF3W	**279,545**	**503**	**343**
OK1KMG	246,828	495	268
IY4W	168,181	331	221
II1D	159,576	370	244
RZ4LWT	154,696	365	244
DF3TE	139,920	356	240
JW8G	**137,558**	**267**	**218**
AN2WP	136,284	386	246
YL1XN	120,032	280	184
LA1TUR	107,120	304	206
LN1K	93,720	292	220
SP9KJU	87,710	256	179
OZ5E	66,676	188	158
F6KOH	66,675	215	175
OT3W	63,578	251	166
G1Y	49,455	188	157
HB9FBK	48,280	196	142
PI4NYM	**46,305**	**172**	**135**
SP9KTL	42,840	146	119
UR4PWC	29,952	144	104
EW8ZZ	**19,065**	**107**	**93**
SP9KMQ	15,708	89	84
SK7A	13,695	95	83
SP6KYU	13,552	84	77
SP3PKL	7,140	78	70
OK5SWL	3,654	51	42
OK2KRO	570	16	15

NORTH AMERICA

TO4T	**10,862,952**	**3971**	**1052**
VE7SV	**8,732,028**	**3402**	**906**
VP55W	**6,433,492**	**3588**	**806**
HU1M	**6,417,264**	**3544**	**807**
KL7RA	**5,788,590**	**2380**	**942**
VE6SV	**4,856,382**	**2365**	**834**
VE7GL	3,714,060	1872	717
HI3CCP	**3,297,184**	**1987**	**646**
VE6AO	3,136,250	2102	625
TIØRC	**2,890,368**	**1775**	**624**
VE3RM	**2,880,640**	**1683**	**640**
VE3HG	1,378,370	1005	490
NL7RT	23,772	103	84

OCEANIA

ZL6QH	**8,200,238**	**3817**	**842**
YE8A	**3,398,382**	**1924**	**611**
WHØV	**2,101,970**	**1333**	**494**

SOUTH AMERICA

PQ2Q	**11,658,240**	**3653**	**1104**
ZY7C	9,024,366	2948	911
LU1NDC	**7,792,120**	**2754**	**952**
ZP4ØZ	**5,338,560**	**2251**	**830**
LT5Y	3,154,960	1608	698
ZW9ØS	2,837,186	1554	638
ZZ8Z	2,248,470	1327	602
PY3MHZ	2,046,800	1190	602
ZV5K	1,123,763	904	457
XR6T	**914,732**	**888**	**364**
PY3PXY	882	19	18

MULTI-OPERATOR TWO TRANSMITTER
UNITED STATES

KM3T	**9,950,919**	**3947**	**1041**
KI5DR	**9,459,537**	**5031**	**1063**
WX5S	**6,767,560**	**3987**	**890**
AA5NT	6,156,410	3980	923
WM4RM	**4,858,233**	**2303**	**879**
NK7U	**4,605,340**	**3543**	**818**
AG1RL	4,269,801	2961	827
NG3U	**3,439,077**	**2120**	**773**
ND6E	2,081,450	1844	665
KO8HIO	**1,509,470**	**1225**	**557**
AG1C	1,008,458	1000	506
K7PAR	16,683	123	83

DX

STØRY	**30,346,161**	**8587**	**1119**
P3A	**27,063,259**	**7132**	**1129**
V47KP	**15,958,488**	**5391**	**1092**
TI5N	**14,729,550**	**5599**	**1054**
HG5N	**12,127,464**	**4464**	**1167**
RU1A	**11,814,660**	**4738**	**1122**
MD4K	**10,381,280**	**4649**	**1040**
9M2RPN	**7,698,094**	**3845**	**829**
LX4B	**7,218,240**	**3425**	**960**
LY4CW	**6,118,082**	**3022**	**926**
EMØU	**5,673,602**	**2772**	**926**
EA5DFV	**5,194,950**	**2564**	**885**
VE6FI	**4,930,242**	**2531**	**797**
JA6ZPR	**4,631,898**	**2125**	**786**
DAØAA	**4,578,700**	**2568**	**844**
VP5RZS	**3,873,416**	**2508**	**646**
CV1T	**2,233,579**	**1263**	**629**
SN5Z	**1,275,845**	**1159**	**545**
OK1KCI	**801,471**	**824**	**447**
ED1EY	99,715	256	185
YO3KYO	**34,680**	**136**	**120**

MULTI-OPERATOR MULTI-TRANSMITTER
UNITED STATES

NR6O	**13,362,844**	**6704**	**1076**
NW4V	**10,332,990**	**4504**	**1110**
NE1C	**5,772,540**	**3251**	**940**
AE9B	**5,660,460**	**3957**	**885**
WX3B	**3,338,015**	**2327**	**779**
K8UP	**451,389**	**605**	**379**
K8PI	213,360	482	280

DX

HC8N	**60,703,452**	**11911**	**1476**
L71F	**29,254,018**	**7213**	**1333**
YW4M	**26,112,248**	**6034**	**1202**
OT3A	**16,418,964**	**5851**	**1178**
LZ9W	**14,107,545**	**5392**	**1145**
YZ7W	**10,032,057**	**4200**	**1071**
LY7A	**9,418,752**	**4275**	**1022**
EA4URE	**9,196,200**	**3854**	**1048**
ED7VG	8,133,906	3918	982
DFØCQ	**5,417,430**	**2968**	**890**
OL7R	**4,352,400**	**2406**	**806**
SN4L	**4,144,770**	**2393**	**810**
VE7SCC	**3,810,534**	**2275**	**637**
VE5RI	**3,414,480**	**2120**	**594**
OK7K	**1,106,714**	**1088**	**491**
LU8XW	**1,032,384**	**808**	**456**
R9/N5XZ	**984,906**	**846**	**414**
VE7FO	639,292	690	362
YO8KRR	**80,256**	**262**	**209**

CHECKLOGS

The following were used for cross-checking. Checklog and SWL logs are always appreciated: 4L4KW, 4Z5FL/M, 9A3VM, 9A4MF, 9A4U, 9A5KV, DH5MM, DJ1CW, DL1JMS, DL5DWW, DL7VMM, DL8UAT, DL9UBF, EA3BJM, EA3DUZ, EA3KN, EA4YT, EA5BCX, EA5GOT, EA7GV, ERSAA, EU1CC, EY8MM, F/G3VQO/P, G3NXT, HAØGK, IU3X, JW9GY, KØRMK, LA7FJA, LA9RY, LU18D, LY1CT, LZ1FJ, N5IJE, OK1DMP, OK1JNL, OK1KDO, OK5SAZ, P49MR, PT7CB, PU5WMB, PY2EMC, PY3CEJ, PY3CQ, RA1QDP, RA3ZH, RA4HT, RA4LO, RA6LAR, RA9AC, RA9FLW, RA9SD, RF4R, RK9LWO, RL3A, RN6FA, RN9CWB, RT9W, RU3DG, RU3DNN, RU6YY, RV3DAR, RV6FG, RWØBG, RWØBM, RW3DIA, RW4PJ, RX4HX, RZ3AWM, RZ3DK, RZ3DO, SMØBNK, SMØLZT, SM3T, SP2GJV, SP2MEF, SP3BLT, SP3CGK, SP3JUN, SP5ELW, SP5ICS, SP6CPF, SP6KFA, SP6M, SP8JMA, SP9CVY, SP9HZF, SP9MDY, SP9PRO, SQ5TT, SQ6FHP, SQ9MZ, SV1XV, UAØCA, UA1AKE, UA1NDX, UA2FT, UA3DEE, UA3RAW, UA6JD, UA9AX, UA9JLL, UN9GD, UO7DG, UT4EK, UT5JAP, UT5JDS, UUØJC, UU4JWF, UW2F, W5BBR, YL2CR, YL5M, YO5AY, YO9GFD, YR5ØØ, YZ1EW, Z35A, Z39Z.

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Looking Ahead...

Here's some of what we're working on for upcoming issues of *CQ*:

"*CQ* Market Survey: FM Mobile Transceivers," by WB6NOA

"Hams and Homeowners' Associations," by KGØKI

"First Look: Elecraft KX-1," by K4TWJ

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